MT. DIABLO UNIFIED SCHOOL DISTRICT
PURCHASING & WAREHOUSE DEPARTMENT
2326 Bisso Lane, Concord, CA 94520-4802

BID #1963

MDUSD 2025 El Dorado Middle School Multi-Purpose Building Upgrade Project

Upgrade the existing multi-purpose building with particular emphasis on upgrades to the kitchen at El Dorado Middle School.

VOLUME II

PROJECT MANUAL AND SPECIFICATIONS
FOR
MT. DIABLO UNIFIED SCHOOL DISTRICT

EL DORADO MIDDLE SCHOOL
MULTI-PURPOSE BUILDING UPGRADES

DSA Application No. 01-121540

SIGNATURE PAGE

IDENTIFICATION STAMP
DIV. OF THE STATE ARCHITECT
APP: 01-121540 INC:
REVIEWED FOR
SS ☑ FLS ☑ ACS ☑
DATE: 3/28/2025

Owner:
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Melanie Koslow – Director of Facilities

Architect:
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Sacramento, CA 95811
(916) 329-4000

LICENSED ARCHITECT
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No. C-26867
RENEWAL DATE: 01/31/27
STATE OF CALIFORNIA

1/27/25

Brian J. Maytum - AIA — California Registration C-26867

Structural Engineer:
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REGISTERED STRUCTURAL ENGINEER
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No. 5393
Exp. 6/30/25
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1/27/25

Jason Thomas Scanlan — California Registration S-5393

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REGISTERED PROFESSIONAL ENGINEER
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M 34234
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1/27/25

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01/27/2025

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DSA 103-22: LISTING OF STRUCTURAL TESTS & SPECIAL INSPECTIONS, 2022 CBC

General

EXHIBIT A

Application Number: 01-121540	**School Name:** El Dorado Middle School Multi Purpose Building Upgrades	**School District:** Mt. Diablo Unified School District
DSA File Number: 7-29	**Increment Number:**	**Date Created:** 2024-02-12 16:01:34

IMPORTANT: This form is only a summary list of structural tests and some of the special inspections required for the project. Generally, the structural tests and special inspections noted on this form are those that will be performed by the Geotechnical Engineer of Record, Laboratory of Record, or Special Inspector. The actual complete test and inspection program must be performed as detailed on the DSA approved documents. The appendix at the bottom of this form identifies work NOT subject to DSA requirements for special inspection or structural testing. The project inspector is responsible for providing inspection of all facets of construction, including but not limited to, special inspections not listed on this form such as structural wood framing, high-load wood diaphragms, cold-formed steel framing, anchorage of non-structural components, etc., per Title 24, Part 2, Chapter 17A (2022 CBC).

****NOTE:** Undefined section and table references found in this document are from the CBC, or California Building Code.

KEY TO COLUMNS

1. TYPE	2. PERFORMED BY
Continuous – Indicates that a continuous special inspection is required **Periodic –** Indicates that a periodic special inspection is required **Test –** Indicates that a test is required	**GE (Geotechnical Engineer) –** Indicates that the special inspection shall be performed by a registered geotechnical engineer or his or her authorized representative. **LOR (Laboratory of Record) –** Indicates that the test or special inspection shall be performed by a testing laboratory accepted in the DSA Laboratory Evaluation and Acceptance (LEA) Program. See CAC Section 4-335. **PI (Project Inspector) –** Indicates that the special inspection may be performed by a project inspector when specifically approved by DSA. **SI (Special Inspection) –** Indicates that the special inspection shall be performed by an appropriately qualified/approved special inspector.

EXHIBIT A

DSA 103-22: LISTING OF STRUCTURAL TESTS & SPECIAL INSPECTIONS (SOILS), 2022 CBC

Table 1705A.6, Table 1705A.7, Table 1705A.8

Application Number: 01-121540	**School Name:** El Dorado Middle School Multi Purpose Building Upgrades	**School District:** Mt. Diablo Unified School District
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Geotechnical Reports: Project does NOT have and does NOT require a geotechnical report

	S1. GENERAL:			
	Test or Special Inspection	**Type**	**Performed By**	**Code References and Notes**
☑	**a.** Verify that: • Site has been prepared properly prior to placement of controlled fill and/or excavations for foundations. • Foundation excavations are extended to proper depth and have reached proper material. • Materials below footings must not contain loose material, mud, organic silt, organic clays, or peat.	**See Notes**	**PI**	Refer to specific items identified in the Appendix listing exemptions for limitations. Placement of controlled fill exceeding 12" depth under foundations and/or within the building envelope is not permitted without a geotechnical report.

	S2. SOIL COMPACTION AND FILL:			
	Test or Special Inspection	**Type**	**Performed By**	**Code References and Notes**
☐	**a.** Perform classification and testing of fill materials.	**Test**	**LOR***	* Under the supervision of the geotechnical engineer.
☑	**b.** Verify use of proper materials, densities and inspect lift thicknesses, placement and compaction during placement of fill.	**Continuous**	**LOR***	* Under the supervision of a geotechnical engineer or LOR's engineering manager. Refer to specific items identified in the Appendix listing exemptions for limitations.
☑	**c.** Compaction testing.	**Test**	**LOR***	* Under the supervision of a geotechnical engineer or LOR's engineering manager. Refer to specific items identified in the Appendix listing exemptions for limitations.

	S3. DRIVEN DEEP FOUNDATIONS (PILES):			
	Test or Special Inspection	**Type**	**Performed By**	**Code References and Notes**
☐	**a.** Verify pile materials, sizes and lengths comply with the requirements.	**Continuous**	**GE***	* By geotechnical engineer or his or her qualified representative.

EXHIBIT A

DSA 103-22: LISTING OF STRUCTURAL TESTS & SPECIAL INSPECTIONS (SOILS), 2022 CBC

Table 1705A.6, Table 1705A.7, Table 1705A.8

Application Number: 01-121540
School Name: El Dorado Middle School Multi Purpose Building Upgrades
School District: Mt. Diablo Unified School District
DSA File Number: 7-29
Increment Number:
Date Created: 2024-02-12 16:01:34

	Test or Special Inspection	Type	Performed By	Code References and Notes
☐	**b.** Determine capacities of test piles and conduct additional load tests as required.	**Test**	**LOR***	* Under the supervision of the geotechnical engineer.
☐	**c.** Inspect driving operations and maintain complete and accurate records for each pile.	**Continuous**	**GE***	* By geotechnical engineer or his or her qualified representative.
☐	**d.** Verify locations of piles and their plumbness, confirm type and size of hammer, record number of blows per foot of penetration, determine required penetrations to achieve design capacity, record tip and butt elevations and record any pile damage.	**Continuous**	**GE***	* By geotechnical engineer or his or her qualified representative.
☐	**e.** Steel piles.	Provide tests and inspections per STEEL section below.		
☐	**f.** Concrete piles and concrete filled piles.	Provide tests and inspections per CONCRETE section below.		
☐	**g.** For specialty piles, perform additional inspections as determined by the registered design professional in responsible charge.	*	*	* As defined on drawings or specifications.

	S4. CAST-IN-PLACE DEEP FOUNDATIONS (PIERS):			
	Test or Special Inspection	**Type**	**Performed By**	**Code References and Note**
☐	**a.** Inspect drilling operations and maintain complete and accurate records for each pier.	**Continuous**	**PI**	Continuous inspection to be provided by project inspector. Refer to specific items identified in the Appendix listing exemptions for limitations.
☐	**b.** Verify pier locations, diameters, plumbness and lengths.Record concrete or grout volumes.	**Continuous**	**PI**	Continuous inspection to be provided by project inspector. Refer to specific items identified in the Appendix listing exemptions for limitations.
☐	**c.** Concrete piers.	Provide tests and inspections per CONCRETE section below.		

EXHIBIT A

DSA 103-22: LISTING OF STRUCTURAL TESTS & SPECIAL INSPECTIONS (SOILS), 2022 CBC

Table 1705A.6, Table 1705A.7, Table 1705A.8

Application Number: 01-121540
School Name: El Dorado Middle School Multi Purpose Building Upgrades
School District: Mt. Diablo Unified School District
DSA File Number: 7-29
Increment Number:
Date Created: 2024-02-12 16:01:34

	Test or Special Inspection	Type	Performed By	Code References and Notes
	S5. RETAINING WALLS:			
	Test or Special Inspection	**Type**	**Performed By**	**Code References and Notes**
☐	**a.** Placement, compaction and inspection of backfill.	**Continuous**	**GE***	**1705A.6.1.** * By geotechnical engineer or his or her qualified representative. (See section S2 above).
☐	**b.** Placement of soil reinforcement and/or drainage devices.	**Continuous**	**GE***	* By geotechnical engineer or his or her qualified representative.
☐	**c.** Segmental retaining walls; inspect placement of units, dowels, connectors, etc.	**Continuous**	**GE***	* By geotechnical engineer or his or her qualified representative. See DSA IR 18-2.
☐	**d.** Concrete retaining walls.	Provide tests and inspections per CONCRETE section below.		
☐	**e.** Masonry retaining walls.	Provide tests and inspections per MASONRY section below.		

	S6. OTHER SOILS:			
	Test or Special Inspection	**Type**	**Performed By**	**Code References and Notes**
☐	**a.** Soil Improvements	**Test**	**GE***	Submit a comprehensive report documenting final soil improvements constructed, construction observation and the results of the confirmation testing and analysis to CGS (California Geological Survey) for final acceptance. * By geotechnical engineer or his or her qualified representative.
☐	**b.** Inspection of Soil Improvements	**Continuous**	**GE***	* By geotechnical engineer or his or her qualified representative.
☐	**c.**			

DSA 103-22: LISTING OF STRUCTURAL TESTS & SPECIAL INSPECTIONS (CONCRETE), 2022 CBC

Table 1705A.3; ACI 318-19 Sections 26.12 & 26.13

EXHIBIT A

Application Number: 01-121540
School Name: El Dorado Middle School Multi Purpose Building Upgrades
School District: Mt. Diablo Unified School District
DSA File Number: 7-29
Increment Number:
Date Created: 2024-02-12 16:01:34

	C1. CAST-IN-PLACE CONCRETE			
	Test or Special Inspection	**Type**	**Performed By**	**Code References and Notes**
☑	**a.** Verify use of required design mix.	**Continuous**	**SI**	**Table 1705A.3 Item 5, 1910A.1.**
☑	**b.** Identifiy, sample, and test reinforcing steel.	**Test**	**LOR**	**1910A.2;** ACI 318-19 Ch.20 and Section 26.6.1.2; DSA IR 17-10. (See Appendix (end of this form) for exemptions.)
☑	**c.** During concrete placement, fabricate specimens for strength tests, perform slump and air content tests, and determine the temperature of the concrete.	**Test**	**LOR**	**Table 1705A.3 Item 6**; ACI 318-19 Sections 26.5 & 26.12.
☑	**d.** Test concrete (f'_c).	**Test**	**LOR**	**1905A.1.17;** ACI 318-19 Section 26.12.
☑	**e.** Batch plant inspection: **Continuous**	**See Notes**	**SI**	Default of **'Continuous'** per **1705A.3.3**. If approved by DSA, batch plant inspection may be reduced to **'Periodic'** subject to requirements in Section **1705A.3.3.1,** or not required per **1705A.3.3.2.** See IR 17-13. (See Appendix (end of this form) for exemptions.)
☐	**f.** Welding of reinforcing steel.	Provide special inspection per STEEL, Category S/A4(d) & (e) and/or S/A5(g) & (h) below.		

	C2. PRESTRESSED / POST-TENSIONED CONCRETE (IN ADDITION TO SECTION C1):			
	Test or Special Inspection	**Type**	**Performed By**	**Code References and Notes**
☐	**a.** Sample and test prestressing tendons and anchorages.	**Test**	**LOR**	**1705A.3.4, 1910A.3**
☐	**b.** Inspect placement of prestressing tendons.	**Periodic**	**SI**	**1705A.3.4, Table 1705A.3 Items 1 & 9.**

EXHIBIT A

Application Number: 01-121540
School Name: El Dorado Middle School Multi Purpose Building Upgrades
School District: Mt. Diablo Unified School District
DSA File Number: 7-29
Increment Number:
Date Created: 2024-02-12 16:01:34

	Test or Special Inspection	Type	Performed By	Code References and Notes
☐	**c.** Verify in-situ concrete strength prior to stressing of post-tensioning tendons.	**Periodic**	**SI**	**Table 1705A.3 Item 13.** Special inspector to verify specified concrete strength test prior to stressing.
☐	**d.** Inspect application of post-tensioning or prestressing forces and grouting of bonded prestressing tendons.	**Continuous**	**SI**	**1705A.3.4, Table 1705A.3 Item 9;** ACI 318-19 Section 26.13

	C3. PRECAST CONCRETE (IN ADDITION TO SECTION C1):			
	Test or Special Inspection	**Type**	**Performed By**	**Code References and Notes**
☐	**a.** Inspect fabrication of precast concrete members.	**Continuous**	**SI**	ACI 318-19 Section 26.13, and PCI MNL-128 and -130.
☐	**b.** Inspect erection of precast concrete members.	**Periodic**	**SI***	**Table 1705A.3 Item 10.** * May be performed by PI when specifically approved by DSA.
☐	**c.** For precast concrete diaphragm connections or reinforcement at joints classified as moderate or high deformability elements (MDE or HDE) in structures assigned to Seismic Design Category D, E or F, inspect such connections and reinforcement in the field for: 1. Installation of the embedded parts 2. Completion of the continuity of reinforcement across joints. 3. Completion of connections in the field.	**Continuous**	**SI**	Table 1705A.3; ACI 318-19 Section 26.13.1.3; ACI 550.5
☐	**d.** Inspect installation tolerances of precast concrete diaphragm connections for compliance with ACI 550.5.	**Periodic**	**SI**	Table 1705A.3; ACI 318-19 Section 26.13.1.3; ACI 550.5

EXHIBIT A

DSA 103-22: LISTING OF STRUCTURAL TESTS & SPECIAL INSPECTIONS (CONCRETE), 2022 CBC

Table 1705A.3; ACI 318-19 Sections 26.12 & 26.13

Application Number:
01-121540

School Name:
El Dorado Middle School Multi Purpose Building Upgrades

School District:
Mt. Diablo Unified School District

DSA File Number:
7-29

Increment Number:

Date Created:
2024-02-12 16:01:34

	C4. SHOTCRETE (IN ADDITION TO SECTION C1):			
	Test or Special Inspection	**Type**	**Performed By**	**Code References and Notes**
☐	**a.** Inspect shotcrete placement for proper application techniques.	**Continuous**	**SI**	**1705A.3.9, Table 1705A.3 Item 7, 1908A.1, 1908A.2, 1908A.3.** See ACI 506.2-13 Section 3.4, ACI 506R-16.
☐	**b.** Sample and test shotcrete (f'_c).	**Test**	**LOR**	**1908A.2, 1705A.3.9**

	C5. POST-INSTALLED ANCHORS:			
	Test or Special Inspection	**Type**	**Performed By**	**Code References and Notes**
☑	**a.** Inspect installation of post-installed anchors	**See Notes**	**SI***	**1617A.1.19, Table 1705A.3 Item 4a (Continuous) & 4b (Periodic), 1705A.3.8** (See Appendix (end of this form) for exemptions). ACI 318-19 Section 26.13. * May be performed by the project inspector when specifically approved by DSA.
☑	**b.** Test post-installed anchors.	**Test**	**LOR**	**1910A.5.** (See Appendix (end of this form) for exemptions.)

	C6. OTHER CONCRETE:			
	Test or Special Inspection	**Type**	**Performed By**	**Code References and Notes**
☐	**a.**			

DSA 103-22: LISTING OF STRUCTURAL TESTS & SPECIAL INSPECTIONS (STEEL AND ALUMNINUM), 2022 CBC

1705A.2.1, Table 1705A.2.1; AISC 303-16, AISC 341-16, AISC 358-16, AISC 360-16; AISI S100-20; RCSC 2014; AWS D1.1, AWS D1.2, AWS D1.3, AWS D1.4, AWS D1.8

EXHIBIT A

Application Number:
01-121540
School Name:
El Dorado Middle School Multi Purpose Building Upgrades
School District:
Mt. Diablo Unified School District
DSA File Number:
7-29
Increment Number:
Date Created:
2024-02-12 16:01:34

	S/A1. STRUCTURAL STEEL, COLD-FORMED STEEL AND ALUMINUM USED FOR STRUCTURAL PURPOSES			
	Test or Special Inspection	**Type**	**Performed By**	**Code References and Notes**
☐	**a.** Verify identification of all materials and: • Mill certificates indicate material properties that comply with requirements. •Material sizes, types and grades comply with requirements.	**Periodic**	*	**Table 1705A.2.1 Item 3a–3c.** 2202A.1**;** AISI S100-20 Section A3.1 & A3.2, AISI S240-20 Section A3 & A5, AISI S220-20 Sections A4 & A6. * By special inspector or qualified technician when performed off-site.
☐	**b.** Test unidentified materials	**Test**	**LOR**	**2202A.1.**
☐	**c.** Examine seam welds of HSS shapes	**Periodic**	**SI**	DSA IR 17-3.
☐	**d.** Verify and document steel fabrication per DSA-approved construction documents.	**Periodic**	**SI**	Not applicable to cold-formed steel light-frame construction, except for trusses (**1705A.2.4**).
☐	**e.** Buckling restrained braces.	**Test**	**LOR**	Testing and special inspections in accordance with IR 22-4.

	S/A2. HIGH-STRENGTH BOLTS:			
	Test or Special Inspection	**Type**	**Performed By**	**Code References and Notes**
☐	**a.** Verify identification markings and manufacturer's certificates of compliance conform to ASTM standards specified in the DSA-approved documents.	**Periodic**	**SI**	**Table 1705A.2.1 Items 1a & 1b, 2202A.1;** AISC 360-16 Section A3.3, J3.1, and N3.2; RCSC 2014 Section 1.5 & 2.1; DSA IR 17-8 & DSA IR 17-9.
☐	**b.** Test high-strength bolts, nuts and washers.	**Test**	**LOR**	**Table 1705A.2.1 Item 1c, 2213A.1**; RCSC 2014 Section 7.2; DSA IR 17-8.
☐	**c.** Bearing-type ("snug tight") connections.	**Periodic**	**SI**	**Table 1705A.2.1 Item 2a, 1705A.2.6, 2204A.2**; AISC 360-16 J3.1, J3.2, M2.5 & N5.6; RCSC 2014 Section 9.1; DSA IR 17-9.
☐	**d.** Pretensioned and slip-critical connections.	*	**SI**	**Table 1705A.2.1 Items 2b & 2c, 1705A.2.6, 2204A.2;** AISC 360-16 J3.1, J3.2, M2.5 & N5.6; RCSC 2014 Sections 9.2 & 9.3; DSA IR 17-9. *"Continuous" or "Periodic" depends on the tightening method used.

EXHIBIT A

Application Number:	**School Name:**	**School District:**
01-121540	El Dorado Middle School Multi Purpose Building Upgrades	Mt. Diablo Unified School District
DSA File Number:	**Increment Number:**	**Date Created:**
7-29		2024-02-12 16:01:34

	S/A3. WELDING:			
	Test or Special Inspection	**Type**	**Performed By**	**Code References and Notes**
☑	**a.** Verify weld filler material identification markings per AWS designation listed on the DSA-approved documents and the WPS.	**Periodic**	**SI**	**1705A.2.5, Table 1705A.2.1 Items 4 & 5**; AWS D1.1 and AWS D1.8 for structural steel; AWS D1.2 for Aluminum; AWS D1.3 for cold-formed steel; AWS D1.4 for reinforcing steel; DSA IR 17-3.
☑	b. Verify weld filler material manufacturer's certificate of compliance.	**Periodic**	**SI**	DSA IR 17-3.
☑	**c.** Verify WPS, welder qualifications and equipment.	**Periodic**	**SI**	DSA IR 17-3.

	S/A4. SHOP WELDING (IN ADDITION TO SECTION S/A3):			
	Test or Special Inspection	**Type**	**Performed By**	**Code References and Notes**
☐	**a.** Inspect groove welds, multi-pass fillet welds, single pass fillet welds > 5/16", plug and slot welds.	**Continuous**	**SI**	**Table 1705A.2.1 Items 5a.1–4;** AISC 360-16 (and AISC 341-16 as applicable); DSA IR 17-3.
☑	b. Inspect single-pass fillet welds ≤ 5/16", floor and roof deck welds.	**Periodic**	**SI**	**1705A.2.2, Table 1705A.2.1 Items 5a.5 & 5a.6;** AISC 360-16 (and AISC 341-16 as applicable); DSA IR 17-3.
☐	**c.** Inspect welding of stairs and railing systems.	**Periodic**	**SI**	**1705A.2.1**; AISC 360-16 (and AISC 341-16 as applicable); AWS D1.1 & D1.3; DSA IR 17-3.
☐	**d.** Verification of reinforcing steel weldability other than ASTM A706.	**Periodic**	**SI**	**1705A.3.1**; AWS D1.4; DSA IR 17-3. Verify carbon equivalent reported on mill certificates.
☐	**e.** Inspect welding of reinforcing steel.	**Continuous**	**SI**	**Table 1705A.2.1 Item 5b, 1705A.3.1, Table 1705A.3 Item 2, 1903A.8;** AWS D1.4; DSA IR 17-3.

EXHIBIT A

Application Number: 01-121540
School Name: El Dorado Middle School Multi Purpose Building Upgrades
School District: Mt. Diablo Unified School District
DSA File Number: 7-29
Increment Number:
Date Created: 2024-02-12 16:01:34

	Test or Special Inspection	Type	Performed By	Code References and Notes
	S/A5. FIELD WELDING (IN ADDITION TO SECTION S/A3):			
	Test or Special Inspection	**Type**	**Performed By**	**Code References and Notes**
☐	**a.** Inspect groove welds, multi-pass fillet welds, single pass fillet welds > 5/16", plug and slot welds.	**Continuous**	**SI**	**Table 1705A.2.1 Items 5a.1–4;** AISC 360-16 (AISC 341-16 as applicable); DSA IR 17-3.
☐	b. Inspect single-pass fillet welds ≤ 5/16".	**Periodic**	**SI**	**Table 1705A.2.1 Item 5a.5;** AISC 360-16 (AISC 341-16 as applicable); DSA IR 17-3.
☐	**c.** Inspect end-welded studs (ASTM A-108) installation (including bend test).	**Periodic**	**SI**	**2213A.2**; AISC 360-16 (AISC 341-16 as applicable); AWS D1.1; DSA IR 17-3.
☐	**d.** Inspect floor and roof deck welds.	**Periodic**	**SI**	**1705A.2.2, Table 1705A.2.1 Item 5a.6;** AISC 360-16 (AISC 341-16 as applicable); AWS D1.3; DSA IR 17-3.
☐	**e.** Inspect welding of structural cold-formed steel.	**Periodic**	**SI***	**1705A.2.5; AWS D1.3; DSA IR 17-3.** The quality control provisions of AISI S240-20 Chapter D shall also apply. * May be performed by the project inspector when specifically approved by DSA.
☐	**f.** Inspect welding of stairs and railing systems.	**Periodic**	**SI***	**1705A.2.1;** AISC 360-16 (AISC 341-16 as applicable); AWS D1.1 & D1.3; DSA IR 17-3. * May be performed by the project inspector when specifically approved by DSA.
☐	**g.** Verification of reinforcing steel weldability.	**Periodic**	**SI**	**1705A.3.1**; AWS D1.4; DSA IR 17-3. Verify carbon equivalent reported on mill certificates.
☐	**h.** Inspect welding of reinforcing steel.	**Continuous**	**SI**	**Table 1705A.2.1 Item 5b, 1705A.3.1, Table 1705A.3 Item 2, 1903A.8;** AWS D1.4; DSA IR 17-3.

EXHIBIT A

Application Number: 01-121540
School Name: El Dorado Middle School Multi Purpose Building Upgrades
School District: Mt. Diablo Unified School District
DSA File Number: 7-29
Increment Number:
Date Created: 2024-02-12 16:01:34

	Test or Special Inspection	Type	Performed By	Code References and Notes
	S/A6. NONDESTRUCTIVE TESTING:			
	Test or Special Inspection	**Type**	**Performed By**	**Code References and Notes**
☐	**a.** Ultrasonic	**Test**	**LOR**	**1705A.2.1, 1705A.2.5;** AISC 341-16 J6.2, AISC 360-16 N5.5; AWS D1.1, AWS D1.8; DSA IR 17-2.
☐	**b.** Magnetic Particle	**Test**	**LOR**	**1705A.2.1, 1705A.2.5;** AISC 341-16 J6.2, AISC 360-16 N5.5; AWS D1.1, AWS D1.8; DSA IR 17-2.
☐	**c.**	**Test**	**LOR**	

	Test or Special Inspection	Type	Performed By	Code References and Notes
	S/A7. STEEL JOISTS AND TRUSSES:			
	Test or Special Inspection	**Type**	**Performed By**	**Code References and Notes**
☐	**a.** Verify size, type and grade for all chord and web members as well as connectors and weld filler material; verify joist profile, dimensions and camber (if applicable); verify all weld locations, lengths and profiles; mark or tag each joist.	**Continuous**	**SI**	**1705A.2.3, Table 1705A.2.3;** AWS D1.1; DSA IR 22-3 for steel joists only. **1705A.2.4;** AWS D1.3 for cold-formed steel trusses.

EXHIBIT A

Application Number: 01-121540	**School Name:** El Dorado Middle School Multi Purpose Building Upgrades	**School District:** Mt. Diablo Unified School District
DSA File Number: 7-29	**Increment Number:**	**Date Created:** 2024-02-12 16:01:34

	Test or Special Inspection	Type	Performed By	Code References and Notes
	S/A8. SPRAYED FIRE-RESISTANT MATERIALS:			
	Test or Special Inspection	**Type**	**Performed By**	**Code References and Notes**
☐	**a.** Examine structural steel surface conditions, inspect application, take samples, measure thickness and verify compliance of all aspects of application with DSA-approved documents.	**Periodic**	**SI**	**1705A.15, 1705A.15.1, 1705A.15.2, 1705A.15.3, 1705A.15.4, 1705A.15.5, 1705A.15.6.**
☐	**b.** Test density.	**Test**	**LOR**	**1705A.15.1, 1705A.15.5, ASTM E605**
☐	**c.** Bond strength adhesion/cohesion.	**Test**	**LOR**	**1705A.15.1, 1705A.15.6, ASTM E736**

	Test or Special Inspection	Type	Performed By	Code References and Notes
	S/A9. ANCHOR BOLTS AND ANCHOR RODS:			
	Test or Special Inspection	**Type**	**Performed By**	**Code References and Notes**
☐	**a.** Anchor Bolts and Anchor Rods	**Test**	**LOR**	Identify, sample and test anchor bolts and anchor rods **not** meeting exemptions identified in Section 1 of IR 17-11.
☐	**b.** Threaded rod not used for foundation anchorage.	**Test**	**LOR**	Identify, sample and test threaded rods **not** meeting exemptions identified in Section 1 of IR 17-11.

	Test or Special Inspection	Type	Performed By	Code References and Notes
	S/A10. STORAGE RACK SYSTEMS:			
	Test or Special Inspection	**Type**	**Performed By**	**Code References and Notes**
☐	**a.** Materials used, to verify compliance with one or more of the material test reports in accordance with the approved construction documents.	**Periodic**	**SI**	Table 1705A.13.7
☐	**b.** Fabricated storage rack elements.	**Periodic**	**SI**	1704A.2.5; Table 1705A.13.7

EXHIBIT A

Application Number:
01-121540

School Name:
El Dorado Middle School Multi Purpose Building Upgrades

School District:
Mt. Diablo Unified School District

DSA File Number:
7-29

Increment Number:

Date Created:
2024-02-12 16:01:34

	Test or Special Inspection	Type	Performed By	Code References and Notes
☐	**c.** Storage rack anchorage installation.	**Periodic**	**SI**	ANSI/MH16.1 Section 7.3.2; Table 1705A.13.7
☐	**d.** Completed storage rack system to indicate compliance with the approved construction documents.	**Periodic**	**SI***	Table 1705A.13.7; * May be preformed by the project inspector when specifically approved by DSA.

	S/A11. Other Steel			
	Test or Special Inspection	**Type**	**Performed By**	**Code References and Notes**
☐	**a.**			

EXHIBIT A

Appendix: Work Exempt from DSA Requirements for Structural Tests / Special Inspections

Application Number:	**School Name:**	**School District:**
01-121540	El Dorado Middle School Multi Purpose Building Upgrades	Mt. Diablo Unified School District
DSA File Number:	**Increment Number:**	**Date Created:**
7-29		2024-02-12 16:01:34

Exempt items given in DSA IR A-22 or the 2022 CBC (including DSA amendments) and those items identified below with a check mark by the design professional are NOT subject to DSA requirements for the structural tests **/** special inspections noted. **Items marked as exempt shall be identified on the approved construction documents**. The project inspector shall verify all construction complies with the approved construction documents.

	SOILS:
☐	1. Deep foundations acting as a cantilever footing with a design based on minimum allowable pressures per CBC Table 1806A.2 and without a geotechnical report for the following cases: A) free standing sign or scoreboard, B) cell or antenna towers and poles less than 35'-0" tall (e.g., lighting poles, flag poles, poles supporting open mesh fences, etc.), C) single-story structure with dead load less than 5 psf (e.g., open fabric shade structure), or D) covered walkway structure with an apex height less than 10'-0" above adjacent grade.
☐	2. Shallow foundations, etc. are exempt from special inspections and testing by a Geotechnical Engineer for the following cases: A) buildings without a geotechnical report and meeting the exception item #1 criteria in CBC Section 1803A.2 supported by native soil (any excavation depth) or fill soil (not exceeding 12" depth per CBC Section 1804A.6), B) soil scarification/recompaction not exceeding 12" depth, C) native or fill soil supporting exterior non-structural flatwork (e.g., sidewalks, site concrete ramps, site stairs, parking lots, driveways, etc.), D) unpaved landscaping and playground areas, or E) utility trench backfill with depth not exceeding 12".

	CONCRETE/MASONRY:
☐	1. Post-installed anchors for the following: A) exempt non-structural components (e.g., mechanical, electrical, plumbing equipment - see item 7 for "Welding" in the Appendix below) given in CBC Section 1617A.1.18 (which replaces ASCE 7-16, Section 13.1.4) or B) interior nonstructural wall partitions meeting criteria listed in exempt item 3 for "Welding" in the Appendix below
☐	2. Concrete batch plant inspection is not required for items given in CBC Section 1705A.3.3.2 subject to the requirements and limitations in that section.
☐	3. Non-bearing non-shear masonry walls may be exempt from certain DSA masonry testing and special inspection items as allowed per DSA IR 21-1. Refer to construction documents for specific exemptions accordingly for each applicable wall condition shown in Appendix A of IR 21-1.
☑	4. Epoxy shear dowels in site flatwork and/or other non-structural concrete.

EXHIBIT A

Appendix: Work Exempt from DSA Requirements for Structural Tests / Special Inspections

Application Number:	**School Name:**	**School District:**
01-121540	El Dorado Middle School Multi Purpose Building Upgrades	Mt. Diablo Unified School District
DSA File Number:	**Increment Number:**	**Date Created:**
7-29		2024-02-12 16:01:34

	CONCRETE/MASONRY:
☑	5. Testing of reinforcing bars is not required for items given in CBC Section 1910A.2 subject to the requirements and limitations in that section.

	WELDING:
☑	1. Solid-clad and open-mesh fences, gates with maximum leaf span of 10', and gates with a maximum rolling section of 10' all having an apex height less than 8'-0" above lowest adjacent grade. When located above circulation or occupied space below, these gates/fences are not located within 1.5x gate/fence height (max 8'-0") to the edge of floor or roof.
☐	2. Handrails, guardrails, and modular or relocatable ramps associated with walking surfaces less than 30" above adjacent grade (excluding post base connections per the 'Exception' language in Section 1705A.2.1); fillet welds shall not be ground flush.
☐	3. Non-structural interior cold-formed steel framing spanning less than 15'-0", such as in interior partitions, interior soffits, etc. supporting only self weight and light-weight finishes or adhered tile, masonry, stone, or terra cotta veneer no more than 5/8" thickness and apex less than 20'-0" in height and not over an exit way. Maximum tributary load to a member shall not exceed the equivalent of that occurring from a 10'x10' opening in a 15' tall wall for a header or king stud.
☐	4. Manufactured support frames and curbs using hot rolled or cold-formed steel (i.e., light gauge) for mechanical, electrical, or plumbing equipment weighing less than 2000# (equipment only) (connections of such frames to superstructure elements using welding will require special inspection as noted in selected item(s) for Sections S/A3, S/A4 and/or S/A5 of listing above).
☐	5. Manufactured components (e.g., Tolco, B-Line, Afcon, etc.) for mechanical, electrical, or plumbing hanger support and bracing (connections of such components to superstructure elements using welding will require special inspection as noted in selected item(s) for Sections S/A3, S/A4 and/or S/A5 of listing above).
☐	6. TV Brackets, projector mounts with a valid listing (see DSA IR A-5) and recreational equipment (e.g., playground structures, basketball backstops, etc.) (connections of such elements to superstructure elements using welding will require special inspection as noted in selected item(s) for sections S/A3, S/A4 and/or S/A5 located in the Steel/Aluminum category of listing above).

EXHIBIT A

Appendix: Work Exempt from DSA Requirements for Structural Tests / Special Inspections

Application Number:	**School Name:**	**School District:**
01-121540	El Dorado Middle School Multi Purpose Building Upgrades	Mt. Diablo Unified School District
DSA File Number:	**Increment Number:**	**Date Created:**
7-29		2024-02-12 16:01:34

	WELDING:
☐	7. Any support for exempt non-structural components given in CBC Section 1617A.1.18 (which replaces ASCE 7-16, Section 13.1.4) meeting the following: A) when supported on a floor/roof, <400# and resulting composite center of mass (including component's center of mass) ≤4' above supporting floor/roof, B) when hung from a wall or roof/floor, <20# for discrete units or <5 plf for distributed systems.

DSA 103-22: LISTING OF STRUCTURAL TESTS & SPECIAL INSPECTIONS(SIGNATURE), 2022 CBC

EXHIBIT A

Application Number:
01-121540

School Name:
El Dorado Middle School Multi Purpose Building Upgrades

School District:
Mt. Diablo Unified School District

DSA File Number:
7-29

Increment Number:

Date Created:
2024-02-12 16:01:34

Name of Architect or Engineer in general responsible charge:

Brian Maytum, AIA

Name of Structural Engineer (When structural design has been delegated):

Jason T. Scanlan, SE

Signature of Architect or Structural Engineer:

Date:
February 12, 2024

Note: To facilitate DSA electronic mark-ups and identification stamp application, DSA recommends against using secured electronic or digital signatures.

DSA STAMP

IDENTIFICATION STAMP
DIV. OF THE STATE ARCHITECT
APP: 01-121540 INC:
REVIEWED FOR
SS ☑ FLS ☐ ACS ☐
DATE: 3/28/2025

DSA 103-22: LIST OF REQUIRED VERIFIED REPORTS, CBC 2022

EXHIBIT A

Application Number:	**School Name:**	**School District:**
01-121540	El Dorado Middle School Multi Purpose Building Upgrades	Mt. Diablo Unified School District
DSA File Number:	**Increment Number:**	**Date Created:**
7-29		2024-02-12 16:01:34

1. Structural Testing and Inspection: Laboratory Verified Report Form DSA 291
2. Concrete Batch Plant Inspection: Laboratory Verified Report Form DSA 291
3. Post-installed Anchors: Laboratory Verified Report Form DSA 291, or, for independently contracting SI, Special Inspection Verified Report Form DSA 292
4. Shop Welding Inspection: Laboratory Verified Report Form DSA 291, or, for independently contracting SI, Special Inspection Verified Report Form DSA 292

SPECIFICATIONS – GENERAL REQUIREMENTS

Exhibit A – DSA 103 Testing and Inspection Form

Division 01	Section	Title
	01 01 50	ADDITIONAL REQUIREMENTS FOR DSA PROJECTS
	01 11 00	SUMMARY OF WORK
	01 12 10	CONTRACT FORMS AND SUBMITTALS
	01 20 00	PRICE AND PAYMENT PROCEDURES
	01 21 00	ALLOWANCES
	01 25 10	PRODUCT OPTIONS AND SUBSTITUTIONS
	01 26 00	CONTRACT MODIFICATION PROCEDURES
	01 26 10	REQUESTS FOR INFORMATION
	01 31 00	COORDINATION AND PROJECT MEETINGS
	01 32 16	CONSTRUCTION SCHEDULE - NETWORK ANALYSIS
	01 33 00	SUBMITTALS
	01 40 00	QUALITY REQUIREMENTS
	01 42 13	ABBREVIATIONS AND ACRONYMS
	01 42 16	GENERAL DEFINITIONS AND REFERENCES
	01 45 29	TESTING LABORATORY SERVICES
	01 50 00	TEMPORARY FACILITIES AND CONTROLS
	01 52 10	SITE STANDARDS
	01 56 39	TEMPORARY TREE AND PLANT PROTECTION
	01 60 00	MATERIALS AND EQUIPMENT
	01 66 10	DELIVERY, STORAGE AND HANDLING
	01 73 00	EXECUTION
	01 73 10	CUTTING AND PATCHING
	01 77 00	CONTRACT CLOSEOUT AND FINAL CLEANING
	01 78 23	OPERATION AND MAINTENANCE DATA
	01 78 36	WARRANTIES
	01 78 39	RECORD DOCUMENTS

TECHNICAL SPECIFICATIONS

Division 02	**02 40 00**	**SITE DEMOLITION**
	02 41 19	**MINOR DEMOLITION FOR REMODEL**
Division 03	**03 00 00**	**CAST-IN-PLACE CONCRETE**
Division 05	**05 50 00**	**METAL FABRICATIONS**
Division 06	**06 10 00**	**ROUGH CARPENTRY**
	06 20 00	**FINISH CARPENTRY**
Division 07	**07 21 00**	**BUILDING INSULATION**
	07 26 00	**VAPOR RETARDERS**
	07 56 10	**BUILT UP BITUMINOUS ROOFING REPAIR**
	07 62 00	**SHEET METAL FLASHING AND TRIM**
	07 90 00	**JOINT SEALANTS**
Division 08	**08 11 00**	**METAL DOORS AND FRAMES**
	08 14 00	**FLUSH WOOD DOORS**
	08 31 13	**ACCESS DOORS AND FRAMES**
	08 71 00	**DOOR HARDWARE**
	08 80 00	**GLAZING**
Division 09	**09 21 00**	**GYPSUM BOARD SYSTEMS**
	09 51 00	**APPLIED ACOUSTICAL WALL PANELS**
	09 53 00	**ACOUSTICAL CEILINGS**
	09 65 00	**RESILIENT FLOORING AND BASE**
	09 67 00	**URETHANE CEMENT FLOORING SYSTEM**
	09 77 23	**VIYNL WRAPPED TACK PANELS**
	09 90 00	**PAINTING**
Division 10	**10 14 00**	**SIGNAGE**
	10 26 00	**CORNER GUARDS**
	10 26 33	**FIBERGLASS REINFORCED LAMINATE (FRL)**
	10 28 00	**TOILET AND BATH ACCESSORIES**
	10 44 16	**FIRE EXTINGUISHERS AND CABINETS**
	10 67 00	**OPEN METAL SHELVING**
Division 11	**11 40 00**	**FOODSERVICE EQUIPMENT**
Division 22	**22 00 50**	**BASIC PLUMBING MATERIALS AND METHODS**
	22 10 00	**PLUMBING PIPING SYSTEMS**
	22 40 00	**PLUMBING FIXTURES**
	22 50 00	**PLUMBING EQUIPMENT**
Division 23	**23 00 50**	**BASIC HVAC MATERIALS AND METHODS**
	23 05 93	**TESTING, ADJUSTING, AND BALANCING FOR HVAC**
	23 09 23	**ENERGY MANAGEMENT SYSTEMS FOR HVAC**
	23 80 00	**HEATING, VENTILATING AND AIR CONDITIONING**
Division 26	**26 00 00**	**ELECTRICAL WORK**
	26 05 05	**SELECTIVE DEMOLITION FOR ELECTRICAL**
	26 05 19	**LOW VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES**
	26 05 26	**GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS**
	26 05 29	**HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS**

	26 05 33	RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS
	26 05 53	IDENTIFICATION FOR ELECTRICAL SYSTEMS
	26 24 00	SWICHBOARDS AND PANELBOARDS
	26 27 16	ELECTRICAL CABINETS AND ENCLOSURES
	26 27 26	WIRING DEVICES
	26 28 16	ENCLOSED SWITCHES
Division 27	27 10 00	DATA COMMUNICATIONS
	27 51 23	SOUND AND COMMUNICATIONS
	27 51 26	ASSISTIVE LISTENING SYSTEMS
Division 28	28 31 00	INTRUSION ALARM SYSTEM
	28 46 00	FIRE ALARM SYSTEM
Division 31	31 00 00	EARTHWORK
	31 23 33	TRENCHING AND BACKFILLING
Division 32	32 12 00	ASPHALT CONCRETE PAVING
	32 16 00	PORTLAND CEMENT CONCRETE PAVING
	32 17 26	DETECTABLE WARNING SURFACES
	32 31 13	CHAIN LINK FENCES AND GATES

END OF DOCUMENT

DOCUMENT 01 11 00

SUMMARY OF WORK

1. GENERAL

1.1. RELATED DOCUMENTS AND PROVISIONS

Contractor shall review all Contract Documents for applicable provisions related to the provisions in this document, including without limitation:

1.1.1. General Conditions;

1.1.2. Special Conditions (if any);

1.1.3. Supplemental Conditions (if any);

1.1.4. Submittals; and

1.1.5. Temporary Facilities and Controls.

1.2. SUMMARY OF WORK COVERED BY CONTRACT DOCUMENTS

The Work may consist of the following:

1.2.1. **This project provides improvements to the existing multi-purpose building with particular emphasis on upgrades to the kitchen. General scope of work includes but is not limited to: Alterations to the kitchen, assembly area and stage. Replacement of all food service equipment. Upgrade lighting, power, and plumbing utilities to meet the needs of new equipment. New HVAC systems throughout the building. Modify the existing low voltage, fire alarm, voice evac, clock/bell/speaker system. Exterior site work improvements include path of travel, accessibility drop-off areas.**

1.2.2. **The Project will require Phasing and Barricading of work areas as indicated on the plans and enumerated in these Specifications.**

1.3. CONTRACTS

Perform the Work under a single, fixed-price Contract.

1.4. SPECIAL PROJECT REQUIREMENTS

1.4.1. Hours of Work: Work is to be performed during regular work hours.. Contractor shall coordinate its operations with activities taking place at the site, including, but not limited to, campus, such as summer school, sate testing, etc. Contractor shall ensure that there are no disruptions to such activities.

1.5. WORK BY OTHERS

1.5.1. Work to be performed and completed prior to the start of the Project:

1.5.1.1. Owner Furnished-Contractor Installed Equipment

1.5.1.1.1. MDUSD will procure the associated equipment outlined in the contract documents. Contractor will receive and store said equipment upon delivery.

1.6. CODES, REGULATIONS AND STANDARDS

1.6.1. The codes, regulations, and standards adopted by the State and federal agencies having jurisdiction shall govern minimum requirements for the Project. Where codes, regulations, and standards conflict with the Contract Documents, these conflicts shall be brought to the immediate attention of the District and the Architect.

1.6.2. Codes, regulations, and standards are as published effective as of date of bid opening, unless otherwise specified or indicated.

1.7. EXAMINATION OF EXISTING CONDITIONS

1.7.1. Contractor shall be held to have examined the Project Site and acquainted itself with the conditions of the Site and of the streets and roads approaching the Site.

1.7.2. Prior to commencement of Work, Contractor shall survey the Site and existing buildings and improvements to observe existing damage and defects such as cracks, sags, broken, missing or damaged glazing, other building elements and Site improvements, and other damage.

1.7.3. Should Contractor observe cracks, sags, and other damage to and defects of the Site and adjacent buildings, paving, and other items not indicated in the Contract Documents, Contractor shall immediately report same to the District and the Architect.

1.8. CONTRACTOR'S USE OF PREMISES

1.8.1. Contractor shall take all reasonable precautions for the safety of the students and the school employees throughout the duration of the Project.

1.8.2. If unoccupied and only with District’s prior written approval, Contractor may use the building(s) at the Project Site without limitation for its operations, storage, and office facilities for the performance of the Work. If the District chooses to beneficially occupy any building(s), Contractor must obtain the District's written approval for Contractor's use of spaces and types of operations to be performed within the building(s) while so occupied. Contractor's access to the building(s) shall be limited to the areas indicated.

1.8.3. If the space at the Project Site is not sufficient for Contractor's operations, storage, office facilities and/or parking, Contractor shall arrange and pay for any additional facilities needed by Contractor, at no expense to District.

1.8.4. Contractor shall not interfere with others use of or access to occupied portions of the building(s) or adjacent property.

1.8.5. Contractor shall maintain corridors, stairs, halls, and other exit-ways of building clear and free of debris and obstructions at all times.

1.8.6. No one other than those directly involved in the demolition and construction or specifically designated by the District or the Architect shall be permitted in the areas of Work during demolition and construction activities.

1.9. PROTECTION OF EXISTING STRUCTURES AND UTILITIES

1.9.1. The Drawings show above-grade and below-grade structures, utility lines, and other installations that are known or believed to exist in the area of the Work. Contractor shall locate these existing installations before proceeding with excavation and other operations that could damage same; maintain them in service, where appropriate; and repair damage to them caused by the performance of the Work. Should damage occur to these existing installations, the costs of repair shall be at the Contractor's expense and made to the District's satisfaction.

1.9.2. Contractor shall be alert to the possibility of the existence of additional structures and utilities. If Contractor encounters additional structures and utilities, Contractor will immediately report to the District for disposition of same as indicated in the General Conditions.

1.10. UTILITY SHUTDOWNS AND INTERRUPTIONS

1.10.1. Contractor shall give the District a minimum of three (3) days written notice in advance of any need to shut off existing utility services or to effect equipment interruptions. District will set exact time and duration for shutdown, and will assist Contractor with shutdown. Work required to re-establish utility services shall be performed by the Contractor.

1.10.2. Contractor shall obtain District's written approval as indicated in the General Conditions in advance of deliveries of material or equipment or other activities that may conflict with District's use of the building(s) or adjacent facilities.

1.11. STRUCTURAL INTEGRITY

1.11.1. Contractor shall be responsible for and supervise each operation and work that could affect structural integrity of various building elements, both permanent and temporary.

1.11.2. Contractor shall include structural connections and fastenings as indicated or required for complete performance of the Work.

END OF DOCUMENT

DOCUMENT 01 12 10

CONTRACT FORMS AND SUBMITTALS

1. GENERAL

1.1. RELATED DOCUMENTS AND PROVISIONS

Contractor shall review all Contract Documents for applicable provisions related to the provisions in this document, including without limitation:

1.1.1. General Conditions;

1.1.2. Special Conditions (if any);

1.1.3. Supplemental Conditions (if any);

1.1.4. Submittals; and

1.1.5. Construction Schedule.

2. REQUIREMENTS OF THE DISTRICT

2.1. Contractor shall utilize the District's forms as indicated below This requirement also applies to submittals, including the requirement that the Contractor and its Subcontractors, as indicated, utilize the software, internet and specific programs on this Project as indicated herein.

2.2. DISTRICT FORMS

All forms identified below shall utilize District forms available at the above referenced link. Contractor must only utilize these forms, including the programs, processes and software indicated below.

2.2.1. **Request for Information.** Contractor shall comply with all applicable provisions in Contract Documents relating to Requests for Information. Contractor shall submit all of its Requests for Information using District's Form attached hereto.

2.2.2. **Construction Directive.** Contractor shall comply with all applicable provisions in Contract Documents relating to Changes in the Work. All Construction Directives shall be issued using District's Form attached hereto.

2.2.3. **Price Request.** Contractor shall comply with all applicable provisions in Contract Documents relating to Price Requests. All Price Requests shall be issued using District's Form attached hereto.

2.2.4. **Proposed Change Order.** Contractor shall comply with all applicable provisions in Contract Documents relating to Changes in the Work. Contractor shall submit all of its Proposed Change Orders using District's Form attached hereto.

2.2.5. **Change Order.** Contractor shall comply with applicable provisions in Contract Documents relating to Changes in the Work. All Change Orders shall be issued using District's Form attached hereto.

2.3. CONTRACTOR SUBMITTALS

All submittals required by the Contract Documents shall be submitted using the programs, processes and software indicated below. If no specific program or format is indicated, then Microsoft Word or Microsoft Excel is acceptable.

2.3.1. **Preliminary Construction Schedule**

2.3.1.1. Utilize Primavera P6 Project Management® software (latest version) by Oracle (PCM) (http://www.oracle.com/us/industries/engineering-and-construction/index.html) or another program if pre-approved by the District.

2.3.2. **Schedule of Values**

2.3.2.1. Utilize PCM or another program if pre-approved by the District.

2.3.3. **Contractor's Completed Subcontractor List**

2.3.4. **Contractor's Safety Plan**

2.3.5. **Schedule of Submittals**

2.3.5.1. Utilize PCM or another program if pre-approved by the District.

2.3.6. **Operations and Maintenance Manual & Instructions**

END OF DOCUMENT

DOCUMENT 01 20 00

PRICE AND PAYMENT PROCEDURES

1. GENERAL

1.1. RELATED DOCUMENTS AND PROVISIONS

Contractor shall review all Contract Documents for applicable provisions related to the provisions in this document, including without limitation:

1.1.1. General Conditions;

1.1.2. Special Conditions (if any);

1.1.3. Supplemental Conditions (if any).

1.2. DESCRIPTION

1.2.1. This Document contains procedures to be followed by the Contractor to request payment.

1.2.2. **IF THERE IS ANY INCONSISTENCY IN THIS DOCUMENT WITH THE PROVISIONS IN THE GENERAL CONDITIONS AND THE SPECIAL CONDITIONS THAT THE CONTRACTOR SHALL COMPLY WITH RELATED TO CHANGES AND/OR REQUESTS FOR CHANGES (e.g., "PAYMENTS," "SCHEDULE OF VALUES"), THOSE PROVISIONS IN THE GENERAL CONDITIONS AND THE SPECIAL CONDITIONS SHALL TAKE PRECEDENCE.**

1.3. SECTION INCLUDES

1.3.1. Schedule of Values.

1.3.2. Application for Payment.

1.4. SCHEDULE OF VALUES

1.4.1. Provide a breakdown of the Contract Price with enough detail to facilitate continued evaluation of Applications for Payment and Progress Reports. Using the AIA form G702 or another form, pre-approved by the District.

1.4.2. Contractor must update and resubmit the Schedule of Values before the next Invoice or Application for Payment when Change Orders or Construction Change Directives result in a change in the Contract Price.

1.4.3. Coordination: Coordinate preparation of the Schedule of Values with preparation of Contractor's Construction Schedule. Comply with the provisions in the General Conditions regarding the Schedule of Values.

1.4.3.1. Correlate line items in the Schedule of Values with other required administrative forms and schedules, including the following:

1.4.3.1.1. Application for Payment forms.

1.4.3.1.2. Submittal Schedule.

1.4.3.1.3. Contractor's Construction Schedule.

1.4.3.2. Submit the Schedule of Values to District as indicated in the Contract Documents and, if an updated Schedule of Values is needed, then no later than ten (10) days before the date scheduled for submittal of the next Application(s) for Payment.

1.4.3.3. Subschedules: Where the Work is separated into phases requiring separately phased payments, provide subschedules showing values correlated with each phase of payment.

1.4.4. Format and Content: Use the Project Manual table of contents as a guide to establish line items for the Schedule of Values. Provide at least one line item for each Specification Section.

1.4.4.1. Identification: Include the following Project identification on the Schedule of Values:

1.4.4.1.1. Project name and location.

1.4.4.1.2. Name of District's Representative.

1.4.4.1.3. District's contract number (_____).

1.4.4.1.4. District's name and address.

1.4.4.1.5. Date of submittal.

1.4.4.2. Arrange the Schedule of Values in tabular form with separate columns to indicate the following for each item listed:

1.4.4.2.1. Related Specification document, section or division.

1.4.4.2.2. Description of the Work.

1.4.4.2.3. Name of subcontractor.

1.4.4.2.4. Name of manufacturer or fabricator.

1.4.4.2.5. Name of supplier.

1.4.4.2.6. Change Orders (numbers) that affect value.

1.4.4.2.7. Dollar value.

1.4.4.2.7.1. Percentage of the Contract Price to nearest one-hundredth percent, adjusted to total 100 percent.

1.4.4.3. Provide a breakdown of the Contract Price in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Provide several line items for principal subcontract amounts, where appropriate. Include separate line items under required principal subcontracts for operation and maintenance manuals, punch list activities, Project Record Documents, and demonstration and training.

1.4.4.4. Round amounts to nearest whole dollar; total shall equal the Contract Price.

1.4.4.5. Provide a separate line item in the Schedule of Values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.

1.4.4.6. Provide separate line items in the Schedule of Values for initial cost of materials, for each subsequent stage of completion, and for total installed value of that part of the Work.

1.4.4.7. Allowances (if any): Provide a separate line item in the Schedule of Values for each allowance. Show line-item value of unit-cost allowances, as a product of the unit cost, multiplied by measured quantity. Use information indicated in the Contract Documents to determine quantities.

1.4.4.8. Each item in the Schedule of Values and Applications for Payments shall be complete. Include total cost and proportionate share of general overhead and profit for each item.

1.4.5. Schedule Updating: Update and resubmit the Schedule of Values before the next Application for Payment if there is a change in the Contract Price.

1.5. APPLICATIONS FOR PAYMENT

1.5.1. **Form:** Contractor shall utilize AIA Form G702 - Application and Certificate for Payment and AIA Form G703 - Continuation Sheet, or District-approved form with the same information as these AIA forms.

1.5.2. **Content and Format**: District shall use Schedule of Values for listing items in its Application for Payment.

1.5.3. Each Application for Payment shall be consistent with previous applications and payments as certified and paid for by District.

END OF DOCUMENT

DOCUMENT 01 21 00

ALLOWANCES

1. GENERAL

1.1. RELATED DOCUMENTS AND PROVISION

Contractor shall review all Contract Documents for applicable provisions related to the provisions in this document, including without limitation:

1.1.1. General Conditions including without limitation, Contract Terms and Definitions;

1.1.2. Special Conditions (if any);

1.1.3. Supplemental Conditions (if any).

1.1.4. Agreement;

1.1.5. Bid Form; and

1.2. SUMMARY

1.2.1. **THE SPECIFIC ALLOWANCES FOR THIS PROJECT ARE AS LISTED IN THE AGREEMENT.**

1.2.2. This Document includes administrative and procedural requirements governing Allowances.

1.2.3. Certain items are specified in the Contract Documents by Allowances. Allowances have been established in lieu of additional requirements and to defer selection of actual materials and equipment to a later date when additional information is available for evaluation. If necessary, additional requirements may be issued by Change Order or similar document.

1.3. SELECTION AND PURCHASE

1.3.1. At the earliest practical date after award of the Contract, Contractor shall advise District of the date when final selection and purchase of each product or system described by an Allowance must be completed to avoid delaying the Work.

1.3.2. At District's request, obtain proposals for each Allowance for use in making final selections. Include recommendations that are relevant to performing the Work.

1.3.3. Purchase products and systems selected by District from the designated supplier.

1.4. SUBMITTALS

1.4.1. Submit proposals for purchase of products or systems included in Allowances, in the form specified for Change Orders.

1.4.2. Submit invoices or delivery slips to show actual quantities of materials delivered to the Site for use in fulfillment of each Allowance.

1.4.3. Coordinate and process submittals for Allowance items in same manner as for other portions of the Work.

1.5. COORDINATION

Coordinate Allowance items with other portions of the Work. Furnish templates as required to coordinate installation.

1.6. PAYMENT FOR ALLOWANCES

1.6.1. Allowance shall include all-inclusive cost to Contractor of specific products and materials under Allowance and Contractor may bill its time, materials, and other items in the identical structure as a Change Order.

1.7. UNUSED MATERIALS

1.7.1. Return unused materials purchased under an Allowance to manufacturer or supplier for credit to District, after installation has been completed and accepted.

1.7.2. If requested, prepare and deliver unused material for storage by District when it is not economically practical (as determined by District) to return the material for credit. If directed, deliver unused material to District's storage space. Otherwise, disposal of unused material is Contractor's responsibility.

2. EXECUTION

2.1. EXAMINATION

Examine products covered by an Allowance promptly on delivery for damage or defects. Return damaged or defective products to manufacturer for replacement.

2.2. PREPARATION

Coordinate materials and their installation for each Allowance with related materials and installations to ensure that each Allowance item is completely integrated and interfaced with related work.

END OF DOCUMENT

DOCUMENT 01 25 10

PRODUCT OPTIONS AND SUBSTITUTIONS

1. GENERAL

1.1. RELATED DOCUMENTS AND PROVISIONS

Contractor shall review all Contract Documents for applicable provisions related to the provisions in this document, including without limitation:

1.1.1. General Conditions;

1.1.2. Special Conditions (if any);

1.1.3. Supplemental Conditions (if any); and

1.1.4. Instructions to Bidders.

1.2. DOCUMENT INCLUDES

1.2.1. Product options.

1.2.2. Limitations on Substitutions.

1.2.3. Regulatory Requirements.

1.2.4. Substitution Representation.

1.2.5. Submittal Procedure.

1.2.6. District's Review.

1.3. DEFINITIONS

1.3.1. Requests for changes in products, materials, or equipment required by Contract Documents proposed by the Contractor prior to and after award of the Contract are considered requests for substitutions. Contractor must refer to the Instructions to Bidders, the General Conditions and the Special Conditions for limitations on when requests for substitution(s) are permitted on Project. The following are not considered substitutions:

1.3.1.1. Revisions to Contract Documents requested by the District or Architect.

1.3.1.2. Specified options of products, materials, and equipment included in Contract Documents.

1.3.2. Whenever in the Specifications any material, product, thing, or service is indicated or specified by grade, patent, or proprietary name, or by name of manufacturer, that Specification shall be deemed to be used for the purpose of facilitating the description

of the material, product, thing, or service, and shall be deemed to be followed by the words "or equal," except:

1.3.2.1. When designated to match other material, product, thing, or service in use on a particular public improvement either completed or in the course of completion; or

1.3.2.2. When designated as a field test or experiment.

1.4. PRODUCT OPTIONS

1.4.1. **Products Specified by Reference Standards or by Description Only**: Any Product meeting those standards or description.

1.4.2. **Products Specified by Naming One or More Manufacturers with or without Provision for Substitution**: Products of manufacturers named and meeting specifications with substitution of Products or manufacturer only when submitted under provisions of this section.

1.5. LIMITATIONS ON SUBSTITUTIONS

1.5.1. **Requests for substitution prior to bid or after bid, shall only be permitted as indicated in and in accordance with requirements specified in the Instructions to Bidders and the Special Conditions.**

1.5.2. The Bid shall be based upon the standards of quality established by those items of equipment and/or materials which are specifically identified in the Contract Documents.

1.5.3. Burden of proof of merit of requested substitution is the responsibility of the Contractor.

1.5.4. It is the sole responsibility of Contractor to submit the proper content of any requests for substitutions. Incomplete submittals will be rejected.

1.6. REGULATORY REQUIREMENTS

1.6.1. It shall be the responsibility of Contractor to obtain all regulatory approvals required for proposed substitutions.

1.6.2. All regulatory approvals shall be obtained for proposed substitutions prior to submittal of substitution request to Architect.

1.6.3. All costs incurred by the District in obtaining regulatory approvals for proposed substitutions to include the costs of the Architect and any authority having jurisdiction over the Project shall be reimbursed to the District. Costs of these services shall be reimbursed regardless of final acceptance or rejection of substitution.

1.6.4. Substitutions of materials or work procedures which affect the health, safety and welfare of the public shall have prior approval of the Division of the State Architect (DSA) field representative.

1.7. SUBSTITUTION REPRESENTATION

1.7.1. In submitting a request for substitution, Contractor makes the representation that:

1.7.2. Contractor has investigated the proposed substitution and determined that it meets or exceeds the quality level of the specified product;

1.7.3. Contractor has determined that all components of the proposed substitution are identical and fully interchangeable with the product name and number specified;

1.7.4. Contractor will provide the same warranty or guarantee for the substitution as for the specified product;

1.7.5. Contractor will coordinate installation and make changes to other work which may be required for the work to be completed with no additional cost to the District;

1.7.6. Contractor waives claims for additional cost or time extension which may subsequently become apparent; and

1.7.7. Contractor will reimburse District for the cost of District's and Architect's review or redesign services associated with substitution request.

1.8. SUBMITTAL PROCEDURE

1.8.1. Submit six (6) copies of each request.

1.8.2. Submit request using District's Substitution Request Form as indicated in Contract Forms and Submittals. Substitution requests that are not on District's required form shall be returned without review.

1.8.3. Limit each request to one proposed substitution.

1.8.4. Request to include sufficient data so that direct comparison of proposed substitution can be made.

1.8.5. Provide complete documentation for each request. Documentation shall include the following information, as appropriate, as a minimum:

1.8.5.1. Statement of cause for substitution request.

1.8.5.2. Identify product by specification section and article number.

1.8.5.3. Provide manufacturer's name, address, and phone number. List fabricators, suppliers, and installers as appropriate.

1.8.5.4. List similar projects where proposed substitution has been used, dates of installation and names of Architect and District.

1.8.5.5. List availability of maintenance services and replacement materials.

1.8.5.6. Documented or confirmation of regulatory approval.

1.8.5.7. Product data, including drawings and descriptions of products.

1.8.5.8. Fabrication and installation procedures.

1.8.5.9. Samples of proposed substitutions.

1.8.5.10. Itemized comparison of significant qualities of the proposed substitution with those of the product specified. Significant qualities may include size, weight, durability, performance requirements and visual effects.

1.8.5.11. Coordination information, including a list of changes or modifications needed to other items of work that will become necessary to accommodate proposed substitution.

1.8.5.12. Statement on the substitutions effect on the Construction Schedule.

1.8.5.13. Cost information including a proposal of the net reduction in cost to the Contract Price if the proposed substitution is accepted.

1.8.5.14. Certification that the substitution is equal to or better in every respect to that required by the Contract Documents and that substitution will perform adequately in the application intended.

1.8.5.15. Waiver of right to additional payment or time that may subsequently become necessary because of failure of substitution to perform adequately.

1.8.6. Inadequate warranty, vagueness of submittal, failure to meet specified requirements, or submittal of insufficient data will be cause for rejection of substitution request.

1.9. DISTRICT'S REVIEW

1.9.1. The District will accept or reject proposed substitution within a reasonable amount of time.

1.9.2. If a request is made prior to bid opening and the District has <u>not</u> completed its review, Contractor shall base its bid on the product specified only.

1.9.3. There shall be no claim for additional time for review of proposed substitutions.

1.9.4. Final acceptance of a substitution submitted prior to the date established for the receipt of bids will be in the form of an addendum.

END OF DOCUMENT

DOCUMENT 01 26 00

CONTRACT MODIFICATION PROCEDURES

1. GENERAL

1.1. RELATED DOCUMENTS AND PROVISIONS

Contractor shall review all Contract Documents for applicable provisions related to the provisions in this document, including without limitation:

1.1.1. General Conditions;

1.1.2. Special Conditions (if any);

1.1.3. Supplemental Conditions (if any);

1.1.4. Allowances;

1.1.5. Product Options and Substitutions; and

1.1.6. Project Coordination.

1.2. DESCRIPTION

1.2.1. This Document contains procedures to be followed by the Contractor to request changes in the Contract Time of the Contract Price.

1.2.2. **IF THERE IS ANY INCONSISTENCY IN THIS DOCUMENT WITH THE PROVISIONS IN THE GENERAL CONDITIONS AND THE SPECIAL CONDITIONS THAT THE CONTRACTOR SHALL COMPLY WITH RELATED TO CHANGES AND/OR REQUESTS FOR CHANGES (e.g., "Change in the Work"), THOSE PROVISIONS IN THE GENERAL CONDITIONS AND THE SPECIAL CONDITIONS SHALL TAKE PRECEDENCE.**

1.3. SUMMARY

This Document specifies administrative and procedural requirements for handling and processing Contract modifications.

1.4. Minor Changes in the Work

Architect may issue supplemental instructions authorizing Minor Changes in the Work, not involving adjustment to the Contract sum or the Contract Time, or Changes not affecting the Structural Safety, Access Compliance or Fire & Life Safety portions of the work, on AIA Document G710, "Architects Supplemental Instructions" or an equivalent form acceptable to the District and Subject to DSA IR A-6 Construction Change Document Submittal and Approval Process (Title 24, Part 1, California Code or Regulations, Section 4-338) requirements for DSA Construction Change Document – Category B.

1.5. Construction Change Process – DSA

1.5.1. Changes or alterations of the approved plans or specifications after a contract for the work has been let affecting the Structural, Access, or Fire-Life Safety portions of the

Project shall be made only by means of Construction Change Document submitted to and approved by DS prior to commencement of the work shown thereon. Construction Change Documents shall comply with DSA IR A-6. Construction Change Document Submittal and approval process (Title 24, Part 1, California Code or Regulations, Section 4-338) requirements. Construction Change Documents shall be made using DSA form 141 and state the reason for the change and the scope of work to be accomplished, and, where necessary, shall be accompanied by supplementary drawings referenced in the text of the change order. All Construction Change Documents and supplementary drawings shall be stamped and signed by the Architect or Engineer in general responsible charge of observation of the work of construction of the Project and by the Architect or registered engineer delegated responsibility for observation for the portion of the work of construction affected by the change order, shall bear the approval of the school board and shall indicate the associated change in the project cost, if any. Once copy of each Construction Change Document is required for the files of DSA.

1.5.2. Construction Change Documents shall be signed by Architect of Record, Structural Engineer (when applicable), Delegated Professional Engineer (when applicable), and DSA.

1.5.3. No changes shall be made to approved documents without DSA approval.

1.5.4. If conflicts between the drawings and specifications for materials to be used and/or work to be done the more stringent, more restrictive, or higher quality shall apply.

1.6. PRICE REQUESTS

1.6.1. Do not consider Price Requests to be instructions either to stop work in progress or to execute the proposed change.

1.6.2. Within time specified in Price Request after receipt of Price Request, submit a quotation estimating cost adjustments to the Contract Price and the Contract Time necessary to execute the change.

1.6.2.1. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.

1.6.2.2. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.

1.6.2.3. Include costs of labor and supervision directly attributable to the change.

1.6.2.4. Include an updated Contractor's Construction Schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.

1.7. PROPOSED CHANGE ORDERS

Contractor may propose changes by submitting a request for a change on District's Proposed Change Order form (PCO) to District.

1.7.1. Include an updated Contractor's Construction Schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.

1.7.2. Comply with Contract Document requirements if the proposed change requires substitution of one product or system for product or system specified.

END OF DOCUMENT

DOCUMENT 01 26 10

REQUESTS FOR INFORMATION

1. GENERAL

1.1. RELATED DOCUMENTS AND PROVISIONS

Contractor shall review all Contract Documents for applicable provisions related to the provisions in this document, including without limitation:

1.1.1. General Conditions;

1.1.2. Special Conditions (if any);

1.1.3. Supplemental Conditions (if any);

1.1.4. Documentation Requirements;

1.1.5. Electronic Data Transfer;

1.1.6. Submittals;

1.1.7. Contract Closeout and Final Cleaning;

1.1.8. Operation and Maintenance Data;

1.1.9. Warranties; and

1.1.10. Record Documents;

1.2. DESCRIPTION

This Document contains procedures to be followed by the Contractor to request Architect provide additional information necessary to clarify or amplify an item in the Contract Documents that Contractor thinks is not clearly shown or called for in the Drawings or Specifications or other portions of the Contract Documents, or to address issues that have arisen under field conditions.

1.3. PROCEDURES

1.3.1. Notification by Contractor:

1.3.1.1. Submit all requirements for clarification or additional information, whether originated by the Contractor, a Subcontractor, or supplier at any tier, in writing to District as required by the Contract Documents.

1.3.1.2. Number RFIs sequentially. Follow RFI number with sequential alphabetical suffix as necessary for each resubmission. For example, the first RFI would be "001." The second RFI would be "002."

1.3.1.3. All RFIs shall reference all applicable Contract Document(s), including Specification section(s), detail(s), page number(s), drawing number(s), and sheet number(s), etc. Contractor shall make suggestions and interpretations of

the issue raised by each RFI. An RFI cannot modify the Contract Price, Contract Time, or the Contract Documents.

1.3.1.4. Limit each RFI to one subject.

1.3.1.5. Submit a RFI if one of the following conditions occurs:

1.3.1.5.1. Contractor discovers an unforeseen condition or circumstance that is not described in the Contract Documents.

1.3.1.5.2. Contractor discovers an apparent conflict or discrepancy between portions of the Contract Documents that appears to be inconsistent or is not reasonably inferred from the intent of the Contract Documents.

1.3.2. Contractor shall not:

1.3.2.1. Submit an RFI as a request for substitution.

1.3.2.2. Submit an RFI as a submittal.

1.3.2.3. Submit an RFI without first having thoroughly reviewed the Contract Documents.

1.3.2.4. Submit an RFI in a manner that suggests that specific portions of the Contract Documents are assumed to be excluded or by taking an isolated portion of the Contract Documents in part rather than whole.

1.3.2.5. Submit an RFI in an untimely manner without proper coordination and scheduling of Work related trades.

1.3.2.6. If Contractor submits an RFI contrary to the above, Contractor shall pay the cost of any review, which cost shall be deducted from the Contract Price.

1.3.3. Contractor shall be liable to the District for all costs incurred by the District associated with the processing, reviewing, evaluating and responding to any RFI, including without limitation, fees of the Architect and any other design consultant to the Architect or the District, that District reasonably determines:

1.3.3.1. Does not reflect adequate or competent supervision or coordination by the Contractor or any Subcontractor; or

1.3.3.2. Does not reflect the Contractor's adequate or competent knowledge of the requirements of the Work or the Contract Documents;

1.3.3.3. Requests an interpretation or decision of a matter where the information sought is equally available to the Contractor; or

1.3.3.4. Is not justified for any other reason.

1.4. RESPONSE TIME

1.4.1. Architect shall review RFIs and issue a response and instructions to Contractor within a reasonable time frame from the date the RFI is received and dated by the District.

1.4.2. Responses from the District will not change any requirement of the Contract unless so noted by the District in the response to the RFI. Should the Contractor contend that a response to an RFI causes a change to the Contract that requires a Change Order, the Contractor shall, before proceeding, give written notice to the District, indicating that the Contractor considers the District's response to the RFI to be a Change Order, as required by the Contract Documents.

1.4.3. Should Contractor direct its Subcontractors to proceed with the Work affected before receipt of a response from Architect, any portion of the Work which is not done in accordance with the Architect's ultimate interpretations, clarifications, instructions, or decisions is subject to removal or replacement at Contractor's sole expense and responsibility.

END OF DOCUMENT

DOCUMENT 01 31 00

COORDINATION AND PROJECT MEETINGS

1. GENERAL

1.1. RELATED DOCUMENTS AND PROVISIONS:

Contractor shall review all Contract Documents for applicable provisions related to the provisions in this document, including without limitation:

1.1.1. General Conditions;

1.1.2. Special Conditions (if any);

1.1.3. Supplemental Conditions (if any); and

1.1.4. Technical Specifications.

1.2. SECTION INCLUDES

1.2.1. Coordination Responsibilities of the Contractor.

1.2.2. Field Engineering Responsibilities of the Contractor.

1.2.3. Preconstruction Conference.

1.2.4. Progress Meetings.

1.2.5. Pre-Installation Conferences.

1.2.6. Post Construction Dedication.

1.3. COORDINATION RESPONSIBILITIES OF THE CONTRACTOR

1.3.1. Coordinate scheduling, submittals, and Work of the Specifications to assure efficient and orderly sequence of installation of interdependent construction elements, with provisions for accommodating items installed later.

1.3.2. Prior to commencement of a particular type or kind of Work examine relevant information, contract documents, and subsequent data issued to the Project.

1.3.3. Verify that utility requirement characteristics of operating equipment are compatible with building utilities. Coordinate Work of various sections having interdependent responsibilities for installing, connecting to, and placing in service such equipment.

1.3.4. Closing up of holes, backfilling, and other covering up operations shall not proceed until all enclosed or covered Work and inspections have been completed. Verify before proceeding.

1.3.5. Coordinate space requirements and installation of mechanical and electrical Work which are indicated diagrammatically on Drawings. Follow routing shown for pipes, ducts, and

conduit as closely as practicable; place runs parallel with line of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.

1.3.6. In finished areas except as otherwise indicated, conceal pipes, ducts, and wiring within the construction. Coordinate locations of fixtures and outlets with finish elements.

1.3.7. In locations where several elements of mechanical and electrical Work must be sequenced and positioned with precision in order to fit into available space, prepare coordination drawings showing the actual conditions required for the installation. Prepare coordination drawings prior to purchasing, fabricating, or installing any of the elements required to be coordinated.

1.3.8. Closing up of walls, partitions or furred spaces, backfilling, and other covering up operations shall not proceed until all enclosed or covered Work and inspections have been completed. Verify before proceeding.

1.3.9. Coordinate completion and cleanup of Work of separate sections in preparation for completion and for portions of Work designated for District's occupancy.

1.3.10. After District occupancy of Project, coordinate access to Site for correction of defective Work and Work not in accordance with Contract Documents, to minimize disruption of District's activities.

1.3.11. Coordinate all utility company Work in accordance with the Contract Documents.

1.3.12. Key Personnel Names: Within ten (10) days of starting construction operations, submit a list of key personnel assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses and telephone numbers, including home and office telephone numbers. Provide names, addresses, and telephone numbers of individuals assigned as standbys in the absence of individuals assigned to Project. Post copies of list in Project meeting room, in temporary field office, and by each temporary telephone. Keep list current at all times.

1.4. FIELD ENGINEERING RESPONSIBILITIES OF THE CONTRACTOR

1.4.1. Contractor shall employ a Land Surveyor registered in the State of California and acceptable to the Architect.

1.4.2. Control datum for survey is that established by District provided survey. Contractor to locate and protect survey control and reference points.

1.4.3. Replace dislocated survey control points based on original survey control.

1.4.4. Provide field engineering services. Establish elevations, lines, and levels utilizing recognized engineering survey practices.

1.4.5. Upon completion of Work, submit certificate signed by the Land Surveyor that elevations and locations of Work are in conformance with Contract Documents. Record deviations on Record Drawings.

1.5. PRECONSTRUCTION CONFERENCE

1.5.1. Construction Manager or Project Engineer will schedule a conference immediately after, and in no case more than fifteen (15) days after, receipt of fully executed Contract Documents prior to Project mobilization.

1.5.2. Mandatory Attendance: Construction Manager, Project Engineer, Project Inspector, Architect of Record, Contractor, Contractor's Project Manager, and Contractor's Job/Project Superintendent.

1.5.3. Optional Attendance: Architect's consultants, and utility company representatives.

1.5.4. Construction Manager shall preside at conference and the Project Architect shall prepare and record minutes and distribute copies.

1.5.5. Agenda:

1.5.5.1. Execution of Owner-Contractor Agreement.

1.5.5.2. Issue Notice to Proceed.

1.5.5.3. Submission of executed bonds and insurance certificates.

1.5.5.4. Distribution of Contract Documents.

1.5.5.5. Submission of list of Subcontractors, list of Products, Schedule of Values, and Progress Schedule.

1.5.5.6. Designation of responsible personnel representing the parties.

1.5.5.7. Procedures for processing Change Orders.

1.5.5.8. Procedures for Request for Information.

1.5.5.9. Procedures for testing and inspecting.

1.5.5.10. Procedures for processing applications for payment.

1.5.5.11. Procedures for Project closeout.

1.5.5.12. Use of Premises.

1.5.5.13. Work restrictions.

1.5.5.14. District’s occupancy requirements or options.

1.5.5.15. Responsibility for temporary facilities and controls.

1.5.5.16. Construction waste management and recycling.

1.5.5.17. Parking availability.

1.5.5.18. Office, work and storage areas.

1.5.5.19. Equipment deliveries and priority.

1.5.5.20. Security.

1.5.5.21. Progress cleaning.

1.5.5.22. Review required submittals and (if applicable) LEED Certification requirements.

1.6. PROGRESS MEETINGS

1.6.1. Construction Manager shall schedule and administer meetings throughout progress of the Work at a minimum of every week.

1.6.2. Construction Manager or Project Engineer will make arrangements for meetings, prepare agenda, and preside at meetings. Project Architect shall record minutes (Field Reports), and distribute copies.

1.6.3. Attendance Required: Job Superintendent, Construction Manager, Project Engineer, Project Inspector, Architect of Record, Subcontractors, and suppliers as appropriate to agenda topics for each meeting.

1.6.4. Agenda:

1.6.4.1. Review minutes of previous meetings (Field Reports).

1.6.4.2. Review of Work progress.

1.6.4.3. Field observations, problems, and decisions.

1.6.4.4. Identification of problems which impede planned progress.

1.6.4.5. Review of submittals schedule and status of submittals.

1.6.4.6. Review of off-site fabrication and delivery schedules.

1.6.4.7. Maintenance of construction schedule.

1.6.4.8. Corrective measures to regain projected schedules.

1.6.4.9. Planned progress during succeeding work period.

1.6.4.10. Coordination of projected progress.

1.6.4.11. Maintenance of quality and work standards.

1.6.4.12. Effect of proposed changes on progress schedule and coordination.

1.6.4.13. Other business relating to Work.

1.6.5. District has authority to schedule mandatory meetings other than those listed, as

necessary.

1.7. PRE-INSTALLATION CONFERENCES

1.7.1. When required in individual specification section, Contractor shall convene a pre-installation conference prior to commencing Work of the section. Refer to individual specification section for timing requirements of conference.

1.7.2. Contractor shall require its Subcontractors and suppliers directly affecting, or affected by, Work of the specific section to attend.

1.7.3. Notify the Construction Manager, Project Engineer, Project Inspector, and Architect of Record four (4) days in advance of meeting date.

1.7.4. A pre-installation conference may coincide with a regularly scheduled progress meeting.

1.7.5. Contractor shall prepare agenda, preside at conference, record minutes, and distribute copies within two (2) days after conference to participants.

1.7.6. The purpose of the meeting will be to review Contract Documents, conditions of installation, preparation and installation procedures, and coordination with related Work and manufacturer's recommendations.

1.7.7. Pre-installation Schedule: As a minimum, Work being installed under the Contract Documents technical sections will require pre-installation conferences. Contractor shall review the technical specifications and add all additional requirements for pre-installation meetings contained in those sections.

1.8. POST CONSTRUCTION DEDICATION

1.8.1. Attendance Required: Project Superintendent, Contractor, Project Manager, major Subcontractors, Construction Manager, Project Engineer, Project Inspector, and Architect of Record.

1.8.2. Preparation prior to Dedication: Contractor and appropriate Subcontractors and suppliers shall:

1.8.3. Assist District in operation of mechanical devices and systems.

1.8.3.1. Verify operation and adjust controls for communication systems.

1.8.3.2. Assist District in operation of lighting systems.

END OF DOCUMENT

DOCUMENT 01 32 16

CONSTRUCTION SCHEDULE – NETWORK ANALYSIS

1. GENERAL

1.1. RELATED DOCUMENTS AND PROVISION

Contractor shall review all Contract Documents for applicable provisions related to the provisions in this document, including without limitation:

1.1.1. General Conditions;

1.1.2. Special Conditions (if any);

1.1.3. Supplemental Conditions (if any);

1.1.4. Coordination and Meetings; and

1.1.5. Submittals.

1.2. REFERENCES

1.2.1. Construction Planning and Scheduling Manual - A Manual for General Contractors and the Construction Industry, The Associated General Contractors of America (AGC).

1.2.2. CSI - Construction Specifications Institute MP-2-1 Master Format.

1.2.3. U.S. National Weather Service - Local Climatological Data.

1.3. PERFORMANCE REQUIREMENTS

1.3.1. Ensure adequate scheduling during construction activities so Work may be prosecuted in an orderly and expeditious manner within stipulated Contract Time.

1.3.2. Ensure coordination of Contractor and Subcontractors at all levels.

1.3.3. Ensure coordination of submittals, fabrication, delivery, erection, installation, and testing of products, materials and equipment.

1.3.4. Ensure on-time delivery of District furnished products, materials and equipment.

1.3.5. Ensure coordination of jurisdictional reviews.

1.3.6. Prepare applications for payment.

1.3.7. Monitor progress of Work.

1.3.8. Prepare proper requests for changes to Contract Time.

1.3.9. Prepare proper requests for changes to Construction Schedule.

1.3.10. Assist in detection of schedule delays and identification of corrective actions.

1.4. QUALITY ASSURANCE

1.4.1. Perform scheduling work in accordance with Construction Planning and Scheduling Manual published by the AGC.

1.4.2. Maintain one copy of Construction Planning and Scheduling Manual on Site.

1.4.3. In the event of discrepancy between the AGC publication and the Contract Documents, provisions of the Contract Documents shall govern.

1.5. QUALIFICATIONS

1.5.1. **Scheduler**:

1.5.1.1. Contractor shall retain a construction scheduler to work in enough capacity to perform all of the Contractor's requirements to prepare the Construction Schedule. The Scheduler shall plan, coordinate, execute, and monitor a cost/resource loaded CPM schedule as required for Project and have a minimum of five (5) years direct experience using Primavera Project Management.

1.5.1.2. Scheduler will cooperate with District and shall be available on site for monitoring, maintaining and updating schedules in a timely manner.

1.5.1.3. District has the right to reject the Scheduler based upon a lack of experience as required by this Document or based on lack of performance and timeliness of schedule submittals/fragnets on past projects. Contractor shall within seven (7) calendar days of District's rejection, propose another scheduler who meets the experience requirements stated above.

1.5.2. **Administrative Personnel**: Five (5) years minimum experience in using and monitoring schedules on comparable projects.

1.6. SUBMITTALS

1.6.1. Submit Short Interval Schedule at each Construction Progress Meeting.

1.6.2. Submit Time Adjustment Schedule within five (5) days of commencement of a claimed delay.

1.6.3. Submit Recovery Schedules as required for timely completion of Work or when demanded by the District.

1.6.4. Submit job cost reports when demanded by the District.

1.6.5. Submit one (1) reproducible and two (2) copies of each schedule and cost report.

1.6.6. Submit large format plotted schedules monthly or at the request of the District or Construction Manager.

1.7. REVIEW AND EVALUATION

1.7.1. Contractor shall participate in joint review of Construction Schedule and Reports with District and Architect.

1.7.2. Within seven (7) days of receipt of District and/or Architect's comments provide satisfactory revision to Construction Schedule or adequate justification for activities in question.

1.7.3. In the event that an activity or element of Work is not detected by District or Architect review, such omission or error shall be corrected by next scheduled update and shall not affect Contract Time.

1.7.4. Acceptance by District of corrected Construction Schedule shall be a condition precedent to making any progress payments.

1.7.5. Cost-loaded values of Construction Schedule shall be basis for determining progress payments.

1.7.6. Review and acceptance by District and Architect of Preliminary Construction Schedule or Construction Schedule does not constitute responsibility whatsoever for accuracy or feasibility of schedules nor does such acceptance expressly or impliedly warrant, acknowledge or admit reasonableness of activities, logic, duration, manpower, cost or equipment loading stated or implied on schedules.

1.8. FORMAT

1.8.1. Prepare diagrams and supporting mathematical analyses using Precedence Diagramming Method, under concepts and methods outlined in AGC Construction Planning and Scheduling Manual, or other method pre-approved by District.

1.8.2. **Listings**: Reading from left to right, in ascending order for each activity.

1.8.3. **Diagram Size**: 42 inches maximum height x width required.

1.8.4. **Scale and Spacing**: To allow for legible notations and revisions.

1.8.5. Illustrate order and interdependence of activities and sequence of Work.

1.8.6. Illustrate complete sequence of construction by activity.

1.8.7. Provide legend of symbols and abbreviations used.

1.9. COST AND SCHEDULE REPORTS

1.9.1. **Activity Analysis**: Tabulate each activity of network diagram and identify for each activity:

1.9.1.1. Description.

1.9.1.2. Interface with outside contractors or agencies.

1.9.1.3. Number.

1.9.1.4. Preceding and following number.

1.9.1.5. Duration.

1.9.1.6. Earliest start date.

1.9.1.7. Earliest finish date.

1.9.1.8. Actual start date.

1.9.1.9. Actual finish date.

1.9.1.10. Latest start date.

1.9.1.11. Latest finish date.

1.9.1.12. Total and free float.

1.9.1.13. Identification of critical path activity.

1.9.1.14. Monetary value keyed to Schedule of Values.

1.9.1.15. Manpower requirements.

1.9.1.16. Responsibility.

1.9.1.17. Percentage complete.

1.9.1.18. Variance positive or negative.

1.9.2. **Cost Report**: Tabulate each activity of network diagram and identify for each activity:

1.9.2.1. Description.

1.9.2.2. Number.

1.9.2.3. Total cost.

1.9.2.4. Percentage complete.

1.9.2.5. Value prior to current period.

1.9.2.6. Value this period.

1.9.2.7. Value to date.

1.9.3. **Required Sorts**: List activities in sorts or groups:

1.9.3.1. By activity number.

1.9.3.2. By amount of float time in order of early start.

1.9.3.3. By responsibility in order of earliest start date.

1.9.3.4. In order of latest start dates.

1.9.3.5. In order of latest finish dates.

1.9.3.6. Application for payment sorted by Schedule of Values.

1.9.3.7. Listing of activities on critical path.

1.9.4. Listing of basic input data which generates schedule.

1.10. CONSTRUCTION SCHEDULE

1.10.1. Contractor shall develop and submit a cost loaded preliminary schedule of construction (or Preliminary Construction Schedule) as required by this Document and the Contract Documents. It shall be submitted in computer generated network format and shall be organized by Activity Codes representing the intended sequencing of the Work, and with time scaled network diagrams of activities. The Preliminary Construction Schedule shall include activities such as mobilization, preparation of submittals, specified review periods, procurement items, fabrication items, milestones, and all detailed construction activities.

1.10.2. Upon District's acceptance of the Preliminary Construction Schedule, Contractor shall update the accepted Preliminary Construction Schedule until Contractor's Construction Schedule is fully developed and accepted. Since updates to the Construction Schedule are the basis for payment to Contractor, submittal and acceptance of the Construction Schedule and updates shall be a condition precedent to making of monthly payments, as indicated in the General Conditions.

1.10.3. Failure to submit an adequate or accurate Preliminary Construction Schedule, Construction Schedule, updates thereto or failure to submit on established dates, will be considered a breach of Contract.

1.10.4. Failure to include any activity shall not be an excuse for completing all Work by required Completion Date.

1.10.5. Activities of long intervals shall be broken into increments no longer than fourteen (14) days or a value over $20,000.00, unless approved by the District or it is a non-construction activity for procurement and delivery.

1.10.6. The Construction Schedule shall comply with the following and include the following:

1.10.6.1. Provide a written narrative describing Contractor's approach to mobilization, procurement, and construction during the first thirty (30) calendar days including crew sizes, equipment and material delivery, Site access, submittals, and permits.

1.10.6.2. Shall designate critical path or paths.

1.10.6.3. Procurement activities to include mobilization, shop drawings and sample submittals.

1.10.6.4. Identification of key and long-lead elements and realistic delivery dates.

1.10.6.5. Construction activities in units of whole days limited to fourteen (14) days for each activity except non-construction activities for procurement and delivery.

1.10.6.6. Approximate cost and duration of each activity.

1.10.6.7. Shall contain seasonal weather considerations.

1.10.6.8. Indicate a date for Project Completion that is no later than Completion Date subject to any time extensions processed as part of a Change Order.

1.10.6.9. Conform to mandatory dates specified in the Contract Documents.

1.10.6.10. Contractor shall allow for inclement weather in the Proposed Baseline Schedule by incorporating an activity titled "Rain Day Impact Allowance" as the last activity prior to the Completion Milestone. No other activities may be concurrent with it. The duration of the Rain Day Impact Allowance activity will be in accordance with the Special Conditions, and will be calculated from the Notice to Proceed until the Completion.

1.10.6.11. Level of detail shall correspond to complexity of work involved.

1.10.6.12. Indicate procurement activities, delivery, and installation of District furnished material and equipment.

1.10.6.13. Designate critical path or paths.

1.10.6.14. Subcontractor work at all levels shall be included in schedule.

1.10.6.15. As developed, shall show sequence and interdependence of activities required for complete performance of Work.

1.10.6.16. Shall be logical and show a coordinated plan of Work.

1.10.6.17. Show order of activities and major points of interface, including specific dates of completion.

1.10.6.18. Duration of activities shall be coordinated with Subcontractors and suppliers and shall be best estimate of time required.

1.10.6.19. Shall show description, duration and float for each activity.

1.10.7. **Activity.** An activity shall meet the following criteria:

1.10.7.1. Any portion or element of Work, action, or reaction that is precisely described, readily identifiable, and is a function of a logical sequential process.

1.10.7.2. Descriptions shall be clear and concise. Beginning and end shall be readily verifiable. Starts and finishes shall be scheduled by logical restraints.

1.10.7.3. Responsibility shall be identified with a single performing entity.

1.10.7.4. Additional codes shall identify building, floor, bid opening and/or District's receipt of proposals, whichever is acceptable and CSI classification.

1.10.7.5. Assigned dollar value (cost-loading) of each activity shall cumulatively equal total contract amount. Mobilization, bond and insurance costs shall be separate. General requirement costs, overhead, profit, shall be prorated throughout all activities. Activity costs shall correlate with Schedule of Values.

1.10.7.6. Each activity shall have manpower-loading assigned.

1.10.7.7. Major construction equipment shall be assigned to each activity.

1.10.7.8. Activities labeled start, continue or completion are not allowed.

1.10.8. **Equipment and Materials.** For major equipment and materials show a sequence of activities including:

1.10.8.1. Preparation of shop drawings and sample submissions.

1.10.8.2. Review of shop drawings and samples.

1.10.8.3. Finish and color selection.

1.10.8.4. Fabrication and delivery.

1.10.8.5. Erection or installation.

1.10.8.6. Testing.

1.10.9. Include a minimum of fifteen (15) days prior to Completion Date for punch lists and clean up. No other activities shall be scheduled during this period.

1.11. SHORT INTERVAL SCHEDULE

1.11.1. The Four-Week Rolling Schedule shall be based on the most recent District Accepted Construction Schedule or Update. It shall include weekly updates to all construction, submittal, fabrication/procurement, and separate Work Contract activities. Contractor shall ensure that it accurately reflects the current progress of the Work.

1.11.2. Shall be fully developed horizontal bar-chart-type schedule directly derived from Construction Schedule.

1.11.3. Prepare schedule on sheet of sufficient width to clearly show data.

1.11.4. Provide continuous heavy vertical line identifying first day of week.

1.11.5. Provide continuous subordinate vertical line identifying each day of week.

1.11.6. Identify activities by same activity number and description as Construction Schedule.

1.11.7. Show each activity in proper sequence.

1.11.8. Indicate graphically sequences necessary for related activities.

1.11.9. Indicate activities completed or in progress for previous two (2) week period.

1.11.10. Indicate activities scheduled for succeeding three (3) week period.

1.11.11. Further detail should be added if necessary to monitor schedule or if requested by District.

1.12. REQUESTED TIME ADJUSTMENT SCHEDULE

1.12.1. Updated Construction Schedule shall not show a Completion Date later than the Contract Time, subject to any time extensions processed as part of a Change Order.

1.12.2. If an extension of time is requested, a separate schedule entitled "Requested Time Adjustment Schedule" shall be submitted to District and Architect.

1.12.3. Indicate requested adjustments in Contract Time which are due to changes or delays in completion of Work.

1.12.4. Extension request shall include forecast of Project Completion date and actual achievement of any dates listed in Contract Documents.

1.12.5. To the extent that any requests are pending at time of any Construction Schedule update, Time Adjustment Schedule shall also be updated.

1.12.6. Schedule shall be a time-scaled network analysis.

1.12.7. Accompany schedule with formal written time extension request and detailed impact analysis justifying extension.

1.12.8. Time impact analysis shall demonstrate time impact based upon date of delay, and status of construction at that time and event time computation of all affected activities. Event times shall be those as shown in latest Construction Schedule.

1.12.9. Activity delays shall not automatically constitute an extension of Contract Time.

1.12.10. Failure of Subcontractors shall not be justification for an extension of time.

1.12.11. Float is not for the exclusive use or benefit of any single party. Float time shall be apportioned according to needs of Project, as determined by the District.

1.12.12. Float suppression techniques such as preferential sequencing, special lead/lag logic restraints, extended activity durations, or imposed dates shall be apportioned according to benefit of Project.

1.12.13. Extensions will be granted only to extent that time adjustments to activities exceed total positive float of the critical path and extends Completion date.

1.12.14. District shall not have an obligation to consider any time extension request unless requirements of Contract Documents, and specifically, but not limited to these requirements, are complied with.

1.12.15. District shall not be responsible or liable for any construction acceleration due to failure of District to grant time extensions under Contract Documents should requested adjustments in Contract Time not substantially comply with submission and justification requirements of Contract for time extension requests.

1.12.16. In the event a Requested Time Adjustment Schedule and Time Impact Analysis are not submitted within ten (10) days after commencement of a delay it is mutually agreed that delay does not require a Contract Time extension.

1.13. RECOVERY SCHEDULE

1.13.1. When activities are behind Construction Schedule a supplementary Recovery Schedule shall be submitted.

1.13.2. Contractor shall prepare and submit to the District a Recovery Schedule whenever activities are behind Construction Schedule or at any time requested by the District, at no cost to the District.

1.13.3. Form and detail shall be sufficient to explain and display how activities will be rescheduled to regain compliance with Construction Schedule and to complete the Work by the Completion Date.

1.13.4. Maximum duration shall be one (1) month and shall coincide with payment period.

1.13.5. Ten (10) days prior to expiration of Recovery Schedule, Contractor shall have to show verification to determine if activities have regained compliance with Construction Schedule. Based upon this verification the following will occur:

1.13.5.1. Supplemental Recovery Schedule will be submitted to address subsequent payment period.

1.13.5.2. Construction Schedule will be resumed.

1.14. UPDATING SCHEDULES

1.14.1. Review and update schedules at least ten (10) days prior to submitting an Application for Payment.

1.14.2. Maintain schedules to record actual prosecution and progress.

1.14.3. Approved Change Orders which affect schedules shall be identified as separate new activities.

1.14.4. Change Orders of less than $5,000.00 value or less than three (3) days duration need not be shown unless critical path is affected.

1.14.5. No other revisions shall be made to schedules unless authorized by District.

1.14.6. **Schedule Narrative Report**: Contractor shall include a written report to explain the Monthly Schedule Update. The narrative shall, at a minimum, include the following headings with appropriate discussions of each topic:

1.14.6.1. Activities or portions of activities completed during previous reporting period.

1.14.6.2. Actual start dates for activities currently in progress.

1.14.6.3. Deviations from critical path in days ahead or behind.

1.14.6.4. List of major construction equipment used during reporting period and any equipment idle.

1.14.6.5. Number of personnel by trade engaged on Work during reporting period.

1.14.6.6. Progress analysis describing problem areas.

1.14.6.7. Current and anticipated delay factors and their impact.

1.14.6.8. Proposed corrective actions and logic revisions for Recovery Schedule.

1.14.6.9. Proposed modifications, additions, deletions and changes in logic of Construction Schedule.

1.14.6.10. In updating the Schedule, Contractor shall not modify Activity ID numbers, schedule calculation rules/criteria, or the Activity Coding Structure required.

1.14.7. Schedule update will form basis upon which progress payments will be made.

1.14.8. District will not be obligated to review or process Application for Payment until the Construction Schedule and Schedule Narrative Report have been submitted.

1.15. DISTRIBUTION

1.15.1. Following joint review and acceptance of updated schedules distribute copies to District, Architect, and all other concerned parties.

1.15.2. Instruct recipients to promptly report in writing any problem anticipated by projections shown in schedules.

2. PRODUCTS

2.1. SCHEDULING SOFTWARE

Contractor shall utilize District-approved software and shall employ the Critical Path Method (CPM) in the development and maintenance of the Construction Schedule The scheduling software shall be capable of being resource loaded with manpower, costs and materials. It shall also be capable of generating time-scaled logic diagrams, resource histograms and profiles, bar charts, layouts and reports with any and/or all activity detail.

2.2. ELECTRONIC DATA

Provide compact disk(s) that contain a back-up of the Proposed Baseline Schedule data on it and in a format approved by the District.

END OF DOCUMENT

DOCUMENT 01 33 00

SUBMITTALS

1. GENERAL

1.1. RELATED DOCUMENTS AND PROVISION

Contractor shall review all Contract Documents for applicable provisions related to the provisions in this document, including without limitation:

1.1.1. General Conditions;

1.1.2. Special Conditions;

1.1.3. Instructions to Bidders;

1.1.4. Summary of Work;

1.1.5. Contract Forms and Submittals;

1.1.6. Product Options and Substitutions;

1.1.7. Requests for Information;

1.1.8. Contract Closeout and Final Cleaning;

1.1.9. Operation and Maintenance Data;

1.1.10. Warranties;

1.1.11. Record Documents;

1.1.12. Demonstration and Training;

1.2. DOCUMENT INCLUDES

1.2.1. Submittal procedures – Use of Primavera.

1.2.2. Shop drawings.

1.2.3. PCM (or other pre-approved program) Electronic Submittal Process

1.2.4. Product data.

1.2.5. Samples.

1.2.6. Manufacturers' Instructions.

1.2.7. Manufacturers' Certificates.

1.2.8. Mock-Up.

1.2.9. Deferred approval requirements.

1.3. SUBMITTAL PROCEDURES – USE OF PRIMAVERA OR ANOTHER PRE-APPROVED PROGRAM

Contractor shall utilize District-approved software for the submittal process.

1.3.1. Contractor shall transmit each submittal in conformance with requirements of this Document. For each submittal, Contractor shall:

1.3.1.1. Sequentially number the transmittal forms. Resubmitted submittals must have the original number with an alphabetic suffix;

1.3.1.2. Identify Project and Architect's project number, Contractor, Subcontractor or supplier; pertinent Drawing sheet and detail number(s), and specification Section number, as appropriate;

1.3.1.3. Apply Contractor's stamp, signed or initialed certifying that review, verification of Products required, field dimensions, adjacent construction work, and coordination of information is in accordance with the requirements of the Work and Contract Documents. Submittals without Contractor's stamp and signature will be returned without review.

1.3.2. Coordinate preparation and processing of submittals with performance of Work. Transmit each submittal sufficiently in advance of performance of Work to avoid delay.

1.3.2.1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.

1.3.2.2. Coordinate transmittal of different types of submittals for related parts of Work so processing will not be delayed because of the need to review submittals concurrently for coordination.

1.3.2.3. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

1.3.3. Comply with Contract Documents for list of submittals and time requirements for scheduled performance of Work.

1.3.4. No extension of Contract Time will be authorized because of failure to transmit submittals to the Architect sufficiently in advance of the Work to permit processing.

1.3.5. Identify variations from Contract Documents and Product or system limitations which may be detrimental to successful performance of the completed Work.

1.3.6. Provide space for Contractor and Architect review stamps.

1.3.7. Revise and resubmit submittals as required, identify all changes made since previous submittal.

1.3.8. Distribute copies of reviewed submittals to concerned parties. Instruct parties to promptly report any inability to comply with provisions.

1.3.9. Submittals not requested will not be recognized or processed. Submittals not requested

will be returned without review.

1.4. SHOP DRAWINGS

1.4.1. Prepare Project-specific information, drawn accurately to scale. Do not reproduce Contract Documents or copy standard information as the basis of shop drawings. Standard information prepared without specific reference to the Project is not a shop drawing.

1.4.2. Do not use or allow others to use Shop Drawings which have been submitted and have been rejected.

1.4.3. Preparation: Fully illustrate requirements in Contract Documents. Include the following information, as applicable:

1.4.3.1. Dimensions.

1.4.3.2. Identification of products.

1.4.3.3. Fabrication and installation drawings.

1.4.3.4. Roughing-in and setting diagrams.

1.4.3.5. Wiring diagrams showing field-installed wiring, including power, signal, and control wiring.

1.4.3.6. Shop work manufacturing instructions.

1.4.3.7. Templates and patterns.

1.4.3.8. Schedules.

1.4.3.9. Design calculations.

1.4.3.10. Compliance with specified standards.

1.4.3.11. Notation of coordination requirements.

1.4.3.12. Notation of dimensions established by field measurements.

1.4.3.13. Relationship to adjoining construction clearly indicated.

1.4.3.14. Seal and signature of professional engineer if specified.

1.4.3.15. Wiring Diagrams: Differentiate between manufacturer-installed and field-installed wiring.

1.4.3.16. All deviations from the Contract Documents, clearly indicated.

1.4.3.17. Copy of letter indicating acceptance of deviations indicated on the submittal.

1.4.4. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop

Drawings on sheets at least 8-1/2 by 11 inches (215 by 280 mm) but no larger than 30 by 40 inches (750 by 1000 mm).

1.4.5. Do not use Shop Drawings without an appropriate final stamp from the Contractor and District indicating action taken in connection with construction.

1.4.6. Deviations from Contract Documents require specific written acceptance by the District of the noted deviation and clear indication on the submittal.

1.5. ELECTRONIC SUBMITTAL PROCESS

1.5.1. Submittal Procedure for Large Format Shop Drawings.

1.5.1.1. Contractor shall provide six (6) paper copies of the large format Shop Drawings directly to the District and the Construction Manager (CM) and Contractor will upload/post an electronic transmittal (with a detailed description of the submittal including the subject, specification number and number of drawings) on PCM (or other pre-approved program).

1.5.1.2. Contractor shall verify that the Schedule of Submittals and all submittal log(s) on PCM (or other pre-approved program) are accurate and up to date.

1.5.1.3. The District and Architect will review and markup each Submittal and provide changes to Contractor for Contractor's incorporation into the Submittal.

1.5.1.4. This process will continue until the Contractor has provided a Submittal that is acceptable to the District and the Architect.

1.5.1.5. Once a Submittal is accepted, the District will provide a final accepted Submittal to the Contractor and the Contractor will closeout that one Submittal.

1.5.1.6. Contractor shall send one (1) copy of the completed record submittal of the large format documents to a vendor (Ford Graphics is suggested) for scanning and posting on PCM (or other pre-approved program).

1.5.2. Product Data, Calculations and Small Format Drawings

1.5.2.1. Contractor shall upload/post one (1) electronic copy (from manufacturer's website or pre-scanned) of the product literature, data, calculations, and/or small format shop drawings to PCM (or other pre-approved program) with a Transmittal (with a detailed description of the submittal) directly to the CM.

1.5.2.2. The District and Architect will review and markup each Submittal and provide changes to Contractor for Contractor's incorporation into the Submittal.

1.5.2.3. This process will continue until the Contractor has provided a Submittal that is acceptable to the District and the Architect.

1.5.2.4. Once a Submittal is accepted, the District will provide a final accepted Submittal to the Contractor and the Contractor will closeout that one Submittal.

1.5.2.5. Contractor shall send one (1) copy of the completed record submittal of the large format documents to a vendor (Ford Graphics is suggested) for scanning and posting on PCM (or other pre-approved program).

1.5.3. Sample Submittal Procedure – (Product / Assembly Samples)

1.5.3.1. Contractor shall provide four (4) physical samples directly to the District and the CM and Contractor will upload/post an electronic transmittal (with a detailed description of the submittal including the subject, specification number and number of drawings) on PCM (or other pre-approved program).

1.5.3.2. The District and Architect will review and markup each Submittal and provide changes to Contractor for Contractor's incorporation into the Submittal.

1.5.3.3. This process will continue until the Contractor has provided a Submittal that is acceptable to the District and the Architect.

1.5.3.4. Once a Submittal is accepted, the District will provide a final accepted Submittal to the Contractor and the Contractor will closeout that one Submittal.

1.5.3.5. Contractor shall send one (1) copy of the completed record submittal of the large format documents to a vendor (Ford Graphics is suggested) for scanning and posting on PCM (or other pre-approved program).

1.6. PRODUCT DATA

1.6.1. In addition to the above requirements, mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information unique to this Project.

1.6.2. After review, distribute in accordance with the above provisions and provide copies for Record Documents described in the Contract Documents.

1.7. SAMPLES

1.7.1. In addition to the above requirements, submit samples to illustrate functional and aesthetic characteristics of the Product in accordance with this Document, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.

1.7.2. Where specific colors or patterns are not indicated, provide materials and products specified in the full range of color, texture and pattern for selection by District. Range shall include standard stocked color/texture/pattern, standard color/texture/pattern not stocked, but available from manufacturer, and special color/ texture/pattern available from manufacturer as advertised in product data and brochures. Unless otherwise indicated in individual specification sections, District may select from any range at no additional cost to District.

1.7.3. Include identification on each sample, with full Project information.

1.7.4. Submit the number of samples that Contractor requires, plus one that will be retained

by Architect and one by District.

1.7.5. Reviewed samples which may be used in the Work are indicated in individual specification Sections.

1.8. MANUFACTURERS' INSTRUCTIONS

1.8.1. When specified in individual specification Sections, submit manufacturers' printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing, in quantities specified for Product Data.

1.8.2. Identify conflicts between manufacturers' instructions and Contract Documents.

1.9. MANUFACTURERS' CERTIFICATES

1.9.1. When specified in individual specification Sections, submit manufacturers' certificates to Architect for review, in quantities specified for Product Data.

1.9.2. Indicate material or Product conforms to or exceeds specified requirements. Submit supporting reference date, affidavits, and certifications as appropriate.

1.9.3. Certificates may be recent or previous test results on material or Product, but must be acceptable to District.

1.10. MOCK-UP

1.10.1. Where indicated, provide mock-ups as required. Mock-ups shall be prepared per the specifications and shall accurately and reasonably represent the quality of construction the Contractor will provide. If the mock-up or portions thereof do not adequately represent the quality of the work specified, the Contractor shall modify the mock-up as needed.

1.10.2. Once completed to the District's satisfaction, the mock-up shall serve as the standard of quality for the work.

1.10.3. All mock-ups, at District's option, shall remain the property of the District. If not required by the District, Contractor shall remove and dispose of the mock-up.

1.10.4. Where indicated, on-site mock-ups, if accepted, may be integrated into the Work.

1.11. ARCHITECT'S REVIEW OF SUBMITTALS

1.11.1. Submittals will be reviewed and stamped by the Architect "No exceptions taken," "Submit specified item" or "Make corrections noted" to indicate full or conditioned approval or "Revise and resubmit" or "Rejected" to indicate disapproval. Terms are defined as follows:

1.11.1.1. No Exceptions Taken: Accepted subject to its compatibility with future submittals and additional partial submittals for portions of the work not covered in this submittal. Does not constitute approval or deletion of specified or required items not shown in the partial submittal.

1.11.1.2. Submit specified item: Submit to the Architect the items indicated for review.

1.11.1.3. Correct as noted: Same as 1., except that minor corrections as noted shall be made by the Contractor. No resubmittal required.

1.11.1.4. Revise and resubmit: Rejected because of major inconsistencies or errors which shall be resolved or corrected by the Contractor prior to subsequent review by the Architect.

1.11.1.5. Rejected: Submitted material does not conform to plans and specifications in major respect. For example, wrong size, model, capacity or material. Resubmit.

1.11.1.6. Receipt Acknowledged. Received, recorded and distributed without further action.

1.11.2. Submittals reviewed by the Architect which have been stamped shall be deemed to have the following language affixed and made a part thereof, regardless of the initial or subsequent readability of the actual stamp.

1.11.2.1. Corrections or comments made on submittals during this review do not relieve the contractor from compliance with the requirements of the drawings and specifications. This check is for review of general conformance with the design concept of the project and general compliance with information given in the Contract Documents. The contractor is responsible for confirming and correlating all quantities and dimensions, selection of fabrication processes and techniques of construction, coordinating the work of the trades; and performing the work in a safe and satisfactory manner.

1.11.3. Architect’s review of submittals shall be completed within ten working days of the date of submission. Any requests by Architect for additional time shall not be unreasonably withheld.

1.11.4. Architect's review of submittals has, as a primary objective, to assist in the completion of the project on time and in conformance with the Contract requirements by permitting review of material and fabricated items prior to ordering. Architect's review of submittals is based only on the data presented and extends only to conformance with general design intent and information contained in the Contract Documents.

1.11.5. Architect's approval of submittals does not constitute final acceptance or unqualified approval of items or work proposed or put in place, nor does it constitute acceptance of responsibility for the accuracy, coordination or completeness of submittals. Architect's approval of submittals does not relieve the Contractor from the responsibility for errors, omissions, or compliance with all the requirements of the Contract Documents.

1.11.6. Reimbursement of the Architect's costs for review:

1.11.6.1. Architect will record all time and expenses incurred to review submittals requiring more than two reviews.

1.11.6.2. Contractor shall reimburse the District through deduction from amounts due the Contractor upon receipt of the Architect's billing and that of the Architect's consultants at standard billing rates for all time and expenses incurred in unanticipated reviews.

1.11.7. Architect's review of submittals does not change the Contract in any manner.

1.12. **RESUBMITTAL**

1.12.1. Make all corrections or revisions required by reviewer's comments at Contractor's expense and resubmit as initially specified above. No additional costs will be authorized for corrections or revisions.

1.12.2. Product data and shop drawings:

1.12.2.1. Revise initial drawings or data and resubmit as initially specified.

1.12.2.2. Indicate changes which have been made other than those requested by reviewer.

1.12.3. Submit new samples as initially specified.

1.13. **DISTRIBUTION**

1.13.1. Distribute only submittals with Architect/Engineer (and DSA as applicable) stamps of review. Contractor is responsible for coordination of submittals and comments following review. Contractor to provide all additional reproduction costs for copies required by the Contractor at its expense. No additional costs will be authorized for Contractor costs pertaining to submittals.

1.14. **DEFERRED APPROVAL REQUIREMENTS**

1.14.1. Installation of deferred approval items shall not be started until detailed plans, specifications, and engineering calculations have been accepted and signed by the Architect or Engineer in general responsible charge of design and signed by a California registered Architect or professional engineer who has been delegated responsibility covering the work shown on a particular plan or specification and approved by the agency having authority (e.g., State Fire Marshall, Division of the State Architect, gas company, electrical utility company, water district, etc.). Deferred approval items for this Project are as indicated in the Summary of Work.

1.14.2. Unless otherwise indicated in the Contract Documents or if District provides written approval of a longer time period, Contractor shall submit all deferred approval items for approval within thirty (30) days of the notice to proceed with the Construction Phase.

1.14.3. Deferred approval drawings and specifications become part of the approved documents for the Project when they are submitted to and approved by DSA.

1.14.4. Submit material using electronic submittal process as defined above.

1.14.5. Identify and specify all supports, fasteners, spacing, penetrations, etc., for each of the deferred approval items, including calculations for each and all fasteners.

1.14.6. Submit documents to Architect for review prior to forwarding to DSA.

1.14.7. Documents shall bear the stamp and signature of the Structural, Mechanical, or Electrical Engineer licensed in the State of California who is responsible for the work shown on the documents.

1.14.8. Architect and its subconsultants will review the documents only for conformance with design concept shown on the documents. The Architect will then forward the Submittal to agency having authority for approval.

1.14.9. Contractor shall respond to review comments made by DSA and revise and resubmit submittal to the Architect for re-submittal to DSA.

1.14.10. Contractor is notified that significant lead time is required for deferred approval review by DSA and shall schedule work accordingly. No extension of Contract Time will be allowed for delays incurred by deferred approval review. The Architect is not responsible for DSA delays in deferred approval review.

END OF DOCUMENT

DOCUMENT 01 40 00

QUALITY REQUIREMENTS

1. GENERAL

1.1. RELATED DOCUMENTS AND PROVISIONS

Contractor shall review all Contract Documents for applicable provisions related to the provisions in this document, including without limitation:

1.1.1. General Conditions;

1.1.2. Special Conditions (if any);

1.1.3. Supplemental Conditions (if any);

1.1.4. Drawings;

1.1.5. Construction Schedule – Network Analysis;

1.1.6. General Definitions and References.

1.2. SUMMARY

1.2.1. This Document includes administrative and procedural requirements for quality assurance and quality control.

1.2.2. Testing and inspecting services by the District are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Documents' requirements.

1.2.2.1. Specific quality-assurance and -control requirements for individual construction activities are specified in the Specifications for those activities. Requirements in those Specifications may also cover production of standard products.

1.2.2.2. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and -control procedures that facilitate compliance with the Contract Documents' requirements.

1.2.2.3. Requirements for Contractor to provide quality-assurance and -control services required by District, District's consultants, or authorities having jurisdiction are not limited by provisions of this Document.

1.3. DEFINITIONS

1.3.1. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.

1.3.2. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Services do not include contract enforcement activities performed by District or its consultants.

1.3.3. Mock-ups: Full-size, physical assemblies that are constructed on-site. Mock-ups are used to verify selections made under sample submittals, to demonstrate aesthetic effects and, where indicated, qualities of materials and execution, and to review construction, coordination, testing, or operation; they are not Samples. Approved mock-ups establish the standard by which the Work will be judged.

1.3.4. Laboratory Mock-ups: Full-size, physical assemblies that are constructed at testing facility to verify performance characteristics.

1.3.5. Preconstruction Testing: Tests and inspections that are performed specifically for the Project before products and materials are incorporated into the Work to verify performance or compliance with specified criteria.

1.3.6. Product Testing: Tests and inspections that are performed by an NRTL (National Recognized Testing Laboratory), an NVLAP (National Voluntary Laboratory Accreditation Program), or a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with industry standards.

1.3.7. Source Quality-Control Testing: Tests and inspections that are performed at the source, i.e., plant, mill, factory, or shop.

1.3.8. Field Quality-Control Testing: Tests and inspections that are performed on-site for installation of the Work and for completed Work.

1.4. CONFLICTING REQUIREMENTS

1.4.1. General: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer uncertainties and requirements that are different but apparently equal, to District for a decision before proceeding.

1.4.2. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to District for a decision before proceeding.

1.5. SUBMITTALS

1.5.1. Qualification Data: For testing agencies specified in "Quality Assurance" below to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.

1.5.2. Schedule of Tests and Inspections: Prepare in tabular form and include the following:

1.5.2.1. Specification number and title.

1.5.2.2. Description of test and inspection.

1.5.2.3. Identification of applicable standards, codes or regulations.

1.5.2.4. Identification of test and inspection methods.

1.5.2.5. Number of tests and inspections required.

1.5.2.6. Time schedule or time span for tests and inspections.

1.5.2.7. Entity responsible for performing tests and inspections.

1.5.2.8. Requirements for obtaining samples.

1.5.2.9. Unique characteristics of each quality-control service.

1.5.3. Reports: Prepare and submit certified written reports that include the following:

1.5.3.1. Date of issue.

1.5.3.2. Project title and number.

1.5.3.3. Name, address, and telephone number of testing agency.

1.5.3.4. Dates and locations of samples and tests or inspections.

1.5.3.5. Names of individuals making tests and inspections.

1.5.3.6. Description of the Work and test and inspection method.

1.5.3.7. Identification of product and Specification.

1.5.3.8. Complete test or inspection data.

1.5.3.9. Test and inspection results and an interpretation of test results.

1.5.3.10. Record of temperature and weather conditions at time of sample taking and testing and inspecting.

1.5.3.11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Documents' requirements.

1.5.3.12. Name and signature of laboratory inspector.

1.5.3.13. Recommendations on retesting and reinspecting.

1.5.3.14. Descriptions of deficiencies noted, and corrective action undertaken to resolve such deficiencies.

1.5.3.14.1. Deficiencies observed shall immediately be brought to the attention of the Contractor's field superintendent, and trade foreman. In the event deficiencies are not corrected, or if an interpretation of the Contract Documents is required, the Testing Agency shall immediately notify the District and applicable consultant, Architect, or Engineer.

1.5.3.14.2. The Testing Agency shall maintain a deficiency list of all items not corrected and shall reinspect the area after the deficiency has been corrected. The list shall include a description of the deficiency, the date and time the deficiency was observed,

who was notified, the date of reinspection and description of any corrective action taken. Distribute the deficiency list at least once per month.

1.5.3.15.15. At the end of the Project, the Testing Agency shall submit a final signed report stating whether the work tested and inspected conforms to the Contract Documents' requirements.

1.5.4. Permits, Licenses, and Certificates: For District's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents established for compliance with standards and regulations bearing on performance of the Work.

1.6. QUALITY ASSURANCE

1.6.1. General: Qualifications paragraphs in this Article establish the minimum qualification levels required; individual Specifications specify additional requirements.

1.6.2. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance. Where required by the individual Specifications, Installer employing workers trained and approved by manufacturer, Installer being acceptable to manufacturer, and/or Installer being an authorized representative of manufacturer for both installation and maintenance.

1.6.3. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

1.6.4. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

1.6.5. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in the State of California, and who is experienced in providing engineering services of the kind indicated.

1.6.6. Engineering services are defined as those performed for installations of the system, assembly, or products that are similar to those indicated for this Project in material, design, and extent.

1.6.7. Specialists: Certain Specifications may require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.

1.6.7.1. Requirement for specialists shall not supersede building codes or regulations governing the Work.

1.6.8. Testing Agency Qualifications: An NRTL, an NVLAP, Division of the State of Architect's Accepted Laboratory, or an independent agency with the experience and capability to conduct testing and inspecting indicated; and with additional qualifications stated in

individual Specifications; and where required by and acceptable to authorities having jurisdiction.

1.6.8.1. NRTL: A Nationally Recognized Testing Laboratory according to 29 CFR 1910.7.

1.6.8.2. NVLAP: A testing agency accredited according to NIST's (National Institute of Standards and Technology) National Voluntary Laboratory Accreditation Program.

1.6.8.3. Tests shall be made by an accredited testing agency with a minimum of 5 years of experience in the specific type of testing to be performed. Except as otherwise provided, sampling and testing of all materials and the laboratory methods and testing equipment shall be in accordance with the applicable standards and methods of the California Building Standards code.

1.6.8.4. For each type of inspection and testing service to be performed, the Testing Agency shall submit certification, signed and sealed by the Agency's professional engineer, of compliance with all applicable requirements of the following:

1.6.8.4.1. ASTM E329, "Specification for Agencies Engaged in the Testing and/or Inspection of Materials Used in Construction."

1.6.8.4.2. "Recommended Requirements for Independent Laboratory Qualifications" published by the American Council of Independent Laboratories.

1.6.8.5. Furnish written certification to the District that all equipment to be used has been calibrated in accordance with applicable ASTM standards within the last year and is in proper working order.

1.6.8.6. Testing Agency Personnel Qualifications: Testing and inspection services shall be performed only by trained and experienced technicians currently qualified for the work they are to perform. Documentation of such training and experience shall be submitted to the District and/or its consultants upon request.

1.6.8.7. Each independent inspection and testing agency engaged on the Project shall be authorized by authorities having jurisdiction to operate in the state where the Project is located.

1.6.8.8. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

1.6.9. Preconstruction Testing: Where a testing agency is indicated to perform preconstruction testing for compliance with specified requirements for performance and test methods, comply with the following:

1.6.9.1. Contractor responsibilities include the following:

1.6.9.1.1. Verify by its Quality Assurance/Quality Control procedures that an element is ready for testing prior to requesting a test.

1.6.9.1.2. Provide test specimens representative of proposed products and construction.

1.6.9.1.3. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.

1.6.9.1.4. Provide sizes and configurations of test assemblies, mock-ups, and laboratory mock-ups to adequately demonstrate capability of products to comply with performance requirements.

1.6.9.1.5. Build site-assembled test assemblies and mock-ups using installers who will perform same tasks for Project.

1.6.9.1.6. Build laboratory mock-ups at testing facility using personnel, products, and methods of construction indicated for the completed Work.

1.6.9.1.7. When testing is complete, remove test specimens, assemblies, mock-ups, and laboratory mock-ups; do not reuse products on Project.

1.6.9.2. Testing Agency Responsibilities: Submit a certified written report of each test, inspection, and similar quality-assurance service to District with copy to Contractor. Interpret tests and inspections and state in each report whether tested and inspected Work complies with or deviates from the Contract Documents' requirements.

1.6.10. Mock-ups: Before installing portions of the Work requiring mock-ups, build mock-ups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:

1.6.10.1. Build mock-ups in location and of size indicated or, if not indicated, as directed by District or its consultant.

1.6.10.2. Notify District and its consultants seven (7) days in advance of dates and times when mock-ups will be constructed.

1.6.10.3. Demonstrate the proposed range of aesthetic effects and workmanship.

1.6.10.4. Obtain District and its consultant's approval of mock-ups before starting work, fabrication, or construction.

1.6.10.4.1. Allow seven (7) days for initial review and each re-review of each mock-up.

1.6.10.5. Incorporate seismic design of nonstructural components as listed in Division 01 Document "Seismic Design Requirements for Non-Structural Components" into mock-ups.

1.6.10.6. Maintain mock-ups during construction in an undisturbed condition as a standard for judging the completed Work.

1.6.10.7. Demolish and remove mock-ups when directed, unless otherwise indicated.

1.6.11. Laboratory Mock-Ups: Comply with requirements of preconstruction testing and those specified in individual Specifications in Divisions 02 through 49.

1.7. QUALITY CONTROL

1.7.1. District Responsibilities: Where quality-control services are indicated as District's responsibility, District will engage a qualified testing agency to perform these services.

1.7.1.1. District will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspecting the testing agencies are engaged to perform.

1.7.1.2. Costs for retesting and reinspecting construction that replaces or is necessitated by Work that failed to comply with the Contract Documents will be charged to Contractor, and the Contract Price will be adjusted by Change Order per the Contract Documents.

1.7.2. Tests and inspections not explicitly assigned to District are Contractor's responsibility. Unless otherwise indicated, provide quality-control services specified and those required by authorities having jurisdiction. Perform quality-control services required of Contractor by authorities having jurisdiction, whether specified or not.

1.7.2.1. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform the quality-control services.

1.7.2.1.1. Contractor shall not employ same entity engaged by District, unless agreed to in writing by District.

1.7.2.2. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspecting will be performed.

1.7.2.3. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.

1.7.2.4. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.

1.7.2.5. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.

1.7.3. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing as specified in Document "Submittal Procedures."

1.7.4. Retesting/Reinspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents' requirements.

1.7.5. Testing Agency Responsibilities: Cooperate with District, District's consultants, and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.

1.7.5.1. Notify District, District's consultants, and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.

1.7.5.2. Determine the location from which test samples will be taken and in which in-situ tests are conducted.

1.7.5.3. Conduct and interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.

1.7.5.4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.

1.7.5.5. Do not release, revoke, alter, or increase the Contract Documents' requirements or approve or accept any portion of the Work.

1.7.5.6. Do not perform any duties of Contractor.

1.7.6. Associated Services: Cooperate with agencies performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify testing agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:

1.7.6.1. Access to the Work.

1.7.6.2. Incidental labor and facilities necessary to facilitate tests and inspections.

1.7.6.3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.

1.7.6.4. Facilities for storage and field curing of test samples.

1.7.6.5. Delivery of samples to testing agencies.

1.7.6.6. Preliminary design mix proposed for use for material mixes that require control by testing agency.

1.7.6.7. Security and protection for samples and for testing and inspecting equipment at Project Site.

1.7.6.8. Furnish tools, samples of materials, design mixes, equipment and assistance as requested.

1.7.6.9. Provide and maintain, for the sole use of the Testing Agency, adequate facilities for the safe storage and proper curing of concrete test cylinders on the project site for the first 24 hours after casting as required by ASTM C31, Method of Making and Curing Concrete Test Specimens in the Field.

1.7.6.10. Build and store masonry test prisms in a manner acceptable to the Testing Agency. Prisms to be tested shall remain at the job site until moved by Testing Agency personnel.

1.7.6.11. Notify Testing Agency at least 10 working days in advance of any qualification testing for welding required herein.

1.7.6.12. Notify Testing Agency at least 24 hours prior to expected time for operations requiring testing or inspection services.

1.7.6.13. Make arrangements with the Testing Agency and pay for additional samples and tests made for the Contractor's convenience or for retesting of failed samples.

1.7.6.14. For deficiencies requiring corrective action, submit in writing a description of the deficiency and a proposed correction to the District. After review and approval, the proposed corrective action shall be implemented and inspected by the Testing Agency. It is Contractor's responsibility to ascertain that the deficiency is corrected and inspected prior to the work being covered.

1.7.6.15. Retention of an independent Testing Agency by the District shall in no way relieve Contractor of responsibility for performing all work in accordance with the Contract Documents' requirements.

1.7.7. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and -control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.

1.7.7.1. Schedule times for tests, inspections, obtaining samples, and similar activities.

1.8. TESTS AND SPECIAL INSPECTIONS

1.8.1. Tests and Special Inspections: District will engage a qualified testing agency to conduct tests and special inspections required by authorities having jurisdiction and in accordance with the DSA 103.

1.8.2. Special Tests and Inspections: Conducted by a qualified testing agency as required by authorities having jurisdiction, as indicated in individual Specifications, and as follows:

1.8.2.1. Verifying that manufacturer maintains detailed fabrication and quality-control procedures and reviewing the completeness and adequacy of those procedures to perform the Work.

1.8.2.2. Notifying District, District's consultants, and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.

1.8.2.3. Submitting a certified written report of each test, inspection, and similar quality-control service to District, with copy to Contractor and to authorities having jurisdiction.

1.8.2.4. Submitting a final report of special tests and inspections at Project Completion, which includes a list of unresolved deficiencies.

1.8.2.5. Interpreting tests and inspections and stating in each report whether tested and inspected Work complies with or deviates from the Contract Documents.

1.8.2.6. Retesting and reinspecting corrected work.

2. PRODUCTS

2.1. GENERAL

2.1.1. Do not use any materials or equipment represented by samples until tests, if required, have been made and the materials or equipment found to be acceptable. Any product which becomes unfit for use after acceptance shall not be incorporated into the Work.

3. EXECUTION

3.1. TEST AND INSPECTION LOG

3.1.1. Prepare a record of tests and inspections. Include the following:

3.1.1.1. Date test or inspection was conducted.

3.1.1.2. Description of the Work tested and inspected.

3.1.1.3. Date test or inspection results were transmitted to District.

3.1.1.4. Identification of testing agency or special inspector conducting test or inspection.

3.1.2. Maintain log at Project Site. Post changes and modifications as they occur. Provide access to test and inspection log for District's reference during normal working hours.

3.2. REPAIR AND PROTECTION

3.2.1. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.

3.2.1.1. Provide materials and comply with installation requirements specified in other Specifications. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible.

3.2.1.2. Comply with Document "Cutting and Patching" and all related Contract Documents' requirements.

3.2.2. Protect construction exposed by or for quality-control service activities.

3.2.3. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF DOCUMENT

DOCUMENT 01 42 13

ABBREVIATIONS AND ACRONYMS

1. GENERAL

1.1. RELATED DOCUMENTS AND PROVISIONS

Contractor shall review all Contract Documents for applicable provisions related to the provisions in this document, including without limitation:

1.1.1. General Conditions including without limitation, Contract Terms and Definitions; and

1.1.2. Special Conditions (if any);

1.1.3. Supplemental Conditions (if any).

1.2. ABBREVIATIONS AND ACRONYMS FOR STANDARDS AND REGULATIONS

1.2.1. Abbreviations and Acronyms for Standards and Regulations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the standards and regulations as indicated in Thomson Gale™ (www.gale.com), Gale Research's "Encyclopedia of Associations" or "Encyclopedia of Associations: National Organizations of the U.S," or in Columbia Books' "National Trade & Professional Associations of the U.S."

1.2.2. Some of the applicable abbreviations and acronyms referenced in the Specifications or other Contract Documents have the following meanings, subject to updates or revisions based on the above-referenced publications:

- AA: Aluminum Association
- AAMA: Architectural Aluminum Manufacturers Association
- AASHTO: American Association of State Highway and Transportation Officials
- ABPA: Acoustical and Board Products Association
- ACI: American Concrete Institute
- AGA: American Gas Association
- AGC: Associated General Contractors
- AHC: Architectural Hardware Consultant
- AI: Asphalt Institute
- AIA: American Institute of Architects
- AIEE: American Institute of Electrical Engineers
- AISC: American Institute of Steel Construction
- AISI: American Iron and Steel Institute
- AMCA: Air Moving and Conditioning Association
- ANSI: American National Standards Institute
- APA: American Plywood Association
- ARI: Air Conditioning and Refrigeration Institute
- ASHRAE: American Society of Heating, Refrigeration and Air Conditioning Engineers
- ASME: American Society of Mechanical Engineers
- ASSE: American Society of Structural Engineers
- ASTM: American Society of Testing and Materials
- AWPB: American Wood Preservers Bureau

- AWPI: American Wood preservers Institute
- AWS: American Welding Society
- AWSC: American Welding Society Code
- AWI: Architectural Woodwork Institute
- AWWA: American Water Works Association
- BIA: Brick Institute of America
- CCR: California Code of Regulations
- CLFMI: Chain Link Fence Manufacturers Institute
- CMG: California Masonry Guild
- CRA: California Redwood Association
- CRSI: Concrete Reinforcing Steel Institute
- CS: Commercial Standards
- CSI: Construction Specifications Institute
- CTI: Cooling Tower Institute
- FGMA: Flat Glass Manufacturer's Association
- FIA: Factory Insurance Association
- FM: Factory Mutual
- FS: Federal Specification
- FTI: Facing Title Institute
- GA: Gypsum Association
- ICC: International Code Council
- IEEE: Institute of Electrical and Electronic Engineers
- IES: Illumination Engineering Society
- LIA: Lead Industries Association
- MIA: Marble Institute of America
- MLMA: Metal Lath Manufacturers Association
- MS: Military Specifications
- NAAMM: National Association of Architectural Metal Manufacturers
- NBHA: National Builders Hardware Association
- NBFU: National Board of Fire Underwriters
- NBS: National Bureau of Standards
- NCMA: National Concrete Masonry Association
- NEC: National Electrical Code
- NEMA: National Electrical Manufacturers Association
- NFPA: National Fire Protection Association/National Forest Products Association
- NMWIA: National Mineral Wool Insulation Association
- NTMA: National Terrazzo and Mosaic Association
- NWMA: National Woodwork Manufacturer's Association
- ORS: Office of Regulatory Services (California)
- OSHA: Occupational Safety and Health Act
- PCI: Precast Concrete Institute
- PCA: Portland Cement Association
- PDCA: Painting and Decorating Contractors of America
- PDI: Plumbing Drainage Institute
- PEI: Porcelain Enamel Institute
- PG&E: Pacific Gas & Electric Company
- PS: Product Standards
- SDI: Steel Door Institute; Steel Deck Institute
- SJI: Steel Joist Institute
- SSPC: Steel Structures Painting Council
- TCA: Tile Council of America

- TPI: Truss Plate Institute
- UBC: Uniform Building Code
- UL: Underwriters Laboratories Code
- UMC: Uniform Mechanical Code
- USDA: United States Department of Agriculture
- VI: Vermiculite Institute
- WCLA: West Coast Lumberman's Association
- WCLB: West Coast Lumber Bureau
- WEUSER: Western Electric Utilities Service Engineering Requirements
- WIC: Woodwork Institute of California
- WPOA: Western Plumbing Officials Association

1.2.3. Additional Abbreviations and Symbols: Refer to the above-referenced publications or to Drawings for additional abbreviations and for symbols.

END OF DOCUMENT

DOCUMENT 01 42 16

GENERAL DEFINITIONS AND REFERENCES

1. GENERAL

1.1. RELATED DOCUMENTS AND PROVISION

Contractor shall review all Contract Documents for applicable provisions related to the provisions in this document, including without limitation:

1.1.1. General Conditions including without limitation, Contract Terms and Definitions;

1.1.2. Special Conditions (if any);

1.1.3. Supplemental Conditions (if any); and

1.1.4. Special Conditions.

1.2. DEFINITIONS

General: Basic Contract definitions are included in the General Conditions of the Contract for Construction. The following are in addition to those definitions.

1.2.1. "Alternate": A cost or credit for certain Work that may be added to or deducted from the Project.

1.2.2. "Indicated": Requirements expressed by graphic representations or in written form on Drawings, in Specifications, and in other Contract Documents. Other terms including "shown," "noted," "scheduled," and "specified" have the same meaning as "indicated."

1.2.3. "Regulations": Laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, and rules, conventions, and agreements within the construction industry that control performance of the Work.

1.2.4. "Furnish": Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.

1.2.5. "Install": Operations at Project site including unloading, temporarily storing, unpacking, assembling, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.

1.2.6. "Provide": Furnish and install, complete and ready for the intended use.

1.3. QUALITY ASSURANCE

1.3.1. For products or workmanship specified by association, trade, or Federal Standards, Contractor shall comply with requirements of the standard, except when more stringent requirements are specified in the Contract Documents, or are required by applicable codes.

1.3.2. Contractor shall conform to current reference standard publication in effect on the date of bid opening.

1.3.3. Unless directed otherwise by the Contract Documents, Contractor shall obtain copies of referenced standards.

1.3.4. Unless directed otherwise by the Contract Documents, Contractor shall maintain a copy of referenced standards at jobsite until Completion.

1.3.5. If specified standards conflict with Contract Documents, Contractor shall request clarification from the District or the Architect before proceeding.

1.3.6. Governing Codes shall be as shown in the Contract Documents including, without limitation, the Specifications.

1.4. STANDARDS

1.4.1. Standard Specifications: References to codes, specifications and standards referred to in the Contract Documents shall mean, and are intended to be, the latest edition, amendment or revision of such reference standard in effect as of the date of these Contract Documents. If those standard specifications are revised prior to Completion of any part of the Work to which such revision would pertain, Contractor may, if acceptable to and approved by the District, perform such Work in accordance with the revised standard specifications.

1.4.2. Conflicting Requirements: Where compliance with two or more standards is specified, and the standards may establish different or conflicting requirements for minimum quantities or quality levels, refer requirements that are different, but apparently equal, and uncertainties to the District for a decision before proceeding.

1.4.3. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of the requirements. Refer uncertainties to District for a decision before proceeding.

1.4.4. Copies of Standards: Each entity engaged in construction on the Project is required to be familiar with industry standards applicable to that entity's construction activity. Copies of applicable standards are not bound with the Contract Documents.

1.4.5. Copies from the Publication Source: Where copies of standards are needed for performance of a required construction activity, Contractor shall obtain copies directly from the publication source.

1.5. SCHEDULE OF REFERENCES

The following information is intended only for the general assistance of Contractor. District does not represent the accuracy of the information. Contractor shall independently verify the information for each entity listed below:

AA	Aluminum Association 900 19th Street NW, Suite 300 Washington, DC 20006 www.aluminum.org	202/862-5100
AABC	Associated Air Balance Council 1518 K Street, NW, Suite 503	202/737-0202

	Washington, DC 20005 www.aabchq.com	
AAMA	American Architectural Manufacturers Association 1827 Walden Office Sq., Suite 104 Schaumburg, IL 60173-4268 www.aamanet.org	847/303-5664
AASHTO	American Association of State Highway and Transportation Officials 444 North Capitol Street, Suite 249 Washington, DC 20001 www.aashto.org	202/624-5800
AATCC	American Association of Textile Chemists and Colorists P.O. Box 12215 One Davis Drive Research Triangle Park, NC 27709-2215 www.aatcc.org	919/549-8141
ACI	American Concrete Institute P.O. Box 9094 Farmington Hills, MI 48333-9094 www.aci-int.org	248/848-3700
ACPA	American Concrete Pipe Association 222 West Las Colinas Blvd., Suite 641 Irving, TX 75039-5423 www.concrete-pipe.org	972/506-7216
ADC	Air Diffusion Council 11 South LaSalle St., Suite 1400 Chicago, IL 60603 http://www.flexibleduct.org/index.asp	312/201-0101
AFPA	American Forest and Paper Association 1111 19th St., NW, Suite 800 Washington, DC 20036 http://www.afandpa.org/	202/463-2700
AGA	American Gas Association 1515 Wilson Blvd. Arlington VA 22209 www.aga.com	703/841-8400
AHA	American Hardboard Association 1210 W. Northwest Hwy Palatine, IL 60067-1897 http://domensino.com/AHA/default.htm	847/934-8800
AI	Asphalt Institute Research Park Drive P.O. Box 14052 Lexington, KY 40512-4052	606/288-4960

	www.asphaltinstitute.org	
AIA	The American Institute of Architects 1735 New York Avenue, NW Washington, DC 20006-5292 www.aia.org	202/626-7300
AISC	American Institute of Steel Construction One East Wacker Drive, Suite 3100 Chicago, IL 60601-2001 http://www.aisc.org/	800/644-2400
AITC	American Institute of Timber Construction 7012 S. Revere Pkwy., Suite 140 Englewood, CO 80112 www.aitc-glulam.org	303/792-9559
ALCA	Associated Landscape Contractors of America 12200 Sunrise Valley Drive, Suite 150 Reston, VA 20191 www.alca.org	703/620-6363
ALI	Associated Laboratories, Inc. P.O. Box 152837 1323 Wall St. Dallas, TX 75315 http://www.assoc-labs.com/	214/565-0593
ALSC	American Lumber Standards Committee P.O. Box 210 Germantown, MD 20875	301/972-1700
AMCA	Air Movement and Control Association International, Inc. 30 W. University Drive Arlington Heights, IL 60004-1893 www.amca.org	847/394-0150
ANLA	American Nursery and Landscape Association 1250 Eye Street, NW, Suite 500 Washington, DC 20005	202/789-2900
ANSI	American National Standards Institute 11 West 42nd Street, 13th Floor New York, NY 10036-8002 www.ansi.org	212/642-4900
APA	APA-The Engineered Wood Association P.O. Box 11700 Tacoma, WA 98411-0700 www.apawood.org	206/565-6600
APA	Architectural Precast Association P.O. Box 08669 Fort Myers, FL 33908-0669	941/454-6989

ARI	Air Conditioning and Refrigeration Institute 4301 Fairfax Drive, Suite 425 Arlington, VA 22203 www.ari/org	703/524-8800
ARMA	Asphalt Roofing Manufacturers Association Center Park 4041 Powder Mill Road, Suite 404 Calverton, MD 20705	301/231-9050
ASA	Acoustical Society of America 500 Sunnyside Blvd. Woodbury, NY 11797	516/576-2360
ASCE	American Society of Civil Engineers- World Headquarters 1801 Alexander Bell Drive Reston, VA 20190-4400 www.asce.org	800/548-2723 703/295-6000
ASHRAE	American Society of Heating, Refrigerating and Air Conditioning Engineers 1791 Tullie Circle, NE Atlanta, GA 30329-2305 www.ashrae.org	800/527-4723 404/636-8400
ASLA	American Society of Landscape Architects 4401 Connecticut Ave., NW, 5th Floor Washington, DC 20008-2369 www.asla.org	202/686-2752
ASME	American Society of Mechanical Engineers 345 East 47th Street New York, NY 10017-2392 www.asme.org	800/434-2763
ASPE	American Society of Plumbing Engineers 3617 Thousand Oaks Blvd., Suite 210 Westlake, CA 91362-3649	805/495-7120
ASQC	American Society for Quality Control 611 E. Wisconsin Avenue Milwaukee, WI 53201-3005 www.asqc.org	800/248-1946 414/272-8575
ASSE	American Society of Sanitary Engineering 28901 Clemens Road Westlake, OH 44145 www.asse-plumbing.org	216/835-3040
ASTM	American Society for Testing and Materials 100 Barr Harbor Drive West Conshohocken, PA 19428-2959 www.astm.org	610/832-9500

AWCI	Association of the Wall and Ceiling Industries--International 307 E. Annandale Road, Suite 200 Falls Church, VA 22042-2433 www.awci.org	703/534-8300
AWPA	American Wood-Preservers' Association 3246 Fall Creek Highway, Suite 1900 Granbury, TX 76049-7979	817/326-6300
AWS	American Welding Society 550 NW LeJeune Road Miami, FL 33126 www.amweld.org	800/443-9373 305/443-9353
AWWA	American Water Works Association 6666 West Quincy Avenue Denver, CO 80235 www.awwa.org	800/926-7337 303/794-7711
BHMA	Builders' Hardware Manufacturers Association 355 Lexington Avenue, 17th Floor New York, NY 10017-6603	212/661-4261
CBM	Certified Ballast Manufacturers Association 1422 Euclid Avenue, Suite 402 Cleveland, OH 44115-2094	216/241-0711
CGA	Compressed Gas Association 1725 Jefferson Davis Hwy, Suite 1004 Arlington, VA 22202-4102 www.cganet.com	703/412-0900
CISCA	Ceilings & Interior Systems Construction Association 1500 Lincoln Hwy, Suite 202 St. Charles, IL 60174 www.cisca.org	630/584-1919
CISPI	Cast Iron Soil Pipe Institute 5959 Shallowford Road, Suite 419 Chattanooga, TN 37421	423/892-0137
CPSC	Consumer Product Safety Commission East West Towers 4330 East-West Hwy. Bethesda, MD 20814	800/638-2772
CPPA	Corrugated Polyethylene Pipe Association 432 N. Superior Street Toledo, OH 43604	800/510-2772 419/241-2221
CRA	California Redwood Association 405 Enfrente Drive, Suite 200	415/382-0662

	Novato, CA 94949	
CRI	Carpet and Rug Institute 310 S. Holiday Avenue Dalton, GA 30722-2048 www.carpet-rug.com	800/882-8846 706/278-3176
CRSI	Concrete Reinforcing Steel Institute 933 N. Plum Grove Road Schaumburg, IL 60173-4758 www.crsi.org	847/517-1200
CTI	Ceramic Tile Institute of America 12061 W. Jefferson Blvd. Culver City, CA 90230-6219	310/574-7800
DHI	Door and Hardware Institute 14170 Newbrook Drive Chantilly, VA 20151-2223 www.dhi.org	703/222-2010
DIPRA	Ductile Iron Pipe Research Association 245 Riverchase Pkwy East, Suite O Birmingham, AL 35244	205/988-9870
DOC	Department of Commerce 14th Street and Constitution Avenue, NW Washington, DC 20230	202/482-2000
DOT	Department of Transportation 400 Seventh Street, SW Washington, DC 20590	202/366-4000
EJMA	Expansion Joint Manufacturers Association 25 N. Broadway Tarrytown, NY 10591-3201	914/332-0040
EPA	Environmental Protection Agency 401 M Street, SW Washington, DC 20460	202/260-2090
FCICA	Floor Covering Installation Contractors Association P.O. Box 948 Dalton, GA 30722-0948	706/226-5488
FM	Factory Mutual 1151 Boston-Providence Turnpike P.O. Box 9102 Norwood, MA 02062-9102 www.factorymutual.com	781/255-4300
FS	Federal Specifications Unit (Available from GSA) 470 East L'Enfant Plaza, SW, Suite 8100	202/619-8925

	Washington, DC 20407	
GA	Gypsum Association 810 First Street NE, Suite 510 Washington, DC 20002 www.usg.com	202/289-5440
GANA	Glass Association of North America 3310 SW Harrison Street Topeka, KS 66611-2279 www.glasswebsite.com/gana	913/266-7013
HMA	Hardwood Manufacturers Association 400 Penn Center Blvd., Suite 530 Pittsburgh, PA 15235-5605 www.hardwood.org	412/828-0770
HPVA	Hardwood Plywood and Veneer Association 1825 Michael Farraday Drive P.O. Box 2789 Reston, VA 22195-0789 www.hpva.org	703/435-2900
IEEE	Institute of Electrical and Electronic Engineers 345 E. 47th Street New York, NY 10017-2394 www.ieee.org	800/678-4333 212/705-7900
IESNA	Illuminating Engineering Society of North America 120 Wall Street, 17th Floor New York, NY 10005-4001 www.iesna.org	212/248-5000
ITS	Intertek Testing Services P.O. Box 2040 607/753-6711 3933 US Route 11 Cortland, NY 13045-7902 www.itsglobal.com	800/345-3851
LMA	Laminating Materials Association 116 Lawrence Street Hillsdale, NJ 07642-2730 www.lma.org	201/664-2700
MCAA	Mechanical Contractors Association of America 1385 Piccard Drive Rockville, MD 20850-4329	301/869-5800
ML/SFA	Metal Lath/Steel Framing Association (A Division of the NAAMM) 8 South Michigan Avenue, Suite 1000 Chicago, IL 60603	312/456-5590
MSS	Manufacturers Standardization Society for the Valve and Fittings Industry	703/281-6613

	127 Park Street, NE Vienna, VA 22180-4602	
NAA	National Arborist Association P.O. Box 1094 603/673-3311 Amherst, NH 03031-1094 www.natlarb.com	800/733-2622
NAAMM	National Association of Architectural Metal Manufacturers 8 South Michigan Avenue, Suite 1000 Chicago, IL 60603 www.gss.net/naamm	312/782-5590
NAIMA	North American Insulation Manufacturers Association 44 Canal Center Plaza, Suite 310 Alexandria, VA 22314 www.naima.org	703/684-0084
NAPA	National Asphalt Pavement Association NAPA Building 5100 Forbes Blvd. Lanham, MD 20706-4413	301/731-4748
NCSPA	National Corrugated Steel Pipe Association 1255 23rd Street, NW, Suite 850 Washington, DC 20037 www.ncspa.org	202/452-1700
NEBB	National Environmental Balancing Bureau 8575 Grovemont Circle Gaithersburg, MD 20877-4121	301/977-3698
NECA	National Electrical Contractors Association 3 Bethesda Metro Center, Suite 1100 Bethesda, MD 20814-5372	301/657-3110
NEI	National Elevator Industry 185 Bridge Plaza North, Suite 310 Fort Lee, NJ 07024	201/944-3211
NEMA	National Electrical Manufacturers' Association 1300 N. 17th Street, Suite 1847 Rosslyn, VA 22209 www.nema.org	703/841-3200
NFPA	National Fire Protection Association One Batterymarch Park P.O. Box 9101 Quincy, MA 02269-9101 www.nfpa.org	800/344-3555 617/770-3000
NHLA	National Hardwood Lumber Association P.O. Box 34518	901/377-1818

	Memphis, TN 38184-0518 www.natlhardwood.org	
NIA	National Insulation Association 99 Canal Center Plaza, Suite 222 Alexandria, VA 22314 www.insulation.org	703/683-6422
NPA	National Particleboard Association 18928 Premiere Court Gaithersburg, MD 20879-1569 www.pbmdf.com	301/670-0604
NPCA	National Paint and Coatings Association 1500 Rhode Island Avenue, NW Washington, DC 20005-5597 www.paint.org	202/462-6272
NRCA	National Roofing Contractors Association O'Hare International Center 10255 W. Higgins Road, Suite 600 Rosemont, IL 60018-5607 www.roofonline.org	800/323-9545
NRMCA	National Ready Mixed Concrete Association 900 Spring Street Silver Spring, MD 20910 www.nrmca.org	301/587-1400
NSF	NSF International P.O. Box 130140 Ann Arbor, MI 48113-0140 www.nsf.org	313/769-8010
NUSIG	National Uniform Seismic Installation Guidelines 12 Lahoma Court Alamo, CA 94526	510/946-0135
NWWDA	National Wood Window and Door Association 1400 E. Touhy Avenue, G-54 Des Plaines, IL 60018 www.nwwda.org	800/223-2301 847/299-5200
SHA	Occupational Safety and Health Administration (U.S. Department of Labor) 200 Constitution Ave., NW Washington, DC 20210	202/219-8148
PCA	Portland Cement Association 5420 Old Orchard Road Skokie, IL 60077-1083 www.portcement.org	847/966-6200
PDCA	Painting and Decorating Contractors of America	800/332-7322 703/359-0826

	3913 Old Lee Hwy, Suite 33-B Fairfax, VA 22030 www.pdca.com	
PDI	Plumbing and Drainage Institute 45 Bristol Drive, Suite 101 South Easton, MA 02375	800/589-8956 508/230-3516
RFCI	Resilient Floor Covering Institute 966 Hungerford Drive, Suite 12-B Rockville, MD 20805-1714	301/340-8580
RIS	Redwood Inspection Service c/o California Redwood Association 405 Enfrente Drive, Suite 200 Novato, CA 94949-7206	415/382-0662
SDI	Steel Deck Institute P.O. Box 25 Fox River Grove, IL 60012 www.sdi.org	847/462-1930
SDI	Steel Door Institute 30200 Detroit Road Cleveland, OH 44145-1967	216/889-0010
SMA	Stucco Manufacturers Association 14006 Ventura Blvd. Sherman Oaks, CA 91403	213/789-8733
SMACNA	Sheet Metal and Airconditioning Contractors National Association, Inc. P.O. Box 221230 Chantilly, VA 20151-1209 www.smacna.org	703/803-2980
SPI	Society of the Plastics Industry, Inc. Spray Polyurethane Division 1801 K Street, NW, Suite 600K Washington, DC 20006 www.socplas.org	800/951-2001 202/974-5200
SSPC	Steel Structures Painting Council 40 24th Street, 6th Floor Pittsburgh, PA 15222-4643	412/281-2331
TCA	Tile Council of America 100 Clemson Research Blvd. Anderson, SC 29625	864/646-8453
TPI	Turfgrass Producers International 1855-A Hicks Road Rolling Meadows, IL 60008	800/405-8873 847/705-9898
UL	Underwriters Laboratories, Inc.	800/704-4050

	333 Pfingston Road Northbrook, IL 60062 www.ul.com	847/272-8800
UNI	Uni-Bell PVC Pipe Association 2655 Villa Creek Drive, Suite 155 Dallas, TX 75234 www.members.aol.com/unibell1	972/243-3902
USDA	U.S. Department of Agriculture 14th St. and Independence Ave., SW Washington, DC 20250	202/720-8732
WA	Wallcoverings Association 401 N. Michigan Avenue Chicago, IL 60611-4267	312/644-6610
WCLIB	West Coast Lumber Inspection Bureau P.O. Box 23145 Portland, OR 97281-3145	503/639-0651
WCMA	Window Covering Manufacturers Association 355 Lexington Ave., 17th Floor New York, NY 10017-6603	212/661-4261
WIC	Woodwork Institute of California P.O. Box 980247 West Sacramento, CA 95798-0247	916/372-9943
WLPDIA	Western Lath/Plaster/Drywall Industries Association 8635 Navajo Road San Diego, CA 92119	619/466-9070
WMMPA	Wood Moulding & Millwork Producers Association 507 First Street Woodland, CA 95695 www.wmmpa.com	800/550-7889 916/661-9591
WRI	Wire Reinforcement Institute 203 Loudoun Street, SW Leesburg, VA 20175-2718	703/779-2339
WWPA	Western Wood Products Association Yeon Building 522 S.W. 5th Avenue Portland, OR 97204-2122	503/224-3930

END OF DOCUMENT

DOCUMENT 01 45 29

TESTING LABORATORY SERVICES

1. GENERAL

1.1. RELATED DOCUMENTS AND PROVISION

Contractor shall review all Contract Documents for applicable provisions related to the provisions in this document, including without limitation:

1.1.1. General Conditions, including “Tests and Inspections”; and

1.1.2. Special Conditions (if any);

1.1.3. Supplemental Conditions (if any).

1.2. DOCUMENT INCLUDES

1.2.1. Observation and Supervision.

1.2.2. Testing Laboratories and Agencies

1.2.3. Tests and Inspections

1.2.4. Selection and Payment

1.2.5. District's Testing Laboratory Responsibilities

1.2.6. Laboratory reports.

1.2.7. Limits on testing laboratory authority.

1.2.8. Contractor responsibilities.

1.2.9. Schedule of inspections and tests.

1.2.10. Project Inspector’s Access to Site

1.3. REFERENCES

1.3.1. ASTM D3740 - Practice for Evaluation of Agencies Engaged in Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction.

1.3.2. ASTM E329 - Recommended Practice for Inspection and Testing Agencies for Concrete, Steel, and Bituminous Materials as Used in Construction.

1.3.3. CBC - California Building Code.

1.3.4. UBC - Uniform Building Code.

1.3.5. Title 24, Parts 1 and 2, of the California Code of Regulations. Contractor shall keep a copy of these available at the job Site for ready reference during construction

1.3.6. DSA - Division of the State Architect, Office of Regulation Services, Structural Safety Section. DSA shall be notified at or before the start of construction.

1.4. OBSERVATION AND SUPERVISION

1.4.1. The District and Architect or their appointed representatives will review the Work and the Contractor shall provide facilities and access to the Work at all times as required to facilitate this review. Administration by the Architect and any consulting Structural Engineer will be in accordance with applicable regulations, including, without limitation, 24 C.C.R. § 4-341.

1.4.2. One or more Project Inspector(s) approved by DSA and employed by or in contract with the District("Project Inspector"), will observe the Work in accordance with 24 C.C.R. §§ 4-333(b) and 4-342:

1.4.3. Project Inspector shall have access to the Work wherever it is in preparation or progress for ascertaining that the Work is in accordance with the Contract Documents and all applicable code sections. Contractor shall provide facilities and access as required and shall provide assistance for sampling or measuring materials.

1.4.3.1. Project Inspector will notify District and Architect and inform Contractor of any observed failure of Work or material to conform to Contract Documents.

1.4.3.2. The Project Inspector shall observe and monitor all testing and inspection activities required.

1.4.4. Contractor shall conform with all applicable laws as indicated in the Contract Documents, including, without limitation, to 24 C.C.R. § 4-343. Contractor shall supervise and direct the Work and maintain a competent superintendent on the Project who is authorized to act in all matters pertaining to the Work. The Contractor shall inspect all materials, as they arrive, for compliance with the Contract Documents. Contractor shall reject defective Work or materials immediately upon delivery or failure of the Work or material to comply with the Contract Documents. The Contractor shall submit verified reports as indicated in the Contract Documents, including, without limitation, the Specifications and as required by 24 C.C.R. § 4-336.

1.5. TESTING LABORATORIES AND AGENCIES

1.5.1. Testing agencies and tests shall be in conformance with the Contract Documents and the requirements of 24 C.C.R. § 4-335.

1.5.2. Testing and inspection in connection with earthwork shall be under the direction of the District's consulting soils engineer ("Soils Engineer").

1.5.3. Testing and inspection of construction materials and workmanship shall be performed by a qualified laboratory ("Testing Laboratory" or "Laboratory"). The Testing Laboratory shall be under direction of an engineer registered in the State of California, shall conform to requirements of ASTM E329, and shall be employed by or in contract with the District.

1.6. TESTS AND INSPECTIONS

1.6.1. Contractor shall be responsible for notifying District and Project Inspector of all required tests and inspections. Contractor shall notify District and Project Inspector forty-eight (48) hours in advance of performing any Work requiring testing or inspection.

1.6.2. Contractor shall provide access to Work to be tested and furnish incidental labor, equipment, and facilities to facilitate all inspections and tests.

1.6.3. District will pay for first inspections and tests required by the Title 24 and other inspections or tests that District and/or Architect may direct to have made, including, but not limited to, the following principal items:

1.6.3.1. Tests and observations for earthwork and pavings.

1.6.3.2. Tests for concrete mix designs, including tests of trial batches.

1.6.3.3. Tests and inspections for structural steel work.

1.6.3.4. Field tests for framing lumber moisture content.

1.6.3.5. Additional tests directed by District that establish that materials and installation comply with the Contract Documents.

1.6.3.6. Test and observation of welding and expansion anchors.

1.6.3.7. Factory observation of components and assembly of modular prefabrication structures and buildings.

1.6.4. District may at its discretion, pay and back charge Contractor for:

1.6.4.1. Retests or reinspections, if required, and tests or inspection required due to Contractor error or lack of required identifications of material.

1.6.4.2. Uncovering of work in accordance with Contract Documents.

1.6.4.3. Testing done on weekends, holidays, and overtime will be chargeable to Contractor for the overtime portion.

1.6.4.4. Testing done off site.

1.6.5. Testing and inspection reports and certifications:

1.6.5.1. If initially received by Contractor, Contractor shall provide to each of the following a copy of the agency or laboratory report of each test or inspection or certification: District; Construction Manager, if any; Architect; Consulting Engineer, if any; Other Engineers on the Project, as appropriate; and; Project Inspector.

1.6.5.2. When the test or inspection is one required by the Title 24, a copy of the report shall also be provided to the DSA.

1.7. SELECTION AND PAYMENT

1.7.1. District will hire and pay for services of an independent Testing Laboratory to perform specified inspection and testing as specified by District's Testing Laboratory.

1.7.2. District's hiring of Testing Laboratory shall in no way relieve Contractor of its obligation to perform work in accordance with requirements of Contract Documents.

1.8. DISTRICT'S TESTING LABORATORY RESPONSIBILITIES

1.8.1. Test samples of mixes submitted by Inspector.

1.8.2. Perform specified inspection, sampling, and testing of Products in accordance with specified standards.

1.8.3. Notify Architect and Contractor of observed irregularities or non-conformance of Work or Products.

1.8.4. Attend preconstruction conferences and progress meetings when requested by Architect.

1.9. LABORATORY REPORTS

1.9.1. After each inspection and test, District shall then submit one copy of laboratory report to Contractor. Reports of test results of materials and inspections found not to be in compliance with the requirements of the Contract Documents shall be forwarded immediately.

1.9.2. Each Testing Laboratory shall submit a verified report covering all of the tests which were required to be made by that agency during the progress of the Project. Such report shall be furnished each time that Work is suspended, covering the tests up to that time and at the Completion of the Project, covering all tests.

1.10. LIMITS ON TESTING LABORATORY AUTHORITY

1.10.1. Laboratory may not release, revoke, alter, or enlarge on requirements of Contract Documents.

1.10.2. Laboratory may not approve or accept any portion of the Work.

1.10.3. Laboratory may not assume any duties of Contractor.

1.10.4. Laboratory has no authority to stop the Work.

1.11. CONTRACTOR RESPONSIBILITIES

1.11.1. Submit proposed items for testing as required herein and/or as further required in the Contract Documents to Architect for review in accordance with applicable specifications.

1.11.2. Cooperate with Laboratory personnel, and provide access to the Work and to manufacturer's facilities.

1.11.3. Notify Architect, District, and Testing Laboratory 48 hours prior to expected time for operations requiring inspection and testing services.

1.11.4. When tests or inspections cannot be performed after such notice, reimburse District for Laboratory personnel and travel expenses incurred due to the Contractor's negligence.

1.11.5. Contractor shall notify District a sufficient time in advance of the manufacture of material to be supplied by Contractor pursuant to the Contract Documents, which must by terms of the Contract be tested, in order that the District may arrange for the testing of same at the source of supply.

1.11.5.1. Any material shipped by the Contractor from the source of supply prior to having satisfactorily passed such testing and inspection or prior to the receipt of notice that such testing and inspection will not be required shall not be incorporated in the Work.

1.11.6. Contract and pay for services of District's Testing Laboratory to perform additional inspections, sampling and testing required when initial tests indicate Contractor's work and/or materials does not comply with Contract Documents.

1.12. SCHEDULE OF INSPECTIONS AND TESTS

The Testing Laboratory shall perform tests and inspections for the following in conformance with the (CBC) California Building Code (International Building Code with State of California Amendments), California Code of Regulations, Title 24, Part 2:

- Structural Tests and Special Inspections (Chapter 17A)
  - Special Inspections (§ 1704A)
- Soils and Foundations (Chapter 18A)
  - Geotechnical Investigations (§ 1803A)
- Concrete (Chapter 19A)
  - Specifications for Tests and Materials
  - Concrete Quality, Mixing and Placing
  - Concrete Reinforcement and Anchor Testing Inspection (§ 1916A)
- Masonry (Chapter 21A)
  - Masonry Construction Materials (§ 2103A)
  - Masonry Quality (§ 2103A)
  - Quality Assurance (§ 2105A)
- Structural Steel (Chapter 22A)
    - Structural Steel (§ 2205A)
    - Identification & Protection of Steel for Structural Purposes (§ 2203A)
  - Inspection and Tests of Structural Steel (§ 2212A)
- Wood (Chapter 23)
  - Minimum Standards and Quality (§ 2303)
  - Wood Construction (§ 1704A.6)
- Exterior Walls (Chapter 14)
    - Masonry Units (§ 1404.4)
    - Masonry Construction Materials (§ 2103A)
  - Exterior Insulation and Finish Systems (§ 1408)
- Roof Assemblies and Roofing Structures (Chapter 15)
  - Materials (§ 1506)
- Aluminum (Chapter 20)
  - Materials (§ 2002.1)
  - Inspection (§ 2003.1)

1.12.1. **Plumbing**

Testing as specified in Division 15 including, but not limited to: Sterilization, soil waste and vent, water piping, source of water, gas piping, downspouts and storm drains.

1.12.2. **Automatic Fire Sprinklers (where applicable)**

Testing as specified in Division 15 shall include, but not be limited to: hydrostatic pressure.

1.12.3. **Heating, Ventilating and Air Conditioning**

Testing as specified in Division 15 shall include, but not be limited to: Ductwork tests, cooling tower tests, boiler tests, controls testing, piping tests, water and air systems, and test and balance of heating and air conditioning systems.

1.12.4. **Electrical**

Testing as specified in Division 16, including, but not limited to: Equipment testing, all electrical system operations, grounding system and checking insulation after cable is pulled.

1.13. **PROJECT INSPECTOR'S ACCESS TO SITE**

1.13.1. A Project Inspector employed by the District in accordance with the requirement of State of California Code of Regulations, Title 24, Part 1 will be assigned to the Work. Project Inspector's duties are specifically defined in 24. C.C.R. §4-342, and as indicated in the General Conditions.

1.13.2. District and Construction Manager shall at all times have access for the purpose of inspection to all parts of the Work and to the shops wherein the Work is in preparation, and Contractor shall at all times maintain proper facilities and provide safe access for such inspection.

1.13.3. The Work in all stages of progress shall be subject to the personal continuous observation of the Inspector. Inspector shall have free access to any or all parts of the Work at any time. Contractor shall furnish the Inspector reasonable facilities for obtaining such information as may be necessary to keep Inspector fully informed respecting the progress and manner of the Work and the character of the materials. Inspection of the Work shall not relieve the Contractor from any obligation set forth in the Contract Documents.

1.13.4. The Inspector is not authorized to change, revoke, alter, enlarge or decrease in any way any requirement of the Contract Documents, drawings, specifications or subsequent change orders.

1.13.5. Whenever there is insufficient evidence of compliance with any of the provisions of Title 24 or evidence that any material or construction does not conform to the requirements of Title 24, the Division of the State Architect may require tests as proof of compliance. Test methods shall be as specified herein or by other recognized and accepted test methods determined by the Division of the State Architect. All tests shall be performed by a testing laboratory accepted by the Division of the State Architect.

END OF DOCUMENT

DOCUMENT 01 50 00

TEMPORARY FACILITIES AND CONTROLS

1. GENERAL

1.1. RELATED DOCUMENTS AND PROVISIONS

Contractor shall review all Contract Documents for applicable provisions related to the provisions in this document, including without limitation:

1.1.1. General Conditions;

1.1.2. Special Conditions (if any);

1.1.3. Supplemental Conditions (if any);

1.1.4. Site Standards; and

1.1.5. Temporary Tree and Plant Protection.

1.2. TEMPORARY UTILITIES

1.2.1. **Electric Power and Lighting**:

1.2.1.1. Contractor will furnish and pay for power during the course of the work to the extent power is not in the building(s) or on the Site. Contractor shall be responsible for providing temporary facilities required on the Site to point of intended use.

1.2.1.2. Contractor shall furnish, wire for, install, and maintain temporary electrical lights wherever it is necessary to provide illumination for the proper performance and/or observation of the Work: a minimum of 20 foot-candles for rough work and 50 foot-candles for finish work.

1.2.1.3. Contractor shall be responsible for maintaining existing lighting levels in the Project vicinity should temporary outages or service interruptions occur.

1.2.2. **Heat and Ventilation**:

1.2.2.1. Contractor shall provide temporary heat to maintain environmental conditions to facilitate progress of the Work, to meet specified minimum conditions for the installation and curing of materials, and to protect materials and finishes from damage due to improper temperature and humidity conditions. Portable heaters shall be standard units complete with controls.

1.2.2.2. Contractor shall provide forced ventilation and dehumidification, as required, of enclosed areas for proper installation and curing of materials, to disperse humidity, and to prevent hazardous accumulations of dust, fumes, vapors, and gases.

1.2.2.3. Contractor shall pay the costs of installation, maintenance, operation, and removal of temporary heat and ventilation, including costs for fuel consumed, required for the performance of the Work.

1.2.3. **Water**:

1.2.3.1. Contractor will furnish and pay for water during the course of the work. Contractor shall be responsible for providing temporary facilities required.

1.2.3.2. Contractor shall make potable water available for human consumption.

1.2.4. **Sanitary Facilities**:

1.2.4.1. Contractor shall provide sanitary temporary facilities in no fewer numbers than required by law and such additional facilities as may be directed by the Inspector for the use of all workers. The facilities shall be maintained in a sanitary condition at all times and shall be left at the Site until removal is directed by the District or Contractor completes all Work.

1.2.4.2. Use of toilet facilities in the Site shall not be permitted except by consent of the Project Inspector and District.

1.2.5. **Telephone Service**:

1.2.5.1. Contractor shall arrange with local telephone service company for telephone service for the performance of the Work. Contractor shall, at a minimum, provide in its field office one line for telephone and one line for fax machine.

1.2.5.2. Contractor shall pay the costs for telephone and fax lines installation, maintenance, service, and removal; for Construction Site Office, Construction Manager's Office and Inspector's Office.

1.2.6. **Fire Protection:**

1.2.6.1. Contractor shall provide and maintain fire extinguishers and other equipment for fire protection. Such equipment shall be designated for use for fire protection only and shall comply with all requirements of the California Fire, State Fire Marshall and/or its designee.

1.2.6.2. Where on-site welding and burning of steel is unavoidable, Contractor shall provide protection for adjacent surfaces.

1.2.7. **Trash Removal:**

1.2.7.1. Contractor shall provide trash removal on a timely basis from all Site Offices and throughout the Site.

1.2.8. **Temporary Facilities:**

1.2.8.1. Contractor shall provide sufficient space and facilities for its own force's needs.

1.2.8.2. In addition, unless otherwise indicated in the Contract Documents, Contractor shall provide the following facilities, trailers, offices, furniture and:

1.2.8.2.1. One (1) 12X60 office trailer with two (2) offices for two (2) District representatives, with bathroom, common space between both offices;

1.2.8.2.2. One (1) 12X20 Project Inspector's Trailer/Office;

1.2.8.2.3. Basic furniture: chair, desks, plan table, conference room table, and chairs; and

1.2.8.2.4. Basic services: fixed line for phone, fax, and high speed internet service.

1.3. CONSTRUCTION AIDS

1.3.1. **Plant and Equipment:**

1.3.1.1. Contractor shall furnish, operate, and maintain a complete plant for fabricating, handling, conveying, installing, and erecting materials and equipment; and for conveyances for transporting workmen. Include elevators, hoists, debris chutes, and other equipment, tools, and appliances necessary for performance of the Work.

1.3.1.2. Contractor shall maintain plant and equipment in safe and efficient operating condition. Damages due to defective plant and equipment, and uses made thereof, shall be repaired by Contractor at no expense to the District.

1.3.2. No District tools or equipment shall be used by Contractor or its subcontractors for the performance of the Work.

1.4. BARRIERS AND ENCLOSURES

1.4.1. Contractor shall obtain District's written permission for locations and types of temporary barriers and enclosures, including fire-rated materials proposed for use, prior to their installation.

1.4.2. Contractor shall provide a six (6) foot high, chain link perimeter fence with posts driven into the ground and fabric screen as a temporary barrier around construction area. Contractor shall provide and maintain temporary enclosures to prevent public entry and to protect persons using other buildings and portions of the Site and/or Premises. Contractor shall remove temporary fence, barriers and enclosure upon Completion of the Work.

1.4.3. Contractor shall provide site access to existing facilities for persons using other buildings and portions of the Site, for the public, and for deliveries and other services and activities.

1.5. SECURITY

Contractor shall secure all construction equipment, machinery and vehicles, park and store only within fenced area, and render inoperable during non-work hours. Contractor is responsible for ensuring that no construction materials, tools, equipment, machinery or vehicles can be used for unauthorized entry or other damage or interference to activities and security of existing facilities adjacent to and in the vicinity of the Project Site.

1.6. TEMPORARY CONTROLS

1.6.1. **Noise Control**:

1.6.1.1. Contractor acknowledges that adjacent facilities may remain in operation during all or a portion of the Work, and Contractor shall take all reasonable precautions to minimize noise as required by applicable laws and the Contract Documents.

1.6.1.2. Notice of proposed noisy operations, including without limitation, operation of pneumatic demolition tools, concrete saws, and other equipment, shall be submitted to District a minimum of forty-eight (48) hours in advance of their performance.

1.6.2. **Noise and Vibration**:

1.6.2.1. Equipment and impact tools shall have intake and exhaust mufflers.

1.6.2.2. Contractor shall cooperate with District to minimize and/or cease the use of noisy and vibratory equipment if that equipment becomes objectionable by its longevity.

1.6.3. **Dust and Dirt**:

1.6.3.1. Contractor shall conduct demolition and construction operations to minimize the generation of dust and dirt, and prevent dust and dirt from interfering with the progress of the Work and from accumulating in the Work and adjacent areas including, without limitation, occupied facilities.

1.6.3.2. Contractor shall periodically water exterior demolition and construction areas to minimize the generation of dust and dirt.

1.6.3.3. Contractor shall ensure that all hauling equipment and trucks carrying loads of soil and debris shall have their loads sprayed with water or covered with tarpaulins, and as otherwise required by local and state ordinance.

1.6.3.4. Contractor shall prevent dust and dirt from accumulating on walks, roadways, parking areas, and planting, and from washing into sewer and storm drain lines.

1.6.4. **Surface and Subsurface Water:**

Contractor shall not permit surface and subsurface water, and other liquids, to accumulate in or about the vicinity of the Premises. Should accumulation develop, Contractor shall control the water or other liquid, and suitably dispose of it by means of temporary pumps, piping, drainage lines, troughs, ditches, dams, or other methods.

1.6.5. **Pollution**:

1.6.5.1. No burning of refuse, debris, or other materials shall be permitted on or in the vicinity of the Premises.

1.6.5.2. Contractor shall comply with applicable regulatory requirements and anti-pollution ordinances during the conduct of the Work including, without limitation, demolition, construction, and disposal operations.

1.6.6. **Lighting**

If portable lights are used after dark, all light must be located so as not to direct light into neighboring property.

1.7. JOB SIGN(S)

1.7.1. **General:**

1.7.1.1. Contractor shall provide and maintain and locate a Project identification sign with the design, text, and colors designated by District and/or the Architect.

1.7.1.2. Signs other than the specified Project sign and or signs required by law, for safety, or for egress, shall not be permitted, unless otherwise approved in advance by the District.

1.7.2. **Materials:**

1.7.2.1. Structure and Framing: Structurally sound, new or used wood or metal; wood shall be nominal 3/4-inch exterior grade plywood.

1.7.2.2. Sign Surface: Minimum 3/4-inch exterior grade plywood.

1.7.2.3. Rough Hardware: Galvanized.

1.7.2.4. Paint: Exterior quality, of type and colors selected by the District and/or the Architect.

1.7.3. **Fabrication:**

1.7.3.1. Contractor shall fabricate to provide smooth, even surface for painting.

1.7.3.2. Size: 4'-0" x 8'-0", unless otherwise indicated.

1.7.3.3. Contractor shall paint exposed surfaces of supports, framing, and surface material with exterior grade paint: one coat of primer and one coat of finish paint.

1.7.3.4. Text and Graphics: As indicated.

1.8. PUBLICITY RELEASES

Contractor shall not release any information, story, photograph, plan, or drawing relating to information about the Project to anyone, including press and other public communications medium, including, without limitation, on website(s).

END OF DOCUMENT

DOCUMENT 01 52 10

SITE STANDARDS

1. GENERAL

1.1. RELATED DOCUMENTS AND PROVISIONS:

Contractor shall review all Contract Documents for applicable provisions related to the provisions in this document, including without limitation:

1.1.1. General Conditions, including without limitation, Site Access, Conditions, and Regulations;

1.1.2. Special Conditions (if any);

1.1.3. Supplemental Conditions (if any);

1.1.4. Drug-Free Workplace Certification;

1.1.5. Tobacco-Free Environment Certification;

1.1.6. Criminal Background Investigation/Fingerprinting Certification; and

1.1.7. Temporary Facilities and Controls.

1.2. REQUIREMENTS OF THE DISTRICT

1.2.1. **Drug-Free Schools and Safety Requirements:**

1.2.1.1. All school sites and other District Facilities have been declared “Drug-Free Zones.” No drugs, alcohol, smoking or the use of tobacco products are allowed at any time in any buildings, Contractor-owned vehicles or vehicles owned by others while on District property. No students, staff, visitors, or contractors are to use drugs on these sites.

1.2.1.2. Contractor shall post: "Non-Smoking Area" in a highly visible location on Site. Contractor may designate a smoking area outside of District property within the public right-of-way, provided that this area remains quiet and unobtrusive to adjacent neighbors. This smoking area must be kept clean at all times.

1.2.1.3. Contractor shall ensure that no alcohol, firearms, weapons, or controlled substances enter or are used at the Site. Contractor shall immediately remove from the Site and terminate the employment of any employee(s) found in violation of this provision.

1.2.2. **Language**: Unacceptable and/or loud language will not be tolerated, "Cat calls" or other derogatory language toward students or public will not be allowed.

1.2.3. **Disturbing the Peace (Noise and Lighting):**

1.2.3.1. Contractor shall observe the noise ordinance of the Site at all times including, without limitation, all applicable local, city, and/or state laws, ordinances, and/or regulations regarding noise and allowable noise levels.

1.2.3.2. The use of radios, etc., shall be controlled to keep all sound at a level that cannot be heard beyond the immediate area of use. District reserves the right to prohibit the use of radios at the Site, except for handheld communication radios.

1.2.3.3. If portable lights are used after dark, the lights must be located so as not to direct light into neighboring properties.

1.2.4. **Traffic**:

1.2.4.1. Driving on the Premises shall be limited to periods when students and public are not present. If driving or deliveries must be made during the school hours, two (2) or more ground guides shall lead the vehicle across the area of travel. In no case shall driving take place across playgrounds or other pedestrian paths during recess, lunch, and/or class period changes. The speed limit on-the Premises shall be five (5) miles per hour (maximum) or less if conditions require.

1.2.4.2. All paths of travel for deliveries, including without limitation, material, equipment, and supply deliveries, shall be reviewed and approved by District in advance. Any damage will be repaired to the pre-damaged condition by the Contractor.

1.2.4.3. District shall designate a construction entry to the Site. If Contractor requests, District determines it is required, and to the extent possible, District shall designate a staging area so as not to interfere with the normal functioning of school facilities. Location of gates and fencing shall be approved in advance with District and at Contractor's expense.

1.2.4.4. Parking areas shall be reviewed and approved by District in advance. No parking is to occur under the drip line of trees or in areas that could otherwise be damaged.

1.2.4.5. All of the above shall be observed and complied with by the Contractor and all workers on the Site. Failure to follow these directives could result in individual(s) being suspended or removed from the work force at the discretion of the District. The same rules and regulations shall apply equally to delivery personnel, inspectors, consultants, and other visitors to the Site.

END OF DOCUMENT

DOCUMENT 01 56 39

TEMPORARY TREE AND PLANT PROTECTION

1. GENERAL

1.1. RELATED DOCUMENTS

Contractor shall review all Contract Documents for applicable provisions related to the provisions in this document, including without limitation:

1.1.1. General Conditions;

1.1.2. Special Conditions (if any);

1.1.3. Supplemental Conditions (if any); and

1.1.4. Temporary Facilities and Controls.

1.2. SUMMARY

This Document includes the protection and trimming of existing trees that interfere with, or are affected by, execution of the Work, whether temporary or permanent construction.

1.3. DEFINITIONS

Tree Protection Zone: Area surrounding individual trees or groups of trees to remain during construction, and defined by the drip line of individual trees or the perimeter drip line of groups of trees, unless otherwise indicated.

1.4. SUBMITTALS

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

1.4.2. Tree Pruning Schedule: Written schedule from arborist detailing scope and extent of pruning of trees to remain that interfere with or are affected by construction.

1.4.3. Qualification Data: For tree service firm and arborist.

1.4.4. Certification: From arborist, certifying that trees indicated to remain have been protected during construction according to recognized standards and that trees were promptly and properly treated and repaired when damaged.

1.4.5. Maintenance Recommendations: From arborist, for care and protection of trees affected by construction during and after completing the Work.

1.5. QUALITY ASSURANCE

1.5.1. Tree Service Firm Qualifications: An experienced tree service firm that has successfully completed tree protection and trimming work similar to that required for this Project and that will assign an experienced, qualified arborist to Project site during execution of tree protection and trimming.

1.5.2. Arborist Qualifications: An arborist certified by ISA (International Society of Arboriculture) or licensed in the jurisdiction where Project is located.

1.5.3. Tree Pruning Standard: Comply with ANSI A300 (Part 1), "Tree, Shrub, and Other Woody Plant Maintenance--Standard Practices (Pruning)."

1.5.3.1. Before tree protection and trimming operations begin, meet with District to review tree protection and trimming procedures and responsibilities.

2. PRODUCTS

2.1. MATERIALS

2.1.1. Unless otherwise specified, Contractor shall select materials as recommended by arborist or landscape architect.

2.1.2. Drainage Fill: Selected crushed stone, or crushed or uncrushed gravel, washed, ASTM D 448, Size 24, with 90 to 100 percent passing a 2-1/2-inch (63-mm) sieve and not more than 10 percent passing a 3/4-inch (19-mm) sieve.

2.1.3. Topsoil: Natural or cultivated surface-soil layer containing organic matter and sand, silt, and clay particles; friable, pervious, and black or a darker shade of brown, gray, or red than underlying subsoil; reasonably free of subsoil, clay lumps, gravel, and other objects more than 1 inch (25 mm) in diameter; and free of weeds, roots, and toxic and other nonsoil materials.

2.1.3.1. Obtain topsoil only from well-drained sites where topsoil is 4 inches (100 mm) deep or more; do not obtain from bogs or marshes.

2.1.4. Filter Fabric: Manufacturer's standard, nonwoven, pervious, geotextile fabric of polypropylene, nylon, or polyester fibers.

2.1.5. Chain-Link Fence: Metallic-coated steel chain-link fence fabric of 0.120-inch- (3-mm-) diameter wire; a minimum of 48 inches (1200 mm) high; with 1.9-inch- (48-mm-) diameter line posts; 2-3/8-inch- (60-mm-) diameter terminal and corner posts; 1-5/8-inch- (41-mm-) diameter top rail; and 0.177-inch- (4.5-mm-) diameter bottom tension wire; with tie wires, hog ring ties, and other accessories for a complete fence system.

2.1.6. Select mulch as recommended by arborist or landscape architect.

2.1.7. Organic Mulch: Use shredded hardwood, ground or shredded bark, or wood and bark chips, all free of deleterious materials.

3. EXECUTION

3.1. PREPARATION

3.1.1. Temporary Fencing: Install temporary fencing around tree protection zones to protect remaining trees and vegetation from construction damage. Maintain temporary fence and remove when construction is complete.

3.1.2. Install chain-link fence according to ASTM F 567 and manufacturer's written instructions.

3.1.3. Protect tree root systems from damage caused by runoff or spillage of noxious materials while mixing, placing, or storing construction materials. Protect root systems from ponding, eroding, or excessive wetting caused by dewatering operations.

3.1.4. Mulch areas inside tree protection zones and other areas indicated.

3.1.4.1. Select mulch as recommended by arborist or landscape architect.

3.1.4.2. Apply 2-inch (50-mm) to 3-inch (75-mm) average thickness of organic mulch. Do not place mulch within 6 inches (150 mm)] of tree trunks.

3.1.5. Do not store construction materials, debris, or excavated material inside tree protection zones. Do not permit vehicles or foot traffic within tree protection zones; prevent soil compaction over root systems.

3.1.6. Maintain tree protection zones free of weeds and trash.

3.1.7. Do not allow fires within tree protection zones.

3.2. EXCAVATION

3.2.1. Install shoring or other protective support systems to minimize sloping or benching of excavations where construction or utility excavation is near trees to be protected.

3.2.2. Do not excavate within tree protection zones, unless otherwise indicated.

3.2.3. Where excavation for new construction is required within tree protection zones, hand clear and excavate to minimize damage to root systems. Use narrow-tine spading forks and comb soil to expose roots.

3.2.3.1. Do not allow exposed roots to dry out before placing permanent backfill. Provide temporary earth cover or pack with peat moss and wrap with burlap. Water and maintain in a moist condition. Temporarily support and protect roots from damage until they are permanently relocated and covered with soil.

3.2.4. Where utility trenches are required within tree protection zones, tunnel under or around roots by drilling, auger boring, pipe jacking, or digging by hand.

3.2.4.1. Root Pruning: Do not cut main lateral roots or taproots; cut only smaller roots that interfere with installation of utilities. Cut roots with sharp pruning instruments; do not break or chop.

3.3. REGRADING

3.3.1. Grade Lowering: Where new finish grade is indicated below existing grade around trees, slope grade beyond tree protection zones. Maintain existing grades within tree protection zones.

3.3.2. Grade Lowering: Where new finish grade is indicated below existing grade around trees, slope grade away from trees as recommended by arborist, unless otherwise indicated.

3.3.2.1. Root Pruning: Prune tree roots exposed during grade lowering. Do not cut main lateral roots or taproots; cut only smaller roots. Cut roots with sharp pruning instruments; do not break or chop.

3.3.3. Minor Fill: Where existing grade is 6 inches (150 mm) or less below elevation of finish grade, fill with topsoil. Place topsoil in a single uncompacted layer and hand grade to required finish elevations.

3.3.4. Moderate Fill: Where existing grade is more than 6 inches (150 mm) but less than 12 inches (300 mm) below elevation of finish grade, place drainage fill, filter fabric, and topsoil on existing grade as follows:

3.3.4.1. Carefully place drainage fill against tree trunk approximately 2 inches (50 mm) above elevation of finish grade and extend not less than 18 inches (450 mm) from tree trunk on all sides. For balance of area within drip-line perimeter, place drainage fill up to 6 inches (150 mm) below elevation of grade.

3.3.4.2. Place filter fabric with edges overlapping 6 inches (150 mm) minimum.

3.3.4.3. Place fill layer of topsoil to finish grade. Do not compact drainage fill or topsoil. Hand grade to required finish elevations.

3.4. TREE PRUNING

3.4.1. Prune trees to remain that are affected by temporary and permanent construction.

3.4.2. Prune trees to remain to compensate for root loss caused by damaging or cutting root system. Provide subsequent maintenance during Contract period as recommended by arborist.

3.4.3. Pruning Standards: Prune trees according to ANSI A300 (Part 1), as recommended by arborist report.

3.4.4. Adjust pruning requirements per arborist's recommendations.

3.4.5. Cut branches with sharp pruning instruments; do not break or chop.

3.4.6. Modify below to specific project requirements.

3.4.7. Chip removed tree branches and dispose of or spread over areas identified by District.

3.5. TREE REPAIR AND REPLACEMENT

3.5.1. Promptly repair trees damaged by construction operations within 24 hours. Treat damaged trunks, limbs, and roots according to arborist's written instructions.

3.5.2. Remove and replace trees indicated to remain that die or are damaged during construction operations or that are incapable of restoring to normal growth pattern.

3.5.2.1. Provide new trees of 6-inch (150-mm) caliper size and of a when damaged trees more than 6 inches (150 mm) in caliper size, measured 12 inches (300 mm) above grade, are required to be replaced. Plant and maintain new trees as specified in Contract Documents.

3.5.3. Where recommended by arborist report, aerate surface soil, compacted during construction, 10 feet (3 m) beyond drip line and no closer than 36 inches (900 mm) to tree trunk. Drill 2-inch (50-mm) diameter holes a minimum of 12 inches (300 mm) deep at 24 inches (600 mm) o.c. Backfill holes with an equal mix of augered soil and sand.

3.6. DISPOSAL OF WASTE MATERIALS

3.6.1. Burning is not permitted.

3.6.2. Disposal: Remove excess excavated material and displaced trees from Site.

END OF DOCUMENT

DOCUMENT 01 60 00

MATERIALS AND EQUIPMENT

1. GENERAL

1.1. RELATED DOCUMENTS AND PROVISIONS

Contractor shall review all Contract Documents for applicable provisions related to the provisions in this document, including without limitation:

1.1.1. General Conditions.

1.1.2. Special Conditions (if any);

1.1.3. Supplemental Conditions (if any); and

1.1.4. Imported Materials Certification.

1.2. MATERIALS AND EQUIPMENT

1.2.1. Only items approved by the District and/or Architect shall be used.

1.2.2. Contractor shall submit lists of Products and other Product information in accordance with the Contract Documents, including, without limitation, the provisions regarding the submittals.

1.3. MATERIALS AND EQUIPMENT COLORS

1.3.1. The Contractor shall comply with all schedule(s) of colors provided by the District and/or Architect.

1.3.2. No individual color selections will be made until after approval of all pertinent materials and equipment and after receipt of appropriate samples in accordance with the Contract Documents, including, without limitation, the provisions regarding the submittals.

1.3.3. Contractor shall request priority in writing for any item requiring advance ordering to maintain the approved Construction Schedule.

1.4. DELIVERY, STORAGE, AND HANDLING

1.4.1. Contractor shall deliver manufactured materials in original packages, containers, or bundles (with seals unbroken), bearing name or identification mark of manufacturer. District may inspect materials prior to Contractor unloading the delivered materials. District may reject any materials that do not conform to the Contract Documents.

1.4.2. Contractor shall deliver fabrications in as large assemblies as practicable; where specified as shop-primed or shop-finished, package or crate as required to preserve such priming or finish intact and free from abrasion.

1.4.3. Contractor shall store materials in such a manner as necessary to properly protect them from damage. Materials or equipment damaged by handling, weather, dirt, or from any other cause will not be accepted.

1.4.4. Materials that have been warehoused for long periods of time, stored or transported in improper environment, improperly packaged, inadequately labeled, poorly protected, excessively shipped, deviated from normal distribution pattern, or reassembled are not acceptable.

1.4.5. Contractor shall store materials so as to cause no obstructions of sidewalks, roadways, or underground services. Contractor shall protect materials and equipment furnished pursuant to the Contract Documents.

1.4.6. Contractor may store materials on Site with prior written approval by District; all materials shall remain under Contractor's control and Contractor shall remain liable for any damage to the materials. Should the Project Site not have storage area available, the Contractor shall provide for off-site storage at no cost to District.

1.4.7. When any room in Project is used as a shop or storeroom, Contractor shall be responsible for any repairs, patching, or cleaning necessary due to that use. Location of storage space shall be subject to prior written approval by District.

2. PRODUCTS

2.1. MANUFACTURERS

2.1.1. Manufacturers listed in various sections of the Contract Documents are names of those manufacturers that are believed to be capable of supplying one or more of the items specified therein.

2.1.2. The listing of a manufacturer does not imply that every product of that manufacturer is acceptable or as meeting the requirements of the Contract Documents.

2.2. FACILITIES AND EQUIPMENT

Contractor shall provide, install, maintain, and operate a complete and adequate facility for handling, execution, disposal, and distribution of materials and equipment as required for proper and timely performance of Work.

2.3. MATERIALS REFERENCE STANDARDS

Where materials are specified solely by reference to “standard specifications” or other general reference, and if requested by District, Contractor shall submit for review data on actual materials proposed to be incorporated into Work, listing name and address of vendor, manufacturer, or producer, and trade or brand names of those materials, and data substantiating compliance with standard specifications.

3. EXECUTION

3.1. WORKMANSHIP

3.1.1. Where not more specifically described in any other Contract Documents, workmanship shall conform to methods and operations of best standards and accepted practices of trade or trades involved and shall include items of fabrication, construction, or installation regularly furnished or required for completion (including finish and for successful operation, as intended).

3.1.2. Work shall be executed by tradespersons skilled in their respective field of work. When completed, parts shall have been durably and substantially built and present a neat appearance.

3.2. COORDINATION

3.2.1. Contractor shall coordinate installation of materials and equipment so as to not interfere with installation of other Work. Adjustment or rework because of Contractor's failure to coordinate will be at no additional cost to District.

3.2.2. Contractor shall examine in-place materials and equipment for readiness, completeness, fitness to be concealed or to receive Work , and compliance with Contract Documents. Concealing or covering work constitutes acceptance of additional cost which will result should in-place materials and equipment be found unsuitable for receiving other work or otherwise deviating from the requirements of the Contract Documents.

3.3. COMPLETENESS

Contractor shall provide all portions of the Work, unless clearly stated otherwise, installed complete and operational with all elements, accessories, anchorages, utility connections, etc., in a manner to ensure well-balanced performance, in accordance with manufacturer's recommendations and in accordance with Contract Documents. For example, electric water coolers require water, electricity, and drain services; roof drains require drain systems; sinks fit within countertop, etc. Terms such as "installed complete," "operable condition," "for use intended," "connected to all utilities," "terminate with proper cap," "adequately anchored," "patch and refinish," and "to match similar" should be assumed to apply in all cases, except where completeness of functional or operable condition is specifically stated as not required.

3.4. APPROVED INSTALLER OR APPLICATOR

Contractor shall ensure that all installations are only performed by a manufacturer's approved installer or applicator.

3.5. MANUFACTURER'S RECOMMENDATIONS

All installations shall be in accordance with manufacturer's published recommendations and specific written directions of manufacturer's representative. Should the Contract Documents differ from recommendations of manufacturer or directions of manufacturer's representative, Contractor shall analyze differences, make recommendations to the District and the Architect in writing, and shall not proceed until interpretation or clarification has been issued by the District and/or the Architect.

END OF DOCUMENT

DOCUMENT 01 66 10

DELIVERY, STORAGE AND HANDLING

1. GENERAL

1.1. RELATED DOCUMENTS AND PROVISIONS

Contractor shall review all Contract Documents for applicable provisions related to the provisions in this document, including without limitation:

1.1.1. General Conditions, including, without limitation, Site Access, Conditions and Requirements; and

1.1.2. Special Conditions.

1.2. PRODUCTS

1.2.1. Products are as defined in the General Conditions.

1.2.2. Contractor shall not use and/or reuse materials and/or equipment removed from existing Premises, except as specifically permitted by the Contract Documents.

1.2.3. Contractor shall provide interchangeable components of the same manufacturer, for similar components.

1.3. TRANSPORTATION AND HANDLING

1.3.1. Contractor shall transport and handle Products in accordance with manufacturer's instructions.

1.3.2. Contractor shall promptly inspect shipments to confirm that Products comply with Contract requirements, are of correct quantity, and are undamaged.

1.3.3. Contractor shall provide equipment and personnel to properly handle Products to prevent soiling, disfigurement, or damage.

1.4. STORAGE AND PROTECTION

1.4.1. Contractor shall store and protect Products in accordance with manufacturer's instructions, with seals and labels intact and legible. Contractor shall store sensitive Products in weather-tight, climate controlled enclosures.

1.4.2. Contractor shall place fabricated Products that are stored outside, on above-ground sloped supports.

1.4.3. Contractor shall provide off-site storage and protection for Products when Site does not permit on-site storage or protection.

1.4.4. Contractor shall cover Products subject to deterioration with impervious sheet covering and provide ventilation to avoid condensation.

1.4.5. Contractor shall store loose granular materials on solid flat surfaces in a well-drained area and prevent mixing with foreign matter.

1.4.6. Contractor shall provide equipment and personnel to store Products by methods to prevent soiling, disfigurement, or damage.

1.4.7. Contractor shall arrange storage of Products to permit access for inspection and periodically inspect to assure Products are undamaged and are maintained under specified conditions.

END OF DOCUMENT

DOCUMENT 01 73 00

EXECUTION

1. GENERAL

1.1. RELATED DOCUMENTS AND PROVISIONS

Contractor shall review all Contract Documents for applicable provisions related to the provisions in this document, including without limitation:

1.1.1. General Conditions;

1.1.2. Special Conditions (if any);

1.1.3. Supplemental Conditions (if any);

1.1.4. Coordination and Project Meetings;

1.1.5. Submittals;

1.1.6. Materials and Equipment;

1.1.7. Cutting and Patching;

1.1.8. Contract Closeout and Final Cleaning; and

1.1.9. General Commissioning Requirements.

1.2. SUMMARY

1.2.1. This Document includes general procedural requirements governing execution of the Work including, but not limited to, the following:

1.2.1.1. Construction layout;

1.2.1.2. Field engineering and surveying;

1.2.1.3. General installation of products;

1.2.1.4. Owner furnished, Contractor installed items;

1.2.1.5. Coordination of District-installed products;

1.2.1.6. Progress cleaning;

1.2.1.7. Staring and adjusting;

1.2.1.8. Protection of installed construction; and

1.2.1.9. Correction of the Work.

1.3. SUBMITTALS

1.3.1. Qualification Data: For land surveyor or professional engineer.

1.3.2. Certificates: Submit certificate signed by land surveyor or professional engineer certifying that location and elevation of improvements comply with requirements.

1.3.3. Landfill Receipts: Submit copy of receipts issued by a landfill facility, licensed to accept the materials as classified, for hazardous waste disposal.

1.3.4. Certified Surveys: Submit electronic files and three (3) paper copies signed by land surveyor or professional engineer.

1.3.5. Final Property Survey: Submit electronic files and three (3) paper copies showing the Work performed and record survey data.

2. EXECUTION

2.1. EXAMINATION

2.1.1. Existing Utilities: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning Site Work, investigate and verify the existence and location of underground utilities and other construction affecting the Work.

2.1.1.1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping; and underground electrical services.

2.1.1.2. Furnish location data for Work related to Project that must be performed by public utilities serving the Project Site.

2.2. PREPARATION

2.2.1. Existing Utility Information: Furnish information to local utility that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.

2.2.2. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

2.2.3. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.

2.2.4. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents, submit a request for information to

District per requirements of Document "Requests for Information." Include a detailed description of problem encountered, together with recommendations for any necessary changes to the Contract Documents.

2.3. CONSTRUCTION LAYOUT

2.3.1. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks. If discrepancies are discovered, notify District and its consultant promptly.

2.3.2. General: Engage a land surveyor or professional engineer to lay out the Work using accepted surveying practices.

2.3.2.1. Establish benchmarks and control points to set lines and levels at each story of construction and elsewhere as needed to locate each element of Project.

2.3.2.2. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.

2.3.2.3. Inform installers of lines and levels to which they must comply.

2.3.2.4. Check the location, level and plumb, of every major element as the Work progresses.

2.3.2.5. Notify District and its consultant when deviations from required lines and levels exceed allowable tolerances.

2.3.2.6. Close site surveys with an error of closure equal to or less than the standard established by authorities having jurisdiction.

2.3.3. Site Improvements: Locate and lay out site improvements, including pavements, grading, fill and topsoil placement, utility slopes, and invert elevations.

2.3.4. Building Lines and Levels: Locate and lay out control lines and levels for structures, building foundations, column grids, and floor levels, including those required for mechanical and electrical work. Transfer survey markings and elevations for use with control lines and levels. Level foundations and piers from two or more locations.

2.3.5. Record Log: Maintain a log of layout control Work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used. Make the log available for reference by District and its consultant.

2.4. FIELD ENGINEERING

2.4.1. Reference Points: Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations.

2.4.1.1. Do not change or relocate existing benchmarks or control points without prior written approval of District and its consultant. Report lost or destroyed

permanent benchmarks or control points promptly. Report the need to relocate permanent benchmarks or control points to District and its consultant before proceeding.

2.4.1.2. Require surveyor to replace lost or destroyed permanent benchmarks and control points promptly. Base replacements on the original survey control points.

2.4.2. Benchmarks: Establish and maintain a minimum of two (2) permanent benchmarks on Project Site, referenced to data established by survey control points. Comply with authorities having jurisdiction for type and size of benchmark.

2.4.2.1. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.

2.4.2.2. Where the actual location or elevation of layout points cannot be marked, provide temporary reference points sufficient to locate the Work.

2.4.2.3. Remove temporary reference points when no longer needed. Restore marked construction to its original condition.

2.4.3. Records: Contractor shall maintain a complete, accurate log of all control and survey Work as it progresses. On request of District or Architect, Contractor shall submit documentation to verify accuracy of field engineering Work at no additional cost to the District.

2.4.4. Certified Survey: On completion of foundation walls, major site improvements, and other Work requiring field-engineering services, prepare a certified survey showing dimensions, locations, angles, and elevations of construction and sitework.

2.4.5. Final Property Survey: Prepare and submit a final property survey showing significant features (real property) for Project. Include on the survey a certification, signed by land surveyor or professional engineer, that principal metes, bounds, lines, and levels of Project are accurately positioned as shown on the survey and are in conformance with Contract Documents.

2.4.5.1. Show boundary lines, monuments, streets, site improvements and utilities, existing improvements and significant vegetation, adjoining properties, acreage, grade contours, and the distance and bearing from a Site corner to a legal point.

2.4.6. Compliance with Laws: Contractor is responsible for meeting all applicable codes, OSHA, safety, and shoring requirements.

2.4.7. Nonconforming Work: Contractor is responsible for any re-surveying required by correction of nonconforming Work.

2.5. INSTALLATION

2.5.1. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.

2.5.1.1. Make vertical Work plumb and make horizontal Work level.

2.5.1.2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.

2.5.1.3. Conceal pipes, ducts, and wiring in finished areas, unless otherwise indicated.

2.5.1.4. Maintain minimum headroom clearance of 7 feet in spaces without a suspended ceiling.

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

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

2.5.4. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.

2.5.5. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels where possible.

2.5.6. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.

2.5.7. Anchors and Fasteners: Provide anchors and fasteners as required to anchor each component securely in place, accurately located and aligned with other portions of the Work.

2.5.7.1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by District.

2.5.7.2. Allow for building movement, including thermal expansion and contraction.

2.5.7.3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project Site in time for installation.

2.5.8. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.

2.5.9. Hazardous Materials: Use products, cleaners, and installation materials that are not classed as hazardous per the MSDS sheets for the products where possible. If hazardous materials are necessary, inform District where and when they will be used no less than 48 hours before use. Take all recommended precautions of the materials' manufacturers to ensure safe use and clean-up.

2.6. DISTRICT-INSTALLED PRODUCTS

2.6.1. Site Access: Provide access to Project Site for District's construction forces.

2.6.2. Coordination: Coordinate construction and operations of the Work with work performed by District's construction forces.

2.6.2.1. Construction Schedule: Inform District of Contractor's preferred schedule for District's portion of the Work. Adjust Construction Schedule based on a mutually agreeable timetable. Notify District if changes to schedule are required due to differences in actual construction progress.

2.6.2.2. Preinstallation Conferences: Include District's construction forces at preinstallation conferences covering portions of the Work that are to receive District's work. Attend preinstallation conferences conducted by District's construction forces if portions of the Work depend on District's construction.

2.7. PROGRESS CLEANING

2.7.1. General: Clean Project Site and work areas daily, including common areas. Coordinate progress cleaning for joint-use areas where more than one installer has worked. Enforce requirements strictly. Dispose of materials lawfully.

2.7.1.1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.

2.7.1.2. Do not hold materials more than seven (7) days during normal weather or three (3) days if the temperature is expected to rise above 80 degrees F.

2.7.1.3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations. Remove hazardous and unsanitary waste materials daily.

2.7.2. Site: Maintain Project Site free of waste materials and debris.

2.7.3. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.

2.7.3.1. Remove liquid spills promptly.

2.7.3.2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.

2.7.4. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.

2.7.5. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.

2.7.6. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Completion.

2.7.7. Waste Disposal: Burying or burning waste materials on-site will not be permitted. Washing waste materials down sewers or into waterways will not be permitted.

2.7.8. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Completion.

2.7.9. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.

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

2.8. STARTING AND ADJUSTING

2.8.1. Start equipment and operating components to confirm proper operation. Replace or repair malfunctioning units and retest.

2.8.2. Adjust operating components for proper operation without binding. Adjust equipment for proper operation.

2.8.3. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

2.8.4. Manufacturer's Field Service: If a factory-authorized service representative is required to inspect field-assembled components and equipment installation, comply with qualification requirements in Document "Quality Requirements."

2.9. PROTECTION OF INSTALLED CONSTRUCTION

2.9.1. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Completion.

2.9.2. Comply with manufacturer's written instruction for temperature and relative humidity unless otherwise addressed in the construction planning, sequences, and instructions.

2.10. CORRECTION OF THE WORK

2.10.1. Repair or remove and replace defective construction. Restore damaged substrates and finishes. Comply with requirements in Document "Cutting and Patching."

2.10.1.1. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment.

2.10.2. Restore permanent facilities used during construction to their specified condition.

2.10.3. Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.

2.10.4. Repair components that do not operate properly. Remove and replace operating components that cannot be repaired.

2.10.5. Remove and replace chipped, scratched, and broken glass or reflective surfaces.

END OF DOCUMENT

DOCUMENT 01 73 10

CUTTING AND PATCHING

1. GENERAL

1.1. RELATED DOCUMENTS AND PROVISIONS

Contractor shall review all Contract Documents for applicable provisions related to the provisions in this document, including without limitation:

1.1.1. General Conditions, including, without limitation, Inspector, Inspections, and Tests, Integration of Work, Nonconforming Work, and Correction of Work, and Uncovering Work;

1.1.2. Special Conditions (if any);

1.1.3. Supplemental Conditions (if any);

1.1.4. Hazardous Materials Procedures and Requirements;

1.1.5. Hazardous Materials Certification;

1.1.6. Lead-Based Materials Certification; and

1.1.7. Imported Materials Certification.

1.2. CUTTING AND PATCHING

1.2.1. Contractor shall be responsible for all cutting, fitting, and patching, including associated excavation and backfill, required to complete the Work or to:

1.2.1.1. Make several parts fit together properly.

1.2.1.2. Uncover portions of Work to provide for installation of ill-timed Work.

1.2.1.3. Remove and replace defective Work.

1.2.1.4. Remove and replace Work not conforming to requirements of Contract Documents.

1.2.1.5. Remove Samples of installed Work as specified for testing.

1.2.1.6. Provide routine penetrations of non-structural surfaces for installation of piping and electrical conduit.

1.2.1.7. Attaching new materials to existing remodeling areas – including painting (or other finishes) to match existing conditions.

1.2.2. In addition to Contract requirements, upon written instructions from District, Contractor shall uncover Work to provide for observations of covered Work in accordance with the

Contract Documents, remove samples of installed materials for testing as directed by District, and remove Work to provide for alteration of existing Work.

1.2.3. Contractor shall not cut or alter Work, or any part of it, in such a way that endangers or compromises the integrity of the Work, the Project, or Work of others.

1.2.4. Contractor shall not cut and patch operating elements or safety related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety. Operating elements include the following:

1.2.4.1. Primary operational systems and equipment.

1.2.4.2. Air or smoke barriers.

1.2.4.3. Fire-suppression systems.

1.2.4.4. Mechanical systems piping and ducts.

1.2.4.5. Control systems.

1.2.4.6. Communication systems.

1.2.4.7. Conveying systems.

1.2.4.8. Electrical wiring systems.

1.2.5. Contractor shall not cut and patch miscellaneous elements or related components in a manner that could change their load-carrying capacity, that results in reducing capacity to perform as intended, or that results in increased maintenance or decreased operational life of safety. Miscellaneous elements include the following:

1.2.5.1. Water, moisture or vapor barriers.

1.2.5.2. Membranes and flashings.

1.2.5.3. Exterior curtain-wall construction.

1.2.5.4. Equipment supports.

1.2.5.5. Piping, ductwork, vessels and equipment.

1.2.5.6. Noise and vibration control elements and systems.

1.2.5.7. Shoring, bracing and sheeting.

1.3. REQUEST TO CUT, ALTER, PATCH OR EXCAVATE

1.3.1. Contractor shall submit written notice to District pursuant to the applicable notice provisions of the Contract Documents, requesting consent to proceed with the cutting or alteration ("Request") at least ten (10) days prior to any cutting or alterations that

may affect the structural safety of the Project, or Work of others, including the following:

1.3.1.1. The Work of the District or other trades.

1.3.1.2. Structural value or integrity of any element of the Project.

1.3.1.3. Integrity or effectiveness of weather-exposed or weather-resistant elements or systems.

1.3.1.4. Efficiency, operational life, maintenance or safety of operational elements.

1.3.1.5. Visual qualities of sight-exposed elements.

1.3.2. Contractor's Request shall also include:

1.3.2.1. Identification of the Project.

1.3.2.2. Description of affected Work.

1.3.2.3. Necessity for cutting, alterations, or excavations.

1.3.2.4. Impacts of that Work on the District, other trades, or structural or weatherproof integrity of the Project.

1.3.2.5. Description of proposed Work:

1.3.2.5.1. Scope of cutting, patching, alterations, or excavations.

1.3.2.5.2. Trades that will execute Work.

1.3.2.5.3. Products proposed to be used.

1.3.2.5.4. Extent of refinishing to be done.

1.3.2.6. Alternates to cutting and patching.

1.3.2.7. Cost proposal, when applicable.

1.3.2.8. The scheduled date the Work is to be performed and the duration of time to complete the Work.

1.3.2.9. Written permission of other trades whose Work will be affected.

1.4. QUALITY ASSURANCE

1.4.1. Contractor shall ensure that cutting, fitting, and patching shall achieve security, strength, weather protection, appearance for aesthetic match, efficiency, operational life, maintenance, safety of operational elements, and the continuity of existing fire ratings.

1.4.2. Contractor shall ensure that cutting, fitting, and patching shall successfully duplicate undisturbed adjacent profiles, materials, textures, finishes, and colors, and that materials shall match existing construction. Where there is dispute as to whether duplication is successful or has been achieved to a reasonable degree, the District's decision shall be final.

1.5. PAYMENT FOR COSTS

1.5.1. Costs caused by ill-timed or defective Work or Work not conforming to Contract Documents, including costs for additional services of the District or its consultants including but not limited to the Architect, inspector(s), engineers, and agents, will be paid by Contractor and/or deducted from the Contract Price by the District.

1.5.2. Contractor shall provide written cost proposals prior to proceeding with cutting and patching. District shall only pay for cost of Work if it is part of the Contract Price or if a change has been made to the Contract in compliance with the provisions of the General Conditions. Cost of Work performed upon instructions from the District, other than defective or nonconforming Work, will be paid by District on approval of written Change Order in accordance with the Contract Documents.

2. PRODUCTS

2.1. MATERIALS

2.1.1. Contractor shall provide for replacement and restoration of Work removed. Contractor shall comply with the Contract Documents and with the industry standard(s), for the type of Work, and the Specification requirements for each specific product involved. If not specified, Contractor shall recommend a product of a manufacturer or appropriate trade association for approval by the District.

2.1.2. Materials to be cut and patched include those damaged by the performance of the Work.

3. EXECUTION

3.1. INSPECTION

3.1.1. Contractor shall inspect existing conditions of the Site and the Work, including elements subject to movement or damage during cutting and patching, excavating and backfilling. After uncovering Work, Contractor shall inspect conditions affecting installation of new products.

3.1.2. Contractor shall report unsatisfactory or questionable conditions in writing to District as indicated in the General Conditions and shall proceed with Work as indicated in the General Conditions by District.

3.2. PREPARATION

3.2.1. Contractor shall provide shoring, bracing and supports as required to maintain structural integrity for all portions of the Project, including all requirements of the Project.

3.2.2. Contractor shall provide devices and methods to protect other portions of Project from damage.

3.2.3. Contractor shall, provide all necessary protection from weather and extremes of temperature and humidity for the Project, including without limitation any work that may be exposed by cutting and patching Work. Contractor shall keep excavations free from water.

3.3. ERECTION, INSTALLATION AND APPLICATION

3.3.1. With respect to performance, Contractor shall ensure its Subcontractors:

3.3.1.1. Execute fitting and adjustment of products to provide finished installation to comply with and match specified tolerances and finishes.

3.3.1.2. Execute cutting and demolition by methods that will prevent damage to other Work, and provide proper surfaces to receive installation of repairs and new Work.

3.3.1.3. Execute cutting, demolition excavating, and backfilling by methods that will prevent damage to other Work and damage from settlement.

3.3.1.4. Contractor shall use original installer or fabricator to perform cutting and patching for:

3.3.1.5. Weather-exposed surfaces and moisture-resistant elements such as roofing, sheet metal, sealants, waterproofing, and other trades.

3.3.1.6. Sight-exposed finished surfaces.

3.3.2. Contractor shall ensure its Subcontractors execute fitting and adjustment of products to provide a finished installation to comply with specified products, functions, tolerances, and finishes as shown or specified in the Contract Documents including, without limitation, the Drawings and Specifications.

3.3.3. Subcontractors shall fit Work airtight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces. Contractor shall conform to all Code requirements for penetrations or the Drawings and Specifications, whichever calls for a higher quality or more thorough requirement. Contractor shall maintain integrity of both rated and non-rated fire walls, ceilings, floors, etc.

3.3.4. Contractor's Subcontractors shall restore Work which has been cut or removed and install new products to provide completed Work in accordance with requirements of the Contract Documents and as required to match surrounding areas and surfaces.

3.3.5. Contractor's Subcontractors shall refinish all continuous surfaces to nearest intersection as necessary to match the existing finish to any new finish.

END OF DOCUMENT

DOCUMENT 01 77 00

CONTRACT CLOSEOUT AND FINAL CLEANING

1. GENERAL

1.1. RELATED DOCUMENTS

Contractor shall review all Contract Documents for applicable provisions related to the provisions in this document, including without limitation:

1.1.1. General Conditions including, without limitation, Documents on Work and Completion of Work;

1.1.2. Special Conditions (if any);

1.1.3. Supplemental Conditions (if any);

1.1.4. Submittals;

1.1.5. Operation and Maintenance Data;

1.1.6. Warranties;

1.1.7. Record Documents;

1.1.8. Demonstration and Training; and

1.1.9. General Commissioning Requirements.

1.2. PRELIMINARY PROCEDURES

1.2.1. Before requesting inspection for determining date of Completion, complete the following. List items below that are incomplete in request.

1.2.1.1. Prepare a list of items to be completed and corrected ("Punch List"), the value of items on the list, and reasons why the Work is not complete.

1.2.1.2. Advise District of pending insurance changeover requirements.

1.2.1.3. Submit specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.

1.2.1.4. Obtain and submit releases permitting District unrestricted use of the Work and access to services and utilities. Include certificate of occupancy, operating certificates, and similar releases, if required.

1.2.1.5. Prepare and submit Project Record Documents, operation and maintenance manuals, Completion construction photograph prints and electronic files, damage or settlement surveys, property surveys, and similar final record information.

1.2.1.6. Deliver tools, spare parts, extra materials, and similar items to location designated by District. Label with manufacturer's name and model number where applicable.

1.2.1.7. Make final changeover of permanent locks and deliver keys to District. Advise District's personnel of changeover in security provisions.

1.2.1.8. Complete startup testing of systems.

1.2.1.9. Submit test/adjust/balance records.

1.2.1.10. Terminate and remove temporary facilities from Project Site, along with mockups, construction tools, and similar elements.

1.2.1.11. Advise District of changeover in heat and other utilities.

1.2.1.12. Submit changeover information related to District's occupancy, use, operation, and maintenance.

1.2.1.13. Complete final cleaning requirements, including touch-up painting.

1.2.1.14. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.

1.3. RECORD DOCUMENTS AND SHOP DRAWINGS

1.3.1. Contractor shall legibly mark each item to record actual construction, including:

1.3.1.1. Measured depths of foundation in relation to finish floor datum.

1.3.1.2. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permit surface improvements.

1.3.1.3. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the Work.

1.3.1.4. Field changes of dimension and detail.

1.3.1.5. Details not on original Contract Drawings

1.3.1.6. Changes made by modification(s).

1.3.1.7. References to related Shop Drawings and modifications.

1.3.1.8. Contractor will provide one set of Record Drawings to District.

1.3.1.9. Contractor shall submit all required documents to District and/or Architect prior to or with its final Application for Payment.

1.4. COMPLETION

1.4.1. Preliminary Procedures: Before requesting inspection for determining date of Completion, complete the following:

1.4.1.1. Submit a final Application for Payment according to the Contract Documents.

1.4.1.2. Submit evidence of final, continuing insurance coverage complying with insurance requirements.

1.4.1.3. Submit pest-control final inspection report and warranty.

1.4.1.4. Instruction of District Personnel:

1.4.1.4.1. Before final inspection, at agreed upon times, Contractor shall instruct District's designated personnel in operation, adjustment, and maintenance of products, equipment, and systems.

1.4.1.4.2. For equipment requiring seasonal operation, Contractor shall perform instructions for other seasons within six (6) months.

1.4.1.4.3. Contractor shall use operation and maintenance manuals as basis for instruction. Contractor shall review contents of manual with personnel in detail to explain all aspects of operation and maintenance.

1.4.1.4.4. Contractor shall prepare and insert additional data in Operation and Maintenance Manual when need for such data becomes apparent during instruction.

1.4.1.4.5. Contractor shall use operation and maintenance manuals as basis for instruction. Contractor shall review contents of manual with personnel in detail to explain all aspects of operation and maintenance.

1.4.2. Inspection: Submit a written request for inspection.

1.4.3. **LIST OF INCOMPLETE ITEMS (PUNCH LIST)** Contractor shall notify District and Architect when Contractor considers the Work complete. Upon notification, District and Architect will prepare a list of minor items to be completed or corrected ("Punch List").

1.4.4. Contractor and/or its Subcontractors shall proceed promptly to complete and correct items on the Punch List. Failure to include an item on Punch List does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents.

1.4.5. Contractor shall comply with Punch List procedures as provided herein and in the Contract Documents, and maintain the presence of a Project Superintendent and Project Manager until the Punch List is complete to ensure proper and timely completion of the Punch List. Under no circumstances shall Contractor demobilize its forces prior to completion of the Punch List. Upon receipt of Contractor's written notice that all of the Punch List items have been fully completed and the Work is ready for final inspection and acceptance, District and Architect will inspect the Work and shall submit to Contractor a final inspection report noting the Work, if any, required in order to reach Completion in accordance with the Contract Documents. Absent unusual

circumstances, this report shall consist of the Punch List items not yet satisfactorily completed and any additional Punch List items not originally included.

1.4.6. Upon Contractor's completion of all items on the Punch List and any other uncompleted portions of the Work, the Contractor shall notify the District and Architect, who shall again inspect such Work. If the District and Architect find the Work complete and acceptable under the Contract Documents, the District will notify Contractor, who shall then jointly submit to the Architect and District its final Application for Payment.

1.4.7. **Costs of Multiple Inspections**. More than two (2) requests of District to make a final inspection shall be considered an additional service of District, the Architect and/or the Inspector, and all subsequent costs will be invoiced to Contractor and withheld from remaining payments, if funds are available.

1.4.8. Punch List shall be deemed complete only upon the District's determination that all items on the Punch List, and all updates to the Punch List, are complete.

1.5. WARRANTIES

1.5.1. Submittal Time: Submit written warranties on request of District for designated portions of the Work where commencement of warranties other than date of Completion is indicated.

1.5.2. Organize warranty documents into an orderly sequence as required by the Division 01 Document "Warranties."

2. PRODUCTS

2.1. MATERIALS

2.1.1. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

3. EXECUTION

3.1. FINAL CLEANING

3.1.1. Provide final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations. Contractor shall use cleaning methods and procedures that reduce the overall impact on human health and the natural environment by reducing the amount of disposed waste, pollution and environmental degradation. If Project is subject to LEED certification, Contractor shall ensure compliance with the applicable LEED requirements for final cleaning of the Site.

3.1.2. Contractor shall employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program.

3.1.2.1. Complete the following cleaning operations before requesting final inspection:

3.1.2.1.1. Clean Project Site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.

3.1.2.1.2. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.

3.1.2.1.3. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.

3.1.2.1.4. Remove tools, construction equipment, machinery, and surplus material from Project Site.

3.1.2.1.5. Remove snow and ice to provide safe access to building.

3.1.2.1.6. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.

3.1.2.1.7. Clean all surfaces and other work in accordance with recommendations of the manufacturer.

3.1.2.1.8. Remove spots, mortar, plaster, soil, and paint from ceramic tile, stone, and other finish materials.

3.1.2.1.9. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.

3.1.2.1.10. Sweep concrete floors broom clean in unoccupied spaces.

3.1.2.1.11. Vacuum carpet and similar soft surfaces, removing debris and excess nap; shampoo if visible soil or stains remain.

3.1.2.1.12. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials. Polish mirrors and glass, taking care not to scratch surfaces.

3.1.2.1.13. Remove labels that are not permanent.

3.1.2.1.14. Touch up and otherwise repair and restore marred, exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored or that already show evidence of repair or restoration.

3.1.2.1.14.1. Do not paint over "UL" and similar labels, including mechanical and electrical nameplates.

3.1.2.1.15. Wipe surfaces of mechanical and electrical equipment and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.

3.1.2.1.16. Replace parts subject to unusual operating conditions.

3.1.2.1.17. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.

3.1.2.1.18. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.

3.1.2.1.19. Clean ducts, blowers, and coils if units were operated without filters during construction.

3.1.2.1.20. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency. Replace burned-out bulbs, and those noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.

3.1.2.1.21. Leave Project Site clean and ready for occupancy.

3.1.3. Pest Control: Engage an experienced, licensed exterminator to make a final inspection and rid Project of rodents, insects, and other pests.

3.1.4. Comply with safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on District's property. Do not discharge volatile, harmful, or dangerous materials into drainage systems. Remove waste materials from Project Site and dispose of lawfully.

END OF DOCUMENT

DOCUMENT 01 78 23

OPERATION AND MAINTENANCE DATA

1. GENERAL

1.1. RELATED DOCUMENTS AND PROVISIONS

Contractor shall review all Contract Documents for applicable provisions related to the provisions in this document, including without limitation:

1.1.1. General Conditions, including, without limitation, Completion of the Work;

1.1.2. Special Conditions (if any);

1.1.3. Supplemental Conditions (if any);

1.1.4. Submittals;

1.1.5. Contract Closeout and Final Cleaning;

1.1.6. Warranties;

1.1.7. Record Documents;

1.1.8. General Commissioning Requirements.

1.2. QUALITY ASSURANCE

1.2.1. Contractor shall prepare instructions and data by personnel experienced in maintenance and operation of described products.

1.3. FORMAT

1.3.1. Contractor shall prepare data in the form of an instructional manual entitled “OPERATIONS AND MAINTENANCE MANUAL & INSTRUCTIONS” (“Manual”).

1.3.2. Binders: Contractor shall use commercial quality, 8-1/2 by 11 inch, three-side rings, with durable plastic covers; two inch maximum ring size. When multiple binders are used, Contractor shall correlate data into related consistent groupings.

1.3.3. Cover: Contractor shall identify each binder with typed or printed title "OPERATION AND MAINTENANCE MANUAL & INSTRUCTIONS"; and shall list title of Project and identify subject matter of contents.

1.3.4. Contractor shall arrange content by systems process flow under section numbers and sequence of the Table of Contents of the Contract Documents.

1.3.5. Contractor shall provide tabbed fly leaf for each separate Product and system, with typed description of Product and major component parts of equipment.

1.3.6. Text: The content shall include Manufacturer's printed data, or typewritten data on 24 pound paper.

1.3.7. Drawings: Contractor shall provide with reinforced punched binder tab and shall bind in with text; folding larger drawings to size of text pages.

1.4. CONTENTS, EACH VOLUME

1.4.1. Table of Contents: Contractor shall provide title of Project; names, addresses, and telephone numbers of the Architect, any engineers, subconsultants, Subcontractor(s), and Contractor with name of responsible parties; and schedule of Products and systems, indexed to content of the volume.

1.4.2. For Each Product or System: Contractor shall list names, addresses, and telephone numbers of Subcontractor(s) and suppliers, including local source of supplies and replacement parts.

1.4.3. Product Data: Contractor shall mark each sheet to clearly identify specific Products and component parts, and data applicable to installation. Delete inapplicable information.

1.4.4. Drawings: Contractor shall supplement Product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams. Contractor shall not use Project Record Documents as maintenance drawings.

1.4.5. Text: The Contractor shall include any and all information as required to supplement Product data. Contractor shall provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions.

1.5. MANUAL FOR MATERIALS AND FINISHES

1.5.1. Building Products, Applied Materials, and Finishes: Contractor shall include Product data, with catalog number, size, composition, and color and texture designations. Contractor shall provide information for re-ordering custom manufactured Products.

1.5.2. Instructions for Care and Maintenance: Contractor shall include Manufacturer's recommendations for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.

1.5.3. Moisture Protection and Weather Exposed Products: Contractor shall include Product data listing applicable reference standards, chemical composition, and details of installation. Contractor shall provide recommendations for inspections, maintenance, and repair.

1.5.4. Additional Requirements: Contractor shall include all additional requirements as specified in the Specifications.

1.5.5. Contractor shall provide a listing in Table of Contents for design data, with tabbed fly sheet and space for insertion of data.

1.6. MANUAL FOR EQUIPMENT AND SYSTEMS

1.6.1. Each Item of Equipment and Each System: Contractor shall include description of unit or system, and component parts and identify function, normal operating characteristics, and limiting conditions. Contractor shall include performance curves, with engineering data and tests, and complete nomenclature, and commercial number of replaceable parts.

1.6.2. Panelboard Circuit Directories: Contractor shall provide electrical service characteristics, controls, and communications.

1.6.3. Contractor shall include color coded wiring diagrams as installed.

1.6.4. Operating Procedures: Contractor shall include start-up, break-in, and routine normal operating instructions and sequences. Contractor shall include regulation, control, stopping, shut-down, and emergency instructions. Contractor shall include summer, winter, and any special operating instructions.

1.6.5. Maintenance Requirements: Contractor shall include routine procedures and guide for trouble-shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.

1.6.6. Contractor shall provide servicing and lubrication schedule, and list of lubricants required.

1.6.7. Contractor shall include manufacturer's printed operation and maintenance instructions.

1.6.8. Contractor shall include sequence of operation by controls manufacturer.

1.6.9. Contractor shall provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.

1.6.10. Contractor shall provide control diagrams by controls manufacturer as installed.

1.6.11. Contractor shall provide Contractor's coordination drawings, with color coded piping diagrams as installed.

1.6.12. Contractor shall provide charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.

1.6.13. Contractor shall provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.

1.6.14. Additional Requirements: Contractor shall include all additional requirements as specified in Specification(s).

1.6.15. Contractor shall provide a listing in Table of Contents for design data, with tabbed fly sheet and space for insertion of data.

1.7. SUBMITTAL

1.7.1. Concurrent with the Schedule of Submittals as indicated in the General Conditions, Contractor shall submit to the District for review two (2) copies of a preliminary draft of proposed formats and outlines of the contents of the Manual.

1.7.2. For equipment, or component parts of equipment put into service during construction and to be operated by District, Contractor shall submit draft content for that portion of the Manual within ten (10) days after acceptance of that equipment or component.

1.7.3. On or before the Contractor submits its final application for payment, Contractor shall submit two (2) copies of a complete Manual in final form. The District will provide comments to Contractor and Contractor must revise the content of the Manual as required by District prior to District's approval of Contractor's final Application for Payment.

1.7.4. Contractor must submit two (2) copies of revised Manual in final form within ten (10) days after receiving District's comments. Failure to do so will be a basis for the District withholding funds sufficient to protect itself for Contractor's failure to provide a final Manual to the District.

END OF DOCUMENT

DOCUMENT 01 78 36

WARRANTIES

1. GENERAL

1.1. RELATED DOCUMENTS AND PROVISIONS

Contractor shall review all Contract Documents for applicable provisions related to the provisions in this document, including without limitation:

1.1.1. General Conditions, including, without limitation, Warranty/Guarantee/Indemnity;

1.1.2. Special Conditions (if any);

1.1.3. Supplemental Conditions (if any);

1.1.4. Submittals;

1.1.5. Contract Closeout and Final Cleaning;

1.1.6. Operation and Maintenance Data;

1.1.7. Record Documents;

1.1.8. General Commissioning Requirements.

1.2. FORMAT

1.2.1. Binders: Contractor shall use commercial quality, 8-1/2 by 11 inch, three-side rings, with durable plastic covers; two inch maximum ring size.

1.2.2. Cover: Contractor shall identify each binder with typed or printed title "WARRANTIES" and shall list the title of Project.

1.2.3. Table of Contents: Contractor shall provide the title of Project; name, address, and telephone number of Contractor and equipment supplier, and name of responsible principal. Contractor shall identify each item with the number and title of the specific Specification, document, provision, or section in which the name of the Product or Work item is specified.

1.2.4. Contractor shall separate each Warranty with index tab sheets keyed to the Table of Contents listing, providing full information and using separate typed sheets as necessary. Contractor shall list each applicable and/or responsible Subcontractor(s), supplier(s), and/or manufacturer(s), with name, address, and telephone number of each responsible principal(s).

1.2.5. In addition to all Warranty documentation and information required herein, Contractor shall provide its Guarantee as required by the Contract Documents.

1.3. PREPARATION

1.3.1. Contractor shall obtain Warranties, executed in duplicate by each applicable and/or responsible Subcontractor(s), supplier(s), and manufacturer(s), within ten (10) days after completion of the applicable item or Work. Except for items put into use with District's permission, Contractor shall leave date of beginning of time of Warranty until the date of Completion is determined.

1.3.2. Contractor shall verify that Warranties.

1.3.3. are in proper form, contain full information, and are notarized, when required.

1.3.4. Contractor shall co-execute submittals when required.

1.3.5. Contractor shall retain warranties until time specified for submittal.

1.4. TIME OF SUBMITTALS

1.4.1. Schedule of Warranties. Contractor shall provide District with a Schedule of Warranties at least fourteen (14) days prior to submitting its other required submittals indicated herein. This will provide District the opportunity to review the anticipated Warranties and make any comments, suggestions or revisions the District may require.

1.4.2. For equipment or component parts of equipment put into service during construction with District's permission, Contractor shall submit a draft Warranty for that equipment or component within ten (10) days after acceptance of that equipment or component.

1.4.3. On or before the Contractor submits its final application for payment, Contractor shall submit all Warranties and related documents in final form. The District shall indicate any Warranty-related Work that is being performed and incomplete at the time Contractor submits its final application for payment. District will provide comments to Contractor and Contractor must revise the content of the Warranties as required by District prior to District's approval of Contractor’s final Application for Payment.

1.4.4. For items of Work that are not completed until after the date of Completion, Contractor shall provide an updated Warranty for those item(s) of Work within ten (10) days after acceptance, listing the date of acceptance as start of the Warranty period.

END OF DOCUMENT

DOCUMENT 01 78 39

RECORD DOCUMENTS

1. GENERAL

1.1. RELATED DOCUMENTS AND PROVISIONS

Contractor shall review all Contract Documents for applicable provisions related to the provisions in this document, including without limitation:

1.1.1. General Conditions, including, without limitation, Documents on Work and Completion of Work;

1.1.2. Special Conditions (if any);

1.1.3. Supplemental Conditions (if any);

1.1.4. Submittals;

1.1.5. Contract Closeout and Final Cleaning;

1.1.6. Operation and Maintenance Data;

1.1.7. Warranties;

1.1.8. General Commissioning Requirements.

2. RECORD DOCUMENTS OR DRAWINGS

2.1. GENERAL

2.1.1. "Record Documents" and "Record Drawings" may also be referred to in the Contract Documents as "As-Built Drawings."

2.1.2. As indicated in the Contract Documents, District will provide Contractor with one set of reproducible plans of the original Drawings.

2.1.3. Contractor shall maintain at each Project Site one (1) set of marked-up Drawings and shall transfer all changes and information to those marked-up Drawings, as often as required in the Contract Documents, but in no case less than once each month. Contractor shall submit to the Project Inspector one set of reproducible vellums of the Project Record Documents ("As-Builts") showing all changes incorporated into the Work since the preceding monthly submittal. The As-Builts shall be available at the Project Site. The Contractor shall submit reproducible vellums at the conclusion of the Project following review of the blueline prints.

2.1.4. Label and date each Record Document "RECORD DOCUMENT" in legibly printed letters.

2.1.5. All deviations in construction, including but not limited to pipe and conduit locations and deviations caused, without limitation, by Change Orders, Construction Directives, RFI's, and Addenda shall be accurately and legibly recorded by Contractor.

2.1.6. Locations and changes shall be done by Contractor in a neat and legible manner and, where applicable, indicated by drawing a "cloud" around the changed or additional information.

2.2. **RECORD DOCUMENT INFORMATION**

2.2.1. Contractor shall record the following information:

2.2.1.1. Locations of Work buried under or outside each building, including, without limitation, all utilities, plumbing and electrical lines, and conduits.

2.2.1.2. Actual numbering of each electrical circuit.

2.2.1.3. Locations of significant Work concealed inside each building whose general locations are changed from those shown on the Drawings.

2.2.1.4. Locations of all items, not necessarily concealed, which vary from the Contract Documents.

2.2.1.5. Installed location of all cathodic protection anodes.

2.2.1.6. Deviations from the sizes, locations, and other features of installations shown in the Contract Documents.

2.2.1.7. Locations of underground work, points of connection with existing utilities, changes in direction, valves, manholes, catch basins, capped stubouts, invert elevations, etc.

2.2.1.8. Sufficient information to locate Work concealed in each building with reasonable ease and accuracy.

2.2.2. In some instances, this information may be recorded by dimension. In other instances, it may be recorded in relation to the spaces in the building near which it was installed.

2.2.3. Contractor shall provide additional Drawings as necessary for clarification.

2.2.4. Contractor shall provide in an electronic format as indicated in the Contract Documents, a copy of the Drawings, made from final Shop Drawings marked "No Exceptions Taken" or "Approved as Noted."

2.2.4.1. With the District's prior approval, Contractor may provide these reproducible Drawings in hard copy.

3. RECORD MATERIALS LOG

3.1.1. Materials Log shall be submitted prior to Completion.

3.1.2. Preparation: Mark Material Log to indicate the actual product installation where installation varies from that indicated in original Material Log.

3.1.3. Give particular attention to information on concealed materials and installations that cannot be readily identified and recorded later.

3.1.4. Mark copy with the proprietary name and characteristics of products, materials, and equipment furnished, including substitutions and product options selected.

3.1.5. Record the name of the manufacturer, supplier, installer, and other information necessary to provide a record of selections made.

3.1.6. The working copy of Materials Log shall be consistently maintained throughout construction, and shall be accessible at Project Site.

4. MAINTENANCE OF RECORD DOCUMENTS

4.1. Contractor shall store Record Documents apart from documents used for construction as follows:

4.1.1. Provide files and racks for storage of Record Documents.

4.1.2. Maintain Record Documents in a clean, dry, legible condition and in good order.

4.2. Contractor shall not use Record Documents for construction purposes.

END OF DOCUMENT

SECTION 02 41 00
SITE DEMOLITION

PART 1 – GENERAL

1.01 INCLUSION OF OTHER CONTRACT DOCUMENTS

A. The General Conditions, Supplementary Conditions and Division 1 are fully applicable to this Section, as if repeated herein.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 02 41 19: Selective Demolition for Remodeling.

1.03 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.

1.04 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.

1.05 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.

1.06 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 Owners 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. Pot-hole 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 LANDSCAPE AND IRRIGATION SYSTEMS DEMOLITION AND RENOVATION

A. Clearing, grubbing, and planting demolition.

1. Remove grass and grass roots to a minimum depth of two inches below existing grade.

2. Remove all shrubs, plants and other vegetation within the area of the work unless designated to remain. Grub and remove all roots of all vegetation to a depth of 24 inches below existing grade.

3. Remove only those trees which are specifically designated for removal, or as shown on the drawings, within the construction area. Remove all stumps. Remove root ball and root systems larger than 1 inch in diameter to a depth of two feet below existing or finished grades, whichever is lower and a minimum of five feet beyond the edge of paving, structure, wall or walkway.

4. Hand cut existing tree roots over 1 inch in diameter as necessary for trenching or other new construction, apply multiple coats of emulsified asphalt sealant especially made for horticultural use on cut or damaged plant tissues to cut faces and adjacent surfaces. Cover exposed roots with wet burlap to prevent roots from dying out until backfilling is complete.

5. Disking and mixing of vegetation, trash, debris, and other deleterious materials with surface soils prior to grading is not permitted.

6. Remove all buried debris, organic material, rubble, trash, or other material not deemed suitable by the Geotechnical Engineer.

7. Fill all voids or excavations resulting from clearing, demolition, or removal of vegetation with fill material in compliance with the General Conditions.

8. Selected equipment of such sizes and capacities that the existing environment is disturbed as little as possible, and to afford ease of mobility within limited and relatively confined work areas. Make every effort to preserve the topography in its natural state.

9. Keep drains, catch basins, surface drainage courses and related drainage system components clear of debris and construction materials.

10. Remove irrigation piping and appurtenances as necessary within area of work, unless noted otherwise to remain. Replace irrigation piping and appurtenances to irrigate new and/or existing landscaping. Contractor shall be responsible for temporary landscape irrigation until such time that irrigation system is restored and operational.

3.07 DISPOSAL

A. Demolished materials become property of the Contractor and shall be removed from premises, except those items specifically identified to be salvaged back to Owner.

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

C. 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).

D. Burning and Burying of Materials: NOT ALLOWED.

E. 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.

3.08 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 02 41 00

SECTION 02 41 19
SELECTIVE DEMOLITION FOR REMODELING

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. Section Includes:

1. Demolition and removal of selected portions of building or structure.

2. Demolition and removal of selected site elements.

3. Salvage of existing items to be reused or recycled.

B. Related Requirements:

1. Section 02 41 00: Site Demolition - For site clearing and removal of above and below-grade improvements not part of selective demolition.

1.03 DEFINITIONS

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

B. Remove and Salvage: Detach items from existing construction, in a manner to prevent damage, and deliver to Owner.

C. Remove and Reinstall: Detach items from existing construction, in a manner to prevent damage, prepare for reuse, and reinstall where indicated.

D. Existing to Remain: Leave existing items that are not to be removed and that are not otherwise indicated to be salvaged or reinstalled.

E. Dismantle: To remove by disassembling or detaching an item from a surface, using gentle methods and equipment to prevent damage to the item and surfaces; disposing of items unless indicated to be salvaged or reinstalled.

1.04 MATERIALS OWNERSHIP

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

B. Historic items, relics, antiques, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, and other items of interest or value to Owner that may be uncovered during demolition remain the property of Owner.

C. Carefully salvage in a manner to prevent damage and promptly return to Owner.

1.05 PREINSTALLATION MEETINGS

A. Pre-Demolition Conference: Conduct conference at Project site.

1. Inspect and discuss condition of construction to be selectively demolished.

2. Review structural load limitations of existing structure.

3. Review and finalize selective demolition schedule and verify availability of materials, demolition personnel, equipment, and facilities needed to make progress and avoid delays.

4. Review requirements of work performed by other trades that rely on substrates exposed by selective demolition operations.

5. Review areas where existing construction is to remain and requires protection.

1.06 INFORMATIONAL SUBMITTALS

A. Qualification Data: For refrigerant recovery technician.

B. Proposed Protection Measures: Submit report, including Drawings, that indicates the measures proposed for protecting individuals and property, for environmental protection, for dust control and, for noise control. Indicate proposed locations and construction of barriers.

C. Schedule of Selective Demolition Activities: Indicate the following:

1. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity. Ensure Owner's on-site operations are uninterrupted.

2. Interruption of utility services. Indicate how long utility services will be interrupted.

3. Coordination for shutoff, capping, and continuation of utility services.

5. Coordination of Owner's continuing occupancy of portions of existing building and of Owner's partial occupancy of completed Work.

D. Pre-demolition Photographs or Video: Show existing conditions of adjoining construction, including finish surfaces, that might be misconstrued as damage caused by demolition operations.

E. Statement of Refrigerant Recovery: Signed by refrigerant recovery technician responsible for recovering refrigerant, stating that all refrigerant that was present was recovered and that recovery was performed according to EPA regulations. Include name and address of technician and date refrigerant was recovered.

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

1.07 QUALITY ASSURANCE

A. Refrigerant Recovery Technician Qualifications: Certified by an EPA-approved certification program.

1.08 FIELD CONDITIONS

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

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

C. Hazardous Materials: Present in buildings and structures to be selectively demolished. A report on the presence of hazardous materials is on file for review and use. Examine report to become aware of locations where hazardous materials are present.

1. Hazardous material remediation is specified elsewhere in the Contract Documents.

2. Do not disturb hazardous materials or items suspected of containing hazardous materials except under procedures specified elsewhere in the Contract Documents.

3. Owner will provide material safety data sheets for suspected hazardous materials that are known to be present in buildings and structures to be selectively demolished because of building operations or processes performed there.

D. Storage or sale of removed items or materials on-site is not permitted.

E. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.

1. Maintain fire-protection facilities in service during selective demolition operations.

1.09 COORDINATION

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

PART 2 – PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

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

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that utilities have been disconnected and capped before starting selective demolition operations.

B. Review Project Record Documents of existing construction or other existing condition and hazardous material information provided by Owner. Owner does not guarantee that existing conditions are same as those indicated in Project Record Documents.

C. Verify that hazardous materials have been remediated before proceeding with building demolition operations.

D. Survey of Existing Conditions: Record existing conditions by use of measured drawings.

1. Before selective demolition or removal of existing building elements that will be reproduced or duplicated in final Work, make permanent record of measurements, materials, and construction details required to make exact reproduction.

3.02 PREPARATION

A. Refrigerant: Before starting demolition, remove refrigerant from mechanical equipment according to 40 CFR 82 and regulations of authorities having jurisdiction.

3.03 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

A. Existing Services/Systems to Remain: Maintain services/systems indicated to remain and protect them against damage.

B. Existing Services/Systems to Be Removed, Relocated, or Abandoned: Locate, identify, disconnect, and seal or cap off utility services and mechanical/electrical systems serving areas to be selectively demolished.

1. Owner will arrange to shut off indicated services/systems when requested by Contractor.

2. If services/systems are required to be removed, relocated, or abandoned, provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.

3. Disconnect, demolish, and remove fire-suppression systems, plumbing, and HVAC systems, equipment, and components indicated on Drawings to be removed.

a. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
b. Piping to Be Abandoned in Place: Drain piping and cap or plug piping with same or compatible piping material and leave in place.
c. Equipment to Be Removed: Disconnect and cap services and remove equipment.
d. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.
e. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner.
f. Ducts to Be Removed: Remove portion of ducts indicated to be removed and plug remaining ducts with same or compatible ductwork material.
g. Ducts to Be Abandoned in Place: Cap or plug ducts with same or compatible ductwork material and leave in place.

3.04 PROTECTION

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

1. Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of building.

2. Provide temporary weather protection, during interval between selective demolition of existing construction on exterior surfaces and new construction, to prevent water leakage and damage to structure and interior areas.

3. Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.

4. Cover and protect furniture, furnishings, and equipment that have not been removed.

5. Comply with requirements for temporary enclosures, dust control, heating, and cooling specified Division 1, General Requirements.

B. Temporary Shoring: Design, provide, and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.

1. Strengthen or add new supports when required during progress of selective demolition.

C. Remove temporary barricades and protections where hazards no longer exist.

D. Cover all fire alarm devices to remain in area of work not being relocated by project. Where device is directly affected by scope of work, de-program device from Fire Alarm Control Panel and remove device from room.

E. Cover or otherwise protect data equipment components including IDF racks and cabinets in a manner that allows for copntinued operation without overheating or other damage.

3.05 SELECTIVE DEMOLITION, GENERAL

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

1. Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition operations above each floor or tier before disturbing supporting members on the next lower level.

2. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping. Temporarily cover openings to remain.

3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.

4. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain portable fire-suppression devices during flame-cutting operations.

5. Maintain fire watch during and for at least 30 minutes after flame-cutting operations.

6. Maintain adequate ventilation when using cutting torches.

7. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.

8. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.

9. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.

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

C. Removed and Reinstalled Items:

1. Clean and repair items to functional condition adequate for intended reuse.

2. Pack or crate items after cleaning and repairing. Identify contents of containers.

3. Protect items from damage during transport and storage.

4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.

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

3.06 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS

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

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

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

D. Resilient Floor Coverings: Remove floor coverings and adhesive according to recommendations in RFCI's "Recommended Work Practices for the Removal of Resilient Floor Coverings." Do not use methods requiring solvent-based adhesive strippers.

3.07 DISPOSAL OF DEMOLISHED MATERIALS

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

1. Do not allow demolished materials to accumulate on-site.

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

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

B. Burning: Do not burn demolished materials.

3.08 CLEANING

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

3.09 SELECTIVE DEMOLITION SCHEDULE

A. District will remove any items they want salvaged and remove them from site.

END OF SECTION 02 41 19

SECTION 03 30 00
CAST-IN-PLACE CONCRETE

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. Concrete Formwork.

B. Reinforcement of Concrete.

C. Concrete Placing and Finishing.

D. Concrete Flatwork.

1.02 RELATED SECTIONS

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

B. Section 05 50 00: Metal Fabrications.

C. Section 06 10 00: Rough Carpentry.

D. Section 07 26 00: Vapor Retarders.

E. Section 32 16 00: Portland Cement Concrete Paving (non-structural).

1.03 REFERENCES

A. Chapter 19A, California Building Code (CBC) 2019.

B. ACI 211.1 - Standard Practice for Selecting Proportions for Normal Weight, Heavy Weight and Mass Concrete.

C. ACI 301 - Specifications for Structural Concrete for Buildings.

D. ACI 304R - Guide for Measuring, Mixing, Transporting and Placing Concrete.

E. ACI 305R - Hot Weather Concreting.

F. ACI 306R - Cold Weather Concreting.

G. ACI 308 - Standard Practice for Curing Concrete.

H. ACI 309R - Guide for Consolidation of Concrete.

I. ACI 318 - Building Code Requirements for Structural Concrete.

J. ASTM A615 / A615M – 09b - Deformed and Plain Billet Steel Bars for Concrete Reinforcement.

K. ASTM C33 / C33M-08 - Concrete Aggregates.

L. ASTM C94 / C94M –09a - Ready-Mixed Concrete.

M. ASTM C114- 09b - Methods of Chemical Analysis of Hydraulic Cement.

N. ASTM C150 / C150M-09 - Portland Cement.

O. ASTM C260-06 - Air Entraining Admixtures.

P. ASTM C494 / C49M-08a - Water Reducing Admixtures.

1.04 QUALITY ASSURANCE

A. All Concrete for the project shall be controlled concrete of specified strengths, of uniform color, and free from defects liable to adversely affect strength, durability or appearance of the structure or its components.

B. Requirements of Regulatory Agencies: The quality and design of structural concrete shall comply with the requirements of the California Building Code, except where more stringent requirements are specified.

C. Workmanship: Materials and methods used for the production and placement of concrete shall be such as to assure the specified quality and shall conform to applicable requirements of the Building Code for Reinforced Concrete (ACI 318) of the American Concrete Institute, except as otherwise specified in this Section.

1. 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.

2. Proper installation of partitions and equipment requires the floor finish to be level and smooth throughout. Extreme care shall be exercised during all floating and troweling operations to check levels often.

3. Any concrete work which does not comply with tolerances and elevations shown on drawings will be cause for rejection of all work affected, and, if so rejected, such work shall be removed and replaced at no increase in cost to the Owner.

D. Repair of Defective Concrete Surfaces shall be done in the following manner when, in the opinion of the Architect, such defects may be repaired and at no additional cost to the Owner.

1. Rock pockets, voids, spalls, cracks, and exposed reinforcing shall be repaired with 1:2 cement mortar or cut out and patched. Prepare surfaces and bond cement mortar with concrete adhesive as hereinafter specified.

2. Floor surfaces which exceed the allowable variation in plane or level (per Section 03 30 00 3.04) shall be ground and/or filled to obtain the level and plane required. Fill materials, where required, shall be of type approved by the Architect.

3. Surfaces which are not plumb and square or which do not conform to the lines and levels indicated shall be chipped, ground, filled or trued as required to obtain the desired results.

E. Uniformity of Concrete: All aggregates shall be measured by weight and the proportion of water to cement shall be accurately controlled by either automatic measuring devices or calibrated containers. All concrete placed shall be uniform strength and color appearance as well as surface texture.

F. Screeds shall be provided all construction joints as required to ensure installation of

concrete to lines and elevations noted.

G. Concrete Preplacement Inspection: Concrete shall not be poured until the forms, reinforcement, and preparations are complete and have been reviewed by the Project Inspector.

H. Ready-Mixed Concrete: ASTM C94 / C94M-09a except as otherwise specified herein. Mix and deliver in accordance with the requirements set forth in ASTM C94 and ACI 301. Continuous Batch Plant inspection is required per CBC Section 1705A.3.3. Contractor may request waiver of batch plant inspection in accordance with CBC Section 1705A.3.3.1 provided the following is met:

1. Approved Testing Laboratory shall check the first batching for each class of concrete and furnish mix proportions to the Licensed Weighmaster.
2. Licensed Weighmaster to positively identify materials as to quantity and to certify to each load by ticket.
3. 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.
4. Do not add water at the site to concrete mixes with a maximum specified WCR unless the water content at batch time provides for a WCR less than specified and this provision, including the quantity of water which may be added at the site, is specifically noted on the Mix Design and Certification by the mix preparer.
5. At end of project, Weighmaster shall furnish affidavit to DSA on form satisfactory to DSA, certifying that all concrete furnished conforms in every particular and to proportions established by mix designs.

I. Tests: For structural concrete, the Testing Lab shall take four (4) test cylinders of concrete not less than once each day, not less than once for every 50 cubic yards of concrete, or not less than 2,000 square feet of slab or wall surface area. Cylinders shall be made and stored as per instructions given by the testing laboratory and shall be in accordance with ASTM Specifications C-31 / C31M-09 and C-39 / C39M-09a. Cylinders shall be tested for ultimate compressive strength of concrete with one cylinder tested at the age of 7 days and two (from the same batch) to be tested at the age of 28 days, with one cylinder held as a spare for future testing if needed. Tests shall be made by a recognized test laboratory selected by the Owner and approved by the Architect.

6. Cylinders not meeting the required design stresses shall indicate defective concrete and such concrete shall be removed and replaced at no increase in cost to the Owner. Core tests requested by the Contractor to establish design stresses, when cylinder tests indicate defective concrete, shall be paid for by the Contractor.

J. Floor Flatness: Provide certification of floor slab flatness per the requirements of Part 3 below.

1.05 SUBMITTALS

A. Submit per the requirements of the General Conditions.

B. Manufacturer's Data: Submit manufacturer's product data with application and installation instructions for proprietary materials and items, including reinforcement and forming accessories, admixtures, patching compounds, joint systems, chemical floor hardeners, and others as may be requested by the Architect.

C. Shop Drawings:

1. Shop drawings sheet size shall be 24" x 30" minimum and shall not be a reproduction of the construction documents.

2. Reinforcing Steel: The correctness of the bending diagrams is the responsibility of the Contractor. Identify such shop drawings with a reference thereon to sheet and detail numbers from the contract drawings. No reinforcing steel shall be fabricated without approved shop drawings.

3. Proposed location of constructions and cold joints when different or in addition to those shown on the drawings.

4. Construction mount layout per paragraph 3.05.

D. Concrete Mix Design: Submit proposed mix design prepared by concrete supplier. Mix design must submitted to Owner for review and acceptance by a recognized independent testing lab, for all structural concrete.

1.06 JOB CONDITIONS

A. Traffic Control: Maintain access for vehicular and pedestrian traffic as required by construction activities.

PART 2 – PRODUCTS

2.01 FORM MATERIALS

A. Plywood Forms shall be exterior plyform, in large sheets of adequate thickness to support the imposed loads, but in no case less than 5/8" thick.

B. Lumber Forms may be used for concrete surfaces that are unexposed and require no further surface applied materials. Lumber, if used, shall be clean and sound 2 x 12 No. 2 grade or better Douglas fir.

C. Form Coating: Form shall be coated with nongrain-raising and nonstaining types of form coating that will not leave a residual matter on the face of the concrete or adversely affect proper bonding of any subsequent paint or other surface applications.

1. Form coating containing mineral oils or other nondrying materials will not be permitted for any concrete work.

D. 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 one-inch diameter; manufactured by Burke, Dayton Superior, or accepted equal.

E. Spreaders: Metal (no wood permitted).

F. Form Release Agent: Colorless, nonstaining, free from Lass; chemically active agent that shall not impair bonding of paint or other coatings intended for use.

2.02 REINFORCING MATERIALS

A. Reinforcing Bars: ASTM A615 / A615M -09b with Supplement S1, marked "S", Grade 60 for #4 bar and larger, Grade 40 for bars smaller than #4.

B. Furnish 6x6 W1.4xW1.4 welded wire fabric in flat sheets; rolls will not be allowed.

C. Wire Ties for tying reinforcing steel shall be #16 annealed wire.

D. Bar Supports: Comply with CRSI "Recommended Practice for Placing Bar Supports, Specifications and Nomenclature, Latest Edition", except as otherwise specified. Wood is not permitted as supports for reinforcing.

E. Spacers and Chairs: As manufactured by Kalman Steel Company, Concrete Engineering Company, or approved equal.

2.03 CONCRETE MATERIALS

A. Portland Cement: ASTM C150 / C150M-09, Type II, low alkali. All cement used shall be of one manufacturer.

1. Use Type IIA cement if pumping of concrete is selected and permitted for placing of concrete.

2. All cement shall contain not more than 0.6 percent total alkali when calculated as sodium oxide as determined by "Methods of Chemical Analysis of Hydraulic Cement", ASTM C114-09b.

B. Fly Ash: Western Fly Ash, conforming to ASTM C618 for Class N or Class F materials (Class C is not permitted). Not more than 15% (by weight) may be substituted for portland cement.

C. Water: Clean and free from deleterious amounts of acids, alkalis, salts and organic matter.

D. Concrete Aggregates: ASTM C33 / C33M-08 except as otherwise specified hereinafter. All aggregates shall be nonreactive and nondegenerative, and shall consist of sound crushed rock, washed gravel, or a combination of both.

1. Modify fine aggregates when air entrained concrete is used in accordance to Paragraph 4.2.4 of ASTM C33 / C33M-08.

2. Aggregate sources shall be approved by the Architect. Aggregate shall result in shrinkage of concrete not exceeding 0.048 percent at 28 days. Testing lab shall verify aggregate and concrete shrinkage.

3. Do not use fine or course aggregates that contain substances that are known to cause spalling or adverse reactions in the concrete.

E. Admixtures: Except for admixtures noted below, no other admixtures shall be used without written approval from the Architect. Where such agents are permitted, they shall be a type approved and used only as directed by the Architect and at no increase in cost to the Owner. Agents including calcium chloride will not be permitted for use in concrete under any circumstances.

1. Air Entraining Agents: ASTM C260. Use where specified. The maximum entrained air content shall be no more than 4 percent + 1 percent by volume unless noted otherwise. Approved air entraining agents are Sika AER, Master Builders Micro Air, Darex AEA, and Protex AEA.

2. Water Reducing Admixtures: ASTM C494 and ACI 318, Section 3.6. Use where specified. Approved agent is Master Builders Pozzolith 322-N, used at the rate of 5+2 fluid ounces per 100 pounds of cement.

2.04 CRUSHED ROCK BASE:

A. Under all new concrete ramps and paving, or as otherwise indicated on the Drawings, provide a minimum of 4 inches of crushed rock fill. Crushed rock fill shall be clean gravel of 1” max. size and have no material passing through a No. 4 sieve.

2.05 JOINT MATERIAL:

A. Provide 3/8” wide fiber expansion joint material, Model No. 320-F, as manufactured by W.R. Meadows or equal.

B. Provide Snap-Cap as manufactured by W.R. Meadows or equal. Snap-Cap shall have a top plastic edge that can be used for leveling concrete. Once concrete has set up, top edge of Snap-Cap can be pulled free and discarded. Joint shall then be sealed.

C. Joint sealing material shall be a two-component, self-leveling, polyurethane elastomeric sealant. Product shall be Sikaflex 2cSL as manufactured Sika Corporation, or equal. Color shall be shall be chosen from the full range of manufacturer’s standard colors.

2.06 RELATED MATERIALS

A. Concrete Adhesive and Bonding Agent: "Concresive #1001-LPL" (1-1/2 hour maximum pot life), an epoxy polysulfide type concrete adhesive as manufactured by Master Builders or equal.

B. Liquid Curing Compound: W.R. Meadows, Product: "Vocomp-20" or equal.

C. Bonding Adhesive: Burke, Bondcrete-S; use as a modifier for patching and overlays up to 1/2" thick or equal.

D. Vapor Barrier: Stego Wrap, 15 mil. vapor barrier system, with a Class A rating, and perm rating not to exceed 0.01 perms; by Stego Industries of San Juan Capistrano, CA (877) 464-7834, VaporGuard by Reef Industries (713) 507-4250., Sundance 15 mil Vapor Barrier by Sundance Inc. (855) 300-7156, or 15 mil Husky, Yellow Guard, Vapor Barrier by Poly-America (800) 527-3322. No substitutions will be accepted. System to include Stego Mastic, Stego “Crete Claw Tape” and pipe boots, or accepted equal by the specified manufacturers. Conform to ASTM 1745.

E. Doweling Epoxy: Hilti “HIT-RE 500” (ICC-ES ESR-3814), Simpson Strong-Tie “SET-3G” Epoxy (ICC-ES ESR-4057), or accepted equal.

1. Anchor rods shall be furnished with a 45-degree chisel point on one end to allow for easy insertion into adhesive filled hole and manufactured to meet the requirements of ASTM A36. Nuts and washers shall be furnished to meet the requirements of the anchor rod specifications noted above.

2. Install per manufacturer’s recommendation; use stainless steel for all exterior work.

3. Testing required as noted in the Structural Drawings.

F. Patching Mortar: Meadow-Crete GPS, one-component, trowel applied, polymer enhanced, shrinkage-compensated, fiber reinforced, cementitious repair mortar for horizontal, vertical and overhead applications as manufactured by W.R. Meadows or accepted equalf

G. Non-shrink Grout: Masterflow 713 Plus by Master Builders or accepted equal. Premixed, non-metallic, no chlorides, non-staining and non-shrinking per CRD-C621, Corps of Engineers Specification and ASTM C 1107, Grades B and C.

2.07 CONCRETE DESIGN

A. Designed Strength and Classes of Concrete:

1. Class "A" concrete of 1-1/2" max. size aggregate shall have 3500 psi 28 day strength with a maximum water to cementitious materials ratio of 0.55. Provide air entrainment of 3% to 5%. Use for footings and other concrete of like nature. (Class "B" concrete may be used in lieu of Class "A" at Contractor's option.).

2. Class "C" concrete of 1" max. size aggregate shall have 4000 psi 28 day strength with a maximum water to cementitious materials ratio of 0.45. Use for interior structural concrete less than 8" min. thickness including interior floor slabs and curbs.

B. Slump of Concrete: The slump of concrete as determined by the Standard Test Method for Slump of Hydraulic Cement Concrete ASTM Designation C-143 / C143M-09 shall be as follows:

1. Class "A": 3.5" plus or minus 1" (4.5" maximum).

2. Class "C": 4" plus or minus 1" (5" maximum).

C. Laboratory Mix Design: Concrete designs shall be reviewed by the Testing Laboratory. The concrete mix designs reviewed by the Testing Laboratory and approved by the Project Architect or Structural Engineer shall be used by the Contractor. Contractor shall provide samples of aggregates as required by the laboratory to review the mix designs.

D. Water Reducing Admixture: Unless noted otherwise, all concrete shall contain a water reducing admixture.

2.07 CONCRETE MIXING

A. Ready-Mixed Concrete: ASTM C94 / C94M-09a except as otherwise specified herein.

1. Transit-mixed concrete shall be mixed for a period of not less than 10 minutes at a peripheral drum speed of approximately 200 feet per minute, and mixing shall be continued until discharge is complete. At least 3 minutes of the mixing period shall be at the job. Transit mixers shall be equipped with water measuring devices consisting of either accurately calibrated water tanks or water meters.

2. When outside air temperature is between 85 degrees and 90 degrees, reduce mixing and delivery time from 90 minutes to 75 minutes. When outside air temperature is above 90 degrees, reduce mixing and delivery time to 60 minutes

B. Job Mixing: Non-structural concrete only. The capacity of the mixer shall be such that it will handle one or more full sack batches. No split sack batches will be permitted except when all materials are weighed. The rated capacity of the mixer shall not be exceeded. The mixing drum shall be equipped with an automatic timing and locking device and with an accurate water gauge for measuring the amount of water used. Mixing time of each batch shall be at least 1-1/2 minutes after all ingredients are in the mixer.

PART 3 – EXECUTION

3.01 FORMS

A. Build and Erect Forms to conform to the required shapes, patterns, lines, grades, and dimensions indicated. Forms shall be substantial and tight to prevent any leakage of mortar, properly braced and tied together to maintain their position and shape. Forms shall not deflect under the dead load weight of the plastic concrete or construction loads. Joints in forming material shall be butted tightly and shall bear on solid construction. Provide tool edges where indicated. Completed form work to be checked for grade and alignment to tolerances not exceeding 1/8” in 10’-0” for top of forms and not more than 1/4” in 10’-0” for vertical face.

B. Cast-in Items: Set in formwork all new sleeves, inserts, anchors, and similar items furnished and required under the work of other sections. Brace, anchor, and support cast-in-items to prevent displacements and distortions.

C. Clean forms after each use and coat with release agent as required.

D. Space clamps, ties, hangers, and other form accessories so that working capacities are not exceeded by loads imposed from concrete or concreting operations.

E. Build openings into vertical forms at regular intervals if necessary to facilitate concrete placement, and at bottoms of forms to permit cleaning and inspection.

F. Build in securely braced temporary bulkheads, keyed as required, at approved locations of construction joints.

G. Slope tie-wires downward to outside of wall.

H. During and immediately after concrete placing, tighten forms, posts, and shores. Readjust to maintain grades, levels, and camber.

I. No metal or wood stakes are allowed in areas to be concreted.

3.02 REINFORCEMENT FABRICATION

A. Steel reinforcement shall not be bent or straightened in a manner that will injure the material. Bars with kinks or bends not shown on the Drawings shall not be used. Heating of the bars for bending will not be permitted.

1. Spacers and chairs shall be as specified or detailed and spaced such that steel reinforcement will be carried without deflection.

2. Concrete blocks may be used to support bottom layer of steel in floor slabs on grade.

3. Bars shall be in long lengths with laps and splices as shown. Offset laps 5'-0" minimum in adjacent bars. Place steel with clearances and cover as shown. Bar laps shall be as indicated on the drawings. Tie all laps and all intersections with specified wire. Maintain clear space between parallel bars not less than 1-1/2 times nominal diameter for round bars, or twice side dimension for square bars, but in no case shall clear space be less than 1-1/2", nor less than 1-1/2 times maximum size concrete aggregate.

4. Reinforcing dowels for slabs shall be placed as detailed. Grease one penetration so that pour will not bond to dowel. Sleeves may be used if approved by the Architect before installation. Install dowels through all construction and expansion joints for all slabs on grade.

5. Cut bars true to length with ends square and free of burrs.

B. Drawing Notes: Refer to notes on Drawings for additional reinforcement requirements.

C. Welding of reinforcing bar shall be performed only where indicated on plans and in compliance with AWS D1.4. All welding of reinforcement is to be inspected in accordance with CBC Table 1705A.2.1, Item 5(b).

3.03 CONCRETE PLACEMENT

A. Surrounding Conditions: Before any concrete is placed, the following items of work shall have been completed in the area of placing.

1. Forms shall have been erected, adequately braced, cleaned, sealed, lubricated if required, and bulkheaded where placing is to stop.

a. Any wood forms other than plywood shall be thoroughly water soaked before placing any concrete. The wetting of forms shall be started at least 12 hours before concreting.

2. Reinforcing steel shall have been placed, tied, supported, and, at the time the concrete is placed around it, shall be cleaned of rust, scale, mill scale or other coatings that will destroy or reduce bond.

3. Embedded work of all trades shall be in place in the forms and adequately tied and braced.

4. The entire place of deposit shall have been cleaned of dirt, chips, sawdust, rubbish, debris, hardened concrete, and other foreign matter before concrete is deposited therein. No wooden ties nor blocking shall be left in concrete except where indicated for attachment of other work.

5. Concrete surfaces to which fresh concrete is to be bonded shall be saw cut and broken away as indicated. Surfaces shall be brush cleaned to remove all dust and foreign matter and to expose the aggregate, and then coated with the bonding adhesive herein specified.

B. Conveying Concrete from mixer to forms shall be as rapid as possible.

1. Ready-mixed concrete shall be mixed and delivered in accordance with ASTM C94 / C94M-09a. A delivery ticket shall be furnished for each load of ready-mix or transit-mix concrete. A copy of each delivery ticket shall be handed to the job superintendent at the time of delivery and unloading. A record copy of the delivery tickets shall be forwarded to the Architect for his files.

2. Conveying equipment shall be of a sufficient capacity to ensure a practically continuous flow of concrete to the placing point without separation or loss of materials. Carts and buggies shall be equipped with pneumatic tires. Runway supports shall not bear on reinforcing or fresh concrete. All conveying equipment shall be thoroughly cleaned before beginning and at frequent intervals during the placing of the concrete.

a. Chutes, if employed, shall slope not less than 4" or more than 6" per foot of horizontal run.

3. Exercise care not to spill concrete on forms and reinforcing steel during the conveying operations. Where such spillage or splattering occurs, the surfaces shall be thoroughly cleaned before concrete hardens.

C. Placing Concrete: Notify the Architect at least 48 hours in advance of beginning of pouring operations. Under no circumstances shall concrete that has partially hardened be deposited on the work. No concrete shall be placed during rainy weather without the Architect's approval.

1. The Project Inspector shall keep a record on the site of the time and date of placing the concrete in each portion of the structure in accordance with CBC Section 1705A.3.6. The record shall be kept until the completion of the structure and a copy provided to the Architect and DSA.

2. Before starting new pour on or against concrete that has hardened, forms shall be retightened, and the hardened concrete roughened and thoroughly cleaned of foreign matter and any laitance by sandblasting. Just ahead of the new pour, slush joints with a 2" layer of grout of the designated concrete mix minus 50 percent of the large aggregate.

3. Reinforcing steel exposed to the sun shall be cooled by a water spray prior to the placing of concrete.

4. No adjustment of steel reinforcement will be permitted during the placement of concrete.

5. Concrete shall be scheduled so that the placing is a continuous operation for the completion of each section between predetermined construction joints. If a planned concreting operation cannot be carried on continuously, the concreting shall stop at temporary bulkheads. Locate where resulting construction joints shall be as shown on the Drawings or as approved by the Architect. Prior to placing of concrete for any concrete slabs, the moisture content of the subgrade below the slabs shall be adjusted to at least optimum moisture.

6. Deposit the concrete in forms as nearly as practicable in its final position to avoid flowing and maintain until completion of the unit an approximate horizontal plastic surface. Thoroughly compact all concrete during placing operations, thoroughly around reinforcement, embedded fixtures or accessories, and into the corners of forms to eliminate air pockets and honeycombing. Compacting shall be done with mechanical vibrators. Vibrators shall not be used to cause concrete to flow horizontally. Thoroughly compact concrete to the forms to release the air and secure full contact of the concrete with the forms.

7. Hot Weather Concreting: Concrete placing and finishing operations during hot weather shall be done as quickly as possible. Ample personnel shall be available to handle and place the concrete immediately after its mixing or delivery to the site of the work. Concrete shall be placed in layers thin enough and over areas small enough to ensure complete bond and union of adjacent layers, and thus prevent "cold joints".

a. At air temperatures of 80 degrees Fahrenheit or above the following precautions should be taken:

1) In no case shall the temperature of the concrete exceed 90 degrees Fahrenheit when placed in the work.

2) If necessary to produce and maintain concrete at an acceptable temperature, chopped or crushed ice shall be added directly into the mixer up to 50 percent by weight of the mixing water used, the weight of the ice being included in batch weight of the mixing water. The ice shall be added at such a rate and in such a manner that it will be completely melted by the time concrete is mixed.

3) Stockpiled aggregates shall be saturated and kept surface moist by continuous fog spray or by intermittent sprinkling.

4) Forms, reinforcements, and subgrade surfaces shall be wet down immediately before concrete is placed in contact therewith. Remove all excess water before placing concrete. Wetting down of areas around the work to cool the surrounding air and increase the humidity is recommended.

8. Cold Weather Requirements: Do not place concrete when ambient temperature is below 40 degrees Fahrenheit and falling.

3.04 FLOOR FLATNESS

A. Contractor shall retain an independent testing agency who will inspect finished slabs for compliance with specified tolerances. Testing agency shall provide written report of findings prior to architect prior to proceeding with any framing or floor covering work.

B. Minimum F(F) Floor Flatness and F(L) Floor Levelness Values:

1. Exposed to View and Foot Traffic: F(F) of 35; F(L) of 25 Slabs on grade and shored slabs
2. Under Thick-Bed Tile: F(F) of 20; F(L) of 15 Slabs on grade and shored slabs
3. Under Carpeting: F(F) of 25; F(L) of 20 Slabs on grade and shored slabs
4. Under Thin Resilient Flooring and Thinset Tile: F(F) of 35; F(L) of 25 Slabs on grade and shored slabs

C. Measure F(F) Floor Flatness and F(L) Floor Levelness in accordance with ASTM E1155 (ASTM E1155M), within 48 hours after slab installation; report both composite overall values and local values for each measured section.

D. Correct the slab surface if composite overall value is less than specified and if local value is less than two-thirds of specified value or less than F(F) 13 / F(L) 10.

E. Correct defects by grinding, floating with leveling compound, or by removal and replacement of the defective work. Areas requiring corrective work to be identified by Contractor. Re-measure corrected areas by the same process.

3.05 CONCRETE FINISHING

A. All Concrete Work, except as otherwise specified, shall be of a quality that will present a finished appearance upon the stripping of the forms. Only a minimum of patching and finishing should be necessary as required to fill holes left by form ties and to remove any fins or minor irregularities left by the joints in the forms. Except as otherwise specified, all concrete surfaces shall be finished as follows:

1. Final Finish: Provide a medium textured broom finish for all exterior surfaces by drawing a soft bristle broom across concrete surface perpendicular to the line of traffic to provide a uniform fine line texture finish.

2. No magnesium bull floats allowed on non-air-entrained concrete.

B. Final Tooling: Tool edges of paving, gutters, curbs and joints formed in fresh concrete with a jointing tool to a radius of 1/4". Repeat tooling of edges and joints after applying surface finishes. Eliminate tools marks on all concrete surfaces.

3.06 CONSTRUCTION JOINTS

A. Control joints shall be saw cut into concrete as soon as concrete slab can be walked on. Do not wait until the following day to saw cut concrete slab control joints.

B. Construct contraction, construction, and isolation joints true to line with faces perpendicular to surface plane of concrete. Construct transverse joints at right angles to the centerline unless otherwise indicated.

C. Joints at Existing Concrete: All joints between existing concrete and new concrete are to include dowels a t a minimum of #4 bars @ 4'-0" on center, 18" maximum from the ends, epoxy set into existing concrete a minimum of 6" in length at the centerline of existing concrete slab.

D. Contraction Joints (Control Joints): Provide weakened-plane contraction joints, sectioning concrete into areas indicated. Construct contraction joints for a depth equal to at least 1/4 of the concrete thickness. Form in fresh concrete by grooving and finishing each edge of joint with a radiused jointer tool. Joints to be spaced at 10' on center maximum or as shown on the drawings.

E. Construction Joints: Set construction joints at side and end terminations of concrete placement and at locations where placement operations are stopped for more than 1/2 hour, unless placement ends at isolation joints.

1. Provide preformed galvanized steel or plastic keyway-section forms or bulkhead forms with keys. Use Burke "Keyed Kold Joint Header Form", or approved equal. Embed keys at least 1 1/2" into concrete.

2. Continue reinforcement across construction joints.

3. Use bonding agent on existing concrete surfaces that will be joined with fresh concrete.

F. Isolation Joints (Expansion Joints): Form isolation joints of performed joint filler strips abutting concrete curbs, catch basin, manholes, inlets, structures, walks, other fixed objects, and where indicated.

1. Extend joint fillers full width and depth of joint, not less than 1/2" or more than 1" below finished surface where a joint sealant is indicated. Place top of removable joint filler flush with finished concrete surface.

2. Protect top edge of joint filler during concrete placement with metal, plastic, or other temporary, removable performed cap.

3. After concrete has set up, remove cap exposing top edge of fiber joint filler, and apply joint sealant.

3.07 PUMPING OF CONCRETE may be permitted for concrete, providing:

A. The Contractor engages a testing laboratory to design concrete mixes for pumping. Trial batches shall be made and tested as required hereinbefore for typical concrete.

B. The quality and proportioning of aggregates for pumping conditions shall be determined in accordance with ACI, Recommended Practice 613. Aggregate proportioning must be tailored to the particular pump intended for use.

C. When starting a pump operation, actual pumping of concrete shall be preceded by a mortar mix (concrete without coarse aggregate) for the purpose of lubrication.

D. All mortar and concrete leakage resulting from pumping operations shall be removed from formwork, reinforcing steel and any finished surface.

3.08 CURING

A. Protect freshly placed concrete from premature drying and excessive cold or hot temperature. Comply with the recommendations of ACI 306R for cold weather protection and ACI 305R for hot weather protection during curing.

B. Evaporation control is to be implemented in hot, dry and windy weather by protecting concrete from rapid moisture loss before and during finishing operations with an evaporation control material. Apply in accordance with manufacturer's instructions after screeding and bull floating, but not before floating.

C. Begin curing after finishing concrete but not before free water has disappeared from concrete surface.

D. Cure concrete by moisture curing, moisture-retaining-cover curing, curing compound, or a combination.

1. For moisture-curing, keep surfaces continuously moist for not less than 7 days with water, a continuous water-fog spray, or absorptive cover kept wet continuously wet.

2. For moisture-retaining-cover, cover concrete with moisture retaining cover with side and end laps sealed.

3. For curing compound, apply in accordance with manufacturer's instructions. Recoat areas subjected to rainfall within 3-hours after initial application.

C. Forms shall remain in place for not less than the following periods of time. These periods represent minimum cumulative number of days during which temperature of air in contact with concrete is 60 degrees F and above.

1. Vertical forms of foundations and walls: 5 days.

2. Slab edge screens or forms: 7 days.

3.09 CLEANING AND PROTECTION

A. Clean all surfaces and leave in satisfactory condition to receive final finish surface treatment.

B. Protect concrete surfaces from damage by tools, equipment, material and workmen. No traffic, shoring or other loading will be permitted until concrete has hardened sufficiently to prevent injury to finish and strength, but at least 14 days.

1. Remove surface stains and spillage of materials as they occur.

2. Sweep concrete and wash free of stains, discolorations, dirt, and other foreign material prior to final inspection.

END OF SECTION 03 30 00

SECTION 05 50 00
METAL FABRICATIONS

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. Shop fabricated ferrous metal items, galvanized and prime painted including but not limited to custom fabricated fence and gate components.

1.02 RELATED SECTIONS

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

B. Section 09 90 00: Painting.

C. Section 32 31 13: Chain Link Fences and Gates.

1.03 REFERENCES

A. ASTM A36 / A36M-14 - Carbon Structural Steel.

B. ASTM A53 / A53M-12 - Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless.

C. ASTM A123 / A123M-15 - Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

D. ASTM A283 / A283M-13 - Low and Intermediate Tensile Strength Carbon Steel Plates.

E. ASTM A307-14 - Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.

F. ASTM A924 / A924M-16ae1 - General requirements for Steel Sheet, Metallic-Coated by the Hot-Dip process.

G. ASTM A501-14 - Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.

H. AWS A2.1 - Standard Welding Symbols.

I. AWS D1.1 - Structural Welding Code.

J. California Building Code, CBC 2022.

1.04 SUBMITTALS

A. Submit under provisions of Division 1, General Requirements.

B. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevations, and details where applicable. Provide specific submittal for all ramp and sloped walk guide rails, handrails, and guardrails prior to fabrication clearly showing spacing of rails and embed details.

C. Indicate welded connections using standard AWS A2.1 welding symbols. Indicate net weld lengths.

1.05 QUALIFICATIONS

A. Welders' Certificates: Submit under provisions of Division 1, General Requirements, certifying welders employed on the Work, verifying AWS qualification within the previous 12 months.

1.06 FIELD MEASUREMENTS

A. Field verify all dimensions prior to fabrication and coordinate with work of others.

PART 2 – PRODUCTS

2.01 MATERIALS

A. General: All material that will be exposed must be smooth and free of surface blemishes including pitting, seam marks, roller marks, trade names and irregularities.

B. Steel Sections: ASTM A36 / A36M-08.

C. Steel Tubing: ASTM A500, Grade B.

D. Pipe and Downspouts: ASTM A53 / A53M-07, Type E, Grade B.

E. Plates: ASTM A36 / A36M-08.

F. Bolts, Nuts, and Washers: ASTM A307-07b.

G. Drilled-in Concrete Anchors: Hilti “Kwik Bolt TZ2” (ICC Report No. ESR-4266), Simpson Strong Bolt 2 (ICC Report No. ESR-3037), or accepted equal; stainless steel for all exterior work; testing required.

H. Welding Materials: AWS D1.1; type required for materials being welded.

I. Shop and Touch-Up Primer: TNEMEC 10-99 - Red primer or Devoe DEVGUARD 4141.

J. Zinc rich galvanizing paint. Must contain either between 65% to 69% metallic zinc by weight or greater than 92% metallic zinc by weight in dry film. “Brite” sheen required at exposed galvanized finish. Spray application not acceptable; brush applied only.

K. Metal Framing Channels: Channel members shall be fabricated from structural grade steel conforming to ASTM A924-09a; P1000 as manufactured by Unistrut or approved equal. Finish shall be hot-dip galvanized coating.

L. Pipe/Conduit Clamps: Punch-press made from hot-rolled, pickled and oiled steel plates, strip or coil and conform to ASTM A36 / A36M-08; P2600 as manufactured by Unistrut or approved substitute. Finish shall be hot-dip galvanized coating.

M. Non-Shrink Grout: Euco-Dry Pack Grout, natural aggregate, high strength non-shrink. “Pac-It” - W.R. Meadows or approved equal.

N. Removable Post Insert Sleeves: For mounting new posts/rails in new concrete, Wagner Companies EZ SLEEVE or equal. (888) 243-6914.

2.02 FABRICATION

A. Workmanship

1. Form exposed work true to line and level with accurate angles and surfaces and straight, sharp edges.

2. Ease exposed edges to a radius of approximately 1/32 inch, unless indicated otherwise.

3. Form bent-metal corners to the smallest radius possible without causing grain separation or otherwise impairing work.

4. 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. Welds to be imperceptible in finished work.

5. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners wherever possible.

B. Assemblies

1. Use materials of sizes and thickness indicted or required to produce strength and durability in finished product for use intended.

2. Work to dimensions indicated.

3. Fit and shop assemble in largest practical sections for delivery to site.

4. Cut, reinforce, drill and tap miscellaneous metal work as required to receive finished hardware and similar items.

5. Exposed mechanical fasteners: When application will not permit concealed fasteners, locate exposed fasteners in unobtrusive manner, consistent with design of component, except where specifically noted otherwise. Use Phillips flat-head countersunk screws or bolts for exposed fasteners.

6. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

7. Fabricate joints exposed to the weather to be weather to be weather tight and provide weep holes as required.

8. All exterior items are required to be hot-dipped galvanized. They shall be assembled in the largest pieces possible and dipped as a large unit. Field welding shall be kept to a minimum to alleviate painted sections of metal. It is the intention of the District that the hot-dip finish be the final/exposed finish.

9. Any field welding shall be repaired and coated with a brush applied zinc-rich galvanizing paint over entire affected area.

C. Fit and shop assemble in largest practical sections, for delivery to site.

D. Fabricate items with joints tightly fitted and secured.

E. Continuously seal joined members by continuous welds.

F. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.

G. Exposed Mechanical Fastenings: Flush countersunk screws or bolts; unobtrusively located; consistent with design of component, except where specifically noted otherwise.

H. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

2.03 FINISHES

A. Prepare surfaces to be primed in accordance with SSPC SP 2.

B. Prime all surfaces that are not scheduled to receive galvanization, except, do not prime surfaces embedded in concrete nor in areas of field welds until welds are completed and inspected.

C. Surfaces scheduled to be galvanized: Galvanize in accordance with ASTM A123 / A123M, designated steel items. Provide minimum 1.25 oz/sq. ft galvanized coating.

D. Apply brush applied zinc-rich galvanizing paint over field welds and adjacent areas where hot dipped galvanizing has been damaged. “Brite” sheen required at exposed galvanized finishes.

PART 3 – EXECUTION

3.01 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive work.

B. Beginning of installation means erector accepts existing conditions.

C. Contractor shall conform all existing downspouts to remain are fully functional.

3.02 PREPARATION

A. Clean and strip primed steel items to bare metal where site welding is required.

B. Supply items required to be cast into concrete or embedded in masonry with setting templates, to appropriate sections.

3.03 INSTALLATION

A. Install items plumb and level, accurately fitted, free from distortion or defects.

B. Allow for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.

C. Field weld components indicated on shop drawings.

D. Perform field welding in accordance with AWS D1.1.

E. Obtain Architect approval prior to site cutting or making adjustments not scheduled.

F. After erection, prime welds, abrasions, and surfaces not shop primed, except surfaces to

be in contact with concrete.

G. At all welded locations, coat with two coats of brush applied zinc-rich galvanizing paint.

3.04 SCHEDULE

A. The Schedule is a list of principal items only. Refer to Drawing details for items not specifically scheduled.

1. Custom fabricated chain link fence gates (hot-dipped galvanized).
2. Steel pipe railing, (hot-dipped galvanized at exterior, primed at interior).
3. Pipe rail wall support brackets, (galvanized at exterior, primed at interior).
4. Steel pipe downspouts and downspout support brackets, galvanized.
5. Unistrut P-1000 Support System.

END OF SECTION 05 50 00

SECTION 06 10 00
ROUGH CARPENTRY

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. Description of requirements for materials, fabrications and installation of rough carpentry and associated items (except that which is specified elsewhere) indicated on Drawings and necessary to complete the work. Items include, but are not necessarily limited to, the following:

1. Blocking, Backing, Stripping, Furring, and Nailers.
2. Rough Hardware.
3. Wood Framing.
4. Plywood Sheathing.
5. Preservative Treatment.
6. Metal Fabrications.

1.02 RELATED SECTIONS

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

B. Section 03 30 00: Cast-in-Place Concrete.

C. Section 05 50 00: Metal Fabrications.

D. Section 06 20 00: Finish Carpentry.

1.03 REFERENCES

A. Chapter 23, California Building Code (CBC), 2022, as adopted by the California Division of the State Architect (DSA).

B. American Society for Testing and Materials (ASTM).

C. Lumber: West Coast Lumber Inspection Bureau (WCLIB), Rule 17, Standard Grading Rules for West Coast Lumber.

D. Lumber: Western Wood Products Association (WWPA); Western Lumber Grading Rules.

E. Plywood: American Plywood Association (APA) Plywood Specifications and Grades and Voluntary Product Standard DOC PS 1 “Construction and Industrial Plywood”.

F. Wood Preservative: American Wood Protection Association (AWPA), Standard U1.

G. AF&PA NDS – National Design Specification for Wood Construction.

H. AF&PA SDPWS – Special Design Provisions for Wind and Seismic.

1.04 QUALITY ASSURANCE

A. Manufacturer data: Submit product data for all materials specified under this section and as applicable to each site.

B. Coordinate the work of all trades to ensure proper placement of all materials, anchors, etc., as well as providing for openings and anchors for the installation of surface mounted materials and equipment.

C. Qualifications of Workmen: Provide sufficient skilled workmen and supervisors who shall be present at all times during execution of this portion of the work and who shall be thoroughly familiar with the type of construction involved and the materials and techniques specified.

D. Rejection: In the acceptance or rejection of rough carpentry, no allowance will be made for lack of skill on the part of the workmen.

E. Design Criteria: Pressure treatment shall not adversely affect application, permanence, or appearance of finish paint system.

1.05 SUBMITTALS

A. Submit per the requirements of the General Conditions.

B. Certification:

1. Pressure Treated Wood: Certification for water-borne preservative that moisture content was reduced to 19% maximum, after treatment.

2. Pressure Treated Wood: Submit certification by treating plant stating the chemicals and process used, net amount of salts retained, and conformance with applicable standards.

1.06 JOB CONDITIONS

A. Environmental Requirements: Maintain uniform moisture content of lumber at 19 percent or less prior to close-in.

B. Sequencing: Coordinate details with other work supporting, adjoining, or fastening to rough carpentry work.

1.07 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Protection, General: Protect wood from moisture while being stored and while work is in progress.

B. Protection:

1. After delivery, store all materials in such a manner as to ensure proper ventilation and drainage and to protect against damage and the weather.

2. Keep all material clearly identified with all grade marks legible; keep all damaged material clearly identified as damaged, and separately store to prevent its inadvertent use. Do not allow installation of damaged or otherwise non-complying material.

3. Use all means necessary to protect the installed work and materials of all other trades.

C. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of the Architect and at no additional cost to the Owner.

PART 2 – PRODUCTS

2.01 MATERIALS

A. Wood:

1. Lumber (Blocking, Backing, Stripping, Furring, and Nailers): WCLIB Construction.

2. Lumber (Wood Framing): Meet requirements of following minimum grades, and as noted on Structural Drawings.

Item	Species	Grade	Reference
Studs	D.F.	No. 1 2 x 4 Light Framing	WCLIB 124b
Studs	D.F.	No. 1	WCLIB 121
Plates	D.F.	No. 1	WCLIB 123b
Beams	D.F.	Select Structural	WCLIB 130b
Joists	D.F.	No. 1	WCLIB 123b
Posts	D.F.	Select Structural	WCLIB 131b

3. 3x and larger lumber shall be free of heart center.

4. 2x6 T & G Douglas Fir No. 1.

B. Plywood:

1. Roof and Wall Structural Sheathing: PS-1 Structural 1, CDX APA with exterior glue.

2. Thickness and type shall be as indicated on Drawings.

C. Pressure-Treated Lumber:

1. Douglas Fir pressure-treated.

   a. Required for cast-in-nailers, sills or anywhere wood is in contact with concrete, masonry, or grout.

   b. Required for all rooftop blocking.

D. Building Paper: Fed. Spec. UU-B-790a, Type I, Grade B (15 lb. min.).

E. Preservative Treatment

1. Furnish pressure treated Douglas Fir in accordance with AWPA, Standard U1. Each piece is required to bear AWPA stamp.

2. Field treat cut edges and holes frilled in factory treated lumber with an approved AWPA Standard U1 preservative product.

3. For fastener requirements, see Paragraph 2.01-F-8.

F. Rough Hardware Fastenings and Connections: All types including bolts, lag screws, nails, spikes, screws, washers, framing devices and other rough hardware, or kinds that may be purchased and that require no further fabrication, shall be furnished and installed for all finish and rough carpentry. All exterior hardware shall be hot-dipped galvanized per ASTM A123 / A123M-09 Standards.

1. Nails: ASTM F1667 Common wire nails or spikes; box nails not permitted.

2. Wood Screws: Wood Screws: ANSI Standard B18.6.1; use galvanized type for exterior work.

3. Lag Screws: Conform to ASTM A307-07b and ANSI Standard B18.2.1. Dimensions and installation shall conform to requirements described in the National Design Specification (NDS), current edition.

4. Bolts: ASTM A307-07b, Grade A, hexagonal heads, unless noted otherwise.

5. Washers: Washers for bearing against wood shall be provided under all bolt heads and nuts. Washers shall be as indicated on Drawings.

6. Powder Driven Fasteners: Tempered steel pins with special corrosive-resistant plating or coating. Pins shall have guide washers to accurately control penetration, minimum 1-1/8 inch. Fastening shall be accomplished by low-velocity pistol-driven powder activated tool. Pins and tool shall be as manufactured by Hilti Fastening Systems; Impex Tool Corporation; or approved equal. ICC approved.

7. Fabricated Sheet Metal Timber Framing Connectors: CBC approved. Fabricate from hot-dipped galvanized steel. Connectors shall be at least 18 gauge minimum material (1/8" plate materials where welded, unless otherwise noted), punched for nailing. Nails and Nailing shall conform to the manufacturer's instructions with a nail provided for each punched hole. Types as noted on Drawings, manufactured by Simpson Co. or approved substitute. All framing connectors shall be stamped with manufacturer's logo, and model designation.

8. All fasteners into preservative-treated and fire-retardant-treated wood shall be of hot dipped zinc-coated galvanized steel, stainless steel, silicon bronze or copper per CBC 2304.10.5. The coating weights for zinc-coated fasteners shall be in accordance with ASTM A 153. Fasteners other than nails, timber rivets, wood screws and lag screws shall be permitted to be of zinc coated steel with coating weights in accordance with ASTM B 695, Class 55 minimum.

G. Exterior Trim and Fascias: RIS Grade Stamped, Redwood, B Heart, Vertical Grain, Kiln Dried, surfaced sizes as indicated on the drawings.

2.02 FABRICATION

A. Lumber:

1. Air- or kiln-dry to maximum 19 percent moisture content, prior to installation. Lumber must be 19 percent moisture content prior to close-in and finish.

2. Furnish S4S unless otherwise noted.

3. Size to conform with rules of governing standard. Sizes shown are nominal

unless otherwise noted.

2.03 SOURCE QUALITY CONTROL

A. Grade Mark each piece of lumber. Marking must be done by recognized agency. Lumber Manufacturer's Association Certificates may be accepted in lieu of such grade and trademarks.

1. Douglas Fir shall bear WCLIB grade stamp.

B. Plywood Sheathing: Each panel shall be legibly identified as to type, grade and specie by APA grade. If plies are spliced, the slope of the scarf shall not be steeper than 1:8. White pockets will not be permitted in face plies.

C. Each piece of preservative treated lumber shall bear AWPA stamp.

2.04 WOOD PRESERVATIVE TREATMENT

A. Preservative treatment: Comply with applicable requirements of AWPA standards C2 for lumber and C9 for plywood. After treatment, kiln dry lumber to a maximum moisture content of 19 percent, and plywood to 15 percent.

1. Pressure treat members connected with roofing, flashing and weatherproofing; including but not limited to cants, nailers, curbs, equipment supports and blocking.

2. Pressure treat members that are concealed and in contact with masonry or concrete, including, but not limited to, sills, nailers, blocking, furring and studs.

PART 3 – EXECUTION

3.01 SURFACE CONDITIONS

A. Inspection:

1. Prior to all work of this Section, carefully inspect the installed work of all other trades, and verify that all such work is complete to the point where this installation may properly proceed.

2. Verify that rough carpentry may be performed in strict accordance with the original design and all pertinent codes and regulations.

B. Selection of Lumber Pieces: Carefully select all members. Select individual pieces so that knot and obvious defects will not interfere with placing bolts or proper nailing or making proper connections. Cut out and discard all defects which will render a piece unable to serve its intended function.

C. Lumber may be rejected by the Architect, whether or not it has been installed, for excessive warp, twist, bow, crook, mildew, fungus, or mold, as well as for improper cutting and fitting. No load carrying member shall be exposed to earthen materials.

D. Shimming: Do not shim any framing component.

3.02 FASTENING

A. Nailing: Except as otherwise indicated on Drawings or specified, all nailing shall be as

scheduled on Drawings:

1. Nails or Spikes shall be common wire unless noted otherwise. Penetration of nails or spikes shall be one-half the length of the nail or spike into the piece receiving the point. However, to connect pieces 2 inches in thickness, 16d nails shall be used unless noted otherwise.

    a. Bore holes for nails wherever necessary to prevent splitting.

    b. Use finish or casing nails for finish work.

    c. Use of nailing guns is as limited by CBC and must be approved by Architect and DSA. Submittal of guns and nails is required.

B. Bolts: Bolts shall be of sizes indicated. Drive fit with washers under nuts. Tighten all bolts and screws before closing in.

C. Framing Devices: As specified under Products, sizes as indicated. Use half-length nails where required.

D. Lag Screws: Pre-Bore lead holes and install per NDS, current edition.

3.03 FRAMING AND ROUGH CARPENTRY

A. Sills: Shall be in long lengths of sizes shown, fastened with anchor bolts at exterior walls and with powder driven fasteners at interior walls as indicated, a minimum of two (2) fasteners per piece and a bolt within 9" but not nearer than 6" from end of piece. Place malleable iron or steel plate washers (but not cut washers) under nuts bearing on wood. Set sills level and true and bed exterior wall sills and interior bearing wall sills on 1/2 inch dry-pack or non-shrink grout.

B. Studs, Posts and Columns: Shall be full length. Corners shall be as detailed. Partitions or walls containing plumbing, heating or other piping shall be so formed as to give proper clearance for materials. Cut members as required to provide full bearing at ends. Connect to structure as indicated.

C. Plates: Shall be in long lengths and spliced as shown.

D. Blocking: Shall be same thickness and width of studs or joists unless shown otherwise. Blocking shall not be spaced over 8'-0" o.c. Install fire blocking in accordance with CBC, Section 717. Install blocking at all plywood joints unless otherwise noted on the drawings. Install blocking for fastening all surface applied items.

E. Joists and Beams: Shall be in long lengths and spliced over bearings unless shown otherwise. Install with crown side up. Beams or headers indicated to be built up of two or more joists shall be fabricated on the job using full length members. For two-piece members, stitch nail pieces together with 16d common nails spaced not over 12" o.c. and staggered. Clinch nails protruding through members.

    1. Provide double joists and headers at all openings through floors and roofs unless otherwise shown on Drawings.

    2. Provide typical headers at all openings through walls where one or more studs are required to be cut. For penetration through walls narrower than stud spacing, provide solid backing on all sides for fastening finish materials.

F. Plywood Structural Sheathing: Install to pattern indicated and provide blocking at joints where noted on the drawings. Center all joints over bearing supports. Nail to framing as indicated. Install plywood with face plies perpendicular to joists or studs unless indicated otherwise.

G. Wood Furring, Stripping and Grounds: Install as shown or required to provide nailing of materials or passage of pipes, conduits, etc., not otherwise accommodated.

H. Bridging: Space not over 8'-0" o.c. for spans over 16'-0". Spans over 8'-0" and under 16'-0" shall have bridging placed at midspan. Bridging shall be two 2 x 3's or solid blocking as indicated. Joists 8" or less in depth shall not require bridging unless specifically indicated.

I. Backing: Shall be provided for all wall and ceiling finishes and for supporting of fixtures and equipment for all trades, including toilet partitions, toilet room accessories, frames, case work, mirrors, trim, applied wall finishes, etc. Coordinate placement of backing and supports with manufacturer or supplier of mounted items.

J. Building Paper: Install two layers in all exterior locations. Install with weather lap edges a minimum of 2 inch horizontal and 6 inch vertical laps. Continue building paper minimum 6 inches around inside and outside corners. Fasten in place with appropriate staples.

K. Cuts or holes in preservative treated wood shall be treated in accordance with AWPB standard M4 in the field.

3.04 MISCELLANEOUS HARDWARE

A. Finish hardware is specified in Section 08 71 00. All other hardware indicated or required but not specified elsewhere shall be furnished and installed hereunder, including appropriate screws or other fastening devices.

3.05 MISCELLANEOUS CARPENTRY WORK

A. Miscellaneous Carpentry Work not included under other sections shall be furnished and installed hereunder as indicated. Carefully locate and securely anchor such items to structure.

B. Drypack: Drypack shall consist of 1 part high early strength Portland cement to not more than 3 parts of sand by volume. Add only a minimum amount of water to hold the mixture in shape while packing and to provide hydration. Solidly ram drypack into place to provide uniform bearing and cure with moist sacks or cloths for a period of at least three (3) days.

C. Plywood Backing for electrical, telephone, and similar types of wall mounted equipment shall be provided hereunder where required. Plywood shall be 3/4" thick exterior A-C plywood with 'A' face exposed.

D. Shoring and Bracing: Shore or brace for temporary support of all work as required during the construction period except any shoring and bracing specified and included under other sections of these specifications.

E. Temporary Enclosures: Provide and maintain all barricades and enclosures required to protect the work in progress.

F. Protect all work in progress and all work installed, as well as the work of all other trades. Any work damaged as a result of the work under this section shall be corrected to its original condition or replaced if directed by the Architect and at no increase in cost to the

Owner.

G. Protection Devices: Pedestrian walkways, barricades, lights, shoring and other protective structures and devices necessary for the protection of pedestrians shall conform in all respects to the requirements of CBC, Section 3303, Title 24 and to the requirements of the Department of Public Works.

3.06 FRAMING TOLERANCES

A. Maximum variation from true flatness: 1/4 inch in ten feet in any direction.

3.07 CLEAN-UP

A. Upon completion of the work of this Section, remove all surplus materials, rubbish, and debris from the premises.

END OF SECTION 06 10 00

SECTION 06 20 00
FINISH CARPENTRY

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. Chair rail trim and miscellaneous wood trim.

B. Exterior wood siding and trim repairs.

C. Patch and repair of existing door frames and trims.

D. All finish carpentry (other than shop fabricated architectural casework) needed for a complete and proper installation of all finish wood items not specifically described as being installed under other Sections of these Specifications.

1.02 RELATED SECTIONS

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

B. Section 06 10 00: Rough Carpentry.

C. Section 09 21 16: Gypsum Board Systems.

D. Section 09 90 00: Painting.

E. Section 10 26 33: Fiberglass Reinforced Laminate (FRL).

1.03 QUALITY ASSURANCE

A. Standards of Construction: All work shall be manufactured in accordance with WI - Woodwork Institute, Architectural Woodwork Standards (latest edition), including all supplements and in the grades hereinafter specified.

B. Installer's Qualifications: Use only journeymen finish carpenters who are thoroughly trained and experienced in the skills required for the cutting and fitting of trim and finish materials.

C. Installation Acceptance: All rejected work shall be removed and replaced with no additional cost to the Owner.

1.04 SUBMITTALS

A. Submit per the requirements of Division 1, General Requirements.

B. Shop Drawings: Shop drawings shall include details and erection data associated with the work of other trades; location; materials, species of wood; quality grade; type of finish; profiles, dimensions; fastenings and clearances. Detail drawings shall be either full size or three inches equals one foot (3" = 1').

1. The mill shall take and be responsible for all field measurements required for the proper fabrication and installation of the work. Show all field dimensions beyond

control of mill.

a. Report any major discrepancy between the Drawings and the field dimensions to the Architect before fabrication of the work.

2. Coordinate dimensions and installation requirements of Owner furnished equipment.

1.05 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Delivery: Do not deliver material to site until required temperature and relative humidity conditions have been stabilized and will be maintained in installation areas.

B. Storage, Handling and Protection: Provide all work or materials necessary to store, cover and protect all materials specified to be furnished and installed under this Section. Store all materials under cover in a well-ventilated enclosure and protect against extreme changes in temperature and humidity. Avoid any marring and keep the materials clean during handling and installation operations. Protect exposed finish work and materials after their erection from damage of any character. Work damaged through neglect or failure to provide protection shall be repaired or replaced by the Contractor without additional cost to the Owner.

PART 2 – PRODUCTS

2.01 CHAIR RAIL/TRANSITION TRIM / MISCELLANEOUS WOOD TRIM

A. Provide minimum 1” x 2” (or as otherwise indicated on Drawings or required to patch and repair existing wood trim finishes) paint grade kiln dried Douglas fir or smooth grain hardwood trim in profiles as shown on the Drawings. Ends of all material shall be mitered at 45 degree angle and shall be precision trimmed to provide tightly mitered face joints when laid in place. Trim to fit tight to transition surfaces, lay flat and true and fit tight into corners. Fasten with brad nails, fill holes and any small joint gaps and smooth prior to paint.

2.01 EXTERIOR WOOD SIDING AND TRIM REPAIRS

A. Provide wood siding and trim components to best match existing siding, batten boards and trim pieces at locations where exterior windows are being infilled and at locations where existing siding is being disrupted or modified. At a minimum, siding and trim products shall be exterior rated and of matching thickness and surface texture to best match existing.

2.03 ROUGH HARDWARE

A. Provide all nails, spikes, screws, bolts, (ASTM A307), etc. necessary for proper installation of products installed herein, in sizes, quantities sufficient to draw and hold products rigidly, permanently in place.

B. Fasteners & Adhesives: As best suited for the intended purposes. Fasteners shall be selected for concealed appearances.

PART 3 – EXECUTION

3.01 INSPECTION

A. Prior to installation of the work of this Section, carefully inspect and verify that the installed work of all other trades is complete to the point where this installation may properly commence.

B. Verify that specified items may be installed in accordance with the approved design.

C. In the event of discrepancy, immediately notify Contractor. Do not proceed in discrepant areas until discrepancies have been fully resolved.

3.02 WORKMANSHIP

A. General: All finish carpentry shall product joints true, tight, and well fastened with all members assembled in accordance with the Drawings.

B. Jointing:

1. Make all joints to conceal shrinkage; miter all exterior corners; cope all interior corners, miter or scarf all end-to-end joints.

2. Install all trim in pieces as long as possible, jointing only where solid support is obtained.

C. Fastening:

1. Install all items straight, true, level, plumb, and firmly anchored in place; where blocking or backing is required, coordinate as necessary with other trades to ensure placement of all required backing and blocking in a timely manner.

2. Nail or screw trim with finish nails or screws of proper dimension to hold the member firmly in place without splitting the wood.

3. On exposed finish work, countersink all nails or screws for putty.

D. Work shall be done under direction of a capable foreman experienced in installation of finish carpentry work.

E. Carefully plan and lay out all finish work; cooperate with other trades.

F. Workmanship shall be of highest quality. Materials that are marred or otherwise damaged during installation shall be immediately replaced at no additional cost to Owner.

3.03 INSTALLATION

A. Install items where indicated on the Drawings and in full accord with all reviewed Shop Drawings and the manufacturer's recommendations, anchoring all components firmly in place.

B. Except as modified by Drawings and Specifications, application of finish carpentry shall be in accordance with specified Standards.

C. Siding and Trim: Install in as long lengths as practicable. Make joints tight. Glue butt end of trims to one another and finish with finish nails into solid backing with heads set and filled smooth with finish surface.

D. Specialties: Install specialties in accordance with specified requirements of each section.

3.04 PROTECTION

A. Protect work and materials of this Section prior to and during installation, and protect the installed work and materials of other trades.

B. In the event of damage, make all repairs and replacements necessary to the approval of the Architect at no additional cost to the Owner.

C. Exposed finishes shall be free from scratches, dents, permanent discolorations and other defects in workmanship or material.

3.05 CLEANING UP

A. Keep the premises in a neat, safe and orderly condition at all times, free from accumulation of sawdust, cut ends, and debris.

B. At the end of each working day, or more often if necessary, thoroughly sweep all surfaces where refuse from this portion of the work has settled.

C. Furnish insulated wall panels for installation by others as shown on the Drawings and specified here.

3.06 ADJUSTING AND CLEANING

A. Upon completion of installation, remove manufacturer's temporary labels and marks of identification. Clean surfaces and remove foreign material. Broom clean all surfaces. Leave entire work in neat, orderly, clean and acceptable condition. Replace damaged parts and surfaces which are not free from imperfections.

B. Touch up damaged areas in shop primed surfaces which will be concealed after erection. Leave in condition fit for finish painting by other trades. Repair or replace defective materials as directed. Lubricate hardware and leave entire installation clean and in good operating condition.

C. Provide protective coverings where necessary over the installed work and materials of this Section until final completion of the project.

END OF SECTION 06 20 00

SECTION 07 21 00
BUILDING INSULATION

PART 1 – GENERAL

1.01 APPLICABLE REQUIREMENTS

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

1.02 SCOPE

A. Building insulation required for this work includes, but is not necessarily limited to:

1. Sound Insulation.

2. Thermal Insulation in walls and below roof deck.

3. At fire rated assemblies, provide insulation at fire rated construction only as allowed by the California Building Code, CBC 2022.

1.03 RELATED WORK SPECIFIED ELSEWHERE

A. Section 06 10 00: Rough Carpentry.

1.04 STANDARDS:

A. CBC, California Building Code - 2022 Edition, as amended.

B. California Quality Standards for Insulating Materials.

1.05 SUBMITTALS:

A. Submit per the requirements of Division 1, General Requirements:

1. List of materials.

2. Product data for each type of insulation specified.

3. Insulation Certificate: Installer shall submit a copy to the Architect and post in a conspicuous location in each building a certificate signed by the installer and the General Contractor stating that the installation conforms with the requirements of CBC 2022 edition, Title 24, Chapter 2–53, and that the materials installed conform with the requirements of the California Quality Standards for Insulating Materials. The certificate shall state the manufacturer's name and material identification and the installed "R" value. Submittal required.

1.06 DELIVERY, STORAGE AND HANDLING:

A. Deliver materials to the job site and store in a safe dry place with all labels intact and legible at time of installation.

B. Protect building insulation materials before installation and protect the installed work and materials of other trades.

C. In the event of damage, immediately make all repairs and replacements necessary to the approval of the Architect and at no additional cost to the Owner.

PART 2 – PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Johns-Manville.

B. Owens–Corning Fiberglass Corporation

C. Celotex Corporation

D. CertainTeed Corporation.

E. USG Thermafiber (at fire rated construction assemblies where required by listed Design Number).

F. Approved equal.

2.02 MATERIALS

A. **Type A, Sound Insulation**: A batt-like non-combustible, formaldehyde free product manufactured from inorganic fibers for installation in framed wall cavities. The nominal 16 inch, or as required x 96 inch batts shall be un-faced and sized to fit full depth and width of framed walls.

1. Un-faced insulation shall comply with ASTM C-665, Type I. Provide fire rated type insulation at all rated walls to receive insulation.

2. Product Fire Hazard Classification Rating as required by the specified codes and standards for use at locations and conditions indicated.

3. Minimum Thickness: As required to fill full depth of wall cavity.

4. Flame Spread = 25, Smoke Developed = 50.

5. Use at ALL newly framed interior framed walls and infill areas to a minimum height of 6" above line of ceiling unless specifically noted otherwise. Where gypsum board finish is specified to continue to bottom of roof deck, insulation shall continue to underside of roof deck.

B. **Type B, Friction-Fit Rated Thermal Insulation**: A blanket-like, formaldehyde free product manufactured from inorganic glass fibers for installation in newly framed exterior walls and opening infill areas. The nominal 16 inch, or as required, wide blankets shall be faced with a factory applied integral kraft vapor barrier which is flame resistant and code approved for exposed or rated applications.

1. Faced insulation shall comply with ASTM C-665, Type III, Class A.

2. Composite Product Fire Hazard Classification Rating as required by the specified codes and standards for use at locations and conditions indicated.

3. Minimum Thickness: 7-1/2” or as otherwise required to fill full width and depth of wall cavity.

4. Minimum R Value: 22 at 75 degrees F at 6" or greater walls in accordance with ASTM C-518 and C-653.

5. Water Vapor Transmission (permeance): 0.5 perms maximum when tested in accordance with ASTM B-96, desiccant method. Moisture absorption less than 1% by volume.

6. Flame Spread = 25, Smoke Developed = 50 or less in accordance with ASTM E-84 test method.

7. Use at all newly framed exterior wall, infill areas and attic wall cavities unless specifically noted otherwise.

C. **Type C, Friction-Fit Thermal Insulation**: A blanket-like non-fire rated, formaldehyde free product manufactured from inorganic glass fibers for installation in framed ceiling and attic spaces. The nominal 24 inch, or as required wide blankets shall be faced with a factory applied integral foil vapor barrier which is flame resistant and code approved for exposed or rated applications.

1. Faced insulation shall comply with ASTM C-665, Type II, Class C.

2. Composite Product Fire Hazard Classification Rating as required by the specified codes and standards for use at locations and conditions as indicated.

3. Minimum Thickness: 13” or as required to fill full cavity depth.

4. Minimum R Value: 38 at 75 degrees F. in accordance with ASTM C-518 or C-653.

5. Water Vapor Transmission (permeance): 1.0 perms maximum when tested in accordance with ASTM B-96, desiccant method. Moisture absorption less than 1% by volume.

6. Flame Spread = 25, Smoke Developed = 50 or less in accordance with ASTM E-84 test method.

7. Use at all non-rated bottom of roof areas and hard lid ceilings and as otherwise shown on Drawings. Use at all areas where roof framing has been modified to accommodate new HVAC and kitchen equipment. Existing insulation shall be completely removed and replaced an all areas of new work.

2.03 MISCELLANEOUS MATERIALS

A. All other materials, such as additional insulation materials, fasteners, retention wires, tape and retainers, not specifically described but required for a complete and proper installation of building insulation, shall be subject to submittal approvals.

1. Provide additional insulation materials selected from manufacturer's standard materials. These materials shall conform to the specified Codes, Standards and performance requirements as indicated in the Contract Documents or as required for the complete and proper construction of the building envelope.

2. Provide all required fasteners, staples, tapes, clips, wires and accessories for a complete installation.

3. Where batt roof insulation is installed at the bottom of roof deck between TJI and/or dimensional lumber, provide insulation support wire struts equal to Simpson Strong Tie Insulation Supports (Model IS16-R100 or IS24-R100) at maximum 24 inches on center to hold batt insulation tight to bottom of roof deck when no finish ceiling is provided.

PART 3 – EXECUTION

3.01 INSPECTION

A. Prior to all work of this Section, carefully inspect and verify that the installed work of all other trades is complete to the point where this installation may begin.

B. In the event of discrepancy, immediately notify the Architect. Do not proceed with installation in discrepant areas until all such discrepancies have been fully resolved.

3.02 INSTALLATION

A. Batt, Blanket Insulation: Provide insulation barrier system with no voids in system. Keep end joints to a minimum. Install with vapor barrier to warm (interior) side. Fit ends and edges tight to framing members. Keep all piping and other work on warm side of insulation. Provide tape vapor barrier joints. Tape as required.

B. Install fire rated insulation where indicated on the Drawings or where required to maintain the code required integrity of fire-rated assemblies.

C. All ceiling insulation visible prior to installing suspended ceiling shall be painted flat black or as otherwise scheduled on finish schedule.

D. Provide wire tie insulation restraints at bottom of roof deck as required to maintain insulation placement at areas where nail-fin installation is not achievable or where finish ceiling is not provided.

3.03 PROTECTION

A. Protect installed insulation from damage until covered.

END OF SECTION 07 21 00

SECTION 07 26 00
VAPOR RETARDERS

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. Concrete Vapor Emission Control System for remediation of excessive slab moisture and / or alkyd levels.

B. Repairs and preparation of concrete substrate and to install the concrete vapor emission control system.

C. Subfloor testing after concrete treatment.

1.02 RELATED SECTIONS

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

B. Bid Form: Bid Allowance with Unit Cost for potential slab treatment.

C. Section 03 30 00: Cast-in-Place Concrete.

D. Section 09 65 00: Resilient Flooring and Base.

E. Section 09 67 00: Urethane Concrete Flooring System.

1.03 REFERENCES

A. ASTM C920-14 - Elastomeric Joint Sealants.

B. ASTM E96 / E96M-16 - Test Method for Water Vapor Transmission of Materials.

C. ASTM F710-11-Practice for Prepping Concrete Floors to Receive Resilient Flooring.

D. ASTM F1869-16 - Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride

E. ASTM F2170-16 - Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes

QUALITY ASSURANCE

A. Manufacturer Qualifications:

1. Ten-year experience in producing moisture vapor control emission products.

2. Minimum $5-million product liability insurance policy from an A-rated carrier.

3. A warranty program covering coats associated with repair or replacement of concrete vapor emission control system and finish floor covering or coating, including repair or replacement labor.

B. Installer Qualifications:

1. Installer shall have experience in the installation of floor covering or floor coatings and shall have experience in the installation of concrete vapor emission control systems.

2. Floor covering installer must be factory trained and certified for the installation of the specific products being installed.

3. Installer to provide project inspector proof of certification prior to starting work.

4. Certified installer must be present on job site while work is in progress.

C. Testing Laboratory Qualifications:

1. Certified, bonded, qualified and experienced agency to perform pH and moisture vapor emission tests.

D. Pre-installation Meeting:

1. Contactor to notify Construction Manager with a minimum of 5-days notice when anticipated to be ready for pre-installation meeting.

2. Contractor, installer and manufacturer representative are required to attend pre-installation meeting. Contractor is responsible for coordinating and scheduling their attendance.

3. Construction Manager will schedule meeting with Contractor team, Project Inspector, and Architect.

4. Purpose of Meeting: To review subfloor condition and test results; determination of appropriate treatment system(s) and location(s); and review installation requirements.

1.05 SUBMITTALS

A. Provide a complete submittal package with all components required within this section. Submit per Division 1 General Requirements.

1. Product Data: Provide product data describing physical and performance characteristics, material safety data sheets, certificates, warranty information and manufacture’s installation instructions for proposed product.

2. Submit product manufacturer’s field reports and test reports with warranty certification.

3. Submit anhydrous calcium chloride testing according to ASTM F1869 and RH Probe Tests results according to ASTM F2170. Submit substrate pH readings. Tests shall be performed by the Owner's Inspector and results provided to the Architect, Owner, General Contractor, flooring installer and Water Vapor Reduction System Manufacturer's Representative.

1.06 DELIVERY, STORAGE AND HANDLING

A. Delivery: Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.

B. Store products in an approved ventilated dry area; protect from dampness, freezing, and direct sun light. Product should not be stored in areas with temperatures in excess of 90 °F or below
50 °F.

1.07 ENVIRONMENTAL REQUIREMENTS

A. Areas to receive Vapor Emission Control System shall be clean, fully enclosed, weather tight with the permanent HVAC set at a uniform temperature per manufacturer's recommendation.

B. Maintain ambient temperature required by manufacturer three days prior to, during, and 24 hours after installation of Vapor Emission Control System.

C. Do not apply moisture vapor reduction system to unprotected surfaces or when water is accumulated on the surface of the concrete.

D. Do not apply water vapor reduction system when temperature is lower than 50° F or expected to fall below this temperature within 24 hours from time of application.

E. Protection: Protect water vapor reduction system to prevent damage from topical water for a minimum period of 24 hours from time of application.

1.09 WARRANTY

A. Contractor shall file a pre-installation checklist with the manufacturer (as required) and receive written confirmation of the approval to proceed in order to obtain full warranty.

B. Emission control system warranty must be from the manufacturer, in writing, and cover the cost of system materials, cementitious compounds and labor costs of application and preparation. In addition, the warranty must extend to the flooring material, adhesive and installation labor.

C. Warranty period shall be no less than ten years or the life of the flooring covering whichever comes first.

D. Warranty exclusion shall be limited to:

1. Moisture failure due to topical intrusion of plumbing failure or other substances entering from the surfaces.

2. Seismic damage occurring after installation.

3. Replacement of flooring during warranty period as removal of flooring could damage emission control system.

4. Aggregate found to be defective (expansive and reactive aggregate are examples).

E. Warranty shall not exclude cracks visible at time of installation nor "improper installation".

F. Manufacturer to provide evidence of a product liability insurance policy. Insurer shall have no less than an “A” rating from one of the four major rating services. A certificate of insurance shall be delivered to the Owner and shall name the Owner, Architect and General contractor as co-insured. Liability shall be in the amount of $5 million per occurrence.

PART 2 – PRODUCTS

2.01 MATERIALS

A. Vapor Emission Control System: The appropriate system(s) shall depend on the existing slab moisture and pH levels and the requirements of the specific floor covering product. The determination of which of the following systems would be most appropriate and the extent of treatment area(s) shall be made by the Owner’s representative once the existing slab testing results are known.

1. Koester VAP1 2000 System. 100% solids epoxy.

2. Mapei Planiseal VS System. An alkali-resistant, two-component, 100%-solids epoxy coating that effectively stops moisture-related problems with floor coverings.

3. ARDEX MC™ RAPID.100% solids epoxy system.

2.02 MIX DESIGNS

A. VAP1 2000:

1. Use clean containers and mix thoroughly as per Manufacturer's requirements to obtain a homogeneous mixture. Use a low speed motor less than 400 rpm and a two bladed Jiffy mixing blade only. DO NOT AERATE. Mix ratios are measured by volume.

2. VAP I® 2000 Mix Ratio: Mix Component A and B at a ratio of 2.4:1 by volume.

B. Mapai Planiseal VS:

1. Premix Part A to a homogenous consistency (2 to 3 minutes) using a low-speed mixer (at 300 to 450 rpm) and a “jiffy” (paint mixer) mixing paddle.

2. Pour Part B into Part A container and mix thoroughly to a smooth, homogenous consistency. Do not mix at high speeds, which can trap air within the mixed material.

3. Pour and spread the entire unit of any mixed Planiseal VS onto the substrate within 5 minutes of mixing.

C. ARDEX MC Plus:

1. Each individual unit of ARDEX MC RAPID™ Red and ARDEX MC RAPID™ Green contains separate, pre-measured quantities of the hardener (Part A) and the resin (Part B). The hardening agent (Part A) is added to the resin (Part B).

2. ARDEX MRP and/or ARDEX K 301 are mixed in 2-bag batches at one time. Mix each bag of powder with the prescribed amount of water using an ARDEX Mixing Paddle and a 1/2" heavy-duty drill (min. 650 rpm). Mix thoroughly for approximately 2-3 minutes to obtain a lump-free mixture. Follow written installation instructions for each material.

3. For mix designs related to the use of ARDEX underlayments and toppings, refer to the standard mixing instructions for installation over concrete as shown in the manufacturer's installation instructions.

4. For instructions on the filling of dormant cracks and joints, follow the written instructions of the selected epoxy manufacturer.

PART 3 – EXECUTION

3.01 EXAMINATION

A. Calcium Chloride, RH Probe and pH test requirements:

1. Anhydrous calcium chloride testing shall be performed by the Owner's Inspector.

2. Provide anhydrous calcium chloride tests according to ASTM F1869 protocol.

3. Provide RH Probe Tests according to ASTM F2170 protocol.

4. Only conduct calcium chloride tests at the same temperature and humidity expected during normal use. If this is not possible then follow the F1869 method for non-acclimated spaces. Maintain these conditions 48 hours prior to and during tests. Water vapor transmission levels are directly affected by ambient room temperature and readings conducted without a sustained ambient temperature and humidity are NOT acceptable.

5. Provide substrate surface pH readings.

6. Owner's Inspector shall provide test results with a marked-up floor finish plan showing test results. Inspector shall provide a written clarification on status of the ambient air temperature and humidity before and during the testing procedures.

B. Concrete Slab Inspection

1. Existing concrete slabs - Testing for concrete deficiencies and contaminates such as un-reacted silicates, chlorides, A.S.R. (alkali-silica reaction), oil contamination, etc. is recommended by Koster to avoid bonding issues. These conditions can cause bonding concerns with all epoxy and finished floor coatings, including the Koster VAP 1 2000. This testing is not required by Koster. This testing should be performed by the owner's independent testing agency using utilizing standard coring methods and review of the history of the slab installation if available. Concrete should conform to ACI Committee 201 Report "Guide to Durable Concrete."

2. New concrete slabs - Review Section 03 30 00 curing compounds. Silicate based curing compounds should be avoided.

3.02 PREPARATION

A. Inspect all surfaces with regard to their suitability to receive moisture vapor reduction system with manufacturer's representative.

B. Clean all surfaces to receive moisture vapor reduction system. Shot blast all floors to a CPS #3 or #4 and clean surfaces with vacuum and remove all residue off the concrete. Grinding is allowed only in areas not accessible by shot blasting. Do not acid etch. Remove ALL defective materials, and foreign matter such as dust, adhesives, gypsum based patching and leveling compounds, paint, dirt, un-reacted sprayed on silicates, floor hardeners, bond breakers, oil, grease, curing agents, form release agents, efflorescence, laitance, shot blast bee bees, etc. Repair all cracks, expansion joint, control joints, and open surface honeycombs and fill in accordance with Manufacturers recommendations. Inform vapor reduction system manufacturer if concrete additives like silicates or chlorides or any other soluble compounds that have been used in the concrete mix or topically applied. Reinforcing fibers that are visible after shot blasting must be removed and vacuumed leaving no fibers left on the concrete surfaces. **Provide uncontaminated, sound surface.**

C. Repair concrete prior to moisture vapor reduction system. Consult with vapor reduction manufacturer to determine suitable products for concrete repair.

D. Shot blast a small test area and review surface profile with the finished flooring applicator. As the moisture vapor reduction system is not a leveling material make sure the flooring installer is aware that a feather finish or leveling material may be utilized to "flatten" the concrete after the application of the moisture vapor reduction system and prior to the flooring installation.

E. Clean substrate surfaces to receive system treatment and treat surface irregularities with a 100% Portland Cement based patching compounded and cementitious fill compatible with prescribed system treatment as recommended by the manufacturer of the moisture control system.

F. At all treated locations under finish goods i.e. carpet, VCT, etc., install self-leveling material to provide a smooth and uninterrupted concrete substrate for proper installation of floor finish.

3.03 JOINT AND CRACK PREPARATION

A. VAP1 2000:

1. Fill cracks, control joints, voids and deteriorated concrete with CTS Cements Rapid Set Cement All, Mortar Mix, Concrete Mix or Skim Coat prior to the VAP I 2000 application. Allow the products to cure according to Rapid Set's requirements before applying the VAP products over the repaired area. Do not use gypsum based cementitious patching, leveling and repair mortars under the VAP I 2000 systems. Cracks should be opened up to at least 1/4" x 1/4" to allow for a proper amount of Rapid Set materials to fill the voids. Any cracks/voids that may be contaminated by known or unknown substances should be routed out to remove any contaminants.
2. Expansion joints should be repaired per the detail on the VAP I 2000 data sheets. A fumed silica epoxy thickening agent (Aerosil or Cabosil) can be added to the VAP I 2000 products and used in place of cementious materials for control

joints and cracks if needed.

3. Consult with Koster America for crack general repair guidelines.

B. Mapai Planiseal VS:

1. Repair cracks before application of the Planiseal VS using an appropriate high-modulus epoxy (Planibond EBA or Planibond CR 50) mixed with sand if required (depending on the size of crack under repair). Cracks narrower than 1/8” (3mm) may typically be filled with Planiseal VS neat. Cracks wider than 1/8” (3mm) are to be repaired with suitable high-modulus epoxy such as Planibond EBA or Planibond CR 50 (consider an epoxy mortar if appropriate) filled to 1/8” to ¼” (3 to 6mm) shy of the substrate surface (just below flush).

2. Avoid overfilling of cracks with high-modulus epoxies that will lead to epoxy spilling onto substrate. Any epoxy that spills onto the substrate surface must be removed, and any remaining residue must be fully seeded with sand. The subsequent application of the Planiseal VS must take place after all loose sand have been vacuumed up off the floor, and fully encapsulate the epoxy utilized for crack repair.

3. Contraction, control or saw-cut joint treatment – Dormant control joints may typically be filled with Planiseal VS, or with Planibond EBA or Planibond CR 50 (consider an epoxy mortar if appropriate) filled to 1/8” to ¼” (3 to 6mm) shy of the substrate surface (just below flush).

C. ARDEX MC:

1. Moving Joints – honor all expansion and isolation joints up through the ARDEX Moisture Control System, and underlayment or topping.

2. Saw cuts, control joints and dormant cracks –To ensure that a continuous barrier to moisture emissions is created over the entire surface, ARDEX recommends the use of a two-part, low viscosity rigid epoxy crack and joint filler to fill small, non-moving cracks and saw-cut joints in existing concrete substrates. Cracks greater than a hairline in width [1/32” (0.79 mm)] and saw-cuts must be filled in strict accordance with the installation instructions provided by the ARDEX Technical Department. Once the dormant cracks and saw-cuts have been properly filled, allow these areas to cure thoroughly in accordance with the epoxy manufacturer’s recommendations prior to proceeding with the ARDEX MC™ RAPID installation.

3. Saw Cuts, Control Joints and Dormant Cracks – fill all non-moving joints and cracks greater than 1/32” with a rigid, low-viscosity, two-part epoxy joint sealant. Once the cracks and joints have been properly filled, broadcast a sand layer to refusal and allow these areas to cure as recommended by the epoxy manufacturer prior to proceeding with the installation of the ARDEX MC™ RAPID.

3.03 INSTALLATION (per manufacturer’s guidelines or as follows)

A. The coverage rates vary by system. Follow manufacturer recommendations for the specific project application.

B. Application of moisture reduction system shall be in strict accordance with manufacturer recommended methods and installation information.

C. Cementitious underlayment with suitable primer is recommended if required by the Owner, floor covering installer, or the floor covering manufacturer to smooth and/or level surfaces after shot blasting and installation of the moisture reduction system. No underlayment or feather finish system is allowed under the moisture reduction system material. When water-based adhesives are utilized in the floor covering installation, use an approved cementitious underlayment system with primer prior to the installation of the flooring system. Contact the adhesive manufacturer for their minimum recommended thickness of cementitious underlayment to absorb excess moisture in the adhesive. Typically a minimum of 1/8" is required. Note this is only for some water-based adhesives.

3.04 PROTECTION

A. Prohibit any traffic or any activity that generates dust or debris from contaminating the treated slab until finished flooring is installed.

B. Do not install finished flooring until the vapor control system has fully cured in accordance with manufacturer's recommendations.

END OF SECTION 07 26 00

SECTION 07 56 10
BUILT-UP BITUMINOUS ROOFING REPAIR

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work Included:

1. Removal of portions of existing roof membrane in preparation for installation of new mechanical equipment and structural upgrades.

2. Installation of a new built-up bituminous roofing system patch at areas affected by new mechanical equipment and structural upgrades.

B. Related Work Specified Elsewhere:

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

2. Section 06 10 00: Rough Carpentry.

3. Section 07 62 00: Sheet Metal Flashing and Trim.

4. HVAC supports and related items: See Mechanical and Electrical work.

1.02 ROOFING SYSTEMS

A. Unless otherwise noted or specified, built-up bituminous roofing systems are to be by one approved manufacturer utilizing hot asphalt and asphalt saturated glass fiber felts. System shall be mineral cap sheet surfaced and rated as Class A by Underwriters' Laboratories. Systems are to be 20 year or better quality for the particular deck, slope and installation indicated, all as per approved manufacturer's published specifications with limitations as per the following:

1. Roofing systems limited to those systems comprised of one (1) base sheet, three (3) ASTM-D 2178, Type IV glass felts and one (1) ASTM-D 3909 mineral cap sheet.

2. Means and Methods of repair of existing roofing systems shall be provided that maintain existing roofing warranties.

1.03 REFERENCES, CODES AND STANDARDS

A. The following references, codes and standards are hereby made a part of this Section and built-up roofing shall conform to the applicable requirements therein except as otherwise specified herein or shown on the Drawings. Nothing in the Drawings or these Specifications shall be construed as permitting work which is contrary to code requirements.

1. Underwriters' Laboratories, Inc. Building Materials Directory, "Built-Up Roof Covering Materials" and "Roof Deck Constructions", latest edition with current supplements.

2. California Building Code, CBC 2022.

1.04 QUALIFICATION

A. Roofing systems shall be installed only by a qualified roofing contractor which has been in business for not less than five (5) years, is experienced in installing the roofing systems specified and is approved by the built-up roofing materials manufacturer.

1.05 PRE-ROOFING CONFERENCE

A. Pre-roofing conference shall be scheduled by the Contractor in advance of commencing roofing work and ordering of materials. Conference shall be attended by the General Contractor, contractor for roofing, contractors for mechanical and electrical work, representative of the roofing manufacturer and representative of the Architect or Owner's Representative. Contractor shall make a written record of the conference proceedings, which record shall be made a part of the Job File.Copies shall be provided to all parties.

B. Project Specifications and Drawings and all roof and flashing details shall be reviewed and any discrepancies, including discrepancies with roofing manufacturer's specifications, resolved. Code and architectural requirements that are in conflict with UL requirements, shall likewise be resolved.

C. In addition to the above, the conference shall also address itself to the following:

1. Establish trade related job schedules, including installation of roof mounted equipment.

2. Establish roofing schedules and work methods that will prevent roof damage.

3. Require all penetrations and curbs to be in place prior to installing roof.

4. Establish areas on the job site to be used as work and storage areas.

5. Establish weather and working conditions to which all parties must agree.

6. Establish any requirements pertaining to temporary roofing.

7. Establish provisions for monitoring of the roof after completion and prior to acceptance of the entire Project.

D. Where changes to any previously agreed upon conditions are desired, the party requesting the change shall:

1. Give written notice regarding the desired change to all parties. Such request shall be made through the Contractor.

2. Secure written agreement to changes from all parties.

1.06 SUBMITTALS:

A. Submit per the requirements of the Division 1, General Conditions.

B. Certificates:

1. Submit, prior to commencing roofing work, evidence of acceptance of roof applicator by roofing manufacturer.

2. Submit, prior to fabrication, delivery or installation, a statement that materials and components furnished; conform with Specification requirements and that materials and components furnished are compatible for the deck and slope indicated, each one to the other and to adjacent related work. Where manufacturer's systems are modified in any way by requirements of project Specifications, statement shall be submitted by the manufacturer accepting such modifications. Absence of such statements shall imply acceptance. Furthermore, submittal shall include a statement that materials and components furnished and applicator doing the work will maintain the existing roofing warranties.

C. Manufacturer's Data: At least 30 days prior to commencing work, furnish to the Architect, two (2) copies of approved manufacturer's specifications for roofing and related flashing installations, listing specific materials proposed for each.

1.07 DELIVERY, STORAGE AND HANDLING OF MATERIALS

A. Deliver materials to the work site in unopened packages bearing the manufacturer's label and U.L. listing mark (where applicable). Stencil softening pointon each bitumen container. A11 materials, except fasteners, shall be labeled products of approved manufacturer.

B. Stack rolls of felt and fabric on end on wood pallets in properly protected piles covered with tarpaulin and maintain at a temperature of 50° or over for a period of not less than 24 hours prior to laying. If polyethylene protection is used, it shall be properly vented. Felt and fabric shall be dry when applied.

C. Store containers of bitumen on wood or other clean, rigid pads to prevent adherence of foreign materials.

D. Bitumens delivered and stored in bulk shall be accompanied by a certificate of the manufacturer clearly stating the type, quality and softening point and shall be maintained in a manner so as not to alter their properties.

E. Do not cause or permit construction materials or equipment to be used or stored in such manner or concentrations as to cause damage to built-up roofing.

1.08 JOB CONDITIONS

A. Environmental Requirements: Apply roofing materials and components in dry weather and at ambient temperatures not less than 45°F. If below 45°F, consult manufacturer on procedures.

B. Protection:

1. Effectively protect buildings from damage by roofer's materials and/or operations. Take care to prevent bitumen from running into and clogging roof drains and rainwater leaders.

2. It shall be the General Contractor's responsibility to protect the completed roofing work from damage due to construction operations. Where it is necessary to use completed work for traffic or for installation of other items of the whole work, and where protection is not otherwise specified herein, plywood on planks shall be provided so that storage of materials and traffic use does not occur directly on roofing.

1.09 PROTECTION OF BUILDING

A. Protect building surfaces against damage from roofing work.

1.10 WARRANTY

A. Unless superceeded by compliance with an existing roofing warranty, the roofing contractor will guarantee all work (materials and labor) under this contract for 3 years in a written document containing the following paragraph:

"If, within three years after the date of final payment, any of the work of this Contract is found to be defective, or not according to the specifications, the Contractor will correct the work within 30 days after receipt of written notice from the Owner to do so. In an emergency leaking condition, the Contractor shall make temporary repairs within 24 hours of telephone or written notice and complete permanent repairs within 14 days, all at no cost to the Owner. Contractor shall provide the prompt repair and replacement of all component materials or systems that admit water or otherwise malfunction, including consequent damage to the building and its contents".

B. Work shall be warranted against, but not limited to, leakage, displacement, buckling, tearing, splitting, alligatoring, blistering, and pulling loose.

C. The roofing manufacturer will guarantee the roof against leaks and system failure under this contract for a period of 20 years and NDL in a written document.

D. The roofing manufacturer will guarantee that the existing roofing warranty is still valid after installation of new work for full remaining period of existing warranty.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Roofing for slopes to 1" Mineral Surfaced Roof System, Johns Manville 5GNC or equal as required to maintain existing roof warranty:

1. Sheet Materials:

   a. Glass Fiber Felts ASTM D 2178: Type VI. Johns Manville GlasPly Premier.

   b. Base Sheet: ASTM D 4601, asphalt saturated and coated inorganic base sheet. Johns Manville PermaPly 28.

   c. Mineral Surfaced Felts: ASTM D 3909; white colored mineral granules. Johns Manville GlasKap.

   d. Dry Sheathing Paper: Red rosin paper, unsaturated.

2. Bituminous Materials:

   a. Asphalt Bitumen: ASTM D 312, Type III Trumbull TruLo

   b. Plastic Cement: ASTM D 4586, Type II, cutback asphalt type. Johns Manville Bestile/Industrial Cement.

3. Flexible Flashings:

a. Sheet Flashing: Rubber modified bitumen sheet containing two polyester mats and a fibrous glass mesh; DynaFlex manufactured by Johns Manville.

b. Flashing specifications DFE 3 WL as listed in the current Johns Manville specification manual.

4. Cants:

a. Perlite Cant and Tapered Edge Strips: Asphalt impregnated perlite (Fes-Cant), preformed to 45 degree angle.

5. Accessories:

a. Roofing Nails: 1 inch diameter head ringed shank nails, size as required to suit application.

b. Traffic Pads: Johns Manville DynaTred.

B. Roofing for slopes to 2” Mineral Surfaced Roof System, Johns Manville 5GIC.

1. Sheet Materials:

a. Glass Fiber Felts: ASTM D 2178, Type VI, JM GlasPly Premier.

b. Mineral Surfaced Felts: ASTM D 3909; JM GlasKap white colored mineral granules.

2. Bituminous Materials:

a. Asphalt Bitumen: ASTM D 312, Type III.

b. Bestile Industrial Cement.

3. Flexible Flashings:

a. Sheet Flashing: Rubber modified bitumen sheet containing two polyester mats and a fibrous glass mesh; DynaFlex manufactured by Johns Manville. Flashing specifications DFE as listed in the current Johns Manville specification manual.

4. Roof Surfacing:

a. Mineral Surfaced Cap Sheet: ASTM D-3909.

5. Cants:

a. Perlite Cant and Tapered Edge Strips: Asphalt impregnated perlite (Fes-Cant), preformed to 45 degree angle.

6. Accessories:

a. Roofing Nails: 1 inch diameter head ringed shank.

b. Traffic Pads: Johns Manville Dyna-Tred.

c. A premium No. 12 hexhead roof insulation fastener coated with ClimaSeal for superior corrosion resistance. UltraFast is required on all Johns Manville guaranteed systems using insulation over metal or other nailable decks. To be used with UltraFast Locking Plastic Plates or UltraFast Galvalume Metal Plates.

2.02 RIGID INSULATION (if required)

A. Insulation: Johns-Manville – Fesco Board, or approved equal conforming to ASTM C728-05; expanded perlite mineral aggregate board; R-Value 2.78 per inch, 10% Consolidation - 40 PSI. Board size per manufacturer's standard sizes. Board edges square. Compression resistance to be per ASTM C165 – 20 psi. Total board thickness as required to match thicknes of existing installation where occurs, Johns-Manville – Tapered Fesco Board, or approved equal where required to match existing installation where occurs, or to form new roof slopes or crickets where indicated on the drawings. Tapered insulation board shall match slope of existing installation where occurs, new installations shall be furnished with a minimum slope of 1/4-inch per foot unless noted otherwise on the drawings.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verity that surfaces and site conditions are ready to receive work.

B. Verify that deck is supported and secured.

C. Verify flatness and tight joints of wood decking. Fill knot holes with latex filler.

D. Verify that roof openings, curbs, pipes, sleeves, ducts, and vents through roof are solidly set, and wood cant strips and reglets are in place.

E. Verify if existing rigid insulation occurs below existing membrane.

F. Beginning of installation means installer accepts existing substrate.

3.02 MEMBRANE APPLICATION FOR SLOPES TO 1"; JOHNS MANVILLE 5GNC or approved equal and means and methods as may be required to maintain existing warranty.

A. Using Perma Ply 28 base sheet starting at the low edge of roof apply one 18" wide. The following base sheet courses are to be applied full width, lapping the preceding felt 2" on the side laps and 4" on the end laps. Nail the side laps 9" o.c. down the longitudinal center of each felt, place two rows of nails spaced approximately 11" apart, with the nails staggered on approximately 18" centers. Use nails or fasteners appropriate to the type of deck with 1" minimum diameter caps.

B. Using GlasPly Premier felt apply a piece 12" wide, then over that, one 24", then over both, a full width piece. The following felts are to be applied full width, overlapping the preceding felts by 2-2/3" so that at least 3 plies of felt cover the base felt/substrate at all locations. Install each felt so that it is firmly and uniformly set, without voids, into the hot asphalt (within 25 degrees F of the EVT) applied just before the felt at a nominal rate of 23 lbs. per square over the entire surface.

C. Equiviscous Temperature at Point of Application: No more than 25 degrees F (14 degrees C) from bitumen rating indicated on bitumen container label.

D. Apply Mineral Surface roof membrane by cutting the cap sheet into handleable lengths (12' – 18') and allow to flatten. Starting at the low edge of the roof area, apply one layer of the cap sheet in a full width mopping of hot asphalt (approx. 20 degrees F above the EVT to maximize bonding of the cap sheet to the ply sheets), also apply asphalt to the side lap areas on the backside of the cap sheet. Then flop the cap sheet into the hot asphalt. At ambient temperature below 70 degrees F. The cap sheet must be firmly and uniformly set into the hot asphalt with all edges well sealed.

E. Apply felts smooth, free from air pockets, wrinkles, fishmouths, lap joints, or tears.

F. Extend membrane felts to the top of cant strips and minimum of 2 inches (50 mm) onto vertical surfaces. Mop on one additional ply of felt and one ply of granular surfaced SBS flashing felt as base flashings over roofing membrane plies.

G. Mop and seal two additional plies of felt around roof penetrations.

H. Install traffic pads.

I. Apply granular surfaced SBS flexible base flashings to seal membrane to vertical elements. Flashing specifications as listed in the current Johns Manville Roofing Manual DFE 3.

J. Coordinate installation of roof drains and related flashings.

K. Mop in and seal flashings and flanges of items penetrating membrane with two plies of felt.

3.03 MEMBRANE APPLICATION FOR SLOPES TO 2"; JOHNS MANVILLE 5GIC or approved equal to maintain existing warranty:

A. Mechanically fasten with Ultrafast Fasteners 1" Fesco Board to the plywood deck.

B. Lay insulation boards with edges in moderate contact without forcing. Cut insulation to fit neatly to perimeter blocking and around penetrations through the roof.

C. Mechanically fasten boards per FM I-90 (although no rating applies).

D. Apply no more insulation than can be sealed with membrane in same day.

E. Starting at the low edge of roof one 12 inch wide, then over that one 24 inch wide, then over both a full 36 inch wide GlasPly Premier, following felts to be applied full width, overlapping each felt 24 2/3 inches giving a minimum of 3 plies cover the insulation in all locations. Install each felt so that it shall be firmly and uniformly set, without voids, into the hot asphalt (within 25 degrees F of the EVT) applied just before the felt at a nominal uniform rate of 23 lbs. per square over the entire surface.

F. Equiviscous Temperature at Point of Application: No more than 25 degrees F (14 degrees C) from bitumen rating indicated on bitumen container label.

G. Apply Mineral Surface roof membrane by cutting the cap sheet into handleable lengths (12' – 18') and allow to flatten. When nailing is required, cut the cap sheet into lengths which conform to the nailer spacing. Starting at the low edge of the roof area, apply one layer of the cap sheet in a full width mopping of hot asphalt (approx. 20 degrees F above the EVT to maximize bonding of the cap sheet to the ply sheets), also apply asphalt to the side lap area on the backside of the cap sheet. Then flop the cap sheet into the hot asphalt. At ambient temperature below 70 degrees F. The cap sheet must be firmly and

uniformly set into the hot asphalt with all edges well sealed.

H. Apply felts smooth, free from air pockets, wrinkles, fishmouths, lap joints, or tears.

I. Extend ply membrane felts to the top of cant strips and minimum of 2 inches (50 mm) onto vertical surfaces. Mop on one additional ply of felt and one ply of granular surfaced SBS flashing felt as base flashings over roofing membrane plies.

J. Mop and seal two additional plies of felt around roof penetrations.

K. Install traffic pads.

L. Apply granular surfaced SBS flexible base flashings to seal membrane to vertical elements. Flashing specifications as listed in the current Johns Manville Roofing Manual.

M. Coordinate installation of roof drains, sumps and related flashings.

N. Mop in and seal flashings and flanges of items penetrating membrane with two plies of felt.

3.04 CLEANING

A. Remove bituminous markings from finished surfaces.

B. In areas where finished surfaces are soiled by asphalt or any other source of soiling caused by work of this Section, consult manufacturer of surfaces for cleaning advice and conform to their documented instructions.

C. Repair or replace defaced or disfigured finishes caused by work of this Section.

3.05 RIGID INSULATION

A. Where existing rigid insulation occurs, and cannot be salvaged for re-use, install new rigid insulation to match thickness of existing. Fasten with mechanical screw fasteners in full accordance with manufacturer's written instructions. Tape all joints prior to installation of new roofing. If existing insulation can be removed and re-installed without damage to existing product, and such re-use will not prevent full compliance with Paragraph 1.10 – Warranty, it may be reinstalled with mechanical screw fasteners in full accordance with manufacturer's written instructions.

3.06 PROTECTION

A. Where traffic must continue over finished roof installation, protect surfaces.

END OF SECTION 07 56 10

SECTION 07 62 00
SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes the following sheet metal flashing and trim:

1. Miscellaneous fabricated sheet metal items, including flashings and counter-flashings, as needed to provide a weathertight enclosure.

B. Related Requirements:

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

2. Section 07 56 10: Built-Up Bituminous Roofing Repair.

5. Section 07 90 00: Joint Sealers.

6. Section 09 90 00: Painting.

1.02 REFERENCE STANDARDS

A. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

B. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.

C. ASTM B32 - Standard Specification for Solder Metal.

D. ASTM D4586/D4586M - Standard Specification for Asphalt Roof Cement, Asbestos-Free.

E. SMACNA (ASMM) - Architectural Sheet Metal Manual; Sheet Metal and Air Conditioning Contractors' National Association.

1.03 ADMINISTRATIVE REQUIREMENTS

A. Pre-installation Meeting: Conduct conference at Project Site and convene one week before starting work of this section.

1. Review construction schedule. Verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.

2. Review requirements for insurance and certificates if applicable.

3. Review sheet metal flashing observation and repair procedures after flashing installation.

1.04 SUBMITTALS

A. Submit per the requirements of Division 1, General Requirements.

B. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

C. Shop Drawings: Show layouts of sheet metal flashing and trim. Distinguish between shop- and field-assembled work. Include the following:

1. Identify material, thickness, weight, and finish for each item and location in Project.

2. Details for forming sheet metal flashing and trim, including profiles, shapes, seams, and dimensions.

3. Details for fastening, joining, supporting, and anchoring sheet metal flashing and trim, including fasteners, clips, and attachments to adjoining work.

4. Include details of termination points and assemblies.

5. Include details of connections to adjoining work.

6. Do not submit Architectural Drawings. Submit fabricator's shop drawings to confirm the actual profiles, shapes, seams, and dimensions of the sheet metal flashing and trim to be installed for the Project.

D. Samples for Verification: For each type of flashings and trims, prepared on Samples of size indicated below:

1. Sheet Metal Flashings: Minimum 12 inches long by actual width of unit, including finished seam and in required profile. Include fasteners, cleats, clips, closures, and other attachments.

2. Trim: Closures, Expansion Joints, Joint Intersections, and Miscellaneous Fabrications: Minimum 12 inches long and in required profile. Include fasteners and other exposed accessories.

E. Submit Qualification Data of firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information.

F. Product Test Reports: For each product, for tests performed by a qualified testing agency.

G. Maintenance Data: For sheet metal flashing and trim, and its accessories, to include in maintenance manuals.

H. Warranty: Sample of special warranty.

I. Maintain one copy of each document on site.

1.05 QUALITY ASSURANCE

A. Sheet Metal Flashing and Trim Standard: Perform work in accordance with SMACNA Architectural Sheet Metal Manual requirements and standard details, except as otherwise indicated.

B. Fabricator/Installer Qualifications: A firm experienced in fabricating and installing sheet metal flashing and trim systems similar in material and extent to those indicated for this

Project, and whose work has resulted in applications with a record of successful in-service performance.

1. Company specializing in performing the work of this section with minimum three (3) years of experience.

2. Workers: Thoroughly skilled and specially trained in the techniques fabricating and installing sheet metal flashing and trim. Fabricators shall be able to demonstrate acceptable level of skill for review and acceptance by the Architect.

C. Use adequate numbers of skilled workmen thoroughly trained and experienced in the necessary crafts and completely familiar with the specified requirements and methods needed for proper performance of the Work of this Section.

D. All Work shall be subject to acceptance by the Owner and Architect. All Work that does not comply with the intent of the specifications shall be corrected by the Contractor.

1.06 COORDINATION

A. Coordinate installation of sheet metal flashing and trim with interfacing and adjoining construction to provide a leak proof, secure, and noncorrosive installation.

B. Coordinate sheet metal flashing and trim layout and seams with sizes and locations of penetrations to be flashed, and joints and seams in adjacent materials.

1.07 DELIVERY, STORAGE AND HANDLING

A. Stack materials on platforms or pallets, covered with suitable weathertight and ventilated covering. Slope metal sheets to ensure drainage.

B. Do not store sheet metal materials in contact with other materials that might cause staining, discoloration, denting, or other surface damage.

C. Deliver sheet metal flashing materials and fabrications undamaged. Protect sheet metal flashing and trim materials and fabrications during transportation and handling.

D. Unload, store, and install sheet metal flashing materials and fabrications in a manner to prevent bending, warping, twisting, and surface damage.

E. Protect strippable protective covering on sheet metal flashing and trim from exposure to sunlight and high humidity, except to extent necessary for period of sheet metal flashing and trim installation.

F. Environmental requirements: Proceed with work of this section only when existing and forecasted weather conditions will permit the application to be performed in accordance with the manufacturer's recommendations.

G. Remove all materials, including cloths, tarps, and empty containers from the area of Work at the close of each day.

1.08 REGULATORY REQUIREMENTS

A. Conform to applicable federal, state, and local regulatory requirements including flame and smoke rating requirements for finishes.

B. Flammable Liquids serve all current regulation regarding flammable liquids such as posting “No Smoking” signs. Allow no open flames, welding, or other ignition sources in the Work.

C. Conform to all applicable laws, codes, and regulations for disposal of all materials, debris, and containers.

1.09 WARRANTY

A. General: Special warranty specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

B. Special Fabricator’s/Installer's Warranty: Installer's standard form in which Fabricator/Installer agrees to repair or replace sheet metal products that do not comply with performance and other requirements specified in this Section within specified warranty period.

1. Warranty Period: Three (3) years from date of Substantial Completion.

PART 2 – PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. General: Install sheet metal flashing and trim to withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failing, rattling, leaking, and fastener disengagement.

B. Sheet Metal Standard for Flashing and Trim: Comply with NRCA's "The NRCA Roofing Manual and SMACNA's "Architectural Sheet Metal Manual" requirements for dimensions and profiles shown unless more stringent requirements are indicated.

C. Thermal Movements: Provide sheet metal flashing and trim that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, hole elongation, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Provide clips that resist rotation and avoid shear stress as a result of sheet metal thermal movements. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

D. Water Infiltration: Provide sheet metal flashing and trim that do not allow water infiltration to building interior.

2.02 SHEET METALS

A. General: Protect mechanical and other finishes on exposed surfaces from damage by applying strippable, temporary protective film before shipping.

B. Sheet Metal Thickness: The following table may be used to convert specified sheet metal thickness to gauges. Not all materials will be used on the Project.

Gauge No.	Aluminum	Stainless Steel	Zinc-Tin Coated Stainless Steel	Galvanized	Aluminum Zinc Coated Steel	Zinc
12	.081"	---	---	---	---	.028"
13	.072"	---	---	---	---	.032"
14	.064"	---	---	---	---	.036"
15	.057"	---	---	---	---	.040"
16	.050"	.063"	---	.064"	.064"	.045"
18	.040"	.050"	---	.052"	.052"	.055"
20	.032"	.038"	---	.040"	.040"	.070"
22	.025"	.031"	---	.034"	.034"	.090"
24	.020"	.025"	---	.028"	.028"	.125"
25	.018"	.022"	.024"	.025"	.025"	---
26	.017"	.019"	.018"	.022"	.022"	---

C. Stainless Steel: ASTM A666 Type 304, soft temper, minimum 0.019 inch (0.5 mm) thick; smooth No. 4 finish.

2.03 ACCESSORIES

A. General: Provide materials and types of fasteners, solder, protective coatings, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation and as recommended by manufacturer of primary sheet metal unless otherwise indicated.

B. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads and recommended by manufacturer of primary sheet metal.

1. General: Blind fasteners or self-drilling screws, gasketed, with hex-washer head.

a. Exposed Fasteners: Stainless steel bolts and stainless steel and neoprene washers. Neoprene isolator at washer if stainless steel bolts contact with galvanized steel. Heads matching color of sheet metal using plastic caps or factory-applied coating.
b. Blind Fasteners: High-strength aluminum or stainless-steel rivets suitable for metal being fastened.

2. Fasteners for Stainless-Steel Sheet: Series 300 stainless steel.

C. Primer: Zinc chromate type.

D. Protective Backing Paint: Zinc molybdate alkyd.

E. Elastomeric Sealant: ASTM C 920, elastomeric polymer sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight. Refer to Section 07 90 00 Joint Sealers.

F. Plastic Cement: ASTM D4586, Type I.

2.04 FABRICATION

A. General: Custom fabricate sheet metal flashing to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions,

geometry, metal thickness, and other characteristics of item indicated. Shop fabricate items where practicable.

1. Fabricate sheet metal flashing and trim in thickness or weight needed to comply with performance requirements, but not less than that specified for each application and metal.

2. Obtain field measurements for accurate fit before shop fabrication.

3. Form sheet metal flashing and trim to fit substrates without excessive oil canning, buckling, and tool marks; true to line, levels, and slopes; and with exposed edges folded back to form hems.

4. Conceal fasteners and expansion provisions where possible. Do not use exposed fasteners on faces exposed to view.

B. Form sections true to shape, accurate in size, square, and free from distortion or defects.

C. Fabrication Tolerances: Fabricate sheet metal flashing and trim that is capable of installation to a tolerance of 1/4 inch in 20 feet on slope and location lines indicated on Drawings and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

D. Expansion Provisions: Where lapped or bayonet-type expansion provisions in the Work cannot be used, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with elastomeric sealant concealed within joints.

1. Provide loose locking slip joint of maximum 8 feet from external and internal corners, maximum 24 feet length of straight runs, unless manufacturer recommends more frequent interval, and 1 at center of runs less than 20 feet, but more than 8 feet, unless specified otherwise following herein.

2. Size and locate joints, fastenings, reinforcements and supports as required to preclude distortion or displacement due to thermal expansion and contraction. Conceal fastenings wherever possible.

E. Sealed Joints: Form non-expansion but movable joints in metal to accommodate elastomeric sealant to comply with SMACNA recommendations. Refer to Section 07 90 00 “Joint Sealers”.

F. Form pieces in longest possible lengths.

G. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal.

H. Fabricate cleats and attachment devices of sizes as recommended by SMACNA's "Architectural Sheet Metal Manual" and by FMG Loss Prevention Data Sheet 1-49 for application, but not less than thickness of metal being secured.

I. Hem exposed edges on underside 1/2 inch; miter and seam corners. Raw edges will not be permitted.

J. Seams: Form non-moving seams with flat lock seams, except where otherwise indicated. Form seams and seal with elastomeric sealant unless otherwise recommended by sealant manufacturer for intended use. Rivet joints where necessary for strength.

K. Fabricate corners from one piece with minimum 18 inch long legs; seam for rigidity, seal with sealant.

L. Metal Accessories: Provide sheet metal clips, straps, anchoring devices, and similar accessories as required for installation of work, matching or compatible with material installed, non-corrosive, size and gauge as required for performance.

M. Do not use graphite pencils to mark metal surfaces.

2.05 WALL SHEET METAL FABRICATIONS

A. Through-Wall Flashing not associated with metal wall panels from Section 11 40 00: Fabricate continuous flashings in minimum 96-inch-long, but not exceeding 12-foot- long, sections, under copings, and at shelf angles. Fabricate discontinuous lintel, sill, and similar flashings to extend 6 inches beyond each side of wall openings; and form with 2-inch- high, end dams. Fabricate from the following materials:

1. Stainless Steel: 0.019 thick.

B. Opening Flashings in Frame Construction: Fabricate head, sill, and similar flashings to extend 4 inches beyond wall openings. Form head and sill flashing with 2-inch-high end dams. Fabricate from the following materials:

1. Stainless Steel: 0.019 thick.

PART 3 – EXECUTION

3.01 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, substrate, and other conditions affecting performance of the Work.

1. Verify compliance with requirements for installation tolerances of substrates.

2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.

3. Verify that air- or water-resistant barriers have been installed over sheathing or backing substrate to prevent air infiltration or water penetration.

4. Verify roof openings, curbs, pipes, sleeves, ducts, and vents through roof are solidly set, reglets in place, and nailing strips located.

5. Verify roofing termination and base flashings are in place, sealed, and secure.

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

3.02 PREPARATION

A. Install starter and edge strips, and cleats before starting installation.

B. Install surface mounted reglets true to lines and levels. Seal top of reglets with sealant.

C. Back paint concealed metal surfaces with protective backing paint to a minimum dry film thickness of 15 mil.

3.03 INSTALLATION, GENERAL

A. Comply with standards of SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item indicated.

B. General: Anchor sheet metal and other components of the Work securely in place, with provisions for thermal and structural movement. Use fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.

1. Install sheet metal flashing and trim true to line, levels, and slopes. Provide uniform, neat seams with minimum exposure of solder, welds, and sealant.

2. Install sheet metal flashing and trim to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.

3. Space cleats not more than 12 inches apart. Attach each cleat with at least two fasteners. Bend tabs over fasteners.

4. Install exposed sheet metal flashing and trim with limited oil canning, and free of buckling and tool marks.

5. Torch cutting of sheet metal flashing and trim is not permitted.

6. Do not use graphite pencils to mark metal surfaces.

C. Metal Protection: Where dissimilar metals contact each other, or where metal contacts pressure-treated wood or other corrosive substrates, protect against galvanic action or corrosion by painting contact surfaces with bituminous coating or by other permanent separation as recommended by sheet metal manufacturer or cited sheet metal standard.

1. Coat concealed side of stainless-steel sheet metal flashing and trim with bituminous coating where flashing and trim contact wood, ferrous metal, or cementitious construction.

2. Underlayment: Where installing sheet metal flashing and trim directly on cementitious or wood substrates, install underlayment and cover with slip sheet or install a course of polyethylene underlayment.

D. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at maximum of 10 feet with no joints within 24 inches of corner or intersection.

1. Form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with sealant concealed within joints.

2. Use lapped expansion joints only where indicated on Drawings.

E. Fasteners: Use fasteners of sizes that will penetrate substrate not less than 1-1/4 inches for nails and 3/4 inch for wood screws.

F. Conceal fasteners and expansion provisions where possible in exposed work and locate to minimize possibility of leakage. Cover and seal fasteners and anchors as required for a tight installation. Use exposed fasteners only where permitted.

G. Fit flashings tight in place. Make corners square, surfaces true and straight in planes, and lines accurate to profiles.

H. Seal joints as required for watertight construction.

1. Use sealant-filled joints unless otherwise indicated. Embed hooked flanges of joint members not less than 1 inch into sealant. Form joints to completely conceal sealant. When ambient temperature at time of installation is between 40 and 70 deg F, set joint members for 50 percent movement each way. Adjust setting proportionately for installation at higher ambient temperatures. Do not install sealant-type joints at temperatures below 40 deg F.

2. Prepare joints and apply sealants to comply with requirements in Section 07 90 00 "Joint Sealers."

3.04 WALL FLASHING INSTALLATION

A. General: Install sheet metal wall flashing to intercept and exclude penetrating moisture according to SMACNA recommendations and as indicated. Coordinate installation of wall flashing with installation of wall-opening components such as windows, doors, and louvers.

B. Openings Flashing in Frame Construction: Install continuous head, sill, and similar flashings to extend 4 inches beyond wall openings.

3.05 ERECTION TOLERANCES

A. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerance of 1/4 inch in 20 feet on slope and location lines indicated on Drawings and within 1/8 inch offset of adjoining faces and of alignment of matching profiles.

3.06 FIELD QUALITY CONTROL

A. Inspection will involve surveillance of work during installation to ascertain compliance with specified requirements.

3.07 CLEANING AND PROTECTION

A. Cleanup: At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

B. Legally dispose of debris in accordance with local, state, and federal regulations.

C. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.

D. Clean and neutralize flux materials. Clean off excess solder.

E. Clean off excess sealants.

F. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed unless otherwise indicated in manufacturer's written installation instructions. On completion of sheet metal flashing and trim installation, remove unused materials and clean finished surfaces as recommended by sheet metal flashing and trim

manufacturer. Maintain sheet metal flashing and trim in clean condition during construction.

G. Replace sheet metal flashing and trim that have been damaged or that have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

H. Protect work of other trades from damage. Correct damage by cleaning, repairing, or replacing as approved by Architect. Leave in an undamaged condition.

END OF SECTION 07 62 00

SECTION 07 90 00
JOINT SEALERS

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. Building and site paving joint sealants.

1.02 RELATED SECTIONS

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

B. Section 08 11 00: Metal Doors and Frames.

C. Section 32 16 00: Portland Cement Concrete Paving.

D. Mechanical, Plumbing and Electrical Sections.

1.03 REFERENCES

A. ASTM C834-10 - Latex Sealants.

B. ASTM C920-05 - Elastomeric Joint Sealants.

C. ASTM E84-10 - Test Method for Surface Burning Characteristics of Building Materials.

D. ASTM E119-07a - Method for Fire Tests of Building Construction and Materials.

E. ASTM E814-02 - Test Method for Fire Tests of Through Penetration Firestops.

F. FM (Factory Mutual) - Fire Hazard Classifications.

G. UL - Fire Hazard Classifications.

H. UL 263 - Fire Tests of Building Construction and Materials.

I. UL 723 - Test for Surface Burning Characteristics of Building Materials.

J. UL 1479 - Fire Tests of Through-Penetration Firestops.

K. FS TT-S-00227 - Sealing Compound: Elastomeric Type, Multi-Component.

L. FS TT-S-00230 - Sealing Compound: Elastomeric Type, Single Component.

M. FS TT-S-001543 - Sealing Compound, Silicone Rubber Base.

1.04 SUBMITTALS

A. Submit per the requirements of Divisions 1, General Requirements.

B. Submit product data indicating sealant chemical characteristics, performance criteria, limitations, and color availability.

C. Submit physical samples.

D. Submit standard color ranges of exposed materials for Architect selection.

E. Submit manufacturer's installation instructions.

F. Submit VOC information for each product included in submittal.

1.05 QUALITY ASSURANCE

A. Manufacturer: Company specializing in manufacturing the products specified in this Section with minimum three years experience.

B. Applicator: Company specializing in applying the work of this section with minimum three years experience, with projects of a similar size and type.

C. Conform to Sealant Water-proofing and Restoration Institute requirements for materials and installation.

D. Prior to installation of joint sealants, field test adhesion to joint substrates.

1. Install joint sealants in 5-foot joint lengths. Allow to cure before testing. Test adhesion by pulling sealant out of joint.

2. Perform field tests for each type of elastomeric sealant and joint substrate.

3. Arrange for tests to take place with joint sealant manufacturer’s technical representative present.

4. Report whether or not sealant in joint connected to pulled out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each type of product and joint substrate.

5. Sealants not evidencing adhesive failure from testing, in absence of other indications of non-compliance with requirements, will be considered satisfactory. Do not use sealants that fail to adhere to joint substrate during testing.

1.06 ENVIRONMENTAL REQUIREMENTS

A. Do not install solvent curing sealants in enclosed building spaces.

B. Maintain temperature and humidity recommended by the sealant manufacturer during and after installation.

C. Do not install sealants under adverse weather conditions or when temperatures are above or below manufacturer's recommended limitations for installation.

D. 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.

E. All adhesives, sealants, and caulks shall have a maximum VOC limit of 250 grams per liter.

1.07 SEQUENCING AND SCHEDULING

A. Coordinate the work of this Section with all Sections referencing this Section.

1.08 WARRANTY

A. Provide two-year warranty for materials and workmanship under provisions of the General Conditions.

B. Warranty: Include coverage of installed sealants and accessories which fail to achieve air tight and watertight seal, exhibit loss of adhesion or cohesion, or do not cure.

PART 2 – PRODUCTS

2.01 SEALANTS

A. Silicone Sealant: Silicone Sealant (use at glazing applications): FS TT-S-01543, Class A, low modulus type; Spectrum I as manufactured by Tremco, Inc.

B. Interior Building Sealant: Acrylic-emulsion; one-part, non-sag, mildew-resistant. Complying with ASTM C834-10, formulated to be paintable; Pecora Corp. “AC-20”, Sonneborn “Sonolac”, Tremco Inc. “Tremco Acrylic Latex 834” or approved equal.

C. Sanitary Sealant: One-part mildew-resistant silicone; ASTM C920 Type S; Grade NS Class 25; Uses NT, G, A and O; formulated with fungicide for sealing interior joints with nonporous substrates around ceramic file, showers, sinks and plumbing fixtures; Dow Corning Corp. “786 Mildew Resistant”, or approved equal.

D. Acoustical Sealant for Concealed Joints: Nondrying, non-hardening, non-skinning, non-staining, gunnable, synthetic rubber sealant recommended for sealing interior concealed joints to reduce transmission of airborne sound; Pecora Corp. “BA-98”, Tremco Inc. “Tremco Acoustical Sealant” or approved equal.

E. Acoustical Sealant for Exposed Joints: Non-oxidizing, skinnable, paintable, gunnable sealant recommended for sealing interior exposed joints to reduce transmission of airborne sound; Pecora Corp. “AC-20”, USG “Sheetrock Acoustical Sealant” or approved equal.

F. Concrete Expansion Joints: Joint sealing material shall be a two-component, self-leveling, polyurethane elastomeric sealant. Product shall be Sikaflex 2cSL as manufactured Sika Corporation, or equal. Color shall be chosen from the full range of manufacturer’s standard colors.

G. Vertical Building Expansion Joints: Joint sealing material shall be a one-component, polyurethane-based non-sag elastomeric sealant. Product shall be Sikaflex Construction Sealant as manufactured Sika Corporation, Pecora Corp. “DynaTrol II”, Dow Corning 758 Weather Barrier Sealant or approved equal. Color shall be chosen from the full range of manufacturer’s standard colors.

H. Sheet Metal Flashings, Trims, Gutters, & Joints: Joint sealing material shall be a premium-grade, high-performance, moisture-cured, 1-component, polyurethane-based, non-sag elastomeric sealant. Product shall be ‘Sikaflex 1a’ as manufactured Sika Corporation, or equal. Color shall be chosen from the full range of manufacturer’s standard colors. Provide

Sikaflex 260 Primer at all stainless steel and/or galvanized substrate location for proper adhesion of Sikaflex 1a.

J. Colors of sealants shall be as selected by Architect from manufacturer's full range of standard colors at time of submittal.

2.02 ACCESSORIES

A. Primer: Non-staining type, recommended by sealant manufacturer to suit application.

B. Joint Cleaner: Non-corrosive and non-staining type, recommended by sealant manufacturer; compatible with joint forming materials.

C. Joint Backing: Non-staining; compatible with sealant and primer; such as round, closed cell polyethylene foam rod; oversized 30 to 50 percent larger than joint width. Materials impregnated with oil, bitumen or similar materials shall not be used. Sealant shall not adhere to back-up material.

D. Bond Breaker: Pressure sensitive tape recommended by sealant manufacturer to suit application.

E. Solvents; cleaning agents or other accessory materials shall be as recommended by the sealant manufacturer.

PART 3 – EXECUTION

3.01 EXAMINATION

A. Verify that surfaces and joint openings are ready to receive work and field measurements are as shown on Drawings and recommended by the manufacturer.

B. Beginning of installation means installer accepts existing surfaces.

3.02 PREPARATION

A. Clean and prime joints in accordance with manufacturer's instructions.

B. Remove loose materials and foreign matter which might impair adhesion of sealant.

C. Verify that joint backing and release tapes are compatible with sealant.

D. Perform preparation in accordance with sealant manufacturer's recommendations.

E. Protect elements surrounding the work of this Section from damage or disfiguration.

F. Clean concrete, masonry, unglazed surfaces of ceramic tile and similar porous surfaces, by brushing, grinding, blast cleaning, mechanical abrading, or acid washing to produce a clean, sound substrate. Remove loose particles remaining from cleaning operations by vacuuming or blowing out joints.

G. Clean metal, glass, glazed surfaces of ceramic tile and other non-porous surfaces by chemical cleaners or other means which are not harmful to substrates or leave residues capable of interfering with adhesion of joint sealants.

3.03 INSTALLATION

A. Install sealant in accordance with manufacturer's instructions.

B. Caulk all exterior joints and openings in the building envelope that are observable sources of air infiltration.

C. Measure joint dimensions and size materials to achieve required width/depth ratios.

D. Install joint backing to achieve a neck dimension no greater than 1/3 the joint width. Roll the material into the joint to avoid lengthwise stretching. Do not twist or braid rod stock.

E. Install bond breaker where joint backing is not used.

F. Prime surfaces to receive joint sealant with primer recommended by sealant manufacturer.

G. Apply sealant within recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges. Apply masking tape where required to protect adjacent surfaces from sealant application.

H. Install sealant free of air pockets, foreign embedded matter, ridges, and sags.

I. Tool joints concave.

J. At exterior joints in concrete paving, joints larger than 3/8” in width shall be lightly sanded while sealant is still wet and tacky. Lightly broadcast sand evenly over sealant, allow sealant to cure completely then brush away excess sand.

3.04 CLEANING AND REPAIRING

A. Clean work under provisions of Division 1, General Requirements.

B. Clean adjacent soiled surfaces. Use a solvent or cleaning agent as recommended by the sealant manufacturer.

C. Repair or replace defaced or disfigured finishes caused by work of this Section.

3.05 PROTECTION OF FINISHED WORK

A. Protect finished installation under provisions of Division 1, General Requirements.

B. Protect sealants until cured.

C. Do not paint sealants until sealant is fully cured.

D. Do not paint silicone sealant.

END OF SECTION 07 90 00

SECTION 08 11 00
METAL DOORS AND FRAMES

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. Non-Rated Steel Doors.

B. Non-Rated Steel Frames for Doors and Windows.

1.02 RELATED SECTIONS

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

B. Section 06 10 00: Rough Carpentry.

C. Section 07 90 00: Joint Sealers.

D. Section 08 14 00: Flush Wood Doors.

E. Section 08 71 00: Door Hardware.

F. Section 08 80 00: Glazing.

G. Section 09 90 00: Painting.

1.03 REFERENCES

A. ANSI/SDI-100 - Standard Steel Doors and Frames.

B. ANSI Z97.1 - Safety Performance Specifications and Methods of Test for Safety Glazing Used in Buildings.

C. ASTM A366/A366M-97e1 - Steel, Sheet, Carbon, Cold-Rolled, Commercial Quality.

D. ASTM A924 / A924M-09a - General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.

E. ASTM A1011 / A1011M-09b - Steel, Sheet and Strip, Hot Rolled, Carbon, Structural, High- Strength Low-Alloy High Strength Low Alloy with Improved Formability, and Ultra-High Strength

F. ASTM A1008 – Standard Specifications for Steel Sheet, Cold -Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.

G. ASTM A568 – Standard Specifications for Sheet Steel and Strip, Carbon, and High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled, General Requirements for

1.04 QUALITY ASSURANCE

A. Provide door and frame complying with Steel Door Institute "Recommended Specifications for Standard Steel Door and Frames" (SDI 100), and as herein specified.

1.05 SUBMITTALS

A. Submit per the requirements of Division1, General Requirements.

B. Shop Drawings: Include illustrations and schedule of finish hardware, door and frame size, type, material, construction, finishing, anchoring, accessories, and preparation for installing hardware.

1. Method of attachment of frames to structure shall be approved by Architect.

C. Templates: Furnish hardware templates to fabricator of frames and doors to be factory prepared for installation of hardware.

D. General Contractor to confirm field measurements of all openings prior to submittal and fabrication of doors and frames.

1.06 PRODUCT DELIVERY AND STORAGE

A. Deliver all materials under protective cover and store in upright position within a dry enclosed space in a manner that will prevent rust and damage. Do not create a humidity chamber by using a plastic or canvas shelter that is not adequately vented.

PART 2 – PRODUCTS

2.01 MANUFACTURERS

A. Steelcraft Manufacturing Co.
   a. Doors: L Series with Polystyrene Core
   b. Frames: F Series

B. Curries Doors
   a. Doors: 707 Series
   b. Frames: M Series

C. Ceco
   a. Doors: Legion Series
   b. Frames: S Series

D. Approved Equal

2.02 MATERIALS

A. Hot-Rolled Steel Sheets and Strip for Frames: Commercial quality carbon steel, complying with ASTM A1011 / A1011M-09b.

B. Cold-Rolled Steel Sheets for Doors: Commercial quality carbon steel, complying with ASTM A1008 / A1008M-09a.

C. Factory Applied Primer Paint: Manufacturer standard rust inhibitor primer.

2.03 METAL DOOR FABRICATION

A. General: Fabricate to sizes shown, providing necessary clearances and bevels to permit operation without binding. Door shall be free from warp, wave, buckle or other defect. Field verify size of all doors.

1. Standard Flush Door Construction: Door shall be fabricated with face sheets of 16-gauge steel. Weld face sheets 2 inches on center, minimum. Door shall be flush with edge seams filled and ground smooth. Bevel lock and hinge edges 1/8" in 2". Door shall be provided with top and bottom inverted 16-gauge steel channels welded within the door. Door shall be polystyrene core. No exposed seams shall occur on the door face or vertical edge. The top and bottom of the door shall be closed with a recessed channel and flush end closure treatment.

B. Preparation of Hardware: Door shall be mortised, reinforced, drilled and tapped at the factory from templates for all mortise hardware listed in the hardware schedule. Door shall be reinforced only for surface applied hardware such as closers, checks, escutcheons and kickplates, the drilling and tapping for which is to be done in the field by the door erector. Reinforcement shall consist of 12-gauge for locksets and latchsets, and 14-gauge for surface applied hardware, except butts, which shall have 3/16" thick plate. Door shall be provided with reinforcing unit as recommended by lock manufacturer. A continuous 12-gauge. reinforcement shall be provided for continuous hinge prep and installation.

C. Hardware Mounting Heights and Door Clearances: In accordance with ANSI Industry Standards.

D. All louvers shall be installed minimum 10” above finished floor to edge of louver flange as required for accessibility requirements.

2.04 METAL DOOR AND WINDOW FRAME FABRICATION

A. General: Pressed metal frames shall be formed to shapes shown. General Contractor to field verify size of all frames. Head and jambs are to be notched, mitered, fully welded and finished to present a smooth surface for painting.

1. For all doors up to 36 inches wide, frames shall be fabricated from 16-gauge galvanized A60 steel, and shall be designed with integral rabbet, stop and trim. Doors over 36" wide shall require 14-gauge frames.

2. Exterior doors and windows shall have an extended perimeter flange for tying into weather barrier system.

B. Anchors: Frame shall be securely anchored to wooden structures with spot welded anchor straps. Where anchorage is not specifically delineated, anchorage shall be as for a similar assembly, or approved manufacturer’s standard type, to securely fasten frames to wall construction involved (wire anchors not acceptable); also provide adjustable floor anchor at bottom of each door jamb. Provide minimum 3 anchors, equally spaced, at jamb end of frames. Anchors shall provide stiffness and rigidity to keep frames square, in accurate position without twisting, buckling or warping.

C. Preparation for Hardware: Frames shall be prepared at the factory for all hardware using templates furnished by hardware supplier. Locations of miscellaneous hardware shall conform to the recommendations for the Door and Hardware Institute. Mortise, reinforce, drill and tap for all mortise type hardware. Reinforce for surface applied hardware, the drilling and tapping for which is to be done in the field door erector.

1. All hardware cutouts shall have steel plate reinforcements with tapped holes welded to frame. Reinforcement shall include 3/16” butt reinforcement; 12-gauge lock strike; 14-gauge for surface applied items.

2. Provide for three (3) rubber door silencers at single doors and (2) silencers at

head of pair doors. Omit holes at frames to receive unitized weather stripping; refer to Section 08 71 00, Finish Hardware.

3. Provide temporary form blocks at locations in grouted frames to allow for proper installation of hardware components.

2.05 FINISH

A. All surfaces shall be cleaned, phosphatized, and given one coat rust-inhibiting prime paint in accordance with the Steel Door Institute Specification "Test Procedure and Acceptance Criteria for Primer Painted Steel Doors and Frames".

B. Field paint doors and frames under provisions of Section 09 90 00.

PART 3 – EXECUTION

3.01 INSTALLATION

A. Set Frame level and plumb, and brace adequately to prevent damage or distortion. Secure standard height frames to structure with minimum of three anchors at each jamb. Provide one additional anchor per 18” above standard height.

1. Attach to wooden structure with 16d nails on both sides of each strap into stud.

2. At concrete unit masonry, provide grout-in anchors and grout all jamb and head frames solid.

3. Removable Spreaders: Size opening by inserting wood spreader cut to the exact opening width and fasten sill anchor at strike jamb with nails or screws. Remove spreader. Insert adjusting screw cover.

B. Door Installation: Fit hollow door accurately in the frame with a tolerance of 1/8” at jamb and head.

C. Seal frame to adjacent surfaces per the requirements of specification section 07 90 00, Joint Sealers.

3.02 ERECTION TOLERANCES

A. Maximum Diagonal Distortion: 1/16 inch measured with straight edge, corner to corner.

B. New doors shall have maximum 3/8” undercut above finished floor with no threshold and 3/4" undercut above finished floor with threshold.

3.03 ADJUST AND CLEAN

A. Prime Coat Touch-Up: Immediately after erection, sand smooth all rusted or damaged areas of prime coat and apply touch-up of compatible air-drying primer. Touch-up shall not be obvious.

B. Cleaning and Finishing: Upon completion of the work, clean all exposed surfaces, removing any discoloration or foreign matter, and touch up all abraded or cut areas and exposed edges with finishing material recommended by the manufacturer. Touch-up of finish shall not be obvious.

C. Final Adjustments: Check and readjust operating finish hardware in hollow metal work

just prior to final inspection. Leave work in complete and proper operating condition.

D. Defective Work: Remove and replace defective work, including doors and frames which are warped, bowed or otherwise damaged as directed by the Architect, with no additional cost to the Owner.

E. Protection: Protect installed hollow metal work against damage from other construction work.

3.04 CLEAN-UP

A. Upon completion of the work of this section, remove all excess materials, rubbish and debris from the premises.

END OF SECTION 08 11 00

SECTION 08 14 00
FLUSH WOOD DOORS

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. Non-Rated Flush Wood Doors.

B. Non-Rated Door Vision Panels.

C. Door Ventilation Louvers.

1.02 RELATED SECTIONS

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

B. Section 08 11 00: Metal Doors and Frames.

C. Section 08 71 00: Door Hardware.

D. Section 08 80 00: Glazing.

E. Section 09 90 00: Painting.

1.03 REFERENCES

A. ANSI A135.4 - Basic Hardboard.

B. ANSI/HPMA HP - Hardwood and Decorative Plywood.

C. AWS - Architectural Woodwork Standards.

1.04 SUBMITTALS

A. Submit per the requirements of Division 1, General Requirements.

B. Shop Drawings: Illustrate door opening criteria, elevations, sizes, types, swings, undercuts required, special beveling, special blocking for hardware, and identify cutouts for glazing.

C. Product Data: Indicate door core materials and construction; veneer species, type and characteristics; factory machining criteria, factory finishing criteria.

D. Contractor to confirm field measurements of all openings prior to submittals and fabrication of doors and frames.

1.05 QUALITY ASSURANCE

A. Perform work in accordance with AWS Custom Grade.

1.06 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum three years experience.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect, and handle products to site under provisions of Division1, General Requirements.

B. Accept doors on site in manufacturer's packaging. Inspect for damage.

1.08 FIELD MEASUREMENTS

A. Verify that field measurements are as indicated on shop drawings.

1.09 COORDINATION

A. Coordinate the work with door opening construction, door frame and door hardware installation.

1.10 WARRANTY

A. Provide warranty under provisions of Division1, General Requirements, to the following term:

1. Interior Doors: Lifetime.

B. Include coverage for delamination of veneer, warping or twisting (not to exceed 1/4 inch in any face including diagonal) or other defects. Warranty shall cover replacement of door plus costs of hanging and finishing.

PART 2 – PRODUCTS

2.01 MANUFACTURERS

A. VT Industries

B. Algoma Hardwoods, Inc.

C. Graham Manufacturing

D. Or approved equal.

2.02 DOOR TYPES

A. Flush Interior Doors: 1-3/4 thick; solid core construction as indicated.

B. Finish Type 1: Paint Grade.

2.03 DOOR CONSTRUCTION

A. Solid Core, Non-Rated:

1. Core: **LD1** or **LD2** cores, Type 2 or better.

2. Stiles: Minimum 1-1/4 inch with two ply edge strips glued to core, outer ply of hardwood.
3. Top and bottom rails: Minimum 1-1/4 inch two ply end strips glued to core.
4. Crossbands: 1/16 inch thick veneer.
5. Faces: Tempered 2S2, 1/8 inch hardboard for opaque painted.
6. Glue: Type 2 or better.

B. Finish Type 1: Factory prime, field finish paint.

2.04 ADHESIVE

A. Facing Adhesive: Type 2 or better.

2.05 ACCESSORIES

A. Non-Rated Door Ventilation Louvers: 18 ga. cold rolled steel frame, 22 ga. cold rolled non-vision inverted “V” blade with grey primer coat finish for field painting. Size as shown on Drawings.

1. Anemostat standard door louvers, Model #AFDL.
2. Air Louvers Inc., Model #800.

B. Non-Rated Door Vision Panels: 20 ga. cold rolled steel, for 1-3/4” doors, unless otherwise noted use with ¼” thick glazing, grey prime coat finish for field painting. Size as shown on drawings. See specification section 08 80 00 for non-rated glazing.

1. Anemostat LoPro Metal Vision Frame.
2. Air Louvers Inc. Model VSL – Slimline.

2.06 FABRICATION

A. Fabricate non-rated doors in accordance with AWS.

B. Provide hardware reinforcement for hardware specified in Section 08 71 00.

C. Fit door edge trim to edge of stiles after applying veneer facing.

D. Bond edge banding to cores.

E. Factory machine doors for finish hardware in accordance with hardware requirements and dimensions. Do not machine for surface hardware. Provide solid blocking for through bolted hardware.

F. Undercut doors 3/8 inch maximum above finish floor or as otherwise shown on Mechanical Drawings.

G. Glass Cutouts: Provide cutouts for glass of size and shape indicated.

H. All louvers shall be installed minimum 10” above finished floor to edge of louver flange as required for accessibility requirements.

PART 3 – EXECUTION

3.01 EXAMINATION

A. Field verify frame opening conditions and sizes.

B. Do not install doors in frame openings that are not plumb or are out-of-tolerance for size or alignment.

3.02 INSTALLATION

A. Trim door width by cutting equally on both jamb edges.

B. Trim door height by cutting bottom edges to a maximum of 3/4 inch.

C. Pilot drill screw and bolt holes.

D. Factory prep for hardware.

E. Coordinate installation of doors with installation of frames specified in Section 08 11 00 and hardware specified in Section 08 71 00.

F. Coordinate installation of fire-rated vision panels with section 08 80 00, Glazing.

3.03 INSTALLATION TOLERANCES

A. Maximum Diagonal Distortion (Warp): 1/8 inch measured with straight edge or taught string, corner to corner, over an imaginary 36 x 84 inch surface area.

B. Maximum Vertical Distortion (Bow): 1/8 inch measured with straight edge or taught string, top to bottom, over an imaginary 36 x 84 inch surface area.

C. Maximum Width Distortion (Cup): 1/8 inch measured with straight edge or taught string, edge to edge, over an imaginary 36 x 84 inch surface area.

D. Doors to have a maximum tolerance of 1/8” between door and frame at jambs and head.

E. Doors shall have maximum 3/8” undercut above sill surface or floor finish.

3.04 ADJUSTING

A. Adjust work under provisions of Division 1, General Requirements.

B. Adjust door for smooth and balanced door movement.

END OF SECTION 08 14 00

SECTION 08 31 13
ACCESS DOORS AND FRAMES

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. Access panels for in-wall/ceiling plumbing, electrical and other accessible items.

1.02 RELATED SECTIONS

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

D. Section 07 90 00: Joint Sealers

E. Section 09 21 16: Gypsum Board Systems.

G. Section 09 90 00: Painting.

H. Mechanical & Plumbing Systems.

1.03 SUBMITTALS

A. Submit per the requirements of Division1, General Requirements.

B. Product Data on panel size including material thickness, hinge type, lock type.

C. Attachment and finishing details.

1.04 FIELD MEASUREMENTS

A. Verify that field measurements are as indicated on shop Drawings.

1.05 COORDINATION

A. Coordinate Work with plumbing valve locations and sizes, wall openings, and adjacent Work.

PART 2 – PRODUCTS

2.01 GENERAL

A. All access panels and frame assemblies shall be stainless steel.

2.02 ACCESS PANEL TYPES

A. Interior Flush Type: Door style is flush with provision to conceal flange with drywall cement. 16-gauge stainless steel frame, 16-gauge Type 304-#4 satin polished stainless steel door panel. Minimum size 10”x10”, U.O.N. on Drawings. Special, double-acting concealed spring hinges to allow 175 degree opening. Provide with optional Torx head latch. Location and quantity shown on Drawings and as otherwise required for access to new and existing equipment and accessible devices.

1. Acudor Products Inc. Model UF-5000 Flush Universal Premium (10”x10”).
2. Elmdoor/Stoneman.
3. Or equal.

PART 3 – EXECUTION

3.01 EXAMINATION

A. Verify prepared openings for adequacy to access panel.

B. Verify that openings for panels are correctly sized and within tolerance.

C. Verify that surfaces of gypsum board and/or ceramic tile are clean, free of obstructions, and ready to receive panels. All ceramic grout joints shall be fully grouted prior to installation of panel.

D. Report in writing to, any conditions that may be detrimental to the Work.

3.02 PREPARATION

A. Contractor shall install blocking/backing in wall as required for correct anchorage of access panel.

B. Prior to final anchorage of panel, Contractor shall confirm that all shutoff valves rotate freely behind panel. Bending of valve levers as a means to rotate freely is not acceptable.

C. Prior to final anchorage of large chase access panel, Contractor shall review locations of piping in wall and that access to chase is not blocked by piping.

D. At exterior locations, confirm all weather barriers have been installed properly prior to setting access door.

3.03 INSTALLATION

A. General: Install panels at locations indicated, according to manufacturer's recommendations and as specified herein.

B. Fill all anchorage hole in panels. Screws shall penetrate blocking minimum 1”.

C. Set all panels level and plumb in wall.

D. Contractor shall carefully cover drywall bead on all panels with concealed flanges. Clean all drywall mud from face of panel and inside panel frame.

3.04 CLEANING

A. Clean work under provisions of Division 1, General Requirements.

B. Remove drywall and grout materials from finish surfaces.

C. Remove labels after work is complete.

D. Clean stainless steel surfaces.

3.05 PROTECTION OF FINISHED WORK

A. Protect finished Work under provisions of Division 1, General Requirements.

B. Replacement: At completion of building construction and prior to its acceptance, all broken, dented, excessively scratched, or otherwise imperfect finished surfaces included under this Section shall be replaced with new panels of the type specified, as directed by the Architect, and at no additional cost to the Owner.

END OF SECTION 08 31 13

SECTION 08 71 00
DOOR HARDWARE

PART I - GENERAL/MATERIALS

1.01 WORK INCLUDED

A. Furnish all finish hardware for doors and gates required to complete the work.

B. Furnish all trim, attachments and fastenings required for proper and complete installation.

C. Furnish thresholds, perimeter seals, gaskets and door bottoms.

D. Coordinate with Districts maintenance department for keying and other specific requirements..

1.02 RELATED SECTIONS

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

B. Section 32 31 13: Chain Link Fences and Gates (hardware for custom fabricated gates).

1.03 GENERAL REQUIREMENTS

A. Where finished shape or size of members taking hardware is such as to prevent or make unsuitable the use of the exact types specified, suitable types shall be specified having as nearly as practicable the same operation and quality as the type specified.

B. Proper kind and type: The hardware shall be the proper kind for its required use and shall fit its intended location perfectly. Provide the services of a Certified hardware Consultant.

C. In order to insure proper placement and fit, all hardware in connection with metal door or metal frames shall be made to template. Templates or physical hardware items shall be furnished to manufacturers concerned and shall be supplied sufficiently in advance to avoid delay in the work.

D. Warranty: All hardware shall be warranted for a period of two years from date of substantial completion. Defects in materials and workmanship occurring during the warranty period shall be corrected to the complete satisfaction of the architect and owner. Specify a 10-year guarantee for all door closers and exit devices.

Note: Installation shall be of such quality that **NO** maintenance or remedial installation shall be required by the Owner for a period of five (5) years.

E. Electrical coordination: Before any electrically controlled and/ or operated hardware is specified, voltages must be coordinated with the Electrical Engineer.

F. Supplier: A recognized architectural finish hardware supplier, with warehousing facilities, who has been furnishing school projects of this size and scope in the Northern California for a period of not less than 5 years. The firm shall employ (or consult with) an architectural hardware consultant (or someone of equal qualifications) who is available at reasonable times during the course of the project, for consultation regarding the project's hardware requirements, to the owner, architect, and contractor. The firm shall have

extensive field experience solving hands-on solutions to field problems. They must be able to demonstrate the ability to successfully complete a school project of this type.

G. Exit door hardware: Where emergency exit devices are required on fire-rated doors, provide UL or WHI labels on exit devices indication “Fire Exit Hardware”. Exit doors in buildings, including but not limited to door of toilet and storage rooms, shall conform with the requirements of section 3304, Title 24 CCR. All exit doors shall be open able from the inside with “non-grasping” operable trim that does not require the use of a key or any special knowledge.

H. All Schlage lever locks are BD-Less SFIC. All exterior locks are furnished with Falcon 6-Pin Construction core C606. Locks are shipped to job site with C606 core installed, including spacer, which is furnished with Schlage lock. All Schlage Locksets for interior doors shall be furnished with M204-152 disposable plastic construction core. C606 construction cores are provided in exterior and dogging KABA cylinders with exit devices. No spacer required.

I. Installer qualifications: An experienced installer with 5 years minimum experience who has completed door hardware similar in material, design and extent to that indicated for this project and whose work has resulted in construction with a record of successful in-service performance.

1.04 SUBMITTALS

A. Hardware list:

1. Prepare and submit a detailed hardware schedule for review. **Use only architect’s door/opening designations and hardware group designations in the development of submittal schedules. Submittal may be rejected for non-compliance with this requirement.**

2. The list shall identify each hardware item by manufacturer’s catalog number, and exact location in the work, including door details and index.

3. Specify that review of the hardware schedule by the architect and owner does not relieve the hardware supplier from the responsibility of furnishing the job complete.

B. Catalog cuts:

1. Submit catalog cuts of every item furnished for this project.

2. Show all finishes, sizes, catalog numbers and pictures. Explain fully all abbreviations.

C. Templates: Specify that the Contractor will furnish the following items to the various subcontractors responsible for installation of, or preparation for installation of, hardware furnished under this section.

1. Printed templates.

2. Actual hardware.

D. Perform field measurements for contractor determined heights of stop/hold open devices and wide-throw hinges prior to submitting the hardware submittal. Adjust specified products as required to meet actual field conditions.

1.05 REGULATORY REQUIREMENTS

A. Comply with the following:

1. California Building Code, CBC 2022.

2. National Fire Protection Association (NFPA) Life Safety Code 101 and Fire Door and Windows Code 80, Current Editions.

3. Applicable State, local codes, laws. Regulations and T-24 accessibility requirements.

1.06 STANDARDS

A. Comply with the following, as applicable:

1. Underwriters' Laboratories, Inc. (UL) Standards.

2. Warnock Hersey Intl. Standards.

3. American National Standards Institute (ANSI).

1.07 FINISH OF HARDWARE

A. The finish of all hardware shall be specified in the hardware groups.

B. Special care shall be taken to coordinate the finish of the various manufacturers to insure a uniform acceptable finish.

1.08 PRODUCT UNIFORMITY

A. Except where otherwise specified, locksets and latchsets, exit devices, closers and component parts shall be by one manufacturer for each type of hardware.

1.09 LOCK STRIKES

A. All lock strikes shall be boxed and shall have a lip of sufficient length to protect the trim and jamb.

1.10 KEYING AND MASTER KEYING

A. All cylinders shall be furnished with construction keyed, master keyed, and grand master keyed as directed by the school district. Hardware supplier shall advise factory of final keying instructions in a timely manner so as not to delay the order. All locks shall be factory keyed. QUANTITIES OF CMK, GMK, MK AND CHANGE KEYS TO BE DETERMINED BY OWNER. Keyway as directed by Owner

B. Furnish 6 keys per lock, 6 master keys, 6 grand master keys, 2 emergency keys, 2 core removal keys, 50 blank keys and 10 extra unkeyed cores.

1.11 DOOR HARDWARE

A. Hand of lock shall be indicated on the drawings. If door hand is changed during construction, specify that the Contractor shall make necessary changes in hardware at no

additional expense to the owner.

1.12 HINGES

A. Unless otherwise specified, provide steel, button tip, and full mortise template type butts with non-rising loose pins. Provide 5 x 4.5 size hinges for doors 3'-0" and wider. Provide two pairs minimum for doors 7'-6" high and over.

1. Exterior door hinges: Provide out-swinging doors with continuous hinges.

2. Interior door hinges: Wrought steel, polished and plated to match specified finish of other hardware on laminate plastic, natural or stained doors. Or as otherwise specified when using interior continuous hinges.

B. Where required to clear trim or permit doors to swing 180 degrees, furnish hinges of sufficient throw. Contractor to field verify all conditions and modify specified hinges as required to accommodate projecting trim and other items needing wider throws.

1.13 LOCKS/EXIT DEVICES

A. Except where otherwise specified, all locks and latches and components parts shall be by one manufacturer. Locksets to be by Schlage, Rhodes lever design with 626 finish.

B. All locks shall be of such construction that when locked, the door may be opened from within by using lever and without the use of a key or special knowledge. All locks shall have box strikes and lips long enough to protect the trim.

C. Except here otherwise specified, exit devices, removable mullions, and component parts shall be by one manufacturer. Specified product is Von Duprin 98 Series.

D. All removable mullions shall be Von Duprin KR4954 or KR9954 x 154.

1.14 DOOR CLOSERS

A. Surface Closers:

1. Surface mounted closers shall be full rack and pinion type with cast iron or pressure cast aluminum alloy shell, with no more than 2-1/8" projection from the door surface.

2. Provide drop plates, brackets, mortise shoes and long arms as required. All shall be non-handed and capable of a 180 degree swing. All parallel arm type closers shall utilize a heavy-duty forearm (PR). All covers shall be metal, no plastic.

3. All door closers shall be, fully adjustable for spring setting, with latch speed, sweep speed and back check. Furnish delayed action option and slide track applications where specified.

4. Templates and adjust closers per manufacturer’s recommendation to meet accessibility requirements.

5. The maximum force for pushing or pulling open a door shall be as follows:

   a. Fire doors shall have the minimum opening force allowable by the appropriate administrative authority.
   b. Interior non-fire rated doors - 5 lbs.

c. Exterior non-fire rated doors - 8.5 lbs.

6. Provide adjustable units complying with ANSI A117.1 and ADA provisions for door opening force and delayed action closing.

7. Mount all surface closers on the side of the door away from the corridor, inside rooms or in the stairwells.

8. All closers to be installed with a minimum of (4) sex bolts.

9. Refer to Section 32 31 13, Chain Link Fence and Gates for self-closing hinges provide for custom accessible gates.

1.15 KICK PLATES

A. Unless indicated otherwise, kick plates shall be 18-gauge stainless steel, 10" high and 2" less than the door width.

1.16 DOOR STOPS AND HOLDERS

A. Place door stops in such a position that they permit maximum door swing but do not present a hazard of obstruction. Stops shall not be placed in accessible path of travel nor shall they be placed more than 4 inches from wall or other permanent barrier.

B. Furnish stops of proper height to engage doors or levers. Carpet risers where required.

C. See special installation requirements for wall mounted and floor mounted stops and holders in this Section.

1.17 WEATHERSEAL

A. Solid neoprene to meet Mil. Spec. R6855, Class II, Grade 40.

B. Silicon rubber material with self-adhesive strip.

1.18 SILENCERS

A. Provide silencers for openings where door or frame is of steel and seals do not occur.

1. Pairs of doors: Furnish 4.

2. Single doors: Furnish 3.

1.19 FASTENINGS

A. Furnish finish hardware with necessary screws, bolts and other fasteners of suitable size and type to anchor the hardware in position. Furnish all thresholds with 1/4"-20 machine screws and lead anchors.

B. Furnish fastenings where necessary with expansion shields, toggle bolts, sex bolts, and other approved anchors, according to material to which hardware is to be applied and the recommendations of hardware manufacturer.

C. Furnish fastenings which harmonize with hardware as to material and finish.

1.20 FIRE DOOR REQUIREMENTS

A. Fire door hardware: Furnish items bearing Underwriter's Laboratories, Inc. (UL) Label compatible for use with fire doors.

B. Specify Installation of closing (self-closing) device on every fire door bearing a UL label.

1.21 ACCEPTABLE MANUFACTURERS

A. Provide finish hardware as follows: Substitutions with architect and owner's written approval prior to bidding only. Where "**As Specified**" is designated there is **NO** substitution. Furnish only the listed manufacturer.

Approved Hardware Item	**Specified Manufacturers**	**Other Manufacturers**
Hinges	Hager	McKinney or Equal
Continuous Hinges	Pemko	Roton
Locksets	Schlage	As specified
Cylinders	Schlage	As Specified
Closers	LCN	LCN
Removable Mullions	Von Duprin	As Specified
Exit Devices	Von Duprin	As Specified
Pulls	Trimco	Ives or Equal
Stops, Kick Plates, Misc	Trimco	Ives or Equal
Mutes/Silencers	Glynn Johnson	Or Equal
View / Peep Holes	Schlage	As Specified

B. Substitutions

1. **NOTE: The Mt. Diablo Unified School District invests heavily in product inventory and training of its staff on the specified products. Because of this substantial investment, substitutions are not allowed on specified items due to the cost impact on the school district.**

PART II – EXECUTION / MAINTENANCE

2.01 INSTALLATION

A. Review Specifications and reviewed submittals / shop drawings carefully and thoroughly prior to installation of any work.

B. Installation shall be of such quality that **NO** maintenance or remedial installation shall be required by the Owner for a period of five (5) years.

C. Contractor shall inspect and direct the method of application and adjustment of all finished hardware required to be installed under work of the sections. Work of this section shall include technical assistance provided upon request.

D. Adjustments and inspection:

1. During the installation of hardware, a periodic inspection, in company with the Project Inspector (PI), will be made by the Architectural Hardware Supplier, or his Agent.

2. Any hardware improperly installed shall be removed and reinstalled at the contractor's expense.

3. At the completion of the work, a final inspection shall be made by the Architectural Hardware Supplier, or his Agent.

E. Install all hardware including Schlage cylinders in accordance with manufacturer's installation instructions and requirements of SDI.

F. Use the templates provided by hardware item manufacturer. Mounting heights for hardware from finished floor to centerline of hardware item shall be between 34” to 44” and conform to ANSI standards.

G. Field measure latch to strike distance prior to mounting Exit Devices.

H. Conform to Title 24 and CBC 2022, Chapter 11B for positioning requirements of the disabled.

I. Hinge Installation:

1. All fasteners for hinge in new frames are to be install per manufacture typical installation recommendations into appropriate steel backing required by the specifications for metal doors and frames and for aluminum storefront frames where applicable.

2. Hinges set in existing frames shall be coordinated with existing fame preps and locations. Where installed in wood frames, provide fasteners long enough to extend through frame and casing and into solid jamb framing.

3. Confirm continuous hinge type and operation prior to ordering and installation. Provide wide throw hinges only where required to clear existing jamb projections.

J. Door Closer Installation:

1. Sex bolts are mandatory for attachment of closer to door. (Door must be prepared with spacer at closers to prevent dimpling of doors.)

2. Closers to be fitted with appropriate length arm to accommodate throw of hinge and enable door to open 180 degrees.

3. Closers Push & Pull effort - must meet disable access requirements:

a. Exterior and Interior: 5 pounds maximum.

b. Rated Doors: The Authority having Jurisdiction, may increase the maximum effort to operate fire doors to achieve positive latching, but not to exceed 15 lbs. maximum.

c. Door closers and gate closers shall be adjusted so that from an open position of 90 degrees, the time required to move the door to a position of 12 degrees from the latch is 5 seconds minimum.

4. All fasteners for door closer fasteners in existing wood frame are to penetrate a minimum of 2” into solid wood (structural framing).

K. Weather-stripping Installation:

1. Install with manufacture screws within 1” from all ends. If trimming is required,

cuts shall be smooth, burr-free, and metal material shall not be warped or deformed. Cleanly cut weather-stripping material.

L. Lock Protector Installation:

1. Install with sex bolts for flush installation.

M. Mutes/Silencers:

1. Provide Glynn Johnson GJ-64 or equal at all non-fire rated hollow interior hollow metal frames, minimum 3 per jamb.

N. Attachment of door stop / hold-open devices:

1. Shim strike bar with manufacture plates as required for proper, vertical, plumb, alignment with receiver.

2. **IMPORTANT NOTE - Do not secure to concrete or masonry with manufacture provided bolts.** Fasten with stainless steel all-threads set in epoxy with a minimum of 3.5” embedment and with stainless steel nut. Trim excess length of all-thread. Tack weld nut to all-thread. De-burr weld.

3. At wall mounted door stops, anchor wall portion of stop to solid wood backing. If backing does not align with door stop, provide 1/4” thick galvanized steel plate surface mounted to face of building spanning to backing on both sides.

O. Custom Chain Link Gate Hardware:

1. Coordinate the supply and installation of hardware specified in this Section with specification section 32 31 13, Chain Link Fence and gates for hardware at custom accessible chain link gates.

2.02 PROTECTION/ADJUSTMENT

A. All finish hardware shall be protected from damage during and after application and until substantial completion of building.

B. Shortages of items and/or incorrect items (based on drawings and specifications in effect at time of bidding) shall be furnished and/or replaced with correct material. Unit prices and credits shall be furnished for approval prior to delivery of these goods.

2.03 FINISHES

A. All hardware to have 626 brushed satin stainless steel finish, or equal, except where otherwise specified in the Hardware Groups below.

2.04 HARDWARE SCHEDULE

Continued on next page…

Hardware Group 100
EXISTING SERVICE LINE WOOD DOOR – NEW DOOR IN EXISTING HM FRAME

1	CONT. HINGE	CFM FM SLF HD1	PEMKO	C
1	CLASSRM LOCKSET	ND70PD RHO	SCHLAGE	626
1	CYLINDER	IC AS REQUIRED	SCHLAGE	626
1	CLOSER	4111-689XSNB	LCN	652
1	KICKPLATE	K0050 10”X2” LDW	TRIMCO	630
1	FLOOR STOP/HOLD	1209HO	TRIMCO	626
1	THRESHOLD	2748	TRIMCO	A

Hardware Group 101
EXISTING SERVICE LINE WOOD DOOR – NEW FLIPPED DOOR IN NEW HM FRAME

1	CONT. HINGE	CFM FM SLF HD1	PEMKO	C
1	CLASSRM LOCKSET	ND70PD RHO	SCHLAGE	626
1	CYLINDER	IC AS REQUIRED	SCHLAGE	626
1	CLOSER	4111-689XSNB	LCN	652
1	KICKPLATE	K0050 10”X2” LDW	TRIMCO	630
1	FLOOR STOP/HOLD	1209HO	TRIMCO	626
1	THRESHOLD	2748	TRIMCO	A

Hardware Group 102
NEW 3’X7’ INTERIOR WOOD KITCHEN OFFICE DOOR IN HM FRAME

Quantity	*Item*	*Model No.*	*Mfr.*	*Finish*
3	HINGE	BB1279 4.5 X 4.5	HAGER	652
1	OFFICE LOCKSET	ND50PD RHO	SCHLAGE	626
1	CYLINDER	IC AS REQUIRED	SCHLAGE	626
1	KICKPLATE	K0050 10”X2”LDW	TRIMCO	630
1 SET	SOUND SEAL	319N	TRIMCO	A
1	FLOOR STOP	1214	TRIMCO	626

Continued on next page…

Hardware Group 103
NEW 3'x7' INTERIOR WOOD STAFF RESTROOM DOOR IN HM FRAME

Quantity	*Item*	*Model No.*	*Mfr.*	*Finish*
3	HINGE	BB1279 4.5 X 4.5	HAGER	652
1	LOCKSET	LV9486XL283-722 OCC. INDICATOR W/ ADA TURN 09-509 X L583-363	SCHLAGE	626
1	CYLINDER	AS REQUIRED	SCHLAGE	626
1	KICKPLATE	K0050 10"X2"LDW	TRIMCO	630
1 SET	SOUND SEAL	319N	TRIMCO	A
1	FLOOR STOP	1214	TRIMCO	626

Hardware Group 104
NEW 3'x7' EXTERIOR HOLLOW METAL KITCHEN DOOR IN EXISTING HM FRAME

Quantity	*Item*	*Model No.*	*Mfr.*	*Finish*
1	CONT. HINGE	WT-FM-HD1	PEMKO	C
1	CLASSRM LOCKSET	ND70PD RHO	SCHLAGE	626
1	CYLINDER	IC AS REQUIRED	SCHLAGE	626
1	CLOSER	4111-689XSNB	LCN	652
1	KICKPLATE	K0050 10"X2" LDW	TRIMCO	630
1	FLOOR STOP/HOLD	1209HO	TRIMCO	626
1	BOTTOM SWEEP	345PK	TRIMCO	A
1 SET	WEATHERSTRIP	319N	TRIMCO	A
1	VISION HOLE	976 X 200 DEGREE	SCHLAGE	626
1	THRESHOLD	2727	TRIMCO	A

NOTE: CONFIM WIDE THROW CONTINUOUS HINGE IS REQUIRED TO CLEAR EXISTING EXTERIOR BATTEN SIDING. IF NOT REQUIRED IT IS ACCEPTABLE TO USE PEMKO CFM-FM-SLF-HD1 STANDARD THROW HINGE.

Hardware Group 105
NEW 3'X7' INTERIOR WOOD STOREROOM DOOR IN HOLLOW METAL FRAME

Quantity	*Item*	*Model No.*	*Mfr.*	*Finish*
3	HINGE	BB1279 4.5 X 4.5	HAGER	652
1	CLASSRM LOCKSET	ND70PD RHO	SCHLAGE	626
1	CYLINDER	IC AS REQUIRED	SCHLAGE	626
1	KICKPLATE	K0050 10"X2"LDW	TRIMCO	630
1	FLOOR STOP	1214	TRIMCO	626

Hardware Group 106
NEW 3'x7' EXTERIOR HOLLOW METAL CUSTODIAN DOOR IN EXISTING HM FRAME

Quantity	*Item*	*Model No.*	*Mfr.*	*Finish*
1	CONT. HINGE	WT-FM-HD1	PEMKO	C
1	CLASSRM LOCKSET	ND70PD RHO	SCHLAGE	626
1	CYLINDER	IC AS REQUIRED	SCHLAGE	626
1	CLOSER	4111-689XSNB	LCN	652
1	KICKPLATE	K0050 10"X2" LDW	TRIMCO	630
1	FLOOR STOP/HOLD	1209HO	TRIMCO	626
1	BOTTOM SWEEP	345PK	TRIMCO	A
1 SET	WEATHERSTRIP	319N	TRIMCO	A

NOTE: CONFIM WIDE THROW CONTINUOUS HINGE IS REQUIRED TO CLEAR EXISTING EXTERIOR BATTEN SIDING. IF NOT REQUIRED IT IS ACCEPTABLE TO USE PEMKO CFM-FM-SLF-HD1 STANDARD THROW HINGE.

Hardware Group 107
NEW 3'x7' EXTERIOR HOLLOW METAL BOILER ROOM DOOR IN EXISTING HM FRAME

Quantity	*Item*	*Model No.*	*Mfr.*	*Finish*
1	CONT. HINGE	WT-FM-HD1	PEMKO	C
1	CLASSRM LOCKSET	ND70PD RHO	SCHLAGE	626
1	CYLINDER	IC AS REQUIRED	SCHLAGE	626
1	CLOSER	4111-689XSNB	LCN	652
1	KICKPLATE	K0050 10"X2" LDW	TRIMCO	630
1	FLOOR STOP/HOLD	1209HO	TRIMCO	626
1	BOTTOM SWEEP	345PK	TRIMCO	A
1 SET	WEATHERSTRIP	319N	TRIMCO	A

NOTE: CONFIM WIDE THROW CONTINUOUS HINGE IS REQUIRED TO CLEAR EXISTING EXTERIOR BATTEN SIDING. IF NOT REQUIRED IT IS ACCEPTABLE TO USE PEMKO CFM-FM-SLF-HD1 STANDARD THROW HINGE.

Hardware Group 108
EXISTING WOOD STUDENTS' RESTROOM DOOR IN HM FRAME

Quantity	*Item*	*Model No.*	*Mfr.*	*Finish*
1	THRESHOLD	2715 Series	TRIMCO	A

Hardware Group G01
SINGLE 42" W. X 6'-0" H. CUSTOM ACCESSIBLE CHAIN LINK FENCE GATE

Quantity	*Item*	*Model No.*	*Mfr.*	*Finish*
1	EXIT DEVICE	CD98-AX-996L	VON DUPRIN	626
1	CYLINDER	IC #20-757	SCHLAGE	626
1	CYLINDER (dogging)	IC #20-763	SCHLAGE	626
2	HINGE/CLOSER	*PROVIDED BY SPEC SECTION 32 31 13*		

Hardware Group G02
PAIR +/-48" W. X 6'-0" H. STANDARD TRASH ENCLOSURE GATES

NO FINISH HARDWARE REQUIRED. GATES TO BE PROVIDED WITH MANUFACTURER'S STANDARD CHAIN LINK FENCE HINGES, FORK LATCH AND CANE BOLT. OWNER TO PROVIDE PADLOCK.

Hardware Group G03
PAIR +/-48" W. X 6'-0" H. STANDARD SITE ACCESS GATES

NO FINISH HARDWARE REQUIRED. GATES TO BE PROVIDED WITH MANUFACTURER'S STANDARD CHAIN LINK FENCE HINGES, FORK LATCH AND CANE BOLT. OWNER TO PROVIDE PADLOCK.

END OF SECTION 08 71 00

SECTION 08 80 00
GLAZING

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. Glass for doors and hollow metal framed window system (non-rated).

B. Replacement glazing for existing windows (non-rated).

1.02 RELATED SECTIONS

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

B. Section 07 90 00: Joint Sealers.

C. Section 08 11 00: Metal Doors and Frames.

D. Section 08 14 00: Flush Wood Doors.

1.03 REFERENCES

A. ANSI Z97.1 - Safety Performance Specifications and Methods of Test for Safety Glazing Used in Buildings.

B. ASTM C864 - Dense Elastomeric Compression Seal Gaskets, Setting Blocks and Spacers.

C. ASTM C920 - Elastomeric Joint Sealants.

D. ASTM C1036 - Flat Glass.

E. ASTM C1048 - Heat Treated Flat Glass - Kind HS, Kind FT Coated and Uncoated Glass.

F. CPSC 16 CFR 1201 - Safety Standard for Architectural Glazing Materials.

1.04 SUBMITTALS

A. Submit per the requirements of Division 1, General Requirements.

B. Product Data on Glass Types Specified: Provide structural, physical and environmental characteristics, size limitations, special handling or installation requirements.

C. Product Data on Glazing Compounds: Provide chemical, functional, and environmental characteristics, limitations, special handling or installation requirements. Identify available colors.

D. Samples: Submit two samples, 12x12 inch in size, illustrating glass.

E. Samples: Submit 3-inch long bead of glazing sealant, color as selected by architect at time of submittal.

1.05 QUALITY ASSURANCE

A. Perform Work in accordance with FGMA Glazing Manual, FGMA Sealant Manual for glazing installation methods.

B. Installer's Qualifications: The installation shall be performed only by an installation firm normally engaged in this business. All work shall be performed by qualified mechanics who specialize in glazing and glass installation.

C. Safety glazing shall be identified in accordance with Section 2406.3, 2022 California Building Code, Title 24, Part 2 with identification etched in glass.

1.06 ENVIRONMENTAL REQUIREMENTS

A. Do not install glazing when ambient temperature is less than 40 degrees F.

B. Maintain minimum ambient temperature before, during and 48 hours after installation of glazing compounds.

1.07 FIELD MEASUREMENTS

A. Verify that field measurements are as indicated on shop Drawings.

1.08 COORDINATION

A. Coordinate Work with glazing frames, wall openings, and adjacent Work.

PART 2 – PRODUCTS

2.01 GENERAL

A. All glass shall be graded and meet requirements of ASTM C1036-06. Each light of glass delivered and installed shall have affixed thereto the manufacturer's grade label.

2.02 GLASS TYPES

A. **Type 1/4CL**: Clear, laminated 7/32” safety glass with .060 inch interlayer. Door and vision lite frames provided by specification Section 08 11 00, Metal Doors and Frames, and Section 08 14 00, Flush Woods.

B. **Type 1/4CL FROST**: Clear, laminated 7/32” safety glass with .060 inch interlayer of white frosted film. For use in re-glazing existing exterior windows.

2.03 GLAZING COMPOUNDS

A. Glazing Sealants (non-sag type): Dow Corning 795, Tremco "Proglaze" or GE Silicone Sealants; Tremco "Mono" acrylic sealant.

B. Glazing Compound: Shall meet requirements of ASTM C669-00.

2.04 GLAZING ACCESSORIES

A. Setting Blocks: Neoprene EPDM blocks with a Shore A durometer hardness of 85, plus or minus 5 percent, chemically compatible with sealant used.

B. Spacer Shims: Neoprene, 50-60 Shore A durometer hardness, minimum 3-inch long x one half the height of the glazing stop x thickness to suit application.

C. Glazing Tape: Preformed butyl compound with integral resilient tube spacing device; 10 - 15 Shore A durometer hardness; coiled on release paper; black color; Tremco No. 440 tape.

D. Glazing Splines: Resilient polyvinyl chloride extruded shape to suit glazing channel retaining slot; black color.

E. Miscellaneous: Furnish all primers-sealers, setting blocks, shims, spacers, compression seals, etc., as required for a first-class workmanlike job.

PART 3 – EXECUTION

3.01 EXAMINATION

A. Verify prepared openings for adequacy to receive glass.

B. Verify that openings for glazing are correctly sized and within tolerance.

C. Verify that surfaces of glazing channels or recesses are clean, free of obstructions, and ready to receive glazing.

D. Report in writing to, any conditions that may be detrimental to the Work.

E. Only laminated glass lites are to be installed in metal doors.

3.02 PREPARATION

A. Clean contact surfaces with solvent and wipe dry.

B. Seal porous glazing channels or recesses with substrate compatible primer or sealer.

C. Check that glass is free of edge damage or face imperfections.

D. Where existing glazing is scheduled to be replaced with new, remove existing glass, glazing compound and accessories. Clean existing surfaces to receive new glazing. Remove any rust from metal frames and sand smooth existing wood frames.

3.03 INSTALLATION

A. General: Install glass types at locations indicated, according to glass manufacturer's recommendations and as specified herein.

B. Glass Glazing:

1. Positioning Glass: Orient pattern and draw of glass pieces in same direction. Set all sheet glass so that any waves, etc. are horizontal.

2. Do not cut, nip or abrade tempered glass.

3. Watershed: Gunnable sealants, when applied as a cap head, shall form a bevel

or watershed away from the glass. When tape is used to the sightline, it shall form a watershed when compressed. Do not undercut a sealant, compound, or tape below the sightline. Tool and finish sealant as required. Use tooling solution recommended by the sealant manufacturer.

4. Positive Contact:

   a. When applying a heel bead, lap onto the glass a minimum of 3/16".

   b. When applying a toe bead, whether continuous or a corner seal, make certain it is large enough to contact both the glass and sash. Install the sealant prior to glass placement.

5. Setting blocks shall be 1/16" less than the full rabbet width, minimum length of 4" and high enough to provide the recommended minimum bite and edge clearance for the glass. Center blocks at 1/4 points unless otherwise recommended by the glass manufacturer.

6. Provide spacer-shims at a maximum of 24" o.c.

7. Clearances: Observe minimum face clearances, edge clearance and glass bite as recommended by the glass and sealant manufacturer.

8. Tape Installation: Do not install glazing tapes more than one day ahead of glass placement. Remove the paper backing from the tape only when the lite is ready to be installed. Do not stretch the tape to make it fit. Do not overlap the ends of the tape. Instead, butt ends together, and when corners are butted together, daub with sealant to assure a positive seal.

9. Glazing tapes must be kept under proper compression.

10. Glazing stops shall be installed so that stop of frame does not bear directly against glass.

3.04 CLEANING

A. Clean work under provisions of Division 1, General Requirements.

B. Remove glazing materials from finish surfaces.

C. Remove labels after work is complete.

D. Clean glass.

3.05 PROTECTION OF FINISHED WORK

A. Protect finished Work under provisions of Division 1, General Requirements.

B. Replacement: At completion of building construction and prior to its acceptance, all broken, cracked, excessively scratched, or otherwise imperfect glazing materials included under this Section shall be replaced with new glazing materials of the type specified, as directed by the Architect, and at no additional cost to the Owner.

END OF SECTION 08 80 00

SECTION 09 21 16
GYPSUM BOARD SYSTEMS

PART 1 – GENERAL

1.01 WORK INCLUDED

A. Gypsum board – Regular and moisture / impact resistant.

B. Taped and sanded joint treatments.

C. Finishing.

D. Accessories.

1.02 RELATED WORK

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

B. Section 06 10 00: Rough Carpentry.

C. Section 07 90 00: Joint Sealants.

D. Section 08 11 00: Metal Doors and Frames.

E. Section 09 90 00: Painting.

F. Section 10 26 00: Corner Guards.

G. Section 10 26 33: Fiber Reinforced Laminate (FRL).

H. Section 10 28 00: Toilet and Bath Accessories.

1.03 REFERENCES

A. ANSI/ASTM C1396 / C1396M-09a - Gypsum Wallboard.

B. ANSI/ASTM C514-04 - Nails for the Application of Gypsum Wallboard.

C. ANSI/ASTM C630/C630M - Water Resistant Gypsum Backing Board.

D. Gypsum Association GA-216 - Application and Finishing of Gypsum Board Products.

E. ASTM C645-09a - Non-Load Bearing (Axial) Steel Studs, Runners (Track), and Rigid Furring Channels for Screw Application of Gypsum Board.

F. ASTM C840-08 - Application and Finishing of Gypsum Board.

G. ASTM C955-09a- Load Bearing (Transverse and Axial) Steel Studs, Runners (Track) and Bracing or Bridging, for Screw Application of Gypsum Board.

H. ASTM C1002-07 - Steel Drill Screws for the Application of Gypsum Wallboard.

I. ASTM C1047-09 - Accessories for Gypsum Wallboard and Gypsum Veneer Base.

J. California Building Code, CBC 2022 – Chapter 25.

1.04 QUALITY ASSURANCE

A. Applicator: Company specializing in gypsum board systems work with minimum five years of experience.

1.05 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Deliver: All materials shall be delivered in original packages or bundles with the manufacturer's labels intact and legible.

B. Handling and Storage: Materials shall be kept dry, stacked off the ground and properly supported and protected from weather. Protect all edges and surfaces. Stack wallboard flat.

1.06 JOB CONDITIONS

A. Building Temperature and Ventilation: Do not install wallboard and joint compounds if building temperature is below 55 degrees F and proper ventilation is not provided to eliminate excessive moisture from building.

B. Protect work in progress as well as work of other trades. Clean surfaces that have been spotted during wallboard application.

1.07 SUBMITTALS

A. Submit per the requirements of Division 1, General Requirements.

B. Provide product data and manufacturer’s installation instruction for gypsum board, trims, joint tape, and topping compound.

PART 2 – PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS - GYPSUM BOARD SYSTEM

A. U.S. Gypsum Co. (Specified).

B. Other acceptable manufacturers offering equivalent products:

1. Pabco Gypsum Co.

2. Gold Bond Building Products.

3. Georgia-Pacific Corp.

4. National Gypsum.

5. Or approved equal.

C. Substitutions: Under provisions of Division 1, General Requirements.

2.02 GYPSUM BOARD MATERIALS

A. **Type 1 – Regular.** Regular Firecode Cores Gypsum Wallboard: ASTM C1396, ASTM C840, 5/8 inch thick, Firecore Core (Type X), maximum permissible length; ends square cut, tapered edges. USG Model No. WB1473.

1. Provide at all ceiling and soffit locations and at wall locations not specified to receive Type-2.

B. **Type 2 – Moisture & Impact Resistant.** Mold Tough VHI Firecode Cores Gypsum Wallboard: ASTM C473, ASTM D3273, ASTM C1396, ASTM C1629 and ASTM C630, Abuse Resistant, Firecode Core (Type X), 5/8 inch thick, with tapered and wrapped edges. USG Model No. WB2529.

1. Provide at ALL walls to a minimum height of 8'-0" above finish floor and extending 10 feet vertically and 4 feet horizontally beyond all wet and kitchen cooking and cleaning equipment including but not limited to sinks, water closets, drinking fountains, water heaters, stoves, ranges, hoods, dishwashers, etc. Provide at other areas where specifically identified on the Drawings.

2.03 ACCESSORIES

A. Corner Beads: Fine mesh expanded metal wing type, zinc coated in conformance with ASTM A525, G90 coating designation.

B. Edge Trim: GA 216; Type "J" bead.

C. Joint Materials: GA 216; reinforcing tape, joint compound, adhesive, water, and fasteners.

D. Fasteners: General provide specific fasteners required for fire rated assemblies.

1. Use Type W screws for gypsum board attachment to wood framing.

2. Use Type G screws for gypsum board attachment to gypsum board.

E. Setting Compound: Durabond as manufactured by USG. For use at all locations where gypsum board is in direct contact with concrete curbs.

F. Electrical Box Sealer: Lowry's "Electrical Box Pads", 6" x 8" x 1-1/8" resilient sealer pads.

PART 3 – EXECUTION

3.01 INSPECTION

A. Verify that site conditions are ready to receive work and opening dimensions are as indicated on shop drawings.

B. Check framing for accurate spacing and alignment.

C. Do not proceed with installation of wallboard until deficiencies are corrected and surfaces to receive wallboard are acceptable.

D. The Painting Contractor shall not be required to accept the gypsum wallboard installation until after he has applied sealer. At that, time he shall inspect the installation and report to the General Contractor, with a letter to the Architect, of any surface damage, defects or uneven walls. Uneven walls shall mean those that are not straight, plumb or of an even, true plane. All such discrepancies shall be the responsibility of gypsum wallboard installer and shall be connected by him prior to application of further wall decoration.

E. Beginning of installation means acceptance of existing surfaces substrate.

3.02 ACOUSTICAL ACCESSORIES INSTALLATION

A. Install acoustical sealant within partitions in accordance with manufacturer's instructions.

B. Install resilient sealer pads over backs and sides of electrical junction boxes.

3.03 GYPSUM BOARD INSTALLATION

A. Prior to installation of any gypsum board product, Contractor shall review locations of all wall mounted accessories, casework, toilet partitions and other items requiring solid backing to place all backing required.

B. Install gypsum board in accordance with GA 216 and ASTM C840-08.

C. Erect single layer standard gypsum board in most economical direction, with ends and edges occurring over firm bearing.

D. Use screws when fastening gypsum board to wood furring or framing.

E. Fasteners for all vertical gypsum boards shall be placed at 8” at the perimeter and 12” in field U.O.N. on drawings.

F. Treat cut edges and holes in moisture resistant gypsum board with sealant.

G. Place control joints consistent with lines of building spaces as indicated by Architect.

H. Place corner beads at external corners. Use longest practical length. Place edge trim where gypsum board abuts dissimilar materials.

I. Contractor shall provide mud ring extensions for all electrical switch and outlets to allow device to flush with face of new gypsum board surface.

J. At all locations where gypsum board extends past bottom sill plate and contacts face of curb, apply Durabond adhesive product to back side of gypsum board per manufacturer’s recommendations to secure to face of concrete curb. Provide moderate pressure and temporary nailing or shoring to ensure adequate bond.

3.04 JOINT TREATMENT AND FINISH TEXTURE

A. Tape, fill, and sand exposed joints, edges, and corners to produce smooth surface ready to receive finishes.

B. Feather coats onto adjoining surfaces so that camber is maximum 1/32 inch.

C. All exposed gypsum board surfaces and surfaces behind Fiber Reinforced

Laminate (FRL) wall coverings shall be finished to Level 4 as described by the USG Corporation with no texture. A spray applied primer surfacer is not acceptable as an alternative to providing required levels of troweled compound and thorough sanding.

D. At custodian closets, electrical/IT closets, behind permanently fixed casework and where gypsum board is covered by plywood panels, gypsum board may receive a Level 2 finish as described by the USG Corporation or as otherwise required at fire rated walls to achieve specified fire rating.

3.05 TOLERANCES

A. Maximum Variation from True Flatness: 1/8 inch in 10 feet in any direction.

3.06 ADJUST AND CLEAN

A. Cleaning and Repair: Clean surfaces that have been spotted or soiled during wallboard application. Contractor shall clean all light fixture lenses, fire alarm devices, electrical outlets, as performing work.

B. Defective Work: Remove and replace defective work which cannot be satisfactorily repaired, at the direction of the Architect, with no additional cost to the Owner.

C. Protection: Protect installed work against damage from other construction work.

3.07 CLEAN-UP

A. 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 09 21 16

SECTION 09 51 00
APPLIED ACOUSTIC WALL PANELS

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. Direct applied PET custom cut fiber acoustic wall panels.

1.02 RELATED DOCUMENTS

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

B. Section 06 20 00: Finish Carpentry.

C. Section 09 90 00: Painting.

1.03 SUBMITTALS

A. Submit per the requirements of Division 1, General Requirements.

B. Product Data: Submit manufacturer's technical data for each type of panel and fastener required.

C. Samples: Minimum 4 inch x 4 inch samples of specified panels demonstrating thickness, texture, color and any specified patterns.

D. Shop Drawings: Layout and details of panels, including custom cut shapes and graphics showing locations of items that are to be coordinated with the installation as required.

1.04 QUALITY ASSURANCE

A. Single-Source Responsibility: Provide acoustical panel units and fasteners by a single manufacturer.

B. Fire Performance Characteristics: Identify acoustical ceiling components with appropriate UL markings.

1. Surface Burning Characteristics: Tested per ASTM E 84 and complying with ASTM E 1264 Classification.

C. Coordination of Work: Coordinate acoustical ceiling work with installers of related work including, but not limited to building insulation, gypsum board, light fixtures, mechanical systems, electrical systems, and sprinklers.

1.05 DELIVERY, STORAGE & HANDLING

A. Deliver acoustical ceiling units to project site in original, unopened packages and store them in a fully enclosed space where they will be protected against damage from moisture, direct sunlight, surface contamination, and other causes.

B. Provide labels indicating brand name, style, size and thickness.

C. Before installing acoustical ceiling units, permit them to reach room temperature and a stabilized moisture content.

D. Handle acoustical ceiling units carefully to avoid chipping edges or damaged units in any way.

1.06 PROJECT/SITE CONDITIONS

A. Environmental Requirements:

1. Do not install ceiling panels until building is closed in and HVAC system is operational.

2. Locate materials onsite at least 72 hours before beginning installation to allow materials to reach temperature and moisture content equilibrium.

3. Maintain the following conditions in areas where acoustical materials are to be installed 72 hours before, during and after installation:

a. Relative Humidity: 25 - 85%.
b. Uniform Temperature: 32 - 120 degrees F.

1.07 WARRANTY

A. Submit a written warranty executed by the manufacturer and/or installer, agreeing to repair or replace panels that fail within the warranty period. Failures include, but are not limited to the following:

1. Defects in materials or factory workmanship.

2. Installation.

B. Warranty Period: Five years from date of substantial completion.

C. The Warranty shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and will be in addition to and run concurrent with other warranties made by the Contractor under the requirements of the Contract Documents.

PART 2 - PRODUCTS

2.01 TYPE AP-1: Signature Acoustics, Sound Absorbing Acoustic Panels

A. Acoustic Panel **(Type AP-1)**: Signature Acoustics, Sound Absorbing Acoustic Panels.

1. Contact: Signature Graphics
620 Sunbeam Ave.
Sacramento, CA 95811
Mark Roberts: 916.503.8550
mroberts@signaturerepro.com

2. Product Pattern: Multi-color custom CNC mill cut in patterns as illustrated on Drawings.
3. Surface Texture: Semi-smooth
4. Composition: 100% PET polyesther.
5. Finish: Surface appearance shall be consistent from panel to panel.
6. **Color/Pattern: Allow for up to (3) colors in a custom-cut, custom-patterned application. Colors to be selected by Architect at time of submittal from manufacturer's full range of standard colors. Architect to provide graphic image file at time of submittal.**
7. Size: As cut from maximum panel size of 4’ x 8’.
8. Thickness: 1/2 inch (12 mm).
9. Hardness: 60-65 (Shore C).
10. Edge Profile: Square
11. UL Classified Noise Reduction Coefficient (NRC): ASTM C 423. NRC 0.35.
12. UL Classified Flame Spread: ASTM E 84; Class A.
13. Mounting: Direct-applied using full perimeter manufacturer's heavy-duty double-sided adhesive tape or trowled adhesive. Apply to full perimeter of each panel and minimum 16" o.c. each direction.

B. EZOBOARD Custom-Cut, Custom Patterned Wall Panels.

C. Approved Equal.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Do not proceed with installation until all substrate work has been completed, painted and dried-out, unless expressly permitted by manufacturer’s printed recommendations.

B. Where gap between panels is indicated on the Drawings, paint substrate prior to panel installation and allow for full dry time.

3.02 PREPARATION

A. Measure each wall area and establish layout of wall units. Coordinate panel layout with mechanical and electrical/mechanical/plumbing and/or other fixtures. Panels/pattern shall be scribed tight around existing items that cannot be removed and reinstalled over acoustic panels including ventilation diffusers, fire alarm devices, a/v devices and other equipment items.

3.03 INSTALLATION

A. Install panels in full accordance manufacturer’s installation instructions.

B. **Type AP-1**: Panels shall be direct-applied using full perimeter manufacturer's heavy-duty double-sided adhesive tape or trowled adhesive as recommended by manufacturer. Apply to full perimeter of each panel and minimum 16" o.c. each direction. Provide in pattern as shown on the Drawings. Some installation locations require a gab between panels. Other locations require a tight butt joint. Firmly roll panels in full accordance with manufacturer's written instructions to seat panel in adhesive tape.

3.04 ADJUSTING AND CLEANING

A. Replace damaged and broken panels.

B. Clean exposed surfaces of acoustical panels of dust and debris. Comply with manufacturer's instructions for cleaning and touch up of minor finish damage. Remove and replace any panels that cannot be successfully cleaned and or repaired.

END OF SECTION 09 51 00

SECTION 09 53 00
ACOUSTICAL CEILINGS

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. Suspended metal grid ceiling system and perimeter trim.

B. Lay-in acoustical panels.

C. Wire, hangers, fasteners, main runners, wall angle molding and accessories.

D. Direct applied replacement acoustical tiles.

1.02 RELATED SECTIONS

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

B. Section 06 10 00: Rough Carpentry.

C. Division 23: Mechanical.

D. Division 26: Electrical.

1.03 REFERENCES

A. American Society for Testing and Materials (ASTM):

1. ASTM A 1008 – Standard Specification for Steel, Sheet, Cold Rolled, Carbon, Structural, High- Strength Low- Alloy and High – Strength Low- Alloy with Improved Formability.

2. ASTM A 641 – Standard Specification for Zinc Coated (Galvanized) Carbon Steel Wire.

3. ASTM A 653 – Standard Specification for Steel Sheet, Zinc Coated (Galvanized) by the Hot-Dip Process.

4. ASTM C 423 – Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method.

5. ASTM C635 / C635M-07 - Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings.

6. ASTM C636 / C636M-08 - Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels.

7. ASTM E 84 – Standard Test Method for Surface Burning Characteristics of Building Materials.

8. ASTM E580 / E580M-09a - Practice for Application of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Requiring Seismic Restraint.

9. ASTM E1264-08 - Classification of Acoustical Ceiling Products.

B. Ceilings and Interior Systems Contractors Association (CISCA) - Acoustical Ceilings: Use and Practice.

C. California Building Code, CBC 2022.

D. ASHRAE Standard 62 1 2004 Ventilation for Acceptable Indoor Air Quality.

E. California Electrical Code.

F. ASCE 7 American Society of Civil Engineers, Minimum Design Loads for Buildings and Other Structures.

G. California Air Resources Board (CARB) compliant.

H. UL - Fire Resistance Directory and Building Material Directory.

I. Division of the State Architect - Interpretations of Regulations, IR 25-2 - Metal Suspension Systems for Lay-in Panel Ceilings.

1.04 SYSTEM DESCRIPTION

A. Non-fire rated suspension system to rigidly secure acoustical ceiling system including integral mechanical and electrical components with a maximum deflection of 1/360.

B. Non-fire rated lay-in acoustical panels.

1.05 SUBMITTALS

A. Submit per the requirements of Division 1, General Requirements.

B. Shop Drawings: Indicate grid layout and related dimensioning, junctions with other work or ceiling finishes, interrelations of mechanical and electrical items related to system.

C. Product Data: Provide data on main grid system components and acoustical units.

D. Samples: Submit two samples 6 x 12 inch in size illustrating material and finish of acoustic units.

E. Samples: Submit two samples each, 12 inches long, of suspension system main runner, cross runner and edge trim.

F. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

1.06 QUALIFICATIONS

A. Grid Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience and pre-approved by the Division of the State Architect (DSA).

B. Acoustical Unit Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

C. Applicator: Company specializing in performing the work of this section with minimum

three years documented experience. Applicator shall be familiar with DSA suspended grid system requirements.

D. Single Source Responsibility: Provide ceiling panel units and grid components by a single manufacturer.

E. Fire Performance Characteristics: identify ceiling components with appropriate markings or applicable testing and inspecting organization.

1. Surface Burning Characteristics: As follows, tested by HPVA (Hardwood Plywood and Veneer Association) under the test standard ASTM E-84 tunnel test and complying with ASTM E 1264 fir Class A products.

a. Flame Spread: 25 or less.
b. Smoke Development: 50 or less.

F. Coordination of Work: Coordinate ceiling work with installers of related work including, but not limited to building insulation, wet work i.e. gypsum board, light fixtures, mechanical systems, electrical systems, and sprinklers.

1.07 ENVIRONMENTAL REQUIREMENTS

A. Maintain uniform temperature of minimum 60 degrees F and maximum humidity of 40 percent prior to, during, and after acoustical unit installation.

1.08 DELIVERY, STORAGE AND HANDLING

A. Do not store materials in unconditioned spaces with humidity greater than 55 percent or lower than 25 percent relative humidity and temperatures lower than 50 degrees F or greater than 86 degrees F. Do not expose the ceiling panels to extreme temperatures, for examples, close to a heating source or near a window with direct sunlight.

B. Handle ceiling units carefully to avoid chipped edges or damage to units in any way.

1.09 WARRANTY

A. Submit a written warranty executed by the manufacturer, agreeing to repair or replace panels that fail within the warranty period. Failure include, but are not limited to:

1. Ceiling Panels: Defects in materials or factory workmanship.

2. Grid System: Rusting and manufacturer’s defects.

B. Warranty Period:

1. Acoustical Panels: one (1) year from date of installation.

2. Grid: one (1) year from date of installation.

C. The Warranty shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract documents and will be in addition to and run concurrent with other warranties made by the Contractor under the requirements of the Contract Documents.

1.10 SEQUENCING

A. Sequence work to ensure acoustical ceilings are not installed until building is enclosed, sufficient heat is provided, dust-generating activities have terminated, and overhead work is completed, tested, and approved.

B. Install acoustic units after interior wet work is dry.

1.11 EXTRA MATERIALS

A. Furnish under provisions of Division 1, General Requirements.

B. Provide 2 percent of each type of extra panels to Owner.

PART 2 – PRODUCTS

2.01 SUSPENSION SYSTEM MATERIALS

A. Acoustical Ceilings Suspension System:

1. Non-fire Rated Grid: ASTM C635, heavy-duty, exposed "tee"; components die cut and interlocking.

2. Metal Grid Materials: 1-1/2 inch high structural "tee" main and cross members, commercial quality cold rolled steel with coating to meet ASTM C635. Acceptable manufacturers:

	Main Runner No.	Cross-Runner No.	ICC #
Armstrong	7301D	XL7341	ESR-1308
Chicago Metallic	200	1204	ESR-2631
USG Interiors, Inc.	DX26	DX424	ESR-1222

3. Grid Finish: White.

4. Accessories: Stabilizer bars, compression structs, clips, splices, edge moldings and hold down clips required for complete suspended grid system for compliance with specifications and Drawing details.

5. Support Channels and Hangers: Galvanized primed steel; size and type to suite application and to meet seismic requirements, and ceiling system flatness requirements.

2.02 SUSPENDED CEILING UNIT MATERIALS

A. **ACT Type 1** – Non-Fire Rated Food Service Grade Lay-in Acoustic Panels:

1. Product: Armstrong World Industries, Clean Room VL #870 or equal from USG Interiors, Inc. or other approved manufacturer meeting all these performance and aesthetic criteria.
2. Sizes: 24 x 48 inches and 24 x 24 inches unless otherwise indicated on Drawings.
3. Thickness: 5/8 inches.
4. CAC: up to 40.
5. Composition: Vinyl covered mineral fiber.
6. Flame Spread: 25 maximum, Class A.
7. Smoke Developed Index: 50 minimum.
8. Edge: Square.
9. Surface Color: White.

10. Surface Finish: Clean Room VL No. 870 Textured, un-perforated.
11. Exposed Grid Surface Width: 15/16 inches.
12. NO ADDED Formaldehyde, Low-Emitting compliant with CalGreen and CHPS.

2.03 APPLIED REPLACEMENT ACOUSTIC TILES

A. **ACT TYPE-2** – Non-Fire Rated applied acoustical tiles to replace existing direct substrate applied tiles where missing or damaged.

1. Product: Armstrong Cortega, Sanserra random perforated or fissured or as required to best match existing. Contractor to field verify prior to submittal and submit only on best match.
2. Organic fiber material held in a cementitious matrix.
3. Thickness: +/- 15/16”.
4. Edge: V-chamfer.
5. Pattern: Random perforated or fissured to best match existing.
6. Size: 12” x 12”.
7. Color: Pre-Finished Factory White.
8. NRC: 0.40 minimum per ASTM C423.
9. Flame Spread Index: 25 maximum, Class A.
10. Smoke Developed Index: 50 or less
11. Method of Fastening: Adhesive applied using manufacturer’s standard adhesive designed specifically for glue-up installation and in full conformance with manufacturer’s written installation instructions. Pin nail option is acceptable if existing wood furring strips are currently installed.

2.04 ACCESSORIES

A. Touch-up Paint: Type and color to match acoustical units and grid.

PART 3 – EXECUTION

3.01 EXAMINATION

A. Verify that layout of hangers will not interfere with other work, either new or existing.

3.02 INSTALLATION - LAY-IN GRID SUSPENSION SYSTEM

A. Install system in accordance with ASTM C636 / C636M-08, DSA IR 25-2 and as supplemented in this section and per the details on the Drawings.

B. Install system capable of supporting imposed loads to a deflection of 1/360 maximum.

C. Install after major above ceiling work is complete. Coordinate the location of hangers with other work.

D. Locate system on room axis according to reflected ceiling plan. At infill areas within existing grid, layout as identified on the reflected ceiling plan.

E. Hang suspension system impendent of walls, columns, ducts, pipes and conduit. Where carrying members are spliced, avoid visible displacement of face plane of adjacent members.

F. Where ducts or other equipment prevent the regular spacing of hangers, provide trapeze or other supplementary support members at obstructions to main hanger spacing. Provide additional hangers, struts or braces as required at all ceiling breaks, soffits or

discontinuous areas. Hanger wires that are more than 1 in 6 out of plumb are to have counter-sloping wires.

G. Flush or recessed light fixtures and air terminals or services weighing less than 56 pounds may be supported directly on the runners of a heavy-duty grid system but, in addition, they must have a minimum of two 12 ga. slack safety wires attached to the fixture at diagonal corners and anchored to the structure above. All 4 ft. x 4ft. light fixtures must have slack safety wires at each corner.

H. All flush or recessed light fixtures and air terminals or services weighing 56 pounds or more must be independently supported by not less than four taught 12 ga. wires each attached to the fixture and to the structure above regardless of the type of ceiling grid system used.

I. The four taught 12 ga. wires including their attachment to the structure above must be capable of supporting four times the weight of the unit.

J. Do not eccentrically load system or produce rotation of runners.

K. Install edge molding at intersection of ceiling and vertical surfaces using longest practical lengths without splices. Miter all corners. Provide edge molding at all junctions with other interruptions.

L. Attach all light fixtures and ceiling mounted air terminals or services to the ceiling grid runners to resist a horizontal force equal to the weight of the fixtures.

M. Separate all ceiling hanging and bracing wires at least 6 inches from all unbraced ducts, pipes, conduits, etc. It is acceptable to attach lightweight items such as single electrical conduit not exceeding 3/4 inches nominal diameter to hanger wires using connectors acceptable to DSA.

N. Modify grid with additional secondary runners as required to accommodate mechanical, electrical, plumbing or food service equipment.

3.03 INSTALLATION – SUSPENDED CEILING ACOUSTICAL UNITS

A. Install acoustical units in accordance with manufacturer's instructions.

B. Fit acoustical units in place, free from damaged edges or other defects detrimental to appearance and function.

C. Lay direction patterned units one way with pattern parallel to the longest room axis. Fit border trim neatly against abutting surfaces.

D. Install units after above ceiling work is complete and accepted.

E. Install acoustical units level, in a uniform plane, and free from twists, warps and dents.

F. Cut panels to neatly fit irregular grid and perimeter edge trim. Kerf all cut panel edges to match factory finish edges.

G. Install hold-down clips to retain panels tight to grid system within 10 feet of an exterior door.

H. Install suspension system and panels in compliance with ASTM C636; CISCA Seismic Guidelines; approved construction drawings; with the authorities having jurisdiction; and

in accordance with the manufacturer's instillation instructions.

3.04 INSTALLATION - APPLIED REPLACEMENT TILES

A. Adhesive applied using manufacturer's standard adhesive designed specifically for glue-up installation and in full conformance with manufacturer's written installation instructions. Pin nail option is acceptable if existing wood furring strips are currently installed.

3.05 ERECTION TOLERANCES

A. Maximum variation from flat and level surface: 1/8 inch in 10 feet.

B. Variation from plumb of grid members caused by eccentric loads: Two degrees maximum.

END OF SECTION 09 53 00

SECTION 09 65 00
RESILIENT FLOORING AND BASE

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. Vinyl composition tiles (VCT).

B. Resilient accessories.

C. Subfloor testing and preparation.

D. Installation of vapor retarder (if determined to be necessary by moisture testing).

1.02 RELATED SECTIONS

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

B. Section 03 33 00: Cast-in-Place Concrete.

C. Section 07 26 00: Vapor Retarders.

1.03 REFERENCES

A. FS L-F-1641 - Floor Covering, Translucent or Transparent Vinyl Surface, with Backing.

B. FS L-F-475A - Floor Covering, Vinyl Surface (Tile and Roll), with Backing.

1.04 QUALITY ASSURANCE

A. Flooring Contractor Installer Qualifications:

1. Flooring Contractor to be an established firm experienced in the installation of the specified product and shall have access to all manufacturers' required technical, maintenance, specifications and related documents.

2. Floor covering installer must be factory trained and certified for the installation of the specific products being installed.

3. Installer to provide project inspector proof of certification prior to starting work.

4. Certified installer must be present on job site while work is in progress.

B. Pre-Floor Covering Installation Meeting:

1. Contactor to notify Construction Manager with a minimum of 5-days notice when anticipated to be ready for pre-floor covering installation meeting. (After subfloor preparation is complete and ready for floor covering installation.)

2. Contractor, installer and manufacturer representative are required to attend pre-floor covering meeting. Contractor is responsible for coordinating and scheduling their attendance.

3. Construction Manager will schedule meeting with Contractor team, Project Inspector, & Architect.

4. Purpose of Meeting: To review subfloor preparation, verification of readiness for floor covering installation and use of correct products, verification of the acclamation of correct finish materials and review installation requirements.

C. Manufacturer's Field Services:

1. Manufacturer representative to attend the "Pre-Flooring" meeting.

2. Upon Owner or Architect's request, and with at least 72-hour notice, provide manufacturer's representative site visit(s) for inspection of product installation.

3. At Owner's request manufacturer representative to attend operation and maintenance training meeting for Owner's custodial staff prior to acceptance of floor covering installation.

D. Testing Laboratory Qualifications:

1. Certified, bonded, qualified and experienced agency to perform pH and moisture vapor emission tests.

1.05 SUBMITTALS

A. Provide a complete submittal package with all components required within this section. Submit per the requirements of Division 1, General Requirements.

1. Product Data: Provide product data describing physical and performance characteristics, sizes, patterns, colors, material safety data sheets and manufacture's installation instructions for all proposed products.

2. Shop Drawings:

a. Provide a floor plan indicating all proposed seam locations.

b. Provide a game stripping plan indicating court layouts and colors.

3. Samples:

a. Submit samples for color selection illustrating color and pattern for floor material with samples of matching welding rod seams, rubber base and transition material proposed for installation.

1.06 OPERATION AND MAINTENANCE DATA

A. Submit cleaning and maintenance data under provisions of Division 1, General Requirements.

B. Include maintenance procedures, recommended maintenance materials, and suggested schedule and products for cleaning, stripping, and re-waxing.

C. At the request of the Owner, provide in-service training with Owner's custodial staff prior

to acceptance of flooring for proper care and maintenance of floor covering.

1.07 DELIVERY, STORAGE AND HANDLING

A. Delivery: Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.

B. Storage and Protection: Store materials protected for exposure to harmful weather conditions and at a temperature and humidity conditions recommended by manufacturer. Materials should be stored in areas that are fully enclosed, weather tight with the permanent HVAC system set at a uniform temperature of at least 68 degrees F (20 degrees C) for 72 hours prior to, during and after installation.

1.08 ENVIRONMENTAL REQUIREMENTS

A. Maintain a minimum temperature in the spaces to receive the flooring and accessories of 65ºF and a maximum temperature of 85ºF for at least 48 hours before, during, and for not less than 48 hours after installation. Thereafter, maintain a minimum temperature of 55ºF in areas where work is completed. Protect all materials from the direct flow of heat from hot-air registers, radiators, or other heating fixtures and appliances.

B. Prior to testing for moisture vapor emission rate, space shall be enclosed, fully weather-tight, wet-work in space shall be completed and nominally dry, work above ceilings finished. The test site should be at the same temperature and humidity expected during normal use.

C. Maintain lighting at a minimum uniform level of 50 or more foot candles in areas where the floor system is being installed.

1.09 CONCRETE SUBFLOOR TESTING

A. The Contractor shall be responsible for conducting calcium chloride test. Three (3) tests are required for the first 1,000 square feet and one additional test for every 1,000 square feet thereafter to ensure concrete moisture emissions do not exceed manufacturer's requirements for different product types specified under this section per 1,000 square feet within a 24-hour period for areas to receive linoleum.

1. F1869-98 Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride. This test method covers the quantitative determination of the rate of moisture vapor emitted from below-grade, on-grade, and above-grade (suspended) concrete floors.

B. The Flooring Contractor shall verify in writing to the Owner, a minimum of thirty (30) days prior to scheduled resilient flooring installation, the following substrate conditions:

1. Moisture: Initial emission rate, as tested with a calcium chloride test kit, per ASTM F1869-16 requirements.

2. Alkalinity: pH level.

C. Moisture and /or Alkalinity Readings:

1. New Construction (New Concrete Slab)

    a. If the Contractor's test results indicate that the slab moisture and/or alkalinity readings are below those of flooring manufacturer's req., the Owner's representative will initiate independent testing to confirm results & will initiate additional testing using petrographic analysis to determine if the Water Cement Ratio & sufficient hydration has taken place.

        1) Once it is determined that the Specifications were followed in their entirety, water/cement ratio (as specified), and or the concrete surface has been adequately hydrated; then the Contractor shall initiate a credit to the Owner for the cost of installation of the Vapor Retarders as specified in section 07 26 00 that were not installed.

2. Modernization Construction (Existing Concrete Slab)

    a. If the Contractor's test results indicate that the slab moisture and/or alkalinity readings are below those of flooring manufacturer's requirements, the Owner's representative will initiate independent testing to confirm results.

        1) If the independent test results do not substantiate the Contractor's findings, then the Contractor will be directed to proceed with the Vaper Retarder installation and the retesting cost will be back charged to the contractor.

        2) If the independent test results confirm the Contractor's findings, then the Contractor shall initiate a credit to the Owner for the cost of installation of the Vapor Retarders as specified in section 07 26 00 that were not installed.

1.10 EXTRA MATERIALS

A. Provide a minimum of 20 sq ft of each type and color of flooring and 10 lineal feet of base and transition pieces of each material and color specified or 2% whichever is greater.

1.11 WARRANTY

A. Installation Warranty: Two (2) year installation warranty commencing on recordation date of the Notice of Completion.

B. Manufacturer's Warranty: Five (5) year manufacturer warranty commencing on recordation date of the Notice of Completion.

PART 2 – PRODUCTS

2.01 MATERIALS

A. Vinyl Composition Tile, **Type VCT-1**: General: ASTM F1066, Coefficient of Friction per ASTM D2047 meets recommended value of 0.6. Composition 1, 12-inch x 12-inch x 1/8-inch gauge. Pattern and color to match existing at repair areas or as selected by Owner Representative from Manufacturer's standard range for new or replacement floors.

1. Armstrong Excelon.

2. Azrock Cortina.

3. Approved equal.

4. Color: Provide minimum of (3) separate colors in patterns identified on the Drawings. Colors to be selected by Architect at time of submittal from manufacturer's full range of standard colors.

B. Rubber Wall Base, **Type RB-1**: General: FS-SS-W-40, Type 1 with matching end stops. 4" high and 1/8-inch gauge. No manufactured corners.

1. Burke Industries, Type TS.

2. Flexco Floors, Wallflowers Series.

3. Roppe Rubber Corp, Pinnacle Series.

4. Approved equal.

5. Color: To be selected by Architect at time of submittal from manufacturer's full range of standard colors.

C. Accessories:

1. Resilient Edge Strips: 1/8-inch-thick, tapered or bullnose, minimum of 1 inch wide, color to be selected.

   a. Burke Mercer, Carpet to Resilient Transition, #152

   b. Johnsonite, Adaptor, CTA-XX-A

   c. Or approved equal.

2. Adhesive: Waterproof, EPA acceptable and as recommended by manufacturer.

3. Primer: Non-staining type as recommended by flooring manufacturer.

4. Leveling and Patching Compounds: Latex type as recommended by flooring manufacturer.

5. Metal Trim Cap: Provide at top edge of sheet vinyl cove.

6. Sealer and Wax wear coats: As recommended by manufacturer.

PART 3 – EXECUTION

3.01 EXAMINATION

A. New Construction (New Concrete Slab)

1. Installer must examine areas and conditions under which resilient flooring and

accessories are to be installed and must notify General Contractor in writing of conditions detrimental to proper and timely completion of work. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to Owner and Architect.

2. The Contractor shall be responsible for conducting calcium chloride test. Three (3) tests are required for the first 1,000 square feet and one additional test for every 1,000 square feet thereafter to ensure concrete moisture emissions do not exceed 5.0 lbs per 1,000 square feet within a 24-hour period for areas to receive flooring. Submit test results a minimum of thirty (30) days prior to scheduled resilient flooring installation to Owner's representative.

3. Verify that new surfaces are smooth and flat with maximum variation as specified in 03 30 00 – Cast-in-place Concrete, and are ready to receive work.

4. Beginning of installation on new substrates means acceptance of substrate. The existing substrates will require as much preparation as necessary to provide proper installation of new materials.

B. Modernization Construction (Existing Concrete Slab)

1. If existing flooring was determined to be asbestos containing and required abatement, verify that the abatement work has been accepted by the Owner's representative prior to commencing work.

2. The Contractor shall be responsible for conducting calcium chloride test. Three (3) tests are required for the first 1,000 square feet and one additional test for every 1,000 square feet thereafter to ensure concrete moisture emissions do not exceed 5.0 lbs per 1,000 square feet within a 24-hour period for areas to receive flooring. Submit test results a minimum of thirty (30) days prior to scheduled resilient flooring installation to Owner's representative.

3.02 PREPARATION

A. New Construction (New Concrete Slab)

1. Install vapor retarder system (unless verified that moisture content meets requirements of Section 1.09-C).

2. Remove sub-floor ridges and bumps. Fill low spots, cracks, joints, holes, and other defects with subfloor filler.

3. Apply, trowel, and float filler to leave a smooth, flat, hard surface.

4. Prohibit traffic from area until filler is cured.

5. Prepare floor substrate to be smooth, rigid, flat, level, permanently dry, clean and free of foreign materials such as dirt, paint, grease, oils, solvent, curing and hardening compounds, sealers, asphalt and old adhesive residue. Vacuum clean substrate.

6. Apply primer to concrete surfaces.

B. Modernization Construction (Existing Concrete Slab)

1. Remove existing finishes, adhesives and other materials as necessary to properly prepare existing substrates. (Refer to asbestos abatement procedures.)

2. Install vapor retarder system (unless verified that moisture content meets requirements of Section 1.09-C).

3. Remove sub-floor ridges and bumps. Fill low spots, cracks, joints, holes, and other defects with subfloor filler.

4. Fill low spots, cracks, joints, holes and other defects with filler prior to flooring installation.

5. Apply, trowel, and float filler to leave a smooth, flat, hard surface.

6. Prohibit traffic from area until filler is cured.

7. Prepare floor substrate to be smooth, rigid, flat, level, permanently dry, clean and free of foreign materials such as dirt, paint, grease, oils, solvent, curing and hardening compounds, sealers, asphalt and old adhesive residue. Vacuum clean substrate.

8. Apply primer to concrete surfaces.

3.03 VINYL COMPOSITION TILE INSTALLATION

A. Install in accordance with manufacturers' instructions.

B. Spread only enough adhesive to permit installation of materials before initial set.

C. Set flooring in place, press with heavy roller to attain full adhesion.

D. Terminate flooring at centerline of door openings where adjacent floor finish is dissimilar.

E. Install edge strips at unprotected or exposed edges, and where flooring terminates.

3.04 INSTALLATION – TOP SET RUBBER BASE MATERIAL

A. Install VCT with resilient wall base on entire wall perimeter including toe spaces and open ends of cabinets. Set all bases in adhesive as recommended by the manufacturer. All joints in bases, shall be plumb, flush, tight and inconspicuous. Seat top edge and back of base firmly against the wall. Wrap base around all outside corners and no seams within 12” of corners. Interior corners shall be mitered and tightly fitted.

3.05 PROTECTION

A. Prohibit traffic on floor finish for 5-days after installation and prior to cleaning.

B. Prohibit traffic on floor for a minimum of 24 hours after sealed and waxed.

C. Protect flooring from damages by other trades prior to owner occupancy.

3.06 INITIAL CLEANING

A. Cleaning: After new floor finish has set for a minimum of 5-days, remove excess adhesive from floor, base, and wall surfaces. Contractor to be responsible for performing initial maintenance requirements based on procedures listed below:

1. Sweep or dust all floors.

2. Scrub floor using a neutral cleaner. Do not remove manufacturer's coating.

3. Rinse floor thoroughly.

4. Apply two (2) coats of sealer. Allow 45 minutes between coats.

5. Apply three (3) coats of wax. Allow 45 minutes between coats.

END OF SECTION 09 65 00

SECTION 09 67 00
URETHANE CEMENT FLOORING SYSTEM

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Polyurethane/cementitious decorative corrosion resistant industrial flooring and integral base system for installation on new and existing structural concrete floor slabs.

B. Vapor emission control system.

1.02 RELATED DOCUMENTS

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

B. Section 03 30 00: Cast-in-Place Concrete.

C. Section 11 40 00: Foodservice Equipment.

D. Mechanical, Plumbing and Electrical Sections.

1.03 SUBMITTALS

A. Submit per the requirements of Division 1, General Requirements.

B. Product Data: For each type of product indicated. Include manufacturer's technical data, application instructions, and recommendations for each resinous flooring component required.

C. Samples for Verification: For each resinous flooring system required provide samples as indicated in “mockups” section below.

D. Product Schedule: Use resinous flooring designations indicated in Part 2 and room designations indicated on Drawings in product schedule.

E. Installer Certificates: Signed by manufacturer certifying that installers comply with specified requirements.

F. Maintenance Data: For resinous flooring to include in maintenance manuals.

1.04 QUALITY ASSURANCE

A. No request for substitution shall be considered that would change the generic type of floor system specified (i.e. Urethane mortar-based system). Equivalent materials of other manufactures may be substituted only on approval of Architect or Engineer. Request for substitution will only be considered only if submitted 10 days prior to bid date. Request will be subject to specification requirements described in this section. **This is a food service facility and system must be capable of withstanding thermal shock.**

B. Installer Qualifications: Engage an experienced installer (applicator) who is experienced in applying resinous flooring systems similar in material, design, and extent to those indicated for this Project, whose work has resulted in applications with a record of

successful in-service performance, and who is acceptable to resinous flooring manufacturer.

1. Engage an installer who is certified in writing by resinous flooring manufacturer as qualified to apply resinous flooring systems indicated.

2. Contractor shall have completed at least 5 projects of similar size and complexity.

C. Source Limitations: Obtain primary resinous flooring materials, including primers, resins, hardening agents, grouting coats, and topcoats, through one source from a single manufacturer, with not less than ten years of successful experience in manufacturing and installing principal materials described in this section. Provide secondary materials, including patching and fill material, joint sealant, and repair materials, of type and from source recommended by manufacturer of primary materials.

D. Manufacturer Field Technical Service Representatives: Resinous flooring manufacture shall retain the services of Field Technical Service Representatives who are trained specifically on installing the system to be used on the project.

1. Field Technical Services Representatives shall be employed by the system manufacture to assist in the quality assurance and quality control process of the installation and shall be available to perform field problem solving issues with the installer.

E. Mockups: Apply mockups to verify selections made and to demonstrate aesthetic and texture effects and set quality standards for materials and execution.

1. Provide small format (+/- 6” x 6”) physical samples of specified system including selected color and abrasive texture at time of initial submittal. Provide additional samples with one level smoother and one level greater than specified. Provide (2) samples each of all (3) texture levels. These will be used to confirm abrasive requirements with Contra Costa County Environmental Health Department.

2. Provide full-thickness on-site mockup of approximately 48 inch x 48 inch area of floor system in area selected by Architect. Mock-up shall also include representation of integral cove base in selected color and abrasive texture as approved by the architect and the Contra Costa County Environmental Health Department from samples provided above.

3. Sign off from Architect and or Owner’s Representative on texture for slip resistance must be complete before installation of full flooring and base system.

F. Pre-installation Conference:

1. General contractor shall arrange a meeting not less than thirty days prior to starting work.

2. Attendance:
   a. General Contractor.
   b. Installing Subcontractor.
   c. Architect or Owner's Representative.
   d. Manufacturer Representative.

1.05 DELIVERY, STORAGE AND HANDLING

A. Deliver materials in original packages and containers, with seals unbroken, bearing manufacturer's labels indicating brand name and directions for storage and mixing with other components.

B. Store materials to prevent deterioration from moisture, heat, cold, direct sunlight, or other detrimental effects.

C. All materials used shall be factory pre-weighed and pre-packaged in single, easy to manage batches to eliminate on site mixing errors. No on site weighing or volumetric measurements allowed.

1.06 PROJECT CONDITIONS

A. Environmental Limitations: Comply with resinous flooring manufacturer's written instructions for substrate temperature, ambient temperature, moisture, ventilation, and other conditions affecting resinous flooring application.

1. Maintain material and substrate temperature between 65 and 85 deg F during resinous flooring application and for not less than 24 hours after application.

B. Lighting: Provide permanent lighting or, if permanent lighting is not in place, simulate permanent lighting conditions during resinous flooring application.

C. Close spaces to traffic during resinous flooring application and for not less than 24 hours after application, unless manufacturer recommends a longer period.

D. Concrete substrate shall be properly cured for a minimum of 30 days. A vapor barrier must be present for concrete subfloors on or below grade. Otherwise, an osmotic pressure resistant grout must be installed prior to the resinous flooring

1.07 WARRANTY

A. Manufacturer shall furnish a single, written warranty covering both material and workmanship for a period of (1) full years from date of installation, or provide a joint and several warranty signed on a single document by material manufacturer and applicator jointly and severally warranting the materials and workmanship for a period of (1) full year from date of installation. A sample warranty letter must be included with bid package or bid may be disqualified.

PART 2 - PRODUCTS

2.01 RESINOUS FLOORING

A. Available Products: Subject to compliance with requirements, product that may be incorporated into the work include:

1. Unsealed or “self-sealing” urethane mortar systems, multiple layers of liquids and broadcasts will not be accepted, and will result in a disqualification from bid.

B. Acceptable Manufactures:

1. **Stonhard** - Basis of design (Specified), The Stonehard Group
Contact: John Wagner, 532-902-1603, jwagner@stonehard.com

2. Approved equal matching all specified characteristics including thermal shock characteristics and having an expanded color pallet of more than 4 colors of grey and red.

C. Products: Subject to compliance with requirements:

1. Stonhard, Inc.; **Stonclad UT®. With UT Sealer**.

D. System Characteristics

1. Color and Pattern: Select from manufacturer's full range of standard colors and abrasive texture levels. Colors must include more than 4 colors of grey and red.

2. Wearing Surface: Light to medium texture to be confirmed against physical samples held by the Contra Costa County Environmental Health Department. Contractor will be required to provide physical mock-up chip samples of proposed installed wear surface for comparison and approval by Contra Costa County. See Mock-up section above. Abrasion level shall be as smooth enough to reduce mop-snag but still provide adequate slip resistance under wet conditions.

3. Integral Cove Base: 6 inch high

4. Overall System Thickness: Nominal 3/16 inch -1/4 inch.

E. System Components: Manufacturer's standard components that are compatible with each other and as follows:

1. Mortar:

a. Material design basis: **Stonclad UT**.
b. Resin: Urethane.
c. Formulation Description: (4) four-component, 100 percent solids.
d. Application Method: Screed, Trowel

1) Thickness of Coats: 3/16".
2) Number of Coats: One.
3) Broadcast texture into wet mortar base.

e. Aggregates: Pigmented blended aggregate.

2. Top coat:

a. Material design basis: **UT Sealer**.
b. Resin: Urethane.
c. Formulation Description: (2) two-component, 100 percent solids.
d. Type: Pigmented.
e. Finish: Light to medium abrasive slip resistance.
f. Number of Coats: One.

Note: Components listed above are the basis of design intent; all bids will be compared to this standard including resin chemistry, color, wearing surface, thickness, and installation procedures, including number of coats. Contractor shall be required to comply with all the requirements of the Specifications and all of the components required by the Specifications, whether or not such products are specifically listed above.

F. System Physical Properties: Provide resinous flooring system with the following minimum physical property requirements when tested according to test methods indicated:

1.	Compressive Strength:	7,700 psi after 7 days per ASTM C 579.
2.	Tensile Strength:	1,000 psi per ASTM C 307.
3.	Flexural Strength:	2,400 psi per ASTM C 580.
4.	Water Absorption:	< 1% per ASTM C 413.
5.	Impact Resistance:	> 160 in. lbs. per ASTM D 2794.
6.	Flammability:	Class 1 per ASTM E-648.
7.	Hardness:	80 to 84, Shore D per ASTM D 2240.

2.02 ACCESSORY MATERIALS

A. Primer: Type recommended by manufacturer for substrate and body coats indicated. Formulation Description: Stonclad UT urethane mortar is self-priming.

B. Pitching and Leveling: Use a four-component fast setting Urethane grout. Moisture resistant polyurethane-based grout designed for permanent repairs under flooring system. Stonhard, Stonset TG 6. See drawings 1/4” per foot slope to drains. Use standard drain detail, saw cut and chase.

C. Waterproofing Membrane: Type recommended by manufacturer for substrate and primer and body coats indicated. Formulation Description Only if application above grade Stonproof ME7. Must include texture 3 to ensure intercoat adhesion.

2.03 VAPOR EMISSION CONTROL SEALER

A. **No resinous floor finish shall be installed without a negative side liquid applied moisture vapor emission control sealer regardless of slab moisture content. Provide as part of bid manufacturer’s recommended vapor emission control sealer that is fully compatible with resinous coating system and is capable of reducing moisture vapor transmission within enclosed and condition spaces to less than 3.0 pounds per 24 hours per 1,000 sf. Vapor emission control sealer shall be provided with this system regardless of tested moisture content of the slab and shall be part of the base bid. This shall not be a unit cost item.**

PART 3 - EXECUTION

3.01 PREPARATION

A. General: Prepare and clean substrates according to resinous flooring manufacturer's written instructions for substrate indicated. Provide clean, dry, and neutral Ph substrate for resinous flooring application.

B. Concrete Substrates: Provide sound concrete surfaces free of laitance, glaze, efflorescence, curing compounds, form-release agents, dust, dirt, grease, oil, and other contaminants incompatible with resinous flooring.

1. Mechanically prepare substrates as follows:

    a. Shot-blast surfaces with an apparatus that abrades the concrete surface, contains the dispensed shot within the apparatus, and recirculates the shot by vacuum pickup.
    b. Comply with ASTM C 811 requirements, unless manufacturer's written instructions are more stringent.

2. Repair damaged and deteriorated concrete according to resinous flooring manufacturer's written recommendations.

3. Verify that concrete substrates are dry.

    a. Perform in situ probe test, ASTM F 2170. Proceed with application only after substrates do not exceed a maximum potential equilibrium relative humidity of 85 percent.
    b. Perform anhydrous calcium chloride test, ASTM F 1869. Proceed with application only after substrates have maximum moisture-vapor-emission rate of 7 lb of water/1000 sq. ft. of slab in 24 hours.
    c. Perform additional moisture tests recommended by manufacturer. Proceed with application only after substrates pass testing.

4. Verify that concrete substrates have neutral Ph and that resinous flooring will adhere to them. Perform tests recommended by manufacturer. Proceed with application only after substrates pass testing.

C. Resinous Materials: Mix components and prepare materials according to resinous flooring manufacturer's written instructions.

D. Use patching and fill material to fill holes and depressions in substrates according to manufacturer's written instructions.

E. Treat all control joints and other nonmoving substrate cracks to prevent cracks from reflecting through resinous flooring according to manufacturer's written recommendations. Allowances should be included for Stonflex MP7 joint fill material, and CT5 concrete crack treatment.

3.02 APPLICATION

A. General: Apply components of resinous flooring system according to manufacturer's written instructions to produce a uniform, monolithic wearing surface of thickness indicated.

1. Coordinate application of components to provide optimum adhesion of resinous flooring system to substrate, and optimum intercoat adhesion.
2. Cure resinous flooring components according to manufacturer's written instructions. Prevent contamination during application and curing processes.
3. At substrate expansion and isolation joints, provide joint in resinous flooring to comply with resinous flooring manufacturer's written recommendations.

    a. Apply joint sealant to comply with manufacturer's written recommendations.

B. Apply primer where required by resinous system, over prepared substrate at manufacturer's recommended spreading rate.

C. Integral Cove Base: Stonclad UR mortar, apply cove base mix to wall surfaces before applying flooring. Apply according to manufacturer's written instructions and details including those for taping, mixing, priming, troweling, sanding, of cove base. Round internal and external corners.

1. Integral Cove Base: 6 inches high.

D. Mortar: Mix mortar material according to manufacturer's recommended procedures. Uniformly spread mortar over substrate at manufacturer's recommended height using specially designed trowel and or Screed box. Broadcast desired light texture directly into mortar base. Field verify texture needed

E. Apply topcoat in number of coats indicated for flooring system and at spreading rates recommended in writing by manufacturer.

3.03 TERMINATIONS

A. Chase edges to "lock" the flooring system into the concrete substrate along lines of termination.

B. Penetration Treatment: Lap and seal the flooring system onto the perimeter of the penetrating item by bridging over compatible elastomer at the interface to compensate for possible movement.

C. Trenches: Continue flooring system into trenches to maintain monolithic protection. Treat cold joints to assure bridging of potential cracks.

D. Treat floor drains by chasing the flooring system to lock in place at point of termination.

3.04 JOINTS AND CRACKS

A. Treat control joints to bridge potential cracks and to maintain monolithic protection.

B. Treat cold joints and construction joints to bridge potential cracks and to maintain monolithic protection on horizontal and vertical surfaces as well as horizontal and vertical interfaces.

C. Discontinue floor coating system at vertical and horizontal contraction and expansion joints by installing backer rod and compatible sealant after coating installation is completed. Provide sealant type recommended by manufacturer for traffic conditions and chemical exposures to be encountered.

3.05 FIELD QUALITY CONTROL

H. Material Sampling: Owner may at any time and any numbers of times during resinous flooring application require material samples for testing for compliance with requirements.

1. Owner will engage an independent testing agency to take samples of materials being used. Material samples will be taken, identified, sealed, and certified in presence of Contractor.

2. Testing agency will test samples for compliance with requirements, using applicable referenced testing procedures or, if not referenced, using testing procedures listed in manufacturer's product data.

3. If test results show applied materials do not comply with specified requirements, pay for testing, remove noncomplying materials, prepare surfaces coated with unacceptable materials, and reapply flooring materials to comply with requirements.

3.06 CLEANING, PROTECTING, AND CURING

A. Cure resinous flooring materials in compliance with manufacturer's directions, taking care to prevent contamination during stages of application and prior to completion of curing process. Close area of application for a minimum of 18 hours.

B. Protect resinous flooring materials from damage and wear during construction operation. Where temporary covering is required for this purpose, comply with manufacturer's recommendations for protective materials and method of application. General Contractor is responsible for protection and cleaning of surfaces after final coats.

C. Cleaning: Remove temporary covering and clean resinous flooring just prior to final inspection. Use cleaning materials and procedures recommended by resinous flooring manufacturer.

END OF SECTION 09 67 00

SECTION 09 77 23
VINYL WRAPPED TACK PANELS

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. Vinyl wrapped tackable wall panels including trims and accessories.

1.02 RELATED SECTIONS

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

B. 06 20 00: Finish Carpentry.

C. Section 09 21 16: Gypsum Wallboard.

1.03 SUBMITTALS

A. Submit per the requirements of Division 1, General Requirements.

B. Submit a sample of each type and color of vinyl and edge trim to be installed for the Architect's approval.

1.04 WARRANTIES

A. Furnish a written warranty against defective workmanship that may develop within one (1) year from date of installation and 5 years against manufacturing defects.

1.05 PRODUCT DELIVERY STORAGE AND HANDLING

A. Deliver vinyl wallcovering and adhesive to the job site in unbroken or undamaged containers and clearly marked with the supplier's identification label. Store vinyl wall coverings in a flat position to avoid damage to roll ends. Store materials in a clean, dry storage area with temperature maintained above 550F with normal humidity.

B. If tackable panels are factory pre-wrapped, deliver and store protective wrapped bundled panels flat.

1.06 PROJECT CONDITIONS

A. Areas where wallcovering will be installed shall have a constant minimum temperature of not less than 60 degrees F for at least seven days prior to and throughout installation period and for seven days thereafter.

PART 2 – PRODUCTS

2.01 VINYL WALLCOVERING

A. Manufacturer: **Koroseal – Ceres** line.

B. **Type VWP-1**: Color to be selected from full range of manufacturer's standard colors from Koreseal Ceres line at time of submittal.

C. Vinyl Wallcovering shall meet Federal Specification CCC-W-408D and the CFFA-W-101-D, Quality Standard for Vinyl Coated Fabric Wallcovering. The wallcovering Type I, Type II or Type III desired shall be specified. The vinyl wallcovering shall contain mildew inhibitors.

1.	Total Weight:	21.0 oz PLY, 14 oz PSY
2.	Roll Width:	53/55 in.
3.	Type/Fire rating:	Type II / Class A
4.	Gauge:	26 mils
5.	Fabric backing:	Osnaburg
6.	Tensile (Minimum):	50 x 55 lb
7.	Tear (Minimum):	25 x 25 lb
8.	Federal Spec:	CCC-W-408D, Type II
9.	Fire Testing:	NFPA 101 Life Safety Code NFPA A255 (UL 723, CAN S102M) Tunnel Test Class A Rating NFPA 286 Corner Burn Test Meets Requirements for Flame Spread, Smoke Developed and Flashover UL Labeled and Listed
10.	Repeat:	Vertical – N/A Horizontal – N/A Match – Random Match, Reverse Hang

D. The vinyl wallcovering shall have a protective coating applied to its surface to minimize migration of stains into the vinyl and, therefore, offer stain protection from a variety of staining agents and provide greater ease of clean ability.

2.02 TACKABLE PANEL SUBSTRATE

A. Tackable Fiber Panels: Vinyl covered tack board substrate shall be industrial insulation board 1/2" by full height and shall be manufactured specifically as a substrate for vinyl covered wall panels.

B. The board shall be asphalt free, shall have an ironed on coating, and have a density of a minimum of 16 pounds per cubic foot.

C. Edges are square without bevel.

D. The vinyl wallcovering shall be mechanically/adhesive laminated, with the long edges wrapped to the back of the tack board. The vinyl covered tack board shall be a Class II flame spread rating.

E. Panel Size: 4’-0” wide x 12’-0” tall (maximum). Actual dimensions are indicated on the Drawings. Panels shall be sized to eliminate or reduce panel joints.

2.03 ADHESIVE

A. The adhesive used must be manufacturer's recommended adhesive for installation over tackable substrate and must contain mildew inhibitors..

2.04 PRIMERS

A. The primer used must be manufacturer's recommended primer.

2.06 EDGE TRIM

A. Manufacturers standard PCV “J” edge trim, fully wrapped with matching vinyl material to match panel color. Minimum ½” lap over face of panel. Provide at all outside panel locations, at exposed panel ends, at cut interior corners, and as otherwise detailed on the Drawings. Color to best match selected vinyl.

PART 3 – EXECUTION

3.01 INSPECTION

A. Installer shall inspect all areas and conditions under which vinyl wallcoverings are to be installed. Installer shall notify the contractor and architect in writing of any conditions detrimental to the proper and timely completion of the installation; work will proceed only when conditions have been corrected and accepted by the installer.

B. Substrate shall be checked with a suitable "Moisture Meter.” Moisture shall not exceed 4%.

3.02 INSTALLATION

A. Vinyl wall covering material shall be factory installed by experienced workers and contractors in strict accordance with the manufacturer's oriented instructions using vinyl wallcovering adhesive recommended by the manufacturer (WHEAT PASTE SHALL NOT BE USED). Wallcovering shall be tight and free of blisters or bubbles.

B. Fiber panels shall be fully wrapped on all sides and secured to back side of panel.

C. Where field cutting is required, contractor shall take care that no fiber panel material is visible. Where field cut ends or openings are required and fiber panel may be exposed, cut opening in a manner which provides wall covering to be salvaged and wrapped into opening without cutting wall covering. Wrapped wall covering shall be secured with manufacturer’s recommended adhesive.

D. Install panels to wall with manufacturer’s recommended adhesives and/or perimeter pin nails or stables that will not be visible upon completion of installation.

E. Provide manufacturer’s standard PVC edge trim at all panel ends that butt into window and door frames, outside corners and other locations where panel edge is exposed or not fully recessed behind adjacent surface.

F. Panels shall be sized to extend from floor to ceiling without interruption up to 12’-0”.

G. Where installed in display cases, panels shall run uninterrupted from top to bottom and side to side without panel joints. Panels shall fit tight within frame.

3.03 CLEAN-UP COMPLETION

A. Upon completion of work, remove surplus materials, rubbish and debris, resulting from the wallcovering installation. Leave areas in neat, clean and order condition.

END OF SECTION 09 77 23

SECTION 09 90 00
PAINTING

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. Surface preparation.

B. Surface finish schedule includes painting of all exposed surfaces, except as otherwise specified or indicated.

C. Painting of all new and existing piping, ductwork, conduit and supports to match interior/exterior paint finishes unless otherwise noted.

1.02 RELATED SECTIONS

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

C. Section 06 20 00: Finish Carpentry.

D. Section 07 62 00: Sheet Metal Flashing and Trim.

E. Section 08 11 00: Metal Doors and Frames.

F. Section 09 21 16: Gypsum Wallboard System.

G. Division 23: Mechanical.

H. Division 26: Electrical.

1.03 DEFINITIONS

A. Conform to ANSI/ASTM D16-08 for interpretation of terms used in this Section.

B. ASTM D4442-07 - Direct Moisture Content Measurement of Wood and Wood-Base Materials.

1.04 QUALITY ASSURANCE

A. Product Manufacturer: Company specializing in manufacturing quality paints and finish products with five years experience.

B. Applicator: Company specializing in commercial painting and finishing with five years experience.

1.05 REGULATORY REQUIREMENTS

A. Conform to California Building Code, CBC 2022, for flame/spread/smoke density rating requirements for finishes.

B. Furnish certification that all paint coatings furnished for project work comply with the EPA clean air act for permissible levels of volatile organic content for architectural coatings

applied in California as designated by California Air Resources Board (CARB).

C. Conform to California Green Building Standards Code, 2022 for maximum VOC limits.

1.06 SUBMITTALS

A. Submit per the requirements of Division 1, General Requirements.

B. Provide product data on all finishing products. Product data shall include the paint manufacturers recommended mil thickness application of each coat for each type of paint specified.

C. Submit four brush-out samples 8x10 inch in size illustrating color and sheen selected for each surface-finishing product shown in the finish schedule.

D. Field Sample: Furnish sample of actual paint colors selected on portion of building item to receive paint as directed by Architect, prior to beginning interior and exterior painting.

E. All shop-primed materials will be re-primed in the field with the specified materials as scheduled below.

F. Submit VOC information for each product included in submittal.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site in manufacturer's original unopened, labeled containers, inspect to verify acceptance.

B. Store and protect products from abuse and contamination.

C. Container labeling to include manufacturer's name, type of paint, brand name, brand code, coverage, surface preparation, drying time, cleanup, color designation, and instructions for mixing and reducing.

D. Store paint materials at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F., in well-ventilated area, unless required otherwise by manufacturer's instructions.

E. Take precautionary measures to prevent fire hazards and spontaneous combustion.

1.08 ENVIRONMENTAL REQUIREMENTS

A. Provide continuous ventilation and heating facilities to maintain surface and ambient temperatures above 45 degrees F for 24 hours before, during, and 48 hours after application of finishes, unless required otherwise by manufacturer's instructions.

B. Do not apply exterior coatings during rain or snow, or when relative humidity is above 50 percent, unless required otherwise by manufacturer's instructions.

C. Minimum Application Temperatures for Latex Paints: 50 degrees F. for exterior work; 45 degrees F for interior work, unless required otherwise by manufacturer's instructions.

D. Provide lighting level of 80-foot candles measured mid-height at substrate surface.

E. Apply all alcohol-based primers, vanishes, lacquers or other products that produce excessive fumes after school hours or on weekends.

F. All flat paints shall have a maximum VOC limit of 50 grams per liter and all nonflat paints shall have a maximum VOC limit of 100 as mandated by 2022 California Green Building Standards Code.

1.09 EXTRA STOCK

A. Provide a one (1) five-gallon (unopened) container of each color to Owner.

B. Label each container with color, in addition to the manufacturer's label.

PART 2 – PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Kelly Moore (specified).

B. ICI Devoe.

C. Dunn-Edwards.

D. Pittsburgh Paints.

2.02 MATERIALS

A. Coatings: Ready mixed manufacturers paint. Process pigments to a soft paste consistency capable of being readily and uniformly dispersed to a homogeneous coating.

B. Coatings: Good flow and brushing properties capable of drying or curing free of streaks or sags.

C. Accessory Materials: All other materials not specifically indicated but required to achieve the finishes specified, of commercial quality.

2.03 FINISHES

A. Refer to schedule at end of Section for surface finish schedule. Refer to drawings for finish schedule.

B. Product numbers listed are as manufactured by Kelly Moore (KM) unless indicated otherwise (equivalent products of other manufacturers listed hereinbefore are also acceptable).

C. Sheens shall be as follows:

1. Exterior Surfaces:

a. Wood:
   1) Wall Surfaces: Low Sheen.
   2) Overheads: Low Sheen.
   3) Trim: Low Sheen.

b. Metals (doors and frames):
1) All Surfaces: Semi-gloss.

c. Sheet Metal Flashings:
1) Match background sheen – No flat.

2. Interior Surfaces:

a. Walls:
1) Low sheen.

b. Wood Trim:
1) Semi-gloss.

c. Ceilings:
1) Flat.

d. Walls and ceilings at Toilet Rooms, Custodian, and other “wet” areas:
1) Semi-gloss.

e. Ductwork:
1) Match background sheen.

f. Exposed Insulation and Exposed Structure at Ceiling:
1) Flat.

D. Contractor shall include in bid amount multiple paint colors inside and out including separate color accent walls, ceilings and trim. Generally, allow for two (2) separate interior wall colors, one (1) interior ceiling color, one (1) interior accent trim color, and three (3) exterior colors. See Drawings for color layout. Colors shall be selected at time of submittal. Architect to provide colored identified exterior elevations.

E. NOTE: Exterior cement plaster walls and soffits are integrally colored and do not require paint. Exterior paint is limited to doors, hollow metal frames, metal canopies, access panels and miscellaneous hardware items as indicated on Drawings.

F. **Colors to be selected by Architect at time of submittal. Contractor shall provide for one wall in each room to be painted an accent color from the other walls in the same room. Additionally, assume that doors, trim and finish carpentry components within a room will be different color from wall surfaces.**

PART 3 – EXECUTION

3.01 INSPECTION

A. Carefully examine all surfaces to receive painting. Verify that all new work is acceptable and has been properly prepared in accordance with associated specification section. Field verify existing conditions of all existing surfaces to receive paint finish prior to bid. Provide all necessary surface preparation as required under this section to provide proper finish.

B. Contractor to arrange for Inspector’s verification of proper surface preparation prior to start of painting and between each coat.

C. Measure moisture content of surfaces using an electronic moisture meter. Provide de-humidifiers and heat as necessary to obtain required environmental conditions for interior paint applications. Do not apply finishes unless moisture content of surfaces is below the following maximums:

1. Plaster, Gypsum Wallboard: 18 percent.

2. Interior Located Wood: 15 percent, measured in accordance with ASTM D4442.

3. Exterior Located Wood: 7 percent measured in accordance with ASTM D4442.

D. Beginning of paint application to any new surface means acceptance of surfaces prepared under separate specification section.

3.02 PREPARATION

A. Remove electrical plates, hardware, light fixture trim, and fittings prior to preparing surfaces for finishing.

B. Correct all defects on surfaces including patching holes in walls and ceilings, skimming surfaces, repairing cracks, puttying, sanding, etc. to restore wall finish and provide a uniform texture. Spot prime all areas of repair.

C. Remove or seal marks which may bleed through surface finishes with B-I-N Primer (additional coats may be required).

D. New Galvanized Surfaces: Remove surface contamination and oils and wash with solvent. Apply coat of etching primer.

E. New Shop Primed Steel Surfaces: Sand, scrape and feather all edges. Remove loose primer and rust. Clean surfaces with solvent. Completely re-prime entire surfaces.

3.03 PROTECTION

A. Protect elements surrounding the work of this Section from damage or disfiguration.

B. Repair damage to other surfaces caused by work of this Section.

C. Furnish drop cloths, shields, and protective methods to prevent spray or droppings from disfiguring other surfaces.

D. Remove all debris from site and properly dispose of in lawful manner.

E. Do not use storm drain system for clean-up.

3.04 APPLICATION

A. Apply products in accordance with manufacturer's instructions. Provide coats in appropriate mill thickness to provide suitable cover. Additional coats may be required to provide an acceptable finish depending on base tint and existing color bleed through.

B. Do not apply finishes to surfaces that are not dry.

C. Apply each coat to uniform finish. Number of coats in schedule are the minimum

required, additional coats shall be applied as required to achieve a uniform final finish.

D. Sand lightly between coats to achieve required finish.

E. Allow applied coat to dry before next coat is applied.

F. Prime back surfaces of interior and exterior woodwork with primer paint as recommended by manufacturer.

G. Interior face of exterior doors to be painted with the “exterior” finish system unless otherwise noted.

3.05 FINISHING MECHANICAL AND ELECTRICAL EQUIPMENT

A. Paint interior surfaces of air ducts and convector heating cabinets that are visible through grilles and louvers with one coat of flat black paint, to limit of sight line. Paint dampers exposed behind grilles, to match face panels. Paint all new conduit, pipes and conduit/pipe supports in exposed interior and exterior locations. Paint all new interior and exterior exposed ductwork and ductwork supports.

B. Replace electrical plates, hardware, light fixture trim, and fittings removed prior to finishing.

C. Do not paint factory finished mechanical and electrical equipment.

3.06 FINISHING EXPOSED CEILINGS

A. Paint all exposed gypsum board ceilings, structure, conduit, piping and other items except factory finished ceiling components and fire alarm devices.

B. Do not paint applied acoustical tiles.

3.07 CLEAN UP

A. As Work proceeds, promptly remove paint where spilled, splashed, or spattered.

B. During progress of Work, maintain premises free of unnecessary accumulation of tools, equipment, surplus materials, and debris.

C. Collect cotton waste, cloths, and material which may constitute a fire hazard, place in closed metal containers and remove daily from site.

D. Upon completion of the work of this section, remove all surplus material and related debris from the site.

3.08 SCHEDULE - EXTERIOR SURFACES

Descriptions in schedule apply to all newly painted surfaces. Number of coats listed are a minimum, additional coats may be required to provide suitable uniform finish. Product numbers listed are based on Kelly Moore (KM). Where not, Devoe Coatings or other products are used to establish the basis of quality.

A. Ferrous Metal:
1st coat – Rust-Oleum CV740 Primer.
2nd and 3rd coats – Devcryl 1448 Acrylic Enamel.

B. Galvanized Metal (Misc. Galvanized metals, flashings, etc.):
1st coat – Etch and clean with solvent new galvanized finishes
2nd coat – Devcryl 1440 DTM Primer/Finish.
3rd and 4th coats – Devcryl 1448 Acrylic Enamel.

C. Painted Wood:
1st coat – KM 295 Kel-Bond Universal Primer
2nd and 3rd coats - KM 1210 Color Shield Exterior Acrylic Enamel.

D. Cementitous Siding and Trim:
1st coat – KM 295 KelBond Universal Primer
2nd and 3rd coat - KM 1210 Color Shield Exterior Acrylic Enamel.

E. Stained/Sealed Wood – Semi-transparent sealer
1st coat – KM Timber Tones, pigmented oil-based penetrating semi-transparent wood stain.
2nd coat – Same.

3.08 SCHEDULE - INTERIOR SURFACES

Descriptions in schedule apply to all newly painted surfaces. Number of coats listed are a minimum, additional coats may be required to provide suitable uniform finish. Product numbers listed are based on Kelly Moore (KM). Where not, Devoe Coatings or other products are used to establish the basis of quality.

A. Gypsum Board:
1st coat - KM 971 Acry-Plex Low VOC Interior PVA Sealer.
2nd and 3rd coats - KM 1007 Professional Low VOC Low-Sheen Enamel.

B. Gypsum Board (wet locations):
1st coat - KM 971 Acry-Plex Low VOC Interior PVA Sealer.
2nd and 3rd coats - KM 1050 Professional Low VOC Semi-Gloss Enamel.

C. Painted Wood:
1st coat - KM 295 Kel-Bond Universal Primer-or B-I-N Primer-Sealer Stain-Killer if necessary.
2nd and 3rd coats - KM 1050 Professional Low VOC Semi-Gloss Enamel.

D. Ferrous Metal:
1st coat - Rust-Oleum CV740 Primer.
2nd and 3rd coats - Industrial Acrylic, Semi-Gloss Enamel Typical paint system at all hollow metal doors and frames - Devcryl 1448 Acrylic Semi-Gloss Enamel.

END OF SECTION 09 90 00

SECTION 10 14 00
SIGNAGE

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. Interior and exterior room, building identification signs and letters, and interior and exterior directional and informational signs including signs for accessible features and regulatory signs.

B. Decals.

C. Cut Letters & Graphics.

D. Support posts.

1.02 RELATED SECTIONS

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

B. Section 06 10 00: Rough Carpentry.

C. Section 08 11 00: Metal Doors and Frames.

D. Section 09 90 00: Painting.

1.03 RELATED CODES AND STANDARDS

A. Accessible signs shall conform with the following requirements as indicated:

1. California Building Code, CBC 2022.

2. ADA Accessibility Guidelines (ADAAG, latest adopted edition).

3. Contracted Grade 2 Braille shall be used whenever Braille symbols are specifically required (CBC Section 11B-703.3 Braille).

4. Means of Egress Identification: CBC 11B-216.1 &11B-703.1.

5. Tactile Exit Signs: CBC 1011.4.

6. Restroom Identification Symbols: CBC 11B-216.8 &11B-703.7.2.6.

7. Signs and Identification: CBC 11B-216.1 &11B-703.1.

8. International Symbol of Accessibility: CBC 11B-703.7.2.1.

9. Identification Signs: CBC 11B-213.2.

10. Direction and Information Signs: CBC 11B-703.1.

11. Symbols of Accessibility: CBC 11B-703.7.

12. Finish and Contrast: CBC 11B-703.5.1.

13. Character Proportions: CBC 11B-703.2.4.

14. Character Height: CBC 11B-703.2.5.

15. Raised Characters and Pictorial Symbol Signs: CBC 11B-703.2 & 11B-703.6.

16. Braille: CBC 11B-703.3.

17. Mounting Height and Location: CBC 11B-703.4.1 & 11B-703.4.2.

18. Symbols of Accessibility: CBC 11B-703.7.2.

19. Color of Symbol: CBC 11B-703.7.2.1.

20. Entrance Signs: CBC 11B-216.6.

1.04 SUBMITTALS

A. Submit per the requirements of Division 1, General Requirements.

B. Submit manufacturer's technical data and installation methods for each required sign type.

C. Submit shop drawings listing sign size, font type style and letter heights and construction detail for each required sign type.

D. Submit samples of fonts, background colors and character colors for selection by Architect.

E. Submit proposed sign type and text schedule to comply with scoping requirements on the Drawings and as specified herein.

F. All signage shall be designed and constructed to comply with these signage specifications and the Drawings.

1.05 QUALITY ASSURANCE, MATERIALS AND FABRICATION TECHNIQUES

A. QUALITY ASSURANCE

1. Manufacturers shall have a minimum of five (5) years of documented experience in fabricating and installing both tactile and non-tactile signs and lettering required by this section.

2. Manufacturer's Two-Year Warranties.

3. Contractor shall provide labor and materials to repair or replace defective signs as directed by Owner. Defects shall include:

   a. Tactile characters and/or Braille dots which come off or are easily removed.
   b. Discoloration, wear and scratching off of the surface color.

c. All signs and sign components, except for damage by mishandling by Owner, including installation by Owner, or vandalism.

4. Field Inspection: All tactile signs must be field inspected after installation per CBC 11B-703.1.1.2.

1.06 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Deliver to project site in manufacturer's original, unopened and undamaged packaging. Store in original packaging under protective cover and protect from damage. Handle materials in such a manner as to prevent damage to products or finishes.

PART 2 – PRODUCTS

2.01 GENERAL SIGN DESIGN CRITERIA

A. Materials and Configuration:

1. Interior room identification signs, restroom wall signs and directional signs shall be minimum 0.125 inch thick acrylic polymer material with gloss letters on matte finish background. Interior restroom door sign with pictograms shall be a total of ¼" thick acrylic polymer material. Text, graphics and pictograms shall have a minimum 70% contrast with background color. All interior signs shall have eased edges.

2. All pole or post mounted exterior signs, projecting signs, and aluminum or metal plaques or signs shall be reflective and shall be .080 aluminum material and shall have minimum 0.125 inch rounded corner radius.

a. Poles shall be minimum 2.5" OD Type 1 galvanized steel pipe with fixed top cap set in concrete footing. Footing shall be minimum 12" dia x 24" deep with post extending to within 3" of bottom of footing. Where new poles and foundations are installed within existing paved areas, contractor shall carefully sawcut paving, place foundation and post and replace paving in like kind smooth and flush with adjoining surface.

3. Non-glare (non-reflective) materials shall be used for all signs which identify, direct to, or give information about facilities and their use.

a. Exception: Parking, traffic signs, and exterior safety signs may use reflective materials. Identification signs for accessible parking spaces shall use reflective materials for graphics.

B. Fonts and Characters:

1. Numerals and upper-case letters on metal signs will be minimum 1 inch high (vertical dimension unless otherwise shown on Drawings or specified herein) embossed text and numerals shall comply with CBC 11B-703.2 & 11B-703.6. Vertical dimension of lower-case letters shall be proportional to height of upper case letters.

2. Raised tactile characters shall be raised 1/32 inch minimum and shall be San Serif uppercase and lowercase characters and numerals accompanied by corresponding California Grade 2 Contract Braille. See Section 2.01.C below.

3. Raised tactile characters shall have beveled edges.

4. Characters shall have a minimum of 70 percent contrast with their backgrounds on all signs which identify, direct to, or give information about facilities and their use.

5. Characters on all signs which identify, direct to, or give information about facilities and their use shall comply with CBC 11B-703.2.4 & 11B-703.2.6.

6. Type styles of characters on all signs which identify, direct to, or give information about facilities and their use shall not be italic, oblique, or decorative in style.

7. Non-tactile characters (letters, numbers and symbols) shall be as identified on the Drawings.

    a. Characters shall be a combination of upper and lower-case font.
    b. Upper case letters shall be 1 inch high (unless otherwise shown on Drawings, maximum 1-1/4 inch high).
    c. Height of lower-case letters shall be proportional to height of upper-case letter.
    d. See Drawings for font type or they will be selected at time of submittal from manufacturer's full range of standard san serif font types.

8. Tactile Characters

    a. Characters required to be tactile shall be San Serif.
    b. Characters shall be raised 1/32 inch minimum and a maximum of 1/16 inch from the background.
    c. Characters shall be uppercase unless otherwise shown on Drawings. Signs shall have tactile characters where shown on Drawings.
    d. Upper-case tactile letters shall be 1 inch high (unless otherwise shown on Drawings, maximum 1-1/4 inch high).
    e. Height of lower-case letters shall be proportional to height of upper case letter.
    f. A minimum of 1/8" space between the top surfaces of adjacent characters measuring between the two closest points shall be provided.
    g. See Drawings for font and character type or they will be selected at time of submittal from manufacturer's full range of standard san serif font types.

9. Non-Tactile Graphics and Text

    a. Non-tactile graphics/pictogram and text shall be screen printed on the surface and complying section.
    b. Identifying pictograms shall be located above the tactile text in a clear, six inch high field.
    c. Non-tactile text shall be upper case and one inch high (unless otherwise shown on Drawings) and shall comply with CBC 11B-703.2.4, 11B-703.2.6, 11B-703.5.1, 11B-703.5.4, 11B-703.5.5, & 11B-703.6.2.

C. Braille:

1. Braille text shall comply with CBC 11B-703.3.

2. Braille dot, cell spacing and dot height shall follow specifications as per CBC11B-703.3 & 11B-703.3.1.

3. There shall be no Braille indication of capital letters except for proper names, individual letters or acronyms, or beginnings of sentences.

4. Braille shall be centered directly below raised print characters.

5. Braille shall be located on the sign 3/8 to ½ inch below the corresponding tactile characters, flush left or centered to the characters depending on the sign layout. (CBC 11B-703.2.9 & 11B-703.3.2).

D. Fasteners:

1. All interior and exterior fasteners shall be one-way tamper resistant screws. Anchor into solid substrate or gypsum wall board sleeve anchor.

E. Refer to Sign Type section below and Drawings for additional information.

2.02 MISCELLANEOUS

A. Furnish all items required for the proper installation of all signage including but not limited to tamper resistant fasteners, adhesives, sealants, metal sleeve spacers, etc.

B. See Section 3.01.D below for requirements for signs mounted to glass.

2.03 SIGN TYPES: (See Drawings for locations and additional design criteria not specified herein. All room identification signs are scheduled from the Opening Schedule on the Drawings.)

1. **Type S-1, Room Identification:**

a. Acrylic polymer sign panel fabricated per regulatory requirements identified in this section. See Drawings for sign shape, font, colors and locations.

2. **Type S-2, Exit:**

a. Acrylic polymer sign panel fabricated per regulatory requirements identified in this section.

b. Sign shall match Type S-1 with the text to read “Exit”. See Drawings for sign shape, font, colors and locations.

2.A **Type S-2A, Exit Route:**

a. Acrylic polymer sign panel fabricated per regulatory requirements identified in this section.

b. Sign shall match Type S-1 with two lines of text to read “Exit Route”. See Drawings for sign shape, font, colors and locations.

3. **Type S-3, Gender Neutral Accessible Staff Restroom:**

a. Acrylic polymer door sign panel and adjacent wall sign panel fabricated per regulatory requirements identified in this section including pictogram. See Drawings for sign shape, font, pictograms, colors and locations.

4. **Type S-4, No Parking Loading and Unloading Area Only:**

a. Pole mounted exterior sign made from .080 minimum aluminum sheet material and shall have minimum 0.125 inch rounded corner radius. Bottom of sign shall be at 7'-0" above finish grade.

b. Size sign panel as required to accommodate 2 inch tall text to read "NO PARKING LOADING AND UNLOADING AREA ONLY" with evenly spaced and centered text.

c. Sign panel shall have white reflectorized background with red screen-printed text and red perimeter boarder.

5. **Type S-5, Accessible Parking Stall Sign (Includes accessible van sign and $250 fine sign where indicated on Drawings:**

a. Pole or wall mounted exterior sign made from .080 minimum aluminum sheet material and shall have minimum 0.125 inch rounded corner radius. Bottom of sign shall be at 7'-0" above finish grade.

b. Size sign panel as required to accommodate 3 inch tall text to read "PARKING ONLY" with evenly spaced and centered text and shall include the international symbol of accessibility located above text. Sign shall be approximately 12" wide x 18" high with Federal Blue background and white text and symbol. At accessible van stall, sign shall read "VAN ACCESSIBLE". All signs to be accompanied with additional text at bottom to read "MINIMUM FINE $250".

6. **Type S-6, Assistive Listening Device Sign:**

a. Acrylic polymer sign panel fabricated per regulatory requirements identified in this section including pictogram. See Drawings for sign shape, font, pictograms, colors and locations.

7. **Type S-7, Maximum Occupancy Sign:**

a. Acrylic polymer sign panel fabricated per regulatory requirements identified in this section. See Drawings for sign shape, font, colors and locations.

8.A **Type S-8A, S-8B, Restroom Route Sign:**

a. Acrylic polymer sign panel fabricated per regulatory requirements identified in this section. Drawings for sign shape, font, colors and locations.

b. S-8A with the text to read "WOMEN" at route to women's restroom.

c. S-8B with the text to read "MEN" at route to men's restroom.

PART 3 – EXECUTION

3.01 GENERAL

A. Signs shall be installed with edges horizontal and vertical and face plumb.

B. Install signs with tamper resistant screws and anchors at all wall conditions except glass.

C. Screw length shall be sufficient for minimum 1-inch embedment.

D. Signs mounted onto glass:

1. Sign shall be securely attached to glass with double stick cushion tape.

2. Where interior and exterior signs are to be mounted back-to-back, signs shall be the same size (the larger sign size shall dictate the size of the smaller sign) and located back-to-back.

3. At locations where signs are applied to glass and without a corresponding sign on the back side, provide matte finished heavy gauge vinyl sticker on opposite side of glass from sign to conceal back of sign and adhesive anchors. Sticker shall be same size, shape and color of base sign.

E. The Contractor is solely responsible for the identification of the material onto which signs are to be mounted. The Contractor shall furnish and install all materials necessary for the proper installation of each sign.

F. Permanent identification signs for rooms or spaces shall be installed on the wall or glazed side-lite adjacent to the latch side of the door.

3.02 ADJUST AND CLEAN

A. Clean and Touch-up: Remove all packing and protection blemishes and thoroughly clean and polish all finish surfaces. Restore any marred or abraded surfaces to their original condition by touching up in accordance with the manufacturer’s recommendations. Touch-up shall not be obvious.

B. Defective Work: Remove and replace all defective work which cannot be properly repaired, cleaned or touched-up with no additional cost to the owner.

C. Protect installed work during the construction period to prevent abuse and damage.

3.03 CLEAN-UP

A. Upon completion of the work of this section, remove all surplus materials, rubbish and debris from the premises.

END OF SECTION 10 14 00

SECTION 10 26 00
CORNER GUARDS

PART 1 – GENERAL

1.01 APPLICABLE REQUIREMENTS

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

1.02 SCOPE

A. Provide all corner guards complete and in places as shown on the Drawings, specified here, and needed for a complete and proper installation.

1.03 RELATED WORK SPECIFIED ELSEWHERE

A. Section 09 21 16: Gypsum Board Systems.

B. Section 10 26 33: Fiber Reinforced Laminate (FRL).

1.04 QUALITY ASSURANCE

A. For installation of corner guards, use only personnel skilled in the work required, completely familiar with the manufacturer's recommended methods of installation, and thoroughly familiar with the requirements of this work.

B. Catalog Standards:

1. Manufacturer's catalog numbers may be shown on Drawings for convenience in identifying specified items. Unless modified by notation on Drawings or specified, catalog description for indicated number constitutes requirements for the item specified.

2. The use of catalog numbers and specific requirements set forth in Drawings and Specifications does not preclude use of any other manufacturer's products or procedures which may be equivalent. Such numbers and requirements establish standards of design and quality for materials, construction, and workmanship.

1.05 SUBMITTALS

A. Refer to Division 1, General Requirements for submitting the following items:

1. Product Data.

2. Installation instructions, locations and drawings.

1.06 DELIVERY, STORAGE AND HANDLING

A. Deliver undamaged products to site in manufacturer's sealed containers or wrappings with legends intact. Store on site secure from weather, soil and physical damage.

PART 2 – PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Koroseal Wall Protection Systems, Muncy, PA. Ph: 800-628-0449; Fax: 330-668-7703; Internet Address: www.korogard.com. (Specified).

B. Approved equal.

2.02 MATERIALS

A. **CG-1: Koroseal No. GS30 Series**.

1. 3" x 3" x 72" high 90°
2. Type 304 stainless steel x 16 gauge thick with #4 Satin finish.
3. Corner radius 1/4 inch.
4. Attachment: Concealed fasteners or adhesive as recommended by manufacturer.

PART 3 – EXECUTION

3.01 SURFACE CONDITIONS

A. Coordinate with all other trades as required to ensure proper and adequate provision in framing and wall finish for the installation of the corner guards in the locations required.

3.02 INSPECTION

A. Prior to installation, carefully inspect and verify that the installed work of other trades is complete to the point where this installation may properly commence.

B. Verify that corner guards may be installed in strict accordance with the original design and the manufacturer's recommendations.

C. In the event of discrepancy, immediately notify the Architect. Do not proceed in discrepant areas until discrepancies have been fully resolved.

3.03 INSTALLATION

A. Corner guards shall be mounted at top of specified resilient base or cove base material. Do not overlap wall base.

B. Use liberal amount of construction adhesive per manufacturer's written instructions. Mask adjacent surfaces to avoid squeeze-out damage from excess adhesive.

C. Press corner guard into sealant to fully seat.

D. Remove any squeeze-out immediately for a clean installation.

E. Temporarily secure in place until adhesive is full cured.

3.04 CLEANING

A. Upon completion, remove manufacturer's temporary labels, marks of identification. Thoroughly wash surfaces and remove foreign material. Leave entire work in neat, orderly, clean and acceptable condition as approved. Replace damaged parts and imperfect surfaces.

3.05 PROTECTION

A. Protect work and materials of this Section prior to and during installation and protect the installed work and materials of other trades.

B. Exposed finishes shall be free from scratches, dents, permanent discolorations and other defects in workmanship or material.

C. In the event of damage, immediately make all repairs and replacements necessary to the satisfaction of the Architect and at no additional cost to the Owner.

END OF SECTION 10 26 00

SECTION 10 26 33
FIBERGLASS REINFORCED LAMINATE (FRL)

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. FRL (Fiber Reinforced Laminate) Wall Protection Panels for wall applications in both manufacturer's standard and dry-erase marker compatible material for use as writing surface.

B. Accessories, including edge trims, adhesives and sealants.

1.02 RELATED SECTIONS

A. Section 06 20 00: Finish Carpentry.

B. Section 09 21 16: Gypsum Board (Level 4 finish required behind FRL).

C. Section 09 65 00: Resilient Flooring and Base.

D. Section 10 26 00: Corner Guards.

E. Section 10 28 00: Toilet and Bath Accessories.

1.03 SUBMITTALS

A. Submit under the requirements of Division 1, General Requirements.

B. Product Data: Submit manufacturer's literature including product characteristics, accessories and limitations.

C. Selection Samples: Submit samples of colors and finishes if requested by architect.

D. Verification Samples: Submit samples of materials selected specified to verify color and finish.

E. Industry Certifications and Standards: Submit copy of documentation indicating compliance.

1.04 QUALITY ASSURANCE

A. Manufacturer: Minimum of 5-years experience manufacturing similar products.

1.05 DELIVERY, STORAGE AND HANDLING

A. Deliver materials and products in unopened factory labeled packages. Store and handle in strict compliance with manufacturer's instructions and recommendations.

1.06 WARRANTY

A. Manufacturer's Warranty: Provide manufacturer's standard warranty against defects in manufacturing.

PART 2 – PRODUCTS

2.01 FIBER REINFORCED LAMINATES

A. Manufacturer: **Panolam Industries International, Inc.**, One Corporate Drive, Suite 725, Shelton, CT 06484. Tel: 203-925-1556. Web: www.panolam.com. Or approved equal meeting the following requirements:

1. Thickness: 0.075 inches minimum. Single-sheet sizes as required to run uninterrupted from floor to 7'-2" AFF or as otherwise indicated on Drawings

2. **Type FRL-1**: Standard Color and Finish: As selected by architect from manufacturer's full range of Nevamar, Pionite or Wilsonart standard and premium colors, patterns and including wood grains and textures including embossed (excluding metalics).

3. **Type FRL-2**: Dry Erase Compatible Finish: As selected by architect from manufacturer's full range of Nevemar, Pionite or Wilsonart standard dry erase compatible materials. Material shall be specifically designed and warranted for the use of standard dry erase makers.

4. Surface Burning Characteristics: US Standard UL-723/ASTM E 84 Class A; Canadian Standard ULC-S102 Class A for Surface Burning Characteristics of Building Materials.

5. Sustainability, Indoor Air Quality: GREENGUARD Gold Certification.

6. IMO Certified for marine use.

7. Chemical resistant compliant with SEFA 8 requirements.

8. Wear Resistance (Cycles) NEMA 3.13: 3500 typical.

9. Flexural Strength ASTM D790: 20,148 psi typical.

10. Molding Profiles: Outside corners flat, outside corners round, division bars, inside corners, standard end caps.

11. Adhesive: Construction Adhesive #4319 by Franklin Adhesives and Polymers or equal approved by panel manufacturer.

12. Joint Caulking: Color Sil by Color Rite or equal approved by panel manufacturer; 100 percent silicone based colored caulking.

PART 3 – EXECUTION

3.01 EXAMINATION

A. Examine substrates for compliance with requirements for installation tolerances and other conditions affecting performance. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Install products in strict accordance with manufacturer's instructions and approved submittals.

1. Clean substrate of dirt, dust, waxes, and other bond breaking substances prior to beginning installation. The wall must be finished to level 3 and fully primed.

2. Install panels with bottom edge located to clear top of any rigid wall base. Rubber wall bases may be bonded over the FRL® panels using a polymer or urethane based adhesive.

3. Apply adhesive uniformly using adhesive manufacturers recommended notched trowel to the entire back of panels completely to the edge.

4. Lay FRL panels in place leaving approximately 1/8 inch vertical installations 3/16 inch for horizontal installations between panel joints.

5. Follow adhesive manufacturer’s recommendations for set and application times.

6. If you are attaching FRL panels to a door or wood substrate, we recommend the use of contact glue. Please follow contact glue manufacturer’s directions.

7. Apply pressure to entire panel face with laminate type roller, removing trapped air and ensure proper adhesion between surfaces.

8. Install panel edge trim in full accordance with manufacturer's written instructions using uninterrupted panels from top of wall base material to height as indicated on Drawings. Where trim is used, seal panel joints and top, side, and bottom edges with colored 100% silicone caulking to match panel color. Wipe smooth and remove excess caulk from FRL panel face.

3.03 ADJUSTING AND CLEANING

A. Replace installations out of plumb and not aligned with adjacent panels and construction.

B. Clean panel face to remove soiling, stains, dust, and dirt using clean rags, and cleaning agents as instructed by manufacturer.

C. Leave installation clean, free of residue and debris resulting from work of this section.

END OF SECTION 10 26 33

SECTION 10 28 00
TOILET & BATH ACCESSORIES

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. Toilet accessories.

B. Attachment hardware.

1.02 RELATED SECTIONS

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

B. Section 06 10 00: Rough Carpentry (For in-wall framing and backing for support of accessories).

C. Section 09 21 16: Gypsum Board Systems.

D. Section 10 26 33: Fiberglass Reinforced Laminate (FRL).

1.03 REFERENCES

A. ASTM A167-99 - Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet and Strip.

B. ASTM A269/A269M-15a - Seamless and Welded Austenitic Stainless Steel Tubing for General Service.

1.04 KEYING

A. All accessories shall be keyed alike, Bobrick Cat-74 key or equal.

1.05 REGULATORY REQUIREMENTS

A. Conform to applicable code for installing work in conformance with Title 24 Accessibility Requirements.

1.06 SUBMITTALS

A. Product Data: Manufacturer’s product data and installation instructions for each toilet accessory.

B. Samples: Full-size sample of each toilet accessory item. Acceptable samples will be returned and may be used in the work.

C. Setting Drawings: Furnish setting drawings, templates, instructions, and direction for installation of anchorage devices and cut-out requirements in other work.

1.07 SEQUENCING AND SCHEDULING

A. Coordinate the work of this Section with the placement of internal wall reinforcement and reinforcement of toilet partitions to receive anchor attachments.

1.08 QUALITY ASSURANCE

A. Manufacturer: Provide products of same manufacturer for each type of accessory unit unless otherwise approved by the Architect.

1.09 PROJECT CONDITIONS

A. Coordinate accessory locations, installation, and sequencing with other work to avoid interference and to assure proper installation, operation, adjustment, cleaning, and servicing.

PART 2 – PRODUCTS

2.01 MANUFACTURERS

A. Bobrick. As Represented by R.E. EDWARDS & ASSOC.

B. Gamco.

C. Or approved equal.

2.02 MATERIALS

A. Tubing: ASTM A269/A269M-15a, stainless steel.

B. Fasteners, Screws, and Bolts: Hot dip galvanized, tamperproof.

C. Expansion Shields: Fiber, lead, or rubber as recommended by accessory manufacturer for component and substrate.

2.03 FABRICATION

A. The following model numbers are Bobrick numbers and establish a quality level:

1. **Toilet Paper Dispenser**:

a. Accessible Stall with stud wall construction: B-3888; 2-roll, semi-recessed, tumbler lock. Satin-finish stainless steel with dispensing mechanism for 2 rolls. Door must have flat face with protruding tumbler lock. Unit must have theft-resistant heavy-duty spindles. Unit extends 2-3/4 inches from wall. No exposed edges or sharp corners are acceptable. Provide 5 additional keys.

b. Standard Stalls: B-2888.60; 2-roll, surface mounted, tumbler lock. Satin-finish stainless steel with dispensing mechanism for 2 rolls. Door must have flat face with protruding tumbler lock. Unit must have theft-resistant heavy duty spindles No exposed edges or sharp corners are acceptable. Provide 5 additional keys.

2. **Toilet Seat Cover Dispenser**: B-221; surface mounted Satin Stainless Steel

with seamless beveled flanges. capacity for 250 single or half-fold covers. No exposed edges or sharp corners are acceptable.

3. **Paper Towel Dispenser**: Georgia Pacific, Model No. 54338, surface mounted, tumbler lock, accepts standard core rolls ranging from 7” to 8” wide and up to 8” in diameter. Provide 5 additional keys.

4. **Liquid Soap Dispenser**: Impact Products, Model No. 9347, surface mounted, 46 oz. capacity

5. **Mirror**: B-293, tilt mirror, size -18”x30”. One piece, roll-formed type 304 stainless steel angle with satin finish. Corners heliarc welded ground and polished smooth. Beveled frame edge mirror. Warranted against silver spoilage for 15 years.

6. **Grab Bars**: B-6806 Series; snap flange covers, configurations and sizes as indicated on drawings.

    a. At accessible toilet stalls: 42” long on back wall, 48” long on side wall or as required by drawings.
    b. Mount to solid wood blocking.

7. **Sanitary Napkin Disposal**: Bobrick S-270 surface mounted stainless steel disposal unit.

B. Assemblies:

1. Weld and grind smooth joints of fabricated components.

2. Form exposed surfaces from single sheet of stock, free of joints.

3. Form surfaces flat without distortion. Maintain flat surfaces without scratches or dents.

4. Shop assemble components and package complete with anchors and fittings.

5. Provide steel anchor plates, adapters, and anchor components for installation.

6. Hot dip galvanize exposed and painted ferrous metal and fastening devices.

2.04 FACTORY FINISHING

A. Satin Finish, Stainless Steel: No. 4 satin luster finish.

PART 3 – EXECUTION

3.01 EXAMINATION

A. Verify that site conditions are ready to receive work and dimensions are as instructed by the manufacturer.

B. Beginning of installation means acceptance of existing conditions.

3.02 PREPARATION

A. Deliver inserts and rough-in frames to site at appropriate time for building-in.

B. Provide templates and rough-in measurements as required.

C. Verify exact location of accessories for installation.

3.03 INSTALLATION

A. Prior to mounting any accessories, Contractor shall provide dimensionally correct cardboard cutouts of all accessories. Contractor shall then walk each toilet room area with District to place all accessories in acceptable locations. This shall take place PRIOR to installing new gypsum board as backing for accessories needs to be installed.

B. Install fixtures, accessories and items in full compliance with CBC 2022 requirements and per manufacturer's recommendations.

C. Install plumb and level, securely and rigidly anchored to substrate. Use vandal resistant fasteners where exposed.

D. Toilet Seat Cover Dispensers: Provide at staff toilet rooms or stalls, and at gender neutral toilet rooms only. Do not provide at student toilet rooms or stalls.

E. Sanitary Napkin Disposal: Provide at staff toilet rooms or stalls, at gender neutral toilet rooms, high school girls toilet rooms, and middle school girls toilet rooms.

3.04 ADJUSTING AND CLEANING

A. Adjust toilet accessories for proper operation and verify that mechanisms function smoothly. Replace damaged or defective items.

B. Clean and polish exposed surfaces of accessories in accordance with manufacturer's recommendations after removing temporary labels and protective coatings.

END OF SECTION 10 28 00

SECTION 10 44 16
FIRE EXTINGUISHERS AND CABINETS

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. Furnish and install fire extinguishers and semi-recessed wall cabinets as indicated on the Drawings and as specified here.

1.02 RELATED SECTIONS

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

B. Section 06 10 00: Rough Carpentry.

C. Section 09 21 16: Gypsum Board Systems.

D. Section 10 26 33: Fiberglass Reinforced Laminate (FRL).

1.03 QUALITY ASSURANCE

A. Single Source Responsibility: Provide specified items from one manufacturer.

B. Catalog Standards:

1. Manufacturer's catalog numbers may be included on Drawings for convenience in identifying specified items. Unless modified by notation on Drawings or specified, catalog description for indicated number constitutes requirements for the item specified.

2. The use of catalog numbers and specific requirements set forth in Drawings and Specifications does not preclude use of any other manufacturer's products or procedures which may be equivalent. Such numbers and requirements establish standards of design and quality for material, construction, and workmanship.

1.04 SUBMITTALS

A. Submit per the requirements of Division 1, General Requirements.

B. Submit manufacturer’s product data and installation instructions.

1.05 STANDARDS

A. California Building Code (CBC), 2022 edition, for fire extinguisher cabinets and location.

B. California Building Code (CBC), 2022 edition, Chapter 11B.

1.06 DELIVERY, STORAGE AND HANDLING

A. Deliver undamaged products to site in manufacturer's sealed containers or wrappings with legends intact. Store on site secure from weather, soil and physical damage.

PART 2 – PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Larsen's Manufacturing Company (Specified).

B. JL Industries.

C. Amerex

D. Badger

E. Or approved equal.

2.02 FIRE EXTINGUISHERS & CABINET

A. **TYPE FEC:** All fire extinguisher units shall be portable and rechargable type with stainless steel discharge lever and fixed carry handle. Valve body shall be chrome-plated brass or aluminum. All units shall have a short hose/horn, visual pressure gauge and red color. Size and model as follows:

1. Multi-purpose, 5 lb. dry chemical UL Rating 2A-10B:C; Larsen MP10, JL Industries Cosmic 10E, Amerex B424, or approved equal.

2. Semi-Recessed Wall Cabinet: Maximum 4” projection from wall. Rolled-edge trim. Heavy gauge baked enamel steel box with brushed stainless steel door and trim. Vertical slot window with laminate glass. Steel pull handle. Vertical format black lettering on cabinet door to read “Fire Extinguisher”. Cabinet shall be equal to Strike First Corp., SAFEGUARD Model 118-EL-RS-SG fire rated model or Larsen Model 2409-R4 or similar matching criteria identified here.

PART 3 – EXECUTION

3.01 INSPECTION

A. Prior to installation of the work of this Section, carefully inspect and verify that the installed work of all other trades is complete to the point where this installation may properly commence.

B. Verify that specified items may be installed in accordance with the approved design.

C. In the event of discrepancy, immediately notify Architect. Do not proceed in discrepant areas until discrepancies have been fully resolved.

D. Wall brackets shall be screw mounted into existing wood stud, solid wood backing, existing metal stud or steel backing, or masonry.

3.02 INSTALLATION

A. Install so that top of cabinet is 48 inches maximum above finished floor line so that pull handles are less than 48 inches above finish floor. Bracket latch force not to exceed 5 lbs.

3.03 PROTECTION

A. Protect work and materials of this Section prior to and during installation and protect the installed work and materials of other trades.

B. In the event of damage, immediately make all repairs and replacements necessary to the satisfaction of the Architect and at no cost to the Owner.

END OF SECTION 10 44 16

SECTION 10 67 00
METAL STORAGE SHELVING

PART 1 - GENERAL

1.01 APPLICABLE REQUIREMENTS:

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

1.02 SCOPE

A. Open metal shelving.

1.03 SUBMITTALS

A. Submit per the requirements of Division 1, General Requirements.

B. Submit product data for sizes, types and methods of construction.

C. Color samples for selection by Architect from manufacturer's full range of standard colors.

1.05 DELIVERY, STORAGE AND HANDLING

A. Submit per the requirements of Division 1, General Requirements.

B. Protect metal shelving from damage by other trades. Store in dry protected areas. Replace any damaged items at no cost to Owner.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Lyon Metal Products, Inc. (Specified)

B. Metro.

C. Or approved equal.

2.02 EQUIPMENT

A. Shelving shall be equal to Lyon Metal Products, Inc., 8000 series, Catalog No. 8342SX. Each shelving unit shall be 48"w x 24"d x 84"h, 18 gauge "box W", number of shelves – 5, and capable of supporting 720 lbs. per shelf.

B. Shelving shall conform to the following characteristics:

1. All uprights punched on 1-1/2" centers with pairs of parallel slots 11/16" long, with one slot keyhole shaped for bolting cross braces and accessories to uprights. Open uprights shall consist of two 16-gauge, cold-rolled, formed steel "T", 1-12/" x 2-1/8" with one pair of 1 x 12-gauge band cross braces on uprights less than 120" high.

2. Shelf clips shall be 12-gauge hot-rolled steel, one-piece construction. Four shelf clips for each shelf.

3. Shelves shall be 18-gauge with front and rear flanged down not less than 1-1/8” with return flange of not less than 3/8” at approximately 45 degrees, and punched to accommodate label-holder and accessories. Ends shall be flanged not less than 1-1/8” with a 90 degree return flange of not less than 5/8”. All corners shall be lapped and spot-welded. All shelve shall be punched on 3” centers for divider adjustment. Reinforce at front and rear with 1” x 13/16” x 12-gauge angles held securely in place by front and rear return flanges. Shelves 18” deep and over shall have a center “T” reinforcement not less than 2” x 1” x 12-gauge attached to shelf end return flanges with bolts.

4. Lateral cross braces shall be 1” x 12’gauge band formed and punched at each end to bolt to upright T. One pair of lateral cross braces used with every three shelving sections with shelf spacings less than 30”. Shelving sections with 30” or greater shelf spacings shall have two pairs of lateral cross braces with every three shelving sections.

5. Provide manufacturer's standard heavy-duty steel angle bracket anchors for back and sides for rigid attachment to walls and floor.

6. Colors shall be as selected by the architect from manufacturer’s full range of standard colors.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install metal shelving units in locations as designated on the Drawings and anchored as indicated on Drawings to solid blocking. Units shall be set plumb and level.

END OF SECTION 10 67 00

SECTION 11 40 00
FOODSERVICE EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This section includes of furnishing all labor and material required to provide and deliver all food service equipment herein specified into the building, uncrate, assemble, set-in-place, level and completely install, exclusive of final utility connections.

B. Furnish all material and labor required to completely provide, deliver and install all Food Service Equipment as specified herein and as shown on the drawings. This work shall be in strict accordance with the plans and specifications with all dimensions verified in the field prior to any fabrication.

1. Coordinate the Food Service Equipment work with the respective trades performing preparatory work for the installation of the Food Service Equipment.

2. Comply with all Federal, State and Municipal regulations which bear on the execution of this project. Food service aisles shall be a minimum of 36” wide and tray slides shall be mounted at 34” maximum above the finished floor. Food service equipment required to be accessible shall conform to all reach requirements in CBC 1104B-5, 1104B-6 and figures 11B-16 and 11B-17.

C. Work Includes:

1. Materials shown on the Food Service Equipment Schedule.

2. Piping, valves, and plumbing accessories that are integral within the equipment.

3. Furnishing control devices such as solenoid valves that are not integral with the equipment, for installation by Heating ventilating & air conditioning division 23 and/or Electrical Division 26

4. Wiring, wiring devices, controls and mechanical accessories that are integral in the equipment.

5. Ventilating ducts, flues, controls and mechanical accessories that are integral in the equipment.

6. Anchors, fasteners, fillers and sealants for mounting equipment securely in place.

7. Cooperation with all other contractors on the job including the furnishing of information in the form of drawings, wiring diagrams and other data.

8. Touch-up painting after the installation of the food service equipment.

D. Related Sections include the following:

1.

2. Division 16 Electrical

1.3 QUALITY ASSURANCE

A. QUALIFICATIONS:

1. Installer: Regularly engaged in providing food service equipment from manufacturers of this type of equipment a minimum of 5 years with at least 5 installations of this size and type that are at least each 3 years old.

B. STANDARD OF MANUFACTURE

1. Food service equipment that is specified as "custom" having no manufacture name or model number shall be manufactured by a Food Service Equipment Fabricator with at least five (5) years' experience with engineering, design and fabrication of food service equipment. The manufacture shall be subject to the review of the Architect and/or Consultant and shall be approved by the National Sanitation Foundation. All Fabricated equipment shall be constructed in strict compliance with the latest standards of the National Sanitation Foundation and shall bear the mark of the National Sanitation Foundation in full compliance with all applicable codes and ordinances.

2. All electrically heated or operated equipment shall bear the seal of approval of the Underwriters Laboratories and shall comply with the National Electrical Code and all local Codes and Ordinances.

3. All food service equipment that is specified as "buy-out" having a specific manufacture name and model number shall comply with the latest editions of the National Sanitation Foundation.

4. All Gas heated or operated equipment shall be the seal of approval of the American Gas Association (AGA)

5. All Steam heated or operated equipment shall conform to the standard of the American Society of Mechanical Engineers (ASME) and shall be ASME approved.

6. Food shields and Sneeze guards shall meet all the requirements of National Sanitation Foundation (NSF) Standard 2.

1.4 SUBMITTALS

A. Spare

B. SHOP DRAWINGS / EQUIPMENT BROCHURES

1. No ordering or fabrication of equipment shall take place until the equipment brochures and shop drawings have been reviewed in writing by the Architect and/or Consultant. Receipt of this review shall not relieve the Contractor from the responsibility of verifying all quantities and related dimensions, maintaining the specified quality of equipment, and verifying conditions of the job site.

2. Equipment Brochures; within twenty (20) calendar days after award of the contract, brochures containing manufacturers specification sheets, dimensioned drawings and/or other pertinent data describing all items of standard manufacture shall be submitted for review by the Architect and/or Consultant. Sheets with the notation "Fabricated Item" and name of the fabricated item, as well as any required mechanical, plumbing or electrical requirements

shall be inserted between the manufacturer's specification sheets describing the "buy-out" equipment.

3. Rough-in and Equipment Location Drawings; within thirty (20) calendar days after award of the contract, complete rough-in and details for electrical and plumbing services with both vertical and horizontal dimensions, from column center-lines or exterior walls for location said connection points and rough-in locations shall be submitted for review by the Architect and/or Consultant. Equipment location plans shall be drawn to scale of not less than 1/4" = 1'-0" and include a schedule of equipment clearly identifying all items. Minimum drawings size shall be 24"x 36".

4. Shop Drawings; within thirty (30) calendar days after award of the contract, shop fabrication drawings shall be submitted for review by the Architect and/or Consultant. Plans shall be drawn to scale of not less than 1/2"=1'-0". Additional plan views, elevations and sections at 3/4"=1'-0" shall be supplied of all counters and tables with complete dimensions. All shop practices regarding joints, gussets, bracing, tie-downs, supports, etc. shall be clearly defined as well as gauges and quality of metals and brands and model numbers of all miscellaneous fittings, plumbing and electrical trim. The drawings shall also show locations of blocking (supplied under another sections) for all wall and ceiling mounted Food Service Equipment. Minimum drawings size shall be 24"x36".

C. SAMPLES

1. Provide all samples if specification requested.

D. SUBSTITUTIONS:

1. Manufacturer's listed in this section are used as standards for quality. All Substitutions shall be approved by the Architect and/or Consultant prior to installation.

2. Refer to Division 1 - General Requirements for procedures governing substitutions

3. Only one substitution for each item will be considered.

4. Installation of any qualified substituted equipment is the Food Service Equipment Contractor's responsibility. Including any mechanical, electrical, structural changes required for the installation of qualified substitution shall be without additional cost to the Owner.

1.5 DISCREPANCIES:

A. In the event of discrepancies within the Contract Documents, the Architect and/or Consultant shall be so notified in sufficient time prior to bid opening, ten (10) days to allow issuance of an addendum.

B. If time does not permit notification or clarification of discrepancies prior to the bid opening, following shall apply: The drawings and drawing schedules shall govern in matters of quantity; the specifications in matter of quality. In the event of conflict within drawings involving quantities, or within the specifications involving quality, the greater quantity and high quality shall apply. Such discrepancies shall be noted and clarified in the contractors bid. No additional allowances will be made because of errors, ambiguities, or omissions which reasonable should have been discovered during the preparation of the bid.

1.6 RESPONSIBILITY:

A. The work as specified in this division shall include assuring that all required submittals conform to the intent and meaning of the documents, conditions at the job site, and all local codes and ordinances.

B. Visit the job site to field check actual wall dimensions and utility rough-ins. Be responsible for furnishing, fabricating, and installing the equipment in accordance with the available space and utility services as they exist on the job site.

C. Check all door openings, passageways, elevators, etc., to verify that the equipment can be transported to its proper location within the building. If necessary, check the possibility with the General Contractor of holding wall erection, placement of doorjambs, window, etc. for the purpose of moving equipment to its proper location.

D. Notify the Architect and/or Consultant of any discrepancies between the plans and specification prior to fabrication of any equipment, to actual condition on the job.

E. If any special hoisting equipment and operators are required, include cost as part of the bid for this work.

1.7 DELIVERY AND STORAGE

A. All equipment specified herein shall be delivered to the job site; received and handled by the Contractor or his authorized agent. The Owner shall in no way be expected to store or handle any such equipment.

B. All equipment shall be delivered in such a manner as to protect it against dirt, water, chemical or mechanical injury.

C. Throughout the progress of the work, the Contractor shall keep the working area free of debris of all types resulting from his work.

D. All packing material shall be removed from the project location by the Contractor.

1.8 COORDINATION

A. Coordinate work with mechanical, electrical, plumbing, interiors and other trades whose work is in conjunction with equipment specified herein.

1.9 MEASUREMENTS

A. Verify all dimensions shown on the drawings by taking field measurements at the job site prior to fabrication of equipment or ordering equipment. Proper fit and attachment of all parts is required and is the sole responsibility of the Food Service Contractor. If necessary, all equipment shall be fabricated so that it may be handled through finished door openings.

1.10 PRODUCT REQUIREMENTS

A. Spare

1.11 GUARANTEE / WARRANTY

A. All work shall be guaranteed by the Foodservice Equipment Contractor against all defects for a term of one (1) year from the date of notice of completion. This guarantee shall cover replacement of defective material at the Foodservice Equipment Contractor expense, including transportation and labor. This guarantee will not cover any cost for replacement of parts or work made necessary by carelessness or misuse of the equipment by others.

B. The Food Service Equipment Contractor shall provide at his own expense the installation, start-up and service for one (1) year from the date of recording the notice of completion of the project; the replacement of all condensing units and other refrigeration devices supplied under this contract. In addition to this one (1) year free service, the condensing units shall have a five (5) year compressor warranty; said warranty commencing at the date of completion.

PART 2 PRODUCTS

2.1 MATERIALS

A. Metal for construction purposes, where entirely concealed, shall be steel of wrought iron sections galvanized by the hot-drip process after fabrication. Bolts, screws, rivets, and similar attachments to this galvanized work shall be galvanized or brass. Exposed screw and rivet work shall be finished to match adjacent surfaces, flush and buffed smooth. Finished work shall be free of tool or construction marks, dents, or other imperfections; and at the completion of the work, all metal shall be gone over with a portable machine and buffed and dressed to perfect surfaces.

B. All materials shall be new and of first grade. All gauges specified herein shall be minimum and shall be minimum and shall be established after polishing. They shall refer to:

1. U.S. Standard Gauge for sheets and plates.

2. Stainless steel shall be manufactured by one of the following: Allegheny Ludlum Steel Corporation, American Rolling Mills, U.S. Steel Corporation.

C. The Contractor will be required to furnish a certified copy of the mill analysis of materials to the Architect and/or Consultant.

D. Stainless steel sheets shall conform to ASTM A240, Type 304 Condition A, 18-8 having a No. 4 finish. No.2B finish shall be acceptable on surfaces of equipment not exposed to view. All sheets shall be uniform throughout in color, finish and appearance.

E. Stainless steel tubing and pipe shall be Type 304, 18-8, having a No. 4 finish, and shall conform to either ASTM A213 if seamless or ASTM A249 if welded.

F. Galvanized steel shall be approved grade of copper-bearing steel sheets with a minimum copper content of 20%. All sheets to be commercial quality, stretcher leveled, bonderized and re-rolled to insure smooth surface. Galvanized steel shall not be allowed in the construction and fabrication of any “Fabricated Assembly” items.

G. All millwork materials shall be free from defect impairing strength, durability, or appearance; straight and free from warpage; and the best grade for their particular function. All wood shall be well seasoned and kiln dried and shall have an average moisture content of 8%, a maximum of 10%, and a minimum of 5%.

H. Plywood and other woodwork of treatable species, where required by code, shall be fire-retardant treated to result in a flame spread rating of 25 or less with no evidence of significant progressive combustion when tested for 30 minutes duration under ASTM E-84 and shall bear the testing laboratory mark on the surface to be concealed.

I. Concealed softwood or hardwood lumber shall be of poplar, Douglas fir, basswood, red oak, birch, maple, beech or other stable wood and shall be select or better grade, unselected for color and grain, surfaced four sides, square-edged, and straight. Basswood may be used where fire-retardant treated materials are required.

J. Face veneers shall be matched for color and grain to produce balance and continuity of character. Mineral streaks and other discolorations, wormholes, ruptured grain, loose texture, doze, or shake will not be permitted. Face veneer leaves on each surface shall be full-length, book matched, center matched, and sequence matched. Surfaces shall be sequenced, and blueprint matched. Veneers not otherwise indicated shall be plain sliced. Backing veneers for concealed surfaces shall be of a species and thickness to balance the pull of the face veneers.

K. Hardwood plywood for painted surfaces shall conform to U.S. Product Standard PS -51-71, Type I, and shall have sound birch, maple or other approved close grain hardwood faces suitable for paint finish.

L. Plastic laminate surfaces shall be laminated with thermosetting decorative sheets in the color, pattern and style as selected by the Architect. Horizontal surfaces shall be laminated with sheets conforming to Federal Specifications L-P-508F, Style D, Type I (general purpose), Grade HP, Class I, 1/16" thick, satin finish with rough sanded backs. Vertical surfaces shall be laminated with sheets conforming to Federal Specification L-P-598F, Style D, Type II (vertical surface), Grade HP, Class I, conforming, satin finish, 1/32" thick or heavier. Balance sheets for backs in concealed locations shall be .020" thick laminate backing sheets conforming to Federal Specification L-P-00508E, Style ND, Type V (backing sheet), Grade HP.

M. Adhesive for application of plastic laminate to wood surfaces of counter tops shall be phonetic, resorcinol or melamine adhesive conforming to Federal Specification MMM-A-181C and producing a waterproof bond. Adhesive for applying plastic laminate to vertical surfaces shall be either a waterproof type or a water-resistant type such as a modified urea formaldehyde resin liquid glue conforming to Federal Specification MMM-A-188C. Contact adhesive will not be acceptable.

N. Plate glass shall be 1/2" thick safety glass with polished edges.

O. Sealant shall be equal to that manufactured by General Electric. Silicone construction 1200 sealant; in either clear or approved color to match surrounding surfaces.

P. Sound deadening material shall be equal to that manufactured by H.W. Mortell Co.,Kankakee, Illinois, and shall be sprayed by use of a mechanical device to a thickness of not less than 1/8" thick.

2.2 FINISHES

A. Paint and coatings shall be of an NSF approved type suitable for use in conjunction with food service equipment. Such paint or coating shall be durable, non-toxic, non-dusting, non-flaking and mildew resistant, shall comply with all governing regulations and shall be applied in accordance with the recommendations of the manufacturer.

B. All exterior, galvanized parts, exposed members of framework where specified to be painted shall be cleaned, properly primed with rust inhibiting primer, degreased, and finished with two (2) coats of epoxy-based grey hammertone paint, unless otherwise specified.

C. Stainless steel, where exposed, shall be polished to a #4 commercial finish. Where unexposed, finish shall be #2B. The grain of polishing shall run in the same direction wherever possible. Where surfaces are disturbed by the fabricating process, such surfaces shall be refinished to match adjacent undisturbed surfaces.

2.3 SHOP FABRICATED EQUIPMENT CONSTRUCTION

A. Leg stands for open base tables or dish tables shall be constructed of 1-5/8" dia. 16-gauge stainless steel tubing, with stringer and cross braces of the same material. Joints between legs

and cross braces shall be welded and ground smooth. Flattened ends on tube stretchers are not permitted. Mechanical fittings are also not permitted.

1. Stainless Steel Leg Sockets: Component Hardware Group, Inc. model A18-0206, or accepted equal; weld to underside of countertop framing or at bottom of enclosed cabinet unit and fastened with flush set screw locking device.

2. Sanitary Type Stainless Adjustable Foot: Component Hardware Group, Inc. model A10-0851, or accepted equal

B. Tabletops shall be 14-gauge stainless steel unless otherwise noted, with all shop seams and corners welded, ground smooth and polished. Tops of closed base fixtures shall be reinforced on the underside with a framework of 1-1/2" angles or 16-gauge stainless steel hat section; and on open pipe frames with a 4" channel at each pair of legs. The leg sockets shall be welded to this channel. The channel in turn stud welded to the top. Tops shall be reinforced so that there will be any noticeable deflection. Unless otherwise shown on the detail drawings, metal tops shall be turned down 2", and back at 15-degree angle, with 1-1/8" turn-under, except where adjacent to walls or other pieces of equipment. The wall side shall be turned up 10" and back 2" at a 45-degree angle. Ends of this splash are to be closed. Free corner of tops shall be spherical. All tops shall have 1/8" of sound-deadening material applied to the underside by use of spray equipment in an oven, smooth application for ease in cleaning.

C. Enclosed bases or cabinet bodies shall be of the material and gauge hereinafter specified. They shall be enclosed on the ends and sides as required. The bases shall be reinforced at the top with a framework of 1-1/2" x 1-1/2" x 1/8" stainless steel angles fully welded to the base with the stainless-steel angles 36” on center (maximum), with all corners of said framework mitered and fully welded. All vertical joints of the bases shall be fully welded, ground and polished. All free corners of enclosed bases or cabinet bodies and all corners against walls and other fixtures shall be square. In the case of fixtures fitting against or between walls, the bodies shall be set in 1" from the wall line, but the tops shall be extended back to the wall line to permit adjustment to wall irregularities. A flush fitting vertical trim strip (extension of the vertical end mullion without vertical seam of the same material as the body shall be provided at each end of the body and shall extend 1" to the wall line). These fixtures shall be constructed to set on bases or legs as hereinafter specified and shall be set in mastic in a vermin-proof manner.

D. Shelves, mullions and aprons shall be fabricated flush with the cabinet body, welded, ground, and polished. Butt joints are not acceptable.

E. Drawers, to be furnished with stainless steel flush pull, Component Hardware Group Inc., model number P63-1012 or equal installed into the 18-gauge double-pan drawer front panel.

1. Stainless steel locks, Component Hardware Group, Inc., model number P30-4781 or equal for each drawer. All drawers are to be keyed alike.

2. Stainless Steel full extension slides, Component Hardware Group, Inc., model no S52-0024 or equal NSF Approved. Provide two (2) per drawer. Slides to be installed so drawer will roll closed when released.

3. Stainless steel removable drawer pan, Component Hardware Group, Inc., model number, S81-1520 or equal one (1) per drawer set loosely in a channel frame so it can be easily lifted out for cleaning. This supporting frame shall be welded stainless steel channel.

4. Drawer face panel to be constructed of 18-gauge stainless steel double pan construction. (Single metal thickness drawer faces are not being expectable.)

F. Hinged doors in base cabinets shall be of double pan construction, insulated and constructed of 18-gauge stainless steel. Doors shall have wire type pull Component Hardware Group Inc., model number P46-1010 or equal installed as shown in elevations. Door pulls to be NSF and ADA compliant.

G. Interior shelves shall be solid, non-removable 16-gauge stainless steel, with ends and backs provided with a 1-1/2" high turn-up against the body of the fixture and welded to the same. Front edge is to be turned down 1-1/2" and under 1/2", at the bottom shelf, beyond the edge of the base to prevent sagging and vermin collection.

H. Under shelves on open tables shall be constructed of 16-gauge stainless steel, flanged down 90 degrees ½". The corners shall be welded to the legs. Under shelves shall be 10" from the floor. Backs shall be turned up 2".

I. Elevated shelves shall be constructed of 16 gauges stainless steel with edges turned down in a square edge, and back 1/8"; except where shelves are adjacent to walls or other fixtures, where they shall be turned up 2". Corners shall be spherical, mounted on 14-gauge stainless steel support brackets.

J. Sinks and drain boards shall be constructed of 14-gauge stainless steel. The working edge of the sink shall be provided with 5/8" radius sanitary rolled edge in one piece with rounded corners. The drain boards shall be made as an integral part of the sink; all vertical and horizontal corners shall be rounded with 5/8" radius; and the working front edges shall be maintained at one level, taking up the pitch of the drain boards by dropping the sink to allow for same. Depth of sink bowl shall be determined from the top bowl. Sinks shall be provided with back and end splashes with top edge flanged back 2-1/4" at 45-degree angle and attached to the building wall with "zee" clips. Splash back of sinks and drain boards shall be grained in the same direction. Suitable openings shall be cut for hot and cold-water supplies and waste outlets. All surface plumbing trim as called for on the drawings and herein specified shall be provided. Bottom of each sink bowl with center drain connection shall be fitted with a 2" lever type action waste valve mounted into the sink and made watertight. Sink bowls and drain boards shall have 1/8" of sound-deadening material underneath, spray-applied.

K. Rivets, bolts and screws shall not be permitted in any exposed location.

L. All welding shall be of the heliarc method with welding rod of the same composition as the parts welded. Welds shall be complete, strong, and ductile with excess metal ground off and joints finished smooth to match adjoining surfaces. Welds shall be free of mechanical imperfections and shall be continuously welded so that the fixture shall appear as one-piece construction. Butt welds made by spot solder and finished by grinding are not acceptable.

M. All exposed joints shall be ground flush with adjoining material and finished to harmonize therein. Whenever material has been sunk or depressed by welding operation, such depressions shall be suitably hammered and peened flush with the adjoining surface and, if necessary, again ground to eliminate low spots. In all cases, the grain of rough grinding shall be removed by successive fine polishing operations.

N. All exposed welded joints in stainless steel construction shall be suitably coated with an approved metallic-based paint.

O. After galvanized steel members have been welded, all welds and areas where galvanizing has been damaged shall have a zinc dust coating applied.

P. Seams shall be continuous welds flush and ground smooth.

1. Field Joints: Flush welded, ground smooth and polished on the job, solder or rivets not allowed.

2. Counter Tops: Field joints in stainless steel counter tops and drain boards butt welded with welds ground flush and smooth and polished to match original finish.

3. Pass windows: Provide a complete all welded seamless counter from inside area to the outside ledge at each pass window location. Mechanical joints, butt joints or lap joints will not be accepted.

2.4 ELECTRICAL REQUIREMENTS

A. Standard UL listed materials, devices and components shall be selected and installed in accordance with NEMA Standards and recommendations and as required for safe and efficient use and operation of the Food Service Equipment without objectionable noise, vibration, and sanitation problems.

B. Motors up to and including ½ HP are to be wired for 120-volt, single phase. Fixtures totaling more than 1000 watts are to be wired for 208-volt, single phase. Fixtures having multiple number of heating elements, can be wired for three phase with the load balanced as equally as possible within the fixture.

C. Heating elements having a connected load of up to and including 1000 watts are to be wired for 120-volt, single phase. Fixtures totaling more then 1000 watts are to be wired for 208-volt, single phase. Fixtures having multiple number of heating elements can be wired for three phase with the load balanced as equally as possible within the fixture.

D. Equipment where applicable shall be furnished with three-wire cord and plug.

2.5 PLUMBING TRIM, SINKS

A. All vegetable and pot washing sinks or other 14" deep sinks shall have Fisher Mfg. Co. Model 22209 series (2" drain size) quick opening drain. Fisher Mfg. Co. Model 60100 splash mounted faucet shall be mounted over each partition as shown on the drawings.

B. All cook sinks, pantry sinks, or other 10" or 12" deep sinks shall have Fisher Mfg. Co. Model 22209 series (2" drain size or as shown on the drawings) quick opening drain. Fisher Mfg Co. Model 57649 faucets mounted as shown on the drawings.

C. All Fisher Mfg., Co. faucets to be furnished as stainless steel to comply with AD1953 Standards and conform to NSF 61 Standard 9.

D. Provide gas pressure regulators for installation by the Plumbing Contractor.

E. FIRE SUPPRESSION GAS SHUT/OFF VALVE: Gas valve to be furnished by the Foodservice Equipment Contractor and furnished to the Plumbing Contractor for installation. Foodservice Equipment Contractor is to verify with plumbing division for gas line size. Valve to be located in an accessible location and if necessary with access panel.

2.6 HARDWARE

A. Elevated shelf brackets shall be as shown on the Drawings.

B. Drawer and door handles shall be as shown on the Drawings.

C. Hinges for all metal doors shall be Klein Hardware Co. 7870 series, finished in satin chrome.

PART 3 INSTALLATION

3.1 POSITIONING OF EQUIPMENT

A. Installation procedure, details and scheduling shall be so arranged that the work of other contractors may progress without unnecessary delay, interference or damage.

B. The Contractor shall do all fitting, joining, fastening, scribing, caulking and adjusting necessary to install any fixed item of equipment in its designated location; and shall locate and/or store portable, non-fixed items as directed by the Architect and/or Consultant with due regard for the security and protection from damage of the items involved.

3.2 WORKMANSHIP

A. Commencement of work shall constitute agreement with and acceptance of all conditions as found.

B. Equipment shall be installed as shown on the plans. Where abutting, curved or irregularly shaped angles or projecting corners of walls occur, equipment shall be made to conform. Where several pieces of equipment are to be assembled in a group, the group shall be complete as whole, with all necessary filler or connecting pieces as may be required to make a complete, sanitary and vermin-proof group.

C. Welded parts shall be non-porous and free of imperfections. Welds on galvanized metal shall be ground smooth, sandblasted and sprayed with molten zinc or 1200 degrees F to a thickness of .004". Tinning of welds will not be acceptable. Welds of stainless steel shall be ground and polished to the original finish and all grained in the same direction.

D. All fixtures, unless made of stainless steel, shall be finished in sprayed lacquer in color as chosen by the architect; or if specifically stated, in “plastic laminate”; in pattern and/or color as selected by the Architect.

3.3 POST INSTALLATION PROCEDURES

A. Prior to being offered for final acceptance, all equipment shall be thoroughly cleaned. This shall include removal of all stains, paint spots, protective wrapping and coatings, tapes, grease, oil, plaster, dust, polishing compounds, etc. and cleaning of floors in food service areas (broom clean) and signed off by the General Contractor with a copy to the Architect and/or Consultant.

B. After installation at least ten (10) days prior to offering for acceptance, all equipment shall undergo a "Start-up" procedure by a Factory Authorized service dealer. Equipment is to be inspected, tested, calibrated and adjusted for normal operation conditions. If inspection or testing indicated defects, such defects shall be corrected, and the inspection and test repeated to insure a perfect operation of all equipment, prior to final acceptance and for a period ninety day after final acceptance.

C. Upon completion of the project, the Contractor shall furnish the Owner two (2) sets of dimensional prints, data sheets, spare parts lists and operating manuals for each piece of mechanical equipment; each set shall be neatly bound in a loose-leaf binder, each set shall be complete with and index of equipment and with a complete list of service contracts with said agencies to perform these services. In addition to this list. The contractor shall submit for review of the Architect and/or Contractor and submittal to the Owner for his files, copies of service contracts with said agencies to perform these services. It shall be the responsibility of this contractor to fill out forward and all warranty forms as required.

D. This contractor shall arrange demonstrations of the operation and maintenance of all buy-out" equipment by competent instructors. These demonstrations to take place within ten (10) days prior to the acceptance of the kitchen. All instruction periods shall be scheduled with the Architect and/or Consultant fourteen (14) days prior to commencement of same, and at times convenient to the Architect and/or consultant and Owner.

PART 4 ITEMIZED EQUIPMENT SCHEDULE

4. 1 FOOD SERVICE EQUIPMENT LIST AND DESCRIPTION

A. Fabricated Equipment: Wherever the term "Fabricated Assembly" is used within the list noted below and description of Food Service Equipment, it shall be presumed to be followed by the phrase, "constructed to the configuration, dimension, detail and design as shown on the drawings and specifications and with workmanship and materials as specified above" and shall meet the fabrication detail requirements of the latest edition of the Sheet Metal and Air Conditioning Contractors National Association (SMACNA), and National Sanitation Foundation (NSF Standard 2).

B. All food service equipment shall be installed per the "Guidelines for Seismic Restraints of Kitchen Equipment" by the Sheet Metal and Air Conditioning Contractors National Association (SMACNA).

C. All food service equipment shall comply with the standards of The California Code of Regulations, Title 24, Part No. 2.

D. All food service equipment shall comply with the current California Energy Commission Appliance Efficiency Regulations.

E. Equipment in the following schedule is listed by Item Numbers shown on Drawings.

F. Equipment listed is schedule as (OFCI) means Owner Furnished Contractor Installed.

1. SCHEDULED ITEMS:

ITEM #1 AIR CURTAIN
Quantity: One (1)
Manufacturer: Berner (or equal)
Model: SLC07-1036A-BK
Status: OFCI
This item is owner furnished contractor installed. Contractor to verify utility and installation requirements. Equipment vendor to verify equipment configurations with the DSA approved drawings.
Sanitation Series Low Profile Air Curtain, 36"L, unheated, (1) 1/5 hp motor, for doors up to 7' high, aluminized steel cabinet, baked-on electrostatic black powdered coated aluminum steel cabinet, interior or exterior mounting, UL, cULus, UL EPH, MADE IN USA

Accessories:
1 ea. Five year parts warranty (unheated units)
1 ea. Model A 120v/60/1-ph
1 ea. Model 9503SD020-P Automatic Door Switch, plunger type, activates air door when door opens, single phase only & max. amp draw of 20 amps, 120-240V
1 ea. Black powder coat exterior finish standard

ITEM #2 HAND SINK
Quantity: One (1)

Manufacturer: Eagle Group (or equal)
Model: HSAP-14-ADA-FW
Status: OFCI
This item is owner furnished contractor installed. Contractor to verify utility and installation requirements. Equipment vendor to verify equipment configurations with the DSA approved drawings.
Hand Sink, wall mount, 14" wide x 16" front-to-back x 5" deep bowl, 16/304 stainless steel construction, splash mount gooseneck faucet with wrist handles & mixer valve, marine edge on front & sides, 1/2" NPS water inlet, chrome-plated P-trap, wrist handles, soap dispenser, basket drain, skirt assembly & paper towel dispenser, PHYSICALLY CHALLENGED, NSF

Accessories:

1 ea. Model 313305 T&S Extra Heavy Duty Gooseneck Faucet, wrist handles, splash mount 4" OC, NSF
1 ea. Model -LRS Left & right side splashes

ITEM #3 PREPARATION SINK
Quantity: One (1)
Manufacturer: American Stainless-Steel Corp. (or equal)
Model: FABRICATED ITEM
Status: OFCI
This item is owner furnished contractor installed. Contractor to verify utility and installation requirements. Equipment vendor to verify equipment configurations with the DSA approved drawings.
Fabricated assembly in length and configuration as shown on the drawings and shall include the following:

A. Work area top to be 14-gauge stainless steel with a 14-gauge stainless steel backsplash at back 2" thick with a 45-degree top edge to wall, turn down ½" at back and right side. Top to be constructed with a 2” turn down on 2 sides as shown. Drainboards are to slope per NSF guidelines to sink.
B. One (1) 14-gauge stainless steel formed and welded sinks, refer to drawings for bowl dimensional requirements. (Diecast sink bowls are not acceptable).
C. Legs to be 16-gauge stainless steel tubular, stainless steel welded leg sockets, stainless steel seismic flanged feet and stainless-steel cross rail bracing. Provide 16-gauge stainless steel undershelf as shown.
D. Approximate size: 30" deep x as shown.
E. Twist waste valve to have support bracket installed as part of fabrication with a minimum of 4” clearance from twist handle.

Accessories:

1 ea. Fisher Model 57657 Faucet, deck mount, 8" centers, 10" swing spout, lever handles with color coded indexes, 1/2" male inlets, stainless steel, ADA Compliant
1 ea. Fisher Model 22209 DrainKing Waste Valve, with flat strainer, 12 GPM drain rate, dual Teflon seals, stainless steel ball, cast red brass body
1 ea. Fisher 5-year warranty against defects in materials or workmanship, standard
2 ea. Fisher Model 5000-2103 Close Elbow, 3/4" female, rough chrome

ITEM #4 WALL MOUNTED SHELF
Quantity: One (1)
Manufacturer: Custom
Model: American Stainless-Steel Corp. (or equal)
Status: OFCI
This item is owner furnished contractor installed. Contractor to verify utility and installation requirements. Equipment vendor to verify equipment configurations with the DSA approved drawings.
Fabricated assembly in length and configuration as shown on the drawings and shall include the following: To be fabricated of 16-gauge stainless steel body and shelves. Furnish with hinged doors and as shown on the drawings.

A. To be 304 16-gauge stainless steel construction, 1 1/2" turn down in front and 2" turn up at back and right end and left ends. Provide 14-gauge stainless steel wall brackets as shown. Shelf to be stud welded with cap nuts (2) ea at each shelf bracket silicone shelf to brackets will not be allowed for attachment.
B. Approximate Size: (1) ea. 12" deep x length as shown.

ITEM #4.1 OVERSHELF WITH POT RACK

Quantity: One (1)
Manufacturer: Advance Tabco
Model: PS-15-36
Status: OFCI
This item owner furnished contractor installed. Contractor to verify/provide backing locations/requirements.

Accessories

1. Model PS-15-36 Shelf with Pot Rack, wall-mounted, 36"W x 15"D, 18/430 stainless steel shelf, 2" x 1/4" stainless steel pot rack, includes: (6) plated double pot hooks, NSF

ITEM #5 SINK, (3) THREE COMPARTMENT

Quantity: One (1)
Manufacturer: American Stainless-Steel Corp. (or equal)
Model: FABRICATED ITEM
Status: OFCI
This item is owner furnished contractor installed. Contractor to verify utility and installation requirements. Equipment vendor to verify equipment configurations with the DSA approved drawings.
Fabricated assembly in length and configuration as shown on the drawings and shall include the following:

A. Work area top to be 14-gauge stainless steel with a 14-gauge stainless steel backsplash at back 2" thick with a 45-degree top edge to wall, turn down ½" at back and right side to Z-clips. Top to be constructed with a rolled edge as shown. Drainboards are to slope per NSF guidelines to sinks.
B. Three (3) 14-gauge stainless steel formed and welded integral sinks, refer to drawings for bowl dimensional requirements. (Diecast sink bows are not acceptable).
C. Provide and install 16-gauge stainless steel tubular legs, stainless steel welded leg sockets, and stainless-steel cross rail bracing.
D. Provide 16-gauge stainless steel undershelf with 1 ½" turn down at front and 2" turn up at back.
E. Provide adjustable seismic flanged feet. Refer to drawings for configuration and quantity.
F. Twist waste valve to have support bracket installed as part of fabrication with a minimum of 4" clearance from twist handle.

Accessories:

3 ea. Fisher Model 22209 DrainKing Waste Valve, with flat strainer, 12 GPM drain rate, dual Teflon seals, stainless steel ball, cast red brass body
2 ea. Fisher Model 60100 Faucet, 3/4", 8" backsplash, with 10" swing spout & elbows, stainless steel
4 ea. Fisher Model 5000-2103 Close Elbow, 3/4" female, rough chrome

ITEM #6 PRE-RINSE FAUCET ASSEMBLY

Quantity: One (1)
Manufacturer: Fisher (or equal)
Model: 13390
Status: OFCI
This item is owner furnished contractor installed. Contractor to verify utility and installation requirements.

Equipment vendor to verify equipment configurations with the DSA approved drawings.
Pre-Rinse Unit, spring style, backsplash mount, 8" centers, 21" riser, 36" hose, 1.15 GPM Ultra-Spray™ PLUS spray valve with built-in spray handle clip & dish guard bumper, lever handles with color coded indexes, includes wall bracket, 1/2" NPT male inlets, brass, ADA Compliant

Accessories:

1 ea. Model 64211 Elbows, (2) 1/2", brass

ITEM #7 DOUBLE STACK COMBI OVEN, GAS

Quantity: Two (2)
Manufacturer: RATIONAL (or equal)
Model: ICP 6-FULL/6-FULL NG 208/240V 1 PH
Status: OFCI
This item is owner furnished contractor installed. Contractor to verify utility and installation requirements. Equipment vendor to verify equipment configurations with the DSA approved drawings.
Two (2) (CC1GRRA.0000238) iCombi Pro® 6-Full Size Combi Ovens, double stack, natural gas, (12) 18" x 26" sheet pan or (24) 12" x 20" steam pan or (12) 2/1 GN pan capacity, (6) stainless steel grids included, intelligent cooking system with (4) assistants; iDensityControl, iCookingSuite, iProductionManager, & iCareSystem, (6) operating modes, (5) cooking methods, (3) manual operating modes, 85° to 572°F temperature range, quick clean, care control, eco mode, 6-point core temperature probe, retractable hand shower, Ethernet interface, Wi-Fi enabled, includes: (2) buckets of Active Green Cleaner, & (2) buckets of Care Tabs, 106,500 BTU each, 208/240v/60/1-ph, 6 ft. cord, 0.9 kW each, IPX5, cCSAus, NSF, ENERGY STAR-®

Accessories:

1ea. Model 60.75.752 Combi-Duo Universal Stacking Kit, for iCombi 6-half size or 6-full size (electric or gas) on iCombi 6-full size (gas only)
1 ea. Model 60.31.205 Stand I Stationary Oven Stand for Combi-Duo (MarineLine), 7-3/4"H, open sides, with fixing mount, for iCombi 6-full size on 6-full size
1 ea. 2 years parts and labor, 5 years steam generator warranty
1 ea. Model 1900.1150US Water Filtration Double Cartridge System, for full-size Combi-Duos or if used for more than (2) units, includes: (1) double head with pressure gauge, (2) R95H filter & (1) filter installation kit (for each additional unit add (1) additional head & additional cartridge. Maximum (4) cartridges)
1 ea. NOTE: The RATIONAL Water Filtration Systems helps provide consistent high quality water to your RATIONAL cooking systems. The patented carbon block technology reduces the effects of sediment, chloramines and chlorine while providing the required flow rates
4 ea. Provide seismic flanged feet.
4 ea. Provide drain water tempering kit one (1) per drain line.

ITEM #8 EXHAUST HOOD AND S/S WALL LINING

Quantity: One (1)
Manufacturer: CAPTIVE AIRE (or equal)
Model: 6024-ND-2-PSP-F
Status: CFCI
To be stainless steel type I exhaust hood. Hood to be 18-gauge stainless steel with removable Captrate Solo Filter cartridges. See drawings for dimensions. The exhaust hood is to have 3" air space at back. Provide 200-watt lights pre-wired to one (1) point of connection as the configuration is shown on the drawings. Provide Hood and all accessories as shown on the drawings.

A. 18-gauge stainless steel wall panels (minimum length to be 36”) per California Mechanical Code Chapter 5. Wall lining to be applied with Dow Corning #995 adhesive. "Liquid Nails" are not acceptable.
B. Wall panels shall be installed horizontally and fluted vertically every 6” from top of floor base to bottom lip of the hood

C. Wall lining shall be installed without exposed screws and bolts.
D. Provide stainless steel “tees” and/or “ells” at each panel on both sides, bottom and top.
E. The stainless-steel wall lining shall extend the full length of the exhaust hood Item including the fire system cabinet on the end of the hood.
F. Insulated wall lining shall meet the requirements of NFPA-96 and all local codes and ordinances.
G. Provide 18-gauge stainless steel closure skirting from top of the hood to finish ceiling.
H. Provide all hanging information to the Contractor including the total weight of the hood.
I. Furnish all necessary materials to support this assembly from the building structure. Assembly shall meet the requirements of NFPA-96 and the latest edition of the California Mechanical Code.
J. 18-gauge stainless steel wall lining with a 1-inch mineral wool blanket and wire mesh backing or ceramic fiber and backing spaced out 1-inch on non-combustible spacers per California Mechanical Code 2019 Chapter 5.
K. Current exhaust hood configuration, DCV set up to provide 0-10v speed signal and does not include VFDs for the fans. Refer to foodservice equipment exhaust hood details.

ITEM #8.1 FIRE SYSTEM
Quantity: One (1)
Manufacturer: CAPTIVE AIRE / ANSUL
Model: R-102
Status: CFCI
Equipment configuration with the DSA approved drawings.
Complete with a stainless-steel control panel, remote pull station, all shut/down electric contractors. This assembly to be in compliance with NFPA 96 and UL-300.

A. All exposed piping, fittings, nozzles, and trim shall be stainless steel or chrome plated finish.
B. All conduit piping and boxes are to be concealed in the building wall or ventilator. Verify with contractors to coordinate installation in the wall areas.
C. Furnish a mechanical gas shut-off valve of proper size to the Plumbing Contractor for installation. Verify with Electrical Contractor what type of electrical panel will be furnished, either for shunt trips or contactors, and provide all necessary information regarding the inter-lock conduit and wiring between this electrical panel and the fire suppression panel. This electrical work and all material to be supplied by the Electrical Contractor.
D. Coordinate with the hood manufacturer to supply the proper access into the hood area for the fire suppression linkage and nozzle locations.
E. Before installation of the fire suppression system is started, approved drawings and fitting lists must be approved by the Office of Regulation Services. Once the installation is completed a field test must be performed in the presence of the inspecting authority.

ITEM #9 HAND SINK
Quantity: One (1)
Manufacturer: Advance Tabco (or equal)
Model: 7-PS-68
Status: OFCI
This item is owner furnished contractor installed. Contractor to verify utility and installation requirements.
Equipment vendor to verify equipment configurations with the DSA approved drawings.
Hand Sink, wall mounted, 14" wide x 10" front-to-back x 5" deep bowl, 20 gauge 304 stainless steel, with splash mounted gooseneck faucet with wrist blades, basket drain, wall bracket, NSF, cCSAus.

Accessories:
1 ea. Model 7-PS-10 P-trap, heavy duty, 1-1/2", 17 gauge
1 ea. Model 7-PS-17 Welded Side Splash, 7-3/4"H (installed height), both sides, for hand sinks with 14" wide x 10" front-to-back bowl, splash mounted faucets

ITEM #10 RANGE, 24", 4 OPEN BURNERS

Quantity: One (1)
Manufacturer: Garland/US Range (or equal)
Model: GFE24-4L
Status: OFCI
This item is owner furnished contractor installed. Contractor to verify utility and installation requirements. Equipment vendor to verify equipment configurations with the DSA approved drawings.
Starfire Pro Series Restaurant Range, gas, 24", (4) 26,000 BTU open burners, cast iron top & ring grates, electric pilot ignition, space saver oven, 3 position rack guides, (1) oven rack, stainless steel front, sides, plate rail and 10" low profile back guard, 6" stainless steel legs with adjustable feet, 136,000 BTU, CSA Flame, CSA Star, cCSAus, CE, NSF (Garland)

Accessories:

1 ea. One year limited parts and labor warranty, covers products purchased and installed in the USA only, standard
1 ea. Gas type to be specified
1 ea. (Electronic ignition) 115v/60/1-ph, 0.1 amps, NEMA 5-15P, standard
1 ea. 10" Low-Profile stainless steel backguard standard
1 ea. Deck fasteners, stainless steel flanged feet (set of 4)

ITEM #11 CHARBROILER, GAS, COUNTERTOP
Quantity: One (1)
Manufacturer: Vulcan (or equal)
Model: VACB36
Status: OFCI
This item is owner furnished contractor installed. Contractor to verify utility and installation requirements. Equipment vendor to verify equipment configurations with the DSA approved drawings.
Achiever Charbroiler, countertop, 36", (6) 17,000 BTU cast iron burners, infinite heat control valves, fully welded chassis, (1) drip tray, stainless steel front, sides & top trim, backsplash & grease trough, 4" adjustable legs, 102,000 BTU, CSA, NSF

Accessories:

1 ea. 1 year limited parts & labor warranty, standard
1 ea. Gas type to be specified
1 ea. Model 3/4QD HOSE-4 3/4" x 4' long gas flex hose & quick disconnect with restraining device

ITEM #12 EQUIPMENT STAND, FOR COUNTERTOP COOKING
Quantity: One (1)
Manufacturer: Vulcan (or equal)
Model: STAND/C-72
Status: OFCI
This item is owner furnished contractor installed. Contractor to verify utility and installation requirements. Equipment vendor to verify equipment configurations with the DSA approved drawings.
Equipment Stand, universal, 73" W x 24" H, 1/2" marine edge, undershelf, stainless steel, seismic flanged feet.

ITEM #13 GRIDDLE, GAS, COUNTERTOP
Quantity: One (1)
Manufacturer: Vulcan (or Equal)
Model: MSA36
Status: OFCI
This item is owner furnished contractor installed. Contractor to verify utility and installation requirements. Equipment vendor to verify equipment configurations with the DSA approved drawings.
Heavy Duty Griddle, countertop, gas, 36" W x 24" D cooking surface, 1" thick polished steel griddle plate, embedded mechanical snap action thermostat every 12", millivolt pilot safety, manual ignition, low profile,

stainless steel front, sides, front grease trough, 4" back & tapered side splashes, 4" adjustable legs, 81,000 BTU, CSA Star, CSA Flame, NSF

Accessories:

1 ea. 1 year limited parts & labor warranty, standard
1 ea. Gas type to be specified
1 ea. Model 3/4QD HOSE-4 3/4" x 4' long gas flex hose & quick disconnect with restraining device

ITEM #14 MOBILE HEATED CABINET

Quantity: One (1)
Manufacturer: Cres Cor (or equal)
Model: H-137-SUA-12D
Status: OFCI
This item is owner furnished contractor installed. Contractor to verify utility and installation requirements. Equipment vendor to verify equipment configurations with the DSA approved drawings.
Cabinet, Mobile Heated, insulated, top-mount heater assembly, recessed push/pull handles, magnetic latch, (12) sets chrome plated wire universal angle slides for 12" x 20" thru 18" x 26" pans on 4-1/2" centers, adjustable 1-1/2" centers, reversible dutch doors, (4) heavy duty 5" swivel casters (2) braked, anti-microbial latches, stainless steel construction, NSF, cCSAus, ENERGY STAR®

Accessories:

1 ea. Standard Warranty: 1 year labor with 3 year parts warranty
1 ea. 120v/60/1-ph, 1.5 kW, 12.0 amp, 10 ft power cord, NEMA 5-15P, standard
1 ea. Right-hand door swing (top & bottom doors), standard
1 ea. Tempered glass window, per door (2 required)
1 ea. Model 1056 002 Corner Bumpers, add 2" to OA dimensions, non-marking, gray
1 ea. 6" casters, set of 4

ITEM 15 MOBILE WORKTABLE WITH UTENSIL DRAWER

Quantity: Two (2)
Manufacturer: American Stainless-Steel Corp. (or equal)
Model: FABRICATED ITEM
Status: OFCI
This item is owner furnished contractor installed. Contractor to verify utility and installation requirements. Equipment vendor to verify equipment configurations with the DSA approved drawings.
Fabricated assembly in length and configuration as shown on the drawings and shall include the following:

A. Work area top to be 14-gauge stainless steel with 2" turn down on all four sides.
B. Provide and install 16-gauge stainless steel tubular legs, stainless steel welded leg sockets, and fully welded stainless-steel cross rail bracing. Provide 16-gauge stainless steel undershelf as shown.
C. Provide swivel expanding stem casters Component Hardware Group, Inc. (4) ea. Model CMS4-4GBN brake model.
D. Provide (2) ea. utensil drawer Component Hardware Group, Inc. Model S90-0020N drawer mounted to the underside of mobile worktable Item No. 15. Provide all necessary hardware mounting angles etc. for a complete installation. Slides to be installed so drawer will roll closed when released.
E. Enclose splash at back.

ITEM #16 DRY STORAGE SHELVING

Quantity: 7 (7)
Manufacturer: Metro (or equal)
Model: A2448NC

Status: OFCI
This item is owner furnished contractor installed. Contractor to verify utility and installation requirements. Equipment vendor to verify equipment configurations with the DSA approved drawings.
Super Adjustable Super Erecta® Shelf, wire, 48"W x 24"D, chrome plated finish, corner release system, NSF. Shelving to be 4-tier units with the bottom shelf at a minimum of 12" above finished floor. Provide post clamps to adjacent shelving unit two at front and two at back. Provide wall mounting angle brackets at top of shelving as shown. Provide "S' hooks where shelving comes together at 90 degrees delete inside post all locations inside corners.

Accessories:

28 ea. 64P - 64-1/2"H, adjustable leveling bolt, posts are grooved at 1" increments & numbered at 2" increments, double grooved every 8" chrome finish
8 ea. 9995Z- Super Erecta® "S"Hook, zinc
8 ea. 9994Z- Super Erecta® Post Clamp, zinc
28 ea. SAFP- Seismic Threaded Foot Plate Kit, (4) foot plates each with a single anchor hole. Zinc plated finish, for use with staked 1" Round Posts, Spec Sheet 10.16,

ITEM #16.1 DRY STORAGE SHELVING
Quantity: One (1)
Manufacturer: Metro (or equal)
Model: A2436NC
Status: OFCI
This item is owner furnished contractor installed. Contractor to verify utility and installation requirements. Equipment vendor to verify equipment configurations with the DSA approved drawings.
Super Adjustable Super Erecta® Shelf, wire, 36"W x 24"D, chrome plated finish, corner release system, NSF. Shelving to be 4-tier units with the bottom shelf at a minimum of 12" above finished floor. Provide post clamps to adjacent shelving unit two at front and two at back. Provide wall mounting angle brackets at top of shelving as shown. Provide "S' hooks where shelving comes together at 90 degrees delete inside post all locations inside corners.

Accessories:

28 ea. 64P - 64-1/2"H, adjustable leveling bolt, posts are grooved at 1" increments & numbered at 2" increments, double grooved every 8" chrome finish
8 ea. 9995Z- Super Erecta® "S"Hook, zinc
8 ea. 9994Z- Super Erecta® Post Clamp, zinc
28 ea. SAFP- Seismic Threaded Foot Plate Kit, (4) foot plates each with a single anchor hole. Zinc plated finish, for use with staked 1" Round Posts, Spec Sheet 10.16,

ITEM #18 WALK-IN FREEZER
Quantity: One (1)
Manufacturer: RMI-Econocold (or equal)
Model: FABRICATED ITEM
Status: CFCI
Assembly shall consist of one (1) refrigerator compartment; Wide x 8’-0” high clear interior dimensions Equipment vendor to verify equipment configurations with the DSA approved drawings.
(see drawings for dimensions and configuration). Assembly to form the configuration as shown on the drawings. Assembly shall be furnished as herein specified. And as prepared by RMI.

1. Assemblies shall be N.S.F (Standard 7) approved and formed in the configuration as shown on the contract drawings. Assemblies shall meet California Code of Regulations Title 20 Sections 11601 through 1608 dated July 2006 Appliance Efficiency Regulations.

2. Panel Construction: Shall consist of exterior and interior die-formed metal panels formed to ensure proper size. Section edges must have lineup pines and double row of closed-cell gaskets to insure panel alignment and proper seal at each joint. Corner panels to be 90-degree angles 12 inches in each direction. (No Wood Construction will be accepted).

3. Insulation: Walls and Ceiling 4" of “foamed-in-place” urethane insulation shall be used with thermal conductivity of not more than 0.118 BTU per hour per square foot. U Factor shall not exceed 0.030. The insulation shall be rated self-extinguishing and fire-retardant type as specified by UL. Insulation must remain stable at temperatures up to 260ºF. Floor to be same as above except Heavy-Duty reinforced for cart storage capable to withstand 500-pound point load with no deflection.

4. Section Fasteners: All wall, floor and ceiling section joints shall be fastened together with steel cam-action speed locks. These fasteners shall not exceed a 46" on center spacing. All locks shall be actuated from inside with a standard hex type Allen wrench. All socket ports shall be finished off with a ½" diameter snap cover to match the color of the panels.

5. Hinged Walk-In Doors: Door shall be installed as shown on the drawings. Door shall be urethane insulated, flush-in fitting type 42" wide x 80" high (as shown on the drawings) with triple-pane 1/4" thick plate glass view windows (freezer heated). Each door shall be furnished with a door heater switch and mortise-style lock. Door finish to be 20-gauge stainless steel inside and out. Door and door section shall be listed by UL and equipped with the following:

    a. Magnetic gasket
    b. Door closer
    c. Polished chrome deadbolt latch and cam-lift spring-loaded hinges Latches shall have a safety release to prevent entrapment of personnel within the box. Latches also have padlocking provisions.
    d. Bottom of door shall have a double sweep gasket. Magnetic gasket shall be of a dart and ridge design that will allow for easy replacement by the end user without the use of any tools. The door jamb shall be constructed of a fully welded anodized aluminum rigid frame. The perimeter of the frame shall be no less than two inches wide to provide integral backing to accommodate all required hardware. Freezer door jambs shall also have a 120-volt jamb and threshold heater with a Snap-On easily removable stainless-steel channel and a heated pressure relief vent assembly listed by UL.
    e. Each entrance door shall be provided with a 3-way rocker light switch with an indicating pilot light exterior. All switches are pre-wired, and factory tested per UL.
    f. A threshold shall be provided with the door section. Heater wire shall continue beneath the threshold (freezer) in a raceway.
    g. A digital thermometer shall be included with each door section to indicate inside temperature.

6. Lights: Each door section shall be equipped with a flush-mounted constant burning pilot light and switch on exterior and interior factory wired to an interior LED Fixture Kason 1806. Each compartment shall be provided with ceiling mounted vapor proof LED light fixture with clear prismatic injection-molded polycarbonate diffuser Kason model 1810 or equal, see drawings for quantity. Light fixtures shall be factory wired to the light switch at the entrance door. Lighting level shall be a minimum of 10-foot candles measured 30" off the finished floor.

7. Finish: Finished: Exterior wall panels, exposed to kitchen shall be 22-gauge stainless steel finish. Ceiling panels and door panels shall be a minimum of .026 galvanized steel with baked enamel embossed white finish and where concealed shall be .026" galvanized steel. Interior wall and ceiling panels shall be .026" galvanized steel and finished in baked enamel embossed white finish. Interior kitchen finish floor to meet interior floor panel of walk-in at same elevation for an even transition into walk-in. Contractor to verify finished floor thickness and provide anti-slip surface. Contractor to verify finished floor thickness.

8. Accessories: Assembly shall be provided with the following accessories.

a. Door hinges: (3) per door, self-closing and chrome-plated Kason No.1256 Cam-Lift.
b. Door Pulls: Chrome plated Kason No. 1229C with inside safety release.
c. Door Closure: Kason No. 1094.
d. Trim Molding: Where unit abuts the building wall they shall be trimmed with a closure strip to match the exterior walk-in wall finish. Provide removable "drop-in" closure panels at ceiling. Provide vertical closure strips at all building wall junctures.
e. Each compartment shall be provided with a high-temperature alarm system, Modular Corporation model No. 75 FLUSH mounted. This unit to be provided complete with built-in N/O & N/C dry contacts and pulse output for remote notification.
f. Dial Thermometer: Provide one (1) 4" dia. built into each walk-in door panel.
g. Pressure Relief Port: One (1) for each compartment Kason No. 1830 (heated at freezer only.
h. Strip Curtains: each walk-in door shall have polyester-reinforced clear vinyl strip curtains.
i. Entrance Doors: Each door shall have a 1/8" thick sheet aluminum diamond plate kick panel 3'-0" high on the exterior and interior door panels and adjacent door jambs.
j. The wall panels exposed to the kitchen shall have a 16-gauge stainless steel rub rail.
k. Provide a stainless-steel interior and exterior coved toe base.
l. Provide necessary backing in wall panel for the attachment
m. Floor to be heavy duty type to support cart traffic capable to withstand 500-pound point load with no deflection.

9. This assembly shall be installed by factory personal and or factory-approved installers with written certification provided by the manufacturer to the Architect and Consultant.

10. Walk-in assembly shall be installed into a recessed area as shown on the drawings. Contractor is to verify finishes and thickness of kitchen floor and allow for proper clearance at walk-in door.

ITEM #18.1 COLD STORAGE SHELVING
Quantity: Two (2)
Manufacturer: Metro (or equal)
Model: A2436NK3
Status: OFCI
This item is owner furnished contractor installed. Contractor to verify utility and installation requirements. Equipment vendor to verify equipment configurations with the DSA approved drawings.
Super Adjustable Super Erecta® Shelf, wire, 36"W x 24"D, Metroseal 3 (corrosion-resistant) finish, corner release system, with Microban® antimicrobial protection, NSF. Shelving to be 4-tier units with the bottom shelf at a minimum of 12" above finished floor. Provide post clamps to adjacent shelving unit two at front and two at back. Provide wall mounting angle brackets at top of shelving as shown. Provide "S' hooks where shelving comes together at 90 degrees delete inside post all locations inside corners.

Accessories:
8 ea. 64PK3 - 64-1/2"H, adjustable leveling bolt, posts are grooved at 1" increments & numbered at 2" increments, double grooved every 8" chrome finish
8 ea. 9995Z- Super Erecta® "S"Hook, zinc
8 ea. 9994Z- Super Erecta® Post Clamp, zinc
8 ea. SAFP- Seismic Threaded Foot Plate Kit, (4) foot plates each with a single anchor hole. Zinc plated finish, for use with staked 1" Round Posts, Spec Sheet 10.16,

ITEM #18.2 COLD STORAGE SHELVING
Quantity: Three (3)
Manufacturer: Metro (or equal)
Model: A2442NK3

Status: OFCI
This item is owner furnished contractor installed. Contractor to verify utility and installation requirements. Equipment vendor to verify equipment configurations with the DSA approved drawings.
Super Adjustable Super Erecta® Shelf, wire, 42"W x 24"D, Metroseal 3 (corrosion-resistant) finish, corner release system, with Microban® antimicrobial protection, NSF. Shelving to be 4-tier units with the bottom shelf at a minimum of 12" above finished floor. Provide post clamps to adjacent shelving unit two at front and two at back. Provide wall mounting angle brackets at top of shelving as shown. Provide "S' hooks where shelving comes together at 90 degrees delete inside post all locations inside corners.

Accessories:

12 ea. 64PK3 - 64-1/2"H, adjustable leveling bolt, posts are grooved at 1" increments & numbered at 2" increments, double grooved every 8" chrome finish
12 ea. 9995Z- Super Erecta® "S"Hook, zinc
12 ea. 9994Z- Super Erecta® Post Clamp, zinc
12 ea. SAFP- Seismic Threaded Foot Plate Kit, (4) foot plates each with a single anchor hole. Zinc plated finish, for use with staked 1" Round Posts, Spec Sheet 10.16,

ITEM #18.3 COLD STORAGE SHELVING
Quantity: Three (3)
Manufacturer: Metro (or equal)
Model: A2448NK3
Status: OFCI
This item is owner furnished contractor installed. Contractor to verify utility and installation requirements. Equipment vendor to verify equipment configurations with the DSA approved drawings.
Super Adjustable Super Erecta® Shelf, wire, 48"W x 24"D, Metroseal 3 (corrosion-resistant) finish, corner release system, with Microban® antimicrobial protection, NSF. Shelving to be 4-tier units with the bottom shelf at a minimum of 12" above finished floor. Provide post clamps to adjacent shelving unit two at front and two at back. Provide wall mounting angle brackets at top of shelving as shown. Provide "S' hooks where shelving comes together at 90 degrees delete inside post all locations inside corners.

Accessories:

12 ea. 64PK3 - 64-1/2"H, adjustable leveling bolt, posts are grooved at 1" increments & numbered at 2" increments, double grooved every 8" chrome finish
12 ea. 9995Z- Super Erecta® "S"Hook, zinc
12 ea. 9994Z- Super Erecta® Post Clamp, zinc
12 ea. SAFP- Seismic Threaded Foot Plate Kit, (4) foot plates each with a single anchor hole. Zinc plated finish, for use with staked 1" Round Posts, Spec Sheet 10.16,

ITEM #18.4 COLD STORAGE SHELVING
Quantity: One (1)
Manufacturer: Metro (or equal)
Model: A2460NK3
Status: OFCI
This item is owner furnished contractor installed. Contractor to verify utility and installation requirements. Equipment vendor to verify equipment configurations with the DSA approved drawings.
Super Adjustable Super Erecta® Shelf, wire, 60"W x 24"D, Metroseal 3 (corrosion-resistant) finish, corner release system, with Microban® antimicrobial protection, NSF. Shelving to be 4-tier units with the bottom shelf at a minimum of 12" above finished floor. Provide post clamps to adjacent shelving unit two at front and two at back. Provide wall mounting angle brackets at top of shelving as shown. Provide "S' hooks where shelving comes together at 90 degrees delete inside post all locations inside corners.

Accessories:

4 ea. 64PK3 - 64-1/2"H, adjustable leveling bolt, posts are grooved at 1" increments & numbered at 2" increments, double grooved every 8" chrome finish
4 ea. 9995Z- Super Erecta® "S"Hook, zinc
4 ea. 9994Z- Super Erecta® Post Clamp, zinc

4 ea. SAFP- Seismic Threaded Foot Plate Kit, (4) foot plates each with a single anchor hole. Zinc plated finish, for use with staked 1" Round Posts, Spec Sheet 10.16,

ITEM #19 WALK-IN REFRIGERATOR

Quantity: One (1)
Manufacturer: RMI-Econocold (or equal)
Model: FABRICATED ITEM
Status: CFCI
This item is owner furnished contractor installed. Contractor to verify utility and installation requirements. Equipment vendor to verify equipment configurations with the DSA approved drawings.
Assembly shall consist of one (1) refrigerator compartment; Wide x 8'-0" high clear interior dimensions (see drawings for dimensions and configuration). Assembly to form the configuration as shown on the drawings. Assembly shall be furnished as herein specified. And as prepared by RMI.

1. Assemblies shall be N.S.F (Standard 7) approved and formed in the configuration as shown on the contract drawings. Assemblies shall meet California Code of Regulations Title 20 Sections 11601 through 1608 dated July 2006 Appliance Efficiency Regulations.

2. Panel Construction: Shall consist of exterior and interior die-formed metal panels formed to ensure proper size. Section edges must have lineup pines and double row of closed-cell gaskets to insure panel alignment and proper seal at each joint. Corner panels to be 90-degree angles 12 inches in each direction. (No Wood Construction will be accepted).

3. Insulation: Walls and Ceiling 4" of "foamed-in-place" urethane insulation shall be used with thermal conductivity of not more than 0.118 BTU per hour per square foot. U Factor shall not exceed 0.030. The insulation shall be rated self-extinguishing and fire-retardant type as specified by UL. Insulation must remain stable at temperatures up to 260ºF. Floor to be same as above except Heavy-Duty reinforced for cart storage capable to withstand 500-pound point load with no deflection.

4. Section Fasteners: All wall, floor and ceiling section joints shall be fastened together with steel cam-action speed locks. These fasteners shall not exceed a 46" on center spacing. All locks shall be actuated from inside with a standard hex type Allen wrench. All socket ports shall be finished off with a ½" diameter snap cover to match the color of the panels.

5. Hinged Walk-In Doors: Door shall be installed as shown on the drawings. Door shall be urethane insulated, flush-in fitting type 42" wide x 80" high (as shown on the drawings) with triple-pane 1/4" thick plate glass view windows (freezer heated). Each door shall be furnished with a door heater switch and mortise-style lock. Door finish to be 20-gauge stainless steel inside and out. Door and door section shall be listed by UL and equipped with the following:

    a. Magnetic gasket
    b. Door closer
    c. Polished chrome deadbolt latch and cam-lift spring-loaded hinges Latches shall have a safety release to prevent entrapment of personnel within the box. Latches also have padlocking provisions.
    d. Bottom of door shall have a double sweep gasket. Magnetic gasket shall be of a dart and ridge design that will allow for easy replacement by the end user without the use of any tools. The door jamb shall be constructed of a fully welded anodized aluminum rigid frame. The perimeter of the frame shall be no less than two inches wide to provide integral backing to accommodate all required hardware. Freezer door jambs shall also have a 120-volt jamb and threshold heater with a Snap-On easily removable stainless-steel channel and a heated pressure relief vent assembly listed by UL.

e. Each entrance door shall be provided with a 3-way rocker light switch with an indicating pilot light exterior. All switches are pre-wired, and factory tested per UL.
f. A threshold shall be provided with the door section. Heater wire shall continue beneath the threshold (freezer) in a raceway.
g. A digital thermometer shall be included with each door section to indicate inside temperature.

6. Lights: Each door section shall be equipped with a flush-mounted constant burning pilot light and switch on exterior and interior factory wired to an interior LED Fixture Kason 1806. Each compartment shall be provided with ceiling mounted vapor proof LED light fixture with clear prismatic injection-molded polycarbonate diffuser Kason model 1810 or equal, see drawings for quantity. Light fixtures shall be factory wired to the light switch at the entrance door. Lighting level shall be a minimum of 10-foot candles measured 30" off the finished floor.

7. Finish: Finished: Exterior wall panels, exposed to kitchen shall be 22-gauge stainless steel finish. Ceiling panels and door panels shall be a minimum of .026 galvanized steel with baked enamel embossed white finish and where concealed shall be .026" galvanized steel. Interior wall and ceiling panels shall be .026" galvanized steel and finished in baked enamel embossed white finish. Interior kitchen finish floor to meet interior floor panel of walk-in at same elevation for an even transition into walk-in. Contractor to verify finished floor thickness and provide anti-slip surface. Contractor to verify finished floor thickness.

8. Accessories: Assembly shall be provided with the following accessories.

a. Door hinges: (3) per door, self-closing and chrome-plated Kason No.1256 Cam-Lift.
b. Door Pulls: Chrome plated Kason No. 1229C with inside safety release.
c. Door Closure: Kason No. 1094.
d. Trim Molding: Where unit abuts the building wall they shall be trimmed with a closure strip to match the exterior walk-in wall finish. Provide removable "drop-in" closure panels at ceiling. Provide vertical closure strips at all building wall junctures.
e. Each compartment shall be provided with a high-temperature alarm system, Modular Corporation model No. 75 FLUSH mounted. This unit to be provided complete with built-in N/O & N/C dry contacts and pulse output for remote notification.
f. Dial Thermometer: Provide one (1) 4" dia. built into each walk-in door panel.
g. Pressure Relief Port: One (1) for each compartment Kason No. 1830 (heated at freezer only.
h. Strip Curtains: each walk-in door shall have polyester-reinforced clear vinyl strip curtains.
i. Entrance Doors: Each door shall have a 1/8" thick sheet aluminum diamond plate kick panel 3'-0" high on the exterior and interior door panels and adjacent door jambs.
j. The wall panels exposed to the kitchen shall have a 16-gauge stainless steel rub rail.
k. Provide a stainless-steel interior and exterior coved toe base.
l. Provide necessary backing in wall panel for the attachment
m. Floor to be heavy duty type to support cart traffic capable to withstand 500-pound point load with no deflection.

9. This assembly shall be installed by factory personal and or factory-approved installers with written certification provided by the manufacturer to the Architect and Consultant.

10. Walk-in assembly shall be installed into a recessed area as shown on the drawings. Contractor is to verify finishes and thickness of kitchen floor and allow for proper clearance at walk-in door.

ITEM #19.1 COLD STORAGE SHELVING

Quantity: Four (4)
Manufacturer: Metro (or equal)
Model: A2448NK3
Status: OFCI
This item is owner furnished contractor installed. Contractor to verify utility and installation requirements. Equipment vendor to verify equipment configurations with the DSA approved drawings.
Super Adjustable Super Erecta® Shelf, wire, 48"W x 24"D, Metroseal 3 (corrosion-resistant) finish, corner release system, with Microban® antimicrobial protection, NSF. Shelving to be 4-tier units with the bottom shelf at a minimum of 12" above finished floor. Provide post clamps to adjacent shelving unit two at front and two at back. Provide wall mounting angle brackets at top of shelving as shown. Provide "S' hooks where shelving comes together at 90 degrees delete inside post all locations inside corners.

Accessories:

16 ea. 64PK3 - 64-1/2"H, adjustable leveling bolt, posts are grooved at 1" increments & numbered at 2" increments, double grooved every 8" chrome finish
16 ea. 9995Z- Super Erecta® "S"Hook, zinc
16 ea. 9994Z- Super Erecta® Post Clamp, zinc
16 ea. SAFP- Seismic Threaded Foot Plate Kit, (4) foot plates each with a single anchor hole. Zinc plated finish, for use with staked 1" Round Posts, Spec Sheet 10.16,

ITEM #19.2 COLD STORAGE SHELVING
Quantity: Two (2)
Manufacturer: Metro (or equal)
Model: A2436NK3
Status: OFCI
This item is owner furnished contractor installed. Contractor to verify utility and installation requirements. Equipment vendor to verify equipment configurations with the DSA approved drawings.
Super Adjustable Super Erecta® Shelf, wire, 36"W x 24"D, Metroseal 3 (corrosion-resistant) finish, corner release system, with Microban® antimicrobial protection, NSF. Shelving to be 4-tier units with the bottom shelf at a minimum of 12" above finished floor. Provide post clamps to adjacent shelving unit two at front and two at back. Provide wall mounting angle brackets at top of shelving as shown. Provide "S' hooks where shelving comes together at 90 degrees delete inside post all locations inside corners.

Accessories:

4 ea. 64PK3 - 64-1/2"H, adjustable leveling bolt, posts are grooved at 1" increments & numbered at 2" increments, double grooved every 8" chrome finish
4 ea. 9995Z- Super Erecta® "S"Hook, zinc
4 ea. 9994Z- Super Erecta® Post Clamp, zinc
4 ea. SAFP- Seismic Threaded Foot Plate Kit, (4) foot plates each with a single anchor hole. Zinc plated finish, for use with staked 1" Round Posts, Spec Sheet 10.16,

ITEM #20.1 SERVING COUNTER UTILITY
Quantity: One (1)
Manufacturer: Duke Manufacturing (or equal)
Model: XP60ST
Status: CFCI
Expressions™ Solid Top Unit, "Salad Bar" utility counter, stainless steel body & bottom shelf, wire chase, and swivel casters. Engineered Stone Countertop, 2cm Silestone quartz (or equal) on 3/4" exterior grade wood backer, 1.5" edge profile, extended on both sides not to exceed 4" for ADA Cane Sweep compliance, 34" high, 38" deep, and 62.5" long

Countertop cutout, isolation trim ring
Removable Decor Panels on front & both ends,
Slotted hinged doors on open side
End Shelf, 16ga stainless steel, mounted one end flush to countertop, hinged brackets
Switches mounted & wired behind door
Electric load center in base, equipment wired final connection 6 ft. cord NEMA L5-30

Drop-In Cold Food Pan, refrigerated, 46-7/8"W x 25-1/2"D x 26"H, fits (3) 6" deep 12" x 20" pans, 300 series stainless steel top, 10" deep 300 series stainless steel interior liner, remote mounted on/off switch with stainless steel face plate, air-cooled condensing unit, R448a, cULus, UL EPH Classified, 120v/60/1-ph, 6.78 amps, 1/2 HP, NEMA 5-15P
Glass Display Over Shelf, both sides, single deck merchandising shelf, self-serve breath guards, stainless steel tube posts with brushed finish & polished hi-light edges, posts extended though top & secured in base, 3/8" tempered glass front panels & serving shelf, glass to have high polished profiled edges with rounded corners, and LED lights, 120V/60Hrz/1Ph

ITEM #21A SERVING COUNTER, UTILITY

Quantity: One (1)
Manufacturer: Duke Manufacturing (or equal)
Model: XP46ST
Status: CFCI

Expressions™ Solid Top Unit, "Hot Food" utility counter, stainless steel body & bottom shelf, wire chase, and stainless-steel kick-plates
6" high stainless-steel leg, with stainless steel adjustable flanged foot
Engineered Stone Countertop, 2cm Silestone quartz (or equal) on 3/4" exterior grade wood backer, 1.5" edge profile, extended on student's side, 34" high, 38" deep, and 46" long
Countertop cutout, isolation trim ring
LED down lighting under countertop, mounted on front & wired to switch in base of item #24
Tray Shelf on operator's side, 7" stainless steel work surface, on stainless steel hinged brackets
Removable Decor Panel on front,
Raised Decor Panel on front, 3Form mounted on stainless steel barrel stand-offs
Hinged doors on open side, stainless steel, lift-off hinges and ADA compliant door pulls
Switches mounted & wired in control panel
Electric receptacle in base, mounted & wired in stainless chase,
Fill Faucet Expression style drain handle
Hot Food Drop-In Unit, electric, with (2) 12" x 20" hot food wells, with remote control panel, 32-1/4" long, 12-3/4" high, stainless-steel top & interior liner, steel exterior housing, sealed wells with drains, cULus, UL EPH Classified, 120v/60/1-ph, 12.5 amps, 1500 watts
Drain manifold, copper tube, brass master valve, Hose bibb connection and high temp hose
Adjustable single tier breath guard, stainless steel 1.25 square tube with #8 high polish accents. Posts to extend through the top and secure to base, 3/8” tempered glass front panel and serving shelf. Glass to have high polish profiled edges with rounded corners, adheres to current NSF standards. includes LED lights & heat

ITEM #21B SERVING COUNTER, UTILITY

Quantity: One (1)
Manufacturer: Duke Manufacturing (or equal)
Model: XP46ST
Status: CFCI

Expressions™ Solid Top Unit, "Hot Food" utility counter, stainless steel body & bottom shelf, wire chase, and stainless-steel kick-plates
6" high stainless steel leg, with stainless steel adjustable flanged foot
Engineered Stone Countertop, 2cm Silestone quartz (or equal) on 3/4" exterior grade wood backer, 1.5" edge profile, extended on student's side, 34" high, 38" deep, and 46" long
LED down lighting under countertop, mounted on front & wired to switch in base of item #24
Tray Shelf on operator's side, 7" stainless steel work surface, on stainless steel hinged brackets
Removable Decor Panel on front,
Raised Decor Panel on front, 3Form mounted on stainless steel barrel stand-offs
Hinged doors on open side, stainless steel, lift-off hinges and ADA compliant door pulls
Switches mounted & wired in control panel
Electric receptacle in base, mounted & wired in stainless chase,

Fill Faucet Expression style drain handle
Hot Food Drop-In Unit, electric, with (2) 12" x 20" hot food wells, with remote control panel, 32-1/4" long, 12-3/4" high, stainless-steel top & interior liner, steel exterior housing, sealed wells with drains, cULus, UL EPH Classified, 120v/60/1-ph, 12.5 amps, 1500 watts
Drain manifold, copper tube, brass master valve, compression fittings factory assembled, for (2) well unit, Hose bibb connection and high temp hose
Adjustable single tier breath guard, stainless steel 1.25 square tube with #8 high polish accents. Posts to extend through the top and secure to base, 3/8" tempered glass front panel and serving shelf. Glass to have high polish profiled edges with rounded corners, adheres to current NSF standards. includes LED lights & heat

ITEM #22A SERVING COUNTER, UTILITY
Quantity: One (1)
Manufacturer: Duke Manufacturing
Model: XP46ST
Status: CFCI

Expressions™ Solid Top Unit, utility counter, stainless steel body & bottom shelf, wire chase, and stainless-steel kick-plates
6" high stainless-steel leg, with stainless steel adjustable flanged foot
Engineered Stone Countertop, 2cm Silestone quartz (or equal) on 3/4" exterior grade wood backer, 1.5" edge profile, extended on student's side, 34" high, 38" deep, and 46" long
LED down lighting under countertop
Tray Shelf on operator's side, 7" stainless steel work surface, on stainless steel hinged brackets
Removable Decor Panel on front and one end,
Raised Decor Panel on front, 3Form mounted on stainless steel barrel stand-offs
Hinged doors on open side, stainless steel, lift-off hinges and ADA compliant door pulls
Electric load center in base, panel box & cover, circuit breakers, schedule mounted inside, stainless steel enclosure, and equipment wired

ITEM #22B SERVING COUNTER, UTILITY
Quantity: One (1)
Manufacturer: Duke Manufacturing
Model: XP46ST
Status: CFCI

Expressions™ Solid Top Unit, utility counter, stainless steel body & bottom shelf, wire chase, and stainless-steel kick-plates
6" high stainless-steel leg, with stainless steel adjustable flanged foot
Engineered Stone Countertop, 2cm Silestone quartz (or equal) on 3/4" exterior grade wood backer, 1.5" edge profile, extended on student's side, 34" high, 38" deep, and 46" long
LED down lighting under countertop
Tray Shelf on operator's side, 7" stainless steel work surface, on stainless steel hinged brackets
Removable Decor Panel on front and one end,
Raised Decor Panel on front, 3Form mounted on stainless steel barrel stand-offs
Hinged doors on open side, stainless steel, lift-off hinges and ADA compliant door pulls

ITEM #23 MILK COOLER
Quantity: Two (2)
Manufacturer: Beverage Air (or equal)
Model: SMF58HC-1-W
Status: OFCI
This item is owner furnished contractor installed. Contractor to verify utility and installation requirements. Equipment vendor to verify equipment configurations with the DSA approved drawings.

School Milk Cooler, forced air, 58"W x 33-5/8"D x 47"H, 24 cu. ft., single access, exterior digital thermometer, flat top carton capacities, (16) 13" x 13" x 11" or (10) 19" x 13" x 11" case capacity, self-latching doors/lids with safety bumpers, cylinder lock, wire floor racks, floor drain, electronic control, auto defrost, galvanized steel interior with stainless steel floor, white exterior, R290 Hydrocarbon refrigerant, 1/3 HP, cULus, UL EPH Classified, UL-Sanitation, Made in USA

Accessories:

2 ea. 3 years parts & labor warranty (excludes maintenance items)
2 ea. Self-Contained refrigeration
2 ea. Additional 4 years compressor warranty (part only), standard
2 ea. 115v/60/1-ph, 3.3 amps, cord with NEMA 5-15P
2 ea. 6" Heavy duty casters, (2) with brakes, standard

ITEM #24 SERVING COUNTER, UTILITY

Quantity: One (1)
Manufacturer: Duke Manufacturing (or equal)
Model: XP30CS
Status: CFCI

Expressions™ Solid Top Unit, "P.O.S. Stand" utility counter, 18ga stainless steel body & interior shelves, and stainless-steel kick-plates
6" high stainless-steel leg, with stainless steel adjustable flanged foot
Engineered Stone Countertop, 2cm Silestone quartz (or equal) on 3/4" exterior grade wood backer, 1.5" edge profile, 34" high, 38" deep, and 39" long
Removable Decor Panels on front & one end,
Raised Decor Panel on front, 3Form mounted on stainless steel barrel stand-offs
On/off switch and outlet for decor lighting
Electric receptacles in base, mounted & wired
Open Base, wheelchair access & ADA compliant
For special length not listed (maximum one-piece length of 88"): To next longer standard unit price...ADD (for TST models)
** 39" long **

ITEM #26 REMOTE REFRIGERATION

Quantity: One (1)
Manufacturer: Cold Zone (or equal)
Model: MPL-2
Status: OFCI
This item is owner furnished contractor installed. Contractor to verify utility and installation requirements. Equipment vendor to verify equipment configurations with the DSA approved drawings.
MINI-PAK REFRIGERATION SYSTEM

A. The outdoor air-cooled, refrigeration system is to be U.L. Listed and will be located on the roof of the building. This unit includes the outdoor painted weather housing, compressors, copper core aluminum finned condenser, electrical control panel, all housed within a single assembly and the evaporator coil assemblies, all with the required options and accessories. All of the component parts, options and accessories will be provided, mounted, piped and wired, as required by the manufacturer.
B. The outdoor weather housing shall include a welded, de-burred and cleaned structural steel frame made of 12 gauge. The exterior housing and access doors will be manufactured of a minimum of 16-gauge galvanized steel which has been assembled and cleaned. The frame and shall be painted with a primer coat of epoxy-based paint and finished with a coat of polyurethane acrylic enamel.
C. All of the component parts, options and accessories will be provided, mounted, piped and wired, as required by the manufacturer. The system shall be manufactured to operate at: 208-230 volts, 3 phase, 60 hertz.

COMPRESSOR AND CONDENSER SYSTEMS

A. All compressors will be Copeland hermetic, scroll, digital scroll, Copelematic or discus. All compressors will be manufactured to operate with R-448 refrigerants. Each Compressor system shall be filled with refrigerant compatible oil and will include discharge and suction line vibration protection for Copelametic and Discus compressors, dual pressure control with stainless steel braided piping, liquid line filter-dryer, moisture indicating sight glass, flooded head pressure control valve and crankcase heater. All equipment must meet current DOE regulations.

B. Each of these systems shall also include a receiver tank capable of accepting the entire systems refrigerant charge without exceeding 90% of its volumetric capacity. Each receiver will be provided with a pressure relief vent and, at its inlet and outlet and an isolation valve with a service port. Additionally, all compressor systems that will operate at suction temperatures below 0°F shall include a suction line accumulator.

C. The condenser system shall include the Multi-Circuited condenser rated for 120 F ambient, 12 fins per inch, ECM condenser fan motors with 24 inch fan blades mounted in a venturi contoured air-scoop protected by plastic coated fan guards, and flooded head pressure controls. The compressors and condenser circuits shall be sized to operate at an average temperature differential between the ambient and condensing temperatures of 20°F.

CONTROL PANEL

A. The control panel shall be protected include circuit breakers, start capacitors, and fan cycle control thermostats for each of the condenser fan motors. A fused disconnect will be located on the rack system. A wiring diagram of the refrigeration system shall be provided and mounted inside of the refrigerated system. All internal wiring shall be shown on the wiring diagram.

EVAPORATOR COILS WITH EcoNet DEFROST

A. Evaporator coils shall be direct expansion type fabricated of cop¬per tubes with aluminum fins.

B. All evaporator coils shall be provided with solenoid valve, thermo¬static expansion valve, thermostat for medium temp evaporators (thermostat for low-temp evaporators is part of the demand defrost system) and wired to the junction box for positive pump-down. Evaporators come standard in a dual voltage configuration, include ECM type fan motors that will operate at the dual speeds of 1,550 rpm max and 900 rpm min, and are designed to function with new “wide glide” refrigerants.

C. Low-temperature evaporator coils are to be provided with ColdZone’s EcoNet Defrost Controller, which is factory mounted and programmed, and includes a visible display with navigation buttons. The EcoNet system will precisely maintains superheat and fixture temperatures, using the electronic expansion valve, and will eliminate unnecessary defrost cycles by measuring compressor run-times in order to defrost only when needed. The Econet is Title 24 compliant and will reduce evaporator fan speeds by 50% during the off-cycle in order to reduce energy consumption.

GENERAL NOTES

A. GENERAL CONTRACTOR
   1. Contractors shall verify all dimensions and coordinate with other trades.
   2. General contractor shall prepare the platform, curbed openings and weatherproofing the same after installation.

B. REFRIGERATION CONTRACTOR
1. The complete system shall be evacuated with vacuum pump.
2. Charge, test and adjust each unit to assure proper operation.
3. All copper tubing to be refrigerant grade ACR. or type "l".
4. Silver solder and/or sil-fos shall be used for all refrigerant piping. Soft solder is not acceptable.
5. All piping to be pressure tested with nitrogen at 3oo psi. After the condensing unit and coil have been connected, the balance of the system shall be leak tested with all valves open.
6. Refrigeration contractor to provide and install drain line heater in freezer to be connected by electrical contractor.

C. ELECTRICAL CONTRACTOR
1. Electrical contractor to connect drain line heater in freezer.
2. Electrical contractor to provide power for refrigeration package and evaporator coils.
3. All electrical wiring and installation shall be in accordance with the wiring diagram and local codes.

D. PLUMBING CONTRACTOR
1. Plumbing contractor to provide ACR or type "l" copper drain lines for walk-in refrigeration and freezer, pitched 1/2" per foot of run. In freezer, unheated drain line must be outside of insulation to prevent freezing. Trap drain line outside of refrigerated space to avoid entrance of warm and moist air.
2. Plumbing contractor to provide individual drain line for each evaporator unless otherwise called for.
3. All plumbing installation shall be in accordance with local codes.

ITEM #27 MOP SINK CABINET
Quantity: One (1)
Manufacturer: Eagle Group (or equal)
Model: F1916-VSCS-DR
Status: OFCI
This item is owner furnished contractor installed. Contractor to verify utility and installation requirements. Equipment vendor to verify equipment configurations with the DSA approved drawings.
Mop Sink Cabinet, double width, 47-1/2"W x 22-1/4"D x 84-1/4"H, slanted top, holds (2) mops, (2) hinged doors with transverse rod handles & keyed locks, 8" deep mop sink with service faucet (in right cabinet), (1) fixed shelf above mop sink, (3) fixed shelves in left cabinet, includes 30" spray hose & spray hose bracket, 430 stainless steel construction, NSF.

ITEM #28 PLANETARY MIXER
Quantity: One (1)
Manufacturer: Hobart (or equal)
Model: HL120-1STD
Status: OFCI
This item is owner furnished contractor installed. Contractor to verify utility and installation requirements. Equipment vendor to verify equipment configurations with the DSA approved drawings.
Bench type mixer; with bowl, beater, & whip; US/EXP configuration - Mixer, Planetary, Bench, 12-quart capacity, (3) fixed speeds plus stir speed, gear-driven transmission, 15-Minute SmartTimer™, #12 taper attachment hub, manual bowl lift, stainless steel bowl, aluminum "B" beater, stainless steel "D" wire whip, stainless steel bowl guard, 1/2 hp, cord with plug
Acessories:
1 ea. Standard warranty - 1-Year parts, labor & travel time during normal working hours within the USA

1 ea. K-12 School Nutrition extended warranty extends the warranty for 12 months beyond the 12 month Original Equipment Warranty, not to exceed 24 months from date of installation

1 ea. Model TABLEHW-HL2012 Mixer Table; 27”W x 32”D x 26”H, the top shelf is drilled for mounting an HL120 or HL200 mixer, includes 4 posts for storing attachments, a lower shelf for additional storage, & (4) locking 5” diameter wheels

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. Flexible joints.
9. 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. 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. Seismic Shop Drawing 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 1617A.1.26 and ASCE 7-16 Section

13.6. Coefficient Ip = 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/warrantees 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, 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.

2.07 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 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.

2.12 EQUIPMENT IDENTIFICATION

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

2.13 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.

2.14 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 and DSA’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 IIIR 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. 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.

D. 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.

E. 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.

F. 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.

G. 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.

    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:

Pipe Diameter	Steel Threaded or Welded (Note 3)	Steel Gas	Copper Brazed or Soldered (Note 3)	CPVC & PVC (Note 2)
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:

Pipe Diameter	Steel Threaded or Welded (Note 2)	Steel Gas	Copper Brazed or Soldered (Notes 2, 3)	CPVC & PVC (Note 1)
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.

Pipe Size	Rod Size Diameter
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.

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 and DSA.

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.

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 Roystron Products, or equal.

    a. Field Joints and Fittings: Protecto Wrap #1170 tape as manufactured by Pipe Line Service Corporation, or Primer #200 tape by Roystron Products, or equal. Installation shall be as per manufacturer's recommendation and instructions.

2. Tape Wrap: Pressure-sensitive polyvinyl chloride tape, "Transtex #V-l0 or V-20", "Scotchwrap 50", Slipknot l00, 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 Rasor 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.

System Tested	Test Pressure PSI	Test With
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 l/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 22 00 50

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.
6. Heat tracing.

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.

C. Schedule heating capacity, length of cable, spacing, and electrical power requirement for each electric heating cable required.

D. Shop Drawings: For electric heating cable.

1. Include plans, elevations, sections, and attachment details.
2. Include diagrams for power, signal, contactors, and control wiring.

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 latest 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. 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. 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. 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.

I. 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.

J. 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.

K. 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.

L. 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.

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. 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.

D. 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.

2.04 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 other 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.

2.05 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.

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. 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.

F. Calibrated Balancing Valves:

1. General: Calibrated orifice ball type rated for 400 psig maximum operating pressure and 250 degrees F. maximum operating temperature.

   a. Body: Brass.
   b. Ball: 304 Stainless Steel.
   c. Seat: Glass and Carbon filled TFE.
   d. End Connections: Threaded.
   e. Pressure Gage connections: Integral capped readout valves with internal check valves and drain port, for use with portable pressure differential meter.
   f. Handle Style: Dial, with memory stops to retain set position.

2. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:

   a. 3 Inch and Smaller: Bell & Gossett model CB, “LF” series.

2.06 VALVES AND FITTINGS FOR NON-POTABLE WATER, COMPRESSED AIR, AND GAS SYSTEMS

A. Gate Valves:

1. 2-1/2 inches and smaller: Class150, 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.

   a. 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.

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. 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.

E. 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.

F. 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.

G. 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.

2.07 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 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.

F. 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.

G. 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 mounted, white enameled or stainless steel cabinet 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.

H. 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.

I. 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.

2.08 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:

Size	Manufacturer/Model
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

2.09 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 ½ 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.

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.

2.10 HEAT TRACING

A. Description: Self-regulating, parallel-resistance heating cables.

B. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:

1. Basis of Design: Raychem; Pentair Thermal Management.

    a. Pipe Freeze Protection: XL Trace.
    b. Temperature Maintenance: HWAT R2.

2. Delta-Therm Corporation.
3. Thermon Americas Inc.

C. Comply with IEEE 515.1.

D. Heating Element: Pair of parallel No. 16 or No. 18 AWG, tinned or nickel-coated, stranded copper bus wires embedded in crosslinked conductive polymer core, which varies heat output in response to temperature along its length. Terminate with waterproof, factory-assembled, nonheating leads with connectors at one end, and seal the opposite end watertight. Cable shall be capable of crossing over itself once without overheating.

E. Electrical Insulating Jacket: Flame-retardant polyolefin.

F. Cable Cover for Above Ground Installation: Tinned-copper or stainless-steel braid and polyolefin outer jacket with ultraviolet inhibitor.

G. Accessories:

1. Fiberglass tape, heat-conductive putty, cable ties, silicone end seals and splice kits, and installation clips all furnished by manufacturer, or as recommended in writing by manufacturer.

H. Warning Tape: Continuously printed "Electrical Tracing"; vinyl, at least 3 mils thick, and with pressure-sensitive, permanent, waterproof, self-adhesive back.

1. Width for Markers on Pipes with OD, Including Insulation, Less Than 6 Inches: 3/4 inch minimum.
2. Width for Markers on Pipes with OD, Including Insulation, 6 Inches or Larger: 1-1/2 inches minimum.

I. Controls:

1. Pipe-Mounted Thermostats:

a. Remote bulb unit with adjustable temperature range.
b. Snap action; open-on-rise, single-pole switch with minimum current rating adequate for connected cable.
c. Remote bulb on capillary, resistance temperature device, or thermistor for directly sensing pipe-wall temperature.
d. Corrosion-resistant, waterproof control enclosure.

2. Programmable Timer for Domestic Hot-Water-Temperature Maintenance:

a. Microprocessor based.
b. Minimum of four separate schedules.
c. Minimum 24-hour battery carryover.
d. On-off-auto switch.
e. 365-day calendar with 20 programmable holidays.
f. Relays with contacts to indicate operational status, on or off, and for interface with central HVAC control-system workstation.

3. Controller for Pipe Freeze Protection and Flow Maintenance:

a. Microprocessor based.
b. Illuminated display panel and function buttons.
c. Indicator lights: Heater on, alarm, receive/transmit data.
d. Minimum 2 temperature sensor inputs.
e. With ground fault detection, alarm, and trip.
f. NEMA 4X enclosure.
g. Line-sensing, ambient-sensing, and proportional ambient-sensing control modes.
h. RS-485 communication module for interface with central HVAC control-system workstation. Optional BACnet gateway shall be available.

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 arresters 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. 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.

F. Grade all vent piping so as to free itself quickly of any water condensation.

G. 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.

H. Install drip pan under storm drain piping, sanitary drain piping, and vent piping that must be run over kitchen areas.

I. 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 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 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.

L. 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”.

3.06 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, Threadolets, 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. Polyethylene and Polypropylene Pipe: Assemble with fusion joints in strict accordance with manufacturer's instructions.

J. 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.

3.07 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. Silent Check Valves: Install in horizontal or vertical position between flanges.

F. Calibrated Balancing Valves: Install calibrated balancing valves per manufacturers’ recommendations, including requirements for straight pipe lengths at valve inlet and outlet.

G. Gas Shut-Off Valves:

1. Provide line size ball valve in gas line to each appliance.
2. 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.

H. 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.

3.08 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.

3.09 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.

3.10 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.

3.11 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.

3.12 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 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.

3.13 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.

3.14 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.

3.15 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.

3.16 INSTALLATION OF HEAT TRACING

A. Examination: Examine surfaces and substrates to receive electric heating cables for compliance with requirements for installation tolerances and other conditions affecting performance. Ensure surfaces and pipes in contact with electric heating cables are free of burrs and sharp protrusions. Proceed with installation only after unsatisfactory conditions have been corrected.

B. Install electric heating cable across expansion, construction, and control joints according to manufacturer's written instructions; use cable-protection conduit and slack cable to allow movement without damage to cable.

C. Electric Heating-Cable Installation for Freeze Protection for Piping:

1. Install electric heating cables after piping has been tested and before insulation is installed.
2. Install electric heating cables according to IEEE 515.1.
3. Install insulation over piping with electric cables according to Section 22 00 50 "Basic Plumbing Materials and Methods."
4. Install warning tape on piping insulation where piping is equipped with electric heating cables.

D. Electric Heating-Cable Installation for Temperature Maintenance for Domestic Hot Water:

1. Install electric heating cables after piping has been tested and before insulation is installed.
2. Install insulation over piping with electric heating cables according to Section 22 00 50 "Basic Plumbing Materials and Methods."
3. Apply "ELECTRICALLY HEATED" warning tape to the outside of the thermal insulation.

E. All junction boxes shall be located above grade level. Covers shall be kept on boxes at all times when not working therein. Where allowable, a hole shall be provided in bottom of junction boxes to permit moisture to escape.

F. Junction boxes, thermostats, transformers and other system components shall not be attached to pipe insulation but shall be mounted on brackets fabricated of galvanized angle, channel or other material of sufficient strength to support components. Brackets shall be supported separately from pipes.

G. Set field-adjustable switches and circuit-breaker trip ranges.

H. Field Quality Control:

1. Perform insulation and continuity testing in accordance with cable manufacturers' recommendations at the following times:

   a. Before cable installation.
   b. Before connection kit installation.
   c. After installing thermal insulation.

2. Perform other tests recommended by cable manufacturer.

I. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.

1. Service representative shall perform final insulation resistance and continuity test, and other tests recommended by cable manufacturer.

J. Demonstration and Training: Manufacturer shall provide one on-site 2-hour training session for Owners' maintenance personnel.

K. All heat traced piping shall be insulated within 24 hours upon cable installation and acceptance. For insulation requirements, refer to Section 22 00 50, Basic Plumbing Materials and Methods.

L. Extra cable to be provided at piping specialties and fittings such as valves and flanges to allow dismantling and removal of equipment.

3.17 KITCHEN EQUIPMENT INSTALLATION

A. Coordinate all work with Specification Section for kitchen equipment.

B. All equipment shall be fully connected.

C. Furnish and install all required "P" traps.

D. Provide stops on all hot and cold water lines at equipment, in an accessible position. Include lines to kettle and range swing faucets.

E. Water pressure for dishwasher and glass-washer to be 25 pound maximum. Provide pressure reducing valves on water line to washers.

F. All floor openings are to be sealed watertight.

G. Indirect waste lines required for standard or fabricated items of kitchen equipment, except sinks, shall be furnished and installed by the kitchen equipment contractor.

H. Provide all sink drains. All indirect drains shall terminate above floor sinks at least 1-1/2 times ID of drain line and shall be so set that flare will not spill on floor area.

I. Provide approved vacuum breaker or anti siphon device on water lines to equipment wherever required.

J. Provide gas pressure regulators for modular front manifold cooking equipment assemblies. Pressure regulators shall be adjustable from 2 inch to 7 inch water column and shall be set for approximately 6 inches W.C. at manifold connection.

K. All gas pressure regulators shipped loose with gas fired equipment shall be installed by plumbing contractor.

L. The kitchen equipment contractor will provide all equipment trim including faucets and sink wastes and swing faucets at kettles all to be installed by Plumbing contractor.

M. All horizontal piping lines connected to equipment shall be run at the highest possible elevation not less than 6 inches above floor. Piping rough-in shall be stubbed in walls wherever possible.

N. Vent piping for waste lines shall be concealed wherever possible and vertical vents for island or free-standing equipment shall be avoided. Any required exposed vents shall be submitted to the Architect for approval.

O. Kitchen equipment contractor to furnish coffee maker. Plumbing contractor shall provide a cold water connection terminating in a 3′-0″ length of 1/4 inch OD soft copper tubing with a 1/4 inch female flare fitting on the end.

P. Fire protection systems for ventilators and cooking equipment are furnished and installed by kitchen equipment contractor unless shown otherwise on the drawings. Gas valves which are a part of the fire protection systems are furnished only. Plumbing Contractor shall install gas valves.

Q. Connect movable gas-fired cooking equipment utilizing flexible gas connection system.

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 22 10 00

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.
3. Refrigerator ice maker outlet boxes.
4. Dishwasher air gap fittings.

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. UL Labels: Provide water coolers that have been listed and labeled by Underwriters' Laboratories.

F. ARI Labels: Provide water coolers that are rated and certified in accordance with applicable Air-Conditioning and Refrigeration Institute Standards.

G. Americans with Disabilities Act (ADA).

H. California Green Building Standards Code Requirements:

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. Modular Lavatories:

    a. Bradley.
    b. Acorn.
    c. Willoughby Industries, Inc.

3. Plumbing Trim:

    a. McGuire Manufacturing Co., Inc.
    b. Delta Commercial.
    c. Chicago Faucet Co.
    d. T&S Brass and Bronze Works, Inc.

4. Flush Valves:

    a. Sloan Valve Co.
    b. Zurn Industries, Hydromechanics Div.

c. Toto USA, Inc.

5. Faucets:

a. Chicago Faucet Co.
b. Symmons Scott.
c. T&S Brass and Bronze Works, Inc.
d. Delta Commercial.

6. Fixture Seats:

a. Church Seat Co.
b. Bemis Mfg. Co.
c. Beneke Corp.

7. Water Coolers and Drinking Fountains:

a. Haws Corporation.
b. Halsey Taylor Mfg. Co.
c. Elkay Mfg. Co.
d. Acorn Aqua.

8. Service Sinks:

a. American Standard.
b. Kohler Co.
c. Williams Serviceptor.
d. Florestone.
e. Acorn.

9. Stainless Steel Sinks:

a. Elkay Mfg. Co.
b. Just Mfg. Co.
c. Haws Corporation.

10. Fixture Carriers:

a. Josam Mfg. Co.
b. J. R. Smith.
c. Tyler Pipe; Wade Div.
d. Zurn Industries; Hydromechanics Div.
e. Mifab, Inc.

2.05 FLUSH VALVE REQUIREMENTS

A. Metering flush valves where required and specified shall be non-hold open type with exposed parts chrome plated. Conform to all codes and manufacturers' recommendations. All diaphragms are to have multiple filtered bypass and be chloramine resistant synthetic rubber with internal components suitable for 180 degree hot water to 150 pounds pressure, plastic or leather diaphragm not acceptable.

B. Electronic flush valves where required and specified shall be non-hold open type with exposed parts chrome plated. Conform to all codes and manufacturers' recommendations. All diaphragms are to have multiple filtered by pass and be chloramine and resistant synthetic rubber with rubber and internal components suitable for 180 degree hot water to 150 pounds pressure, plastic or leather diaphragm not acceptable. All flush valve solenoids and sensors shall be UL listed.

2.06 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.

2.07 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.

2.08 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.

2.09 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.

C. Refrigerator Ice Maker Outlet Boxes:

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. Guy Gray.
b. Water-Tite.

D. Dishwasher Air Gap Fittings:

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 Industries, LLC.
    b. Dearborn Brass.

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.

E. Refer to Division 26 for wiring for electronic flush valves.

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 22 40 00

SECTION 22 50 00
PLUMBING EQUIPMENT

PART 1 - GENERAL

1.01 SUMMARY

A. SECTION INCLUDES

1. Gas fired water heaters.
2. Expansion tanks.
3. In-line domestic hot water recirculation pumps.
4. Plastic grease interceptors.
5. 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_{CL} or PEI_{VL} (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. Direct Vented Sealed Combustion Condensing Gas-Fired Water Heater: Three-year minimum limited warranty on tank.

B. 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 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. 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 though 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.

2.03 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.

2.04 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 Energy Management Systems for HVAC 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.

2.05 PLASTIC GREASE INTERCEPTORS

A. Furnish and install a plastic grease interceptor with minimum capacity as indicated on the drawings, complete as cataloged. Provide manholes to grade for access to each section. Provide gastight cast-iron ring and cover at grade for each manhole.

B. Compliant with ANSI Z1001.

C. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:

1. Green Turtle Zurn.
2. MIFAB, Inc.
3. Schier Products Company.

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 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.

3.03 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 access space around pumps for service as indicated, but in no case less than that recommended by manufacturer.

C. Install in-line pumps with support from overhead structure on each side of pump, or as indicated on Drawings.

D. 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.

E. Install electrical devices furnished by manufacturer but not specified to be factory mounted. Furnish copy of manufacturer's wiring diagram submittal to Electrical Installer.

F. 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.

G. Check alignment, and where necessary, realign shafts of motors and pumps within recommended tolerances by manufacturer.

H. Lubricate pumps before start-up. Start-up in accordance with manufacturer's instructions.

I. Increase piping immediately at pump suction and discharge; flexible couplings and all valves shall be full line size.

J. Trim pump impeller to obtain the desired water flow after installation, without cost to Owner.

K. 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.

3.04 INTERCEPTOR INSTALLATION

A. Install interceptors as indicated, in accordance with manufacturer's installation instructions and in compliance with applicable codes.

B. Support: Anchor interceptors securely to substrate. Locate interceptors so that adequate clearance is provided to remove covers and sediment baskets. Set recessed units so top of cover is flush with finished grade.

C. Piping: Connect inlet and outlet piping to interceptors.

D. Refer to local standards for special installation requirements.

3.05 DEMONSTRATION AND TRAINING

A. Provide a minimum of 4 hours of training and orientation of Owners staff in proper care and operation of Plumbing Equipment.

3.06 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.

3.07 OPERATIONAL TESTS

A. Test each piece of equipment to show that it will operate in accordance with indicated requirements.

3.08 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 22 50 00

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.

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.

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 Contactors' 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. Seismic Shop Drawing 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/warrantees 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 EQUIPMENT IDENTIFICATION

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

2.10 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 and DSA’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 IIIR 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 3 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 Roystron Products, or equal.

    a. Field Joints and Fittings: Protecto Wrap #1170 tape as manufactured by Pipe Line Service Corporation, or Primer #200 tape by Roystron Products, or equal. Installation shall be as per manufacturer's recommendation and instructions.

2. Tape Wrap: Pressure-sensitive polyvinyl chloride tape, "Transtex #V-l0 or V-20", "Scotchwrap 50", Slipknot l00, 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 Rasor 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. 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 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.

3.17 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.

3.18 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.

3.19 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.

3.20 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.

3.21 ACCEPTANCE REQUIREMENTS

A. Contractor shall complete the applicable Acceptance Requirements for Code Compliance contained in the California Building Energy Efficiency Standards. Refer to T-24 compliance forms on Drawings for systems having Acceptance testing requirements. Contractor shall perform Acceptance tests and complete the appropriate "Certificates of Acceptance." Submit certificates to the authorities having jurisdiction for approval and issuance of final occupancy permit. Contractor shall engage certified HERS Rater to verify duct leakage rate for duct systems indicated on T-24 compliance forms on Drawings as requiring duct leakage rate testing. For additional duct leak testing requirements, refer to Section 23 80 00, "Heating, Ventilating, and Air Conditioning," Article, "Ductwork Sealing and Leak Testing."

1. Covered Processes: In addition to systems listed on T-24 compliance forms on Drawings, complete Acceptance Requirements for the following systems, if applicable to Project:

a. Parking garage ventilation systems.
b. Compressed air systems.

c. Type 1 Kitchen exhaust systems.

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 23 00 50

SECTION 23 05 93
TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Balancing Air Systems:

a. Constant-volume air systems.
b. Dual-duct systems.
c. Variable-air-volume systems.

2. Balancing Domestic Water Piping Systems.

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.

1.03 REFERENCES AND STANDARDS

A. Associated Air Balance Council (AABC)

1. National Standards for Total System Balance, latest edition.

B. National Environmental Balancing Bureau (NEBB)

1. Procedural Standards for Testing and Balancing of Environmental Systems, latest edition.

1.04 DEFINITIONS

A. The intent of this Section is to use the standards pertaining to the TAB specialist engaged to perform the Work of this Contract, with additional requirements specified in this Section. Contract requirements take precedence over corresponding AABC or NEBB standards requirements. Differences in terminology between the Specifications and the specified TAB organization standards do not relieve the TAB entity engaged to perform the Work of this Contract of responsibility from completing the Work as described in the Specifications.

B. Similar Terms: The following table is provided for clarification only:

Similar Terms		
Contract Term	AABC Term	NEBB Term
TAB Specialist	TAB Agency	NEBB Certified Firm
TAB Standard	National Standards for Testing and Balancing Heating, Ventilating, and Air Conditioning Systems	Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems
TAB Field Supervisor	Test and Balance Engineer	Test and Balance Supervisor

C. AABC: Associated Air Balance Council.

D. NEBB: National Environmental Balancing Bureau.

E. TAB: Testing, adjusting, and balancing.

F. TAB Organization: Body governing practices of TAB Specialists.

G. TAB Specialist: An entity engaged to perform TAB Work.

1.05 ACTION SUBMITTALS

A. For additional requirements, refer to Section 23 00 50, Basic HVAC Materials and Methods.

B. LEED Submittals:

1. Air-Balance Report for Prerequisite IEQ 1: Documentation of work performed for ASHRAE 62.1, Section 7.2.2 - "Air Balancing."
2. TAB Report for Prerequisite EA 2: Documentation of work performed for ASHRAE/IESNA 90.1, Section 6.7.2.3 - "System Balancing."

1.06 INFORMATIONAL SUBMITTALS

A. For additional requirements, refer to Section 23 00 50, Basic HVAC Materials and Methods.

B. Qualification Data: Within 30 days of Contractor's Notice to Proceed, submit documentation that the TAB specialist and this Project's TAB team members meet the qualifications specified in "Quality Assurance" Article.

1. Provide list of similar projects completed by proposed TAB field supervisor.
2. Provide copy of completed TAB report, approved by mechanical engineer of record for a completed project with similar system types and of similar complexity.

C. Contract Documents Examination Report: Within 30 days of Contractor's Notice to Proceed, submit the Contract Documents review report as specified in Part 3.

1. Submit examinations report with qualifications data.

D. Strategies and Procedures Plan: Within 60 days of Contractor's Notice to Proceed, submit TAB strategies and step-by-step procedures as specified in "Preparation" Article.

E. Interim Reports. Submit interim reports as specified in Part 3. Include list of system conditions requiring correction and problems not identified in Contract Documents examination report.

F. Certified TAB reports.

1. Provide three printed copies of final TAB report. Provide one electronic file copy in PDF format.

G. Sample report forms.

H. Instrument calibration reports, to include the following:

1. Instrument type and make.
2. Serial number.
3. Application.
4. Dates of use.
5. Dates of calibration.

a. Instruments to be used for testing and balancing shall have been calibrated within a period of one year, or less if so recommended by instrument manufacturer and be checked for accuracy prior to start of work.

1.07 CLOSEOUT SUBMITTALS

A. For additional requirements, refer to Section 23 00 50, Basic HVAC Materials and Methods.

B. Certified TAB reports, for inclusion in Operation and Maintenance Manual.

1.08 QUALITY ASSURANCE

A. Independent TAB Specialist Qualifications: Engage a TAB entity certified by AABC or NEBB.

1. The certification shall be maintained for the entire duration of TAB work for this Project. If TAB specialist loses certification during this period, the Contractor shall immediately notify the Architect and submit another TAB specialist for approval. All work specified in this Section and in other related Sections performed by the TAB specialist shall be invalidated if the TAB specialist loses certification, and shall be performed by an approved successor.

B. To secure approval for the proposed TAB specialist, submit information certifying that the TAB specialist is either a first tier subcontractor engaged and paid by the Contractor, or is engaged and paid directly by the Owner. TAB specialist shall not be affiliated with any other entity participating in Work of this Contract, including design, furnishing equipment, or construction. In addition, submit evidence of the following:

1. TAB Field Supervisor: Full-time employee of the TAB specialist and certified by AABC or NEBB.

a. TAB field supervisor shall have minimum 10 years supervisory experience in TAB work.

2. TAB Technician: Full-time employee of the TAB specialist and who is certified by AABC or NEBB as a TAB technician.

    a. TAB technician shall have minimum 4 years TAB field experience.

C. TAB Specialist engaged to perform TAB work in this Project shall be a business limited to and specializing in TAB work, or in TAB work and Commissioning.

D. TAB specialist engaged to perform TAB work shall not also perform commissioning activities on this Project.

E. Certified TAB field supervisor or certified TAB technician shall be present at the Project site at all times when TAB work is performed.

1. TAB specialist shall maintain at the Project site a minimum ratio of one certified field supervisor or technician for each non-certified employee at times when TAB work is being performed.

F. Contractor shall notify Architect in writing within three days of receiving direction resulting in reduction of test and balance scope or other deviations from Contract Documents. Deviations from the TAB plan shall be approved in writing by the mechanical engineer of record for the Project.

G. TAB Standard:

1. Perform TAB work in accordance with the requirements of the standard under which the TAB agencies' qualifications are approved unless Specifications contain different or more stringent requirements:

    a. AABC National Standards for Total System Balance, or
    b. NEBB Procedural Standards for Testing, Adjusting, Balancing of Environmental Systems.

2. All recommendations and suggested practices contained in the TAB standard are mandatory. Use provisions of the TAB standard, including checklists and report forms, to the extent to which they are applicable to this Project.
3. Testing, adjusting, balancing procedures, and reporting required for this Project, and not covered by the TAB standard applicable to the TAB specialist engaged to perform the Work of this Contract, shall be submitted for approval by the design engineer.

H. TAB Conference: Meet with Architect and mechanical engineer on approval of the TAB strategies and procedures plan to develop a mutual understanding of the project requirements. Require the participation of the TAB field supervisor. Provide seven days' advance notice of scheduled meeting time and location. TAB conference shall take place at location selected by Architect offices of Capital.

1. Agenda Items:

    a. The Contract Documents examination report.
    b. The TAB plan.
    c. Coordination and cooperation of trades and subcontractors.
    d. Coordination of documentation and communication flow, including protocol for resolution tracking and documentation.

2. The requirement for TAB conference may be waived at the discretion of the mechanical engineer of record for the Project.

I. Certify TAB field data reports and perform the following:

1. Review field data reports to validate accuracy of data and to prepare certified TAB reports.
2. Certify that the TAB team complied with the approved TAB plan and the procedures specified and referenced in this Specification.

J. TAB Report Forms: Use standard TAB specialist's forms approved by Architect.

K. Instrumentation Type, Quantity, Accuracy, and Calibration: As described in ASHRAE 111, Section 5, "Instrumentation."

L. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 7.2.2 - "Air Balancing."

M. ASHRAE/IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1, Section 6.7.2.3 - "System Balancing."

1.09 PROJECT CONDITIONS

A. Full Owner Occupancy: Owner will occupy the site and existing building during entire TAB period. Cooperate with Owner during TAB operations to minimize conflicts with Owner's operations.

1.10 WARRANTY

A. Provide workmanship and performance warranty applicable to TAB specialist engaged to perform Work of this Contract:

1. AABC Performance Guarantee.
2. NEBB Quality Assurance Program.

B. Refer to Division 01 Specifications for additional requirements.

1.11 COORDINATION

A. Notice: Provide seven days' advance notice for each test. Include scheduled test dates and times.

B. Perform TAB after leakage and pressure tests on air and water distribution systems have been satisfactorily completed.

C. Coordinate TAB work with work of other trades.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.01 EXAMINATION

A. Contract Documents Examination Report:

1. TAB specialist shall review Contract Documents, including plans and specifications. Provide report listing conditions that would prevent the system(s)

from operating in accordance with the sequence of operations specified, or would prevent accurate testing and balancing:

a. Identify each condition requiring correction using equipment designation shown on Drawings. Provide room number, nearest building grid line intersection, or other information necessary to identify location of condition requiring correction.
b. Proposed corrective action necessary for proper system operation.

B. Examine systems for installed balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers. Verify that locations of these balancing devices are accessible.

C. Examine the approved submittals for HVAC systems and equipment.

D. Examine design data including HVAC system descriptions, statements of design assumptions for environmental conditions and systems' output, and statements of philosophies and assumptions about HVAC system and equipment controls.

E. Examine equipment performance data including fan and pump curves.

1. Relate performance data to Project conditions and requirements, including system effects that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system.

F. Examine system and equipment installations and verify that field quality-control testing, cleaning, and adjusting specified in individual Sections have been performed.

G. Examine test reports specified in individual system and equipment Sections.

H. Examine HVAC equipment and filters and verify that bearings are greased, belts are aligned and tight, and equipment with functioning controls is ready for operation.

I. Examine strainers. Verify that startup screens are replaced by permanent screens with indicated perforations.

J. Examine heat-transfer coils for correct piping connections and for clean and straight fins.

K. Examine system pumps to ensure absence of entrained air in the suction piping.

L. Examine operating safety interlocks and controls on HVAC equipment.

M. Report conditions requiring correction discovered before and during performance of TAB procedures.

N. Observe and record system reactions to changes in conditions. Record default set points if different from indicated values.

3.02 PREPARATION

A. Prepare a TAB plan that includes strategies and step-by-step procedures. TAB plan shall be specific to Project and include the following:

1. General description of each air system and sequence(s) of operation.
2. Complete list of measurements to be performed.
3. Complete list of measurement procedures. Specify types of instruments to be utilized and method of instrument application.
4. Qualifications of personnel assigned to Project.

5. Single-line CAD drawings reflecting all test locations (terminal units, grilles, diffusers, traverse locations, etc.

6. Air terminal correction factors for the following:

    a. Air terminal configuration.
    b. Flow direction (supply or return/exhaust).
    c. Effective area of each size and type of air terminal.
    d. Air density.

B. Complete system-readiness checks and prepare reports. Verify the following:

1. Permanent electrical-power wiring is complete.
2. Automatic temperature-control systems are operational.
3. Equipment and duct access doors are securely closed.
4. Balance, smoke, and fire dampers are open.
5. Isolating and balancing valves are open and control valves are operational.
6. Ceilings are installed in critical areas where air-pattern adjustments are required and access to balancing devices is provided.
7. Windows and doors can be closed so indicated conditions for system operations can be met.

3.03 GENERAL PROCEDURES FOR TESTING AND BALANCING

A. Perform testing and balancing procedures on each system according to the procedures contained in AABC's "National Standards for Total System Balance" or NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems" and in this Section.

1. Comply with requirements in ASHRAE 62.1, Section 7.2.2 - "Air Balancing."

B. Cut insulation, ducts, pipes, and equipment cabinets for installation of test probes to the minimum extent necessary for TAB procedures.

1. After testing and balancing, patch probe holes in ducts with same material and thickness as used to construct ducts.
2. Install and join new insulation that matches removed materials. Restore insulation, coverings, vapor barrier, and finish according to Section 23 80 00 Heating, Ventilating, and Air Conditioning."

C. Mark equipment and balancing devices, including damper-control positions, valve position indicators, fan-speed-control levers, and similar controls and devices, with paint or other suitable, permanent identification material to show final settings.

D. Take and report testing and balancing measurements in inch-pound (IP) units.

3.04 GENERAL PROCEDURES FOR BALANCING AIR SYSTEMS

A. Prepare test reports for both fans and outlets. Obtain manufacturer's outlet factors and recommended testing procedures. Crosscheck the summation of required outlet volumes with required fan volumes.

B. Test each system to verify building or space operating pressure, including all stages of economizer cycle. Maximum building pressure shall not exceed 0.03 inches of pressure.

C. Except as specifically indicated in this Specification, Pitot tube traverses shall be made of each duct to measure airflow. Pitot tubes, associated instruments, traverses, and

techniques shall conform to ASHRAE Handbook, HVAC Applications, and ASHRAE Handbook, HVAC Systems and Equipment.

1. Use state-of-the-art instrumentation approved by TAB specialists governing agency.
2. Where ducts' design velocity and air quantity are both less than 1000 fpm/CFM, air quantity may be determined by measurements at terminals served.

D. Test holes shall be placed in straight duct, as far as possible downstream from elbow, bends, take-offs, and other turbulence-generating devices.

E. Determine the best locations in main and branch ducts for accurate duct-airflow measurements.

F. Check airflow patterns from the outdoor-air louvers and dampers and the return- and exhaust-air dampers through the supply-fan discharge and mixing dampers.

G. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.

H. Verify that motor starters are equipped with properly sized thermal protection.

I. Check dampers for proper position to achieve desired airflow path.

J. Check for airflow blockages.

K. Check condensate drains for proper connections and functioning.

L. Check for proper sealing of air-handling-unit components.

M. Verify that air duct system is sealed as specified in Section 23 80 00 "Heating, Ventilating, and Air Conditioning."

N. 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.

O. Automatically operated dampers shall be adjusted to operate as indicated in Contract Documents. Controls shall be checked for proper calibration.

3.05 PROCEDURES FOR CONSTANT-VOLUME AIR SYSTEMS

A. Adjust fans to deliver total indicated airflows within the maximum allowable fan speed listed by fan manufacturer.

1. Measure total airflow.

    a. Where sufficient space in ducts is unavailable for Pitot-tube traverse measurements, measure airflow at terminal outlets and inlets and calculate the total airflow. Alternative methods shall be examined for determining total CFM, i.e., Pitot-tube traversing of branch ducts, coil or filter velocity profiles, prior to utilizing airflow values at terminal outlets and inlets.

2. Measure fan static pressures as follows to determine actual static pressure:

    a. Measure outlet static pressure as far downstream from the fan as practical and upstream from restrictions in ducts such as elbows and transitions.

b. Measure static pressure directly at the fan outlet.
c. Measure inlet static pressure of single-inlet fans in the inlet duct as near the fan as possible, upstream from the flexible connection, and downstream from duct restrictions.
d. Measure inlet static pressure of double-inlet fans through the wall of the plenum that houses the fan.

3. Measure static pressure across each component that makes up an air-handling unit, rooftop unit, and other air-handling and -treating equipment.

   a. Report the cleanliness status of filters and the time static pressures are measured.

4. Measure static pressures entering and leaving other devices, such as sound traps, heat-recovery equipment, and air washers, under final balanced conditions.

5. Review Record Documents to determine variations in design static pressures versus actual static pressures. Calculate actual system-effect factors. Recommend adjustments to accommodate actual conditions.

6. Obtain approval from Architect for adjustment of fan speed higher or lower than indicated speed. Comply with requirements in HVAC Sections for air-handling units for adjustment of fans, belts, and pulley sizes to achieve indicated air-handling-unit performance.
7. Do not make fan-speed adjustments that result in motor overload. Consult equipment manufacturers about fan-speed safety factors. Modulate dampers and measure fan-motor amperage to ensure that no overload will occur. Measure amperage in full-cooling, full-heating, economizer, and any other operating mode to determine the maximum required brake horsepower.

B. Check operation of relief air dampers. Measure total relief air quantity at each stage of normal, economizer, power exhaust, or power exhaust economizer operation, as applicable to installed equipment. Adjust relief air dampers to provide 100 percent relief in economizer mode. Ensure that relief dampers close completely upon unit shutdown.

C. Check operation of outside air dampers. Measure total outside air quantity at each stage of normal, economizer, power exhaust, or power exhaust economizer operation, as applicable to installed equipment. Adjust outside air dampers to provide 100 percent outside air in economizer mode. Ensure that outside air dampers close completely upon unit shutdown.

D. Adjust volume dampers for main duct, submain ducts, and major branch ducts to indicated airflows within specified tolerances.

1. Measure airflow of submain and branch ducts.

   a. Where sufficient space in submain and branch ducts is unavailable for Pitot-tube traverse measurements, measure airflow at terminal outlets and inlets and calculate the total airflow for that zone.

2. Measure static pressure at a point downstream from the balancing damper, and adjust volume dampers until the proper static pressure is achieved.
3. Remeasure each submain and branch duct after all have been adjusted. Continue to adjust submain and branch ducts to indicated airflows within specified tolerances.

E. Measure air outlets and inlets without making adjustments.

1. Measure terminal outlets using a direct-reading digital backflow compensating hood. Use outlet manufacturer's written instructions and calculating factors only when direct-reading hood cannot be used due to physical obstruction or other limiting factors. Final report shall indicate where values listed have not been obtained by direct measurement.

F. Adjust air outlets and inlets for each space to indicated airflows within specified tolerances of indicated values. Make adjustments using branch volume dampers rather than extractors and the dampers at air terminals.

1. Adjust each outlet in same room or space to within specified tolerances of indicated quantities without generating noise levels above the limitations prescribed by the Contract Documents, if included.
2. Adjust patterns of adjustable outlets for proper distribution without drafts. Terminal air velocity at five feet above finished floor shall not exceed 50 feet per minute in occupied air conditioned spaces.

G. Do not overpressurize ducts.

3.06 PROCEDURES FOR VARIABLE-AIR-VOLUME SYSTEMS

A. Comply with applicable requirements for constant-volume air systems in addition to those listed below.

B. Compensating for Diversity: When the total airflow of all terminal units is more than the indicated airflow of the fan, place a selected number of terminal units at a minimum set-point airflow with the remainder at maximum-airflow condition until the total airflow of the terminal units equals the indicated airflow of the fan. Select the reduced-airflow terminal units so they are distributed evenly among the branch ducts.

C. Pressure-Independent, Variable-Air-Volume Systems: After the fan systems have been adjusted, adjust the variable-air-volume systems as follows:

1. Set outdoor-air dampers at minimum, and set return- and exhaust-air dampers at a position that simulates full-cooling load.
2. Select the terminal unit that is most critical to the supply-fan airflow and static pressure. Measure static pressure. Adjust system static pressure so the entering static pressure for the critical terminal unit is not less than the sum of the terminal-unit manufacturer's recommended minimum inlet static pressure plus the static pressure needed to overcome terminal-unit discharge system losses.
3. Measure total system airflow. Adjust to within indicated airflow.
4. Set terminal units at maximum airflow and adjust controller or regulator to deliver the designed maximum airflow. Use terminal-unit manufacturer's written instructions to make this adjustment. When total airflow is correct, balance the air outlets downstream from terminal units the same as described for constant-volume air systems.
5. Set terminal units at minimum airflow and adjust controller or regulator to deliver the designed minimum airflow. Check air outlets for a proportional reduction in airflow the same as described for constant-volume air systems.

a. If air outlets are out of balance at minimum airflow, report the condition but leave outlets balanced for maximum airflow.

6. Remeasure the return airflow to the fan while operating at maximum return airflow and minimum outdoor airflow.

    a. Adjust the fan and balance the return-air ducts and inlets the same as described for constant-volume air systems.

7. Measure static pressure at the most critical terminal unit and adjust the static-pressure controller at the main supply-air sensing station to ensure that adequate static pressure is maintained at the most critical unit.
8. Record final fan-performance data including optimum operating static control set point.

3.07 PROCEDURES FOR MOTORS

A. Motors, 1/2 HP and Larger: Test at final balanced conditions and record the following data:

1. Manufacturer's name, model number, and serial number.
2. Motor horsepower rating.
3. Motor rpm.
4. Efficiency rating.
5. Nameplate and measured voltage, each phase.
6. Nameplate and measured amperage, each phase.
7. Starter manufacturer’s name, model number, size, type, and thermal-protection-element rating.

    a. Starter strip heater size, type, and rating.

B. Motors Driven by Variable-Frequency Controllers: Test for proper operation at speeds varying from minimum to maximum. Test the manual bypass of the controller to prove proper operation. Record observations including name of controller manufacturer, model number, serial number, and nameplate data.

3.08 PROCEDURES FOR CONDENSING UNITS

A. Verify proper rotation of fans.

B. Measure entering- and leaving-air temperatures.

C. Record compressor data.

3.09 PROCEDURES FOR HEAT-TRANSFER COILS

A. Measure, adjust, and record the following data for each electric heating coil:

1. Nameplate data.
2. Airflow.
3. Entering- and leaving-air temperature at full load.
4. Voltage and amperage input of each phase at full load and at each incremental stage.
5. Calculated kilowatt at full load.
6. Fuse or circuit-breaker rating for overload protection.

B. Measure, adjust, and record the following data for each refrigerant coil:

1. Dry-bulb temperature of entering and leaving air.
2. Wet-bulb temperature of entering and leaving air.

3. Airflow.
4. Air pressure drop.

3.10 PROCEDURES FOR TESTING, ADJUSTING, AND BALANCING EXISTING SYSTEMS

A. Perform a preconstruction inspection of existing equipment that is to remain and be reused.

1. Measure and record the operating speed, airflow, and static pressure of each fan.
2. Measure motor voltage and amperage. Compare the values to motor nameplate information.
3. Check the condition of filters.
4. Check the condition of coils.
5. Check the operation of the drain pan and condensate-drain trap.
6. Check bearings and other lubricated parts for proper lubrication.
7. Report on the operating condition of the equipment and the results of the measurements taken. Report conditions requiring correction.

B. Before performing testing and balancing of existing systems, inspect existing equipment that is to remain and be reused to verify that existing equipment has been cleaned and refurbished. Verify the following:

1. New filters are installed.
2. Coils are clean and fins combed.
3. Drain pans are clean.
4. Fans are clean.
5. Bearings and other parts are properly lubricated.
6. Conditions requiring correction noted in the preconstruction report are corrected.

C. Perform testing and balancing of existing systems to the extent that existing systems are affected by the renovation work.

1. Compare the indicated airflow of the renovated work to the measured fan airflows, and determine the new fan speed and the face velocity of filters and coils.
2. Verify that the indicated airflows of the renovated work result in filter and coil face velocities and fan speeds that are within the acceptable limits defined by equipment manufacturer.
3. If calculations increase or decrease the air flow rates and water flow rates by more than 5 percent, make equipment adjustments to achieve the calculated rates. If increase or decrease is 5 percent or less, equipment adjustments are not required.
4. Balance each air outlet.

3.11 GENERAL PROCEDURES FOR PLUMBING SYSTEMS

A. Measure pressure drop across each backflow preventer assembly at design flows.

B. Measure water flow at pumps. Use the following procedures except for positive-displacement pumps:

1. Verify impeller size by operating the pump with the discharge valve closed. Read pressure differential across the pump. Convert pressure to head and correct for differences in gage heights. Note the point on manufacturer's pump curve at zero flow and verify that the pump has the intended impeller size.

a. If impeller sizes must be adjusted to achieve pump performance, obtain approval from Architect Owner Construction Manager Commissioning Authority and comply with requirements in Section 22 50 00 “Plumbing Equipment."

2. Check system resistance. With all valves open, read pressure differential across the pump and mark pump manufacturer's head-capacity curve. Adjust pump discharge valve until indicated water flow is achieved.

a. Monitor motor performance during procedures and do not operate motors in overload conditions.

3. Verify pump-motor brake horsepower. Calculate the intended brake horsepower for the system based on pump manufacturer's performance data. Compare calculated brake horsepower with nameplate data on the pump motor. Report conditions where actual amperage exceeds motor nameplate amperage.
4. Report flow rates that are not within range given in article, Tolerances.

C. Set calibrated balancing valves, if installed, at calculated presettings.

D. Measure flow at all stations and adjust, where necessary, to obtain first balance.

1. System components that have Cv rating or an accurately cataloged flow-pressure-drop relationship may be used as a flow-indicating device.

E. Measure flow at main balancing station and set main balancing device to achieve flow that is 5 percent greater than indicated flow.

F. Adjust balancing stations to within specified tolerances of indicated flow rate as follows:

1. Determine the balancing station with the highest percentage over indicated flow.
2. Adjust each station in turn, beginning with the station with the highest percentage over indicated flow and proceeding to the station with the lowest percentage over indicated flow.
3. Record settings and mark balancing devices.

G. Measure pump flow rate and make final measurements of pump amperage, voltage, rpm, pump heads, and systems' pressures and temperatures including outdoor-air temperature.

H. Measure the differential-pressure-control-valve settings existing at the conclusion of balancing.

I. Check settings and operation of each safety valve. Record settings.

3.12 TOLERANCES

A. Set HVAC system's air flow rates and water flow rates within the following tolerances:

1. Supply, Return, and Exhaust Fans and Equipment with Fans: Plus 10 percent and minus 0 percent.
2. Air Outlets and Inlets: Plus 5 percent and minus 5 percent.
3. Multiple outlets within single room: Plus 5 percent and minus 0 percent for total airflow within room. Tolerance for individual outlets within a single room having multiple outlets shall be as for “Air Outlets and Inlets”.

B. Set plumbing systems water flow rates within plus or minus 10 percent.

3.13 REPORTING

A. Initial Construction-Phase Report: Based on examination of the Contract Documents as specified in "Examination" Article, prepare a report on the adequacy of design for systems' balancing devices. Recommend changes and additions to systems' balancing devices to facilitate proper performance measuring and balancing. Recommend changes and additions to HVAC systems and general construction to allow access for performance measuring and balancing devices.

B. Interim Reports: Prepare periodic lists of conditions requiring correction and problems found in systems being tested and balanced. Prepare a separate report for each system and each building floor for systems serving multiple floors.

3.14 FINAL REPORT

A. General: Prepare a certified written report; tabulate and divide the report into separate sections for tested systems and balanced systems.

1. Include a certification sheet at the front of the report's binder, signed and sealed by the certified testing and balancing field supervisor. Report shall be co-signed by the Contractor, attesting that he has reviewed the report, and the report has been found to be complete and accurate.
2. The certification sheet shall be followed by sheet(s) listing items for which balancing objectives could not be achieved. Provide explanation for failure to achieve balancing objectives for each item listed.
3. Include a list of instruments used for procedures, along with proof of calibration.

B. Final Report Contents: In addition to certified field-report data, include the following:

1. Pump curves.
2. Fan curves.
3. Manufacturers' test data.
4. Field test reports prepared by system and equipment installers.
5. Other information relative to equipment performance; do not include Shop Drawings and product data.

C. General Report Data: In addition to form titles and entries, include the following data:

1. Title page.
2. Name and address of the TAB specialist.
3. Project name.
4. Project location.
5. Project Performance Guaranty
6. Architect's name and address.
7. Engineer's name and address.
8. Contractor's name and address.
9. Report date.
10. Signature of TAB supervisor who certifies the report.
11. Table of Contents with the total number of pages defined for each section of the report. Number each page in the report.
12. Summary of contents including the following:

    a. Indicated versus final performance.
    b. Notable characteristics of systems.
    c. Description of system operation sequence if it varies from the Contract Documents.

13. Nomenclature sheets for each item of equipment.
14. Test conditions for fans and pump performance forms including the following:

    a. Settings for outdoor-, return-, and exhaust-air dampers.
    b. Conditions of filters.
    c. Cooling coil, wet- and dry-bulb conditions.
    d. Fan drive settings including settings and percentage of maximum pitch diameter.
    e. Settings for supply-air, static-pressure controller.
    f. Other system operating conditions that affect performance.

D. System Diagrams: Include schematic layouts of air and hydronic distribution systems. Present each system with single-line diagram and include the following:

1. Quantities of outdoor, supply, return, and exhaust airflows.
2. Duct, outlet, and inlet sizes.
3. Pipe and valve sizes and locations.
4. Balancing stations.
5. Position of balancing devices.

E. Air distribution outlets and inlets shall be shown on keyed plans with designation for each outlet and inlet matching designation used in Contract Documents and TAB test reports. Room numbers shall be included in keyed plans and test reports. Where multiple outlets and inlets are installed within a single room, a designation shall be assigned and listed for each outlet and inlet in addition to room number.

F. Test Reports – General:

1. All test reports containing air or liquid flow data shall record flow values prior to system adjustment in addition to required data listed for each test report.

G. Air-Handling-Unit Test Reports: For air-handling units with coils, include the following:

1. Unit Data:

    a. Unit identification.
    b. Location.
    c. Make and type.
    d. Model number and unit size.
    e. Manufacturer's serial number.
    f. Unit arrangement and class.
    g. Discharge arrangement.
    h. Sheave make, size in inches, and bore.
    i. Center-to-center dimensions of sheave, and amount of adjustments in inches.
    j. Number, make, and size of belts.
    k. Number, type, and size of filters.

2. Motor Data:

    a. Motor make, and frame type and size.
    b. Horsepower and rpm.
    c. Volts, phase, and hertz.
    d. Full-load amperage and service factor.
    e. Sheave make, size in inches, and bore.

f. Center-to-center dimensions of sheave, and amount of adjustments in inches.

3. Test Data (Indicated and Actual Values):

a. Total air flow rate in cfm.
b. Total system static pressure in inches wg.
c. Fan rpm.
d. Discharge static pressure in inches wg.
e. Filter static-pressure differential in inches wg.
f. Cooling-coil static-pressure differential in inches wg.
g. Heating-coil static-pressure differential in inches wg.
h. Outdoor airflow in cfm.
i. Return airflow in cfm.
j. Relief airflow in cfm.
k. Outdoor-air damper position, normal and economizer, power exhaust, or power exhaust economizer modes, as applicable to installed equipment.
l. Return-air damper position.
m. Relief-air damper position, normal and economizer, power exhaust, or power exhaust economizer modes, as applicable to installed equipment.

H. Apparatus-Coil Test Reports:

1. Coil Data:

a. System identification.
b. Location.
c. Coil type.
d. Number of rows.
e. Fin spacing in fins per inch o.c.
f. Make and model number.
g. Face area in sq. ft.
h. Tube size in NPS.
i. Tube and fin materials.
j. Circuiting arrangement.

2. Test Data (Indicated and Actual Values):

a. Air flow rate in cfm.
b. Average face velocity in fpm.
c. Air pressure drop in inches wg.
d. Outdoor-air, wet- and dry-bulb temperatures in deg F.
e. Return-air, wet- and dry-bulb temperatures in deg F.
f. Entering-air, wet- and dry-bulb temperatures in deg F.
g. Leaving-air, wet- and dry-bulb temperatures in deg F.
h. Refrigerant expansion valve and refrigerant types.

I. Gas- and Oil-Fired Heat Apparatus Test Reports: In addition to manufacturer's factory startup equipment reports, include the following:

1. Unit Data:

a. System identification.
b. Location.
c. Make and type.
d. Model number and unit size.

e. Manufacturer's serial number.
f. Fuel type in input data.
g. Output capacity in Btu/h.
h. Ignition type.
i. Burner-control types.
j. Motor horsepower and rpm.
k. Motor volts, phase, and hertz.
l. Motor full-load amperage and service factor.
m. Sheave make, size in inches, and bore.
n. Center-to-center dimensions of sheave, and amount of adjustments in inches.

2. Test Data (Indicated and Actual Values):

a. Total air flow rate in cfm.
b. Entering-air temperature in deg F.
c. Leaving-air temperature in deg F.
d. Air temperature differential in deg F.
e. Entering-air static pressure in inches wg.
f. Leaving-air static pressure in inches wg.
g. Air static-pressure differential in inches wg.
h. Low-fire fuel input in Btu/h.
i. High-fire fuel input in Btu/h.
j. Manifold pressure in psig.
k. High-temperature-limit setting in deg F.
l. Operating set point in Btu/h.
m. Motor voltage at each connection.
n. Motor amperage for each phase.
o. Heating value of fuel in Btu/h.

J. Electric-Coil Test Reports: For electric furnaces, duct coils, and electric coils installed in central-station air-handling units, include the following:

1. Unit Data:

a. System identification.
b. Location.
c. Coil identification.
d. Capacity in Btu/h.
e. Number of stages.
f. Connected volts, phase, and hertz.
g. Rated amperage.
h. Air flow rate in cfm.
i. Face area in sq. ft.
j. Minimum face velocity in fpm.

2. Test Data (Indicated and Actual Values):

a. Heat output in Btu/h.
b. Air flow rate in cfm.
c. Air velocity in fpm.
d. Entering-air temperature in deg F.
e. Leaving-air temperature in deg F.
f. Voltage at each connection.
g. Amperage for each phase.

K. Fan Test Reports: For supply, return, and exhaust fans, include the following:

1. Fan Data:

    a. System identification.
    b. Location.
    c. Make and type.
    d. Model number and size.
    e. Manufacturer's serial number.
    f. Arrangement and class.
    g. Sheave make, size in inches, and bore.
    h. Center-to-center dimensions of sheave, and amount of adjustments in inches.

2. Motor Data:

    a. Motor make, and frame type and size.
    b. Horsepower and rpm.
    c. Volts, phase, and hertz.
    d. Full-load amperage and service factor.
    e. Sheave make, size in inches, and bore.
    f. Center-to-center dimensions of sheave, and amount of adjustments in inches.
    g. Number, make, and size of belts.

3. Test Data (Indicated and Actual Values):

    a. Total airflow rate in cfm.
    b. Total system static pressure in inches wg.
    c. Fan rpm.
    d. Discharge static pressure in inches wg.
    e. Suction static pressure in inches wg.

L. Round, Flat-Oval, and Rectangular Duct Traverse Reports: Include a diagram with a grid representing the duct cross-section and record the following:

1. Report Data:

    a. System and air-handling-unit number.
    b. Location and zone.
    c. Traverse air temperature in deg F.
    d. Duct static pressure in inches wg.
    e. Duct size in inches.
    f. Duct area in sq. ft.
    g. Indicated air flow rate in cfm.
    h. Indicated velocity in fpm.
    i. Actual air flow rate in cfm.
    j. Actual average velocity in fpm.
    k. Barometric pressure in psig.

M. Air-Terminal-Device Reports:

1. Unit Data:

    a. System and air-handling unit identification.
    b. Location and zone.

c. Apparatus used for test.
d. Area served.
e. Make.
f. Number from system diagram.
g. Type and model number.
h. Size.
i. Effective area in sq. ft.

2. Test Data (Indicated and Actual Values):

a. Air flow rate in cfm.
b. Air velocity in fpm.
c. Preliminary air flow rate as needed in cfm.
d. Preliminary velocity as needed in fpm.
e. Final air flow rate in cfm.
f. Final velocity in fpm.
g. Space temperature in deg F.

N. Pump Test Reports: Calculate impeller size by plotting the shutoff head on pump curves and include the following:

1. Unit Data:

a. Unit identification.
b. Location.
c. Service.
d. Make and size.
e. Model number and serial number.
f. Water flow rate in gpm.
g. Water pressure differential in feet of head or psig.
h. Required net positive suction head in feet of head or psig.
i. Pump rpm.
j. Impeller diameter in inches.
k. Motor make and frame size.
l. Motor horsepower and rpm.
m. Voltage at each connection.
n. Amperage for each phase.
o. Full-load amperage and service factor.
p. Seal type.

2. Test Data (Indicated and Actual Values):

a. Static head in feet of head or psig.
b. Pump shutoff pressure in feet of head or psig.
c. Actual impeller size in inches.
d. Full-open flow rate in gpm.
e. Full-open pressure in feet of head or psig.
f. Final discharge pressure in feet of head or psig.
g. Final suction pressure in feet of head or psig.
h. Final total pressure in feet of head or psig.
i. Final water flow rate in gpm.
j. Voltage at each connection.
k. Amperage for each phase.

O. Instrument Calibration Reports:

1. Report Data:

    a. Instrument type and make.
    b. Serial number.
    c. Application.
    d. Dates of use.
    e. Dates of calibration.

3.15 INSPECTIONS

A. Initial Inspection:

1. After testing and balancing are complete, operate each system and randomly check measurements to verify that the system is operating according to the final test and balance readings documented in the final report.
2. Check the following for each system:

    a. Measure airflow of 100 percent of air outlets.
    b. Measure water flow of at least percent of terminals.
    c. Measure room temperature at each thermostat/temperature sensor. Compare the reading to the set point.
    d. Verify that balancing devices are marked with final balance position.
    e. Note deviations from the Contract Documents in the final report.

B. Final Inspection:

1. After initial inspection is complete and documentation by random checks verifies that testing and balancing are complete and accurately documented in the final report, request that a final inspection be made by Architect.
2. The TAB specialist's test and balance engineer shall conduct the inspection in the presence of Architect.
3. Architect shall randomly select measurements, documented in the final report, to be rechecked. Rechecking shall be limited to either 10 percent of the total measurements recorded or the extent of measurements that can be accomplished in a normal 8-hour business day.
4. If rechecks yield measurements that differ from the measurements documented in the final report by more than 10 percent, the measurements shall be noted as "FAILED."
5. If the number of "FAILED" measurements is greater than 10 percent of the total measurements checked during the final inspection, the testing and balancing shall be considered incomplete and shall be rejected.

C. TAB Work will be considered defective if it does not pass final inspections. If TAB Work fails, proceed as follows:

1. Recheck all measurements and make adjustments. Revise the final report and balancing device settings to include all changes; resubmit the final report and request a second final inspection.
2. If the second final inspection also fails, Owner may contact the TAB specialists' governing organization for remedial action by the governing organization under the workmanship and performance warranty. See article, Warranty.
3. If remedial action is not provided by the TAB specialists' governing organization in a timely manner, Owner may contract the services of another TAB specialist to complete the TAB Work according to the Contract Documents and deduct the cost of the services from the original TAB specialists' final payment.

D. Prepare test and inspection reports.

3.16 ADDITIONAL TESTS

A. Seasonal Periods: If initial TAB procedures were not performed during near-peak summer and winter conditions, perform additional TAB during near-peak summer and winter conditions.

END OF SECTION 23 05 93

SECTION 23 09 23
ENERGY MANAGEMENT SYSTEM FOR HVAC (EMS)

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes equipment and performance criteria for furnishing all labor and materials for the installation and programming for Energy Management System for HVAC Systems utilizing wireless communication with cloud based servers.

1.02 RELATED SECTIONS:

A. Division 01: General Requirements

B. Division 23: Heating, Ventilating, and Air-Conditioning (HVAC)

1.03 SUBMITTALS:

A. Shop Drawings and product data in accordance with the specifications.

B. All shop drawings shall be prepared in AutoCAD 2000 or newer. In addition, Contractor shall provide drawings in electronic format with x-ref and layer information to other trades as required.

C. All submittals shall be bound or in a three ring binder with a table of contents and related section tabs. Five (5) copies shall be submitted to the Architect or engineer for distribution and review.

D. Shop drawings shall include basic floor plans depicting locations of all equipment and wiring, installed by others, to be controlled by system and locations of thermostats, gateways and other equipment provided under this section. Drawings shall also show location of electrical power, low voltage wiring and data ports, provided by others, required for proper installation of systems of this section.

E. Submittal data shall contain manufacturer's data on all hardware and software products required by the specification.

F. Submit five (5) copies of submittal data and shop drawings to the Engineer for review prior to ordering or fabrication of the equipment. The Contractor prior to submitting shall check all documents for accuracy.

G. The Engineer will make corrections, if required, and return to the Contractor. The Contractor will then resubmit with the corrected or additional data. This procedure shall be repeated until all corrections are made to the satisfaction of the Engineer and the submittals are fully approved.

1.04 SCOPE OF WORK

A. Except as otherwise noted, the control system shall consist of all thermostats, and gateways to fill the intent of the specification and provide for a complete and operable system.

B. The EMS contractor shall review and study existing building/site conditions where applicable and all new construction drawings for the project including HVAC drawings and the entire project specifications to familiarize themselves with the equipment and system operation prior to prior to bidding and submittal of a bid/price and notify the owner

immediately of any conflicts between the project and the scope of work of this section, including work to be completed by others.

C. All equipment and installation of control devices associated with the equipment listed below shall be provided under this Contractor.

D. When the EMS system is fully installed and operational, the EMS Contractor will make themselves available to meet with the designated representatives of the owner to review the as-installed condition of the system. At that time, the EMS contractor shall demonstrate the operation of the system and prove that it complies with the intent of the drawings and specifications.

E. The Contractor shall furnish and install a complete EMS control system including all necessary hardware and all operating and applications software necessary to perform the control sequences of operation as called for in this specification. Provide and Install EMS controls for the HVAC Equipment as noted on the drawings:

F. Provide technical support necessary for commissioning of system in coordination with the HVAC Contractor, Balancing Contractor, and the owner's team.

G. Contractor shall provide one training session in the operation of the system, for owner's personnel.

H. All work performed under this section of the specifications will be in compliance with all codes and regulations as mandated by the authority having jurisdiction.

1.05 SYSTEM DESCRIPTION

A. The Energy Management System (EMS) shall consist of thermostats, gateways and related accessories as indicated below and all related programming for a complete and fully operational web based management system using a cloud server program complying with the following specifications.

1. The entire Energy Management Solution (EMS) shall include a network of commercial Internet programmable thermostats which use IEEE 802.15.4 mesh wireless communication protocol to reach a Wireless Gateway (WG). The WG must connect to the owner’s wide area network (WAN) over a TCP/IP connection. Access and control of EMS is through a web based management tool which sits on a cloud server and must be accessible either locally or remotely via the Internet.

1.06 WORK BY OTHERS

A. The EMS Contractor shall coordinate with other contractors prior to performing the work on this project and cooperate as necessary to achieve a complete and neat installation. To that end, each contractor shall consult the drawings and specifications for all trades to determine the nature and extent of others’ work prior to fabrication and installation. The owner's representative shall be immediately notified if an area of conflict occurs between trades prior to fabrication and installation. EMS Contractor shall provide field supervision to the Mechanical Contractor for pre-installation of control components.

B. Low voltage thermostat wiring between equipment and thermostat locations shall be furnished and installed by others. Unless noted otherwise all new low voltage wiring shall be multiple conductor thermostat wiring (wire count as indicated in Thermostat Manufacture's installation instructions) installed per owner's specifications. (Wiring in existing installations shall be minimum 3 conductor / 24 gauge wires per EMS manufacturer's standard specifications, multiple c conductor/24 gauge thermostat wiring

preferred - see Installation Instructions for specific conductor counts depending on heating and cooling modes of existing equipment.)

C. Related work provided by others:

1. 110 V outlets shall be provided within 5 feet of each gateway location.
2. 1 Data port shall be provided within 10 feet of each gateway location.

D. Equipment start-up and servicing

1.07 CODE COMPLIANCE

A. Provide EMS components and ancillary equipment which are code compliant.

B. All wiring shall conform to the National Electrical Code.

C. All products of the EMS shall reside with the following agency approvals.

1. California 2022 Title 24 Compliant.
2. California Energy Commission Occupant Control Smart Thermostat (OCST) certified.
3. OpenADR2.0 certified.

1.08 SYSTEM STARTUP & COMMISSIONING

A. Each EMS component in the system shall be tested for both hardware and software functionality. In addition, each mechanical and electrical system under control of the EMS will be tested against the appropriate sequence of operation specified herein. Successful completion of the system test shall constitute the beginning of the warranty period. A written report will be submitted to the owner indicating that the installed system functions in accordance with the plans and specifications.

B. The EMS Contractor shall provide all manpower and engineering services required to assist the HVAC Contractor and Balancing Contractor in testing, adjusting, and balancing all systems in the building. The EMS Contractor shall have a trained technician available on request during the balancing of the systems. The EMS Contractor shall coordinate all requirements to provide a complete air balance with the Balancing Contractor and shall include all labor and materials in his contract to assist with functional testing of system as it relates to EMS.

1.09 TRAINING

A. The EMS Contractor shall provide training for two (2) owner's representatives and/or maintenance personnel. The EMS Contractor shall provide on-site training to the District’s representative(s) and maintenance personnel per the following description:

B. On-site training shall consist of a minimum of (1) hours, as indicated above of hands-on instruction geared at the operation and maintenance of the systems. The curriculum shall include

1. System Overview
2. System Software and Operation
3. System access
4. Software features overview
5. Changing set points and other attributes
6. Scheduling
7. Editing programmed variables
8. Displaying color graphics

9. Running reports
10. Workstation maintenance
11. Application programming
12. Operational sequences including start-up, shutdown, adjusting and balancing.
13. Equipment maintenance

1.10 OPERATING AND MAINTENANCE MANUALS

A. The operation and maintenance manuals shall contain all information necessary for the operation, maintenance, replacement, installation, and parts procurement for the entire EMS. This documentation shall include specific part numbers.

B. Following project completion and testing, the EMS contractor will submit as-built documentation reflecting the exact installation of the system.

1.11 WARRANTY

A. The EMS contractor shall warrant the system for 12 months after system acceptance and beneficial use by the District. During the warranty period, the EMS contractor shall be responsible for all necessary revisions to the software as required to provide a complete and workable system consistent with the letter and intent of the Sequence of Operation section of the specification. EMS equipment shall be warranted for a period of 5 years from the time of system acceptance.

B. Warranty of equipment is limited to replacement of defective products.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Unless noted otherwise, all products shall be of a single manufacturer. The standard of design and quality shall be products as manufactured by Pelican Wireless Systems,

B. Products of other manufacturers will be considered for acceptance provided they equal or exceed the material requirements and functional requirements of the specified product. A request for Architect/Engineer's approval must be submitted with complete technical data to allow for proper evaluation. All materials for evaluation must be received by Project Manager at least 10 days prior to bid due date.

2.02 WIRELESS GATEWAY (WG)

A. A single WG shall be capable of providing communication between a dedicated cloud server using TCP/IP and the on-site Internet Programmable Thermostats using the IEEE 802.15.4 wireless communication protocol. Additional WGs can be used for a single site, but each WG must meet or exceed these requirements

B. The WG must provide the following hardware features as a minimum:

1. Single Ethernet Port.
2. One micro-USB 5VDC power input.
3. 2.4 GHz IEEE std. 802.15.4 built-in communication processor.

C. The WG shall provide the communication link between the entire system and a cloud based server. Communication with cloud server shall be secured using AES (Advanced Encryption Standard).

D. The WG shall be able to support 2000 Internet Programmable Thermostats.

2.03 INTERNET PROGRAMMABLE THERMOSTAT (IPT)

A. Internet Programmable Thermostat shall be a wireless communicating commercial programmable thermostat that uses IEEE 802.15.4 for networking communication and a wiring terminal block for controlling a single zone HVAC unit.

B. The IPT shall provide a keypad for setting:

1. Temperature Set points.
2. System Mode (Heat, Cool, Auto, Off).
3. Fan Mode (Auto, On).
4. Light Button.

C. The IPT shall include a wiring terminal for controlling a single zone HVAC unit. The wiring terminal must be able to be removed from the IPT for installations where only 3-wires exist or are available between where the IPT will be placed and its connection with the HVAC unit it will be controlling. Over these 3-wires the thermostat must still be able to control the HVAC unit based on these specifications.

D. The IPT must be configurable using a Web Based App. No thermostat configuration, other than setting the IPT to Conventional, Heat Pump - O, or Heat Pump -B, shall be done at the thermostat. Web based Configuration Setting options shall include:

1. Naming the thermostat
2. Grouping multiple thermostats.
3. Heat Pump or Conventional system setting.
4. If Heat Pump; reversing valve O or B setting.
5. Cycles Per Hour (1 - 6).
6. Anticipation Degrees (0˚F - 0.5˚F)
7. Calibration Degrees (2.0˚F - -2.0˚F)
8. Heat Stages (0 - 2)
9. If Heat Pump; Aux Heat (Disabled and/or Enabled Option)
10. Cool Stages (0 - 2)
11. Fan Stages (1 - 2)
12. Fan Circulation Minutes Per Hour.
13. Temperature Display (Fahrenheit or Celsius)
14. Heat Range Temperature Setting Limitation
15. Cool Range Temperature Setting Limitation
16. Ability to disable and enable Keypad Control through schedule.
17. Heat consumption (kw, btu, ton, or watt)
18. Cool consumption (kw, btu, ton, or watt)
19. Notification Sensitivity (High, Medium, Low)
20. Alarm of exceeding temperature based on a Safe Range
21. Schedule set times (2, 3, 4, or Variable).

E. IPT settings and control through the Web Base App shall be in real-time and include:

1. Space Temperature
2. System Mode (Heat, Cool, Auto, Off).
3. Fan Mode (Auto, On).
4. Current set point.
5. Relay status (Heat/Cool and Fan).
6. Historical Trend Graphs.
7. Scheduling
8. Lock and Unlock Entire Thermostat’s Keypad
9. Lock and Unlock the Thermostat’s Fan Mode setting Only

2.04 WEB BASED GRAPHICAL USER INTERFACE

A. The Web Based App (WBA) shall be able to run on any PC that uses Safari, Chrome, Firefox, or any other web browser that meets these browsers' functionality.

B. The WBA Platform shall be able to run on any Internet Accessible Smartphone and/or Tablet that has a Web Browser compatible with HTML5.

C. The WBA shall allow up to a minimum of 100 simultaneous users/clients to access the Energy Management System.

D. The Web Based client shall support at a minimum, the following functions:

1. User log-on identification and password shall be required.
2. HTML programming shall not be required to display any graphics or data on the Web page.
3. Storage of data shall reside within the cloud server and shall not sit within the client's computer or device. EMS that requires data storage on a client computer or an on-site server is not acceptable.
4. Users shall have administrator and user definable access privileges.
5. OpenAPI interface with XML data output.

E. Schedules:

1. The WBA shall provide user with access to setting Internet Programmable Thermostat (IPT) schedules. Up to 12 schedule periods per day shall be available for each IPT.
2. Schedules shall be available as Weekly (7-day), Daily, or Weekday/Weekend (5-2).
3. The WBA shall provide the user the ability to:

    a. View Schedules.
    b. Add/Modify Schedules.
    c. Assign Thermostat to a Group Schedule.
    d. Delete Schedules.

F. Trending

1. The WBA shall provide real-time trend information on:

    a. Each IPT's space temperature.
    b. Each IPT's temperature set points.
    c. Each IPT's current call; heat, cool, and/or fan.
    d. Each IEE's call for economization

2. The WBA shall be able to record and provide at least two years of past trend data for every thermostat in the wireless network. Trend data shall include:

    a. space temperature; with resolution of every 1/10th of a degree Fahrenheit.
    b. IPT's temperature set points.
    c. indication of whether the thermostat was calling for; heat, cool, and/or fan.

3. Trend data shall be viewable on the WBS

G. Alarm Notifications

1. The WBA shall provide automatic alarming functionally based on real-time monitoring of at least:

    a. space temperature and temperature change.
    b. IPT's temperature set points.
    c. IPT's current call; heat, cool, and/or fan.

2. The WBA shall be able to provide a user with the ability to:

    a. View Alarms.
    b. Set Alarm Notification sensitivity level to High, Medium, or Low.
    c. Delete Alarms.

3. Alarms shall be able to be sent via email and/or text message to up to 100 or more clients.

H. Consumption Usage

1. The WBA shall be able to calculate and graphically display the consumption of running a single zone HVAC unit based on a user defined HVAC unit heat and/or cool consumption rate multiplied by the thermostat heat/cool call time.
2. The WBA shall be able to calculate and graphically display the cost of consumption of running a single zone HVAC unit based on taking a user defined HVAC unit heat and/or cool consumption and multiplying that by the client defined cost per kw and/or therm.
3. The WBA shall be able to display consumption usage for a single thermostat, multiple thermostats at a single time, or all the thermostats in the EMS.
4. The WBA shall be able to record and display up to at least two years of consumption usage information.

2.05 WIRED REMOTE TEMPERATURE SENSORS AND DIGITAL ALARM INPUT

A. Input Temperature Sensor (ITS).

1. The ITS shall connect to the Internet Programmable Thermostat over 3-wires.
2. ITS shall provide at least one external 10K Type II thermistor temperature sensor input.
3. Web Based App shall be able to record and provide at least two years of past temperature data for ITS.
4. The trend data shall be viewable on the WBA.
5. ITS must be accurate to ±1.0℉
6. ITS must be able to be installed up to 500' away from IPT using standard thermostat wiring.

2.06 INTERNET ENABLED ECONOMIZER (IEE)

A. The IEE shall connect to the Internet Programmable Thermostat (ITS) with ONLY 3-wires. No additional wiring must be required between the IEE and the ITS to gain complete Title 24 compliant economization control.

B. IEE shall provide up to three 10K Type II external thermistor temperature sensor input.

C. Web Based App shall be able to record and provide at least two years of past data for IEE. Data must represent historical representations of:

1. Calls for Economization
2. Outside Air Damper Position
3. Supply and Outside Air Temperature

D. The trend data shall be viewable on the WBA.

E. IEE must be able to send California Title 24 Fault and Diagnostics codes to the WBA, email addresses, and or text messages.

F. IEE must be able to be installed up to 500' away from IPT using standard thermostat wiring.

G. IEE must have a settable 0-10VDC output for Outside Air Damper Actuator control.

H. IEE must have a settable 0-10VDC output for Variable Frequency Drive (VFD) control.

1. IEE must be configurable for different VFD speeds based on calls for cold, heat, and ventilation.

I. IEE must have a 0-10VDC input for Outside Air Damper Position Feedback.

2.07 WIRELESS PROXIMITY SENSORS

A. Wireless Proximity Sensor (WPS).

1. The WPS shall connect with the Internet Programmable Thermostat over the 802.15.4 wireless network.
2. WPS shall be powered by 2 AA batteries or equivalent.
3. WPS must be able to be used for either:

a. Accepting a motion sensor's 2-wire dry contact output.

1) The WPS shall be able to notify an Internet Programmable Thermostat if a motion sensor's dry contact is in either the open or closed position.
2) Dry contact open positions will indicate that the space is occupied and the IPT must be able to automatically setback its temperature setting by a range of 0℉ - 10℉ or OFF.
3) Dry contact closed position will indicate that the space is unoccupied and set the temperature to a comfort setting when the space is occupied.
4) Setback settings and comfort settings must be settable through the Internet Programmable Thermostat's schedule through the Web Based App (cannot be settable at thermostat).
5) Web Based App must be able to display when a space is "Unoccupied".

b. Detecting if a Window OR Door is Opened or Closed.

1) The WPS must have a built-in magnetic sensor and come with a magnet that can be installed on a door OR window.
2) The WPS must be able to notify an Internet Programmable Thermostat if the door is open and the IPT must automatically turn to the OFF position.
3) The WPS must be able to notify an Internet Programmable Thermostat if the door is closed and the IPT must automatically return to its last temperature and system settings.
4) Web Based App must be able to display when the Door OR Window is Open and must be able to be set to indicate "Door" or "Window".

4. Web Based App shall be able to notify if the WPS batteries are low and record and provide at least two years of past history on occupancy and/or door/window status for each space a WPS is installed in.
5. The trend data shall be viewable on the Web Based App.
6. Internet Programmable Thermostat must be able to connect with at least 8 WPS, each WPS must have a unique serial number and each WPS shall be settable, through the Web Based App, as either a motion sensor input or as a door/window sensor.

PART 3 - EXECUTION

3.01 CONTRACTOR RESPONSIBILITIES

A. General

1. Installation of the Energy Management System shall be performed by an approved Contractor. The Contractor shall certify all work as proper and complete. Under no circumstances shall the design, scheduling, coordination, programming, training, and warranty requirements for the project be delegated to a subcontractor without prior written approval of the owner.

B. Demolition

1. Remove controls which do not remain as part of the Energy Management System. The Owner will inform the Contractor of any equipment which is to be removed that will remain the property of the Owner. All other equipment which is removed will be disposed of by the Contractor.

C. Access to Site

1. Unless notified otherwise, entrance to building is restricted. No one will be permitted to enter the building unless their names have been cleared with the District or the District's Representative.

D. Code Compliance

1. All wiring shall be installed in accordance with all applicable electrical codes and will comply with equipment manufacturer's recommendations.

E. Cleanup

1. At the completion of the work, all equipment pertinent to this contract shall be checked and thoroughly cleaned, and all other areas shall be cleaned around equipment provided under this contract.

3.02 WIRING, CONDUIT, AND CABLE

A. All control wires between HVAC units and thermostat locations to be furnished and installed by others. The EMS contractor shall not begin work on this contract until all wiring is installed to the satisfaction of the EMS contractor. The EMS contractor shall provide wiring between remote temperature sensors, TA1 and thermostats as required, unless noted otherwise in drawings or specifications.

3.03 HARDWARE INSTALLATION

A. Installation Practices for Devices

1. All devices are to be mounted level/plumb and per the manufacturer's installation documentation.

B. Identification

1. Identify all control wires with labeling tape or sleeves using either words, letters, or numbers that can be exactly cross-referenced with as-built drawings.
2. All field enclosures, other than controllers, shall be identified with a back lite nameplate. The lettering shall be in white against a black or blue background.
3. Junction box covers will be marked to indicate that they are a part of the EMS system.
4. All I/O field devices (except space sensors) that are not mounted within FIP's shall be identified with name plates.
5. All I/O field devices inside FIP's shall be labeled.

C. Existing Controls.

1. Existing controls are not to be reused. All EMS devices will be new.

D. Control System Switch-over

1. The Contractor shall minimize control system downtime during switch-over. Sufficient installation mechanics will be on site so that the entire switch-over can be accomplished in a reasonable time frame.

E. Location

1. The location of sensors is per mechanical and architectural drawings.
2. Space humidity or temperature sensors will be mounted away from machinery generating heat, direct light, and diffuser air streams.
3. If Input Temperature Sensor(s) (ITS) is used as Outdoor air sensor, Outdoor air sensors will be mounted on the north building face directly in the outside air. Install sensors such that the effects of heat radiated from the building or sunlight is minimized.
4. If any line voltage electrical control is being installed, field enclosures shall be located immediately adjacent to the controller panel(s) to which it is being interfaced.

3.04 SYSTEM PROGRAMMING

A. General.

1. The Contractor shall provide all labor necessary to install, initialize, start-up and debug all system software as described in this section. This includes any operating system software.
2. Contractor shall work with owner's representative to determine programming parameters including but not limited to hours of operation, set points, system variables, thermostat naming, and site naming. Thermostat & Site naming shall be performed by the contractor. Naming convention (equipment # or name, or space served) shall be provided by or agreed upon with the Owner.

3.05 COMMISSIONING AND SYSTEM STARTUP

A. EMS device functional testing.

1. Each system for which a EMS device has been installed shall be tested for proper installation and functional operation. Test shall include on-site control test to verify each wireless device is responding to signals sent from cloud based servers and responding in accordance with manufacture's specifications.

END OF SECTION 23 09 23

SECTION 23 80 00
HEATING, VENTILATING AND AIR CONDITIONING

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Roof mounted air conditioning units.
2. Fans.
3. Kitchen exhaust hood – type 1.
4. Kitchen exhaust hood – type 2.
5. Relief and intake vents.
6. Louvers.
7. Air inlets and outlets.
8. Filters.
9. Dampers.
10. Ductwork.
11. Hydronic Piping.
12. Valves.
13. Insulation.
14. Thermal hanger shield inserts.

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 23 00 50, Basic HVAC Materials and Methods.

C. Section 23 05 93, Testing, Adjusting, and Balancing for HVAC.

D. Section 23 09 23, Energy Management Systems for HVAC.

1.03 ACTION SUBMITTALS

A. For additional requirements, refer to Section 23 00 50, Basic HVAC Materials and Methods.

B. Product Data: Submit manufacturer's technical product data, including rated capacities of selected model clearly indicated, dimensions, weight, corner, or mounting point weights, furnished specialties and accessories; and installation and start-up instructions. Product data shall include applicable product listings and standards. Refer to Section 23 00 50, Basic HVAC Material and Methods for additional requirements.

1. Upon approval of submittal, provide manufacturer’s installation and operating instructions to the Project inspector for the following:

a. Fire dampers, smoke dampers, and combination smoke-fire dampers.
b. Type 1 kitchen exhaust field applied grease duct enclosures.

C. Engineering Data: Submit fan curves and sound power level data for each fan unit. Data shall be at the scheduled capacity. Data shall include the name of the rating agency or independent laboratory.

1.04 INFORMATIONAL SUBMITTALS

A. For additional requirements, refer to Section 23 00 50, Basic HVAC Materials and Methods.

B. Roof Curb Data: For roof mounted equipment where combined weight of equipment unit and roof curb or rail exceeds 400 pounds, submit calculations from manufacturer for roof curbs proving compliance with the seismic requirements of the California Building Code, and ASCE 7-16. Manufacturer shall certify that roof curbs are suitable for use indicated on Drawings and in Specifications for the seismic design category indicated in structural Contract Documents. Calculations shall be stamped and signed by a State of California registered structural engineer. If the roof curb does not match the approved drawings, the substituted curb and calculations shall be submitted to DSA for approval.

C. Economizer Fault Detection and Diagnostics (FDD) System Data: For all air-cooled unitary direct-expansion units equipped with an economizer, provide data for third-party supplied California Energy Commission certified FDD controller, documenting compliance with the requirements of California Building Energy Efficiency Standards. Provide evidence of certification.

D. Record of pre-installation meeting.

E. Coordinated Layouts: Submit coordinated layouts. For requirements refer to article, Coordinated Layouts, in this Section.

1.05 CLOSEOUT SUBMITTALS

A. For additional requirements, refer to Section 23 00 50, Basic HVAC Materials and Methods.

B. Maintenance Data: Submit maintenance data and parts list for each piece of equipment, control, and accessory; including "trouble-shooting guide," in Operation and Maintenance Manual.

C. Record Drawings: Submit Record Drawings of installed ductwork, duct accessories, and outlets and inlets in accordance with requirements of Division 01.

1.06 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Belts: One set(s) for each belt-driven unit.
2. Provide one complete set(s) of filters for each filter bank.

1.07 COORDINATED LAYOUT

A. Coordinated layouts are required to amplify, expand and coordinate the information contained in the Contract Documents.

B. Provide minimum 1/4 inch equals one foot scaled coordinated layout drawings showing plan and pertinent section or elevation views of piping, ductwork, equipment, accessories, and electrical systems. Drawings shall be reproducible and work of each trade represented shall be fully coordinated with structure, other disciplines, and finished surfaces. Drawings shall be presented on a single size sheet. Coordinated layout drawings shall have title block, key plan, north arrow, and sufficient grid lines to provide cross-reference to design Drawings.

1. Provide a stamp or title block on each drawing with locations for signatures from all contractors involved, including but not limited to the General, HVAC, Plumbing, Fire Protection, and Electrical contractors. Include statement for signature that the contractor has reviewed the coordinated layout drawings in detail and has coordinated the work of his trade.
2. Show on drawings the intended elevation of all ductwork in accordance with the following example:

   a. B.O.D. = 9'-0"
   OFFSET UP 6"
   B.O.D. = 9'-6"

3. Highlight, encircle or otherwise indicate deviations from the Contract Documents on the coordinated layouts. Architect will not be responsible for identifying deviations from the original Contract Documents.

C. Since scale of contract drawings is small and all offsets and fittings are not shown, Contractor shall make allowances in bid for additional coordination time, detailing, fittings, offsets, hangers, and the like to achieve a fully coordinated installation. If changes in duct size are required, equivalent area shall be maintained and the aspect ratio shall not be in excess of 2 to 1 unless approved by the engineer. Drawings shall be submitted for review prior to fabrication and installation. Drawings may be submitted in packages representing at least one quarter of the building ductwork.

D. Check routing on all ductwork before fabricating. Report any discrepancies to Architect. No extra cost will be allowed for failure to conform to above.

1.08 QUALITY ASSURANCE

A. Design Criteria:

1. All equipment and accessories to be the product of a manufacturer regularly engaged in its manufacture. All gas-fired equipment shall be UL, ETL or CSA listed.
2. Supply all equipment and accessories in accordance with requirements of applicable national, state, and local codes.
3. All items of a given type shall be products of the same manufacturer.
4. Scheduled equipment performance is minimum capacity required.
5. Scheduled electrical capacity shall be considered as maximum available.
6. Scheduled gas BTU input shall be considered as maximum available.

1.09 FIELD CONDITIONS

A. Interruption of Existing Services: Do not interrupt services to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary services according to requirements indicated:

1. Notify Architect no fewer than two days in advance of proposed interruption of services.
2. Do not interrupt services without Architect's written permission.

1.10 WARRANTY

A. Air Conditioning Unit, Roof-Mounted:

1. Compressor shall have a five-year warranty.

2. Standard heat exchanger shall have a ten-year warranty.

B. Air Cooled Condensing Unit: Unit shall have 5-year limited compressor warranty.

PART 2 - PRODUCTS

2.01 MATERIALS

A. 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 GAS FIRED EQUIPMENT

A. All gas-fired equipment shall be listed for use as a gas appliance.

B. All units shall comply with the emissions requirements of the Air Quality Management District (AQMD) in which they are to be installed.

2.03 AIR CONDITIONING UNIT, ROOF-MOUNTED

A. Provide factory assembled single packaged outdoor rooftop mounted, electrically controlled gas heating and electric cooling unit, rated in accordance with ARI Standards 210/240 or 340/360, and ETL or UL listed and labeled, classified in accordance with UL 1995. Provide refrigerant charge R-410A, all internal wiring, piping, controls, and special features required prior to field startup. Design unit to conform to the following:

1. California NOx emission requirements.
2. ASHRAE 15.
3. ASHRAE 90.1.
4. Insulation, adhesive, and all materials exposed to air stream shall meet NFPA 90A requirements for flame spread and smoke generation.
5. Unit casing shall be capable of withstanding 500-hour salt spray exposure per ASTM B117 (scribed specimen).

B. Unit shall be rated in accordance with ARI sound standards 270 or 370.

C. Unit shall be ETL or UL tested and certified in accordance with ANSI Z21.47 Standards as a total package.

D. Roof curb shall be designed to conform to NRCA Standards.

E. Unit shall be designed and manufactured in accordance with ISO 9001.

F. For unit sizes applicable to Energy Star program, units shall be Energy Star qualified.

G. Cabinet:

1. Provide galvanized steel unit cabinet, bonderized and coated with a baked enamel finish.
2. All airstream interior surfaces shall be insulated with a minimum 1/2 inch thick, 1.5 lb density cleanable insulation. Insulation shall be encapsulated with panel design or have sealed edges.
3. Cabinet panels shall be hinged with integrated non-corrosive hinges. Provide hinged access panels for the filter, compressors, evaporator fan, and control box/ heat section areas. Each panel shall have multiple latches and handles. Each external hinged access panel shall be permanently attached to the rooftop unit.
4. Return air filters shall be accessible through a dedicated hinged access panel.
5. Fork lift slots and rigging holes shall be provided in unit base rails. Base rails shall be minimum 16 gauge.

6. Unit shall have an integral sloped condensate drain pan, providing minimum 3/4 in.-14 NPT connections for horizontal drain configuration. Provide unit with alternate vertical thru-the-bottom drain connection when furnished as standard for units sizes scheduled on Drawings. See Drawings for drain configuration. Pan shall be removable for cleaning and maintenance. All drain pans shall conform to ASHRAE 62.1 self-draining provisions.
7. Unit shall have standard side and alternate field or factory installed thru-the-bottom power and control wiring connection capability. Thru-the-bottom electrical connections shall use manufacturer's approved water-tight connection method.
8. Unit shall be field convertible to, or factory furnished with, horizontal air discharge, as applicable for unit sizes as scheduled on Drawings.

H. Fans:

1. Centrifugal supply air blower (evaporator fan) shall have sealed, permanently lubricated ball bearings, or rigid pillow block bearings, as supplied as standard equipment for unit sizes scheduled on Drawings. Units supplied with pillow block bearings shall be furnished with accessible lubricant fittings. Provide belt-driven double inlet fan wheel, centrifugal type with forward curved blades and adjustable sheaves. Multiple speed direct drive motors may be utilized when supplied as standard equipment for efficiency and electrical requirements as scheduled on the Drawings. Fan wheel shall be steel, with corrosion resistant finish, dynamically balanced.
2. Condenser fans shall be of the direct-driven propeller type, with corrosion-resistant aluminum blades. Fans shall be dynamically balanced and discharge air upwards. Induced-draft blower shall be of the direct-driven, single inlet, forward-curved, centrifugal type, made from aluminized steel with a corrosion-resistant finish and shall be dynamically balanced.
3. Induced draft fan shall be of the direct driven, single inlet, forward-curved centrifugal type. Fan wheel shall be steel, with corrosion resistant finish, dynamically balanced.

I. Motors:

1. Compressor motors shall be cooled by refrigerant gas passing through motor windings and shall have line break thermal and current overload protection.
2. Evaporator fan motor shall have permanently lubricated, sealed bearings and inherent automatic-reset thermal overload protection or manual reset calibrated circuit breakers.
3. Totally enclosed condenser-fan motor shall have permanently lubricated, sealed bearings, and inherent automatic-reset thermal overload protection.
4. Induced-draft motor shall have permanently lubricated sealed bearings and inherent automatic-reset thermal overload protection.
5. For single-phase fan motors sized larger than 1/12 hp and smaller than 1 hp, refer to Article, Electric Motors, in Section 23 00 50, Basic HVAC Materials and Methods.

J. Compressor:

1. Fully hermetic, scroll type with internal high-pressure and temperature protection.
2. Factory installed rubber shock mounted and internally spring mounted for vibration isolation.
3. Compressor Anti-Recycle Timer: Compressor shall be prevented from restarting for a minimum of five minutes after shutdown, with manufacturers installed compressor cycle delay.

K. Coils:

1. Standard evaporator and condenser coils shall have aluminum plate fins mechanically bonded to seamless internally finned copper tubes with all joints brazed.
2. Units shall have face-split type evaporator coils.
3. For units with single compressor, condenser coils shall be single slab, single pass design. For dual compressor units, condenser coils shall be single slab, 2 pass design.
4. Evaporator coils shall be leak tested at minimum 150 psig, and pressure tested at minimum 450 psig.
5. Condenser coils shall be leak tested at minimum 150 psig, and pressure tested at minimum 650 psig.

L. Heating Section:

1. Induced-draft combustion type with direct-spark ignition system and redundant main gas valve with 2-stage capability on all 3-phase units.
2. Heat Exchanger:

    a. The standard aluminized heat exchanger shall be of the tubular-section type constructed of minimum 20-gage aluminized steel.

3. Burners shall be of the in-shot type constructed of aluminum-coated steel.
4. All gas piping shall enter the unit at a single location. Gas entry shall be through side or bottom of unit. See Drawings for gas entry location. When bottom gas entry is utilized, unit shall be furnished with field installed conversion kit, arranged so that gas shut-off valve is accessible from the roof.
5. All factory-installed orifices are for operation up to 2,000 feet of altitude. For altitudes between 2,000 feet and 7,000 feet, a factory certified kit shall be furnished for field installation.
6. Units shall be suitable for use with natural gas or propane. Provide field-installed propane conversion kit as required, see schedule on Drawings.
7. The integrated gas controller board shall include gas heat operation fault notification using an LED (light-emitting diode).
8. Unit shall be equipped with anti-cycle protection with one short cycle on unit flame rollout switch or 4 continuous short cycles on the high-temperature limit switch. Fault indication shall be made using an LED.
9. The integrated gas controller board shall contain algorithms that modify evaporator-fan operation to prevent future cycling on high-temperature limit switch.
10. The LED shall be visible without removal of control box access panel.
11. Gas burner tray shall be removable for maintenance.
12. Heating section shall be insulated with foil-faced fiberglass insulation.

M. Refrigerant Components:

1. Each refrigerant circuit shall include:

    a. Balanced port thermostatic expansion valve (TXV) with removable power element.
    b. Solid core refrigerant filter driers with pressure ports.
    c. Refrigerant pressure gage ports and connections on suction, discharge, and liquid lines.

N. Filter Section:

1. Standard filter section shall accommodate 2 inch deep filters. Filters shall conform to the “Air Filters” Article in this Specification Section.

2. Filter section shall use standard size filters.

O. Controls:

1. Unit shall be complete with self-contained low voltage fuse protected control circuit. Refer to equipment schedule, sequence of operation and control diagram on Drawings for additional requirements.
2. When third party direct digital controls with an Energy Management System will be utilized, provide electro-mechanical controls with 24V thermostat interface.
3. When stand-alone thermostat operation is utilized, provide electro-mechanical controls with 24V thermostat interface, or provide microprocessor controls.
4. When stand-alone thermostat operation is utilized for single-zone VAV units, provide microprocessor controls. Units shall have factory mounted supply fan variable frequency drives.
5. When third party direct digital controls with an Energy Management System will be utilized for single zone VAV units, provide microprocessor controls with BACnet or LON interface. Units shall have factory mounted supply fan variable frequency drives.
6. Electro-mechanical controls shall include the following, as a minimum:

    a. Service run test capability.
    b. Provide compressor minimum run time (3 minutes) and minimum off time (5 minutes).
    c. Economizer control.
    d. Unit shall have 35° F low ambient cooling operation.
    e. Time delay relay.

7. Microprocessor controls shall include the following, as a minimum:

    a. User diagnostic interface.
    b. Unit control with standard suction pressure transducers and condensing temperature thermistors.
    c. Shall provide a 5° F temperature difference between cooling and heating set points to meet ASHRAE 90.1 energy standard.
    d. Service run test capability.
    e. Shall accept input from a CO2 sensor (indoor).
    f. Configurable alarm light shall be provided which activates when certain types of alarms occur.
    g. Provide compressor minimum run time (3 minutes) and minimum off time (5 minutes).
    h. Service diagnostic mode.
    i. Economizer control.
    j. Unit shall have 0° F low ambient cooling operation.
    k. Time delay relay.

P. Safeties:

1. Unit shall incorporate a solid-state compressor lockout that provides optional reset capability at the space thermostat, should any of the following safety devices trip and shut off compressor:

    a. Compressor lockout protection provided for either internal or external overload.
    b. Low-pressure protection.
    c. Freeze protection (evaporator coil).
    d. High-pressure protection (high pressure switch or internal).
    e. Compressor reverse rotation protection.

f. Loss of charge protection.
g. Start assist on singe-phase units.

2. Supply-air sensor shall be located in the unit and detect both heating and cooling operation.
3. Induced draft heating section shall be provided with the following minimum protections:

a. High-temperature limit switch.
b. Induced-draft motor speed sensor.
c. Flame rollout switch.
d. Flame proving controls.
e. Redundant gas valve.

4. Phase Protection: Provide unit-mounted “SymCom,” or equal, Motor Saver three phase voltage monitor, model 201A or equal, adjustable voltage range for each unit, install per manufacturer's recommendations, mount in NEMA 3R enclosure if exposed to the weather.

a. Units shall provide the following features:

1) Low voltage fault trip and reset.
2) Voltage unbalance/phasing fault trip and reset.
3) High voltage fault trip and reset.
4) Transient Protection (Internal).
5) Automatic restart.

b. Provide each unit with 600V socket, “SymCom” model OT08, or equal.

Q. Operating Characteristics:

1. Unit shall be capable of starting and running at 125° F ambient outdoor temperature per maximum load criteria of ARI Standards 210 or 360.
2. Unit will operate in cooling down to an outdoor ambient temperature of 35° F.
3. Unit shall be provided with fan time delay to prevent cold air delivery in heating mode.

R. Electrical Requirements:

1. All unit power wiring shall enter unit cabinet at a single location. Both unit side and bottom power entry provisions shall be provided. Refer to Drawings schedule for thru-the-bottom power wiring requirement.

S. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:

1. Carrier Corporation.
2. Trane Inc.
3. Johnson Controls, Inc.

T. Provide the following additional features and equipment:

1. Roof Curb: Formed galvanized steel with wood nailer strip capable of supporting entire unit weight. Provide 3 inch wide bottom flange.
2. Provide heavy-duty 18 gauge expanded metal coil guard grille to protect all surfaces of the condensing coil. Coil guard by Micrometl, Canfab, or equal.
3. Modulating Power Exhaust Economizer: Micrometl, Canfab, or equal. Integrated type capable of simultaneous economizer and compressor operation.

a. Provide self-contained outdoor rooftop system, mounted directly to the return air compartment of the HVAC packaged equipment. Provide differential dry bulb economizer control system and a factory programmed, fully programmable variable frequency drive package controlled by a differential pressure transmitter, mounted directly to the return air compartment of the HVAC packaged equipment. Design the system to continuously maintain space pressure, and provide capability of introducing up to 100 percent outdoor air.

1) Economizer control system shall be certified as meeting the requirements for Fault Detection and Diagnostics (FDD) in the California Building Energy and Efficiency Standards.

b. Provide outside differential pressure tubing termination with hex style pneumatic filter-muffler, minimum filtration 40 microns, 53 SCFM maximum at 100 psi, as manufactured by McMaster-Carr, or equal.
c. Provide hinged cabinet access doors and include latches to provide a tool-less entry for servicing.
d. Provide door lock on the power exhaust cabinet to meet ETL safety requirements.
e. Outdoor air intake dampers shall be low leak not to exceed 3 percent at 1 inch wg pressure differential and include stainless steel side seal and neoprene edge seal. Arrange dampers to close upon loss of power.
f. Provide belt driven exhaust blowers, double inlet, forward-curved centrifugal type. Provide gravity backdraft damper at fan outlet.
g. Provide fully programmable factory programmed variable frequency drive (VFD) package for each fan, driven by 4 to 20 mA signal from a differential pressure transmitter. Pressure transmitters shall measure 0 - 0.1 in wg. Install room sensor tubing with sensor tube termination installed within the room.

1) Where direct digital controls are utilized, provide Belimo, or equal, damper actuator, complete with spring return and all controls required to make the system fully operational.
2) Where stand-alone controls are utilized, provide Belimo, or equal, damper actuator, complete with spring return and all controls, including logic module, required to make the system fully operational.

4. Gas Flue Extensions:

a. Provide at all locations where gas flue outlet will be within 10 feet of an adjacent building forced air inlet, or mechanical unit air intake, and where indicated on Drawings.

5. Other features, accessories, and equipment scheduled on Drawings.

U. Replenish for a period of one year without cost to the Owner all refrigerant and oil required to maintain the proper levels.

V. Owner Training: Manufacturer shall provide two initial on-site 4-hour training sessions for Owners' maintenance personnel. Manufacturer shall provide one 4-hour follow-up training session to be scheduled by Owner within one year of the date of the final initial training session. Training session agenda shall be as follows:

1. First session: Equipment.
2. Second session: Controls.

3. Follow-up session: Agenda by Owner.

2.04 FANS

A. All fans shall be Air Moving and Control Association Inc. (AMCA) labeled.

B. Provide self-aligning, enclosed ball bearings, accessible for lubrication unless specified otherwise.

C. Provide variable speed switch for all direct drive fans.

D. Roof Mounted:

1. Direct or V-belt Drive: Provide one-piece heavy-duty ventilator housings, one piece heavy gauge spun aluminum construction, with weatherproof assembly and integral weather shield. Mount ventilators on curbs furnished by the fan manufacturer. Install with fan assembly level.
2. Fan wheels shall be centrifugal design, statically and dynamically balanced. Tip speed, rpm and motor horsepower shall not exceed listing in manufacturer's catalog for unit specified.
3. Fans shall have integral factory formed base and one piece spinning without welding. Housings shall be provided with wiring channel and are to be of the direct discharge design. Motor and fan assembly shall be on vibration isolating mounts. Fans shall have capacity, speeds and motor sizes as shown.
4. Provide the following accessories:

    a. Gravity backdraft dampers.
    b. Aluminum bird screen with a minimum of 85 percent free area.
    c. Adjustable motor pulley.
    d. Provide grease collection tray for kitchen exhaust fans.
    e. Provide ventilated roof curb for kitchen exhaust fans where exhaust duct is mounted within rated shaft.
    f. Provide hinge kit for kitchen hood exhaust fans.

E. In-Line Centrifugal Fans:

1. Centrifugal fan with airfoil blades, aluminum or steel housing, externally mounted belt-drive motor, external lube tubes, integral support brackets.
2. Provide sloped roof or flat roof type roof cap, or wall cap to suit the location indicated on the Drawings.

F. Ceiling Mounted Fans:

1. Acoustic lined cabinet, built-in back draft damper, vibration isolated fan and motor, variable speed switch.
2. Provide sloped roof or flat roof type roof cap, or wall cap to suit the location indicated on the Drawings.

G. Fan Drives:

1. Drive Design: The design horsepower rating of each drive shall be at least 1.5 times, single belt drives 2 times, the nameplate rating of the motor with proper allowances for sheave diameters, speed ratio, arcs of contact and belt length.
2. Provide variable speed drives, Dayco, Browning, Woods, or equal. Allow for replacement of fan and motor drives and belts as required to suit the balance requirements of the project.
3. Select variable speed drives to allow an increase or decrease of minimum of ten percent of design fan speed.

H. Motors:

1. Motors of 25 HP and less shall have adjustable pitch sheaves; sheaves on motors above 25 HP may be non-adjustable. Change, at no extra cost to Owner, the non-adjustable sheaves to obtain desired air quantities.
2. For single-phase fan motors sized larger than 1/12 hp and smaller than 1 hp, refer to Article, Electric Motors, in Section 23 00 50, Basic HVAC Materials and Methods.

I. Sheaves: Sheaves shall be cast or fabricated, bored to size or bushed with fully split tapered bushings to fit properly on the shafts. All sheaves shall be secured with keys and set screws.

J. Belts:

1. All belts shall be furnished in matched sets.
2. Belts shall be within 1 degree 30 minutes of true alignment in all cases.

K. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:

1. Greenheck Fan Corporation.
2. Loren Cook Company.
3. PennBarry.
4. American Coolair Corporation.

L. Fly Fan (Air Curtain)

1. Manufacturer's standard, high velocity, non-recirculating type. Units for kitchens or food storage shall comply with NSF 37.
2. Casing: Sheet metal or polycarbonate plastic. Provide internal or external vibration isolation to effectively prevent transmission of vibration and noise from units to building structure. Units shall completely house all parts and have manufacturer's standard finish coating.
3. Fans: Ruggedly constructed, statically and dynamically balanced. Noise level shall not exceed 77 dBA measured at 5 feet distance.
4. Air Discharge Outlet Nozzle: Cover full width of door opening. Fan discharge ducts, plenum, flow control vanes and nozzles shall provide a uniform distribution of air over entire length of door. Provide adjustable volume and directional control.
5. Heating Coil: Provide electric heating coil. Maximum discharge air temperature shall be 120 degrees F.
6. Controls: Provide on-off door operated switch. The "on-off" switch circuit shall close to start fan motors when door starts to open and open when the door reaches closed position. A local disconnect switch for each fan motor shall be provided and shall be mounted to be accessible without use of ladder.
7. Motors: Provide heavy-duty totally enclosed fan motor, sealed ball bearings, resilient mounting, automatic thermal overload switch, UL listed. Provide weather protection for motor and electrical equipment.
8. Available Manufacturers: Subject to compliance with requirements, manufacturers offering air doors / fly fans which may be incorporated in the work include the following, or equal:

    a. Mars Air Products; Mars Air Door Division.
    b. Berner International.
    c. Fantech.

M. Owner Training: Manufacturer shall provide one on-site 1-hour training session for Owners' maintenance personnel.

2.05 KITCHEN EXHAUST HOOD – TYPE 1

A. Furnish packaged pre-manufactured ventilator, constructed of stainless steel, complete with baffles and lights. Unit shall be equal to that specified in equipment schedule.

B. Each ventilator shall be a high velocity type grease extractor.

1. Centrifugal grease extraction efficiency of 90 percent to be accomplished without the use of filters, cartridges, or constant running water. (Verify with hood selected)

C. Compensating ventilators shall not be of the short-circuiting type. Furnish integral front face discharge for up to 80 percent make-up air of the exhausted air.

D. Construction: The ventilator shall be of all stainless steel construction not less than 18 gauge, Type 304, number 4 finish. The assembly at joints and seams shall be liquid tight and all exposed external welds shall be ground and polished to match the original finish of the metal. All unexposed surfaces shall be constructed of minimum 18 gauge galvanized steel, including but not limited to duct, plenums, framing and brackets. Provide stainless steel closure panels as required for a complete finish, satisfactory to the Architect.

E. Filters: Grease Filters shall be manufactured in accordance with UL 1046.

F. Approvals: Ventilators to be listed or recognized by ICBO (refer to Research Report 2064), NSF, UL and in accordance with all recommendations of NFPA's Standard #96.

G. Fire Suppression System:

1. Fire suppression system shall be listed and labeled as conforming to NFPA 17A and UL 300, current edition.
2. Furnish wet chemical system to protect the hood, exhaust duct and cooking appliances against fire. The system shall be installed by an authorized distributor in accordance with NFPA 96, NFPA 17A, UL listings, and the requirements of authorities having jurisdiction.
3. The system shall be manually operable at the release. The system shall contain a fusible link series detector system for automatic actuation of the system. Actuation of the system shall provide automatic mechanical gas valve line shutoff. Provide manual operation, with local actuation at the tank enclosure.
4. System shall consist of suppressant, pressurizing cartridge, Schedule 40 piping and nozzles. Provide system with fresh cartridge. Provide stainless steel enclosure for cartridge, regulated release mechanism, regulator and all other material required for operation of the system.
5. System shall be Ansul R102, Kidde, or equal. Provide multiple system if required.
6. Upon completion of the installation of the fire suppression system a test of the system shall be conducted in the presence of the enforcing agency.

H. Owner Training: Manufacturer shall provide one on-site 1-hour training session for Owners' maintenance personnel.

2.06 KITCHEN EXHAUST HOOD – TYPE 2

A. General:

1. Furnish ventilator hood of size and qualities as indicated on plans, the ventilator shall be of all stainless steel construction not less than 18 gauge, Type 304, Number 4 finish.
2. Furnish condensate hoods with full perimeter welded condensate collecting gutter with 1/2 inch NPT stainless steel drain fitting.

B. Approvals: Ventilators to be listed or recognized by ICC (Research Report 2064), NSF, UL, and in accordance with all recommendations of NFPA-96.

C. Owner Training: Manufacturer shall provide one on-site 1-hour training session for Owners' maintenance personnel.

2.07 RELIEF AND INTAKE VENTS

A. Galvanized steel housing with 1/2 inch mesh screen, counterbalanced backdraft damper and matching prefabricated curb. Omit backdraft damper on intake vents. Provide pitched roof curb for relief vents, and install with backdraft damper level.

B. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:

1. Greenheck Fan Corporation.
2. Lauren Cook Company.
3. PennBarry.
4. American Coolair Corporation.

2.08 LOUVERS

A. Louvers shall be minimum 16 gauge steel with Bonderite and Epon gray primer and 1/2 inch square mesh, 16 gauge galvanized steel screen on the inside. Louvers shall be Airolite #609, Arrow United Industries, or equal, with 4 inch louver depth.

2.09 AIR INLETS AND OUTLETS

A. Except as otherwise indicated, provide manufacturer's standard inlets and outlets where shown; of size, shape, capacity, and type indicated; constructed of materials and components as indicated, and as required for complete installation.

B. Ceiling, wall, or floor Compatibility: Provide inlets and outlets with border styles that are compatible with adjacent ceiling, wall, or floor systems, and that are specifically manufactured to fit into ceiling, wall, or floor module with accurate fit and adequate support. Refer to general construction drawings and specifications for types of ceiling systems that will contain each type of air outlet and inlet.

C. Refer to Schedule on Mechanical Drawings for details of inlets and outlets to be used.

2.10 AIR FILTERS

A. Provide MERV 13 disposable pleated media type. Refer to specific equipment Articles for filter depth and for exceptions to this specification. Filters shall conform to the following:

1. Standards:

a. ASHRAE Standard 52.2-2007.
b. Underwriters Laboratories: U.L. 900, Class 2.

2. Construction:

a. Media: Synthetic or cotton-synthetic blend with radial pleats.
b. Media Frame: High wet-strength beverage board.
c. Media Support: Welded wire or expanded metal grid bonded to air leaving side of the media.

3. Performance: 2” deep filter shall have a maximum initial air resistance of 0.31 inches w.g.

B. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:

1. Camfil Farr, Inc., model 30/30.
2. Flanders Corporation, model 40 LPD.

C. Temporary (Construction Period) Filters:

1. Install new temporary filters in all units that have filter systems installed. Temporary filters shall match the permanent filters that are specified for the units. Replace filters as needed, in accordance with manufacturer’s directions, in order to provide protection for the unit prior to occupancy by the Owner.
2. If air handling units are operated during construction of the project, install temporary filters directly over each return air inlet. Filters shall match the permanent filters that are specified for the units. Select size of filter to completely cover the frame of the return air inlet, and tape filters firmly in place to eliminate any construction debris from entering the duct system or unit. Remove the temporary filters upon completion of the work, and repair all damaged paintwork.

D. Spare Filters:

1. Furnish two new, complete sets of filter cartridges for each filter bank on completion and acceptance of the work. Install one set of filters in units (prior to final air balance). Provide units designed to accommodate washable, permanent filters with one washable, permanent filter.

2.11 DAMPERS

A. Backdraft Dampers: Ruskin CBD2, counterbalanced, Nailer Industries, or equal.

B. Manual Air and Balance Dampers: Provide dampers of single blade type or multi-blade type constructed in accordance with SMACNA, "HVAC Duct Construction Standards," except as noted herein.

1. Rectangular Ductwork:

a. Single damper blades may be used in ducts up to 10 inches in height. Dampers shall be 16 gauge minimum. Provide self-locking regulators, equal to Ventlok 641. Provide end bearings equal to Ventlok 607 at each damper. Provide continuous solid 3/8 inch square shafts.
b. Multiple blade dampers shall be equal to Ruskin CD35 Standard Control Damper. Maximum width for multiple damper blades for use in rectangular duct shall not exceed 6 inches.
c. Where duct velocity may be expected to exceed 1500 fpm, provide Ruskin CD-50, or equal, low leakage dampers with airfoil blades.

2. Round Ductwork:

a. Single damper blades may be used in ducts up to 12 inches in diameter. Provide multiple blade opposed blade dampers, with connected linkage, for ductwork larger than 12 inches in diameter.
b. Damper blades for round ductwork shall be 20 gauge steel for ducts up to 12 inches diameter and 16 gauge steel for dampers larger than 12 inches damper. Provide self-locking regulators, equal to Ventlok 641, Durodyne, or equal for operation of dampers. Provide end bearings equal to Ventlok 607 and provide continuous solid 3/8 inch square shafts.

3. Where ductwork is externally insulated, provide self-locking regulators equal to Ventlok 644, Durodyne, or equal for rectangular ductwork, and Ventlok 637, Durodyne, or equal for round ducts.

C. Fire Dampers and Combination Fire/Smoke Dampers:

1. Fire dampers and combination fire/smoke dampers shall be listed and approved by the California State Fire Marshal. Installation shall conform to the manufacturer's UL approved installation instructions.

a. Fire dampers shall be UL 555 classified and labeled as dynamic fire dampers approved for wall and floor installation. They shall ship from the manufacturer as an assembly with a minimum 20-gauge factory installed sleeve. Sleeve length shall suit the requirements of the wall construction. Each dynamic fire damper/sleeve assembly shall ship complete with factory "roll formed" one-piece angles with pre-punched holes for easy installation. Dynamic fire dampers for vertical installation must consist of a single section on sizes up to 33" x 36" and a single section on sizes up to 24" x 24" for horizontal installation. 1-1/2 hour dynamic fire dampers shall be Ruskin DIBD20, Pottorff, or equal. 3 hour dynamic fire dampers shall be Ruskin DIBD230, Pottorff, or equal.
b. Fire dampers for high pressure/velocity systems where velocities exceed 2000 fpm and/or 4" w.g. pressure fire damper shall be Ruskin FD60, Pottorff, or equal.
c. Fire dampers for ceiling installation shall be UL 555C classified and labeled as ceiling dampers. They shall be provided with a thermal insulating blanket to fit the inlet or outlet condition if required by the application. Ceiling dampers shall be Ruskin CFD 2, 3, 4 or 5. Ceiling dampers for ceilings constructed of wood shall have UL tested in design L501 and shall be Ruskin CFD7, Pottorff, or equal.
d. Combination fire/smoke dampers. Dampers shall be UL classified and labeled as Leakage Class I Smoke Dampers in accordance with the latest version of UL 555S. Dampers shall be warranted to be free from defects in material and workmanship for a period of 5 years after date of shipment. Damper/actuator assembly shall be tested to full open and full close at minimum 2000 fpm 250° F heated air and 4" w.g. with airflow in both directions. (Specified select: 250° / 350°, 2000 fpm/3000 fpm). Each damper shall be equipped with "controlled closure" quick detect heat actuated release device to prevent duct and HVAC component damage resulting from instantaneous damper closure. Release device shall be EFL type and shall allow reset from outside the sleeve after moderate temperature exposure. (Replacement type fusible links not acceptable.)
e. Two position combination fire smoke dampers shall be equipped with one or more factory installed, direct coupled, 120 volt, single phase, electric actuator for energize open – fail close operation. Dampers with multiple actuators shall be factory wired with single point connection at

the EFL heat release device for connection to power. Damper actuator shall include minimum one-year energized hold open (no cycles) and spring return (fail) close reliability. Damper/actuator shall include minimum 20,000 full open-full close cycle performances.

f. Modulating combination fire smoke dampers shall be equipped with one or more factory installed contact for modulating signal connection. Damper/actuator shall include minimum 100,000 full open-full close cycle performances with spring return (fail) close on loss of power.

g. Round combination fire smoke dampers up to 24” diameter shall be true round type with minimum 20 gauge galvanized steel designed for lowest pressure drop and noise performance. Bearings shall be stainless steel sleeve turning in an extruded hole in the frame. Blade seals shall be silicone edge designed to withstand 450° F and galvanized steel mechanically locked in to the blade edge (adhesive type seals are not acceptable). Each damper shall be equipped with a factory-installed sleeve of 17 inches minimum length and factory “roll formed” one-piece angles with pre-punched holes. Dampers shall be Ruskin FSDR25, Pottorff, or equal.

h. Round (larger than 24” diameter) or rectangular combination fire smoke dampers shall include roll-formed structural hat channel frame, reinforced at the corners, formed from a single piece of minimum 16 gauge equivalent thickness formed from single piece galvanized steel. Bearings shall be stainless steel turning in an extruded hole in the frame. Blade edge seals shall be silicone rubber designed to withstand 450° F and galvanized steel mechanically locked in to the blade edge (adhesive type seals are not acceptable). Each damper shall be equipped with a factory-installed sleeve of 17” minimum length and factory “roll formed” one-piece angles with pre-punched holes for easy installation. Dampers shall be Ruskin FSD60, Pottorff, or equal.

i. 3-hour rated combination fire smoke dampers shall be Ruskin model FSD60-3, Pottorff, or equal.

j. All FSD60 type dampers shall be AMCA licensed and shall bear the AMCA Seal for Air Performance. AMCA certified testing shall verify pressure drop does not exceed .03” w.g. at a face velocity of 1,000 fpm on a 24” x 24” damper.

k. Wall type fire/smoke damper:

1) Combination fire/smoke dampers for use in the wall of exit corridors shall be classified and labeled as Leakage Class II Smoke Dampers in accordance with the latest version of UL 555S. Dampers shall meet the requirements for combination fire/smoke dampers in paragraph 3 above except AMCA certified testing shall verify pressure drop does not exceed .07” w.g. at a face velocity of 1,000 fpm on a 24” x 24” damper and blades shall be single skin galvanized steel 10 gauge minimum with 3 longitudinal grooves for reinforcement. Dampers shall be Ruskin FSD36, Pottorff, or equal.

2) Front access combination fire/smoke dampers shall meet all the requirements for combination fire/smoke dampers in paragraph 3 above except pressure drop requirement. In addition the dampers shall be constructed so that actuators and all accessories are accessible from the grille side. Actuators and accessories shall be housed within an integral cabinet on the side of the damper frame and shall not be installed in the air stream in front of the damper. The damper sleeve shall be minimum 14” and flanged to accept a steel framed grille. The

sleeve shall be covered with fire resistant material. Dampers shall be Ruskin FSD60FA, Pottorff, or equal.

l. Ceiling type fire/smoke damper for tunnel type corridor construction: Combination fire/smoke dampers for use in the corridor ceiling of tunnel type corridor construction shall be UL classified and labeled as Corridor Damper. Dampers shall meet the requirements of paragraph 4a above except pressure drop testing does not require AMCA certification. Dampers shall be Ruskin FSD36C, Pottorff, or equal.

m. Fusible links shall have temperature rating approximately 50° F above normal maximum operating temperature of the heat producing appliance.

1) If project requires re-openable fire/smoke dampers, provide Ruskin 165 ° F / 350° F TS150, NCA or equal. The TS150 firestat replaces the EFL and allows the damper to be re-opened from remote location up to 350 ° F. TS150 shall include full open and full closed damper position contacts for interface with remote position indication panel.

2) Each fire/smoke damper shall be equipped with “controlled closure” quick detect heat actuated release device to prevent duct and HVAC component damage. Release device shall allow easy reset after moderate temperature rise outside the sleeve. Heat release device shall be the Ruskin EFL, NCA or equal.

3) Unless the system is using a validation control system, each fire/smoke damper shall be equipped with a control panel including blade position indicator lights and a key operated switch. The panel cover shall be oversized for flush mount into the wall or ceiling and shall have a brushed look. Control panel shall be Ruskin MCP2, Pottorff, or equal.

2. All actuators used for smoke dampers or combination fire/smoke dampers shall have a cycle time requirement of not more than every twelve months and shall be rated for continuous "0n" duty and shall be provided with internal spring return. Actuators shall be equipped with pilot light, remote key test switch, end switch and circuitry to activate pilot light on remote key (test) switch located in corridor ceiling adjacent to damper. Electric motors shall be Invensys MA-250, MA-253, Honeywell H2000, or equal.

D. Where required to suit the size of damper required, provide manufacturers standard UL Classified mullions, arranged to support multiple dampers. Assembly shall be of minimum 16 gauge galvanized steel, complete with all accessory caps and framing members required for installation.

2.12 DUCTWORK

A. Construct and install sheet metal ductwork in accordance with the California Mechanical Code for 2 inches static pressure for supply air, and 2 inches minimum for return and exhaust air unless otherwise noted on Drawings.

1. Where not in conflict with the California Mechanical Code, construct and install all sheet metal ductwork in accordance with SMACNA HVAC Duct Construction Standards (Metal and Flexible). Where applicable for HVAC work, construct and install sheet metal work in accordance with SMACNA Architectural Sheet Metal Manual.
2. Provide variations in duct size, and additional duct fittings as required to clear obstructions and maintain clearances as approved by the Architect at no extra cost to the Owner.

3. Gauges, joints, and bracing shall be in accordance with the California Mechanical Code.
4. Provide beading or cross breaking for all ductwork inside building. Provide cross breaking for ductwork exposed to weather.
5. At the contractor's option, ductwork may be fabricated using the Ductmate, Nexus, Quickduct, Transverse Duct Connection (TDC), Pyramid-Loc duct connection systems, or equal. Fabricate in strict conformance with manufacturer's written installation instructions and in accordance with California Mechanical Code.

    a. Seal flanged ends with pressure sensitive high density, closed cell neoprene or polyethylene tape gasket, Thermo 440, or equal.
    b. Provide metal clips for duct connections, except at breakaway connections for fire dampers and fire smoke dampers. Provide corner clips at each corner of duct, through bolted, at all locations except at breakaway connections for fire dampers and fire smoke dampers. Where used on locations exposed to weather, provide continuous metal clip at top and sides of duct, with 1 inch overhang for top side.

B. Design and installation standards:

1. SMACNA Compliance: Comply with applicable portions of Sheet Metal and Air Conditioning Contractor's National Association (SMACNA) for all work in this section.
2. NFPA Compliance: Comply with ANSI/NFPA 90A, "Standard for the Installation of Air Conditioning and Ventilating Systems," and ANSI/NFPA 90B, "Standard for the Installation of Warm Air Heating and Air Conditioning Systems."
3. California Mechanical Code.

C. Duct sizes indicated are external sizes.

D. Galvanized Sheet Steel: Lock-forming quality, ASTM A924 and ASTM A653, Coating Designation G 90. Provide mill phosphatized finish for exposed surfaces of ducts exposed to view.

1. Provide mill certification for galvanized material at request of the Project Inspector.

E. Duct Sealants:

1. Sealant shall have a VOC content of 250 g/L or less.
2. Sealant shall comply with testing and product requirements of South Coast Air Quality Management District, Rule 1168.
3. Provide one part, non-sag, synthetic latex sealant, formulated with a minimum of 68 percent solids. Sealant shall comply with ASTM E84, Surface Burning Characteristics.

    a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:

        1) Design Polymerics, model DP1010.
        2) Polymer Adhesive Sealant Systems Inc, model Airseal #11.
        3) McGill Airseal, LLC.

F. Duct Support Materials: Except as otherwise indicated, provide hot-dipped galvanized steel fasteners, anchors, straps, trim, and angles for support of ductwork.

G. Rectangular Duct Fabrication:

1. Shop fabricate ductwork of gauges and reinforcement complying with the more stringent of the following standards, except as noted herein.

   a. SMACNA HVAC Duct Construction Standards
   b. California Mechanical Code

2. Fabricate ducts for 2 inch pressure class with minimum duct gauges and reinforcement as follows, except as otherwise noted:

Table A

Duct Dimension	Minimum Gauge	Joint Reinforcement Per CMC
Through 12"	26	Not Required
13" through 18"	24	Not Required
19" through 30"	24	C/4
31" through 42"	22	E/4
43" through 54"	22	F/2
55" through 60"	20	G/4
61" through 84"	20	I/2
85" through 96"	20	J/2
Over 96"	18	K/2

3. Fabricate duct fittings to match adjoining ducts and to comply with duct requirements as applicable to fittings. Except as otherwise indicated, fabricate elbows with center-line radius equal to 1.5 times associated duct width. Fabricate to include single thickness turning vane in elbows where space does not permit the above radius or where square elbows are shown. Limit angular tapers to 30 degrees for contracting tapers and 20 degrees for expanding tapers. Turning vanes shall be E-Z Rail II, Durodyne, or equal.
4. Fabricate round supply connections at rectangular, plenum type fittings using spin-in type fittings, complete with extractor and volume control damper. Refer to Paragraph “DAMPERS” for damper requirements.
5. Provide drive slip or equivalent flat seams for ducts exposed in the conditioned space or where necessary due to space limitations. On ducts with flat seams, provide standard reinforcing on inside of duct. Duct connection to outlet on exposed duct shall be full size of outer perimeter of outlet flange.
6. Ducts exposed in the conditioned space shall be free of dents and blemishes and be mounted tight against adjacent surface with flat hangers. Remove all fabrication labels from ductwork.
7. Provide 20 gauge minimum for ductwork exposed within occupied spaces.

H. Rectangular Internally Insulated Duct Fabrication:

1. Provide internal duct lining where indicated on the Drawings, with a minimum of 10'-0" length in each direction from the fan, fan casing, or unit casing. Line all transfer ducts.

   a. Where ductwork is exposed to weather or outside the building insulation envelope, provide 2 inch thick, 1-1/2 pound density internal lining with matte facing, with an R-Value of 8.0 minimum.
   b. Where ductwork is within the building insulation envelope, lining shall be 1” thick, 1-1/2 pound density, with R-value of 4.2 minimum.
   c. Ducts exposed in the conditioned space shall be free of dents and blemishes and be mounted tight against adjacent surface with flat hangers. Remove all fabrication labels from ductwork.
   d. Where installed exposed in the conditioned space, duct shall be minimum 20 gauge with 1 inch insulation layer (minimum R-value – R-4.2).
   e. Cement duct liner in place with nonflammable, non-hardening duct adhesive. Seal all raw edges of insulation inside ductwork with adhesive, including longitudinal liner edges.
   f. Provide metal nosing at all locations where liner is preceded by unlined metal.
   g. Provide sheet metal weld pins and washers or clinch pins and washers on all ductwork on 12 inch intervals with the first row within 3 inches of the leading edge of each piece of insulation and within 4 inches of corners. No use of adhesive mounted pins will be considered.

      1) Install clinched pin fasteners with properly adjusted automatic fastening equipment. Manual installation will not be considered.
      2) Install weld pins with properly adjusted automatic fastening equipment. Installation shall not damage the galvanized coating on the outside of the duct.

   h. All ductwork, adhesives, lining, sealant, flex duct and the like shall have a flame spread of 25 or less and developed smoke rating of 50 or less when tested in accordance with one of the following test methods: NFPA 255, ASTM E84, or UL 723.
   i. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:

Manufacturer:	Product:
Johns Manville	Linacoustic RC
CertainTeed Corporation	ToughGard
Fosters Adhesive	85-62
Swifts Adhesive	7336

I. Round and Oval Ductwork Fabrication:

1. Round and oval duct and fittings shall be spiral lockseam or longitudinal seam as indicated in table below. Provide couplings to join each length of duct.

   a. At contractors' option, round or oval ductwork may be utilized in place of rectangular ductwork shown on Drawings, provided available space allows installation of round or oval ductwork without compromising space required for installation of products and systems of other trades.

      1) Round or oval ductwork utilized in place of rectangular ductwork shown on Drawings shall be sized to have a static pressure loss equivalent to rectangular duct shown on Drawings.
      2) Unlined round or oval duct shall not be utilized in place of rectangular internally lined ductwork shown on Drawings.

2. Fabricate duct fittings to match adjoining ducts and to comply with duct requirements as applicable to fittings. Except as otherwise indicated, fabricate elbows with center-line radius equal to 1.5 times associated duct width. Provide two-piece, die-stamped, 45-degree to 90-degree elbows for sizes up to 12 inches; five-piece, 90-degree elbows for sizes 12 inches and above; conical tees; and conical laterals. All reducers shall be placed after a tap has been made on the duct main. Reducers shall be long-taper style.
3. Round Ductwork: Construct of galvanized sheet steel complying with ANSI/ASTM A 653 by the following methods and in minimum gauges listed.

Diameter	Minimum Gauge	Method of Manufacture
Up to 14"	26	Spiral Lockseam
15" to 23"	24	Spiral Lockseam
24" to 36"	22	Spiral Lockseam
37" to 50"	20	Spiral Lockseam
51" to 60"	18	Spiral Lockseam
Over 60"	14	Longitudinal Seam

4. Provide locked seams for spiral duct; fusion welded butt seam for longitudinal seam duct.
5. Fittings and Couplings: Construct of minimum gauges listed. Provide continuous welds along seams at exposed ducts. Provide spot weld bonded seams at concealed ducts.

Diameter	Minimum Gauge
3" to 36"	20
38" to 50"	18
Over 50"	16

6. Ducts exposed in the conditioned space shall be free of dents and blemishes and be mounted tight against adjacent surface with flat hangers. Remove all fabrication labels from ductwork.
7. Provide 20 gauge minimum for ductwork exposed within occupied spaces.

J. Round Internally Insulated Duct and Fittings: Where ductwork is exposed to weather or outside the building insulation envelope, construct with outer pressure shell, 2 inch thick (Minimum R-value = R-8) insulation layer, and perforated inner liner. Where ductwork is within the building insulation envelope, construct with outer pressure shell, 1 inch thick (minimum R-value = R4.2) insulation layer, and perforated inner liner. Construct shell and liner of galvanized sheet steel complying with ANSI/ASTM A 653, of spiral lockseam construction (use longitudinal seam for over 59 inches), in minimum gauges listed in table below. Where installed exposed in the conditioned space: duct and fitting outer pressure shell shall be minimum 20 gauge with 1 inch insulation layer (minimum R-value = R-4.2), and perforated inner liner.

Nominal Duct Diameter	Outer Shell	Inner Liner
3" TO 12"	26 gauge	24 gauge
13" TO 24"	24 gauge	24 gauge
25" to 34"	22 gauge	24 gauge
35" to 48"	20 gauge	24 gauge
49" to 58"	18 gauge	24 gauge
Over 59"	16 gauge	20 gauge

1. Fittings and Couplings: Construct of minimum gauges listed. Provide continuous weld along seams of outer shell at exposed ducts. Provide spot weld bonded seams at concealed ducts.

Nominal Duct Diameter	Outer Shell	Inner Liner
3" to 34"	20 gauge	24 gauge
36" to 48"	18 gauge	24 gauge
Over 48"	16 gauge	24 gauge

2. Inner Liner: Perforate with 3/32 inch holes for 22 percent open area. Provide metal spacers welded in position to maintain spacing and concentricity.
3. Ducts exposed in the conditioned space shall be free of dents and blemishes and be mounted tight against adjacent surface with flat hangers. Remove all fabrication labels from ductwork.
4. Where installed exposed in the conditioned space, duct shall be minimum 20 gauge with 1 inch insulation layer (minimum R-value – R-4.2).
5. All ductwork, adhesives, lining, sealant, flex duct and the like shall have a flame spread of 25 or less and developed smoke rating of 50 or less when tested in accordance with one of the following test methods: NFPA 255, ASTM E84, or UL 723.
6. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:

    a. Sheet Metal Div., McGill AirFlow, LLC., Acousti-k27
    b. Semco Duct and Acoustical Products, Inc.
    c. Air Systems Manufacturing, Inc. - Las Vegas

K. Duct Access Doors:

1. Duct Access: Provide hinged access door in rectangular ducts for access to fire dampers, control equipment, etc. Access door size shall be duct diameter wide by duct diameter high for all ducts under 24 inches. Ducts over 24 inches in diameter shall have 24-inch by 18-inch access doors. Minimum size access doors shall be 6 inches by 6 inches.
2. Provide hinged style access doors for round ductwork, NCA Manufacturing, Inc., Model AD-RD-87, Pottorff Series 60, or equal. Access doors shall be 16 gauge galvanized steel with continuous piano hinge. Locks shall be plated steel strike and catch. Provide 1" x 3/8" Polyethylene "Perma Stik" gasket all around door.

L. Flexible Air Ducts:

1. Provide exterior reinforced laminated vapor barrier, fiberglass insulation, encapsulated spring steel wire Helix, and impervious, smooth, non-perforated interior vinyl liner. Individual lengths of flexible ducts shall contain factory fabricated steel connection collars.

    a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:

        1) C.A. Schroeder, Inc., Cal Flex model 2PMJ.
        2) ThermaFlex model M KC.

2. Factory made air ducts shall be approved for the use intended and shall conform to the requirements of UL 181 and NFPA 90A. Each portion of a factory-made air

duct system shall be identified by the manufacturer with a label or other suitable identification indicating compliance with UL 181, Class 1. Ducts shall be UL listed Class 1, maximum 25/50 smoke and flame spread and shall be installed in accordance with the terms of their listing and the requirements of SMACNA HVAC Duct Construction Standards (Metal and Flexible). Factory-made air ducts shall have the following minimum R-values: R-6.0 for ductwork installed within the building insulation envelope, R-8.0 for ductwork installed outside the building insulation envelope.

3. Flexible ductwork shall be maximum of 5 feet long, and shall be extended to the fullest possible length, in order to minimize pressure drop in the duct.
4. Flexible ducts shall be selected for minimum of 6 inch positive static pressure and minimum of 1 inch negative static pressure.

M. Kitchen Exhaust Ducts (Type 1):

1. Fabricate kitchen exhaust ducts and supports used for removal of smoke and grease-laden air from cooking equipment of 16 gauge minimum black steel where concealed and of 18 gauge minimum Type 304 stainless steel where exposed. At Contractor’s option, 18 gauge minimum Type 304 stainless steel may be used where concealed. Finish exposed stainless steel with Number 4 finish. All ductwork shall be of welded construction in accordance with Section 510 of California Mechanical Code. For duct construction, comply with SMACNA "HVAC Duct Construction Standards" and ANSI/NFPA 96 “Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations.”
2. Kitchen Exhaust Duct Access Panels:

    a. Provide listed duct access panel assembly of the same material and gauge used for the duct. Duct access panels shall conform to the following:

        1) Fasteners: Black steel or stainless steel to match material used for the duct. Panel fasteners shall not penetrate duct wall.
        2) Gasket: Comply with NFPA 96, grease-tight, high temperature ceramic fiber, rated for minimum 1500 °F.
        3) Minimum Pressure rating: 10 inches wg., positive or negative.

    b. Available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

        1) Ductmate Industries, Inc.
        2) 3M.
        3) Flame Gard, Inc.

3. Field-Applied Grease Duct Enclosure:

    a. Thermal Ceramics Firemaster FastWrap XL, or equal, field-applied grease duct enclosure listed in accordance with ASTM E 2336.

N. Kitchen Exhaust Ducts (Type 2):

1. Cooking Equipment Exhaust Ducts:

    a. Fabricate kitchen exhaust ducts and supports used for removal of vapor, heat and odors from cooking equipment of 16 gauge minimum black steel where concealed and of 18 gauge minimum Type 304 stainless steel where exposed. At Contractor’s option, 18 gauge minimum Type 304 stainless steel may be used where concealed. Finish exposed

stainless steel with Number 4 finish. All ductwork shall be of welded construction in accordance with Section 510 of California Mechanical Code. For duct construction, comply with SMACNA "HVAC Duct Construction Standards" and ANSI/NFPA 96 “Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations.”

2. Dishwasher Exhaust Ducts:

a. Fabricate dishwasher exhaust ducts and supports used for steam removal from dishwasher of 18 gauge minimum 304 stainless steel. All ductwork shall be of welded construction in accordance with Section 510 of California Mechanical Code. For duct construction, comply with California Mechanical Code, SMACNA "HVAC Duct Construction Standards," and ANSI/NFPA 96 “Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations.”

3. Duct Access Panels:

a. Provide duct access panel assembly of the same material and gauge used for the duct. Duct access panels shall conform to the following:

1) Fasteners: Black steel or stainless steel to match material used for the duct. Panel fasteners shall not penetrate duct wall.
2) Gasket: Comply with NFPA 96, grease-tight, high temperature ceramic fiber, rated for minimum 1500 °F.

O. Flexible Connectors:

1. Materials: Flame-retardant or noncombustible fabrics. Coatings and adhesives shall comply with UL 181, Class 1, with flame spread index of 25 or less, and smoke-developed index of 50 or less.
2. Metal-Edged Connectors: Factory fabricated with a fabric strip 3 inches wide attached to two strips of 3-inch-wide, 0.028-inch-thick, galvanized sheet steel or 0.032-inch-thick aluminum sheets. Provide metal compatible with connected ducts.
3. Flexible Connector Fabric: Glass fabric double coated with weatherproof, synthetic rubber resistant to UV rays and ozone.

a. Minimum Weight: 26 oz./sq. yd.
b. Tensile Strength: Minimum 475 lbf/inch in the warp and minimum 375 lbf/inch in the filling.
c. Service Temperature: Minus 50 to plus 200 deg F.

4. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:

a. Ductmate Industries, Inc., model Proflex.
b. Ventfabrics, Inc., model Ventlon.

2.13 HYDRONIC PIPING

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 Mechanical Code. Where more than one type of material or product is indicated, selection from materials or products specified is Contractor's option.

B. Chilled Water, Heating Hot Water, and Condenser Water Piping:

1. Copper Tube and Fittings Aboveground:

    a. Copper Tube and Fittings Aboveground: ASTM B88, Type L, drawn-temper, 150 psig minimum working pressure at 200 deg. F. Provide wrought-copper fittings and unions, ASTM B16.22, with full solder cup. Capped outlets shall be Schedule 40 screwed brass.

2. Steel Pipe and Fittings Aboveground:

    a. 2 inches and smaller: ASTM A 53/A 53M, Schedule 40 black steel with plain ends, 150 psig minimum working pressure at 200 deg. F. Provide malleable-iron threaded fittings, ASTM B16.3, Class 150, and unions, ASTM B16.39, Class 150, and cast-iron flanges and flange fittings, and threaded joints.
    b. 2-1/2 inches and larger: ASTM A 53/A 53M, Schedule 40 black steel with plain ends, 150 psig minimum working pressure at 200 deg. F. Provide wrought-steel fittings, ASTM A 234/A 234M, and wrought-cast or forged-steel flanges and flange fittings, ASME B16.5, material group 1.1, with butt welding end connections and raised face..

2.14 PIPE JOINING MATERIALS

A. Refer to Division 22 and 23 piping sections for special joining materials not listed below.

B. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.

1. ASME B16.21, nonmetallic, flat, asbestos-free, 1/8-inch (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 other indicated.
3. Flange Bolts and Nuts: AWWA C111, carbon steel, unless otherwise indicated.

C. Brazing Filler Metals:

1. General Duty: AWS A5.8, BCup-5 Series, copper-phosphorus unless otherwise indicated. Sil-Fos 15, or equal.
2. Refrigerant Piping:

    a. Joining copper to copper: AWS A5.8, BCup-5 Series, copper-phosphorus unless otherwise indicated. Sil-Fos 15, or equal.
    b. Joining copper to bronze or steel: AWS A5.8, Bag-1, silver alloy unless otherwise indicated.

D. Welding Filler Metals: Comply with ASME B31.1 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

2.15 VALVES

A. 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.

B. 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.

2.16 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. 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.
7. Adhesives and sealants shall comply with testing and product requirements of South Coast Air Quality Management District, Rule 1168.

B. Insulation Materials:

1. Flexible Elastomeric Insulation: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type I for tubular materials and Type II for sheet materials.

    a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:

        1) Aeroflex USA, Inc.
        2) Armacell LLC.
        3) K-Flex USA.

2. Mineral-Fiber, Preformed Pipe Insulation:

    a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:

        1) Johns Manville; a Berkshire Hathaway company.
        2) Knauf Insulation.
        3) Manson Insulation Inc.
        4) Owens Corning.

    b. Type I, 850 deg F Materials: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 547, Type I, Grade A, with factory-applied ASJ-SSL.

3. Mineral-Fiber Blanket Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 553, Type II and ASTM C 1290, Type III with factory-applied FSK jacket. Provide 2-inch wide stapling and taping flange.

    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. Vapor-Barrier Mastic: Solvent based; suitable for outdoor 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. Childers Brand; H. B. Fuller Construction Products.
    c. Foster Brand; H. B. Fuller Construction Products.

2. Water-Vapor Permeance: Comply with ASTM E96/E96M or ASTM F1249.
3. Service Temperature Range: Minus 50 to plus 220 deg F.
4. Color: White.

E. 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.

F. Field Applied Jackets:

1. PVC Jacket and Factory Fabricated Fitting Covers: High-impact-resistant, UV-resistant PVC complying with ASTM D 1784, Class 16354-C; thickness as scheduled; roll stock ready for shop or field cutting and forming.

    a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:

        1) Johns Manville, model Zeston, with Zeston 2000 fitting covers.
        2) Proto Corporation, model LoSmoke.

2. Aluminum Jacket: Comply with ASTM B 209, Alloy 3003, 3005, 3105, or 5005, Temper H-14.

    a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:

        1) Childers Brand; H. B. Fuller Construction Products.
        2) ITW Insulation Systems; Illinois Tool Works, Inc.
        3) RPR Products, Inc.

    b. Finish and thickness are indicated in field-applied jacket schedules.
    c. Moisture Barrier for Outdoor Applications: 2.5-mil- thick polysurlyn.
    d. Factory-Fabricated 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.

2.17 THERMAL HANGER SHIELD INSERTS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:

1. Buckaroos, Inc.
2. Carpenter & Paterson, Inc.
3. Clement Support Services.
4. Rilco Manufacturing Co., Inc.

B. Flame-spread index of 25 or less and smoke-developed index of 50 or less as tested by ASTM E 84.

C. Insulation-Insert Material for Cold or Hot Piping, from Minus 40 to Plus 275 Deg F: ASTM C 552, Type II cellular glass with 100-psig minimum compressive strength or ASTM C 1126, Type III rigid phenolic foam and vapor barrier.

1. Phenolic:

a. NPS 10 and Smaller: 3.75-lb/cu. Ft. minimum compressive strength.
b. NPS 12 to NPS 30: 5.0-lb/cu. ft. minimum compressive strength.

D. Insulation-Insert Material for Piping Above 275 Deg F: Water-repellent treated, ASTM C 533, Type I calcium silicate with 100-psig or ASTM C 552, Type II cellular glass with 100-psig minimum compressive strength.

E. Insulation Protection Shields: Galvanized metal, G90 coating designation, complying with ASTM A 653/A 653M, 180-degree saddle.

F. Heavy Duty Insulation Protection Shields: Galvanized metal, 12-gage, G90 coating designation, complying with ASTM A 653/A 653M, 180-degree saddle. Structural steel plate welded to bottom of galvanized shield for sizes NPS 6 and larger.

G. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.

H. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.

I. Insert Length: Extend minimum 1-1/2 inches beyond sheet metal shield.

2.18 TEMPERATURE CONTROL SYSTEM

A. Refer to Section 23 09 23, Direct Digital Control System for HVAC.

PART 3 - EXECUTION

3.01 ROOF MOUNTED EQUIPMENT INSTALLATION

A. Mount and anchor equipment in strict compliance with Drawings details. Alternate anchorage methods will not be considered for roof mounted equipment.

B. Examine rough-in for roof mounted equipment to verify actual locations of piping and duct connections prior to final equipment installation.

C. Verify that piping to be installed adjacent to roof mounted equipment allows service and maintenance.

D. Verify that gas piping will be installed with sufficient clearance for burner removal and service.

E. Install gas flue extensions. Attach gas flue extensions to unit according to unit manufacturers' installation instructions. Terminate gas flue extensions with lowest discharge opening at height compliant with requirements of California Mechanical Code, based on final unit location.

F. Install ducts to termination at top of roof curb and install heavy duty rubber gaskets on supply and return openings and on full perimeter of curb, or as required for an airtight installation, prior to setting unit on curb.

G. Cover roof inside each roof mounted air conditioning unit, heat pump unit, and heating and ventilating unit roof curb with 2 inch thick, 3 pound density fiberglass insulation board.

H. Connect supply and return air ducts to horizontal discharge roof mounted equipment with flexible duct connectors. Provide G 90 galvanized steel weather hood over flexible connections exposed to the weather. Weather hood minimum gauge shall be per PART 2 article, Ductwork, Table A.

I. Remove roof decking only as required for passage of ducts. Do not cut out decking under entire roof curb.

3.02 FAN INSTALLATION

A. Ceiling Mounted Fans: Mount variable speed switch within fan housing. Mark final balance point on variable speed switch.

B. Provide access doors for fans or motors mounted in ductwork.

C. Mount all fans as detailed on Drawings and in compliance with CBC standards.

D. Fan motors mounted in air-stream to be totally enclosed.

E. Completely line supply, return or exhaust fan cabinets with 1 inch thick, 3/4 pound density acoustic insulation securely cemented in place.

F. Roof fans shall be mounted level.

G. Provide heavy-duty rubber gasket between exhaust fan mounting flange and roof curb, or as required for an airtight installation.

3.03 RELIEF VENT INSTALLATION

A. Install relief vents to provide a level mounting for backdraft damper.

3.04 AIR INLETS AND OUTLETS INSTALLATION

A. Provide all air inlets and outlets with gaskets and install so that there will be no streaking of the walls or ceilings due to leakage. Duct connection to outlet on exposed duct shall be full size of outer perimeter of outlet flange.

B. Unless otherwise indicated on Drawings, provide rectangular galvanized steel plenum on top of each diffuser and ceiling return for connection to ductwork. Line plenum with internal insulation as indicated for lined ductwork. Size plenum to allow full opening into air terminal. Plenum sheet metal gauge shall be equal to gauge for rectangular equivalent of the branch duct serving the air inlet or outlet.

C. Ceiling-mounted air inlets, outlets, or other services installed in T-Bar type ceiling systems shall be positively attached to the ceiling suspension main runners or to cross runners with the same carrying capacity as the main runners.

1. Air inlets, outlets, or other services weighing not more than 56 pounds shall have two No. 12 gauge hangers connected from the terminal or service to the structure above. These wires may be slack.
2. Support air inlets, outlets, or other services weighing more than 56 pounds directly from the structure above by approved hangers. Provide 4 taut 12 gauge wires each, attached to the fixture and to the structure above. The 4 taut 12 gauge wires, including their attachment to the structure above must be capable of supporting 4 times the weight of the unit.
3. Secure air inlets and outlets to main runners of ceiling suspension system with two No. 8 sheet metal screws at opposing corners.

D. Furnish all air inlets and outlets with a baked prime coat unless otherwise noted. Provide off-white baked enamel finish on ceiling-mounted air inlets and outlets. Paint exposed mounting screws to match the material being secured.

E. Air inlets and outlets shall match all qualities of these specified including appearance, throw, noise level, adjustability, etc.

3.05 FILTER HOUSING INSTALLATION

A. Mount filters in airtight galvanized steel housings furnished by the filter manufacturer, or shop fabricated. Housings shall incorporate integral tracks to accommodate filters, and flanges for connection to duct or casing system.

1. Sealing: Incorporate positive-sealing gasket material on channels to seal top and bottom of filter cartridge frames and to prevent bypass of unfiltered air.
2. Access Doors: Hinged, with continuous gaskets on perimeter and positive-locking latch handle devices.

B. Air filters shall be accessible for cleaning or replacement.

C. Identify each filter access door with 1/2 inch high minimum stenciled letters.

3.06 TEMPORARY FILTERS

A. Provide temporary filters for fans that are operated during construction; after construction dirt has been removed from the building install new filters at no additional cost to the

Owner. In addition to temporary filters at filter location, provide temporary filters on all duct openings which will operate under a negative pressure.

1. Filters used for temporary operation shall be the same as permanent filters for the application. Filters used for duct openings may be 1 inch thick pleated media disposable type.

3.07 DAMPER INSTALLATION

A. All dampers automatically controlled by damper motors are specified under "Temperature Control System" except those specified with items of equipment.

B. Provide opposed blade manual air dampers at each branch duct connection and at locations indicated on the drawings and where necessary to control air flow for balancing system. Provide an opposed blade balancing damper in each zone supply duct. Provide an access panel or Ventlok flush type damper regulator on ceiling or wall for each concealed damper.

C. Install fusible link fire dampers full size of duct at points where shown or required.

D. Provide 18 inch x 12 inch minimum hinged access doors in ductwork and furring for easy access to each fire damper; insulated access doors in insulated ducts. Label access doors with 1/2 inch high red letters.

1. Provide Ventlok Series 100, Durodyne, or equal access doors with hardware for convenient access to all automatic dampers and other components of the system, insulated type in insulated ducts. Provide Ventlok #202 for light duty up to 2 inch thick doors, #260 heavy-duty up to 2 inch thick doors and #310 heavy-duty for greater than 2 inch thick doors. Provide #260 hinges on all hinged and personnel access doors; include gasketing.

3.08 DUCTWORK INSTALLATION

A. General:

1. Assemble and install ductwork in accordance with recognized industry practices which will achieve air tight and noiseless (no objectionable noise) systems capable of performing each indicated service. Install each run with minimum of joints. Align ductwork accurately at connections within 1/8 inch misalignment tolerance and with internal surfaces smooth. Support ducts rigidly with suitable ties, braces, hangers, and anchors of type which will hold ducts true to shape and to prevent buckling. Where possible, install ductwork to clear construction by 1/4 inch minimum, except at air inlets and outlets. Where ductwork will not clear construction, secure duct firmly to eliminate noise in the system.
2. Duct Joints: Install duct sealers, pop rivets or sheet metal screws at each fitting and joint. Duct sealers shall be fire retardant. Sheet metal screws for joints shall be minimum #10 size galvanized.
3. Where ductwork 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.
4. Horizontal runs of ductwork 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.
5. Provide sheet metal angle frame at all duct penetrations to wall, floor, roof, or ceiling.
6. Paint inside of ducts, visible through grille, dull black.

7. Where ductwork is installed in finished areas of buildings that do not have ceilings, paint ductwork, support hangers, and air inlets and outlets to match adjacent architectural surfaces, or as directed by Architect.
8. At the time of rough installation, or during storage on the construction site and until final startup of the heating and cooling equipment, duct and other related air distribution component openings shall be covered with tape, plastic, sheet metal, or other methods acceptable to the enforcing agency.

B. Firestopping:

1. Pack the annular space between duct openings and ducts penetrating 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. Firestopping systems to be installed in strict accordance with manufacturer's instructions.
3. 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.

C. Flashing:

1. The work of this section shall include furnishing, layout, sizing, and coordination of penetrations required for the mechanical work.
2. Refer to Division 07 specifications and Drawings details as applicable.
3. Flashing for penetrations of roof for mechanical items such as flues and ducts 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. Flues and ducts shall have 24 gauge galvanized sheet metal storm collar securely clamped to the flue above the flashing.

D. Upper connection of support to wood structure shall be with wood screws or lag screws in shear fastened in the upper one half of the wood structural member. Fasteners shall conform to the following schedule:

For ducts with P/2=30"	#10 x 1-1/2" wood screw
For ducts with P/2=72"	1/4"x 1-1/2" lag screw
For ducts with P/2 over 73"	3/8"x 1-1/2" lag screw

E. Upper connection in tension to wood shall not be used unless absolutely necessary. Where deemed necessary the contractor shall submit calculations to show the size fastener and penetration required to support loads in tension from wood in accordance with the following schedule:

For ducts with P/2=30"	260 pounds per hanger
For ducts with P/2=72"	320 pounds per hanger
For ducts with P/2=96"	460 pounds per hanger
For duct with P/2 larger than 120"	NOT ALLOWED

F. Install concrete inserts for support of ductwork in coordination with formwork as required to avoid delays in work.

G. Upper connection to manufactured truss construction must comply with truss manufacturers published requirements and Structural Engineers requirements.

H. Where ducts pass through interior partitions and exterior walls, conceal space between construction opening and duct or duct plus insulation with sheet metal flanges of same gauge as duct. Overlap opening on four sides by at least 1-1/2 inches.

I. Support ductwork in manner complying with SMACNA "HVAC Duct Construction Standards," hangers and supports sections. Where special hanging of ductwork is detailed or shown on Drawings, Drawings shall be followed. Angles shall be attached to overhead construction in a manner so as to allow a minimum of 2 inches of movement in all directions with no bending or sagging of the angle.

1. Except where modified in individual paragraphs of this Section, provide hanger support with minimum 18 gauge straps, 1 inch wide. Fold duct strap over at bottom of duct.
2. Install duct supports to rectangular ducts with sheet metal screws. Provide one screw at top of duct and one screw into strap at bottom of duct.

J. Installation of Flexible Ductwork:

1. Provide flexible ducts with supports at 30 inch centers with 2 inch wide, 26 gauge steel hanger collar attached to the structure with an approved duct hanger. Installation shall minimize sharp radius turns or offsets.

    a. Supports shall be in accordance with SMACNA HVAC Duct Construction Standards (Metal and Flexible).
    b. Flexible duct bends shall be not less than 1-1/2 duct diameter bend radius.

2. Make connections to rigid duct and units with Panduit style draw band at inner liner material, and a second draw band over the outer vapor barrier material.
3. Make connection to duct with spin-in fittings, with air scoop and balance damper.

K. Installation of Kitchen Exhaust Ducts (Type 1):

1. Install commercial kitchen hood exhaust ducts without dips and traps that may hold grease.
2. Slope duct a minimum of 2 percent to drain grease back to the hood.
3. Provide for thermal expansion of ductwork through 2000 ◦F temperature range.
4. Install listed grease duct access panel assemblies at each change of direction and at maximum intervals of 12 feet in horizontal ducts, and at every floor for vertical ducts, and as indicated on Drawings. Locate access panel on top or sides of duct. Locate panel so that edge of opening is not less than 1-1/2 inch from all outside edges of the duct or welded seams. For large horizontal ducts,

install 20 inch by 20 inch access panel for personnel entry at maximum intervals of 20 feet.

5. Install listed grease duct access panel assemblies in accordance with the terms of their listings and the manufacturers' instructions. Access panels shall be labeled with the words: "Access Panel – Do Not Obstruct."
6. Fabricate ducts with continuous welds for grease-tight construction.
7. Grind welds to provide smooth surface free of burrs, sharp edges and weld splatter. When welding stainless steel with a No. 4 finish, grind the welds flush, polish the exposed welds, and treat the welds to removed discoloration caused by welding.
8. Cover grease exhaust duct with two layers of 1-1/2 inch thick field-applied grease duct enclosure. Install grease duct enclosure in accordance with manufacturer's instructions and listing requirements.

L. Installation of Kitchen Exhaust Ducts (Type 2):

1. Install commercial kitchen hood exhaust ducts without dips and traps that may hold grease.
2. Slope duct a minimum of 1 percent to drain back to the hood or dishwasher connection.
3. Install duct access panel assemblies at each change of direction and at maximum intervals of 12 feet in horizontal ducts, and at every floor for vertical ducts, and as indicated on Drawings. Locate access panel on top or sides of duct. Locate panel so that edge of opening is not less than 1-1/2 inch from all outside edges of the duct. For large horizontal ducts, install 20 inch by 20 inch access panel for personnel entry at maximum intervals of 20 feet.
4. Fabricate ducts with continuous welds for water-tight construction.
5. Grind welds to provide smooth surface free of burrs, sharp edges and weld splatter. When welding stainless steel with a No. 4 finish, grind the welds flush, polish the exposed welds, and treat the welds to removed discoloration caused by welding.
6. Fabricate ducts for dishwasher exhaust with seams on top of duct, and with minimum joints.
7. Access panels shall be labeled with the words: "Access Panel – Do Not Obstruct."

3.09 DUCTWORK SEALING AND LEAK TESTING

A. All ductwork shall receive a Class A seal.

B. Seal airtight all joints and seams, including standing seams and manufactured joints and seams, of all supply, return and exhaust ducts except those exposed in conditioned space.

C. Leakage Classes:

Pressure Class	Leakage Class	
	Round Duct	Rectangular Duct
2"W.G. or less	8	16
4"W.G. or greater	2	4

D. All duct systems (supply, return, outside air intake, and exhaust), except those identified on compliance forms on Drawings as requiring Acceptance Testing per the requirements

of the California Energy Code, shall be tested in accordance with the requirements of the California Mechanical Code and SMACNA “HVAC Air Duct Leakage Test Manual.” Test pressure shall be equal to the pressure class of the duct. For additional duct leak testing requirements, refer to Section 23 00 50, “Basic HVAC Materials and Methods,” Article, “Acceptance Requirements.”

3.10 PIPING INSTALLATION

A. 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 conduits 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. Use reducing fittings; bushings shall not be allowed. Use eccentric reducing fittings wherever necessary to provide free drainage of lines and passage of air.
8. Verify final equipment and fixture locations for roughing-in.
9. 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.
10. Each piping system shall be thoroughly flushed and proved clean before connection to equipment.
11. Install exposed polished or enameled connections with special care showing no tool marks or threads at fittings.
12. 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.
13. Pipe the discharge of each relief valve, air vent, backflow preventer, and similar device to floor sink or drain.

B. 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.

C. 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.

D. Firestopping:

1. Pack the annular space between pipe sleeves and pipes penetrating 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 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, or equal, plugs on both sides of the penetrator to reduce noise and to provide waterproofing.
5. Firestopping 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.

E. Flashing:

1. The work of this section shall include furnishing, layout, sizing, and coordination of penetrations required for the mechanical work.
2. Refer to Division 07 specifications and Drawings details as applicable.
3. Flashing for penetrations of metal or membrane roof for pipes shall be coordinated with the roofing manufacturer and roofing installer for the specific roofing type.

    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. Elmdor/Stoneman Model 1540.

4. 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.

3.11 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 type of water conveyed by pipe. Join flanges with gasket and bolts according to ASME B31.9.

D. Copper Pipe and Tubing: All joints shall be brazed according to ASME Section IX, Welding and Brazing Qualifications, except pneumatic control piping, and hydronic piping having grooved-end fittings and couplings.

E. Welded Pipe:

1. Make up with oxyacetylene or electric arc process.
2. All welding shall conform to the American Standard Code for Power Piping ASME B-31.1. When requested by the Architect, furnish certification from an approved testing agency or National Certified Pipe Welding Bureau that the welders performing the work are qualified.
3. All line welds shall be of the single "V" butt type. Welds for flanges shall be of the fillet type.
4. Where the branch is two pipe sizes smaller than the main or smaller, Bonney Weldolets, Threadolets, Nibco, or equal, may be used in lieu of welding tees.

F. 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, except fan coil units under 2000 cfm, on each connection to each base mounted pump and where shown. Couplings shall be suitable for pressure and type of service.
2. Flexible connections in refrigerant lines; Flexonic, Anaconda or equal, metal hose, full size.
3. Anchor piping securely on the system side of each flexible connection.

3.12 VALVE INSTALLATION

A. 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. Provide gate or globe valves on inlet and outlet of each pump.

B. Butterfly Valves: Install with stems horizontal.

C. 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.

3.13 HANGER AND SUPPORT INSTALLATION

A. General: Support ductwork, 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 ductwork, 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.

1. Materials, design, and type numbers for support of piping per Manufacturers' Standardization Society (MSS), Standard Practice (SP)-58.

    a. Provide copper-plated or felt-lined hangers for use on uninsulated copper tubing.

2. Materials and design for ductwork support shall be per SMACNA “HVAC Duct Construction Standards, Metal and Flexible.”

B. Hanger components shall be provided by one manufacturer: B-Line, Grinnell, Unistrut, Badger, or equal.

C. Riser clamps: B-line model B3373, or equal.

D. Rubber Neoprene Pipe Isolators:

1. 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.
2. 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.
3. Manufacturers:

    a. Vertical runs: Acousto-Plumb or equal.
    b. Horizontal runs: B-Line, Vibraclamp; Acousto-Plumb or equal.

E. Pipe Hanger and Support Placement and Spacing:

1. 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.
2. Vertical piping hanger and 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:

Pipe Diameter	Steel Threaded or Welded (Note 3)	Copper Brazed or Soldered (Notes 3, 4)	CPVC & PVC (Note 2)
1/2 - 1”	12 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.	Base and Each Floor (Note 1)
2-1/2 - 3”	12 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.	Base and Each Floor (Note 1)

a. Note 1: Provide mid-story guides.
b. 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.
c. Note 3: Spacing of hangers and supports for piping assembled with mechanical joints shall be in accordance with standards acceptable to authorities having jurisdiction.
d. Note 4: Includes refrigerant piping, including vapor and hot gas pipes.

3. 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:

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

a. 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.
b. Note 2: Spacing of hangers and supports for piping assembled with mechanical joints shall be in accordance with standards acceptable to authorities having jurisdiction.
c. Note 3: Includes refrigerant piping, including vapor and hot gas pipes.

4. 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.

Pipe Size	Rod Size Diameter
2" and Smaller	3/8"
2-1/2" to 3-1/2"	1/2"
4" to 5"	5/8"
6"	3/4"

b. Suspend rods from concrete inserts with removable nuts where suspended from concrete decks. Power actuated inserts will not be allowed.
c. Trapeze Suspension: B-Line, or equal, 1-5/8 inch width channel in accordance with manufacturers' published load ratings. No deflection to exceed 1/180 of a span.
d. Trapeze Supporting Rods: Shall have a safety factor of five; securely anchor to building structure.
e. Pipe Clamps and Straps: B-Line B2000, B2400, or equal. Where used for seismic support systems, provide B-Line B2400 series, or equal, pipe straps.
f. 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.
g. Steel Connectors: Beam clamps with retainers.

5. Provide support for piping through roof, arranged to anchor piping solidly in place at the roof penetration.
6. Insulated Piping:

a. Do not interrupt insulation at pipe hangers and clamps.
b. Use thermal hanger shield inserts or MSS protection saddles and shields.
c. Thermal Hanger Shield Inserts:

1) Use thermal-hanger shield insert with clamp sized to match OD of insert.
2) Do not exceed pipe stress limits allowed by ASME B31.9 for building services piping.
3) For below ambient services, maintain continuous vapor barrier.
4) For Clevis or Band Hangers: Install thermal-hanger shield inserts with insulation protection shields.
5) For Trapeze or Clamped Systems: Install thermal-hanger shield inserts with heavy-duty insulation protection shields. Install additional 180-degree galvanized shield for top of support if clamping is required.

d. MSS Protection Saddles and Shields:

1) MSS SP-58, Type 39, protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.

2) MSS SP-58, Type 40, protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.
3) Shield Dimensions for Pipe: Of length recommended in writing by manufacturer to prevent crushing insulation. Not less than the following:

a) NPS 1/4 to NPS 3-1/2: 12 inches long and 0.048 inch thick.
b) NPS 4: 12 inches long and 0.06 inch thick.
c) NPS 5 and NPS 6: 18 inches long and 0.06 inch thick.
d) NPS 8 to NPS 14: 24 inches long and 0.075 inch thick.
e) NPS 16 to NPS 24: 24 inches long and 0.105 inch thick.

F. Piping Support to Structure:

1. 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.

a. 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

b. 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.
c. 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.

2. 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.

G. Duct Hanger and Support Spacing: Conform to Requirements of CMC and SMACNA “HVAC Duct Construction Standards, Metal and Flexible.”

H. Duct Support to Structure:

1. Upper connection of support to wood structure shall be with wood screws or lag screws in shear fastened in the upper one half of the wood structural member. Fasteners shall conform to the following schedule:

For ducts with P/2=30"	#10 x 1-1/2" wood screw
For ducts with P/2=72"	1/4"x 1-1/2" lag screw
For ducts with P/2 over 73"	3/8"x 1-1/2" lag screw

2. Upper connection in tension to wood shall not be used unless absolutely necessary. Where deemed necessary the contractor shall submit calculations to show the size fastener and penetration required to support loads in tension from wood in accordance with the following schedule:

For ducts with P/2=30"	260 pounds per hanger
For ducts with P/2=72"	320 pounds per hanger
For ducts with P/2=96"	460 pounds per hanger
For duct with P/2 larger than 120"	NOT ALLOWED

3. Install concrete inserts for support of ductwork in coordination with formwork as required to avoid delays in work.
4. Upper connection to manufactured truss construction must comply with truss manufacturers published requirements and Structural Engineers requirements.

3.14 INSULATION AND FIELD-APPLIED JACKET INSTALLATION

A. General:

1. The term "piping" used herein includes pipe, air separators, valves, strainers and fittings.
2. Clean thoroughly, test and have approved, all piping and equipment before installing insulation and/or covering.
3. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of piping, ductwork, and equipment.
4. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of equipment as specified in insulation system schedules.
5. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.
6. Install insulation with longitudinal seams at top and bottom of horizontal runs.
7. Install multiple layers of insulation with longitudinal and end seams staggered.
8. Keep insulation materials dry during application and finishing.
9. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.
10. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.
11. Install insulation in removable segments on equipment access doors, manholes, handholes, and other elements that require frequent removal for service and inspection. Bevel and seal insulation ends around manholes, handholes, ASME stamps, and nameplates.
12. For piping, ductwork, and equipment, with surface temperatures below ambient, apply mastic to open ends, joints, seams, breaks, and punctures in insulation.
13. Repair all damage to existing pipe, duct 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.
14. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.

a. Install insulation continuously through hangers and around anchor attachments.
b. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
c. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
d. Cover inserts with jacket material matching adjacent insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.

B. Piping Insulation Installation:

1. General:

a. 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.
b. Provide removable insulation covers for items requiring periodic service or inspection.
c. Insulation shall be vapor tight before applying PVC jacket and fitting covers. Verify suitability with manufacturer of insulation.
d. Provide pre-formed PVC valve and fitting covers for indoor piping.
e. Provide factory-fabricated aluminum valve and fitting covers for outdoor piping.
f. 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.

2. Below-Ambient Services Including Chilled Water Supply and Return and Refrigerant Piping:

a. Insulate valves and irregular surfaces to match adjacent insulation and cover with two layers of woven glass fiber cloth saturated in Foster Sealfas 30-36, 3M, or equal, extending 3 inches over the adjoining pipe insulation. Finish with a coat of Foster Sealfas 30-36, 3M, or equal. The 3 inch wide SSL end laps furnished with the insulation shall be adhered over the end joints. Seal entire surface of insulation vapor tight, including joints and ends of PVC or aluminum fitting covers.
b. Variable refrigerant flow (VRF) heat pump systems: Insulation for VRF system refrigerant piping shall be installed according to VRF unit manufacturer’s instructions.

3. PVC Jacket Installation:

a. Where PVC jackets are indicated, install with 1-inch overlap at longitudinal seams and end joints; for horizontal applications. Seal with manufacturer's recommended adhesive.

1) Apply two continuous beads of adhesive to seams and joints, one bead under lap and the finish bead along seam and joint edge.

4. Aluminum Jacket Installation:

a. Where insulated piping is exposed to the weather apply aluminum jacket secured with 1/2 inch stainless-steel bands on 12 inch centers. 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.
b. Do not install aluminum jackets on refrigerant flexible connectors to vibration isolated outdoor condensing units. Coat elastomeric insulation with insulation manufacturer’s recommended ultraviolet light protective coating.

C. Duct Insulation Installation:

1. General:

a. Insulation applied to the exterior surface of ducts located in buildings shall have a flame spread of not more than 25 and a smoke-developed rating of not more than 50 when tested as a composite installation including insulation, facing materials, tapes and adhesives as normally applied. Material exposed within ducts or plenum shall have a flame-spread rating of not more than 25 and a smoke-developed rating of not more than 50.
b. Duct insulation applied to the exterior surface of ducts installed outside the building insulation envelope shall meet minimum R-value of R-8 at 3 inches thickness and 3/4 pound per cubic foot density.
c. Duct insulation applied to the exterior surface of ducts installed within the building insulation envelope shall meet minimum R-value of R-4.2 at 1-1/2 inches thickness and 3/4 pound per cubic foot density.

2. Mineral Fiber Blanket Installation:

a. Insulate all unlined concealed supply and return ducts with fiberglass duct wrap, manufactured as a blanket of glass fibers factory laminated to a reinforced foil/kraft vapor retarding facing. Provide 2 inch stapling and taping flange. Wrap insulation entirely around duct and secure with outward clinching staples on 6 inch centers. Provide mechanical fasteners at maximum 18 inch centers for all bottoms of duct which are greater than 24 inches. Lap all insulation joints 3" minimum. Insulate ducts installed tight against other work before hanging in place. Seal all seams, both longitudinal and transverse, and all staple and mechanical fastener penetrations of facing with scrim backed foil tape or recommended sealant, to provide a vapor tight installation.

3. PVC Jacket Installation:

a. Where PVC jackets are indicated, install with 1-inch overlap at longitudinal seams and end joints; for horizontal applications. Seal with manufacturer's recommended adhesive.

1) Apply two continuous beads of adhesive to seams and joints, one bead under lap and the finish bead along seam and joint edge.

3.15 TEMPERATURE CONTROL SYSTEM INSTALLATION

A. Provide thermostats where indicated on drawings. All wiring shall be in conduit. Provide all relays, transformers and the like to render the control system complete and fully operable. All control conduit to be rigid steel type.

3.16 EQUIPMENT START-UP

A. Initial start-up of the systems and pumps shall be under the direct supervision of the Contractor.

B. Equipment start-up shall not be performed until the piping systems have been flushed and treated and the initial water flow balance has been completed.

C. It shall be the responsibility of the Contractor to assemble and supervise a start-up team consisting of controls contractor, start-up technician, and test and balance contractor; all to work in concert to assure that the systems are started, balanced, and operate in accordance with the design.

D. After start-up is complete, instruct the Owner's personnel in the operation and maintenance of the systems. Obtain from the Owner's representative a signed memo certifying that instruction has been received.

E. For additional requirements, refer to article, Check, Test and Start Requirements, in Section 23 00 50, Basic HVAC Materials and Methods.

3.17 TESTING AND BALANCING

A. For testing and balancing requirements, refer to Section 23 05 93, Testing and Balancing for HVAC.

3.18 CLEANING AND PROTECTION

A. As each duct section is installed, clean interior of ductwork of dust and debris. Clean external surfaces of foreign substances that might cause corrosive deterioration of metal or where ductwork is to be painted.

B. Strip protective paper from stainless steel ductwork surfaces, and repair finish wherever it has been damaged.

C. Temporary Closure: At ends of ducts that are not connected to equipment or air distribution devices at time of ductwork installation, provide temporary closure of polyethylene film or other covering that will prevent entrance of dust and debris until connections are to be completed.

D. As each internally lined duct section is installed, check internal lining for small cuts, tears, or abrasions. Repair all damage with fire retardant adhesive.

3.19 EQUIPMENT MOUNTING

A. Mount and anchor equipment in strict compliance with Drawings details. Alternate anchorage methods will not be considered for roof mounted equipment.

3.20 INDOOR DUCT INSULATION SCHEDULE

A. Ducts Located Within Building Thermal Envelope:

1. Minimum R-Value = R-4.2.

2. Supply and Return Ducts: Mineral Fiber Blanket, 1-1/2 inches thick, 0.75 lb/cu. ft.

B. Ducts Located Within Building Outside Thermal Envelope:

1. Minimum R-Value – R-8.0.
2. Supply and Return Ducts: Mineral Fiber Blanket, 3 inches thick, 0.75 lb/cu. ft.

3.21 OUTDOOR DUCT INSULATION SCHDULE.

A. Minimum R-Value = R-8.

B. Refer to article, Ductwork, for internal duct lining. Provide 2 inches thick internal duct lining where indicated on Drawings.

3.22 INDOOR FIELD-APPLIED DUCT JACKET SCHEDULE

A. Insulated ducts in concealed spaces: None.

B. Insulated ducts in exposed unconditioned spaces: PVC, 20 mils thick.

END OF SECTION 23 80 00

SECTION 26 00 00
ELECTRICAL WORK

PART 1 - GENERAL

1.1 SUMMARY

A. The Requirements of General Conditions and Special Conditions apply to Work of this Section as if fully repeated herein.

1.2 WORK INCLUDED

A. Provide a complete working installation with all material and equipment as shown and specified.

B. Provide submittals and shop drawings.

C. Make electrical connections for equipment furnished as part of Work of other Sections.

D. Include sealing and fireproofing of conduits and cables.

E. Provide as-built drawings.

1.3 QUALITY ASSURANCES

A. Requirements of Regulatory Agencies:

1. Nothing in the Contract Documents shall be construed to permit Work not conforming to applicable codes, laws, ordinances, rules or regulations.
2. All installed or connected equipment shall be labeled or certified for its use by a nationally recognized testing laboratory.
3. All materials and equipment shall be installed in accordance with manufacturer's recommendations and in accordance with the National Electrical Contractors Association (NECA) Standard of Installation.

1.4 PERMITS, FEES AND INSPECTIONS

A. Contractor shall obtain all permits and arrange for Owner to pay required fees to any governmental agency or utility company having jurisdiction over the work of this Section. Inspections required by any local ordinances or utility companies during construction shall be arranged by the Contractor.

B. All work and materials covered by these specifications and accompanying drawings shall at all times be subject to inspection by the Architect or his representative. Any material not in accordance with the plans and specifications, or not installed in a neat and workmanlike manner, shall, upon order from the Architect, be removed from the premises or corrective action taken within three (3) days; and if material in question has been installed, the entire expense for removing and reinstalling shall be borne by the Contractor.

C. On completion of the work, satisfactory evidence shall be furnished to the Architect to show that all work has been installed in accordance with the Codes.

1.5 SPECIFICATIONS AND CONTRACT DRAWINGS

A. Accuracy of data given herein and on the drawings is as exact as could be secured, but their extreme accuracy is not guaranteed. The drawings and specifications are for the assistance and

guidance of the Contractor and exact locations, distances, levels, etc., will be governed by the construction and the Contractor shall accept same with this understanding.

B. Layouts of equipment, accessories and wiring systems are diagrammatic (not pictorial and not exact), but shall be followed as closely as possible. Architectural, structural, mechanical, and other drawings shall be examined noting all conditions that may affect this work. Where connections to equipment provided by other divisions are shown on electrical drawings, refer to drawings of respective division for exact locations and electrical requirements of equipment.

C. Report conflicting conditions to the Architect for adjustment before proceeding with work. Should Contractor proceed with work without reporting conflict(s), he does so on his own responsibility, and shall alter work if directed by the Architect, at his own expense.

D. Right is reserved to make minor changes in locations of equipment and wiring systems shown, providing change is ordered before conduit runs and/or work directly connected to same Is Installed and no extra materials are required.

E. Drawings and specifications may be superseded by later detail specification and detail drawings prepared by the Architect, and the Contractor shall conform to them and to such reasonable changes in the contract drawings as may be called for by these revised drawings without extra cost to the Owner.

F. Contractor may request additional detail(s) and such shall be conformed to, without additional cost. Contractor may offer alternate detail(s), but such detail(s) shall be approved by Architect and authority having jurisdiction

1.6 SUBMITTALS

A. Submission Requirements

1. Contractor is responsible for the scheduling of submittals in order to avoid detrimental impact to the construction schedule and to support the timely sequence of the Work. Allow a minimum of 15-working days for submittal review by the Engineer. Complex submittals or submittals which are not provided as complete packages may take longer than 15-working days for review. Contractor should allow time for potential rejection and re-submittal of submittals which are being offered as substitution to the specified products.
2. Contractor shall review submittals for completeness, coordination and conflicts between subcontractors and other work in the Contract Documents. Submittals made by Contractor which are not thoroughly reviewed by the Contractor will be returned. Submittals which vary significantly from the Contract Documents and are not so identified prior to submission, will be returned to the Contractor without review.
3. Make submissions within following number of days from issuance of Notice to Proceed or Start Letter
    a. Items needed in initial stages of Work or requiring long lead-time for ordering: 15 calendar days.
    b. All other items: 21 calendar days.
4. Before submitting a shop drawing or any related material, Contractor shall: review each such submission for conformance with the means, methods, techniques, sequences, and operations of construction, and safety precautions and programs incidental thereto, all of which are the sole responsibility of the Contractor; approve each such submission before submitting it; and stamp each such submission before submitting it. Engineer shall assume that no shop drawing or related submittal comprises a variation unless the Contractor advises the Engineer otherwise via a written instrument which is acknowledged by the Engineer in writing.

5. Engineer will check submittals for conformance with design concepts of project. Approval covers only such conformance. Effort will be made by Engineer to discover any errors, but responsibility for accuracy and correctness of all submittals shall be with the Contractor.
6. Approval of submittals will be on a general basis only and shall not relieve the Contractor from their responsibility for proper fitting and construction of the Work, nor from furnishing materials and labor required by the Contract which may not be indicated on the submittals when approved.
7. No portion of the work requiring submittals shall be commenced until the submittal for that portion of the work has been approved by Engineer. All such portions of work shall be in accordance with the approved submittal. Any work performed without approved submittals will be done so at the Contractor's own risk. Work found not to be in compliance with the approved submittals shall be removed and corrected at the Contractor's own expense.
8. Number of Copies Required - Contractor shall submit following number of copies:
    a. Shop Drawings: 1-electronic copy in PDF format.
    b. Product Data/Material Lists: 1-electronic copy in PDF format.
    c. Samples: As specifically indicated in pertinent specification section.
    d. Substitution Request: 1-copy in PDF format
9. Submittals shall include (where applicable):
    a. Date and revision dates.
    b. Project title and number.
    c. The names of Architect, Engineer, Contractor, Subcontractor and supplier or manufacturer.
    d. Identification of product or material.
    e. Relation to adjacent structure or material.
    f. Field dimensions, clearly identified as such.
    g. Specification section number.
    h. A blank space for Engineer's stamp.
    i. Contractor's stamp on each, initialed or signed, certifying that submittal was reviewed, field measurements have been verified and submittal is in compliance with the applicable specification section and the overall Contract Documents.
10. Incomplete, inaccurate or non-complying submittals requiring revisions, re-submittal and additional review time, shall not be considered as a basis for Contract time extension.
11. Two reviews will be made for each submittal. Additional reviews will be charged to the Contractor. A rejection of a submittal or review of a partially presented submittal constitutes one submittal review. Incomplete submittals, such as product data submitted without required shop drawings, will be returned without review.

B. Required Submittals

1. Various specification sections may state additional information to be submitted.
2. Submittals are required for all equipment and low voltage/control systems even though the submitted material may be exactly as specified in the Project Manual.
3. Electrical Materials Submittal:
    a. Submit product data only for materials that are being substituted. Product data is not required for materials that are being provided as specified.
    b. Electrical materials include raceway, boxes, supports, finish material, etc.
4. Electrical Equipment Submittal:
    a. Submit product data for all equipment.

b. Electrical equipment includes panelboards, switchboards, transformers, underground pullboxes, floor boxes, light fixtures, etc.

5. Low Voltage and Control Systems Submittals:
   a. Provide product data for each item in the system.
   b. Provide shop drawings for each system.
   c. Low voltage and control systems include lighting controls, sound communications, fire alarm, etc.

C. Product Data

1. Manufacturer's Standard Schematic Drawings:
   a. Modify drawings to delete information which is not applicable to the Project.
   b. Supplement standard information to provide additional information which is applicable to the Project.
2. Manufacturer's catalog sheets, brochures, diagrams, schedules, performance charts, illustrations and other standard descriptive data.
   a. Clearly mark each copy to identify pertinent materials, products or models. Mark out or remove all extraneous information.
   b. Show dimensions and clearances required.
   c. Show performance characteristics and capacities.
   d. Show wiring diagrams and controls.

D. Shop Drawings

1. Submit shop drawings as a copy of the original set maintained by the Contractor. Shop drawings are to include the name of the project, the name of Contractor and are to be numbered consecutively. Provide legible and complete copies in every respect. Provide quantity as described below. Do not reproduce bid document drawings in lieu of Contractor or subcontractor produced shop drawings.
2. Contract documents define the general scope of work. Contractor’s submittal shall not be a duplication of the contract drawings, but shall be a result of site and system investigation and shall show all the work required. Do not reproduce bid document drawings in lieu of Contractor or subcontractor produced shop drawings.
3. If shop drawings show variations from Contract requirements because of standard shop practice or other reason, make specific mention of such variations in letter of transmittal, as well as on drawings, in order that (if acceptable) suitable action may be taken for proper adjustment of the Contract Documents. Unless specific changes have been noted and approved, no deviations from Contract Documents will be accepted.
4. If the shop drawings are accepted or rejected, all reviewed and stamped copies will be distributed to all parties. If corrections are required, the Contractor is responsible for making the necessary corrections and re-submitting the shop drawings in a timely fashion as to not affect the project schedule. The Contractor must secure final acceptance prior to commencing work involved.

E. Substitutions

1. Engineer's Approval Required:
   a. Contract is based on materials, equipment and methods described in Contract Documents. Substitutions will not be reviewed and approved prior to the award of the contract.
   b. Engineer will consider proposals during the submittal process for substitution of materials, equipment and methods only when such proposals are accompanied by

full and complete technical data and all other information required by Engineer to evaluate proposed substitution. Substitution shall be submitted with completed Substitution Request Form.

c. Do not substitute materials, equipment or methods unless such substitution has been specifically approved for this work by Engineer.

2. "Or Equal": Whenever, in Contract Documents, any material, process or specified patent or proprietary name and/or by name of manufacturer is indicated, such name shall be deemed to be used for purpose of facilitating description of material and/or process desired, and shall be deemed to be followed by the words "or equal", or “accepted equal”, and Contractor may offer any material or process which shall be equal in every respect to that so indicated or specified; provided, however, that if material, process or article offered by Contractor is not, in opinion of Architect, equal in every respect to that specified, then Contractor must furnish material, process or article specified or one that in opinion of Engineer is equal thereof in every respect.
3. “No Substitutions”: Items indicated as “No Substitutions” must be provided as specified and no alternates will be allowed. These items are required either due to District standards by the Board or to match materials recently installed by others.
4. Coordination: Approval of substitution shall not relieve Contractor from responsibility for compliance with all requirements of Drawings and Project Manual, and Contractor shall be responsible at his own expense for any changes in other parts of his own work or work of others which may be caused by approved substitution.
5. DSA Approval: Substitutions of certain items may cause such items to require a Deferred Approval by DSA. Should a DSA Deferred Approval be required, the Contractor shall provide all information and documents necessary to complete the Deferred Approval process without any additional costs to the Owner, including engineering, calculation and modification of substitute products.

1.7 OPERATION AND MAINTENANCE MANUALS

A. General: Contractor shall incorporate in Maintenance/Operation Manual(s) all brochures, manufacturer's catalogs and written instructions for equipment and materials needing regular care or maintenance and other items as required elsewhere in project documents. Prepare all such manuals in durable plastic loose leaf binders size to accommodate 8-1/2 x 11 sheets with following minimum data:

1. Identification on or readable through, front cover stating general nature of manual.
2. Neatly typewritten index of all contents.
3. Site plan and building plans indicating location of equipment referenced (reduced scale).
4. Complete instructions regarding operation, maintenance, replacement instructions and programming instructions of all equipment involved.
5. Complete nomenclature of all replaceable parts, their part numbers, current cost and name and address of nearest vendor of parts.
6. Copy of all guarantees and warranties issued, in a separate binder as specified in this section.
7. Copy of approved shop drawings (reduced scale) with all data concerning changes made during construction.

B. Extraneous Data:

1. Where contents of manuals include manufacturer's catalog pages, clearly indicate precise items included in the Project installation and delete, or otherwise clearly indicate, all manufacturer's data with which the Project installation is not concerned.

C. Materials shall be organized in a logical and consistent manner, by specification section number, with separating tabs clearly marked.

D. Data shall be provided for:

1. Panelboards
2. Lighting Fixtures
3. Lighting Control System
4. Emergency Lighting System
5. Sound and Signal Systems
6. Intrusion Alarm System
7. Clock System
8. Fire Alarm System

E. In addition to the requirements above, contractor shall provide final programming information to District on disk for all systems requiring programming.

1.8 RECORD DRAWINGS (AS-BUILTS)

A. At time of installation, installed locations of all underground work shall be recorded on prints by Contractor, and reviewed with Inspector. Record drawings are to be maintained and adjusted on a daily basis by the Contractor.

B. All information entered on drawings copy shall be neat, legible and emphasized by drawing "clouds" around changed items. Changes shall be made in an accurate manner by a qualified draftsperson acceptable to Architect. Completed Record Drawings shall be signed by the Contractor.

C. Locate and dimension all major equipment and underground work, including stubs and pullboxes. Provide dimensions from curbs, foundations, or other permanent landmarks.

D. All symbols and designations used in preparing record drawings shall match those used in the Contract Drawings.

E. Record drawing shall be up-dated monthly.

F. Record drawing signoff:

1. At such time that the underground work has been completed, all the contractors and sub contractors notes, sketch and miscellaneous drawings documenting installed locations not currently part of the ongoing record drawing set shall be transferred. These updates shall be reviewed for accuracy by the inspector of record and architect. Once all corrections have been completed the inspector shall sign and date the record set coversheet noting it as acceptance of the underground phase of record drawings.
2. At project completion, the record drawings shall be submitted by the contractor for project inspector and architect review and comment. These will be returned to the contractor for revisions. Once all corrections have been completed the inspector shall sign and date the record set coversheet noting it as acceptance of the completed record drawings. The original record drawings are to be resubmitted to the architect along with a scanned electronic file set in PDF format with file names matching the drawing titles.

1.9 GUARANTEES

A. Standard Guarantee: Provide individual as well as overall guarantees for all work executed under this Contract or any extra work to be absolutely free of all defects of workmanship and materials for a period of two years from the date of filing of notice of completion and acceptance by Owner. Repair and make good all such defects and repair any damage to other work caused thereby which may occur during same period at no cost to the owner.

B. Indicate on Guarantee Form specific provisions required by individual specification sections. List all special requirements, extended periods, bonding, etc.

C. Additional Guarantees: Provide additional guarantees (in excess of year(s) required by Standard Guarantee) where specifically required by pertinent Specification Sections.

D. Binder: Provide a binder with all guarantees placed in the order in which they occur in the project manual. Include an Index of Guarantees listing each specification section, specific items covered and length of guarantee for each item.

1.10 SITE EXAMINATION AND CONDITIONS

A. Examine site; verify dimensions and locations against Drawings and become informed of all conditions under which Work is to be done before submitting proposals.

B. Where signal systems exist, and services of other firms are required, Contractor shall instruct those firms to investigate existing systems and determine labor and materials needed to add devices or modify systems.

C. Where new conduits are to be run underground at existing sites, contractor shall visit site prior to bidding and walk routes of new underground conduits, note areas of concrete and asphalt being crossed, and include in bid all costs for cutting and patching.

D. Where existing conduits are shown, their location is diagrammatic and their exact location may not be known.

E. No allowances shall subsequently be made in Contractor’s behalf for any extra expense to which he or his “subs” may be put due to failure or neglect to discover conditions affecting the work.

1.11 UNDERGROUND UTILITIES:

A. Existing underground utilities, services, circuits, piping, irrigation piping, etc., are present, but their exact locations are not known. Contractor shall locate and protect before trenching or excavating in any area. Consult utility companies, “as-built drawings” and Owner’s maintenance personnel for location of existing underground work. If existing piping or utilities are damaged during construction. Contractor shall repair immediately at own expense. New underground work shall be modified as necessary to conform to existing conditions.

1.12 CLEANING AND CLEANUP

A. After all work has been accomplished such as sanding, painting, etc., lighting fixtures, panelboards, and switchboards shall be cleaned to remove all dust, dirt, grease, paint, or other marks. All electrical equipment shall be left in a clean condition inside and out, satisfactory to the Architect. Keep buildings and premises free from accumulated waste materials, rubbish, and debris resulting from work herein, and, upon completion of said work, remove tools, appliances, surplus materials, waste materials, rubbish, debris, and accessory items used in or resulting from said work and legally dispose of off the site.

1.13 PROTECTION

A. The Contractor shall protect from damage during construction the work and materials of other trades as well as the electrical work and material. Electrical equipment stored and installed on the job site shall be protected from dust, water, or any other damage.

1.14 WORKING SPACE

A. Adequate working space shall be provided around electrical equipment in strict compliance with the Codes. In general, provide 6'6" of headroom and 36" minimum clear work space in front of switchboards, panelboards, transformers, disconnect switches and controls for 120/208 volts and 42" for 277/480 volts. Carefully coordinate locations and orientation of electrical equipment with other divisions to ensure that working space will be clear of piping, conduits, and equipment provided by others.

1.15 COOPERATION AND COORDINATION

A. Cooperate and coordinate with other crafts in putting the installation in place at a time when the space required by this installation is accessible. Work done without regard to other crafts shall be moved at the Contractor’s expense.

1.16 INSPECTION

A. The Contractor shall cooperate with the Architect and shall provide assistance at all times for the inspection of the electrical work performed under this contract. He shall remove covers, operate machinery, or perform any reasonable work which, in the opinion of the Engineer, will be necessary to determine the quality and adequacy of the work.

1.17 MANUFACTURER’S DIRECTIONS

A. Follow manufacturer's directions where these directions cover points not included on the drawings or in the specifications. When equipment is provided by other divisions, obtain directions from respective supplier.

1.18 WORKMANSHIP

A. Good workmanship shall be evidenced in the installation of all electrical materials and equipment. Equipment shall be level, plumb and true with the structure and other equipment. All materials shall be firmly secured in place and adequately supported and permanent. The recommendations of the National Electrical Contractors Association Standard of installation shall be followed except where otherwise specifically directed.

1.19 OPERATING TEST

A. After the installation is complete, and at such time as the Engineer and other authorities having jurisdiction may request, the Contractor shall conduct an operating test for approval.

PART 2 - PRODUCTS

2.1 NOT USED

PART 3 - EXECUTION

3.1 GENERAL

A. Manufacturer's Directions: Follow manufacturer's directions where manufacturers of articles used furnish directions covering points not specified or shown.

B. All Work shall be done in orderly, workmanlike manner and present neat appearing installation when completed.

C. Provide metal backing plates, anchor plates, and similar items that are required for anchorage for the Work of this Section; securely weld or bolt to metal framing. Wood blocking or backing will not be permitted in combination with metal framing.

D. Equipment: Accurately set and level, neatly place support and anchor properly. Anchorage shall conform to the requirements of California Building Code. No allowance will be made for negligence to foresee means of placing, installing or supporting equipment in position.

E. Electrical products shall be anchored and fastened to building elements and finishes as follows:

1. Concrete Structural Elements: Provide expansion anchors and powder actuated anchors.
2. Steel Structural Elements: Provide beam clamps and spring steel clips.
3. Concrete Surfaces: Provide expansion anchors.
4. Solid Masonry Walls: Provide expansion anchors.
5. Sheet Metal: Provide sheet metal screws.
6. Wood Elements: Provide wood screws.

F. All wiring shall be installed in conduit, unless specifically shown otherwise on plans.

3.2 TESTING AND ADJUSTING

A. Furnish all labor and test equipment required for the Work of this Division. Testing work is defined as that work necessary to establish that equipment has been properly assembled, connected, and checked to verify that intent and purpose of Drawings, manufacturer's instruction manuals, and directions of Architect have been accomplished in satisfactory manner.

END OF SECTION 26 00 00

SECTION 26 05 05
SELECTIVE DEMOLITION FOR ELECTRICAL

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Removal of existing electrical equipment, wiring, and conduit in areas to be remodeled; removal of designated construction; dismantling, cutting and alterations for completion of the Work.
2. Disposal of materials.
3. Storage of removed materials.
4. Identification of utilities.
5. Salvaged items.
6. Protection of items to remain as indicated on Drawings.
7. Relocate existing equipment to accommodate construction.

1.2 CLOSEOUT SUBMITTALS

A. Project Record Documents: Record actual locations of capped utilities, conduits, and equipment abandoned in place.

1.3 QUALITY ASSURANCE

A. Perform Work in accordance with State, Municipality, Highways, and Public Work's standard.

1.4 SCHEDULING

A. Schedule work to coincide with new construction.

B. Cease operations immediately when structure appears to be in danger and notify Architect/Engineer. Do not resume operations until directed.

1.5 COORDINATION

A. Conduct demolition to minimize interference with adjacent and occupied building areas.

B. Coordinate demolition work with Owner’s representative and all other disciplines.

C. Coordinate and sequence demolition so as not to cause shutdown of operation of surrounding areas.

D. Shut-down Periods:

1. Arrange timing of shut-down periods of in service panels with Owner’s representative. Do not shut down any utility without prior written approval.
2. Keep shut-down period to minimum or use intermittent period as directed by Owner’s representative.
3. Maintain life-safety systems in full operation in occupied facilities, or provide notice minimum 72 hours in advance.

E. Identify salvage items in cooperation with Owner.

PART 2 - PRODUCTS

2.1 NOT USED

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify wiring and equipment indicated to be demolished serve only abandoned facilities.

B. Verify termination points for demolished services.

C. Verify extent of demolition work required. Drawings show the general demolition scope and may not show all required work.

3.2 PREPARATION

A. 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.

B. Erect, and maintain temporary safeguards, including warning signs and lights, barricades, and similar measures, for protection of the public, Owner, Contractor's employees, and existing improvements to remain.

C. Protect existing structures, facilities, and plant life from damage. Items damaged because of demolition operations shall be repaired or replaced, at no cost to the Owner.

D. Interruption of Service:

1. Services (power, telephone, fire alarm and other signal services) to existing building(s) and their related circuits which are to remain in operation shall not be interrupted except by specific approval of the Owner.
2. Make temporary connections to maintain service in areas adjacent to work area.
3. If it is deemed necessary to shut down circuits for the installation of new work, such shut down shall be scheduled with the Owner who may, at his option, have a representative present.
4. Any accidental interruption of service to circuits or equipment as a result of work performed by the Contractor shall, at the Contractor's expense, be restored in a manner acceptable to the Owner.
5. Fire Alarm and Intrusion Alarm Systems:
    a. Fire alarm system must be kept operational during work of this contract. If operation of existing system or portion of existing system is disrupted for connections into system or cutoff for any reason by work of this project, Contractor must provide fire watch. Fire watch must occur 24-hours per day and every day system is down. Fire watch proposed by Contractor must be acceptable to local fire authority and Owner. All costs for fire watch shall be Contractor’s responsibility.
    b. Intrusion alarm system must be kept operational during unoccupied hours. In the event that the system or portion of system in nonoperational during off-hour periods as a result of work of this contract, the Contractor must provide guard(s) to patrol the campus. Guard(s) and guard duties proposed by Contractor must be acceptable

to District and District Police (local enforcement if District does not have its own Police Services). All costs for security guard(s) shall be Contractor's responsibility.

3.3 DEMOLITION

A. Demolition Drawings are based on casual field observation and existing record documents. Report discrepancies to Owner or Architect/Engineer before disturbing existing installation.

B. Completely remove items shown to be removed on plans. Remove all associated raceways, supports, boxes, wiring, etc.

C. When walls or ceilings are opened up during construction, remove any abandoned raceways, boxes, supports, wiring, etc.

D. Cut conduit flush with walls and floors, and patch surfaces.

E. Where devices are removed and flush outlet box is to remain, provide blank cover plates.

F. Where removal of a device cuts off circuits to devices that are to remain, make connections as required to maintain the existing circuits.

G. Remove conduit, wire, boxes, and fastening devices to avoid any interference with new installation.

H. Disconnect abandoned outlets and remove devices. Remove abandoned outlets if conduit and wiring servicing them is abandoned and removed. Provide blank cover for abandoned outlets which are not removed.

I. Disconnect and remove abandoned panelboards and distribution equipment.

J. Disconnect and remove electrical devices and equipment serving utilization equipment that has been removed.

K. Disconnect and remove abandoned luminaires. Remove brackets, stems, hangers, and other accessories.

L. Disconnect electrical systems in walls, floors, and ceilings scheduled for removal.

M. Remaining Circuits and Equipment: Reinstall existing electrical installations disturbed. Certain existing electrical installations may be in walls, ceilings or floors that are to be removed and are essential for the operation of other remaining installations. Where this condition occurs provide a new extension of original circuits, raceways, equipment and outlets to retain service continuity. Installations shall be concealed in finished areas.

N. Reconnect equipment being disturbed by renovation work and required for continue service to or nearest available panel.

O. Disconnect or shut off service to areas where electrical work is to be removed. Remove electrical fixtures, equipment, and related switches, outlets, conduit and wiring which are not part of final project.

P. Install temporary wiring and connections to maintain existing systems in service during construction.

Q. Perform work on energized equipment or circuits with experienced and trained personnel.

R. Remove, relocate, and extend existing installations to accommodate new construction.

S. Repair adjacent construction and finishes damaged during demolition and extension work.

T. Remove exposed abandoned grounding and bonding components, fasteners and supports, and electrical identification components, including abandoned components above accessible ceiling finishes. Cut embedded support elements flush with walls and floors.

U. Clean and repair existing equipment to remain or to be reinstalled.

V. Protect and retain power to existing active equipment remaining.

W. Cap abandoned empty conduit at both ends.

X. 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 jack-hammer within 2-inches of reinforcing or structural steel to remain; remove final 2-inches of material with chipping gun.

3.4 EXISTING PANELBOARDS

A. Ring out circuits in existing panel affected by the Work. Where additional circuits are needed, reuse circuits available for reuse. Install new breakers.

B. Tag unused circuits as spare.

C. Where existing circuits are indicated to be reused, use sensing measuring devices to verify circuits feeding Project area or are not in use.

D. Remove existing wire no longer in use from panel to equipment.

E. Provide new updated directories where more than three circuits have been modified or rewired.

3.5 SALVAGE ITEMS

A. Remove and protect items indicated on Drawings to be salvaged and turn over to Owner.

B. Items of salvageable value may be removed as work progresses. Transport salvaged items from site as they are removed.

3.6 REUSABLE ELECTRICAL EQUIPMENT

A. Carefully remove equipment, materials, or fixtures which are to be reused.

B. Disconnect, remove, or relocate existing electrical material and equipment interfering with new installation.

C. Relocate existing lighting fixtures as indicated on Drawings. Clean fixtures and re-lamp. Test fixture to see if it is in good working condition before installation at new location.

3.7 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 adjacent area.

3.8 CLEANING

A. Remove demolished materials as work progresses. Legally dispose.

B. Keep workplace neat.

C. 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.

D. Perform sandblasting, chipping, grinding, acid washing, etching, and other work as required by conditions encountered and new materials involved

E. Use of acids or other cleaning agents shall include neutralizing, washing, rinsing, and drying, as applicable.

F. Determine substrate requirements for reconditions surfaces in cooperation with the manufacturer’s representative and installer of each new installer involved.

G. 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.

3.9 PROTECTION OF FINISHED WORK

A. Do not permit traffic over unprotected floor surface.

END OF SECTION 26 05 05

SECTION 26 05 19
ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes building wire and cable, wiring connectors and connections.

1.2 REFERENCES

A. International Electrical Testing Association:

1. NETA ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.

B. National Fire Protection Association:

1. NFPA 70 - National Electrical Code with California Amendments.
2. NFPA 262 - Standard Method of Test for Flame Travel and Smoke of Wires and Cables for Use in Air-Handling Spaces.

C. Underwriters Laboratories, Inc.:

1. UL 1277 - Standard for Safety for Electrical Power and Control Tray Cables with Optional Optical-Fiber Members.

1.3 SYSTEM DESCRIPTION

A. Product Requirements: Provide products as follows:

1. All wiring shall be copper.
2. All wiring shall be installed in raceway.
3. Solid conductor for feeders and branch circuits 10 AWG and smaller.
4. Stranded conductors for control circuits.
5. Conductor not smaller than 12 AWG for power and lighting circuits.
6. Conductor not smaller than 14 AWG for control circuits.
7. Increase wire size in branch circuits to limit voltage drop to a maximum of 3 percent.
8. 10 AWG conductors for 20 ampere or larger as designated on plans for 120 volt branch circuit home runs longer than 75 feet.
9. 10 AWG conductors for 20 ampere or larger as designated on plans for 277 volt branch circuit home runs longer than 200 feet.

B. Wiring Methods: Provide the following wiring methods:

1. Concealed Dry Interior Locations: Use only building wire, Type THHN/THWN-2 insulation, in raceway.
2. Exposed Dry Interior Locations: Use only building wire, Type THHN/THWN-2 insulation, in raceway.
3. Above Accessible Ceilings: Use only building wire, Type THHN/THWN-2 insulation, in raceway.

4. Wet or Damp Interior Locations: Use only building wire, Type THHN/THWN-2 insulation, in raceway.
5. Exterior Locations: Use only building wire, Type XHHW-2 insulation, in raceway.
6. Underground Locations: Use only building wire, Type XHHW-2 insulation, in raceway.

1.4 DESIGN REQUIREMENTS

A. Conductor sizes are based on copper.

1.5 SUBMITTALS

A. Refer to 26 0000.

1.6 QUALITY ASSURANCE

A. Provide wiring materials located in plenums with peak optical density not greater than 0.5, average optical density not greater than 0.15, and flame spread not greater than 5 feet when tested in accordance with NFPA 262.

B. Perform Work in accordance with State, Municipality, Highways, and Public Work's standard.

C. Maintain one copy of each document on site.

1.7 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented experience.

1.8 FIELD MEASUREMENTS

A. Verify field measurements are as indicated on Drawings.

1.9 COORDINATION

A. Where wire and cable destination is indicated and routing is not shown, determine routing and lengths required.

B. Wire and cable routing indicated is approximate unless dimensioned.

C. Determine required separation between wire, cable and other work. Determine cable routing to avoid interference with other work.

PART 2 - PRODUCTS

2.1 BUILDING WIRE

A. Product Description: Single conductor insulated wire.

B. Conductor: Copper.

C. Insulation Voltage Rating: 600 volts.

D. Insulation Temperature Rating: 75 or 90 degrees C.

E. Insulation Material: Thermoplastic.

2.2 PLASTIC TAPE:

A. Black 7 mil thick general purpose electrical tape, Scotch 33 plus or equal.

2.3 INSULATING RESIN:

A. Use two part liquid epoxy resin with resin and catalyst in premeasured, sealed mixing pouch. Scotchcast 4 or equivalent.

2.4 REDUCING ADAPTERS:

A. Burndy, Thomas and Betts or approved equal.

2.5 TERMINATIONS

A. Terminal Lugs for Wires 6 AWG and Smaller: Solderless, compression type copper.

B. Lugs for Wires 4 AWG and Larger: Color keyed, compression type copper, with insulating sealing collars.

2.6 SPLICES:

A. #10 and smaller, including fixture taps - pre-insulated coiled-spring type connectors, 3M Scotchloks, T&B Piggys, or equal.

B. #8 to #4, Split bolt service connectors, T&B locktite, Burndy Servit, or equal, insulated with Scotch #88, Okoweld four purpose tape, or equal.

C. #2 and larger, bolted pressure connectors, OZ ST, Burndy OKLIP, or equal, insulated with "Scotchfill" and Scotch #88 or Okoweld four purpose tape.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify interior of building has been protected from weather.

B. Verify mechanical work likely to damage wire and cable has been completed.

C. Verify raceway installation is complete and supported.

3.2 PREPARATION

A. Completely and thoroughly swab raceway before installing wire.

3.3 EXISTING WORK

A. Remove exposed abandoned wire and cable, including abandoned wire and cable above accessible ceiling finishes. Patch surfaces where removed cables pass through building finishes.

B. Disconnect abandoned circuits and remove circuit wire and cable. Remove abandoned boxes when wire and cable servicing boxes is abandoned and removed. Install blank cover for abandoned boxes not removed.

C. Provide access to existing wiring connections remaining active and requiring access. Modify installation or install access panel.

D. Extend existing circuits using materials and methods as specified.

E. Clean and repair existing wire and cable remaining or wire and cable to be reinstalled.

3.4 INSTALLATION

A. Route wire and cable 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.

B. Neatly train and lace wiring inside boxes, equipment, and panelboards.

C. Identify and color code wire and cable. Identify each conductor with its circuit number or other designation indicated.

D. Special Techniques--Building Wire in Raceway:

1. Pull conductors into raceway at same time.
2. Install building wire 4 AWG and larger with pulling equipment.
3. Use suitable cable fittings and connectors.

E. Special Techniques - Wiring Connections:

1. Clean conductor surfaces before installing lugs and connectors.
2. Make splices, taps, and terminations to carry full ampacity of conductors with no perceptible temperature rise.
3. Tape uninsulated conductors and connectors with electrical tape to 150 percent of insulation rating of conductor.
4. Install bolted pressure connectors for copper conductor splices and taps, 2 AWG and larger.
5. Install split bolt connectors with for copper conductor splices and taps, 8 AWG to 4 AWG.
6. Install insulated spring wire connectors with plastic caps for copper conductor splices and taps, 10 AWG and smaller.
7. Install suitable reducing connectors or mechanical connector adaptors for connecting aluminum conductors to copper conductors.
8. Encapsulate below grade splices at outlet, pull and junction boxes with specified insulating resin kits. Make all splices watertight.
9. Install waterproof wire connectors with plastic caps for copper conductor splices and taps, 10 AWG and smaller in outdoor or wet locations.
10. Where oversized cables are used to accommodate voltage drop, whether a single or parallel feeder, provide appropriate reducing adapter and conductors for termination.

F. Install stranded conductors for branch circuits 10 AWG and smaller. Install crimp on fork terminals for device terminations. Do not place bare stranded conductors directly under screws.

G. Install terminal lugs on ends of 600 volt wires unless lugs are furnished on connected device, such as circuit breakers.

H. Size lugs in accordance with manufacturer's recommendations terminating wire sizes. Install 2-hole type lugs to connect wires 4 AWG and larger to copper bus bars.

I. For terminal lugs fastened together such as on motors, transformers, and other apparatus, or when space between studs is small enough that lugs can turn and touch each other, insulate for dielectric strength of 2-1/2 times normal potential of circuit.

3.5 WIRE COLOR

A. General:

1. For wire sizes 10 AWG and smaller, install wire colors in accordance with the following:
   a. Black and red for single phase circuits at 120/240 volts.
   b. Black, red, and blue for circuits at 120/208 volts single or three phase.
   c. Orange, brown, and yellow for circuits at 277/480 volts single or three phase.
2. For wire sizes 8 AWG and larger, identify wire with colored tape at terminals, splices and boxes. Colors are as follows:
   a. Black and red for single phase circuits at 120/240 volts.
   b. Black, red, and blue for circuits at 120/208 volts single or three phase.
   c. Orange, brown, and yellow for circuits at 277/480 volts single or three phase.

B. Neutral Conductors: White. When two or more neutrals are located in one conduit, individually identify each with proper circuit number.

C. Branch Circuit Conductors: Install three or four wire home runs with each phase uniquely color coded.

D. Feeder Circuit Conductors: Uniquely color code each phase.

E. Ground Conductors:

1. For 6 AWG and smaller: Green.
2. For 4 AWG and larger: Identify with green tape at both ends and visible points including junction boxes.

3.6 FIELD QUALITY CONTROL

A. Inspect and test in accordance with NETA ATS, except Section 4.

B. Perform inspections and tests listed in NETA ATS, Section 7.3.2.

END OF SECTION 26 05 19

SECTION 26 05 26
GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Rod electrodes.
2. Wire.
3. Grounding well components.
4. Mechanical connectors.
5. Exothermic connections.

1.2 REFERENCES

A. Institute of Electrical and Electronics Engineers:

1. IEEE 142 - Recommended Practice for Grounding of Industrial and Commercial Power Systems.
2. IEEE 1100 - Recommended Practice for Powering and Grounding Electronic Equipment.

B. International Electrical Testing Association:

1. NETA ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.

C. National Fire Protection Association:

1. NFPA 70 - National Electrical Code, with California Amendments.
2. NFPA 99 - Standard for Health Care Facilities.

1.3 SYSTEM DESCRIPTION

A. Grounding systems use the following elements as grounding electrodes:

1. Metal underground water pipe.
2. Metal building frame.
3. Concrete-encased electrode.
4. Ground ring.
5. Rod electrode.
6. Plate electrode.

1.4 PERFORMANCE REQUIREMENTS

A. Grounding System Resistance: 25 ohms maximum.

1.5 SUBMITTALS

A. Product Data: Submit data on grounding electrodes and connections.

1.6 CLOSEOUT SUBMITTALS

A. Project Record Documents: Record actual locations of components and grounding electrodes.

B. Test Reports: Indicate overall resistance to ground and resistance of each electrode.

1.7 QUALITY ASSURANCE

A. Provide grounding materials conforming to requirements of NEC, IEEE 142, and UL labeled.

B. Perform Work in accordance with State, Municipality, Highways, and Public Work's standard.

C. Maintain one copy of each document on site.

1.8 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing Products specified in this section with minimum three years documented experience.

B. Installer: Company specializing in performing work of this section with minimum 3 years documented experience.

1.9 PRE-INSTALLATION MEETINGS

A. Convene minimum one week prior to commencing work of this section.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Accept materials on site in original factory packaging, labeled with manufacturer's identification.

B. Protect from weather and construction traffic, dirt, water, chemical, and mechanical damage, by storing in original packaging.

C. Do not deliver items to project before time of installation. Limit shipment of bulk and multiple-use materials to quantities needed for immediate installation.

1.11 COORDINATION

A. Complete grounding and bonding of building reinforcing steel prior concrete placement.

PART 2 - PRODUCTS

2.1 ROD ELECTRODES

A. Product Description:

1. Material: Copper.
2. Diameter: 0.75 inch.
3. Length: 10 feet.

B. Connector: Connector for exothermic welded connection.

2.2 WIRE

A. Material: Stranded copper.

B. Foundation Electrodes: 4/0 AWG or as indicated on drawings.

C. Grounding Electrode Conductor: Copper conductor insulated.

D. Bonding Conductor: Copper conductor insulated.

2.3 GROUNDING WELL COMPONENTS

A. Well Pipe: 8 inches by 24 inches long concrete pipe with belled end.

B. Well Cover: Cast iron with legend "GROUND" embossed on cover.

2.4 MECHANICAL CONNECTORS

A. Description: Bronze connectors, suitable for grounding and bonding applications, in configurations required for particular installation.

2.5 EXOTHERMIC CONNECTIONS

A. Product Description: Exothermic materials, accessories, and tools for preparing and making permanent field connections between grounding system components.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify final backfill and compaction has been completed before driving rod electrodes.

3.2 PREPARATION

A. Remove paint, rust, mill oils, surface contaminants at connection points.

3.3 EXISTING WORK

A. Modify existing grounding system to maintain continuity to accommodate renovations.

B. Extend existing grounding system using materials and methods as specified.

3.4 INSTALLATION

A. Install in accordance with IEEE 142 and 1100.

B. Accomplish grounding of electrical system by using insulated grounding conductor installed with feeders and branch circuit conductors in conduits. Size grounding conductors in accordance with NEC. Install from grounding bus of serving panel to ground bus of served panel, grounding screw of receptacles, lighting fixture housing, light switch outlet boxes or metal enclosures of service equipment. Ground conduits by means of grounding bushings on terminations at panelboards with installed number 12 conductor to grounding bus.

C. Permanently ground entire light and power system in accordance with NEC, including service equipment, distribution panels, lighting panelboards, switch and starter enclosures, motor frames, grounding type receptacles, and other exposed non-current carrying metal parts of electrical equipment.

D. Each building shall have its own grounding electrode. Metal water and gas piping, and building structural steel, shall be bonded to grounding electrode at first panel ground bus unless detailed otherwise on the Drawings.

E. Unless detailed otherwise on drawings, grounding electrode(s) shall be foundation ground grid(s) consisting of two opposing runs of 25' lengths of #4/0 soft drawn bare copper conductors installed at bottom of foundation with 2" of concrete between conductors and earth, encased in concrete their entire length exclusive of tails for connections to equipment. Keep conductors separated from reinforcing steel by use of insulating tape. Conductors shall be interconnected by the Cadweld process using molds and charges according to manufacturer's recommendations. Tails for connection to equipment where shown or called for on drawings shall provide not less than 24" length above finished floor level. Protect all tails against damage.

F. Grounding electrodes and connections to building water and gas mains or building structural steel shall have insulated conductors run in conduit directly to service ground bus separate from any other grounding conductor.

G. Install rod electrodes at locations as indicated on Drawings. Install additional rod electrodes to achieve specified resistance to ground.

H. Install grounding and bonding conductors concealed from view.

I. Provide grounding bar in electrical room, closet, etc. for grounding of low voltage (LV) equipment, racks and the like. Refer to drawings for detail. Locate grounding bar adjacent to data communication rack.

J. Install grounding well pipe with cover at each rod location. Install well pipe top flush with finished grade.

K. Bond together metal siding not attached to grounded structure; bond to ground.

L. Bond together reinforcing steel and metal accessories in pool and fountain structures.

M. Install ground grid under access floors. Construct grid of 4 AWG bare copper wire installed on 24 inch centers both ways. Bond each access floor pedestal to grid.

N. Bond together each metallic raceway, pipe, duct and other metal object entering space under access floors. Bond to underfloor ground grid. Install 2 AWG bare copper bonding conductor.

O. Equipment Grounding Conductor: Install separate, insulated conductor within each feeder and branch circuit raceway. Terminate each end on suitable lug, bus, or bushing.

P. All grounding type receptacles shall have grounding contact connected to a grounding conductor. Grounding conductor may be code size green insulated copper conductor installed in circuit raceway or may be metallic raceway. If metallic raceway is used as grounding conductor, a green insulated copper conductor must connect receptacle grounding contact to lug or screw terminal in outlet box or to grounding bushing at raceway. Isolated grounding type receptacles shall have code sized green insulated copper conductor installed in circuit raceway.

Q. Connect to site grounding system.

R. Install continuous grounding using underground cold water system and building steel as grounding electrode. Where water piping is not available, install artificial station ground by means of driven rods or buried electrodes.

S. Install branch circuits feeding isolated ground receptacles with separate insulated grounding conductor, connected only at isolated ground receptacle, ground terminals, and at ground bus of serving panel.

T. Grounding electrical system using continuous metal raceway system enclosing circuit conductors in accordance with NEC.

U. Permanently attach equipment and grounding conductors prior to energizing equipment.

3.5 FIELD QUALITY CONTROL

A. Inspect and test in accordance with NETA ATS, except Section 4.

B. Grounding and Bonding: Perform inspections and tests listed in NETA ATS, Section 7.13.

C. Perform ground resistance testing in accordance with IEEE 142.

D. Perform leakage current tests in accordance with NFPA 99.

E. Perform continuity testing in accordance with IEEE 142.

F. When improper grounding is found on receptacles, check receptacles in entire project and correct. Perform retest.

3.6 INDEPENDENT TESTING ORGANIZATION AND PERSONNEL

A. Obtain the services of an independent third-party testing organization to perform electrical tests.

B. Independent testing organization and personnel shall meet the requirements of NETA ATS 3.1 and 3.2.

C. Tests shall be performed using a Megger Earth Tester or equivalent.

D. Provide written test results and a final report of electrical tests per NETA ATS 5.4 to Engineer.

END OF SECTION 26 05 26

SECTION 26 05 29
HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Conduit supports.
2. Formed steel channel.
3. Spring steel clips.
4. Sleeves.
5. Mechanical sleeve seals.
6. Firestopping relating to electrical work.
7. Firestopping accessories.
8. Equipment bases and supports.

1.2 REFERENCES

A. ASTM International:

1. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
2. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials.
3. ASTM E814 - Standard Test Method for Fire Tests of Through-Penetration Fire Stops.
4. ASTM E1966 - Standard Test Method for Fire-Resistive Joint Systems.

B. FM Global:

1. FM - Approval Guide, A Guide to Equipment, Materials & Services Approved by Factory Mutual Research for Property Conservation.

C. National Fire Protection Association:

1. NFPA 70 - National Electrical Code with California Amendments.

D. Underwriters Laboratories Inc.:

1. UL 263 - Fire Tests of Building Construction and Materials.
2. UL 723 - Tests for Surface Burning Characteristics of Building Materials.
3. UL 1479 - Fire Tests of Through-Penetration Firestops.
4. UL 2079 - Tests for Fire Resistance of Building Joint Systems.
5. UL - Fire Resistance Directory.

1.3 DEFINITIONS

A. Firestopping (Through-Penetration Protection System): Sealing or stuffing material or assembly placed in spaces between and penetrations through building materials to arrest movement of fire, smoke, heat, and hot gases through fire rated construction.

1.4 SYSTEM DESCRIPTION

A. Firestopping Materials: ASTM E119, ASTM E814, UL 263, UL 1479, to achieve fire ratings of adjacent construction in accordance with FM and UL Design Numbers noted on Drawings.

B. Firestop interruptions to fire rated assemblies, materials, and components.

1.5 PERFORMANCE REQUIREMENTS

A. Firestopping: Conform to applicable code, FM, and UL for fire resistance ratings and surface burning characteristics.

B. Firestopping: Provide certificate of compliance from authority having jurisdiction indicating approval of materials used.

1.6 SUBMITTALS

A. Shop Drawings: Indicate system layout with location and detail of trapeze hangers.

B. Product Data:

1. Hangers and Supports: Submit manufacturers catalog data including load capacity.
2. Firestopping: Submit data on product characteristics, performance and limitation criteria.

C. Firestopping Schedule: Submit schedule of opening locations and sizes, penetrating items, and required listed design numbers to seal openings to maintain fire resistance rating of adjacent assembly.

D. Design Data: Indicate load carrying capacity of trapeze hangers and hangers and supports.

E. Submit details and calculations for support and anchors that are not specifically detailed on the Drawings where required by California Building Standards Code, California Code of Regulations, Title 24. Pre-approved systems may be used as noted below only if the pre-approval is current and accepted by the local agency having jurisdiction.

F. Where pre-approved bracing systems will be employed, submit:

1. System component brochure describing components used and detailed installation instructions.
2. Loads to be transmitted to the structure at anchor points.

G. Manufacturer's Installation Instructions:

1. Hangers and Supports: Submit special procedures and assembly of components.
2. Firestopping: Submit preparation and installation instructions.

H. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

I. Firestopping Engineering Judgments: For conditions not covered by UL listed designs, submit judgments by licensed professional engineer suitable for presentation to authority having jurisdiction for acceptance as meeting code fire protection requirements.

1.7 QUALITY ASSURANCE

A. Through Penetration Firestopping of Fire Rated Assemblies: UL 1479 or ASTM E814 with 0.10-inch water gage minimum positive pressure differential to achieve fire F-Ratings and temperature T-Ratings as indicated on Drawings, but not less than 1-hour.

1. Wall Penetrations: Fire F-Ratings as indicated on Drawings, but not less than 1-hour.
2. Floor and Roof Penetrations: Fire F-Ratings and temperature T-Ratings as indicated on Drawings, but not less than 1-hour.
    a. Floor Penetrations Within Wall Cavities: T-Rating is not required.

B. Through Penetration Firestopping of Non-Fire Rated Floor and Roof Assemblies: Materials to resist free passage of flame and products of combustion.

1. Noncombustible Penetrating Items: Noncombustible materials for penetrating items connecting maximum of three stories.
2. Penetrating Items: Materials approved by authorities having jurisdiction for penetrating items connecting maximum of two stories.

C. Fire Resistant Joints in Fire Rated Floor, Roof, and Wall Assemblies: ASTM E1966 or UL 2079 to achieve fire resistant rating as indicated on Drawings for assembly in which joint is installed.

D. Fire Resistant Joints Between Floor Slabs and Exterior Walls: ASTM E119 with 0.10-inch water gage minimum positive pressure differential to achieve fire resistant rating as indicated on Drawings for floor assembly.

E. Surface Burning Characteristics: Maximum 25/450 flame spread/smoke developed index when tested in accordance with ASTM E84.

F. Perform Work in accordance with State, Municipality, Highways, and Public Work's standard.

G. Maintain one copy of each document on site.

1.8 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing Products specified in this section with minimum three years documented experience.

B. Installer: Company specializing in performing work of this section with minimum 3 years documented experience.

1.9 PRE-INSTALLATION MEETINGS

A. Convene minimum one week prior to commencing work of this section.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Accept materials on site in original factory packaging, labeled with manufacturer's identification.

B. Protect from weather and construction traffic, dirt, water, chemical, and mechanical damage, by storing in original packaging.

1.11 ENVIRONMENTAL REQUIREMENTS

A. Do not apply firestopping materials when temperature of substrate material and ambient air is below 60 degrees F.

B. Maintain this minimum temperature before, during, and for minimum 3 days after installation of firestopping materials.

C. Provide ventilation in areas to receive solvent cured materials.

PART 2 - PRODUCTS

2.1 CONDUIT SUPPORTS

A. Hanger Rods: Threaded high tensile strength galvanized carbon steel with free running threads.

B. Beam Clamps: Malleable Iron, with tapered hole in base and back to accept either bolt or hanger rod. Set screw: hardened steel.

C. Conduit clamps for trapeze hangers: Galvanized steel, notched to fit trapeze with single bolt to tighten.

D. Conduit clamps - general purpose: One-hole malleable iron for surface mounted conduits.

E. Cable Ties: High strength nylon temperature rated to 185 degrees F. Self-locking.

2.2 FORMED STEEL CHANNEL

A. Product Description: Galvanized 12 gage thick steel.

2.3 SPRING STEEL CLIPS

A. Product Description: Mounting hole and screw closure.

2.4 SLEEVES

A. Sleeves for Through Non-fire Rated Floors: 18 gage thick galvanized steel.

B. Sleeves for Through Non-fire Rated Beams, Walls, Footings, and Potentially Wet Floors: Steel pipe or 18 gage thick galvanized steel.

C. Sleeves for Through Fire Rated and Fire Resistive Floors and Walls, and Fire Proofing: Prefabricated fire rated sleeves including seals, UL listed.

D. Fire-stopping Insulation: Glass fiber type, non-combustible.

2.5 MECHANICAL SLEEVE SEALS

A. Product Description: Modular mechanical type, consisting of interlocking synthetic rubber links shaped to continuously fill annular space between object and sleeve, connected with bolts and pressure plates causing rubber sealing elements to expand when tightened, providing watertight seal and electrical insulation.

2.6 FIRESTOPPING

A. Product Description: Different types of products by multiple manufacturers are acceptable as required to meet specified system description and performance requirements; provide only one type for each similar application.

1. Silicone Firestopping Elastomeric Firestopping: Single component silicone elastomeric compound and compatible silicone sealant.

2. Foam Firestopping Compounds: Single component foam compound.
3. Formulated Firestopping Compound of Incombustible Fibers: Formulated compound mixed with incombustible non-asbestos fibers.
4. Fiber Stuffing and Sealant Firestopping: Composite of mineral fiber stuffing insulation with silicone elastomer for smoke stopping.
5. Mechanical Firestopping Device with Fillers: Mechanical device with incombustible fillers and silicone elastomer, covered with sheet stainless steel jacket, joined with collars, penetration sealed with flanged stops.
6. Intumescent Firestopping: Intumescent putty compound which expands on exposure to surface heat gain.
7. Firestop Pillows: Formed mineral fiber pillows.

B. Color: Dark gray.

2.7 FIRESTOPPING ACCESSORIES

A. Primer: Type recommended by firestopping manufacturer for specific substrate surfaces and suitable for required fire ratings.

B. Dam Material: Permanent:

1. Mineral fiberboard.
2. Mineral fiber matting.
3. Sheet metal.
4. Plywood or particle board.
5. Alumina silicate fire board.

C. Installation Accessories: Provide clips, collars, fasteners, temporary stops or dams, and other devices required to position and retain materials in place.

D. General:

1. Furnish UL listed products.
2. Select products with rating not less than rating of wall or floor being penetrated.

E. Non-Rated Surfaces:

1. Stamped steel, chrome plated, hinged, split ring escutcheons or floor plates or ceiling plates for covering openings in occupied areas where conduit is exposed.
2. For exterior wall openings below grade, furnish modular mechanical type seal consisting of interlocking synthetic rubber links shaped to continuously fill annular space between conduit and cored opening or water-stop type wall sleeve.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify openings are ready to receive sleeves.

B. Verify openings are ready to receive firestopping.

3.2 PREPARATION

A. Clean substrate surfaces of dirt, dust, grease, oil, loose material, or other matter affecting bond of firestopping material.

B. Remove incompatible materials affecting bond.

C. Install backing materials to arrest liquid material leakage.

D. Obtain permission from Architect/Engineer before using powder-actuated anchors.

E. Obtain permission from Architect/Engineer before drilling or cutting structural members.

3.3 INSTALLATION - HANGERS AND SUPPORTS

A. Anchors and Fasteners:

1. Concrete Structural Elements: Provide precast inserts and expansion anchors.
2. Steel Structural Elements: Provide beam clamps, spring steel clips, steel ramset fasteners, and welded fasteners.
3. Concrete Surfaces: Provide self-drilling anchors and expansion anchors.
4. Hollow Masonry, Plaster, and Gypsum Board Partitions: Provide toggle bolts.
5. Solid Masonry Walls: Provide expansion anchors and preset inserts.
6. Sheet Metal: Provide sheet metal screws.
7. Wood Elements: Provide wood screws.

B. Inserts:

1. Install inserts for placement in concrete forms.
2. Install inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.
3. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4 inches.
4. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.
5. Where inserts are omitted, drill through concrete slab from below and provide through-bolt with recessed square steel plate and nut flush with top of slab.

C. Install conduit and raceway support and spacing in accordance with NEC.

D. Do not fasten supports to pipes, ducts, mechanical equipment, or conduit.

E. Install multiple conduit runs on common hangers.

F. Supports:

1. Fabricate supports from structural steel or formed steel channel. Install hexagon head bolts to present neat appearance with adequate strength and rigidity. Install spring lock washers under nuts.
2. Install surface mounted cabinets and panelboards with minimum of four anchors.
3. In wet and damp locations install steel channel supports to stand cabinets and panelboards 1 inch off wall.
4. Support vertical conduit at every floor.

3.4 INSTALLATION - FIRESTOPPING

A. Install material at fire rated construction perimeters and openings containing penetrating sleeves, piping, ductwork, conduit and other items, requiring firestopping.

B. Apply primer where recommended by manufacturer for type of firestopping material and substrate involved, and as required for compliance with required fire ratings.

C. Apply firestopping material in sufficient thickness to achieve required fire and smoke rating.

D. Place intumescent coating in sufficient coats to achieve rating required.

E. Remove dam material after firestopping material has cured.

F. Fire Rated Surface:

1. Seal opening at floor, wall, partition, ceiling, and roof as follows:
    a. Install sleeve through opening and extending beyond minimum of 1 inch on both sides of building element.
    b. Size sleeve allowing minimum of 1-inch void between sleeve and building element.
    c. Pack void with backing material.
    d. Seal ends of sleeve with UL listed fire resistive silicone compound to meet fire rating of structure penetrated.
2. Where cable tray, bus, cable bus, conduit, wireway, and trough penetrates fire rated surface, install firestopping product in accordance with manufacturer's instructions.

G. Non-Rated Surfaces:

1. Seal opening through non-fire rated wall, partition, floor, ceiling, and roof opening as follows:
    a. Install sleeve through opening and extending beyond minimum of 1 inch on both sides of building element.
    b. Size sleeve allowing minimum of 1-inch void between sleeve and building element.
    c. Install type of firestopping material recommended by manufacturer.
2. Install floor plates or ceiling plates where conduit, penetrates non-fire rated surfaces in occupied spaces. Occupied spaces include rooms with finished ceilings and where penetration occurs below finished ceiling.
3. Exterior wall openings below grade: Assemble rubber links of mechanical seal to size of conduit and tighten in place, in accordance with manufacturer's instructions.
4. Interior partitions: Seal pipe penetrations at clean rooms, laboratories, hospital spaces, computer rooms, telecommunication rooms, and data rooms. Apply sealant to both sides of penetration to completely fill annular space between sleeve and conduit.

3.5 INSTALLATION - EQUIPMENT BASES AND SUPPORTS

A. Provide housekeeping pads of concrete, minimum 3-1/2 inches thick and extending 6 inches beyond supported equipment.

B. Using templates furnished with equipment, install anchor bolts, and accessories for mounting and anchoring equipment.

C. Construct supports of formed steel channel. Brace and fasten with flanges bolted to structure.

3.6 INSTALLATION - SLEEVES

A. Exterior watertight entries: Seal with adjustable interlocking rubber links.

B. Conduit penetrations not required to be watertight: Sleeve and fill with silicon foam.

C. Set sleeves in position in forms. Provide reinforcing around sleeves.

D. Size sleeves large enough to allow for movement due to expansion and contraction. Provide for continuous insulation wrapping.

E. Extend sleeves through floors 1 inch above finished floor level. Caulk sleeves.

F. Where conduit or raceway penetrates floor, ceiling, or wall, close off space between conduit or raceway and adjacent work with fire stopping insulation and caulk airtight. Provide close fitting metal collar or escutcheon covers at both sides of penetration.

G. Install chrome plated steel escutcheons at finished surfaces.

3.7 FIELD QUALITY CONTROL

A. Inspect installed firestopping for compliance with specifications and submitted schedule.

3.8 CLEANING

A. Clean adjacent surfaces of firestopping materials.

3.9 PROTECTION OF FINISHED WORK

A. Protect adjacent surfaces from damage by material installation.

END OF SECTION 26 05 29

SECTION 26 05 33
RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes conduit, surface raceways, J-hooks, wireways, outlet boxes, pull and junction boxes, concrete pullboxes and vaults, floor boxes.

1.2 REFERENCES

A. American National Standards Institute:

1. ANSI C80.1 - Rigid Steel Conduit, Zinc Coated.
2. ANSI C80.3 - Specification for Electrical Metallic Tubing, Zinc Coated.

B. National Electrical Manufacturers Association:

1. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).
2. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit and Cable Assemblies.
3. NEMA OS 1 - Sheet Steel Outlet Boxes, Device Boxes, Covers, and Box Supports.
4. NEMA OS 2 - Nonmetallic Outlet Boxes, Device Boxes, Covers, and Box Supports.
5. NEMA RN 1 - Polyvinyl Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit.
6. NEMA TC 2 - Electrical Polyvinyl Chloride (PVC) Tubing and Conduit.
7. NEMA TC 3 - PVC Fittings for Use with Rigid PVC Conduit and Tubing.

1.3 SYSTEM DESCRIPTION

A. Raceway and boxes located as indicated on Drawings, and at other locations required for splices, taps, wire pulling, equipment connections, and compliance with regulatory requirements. Raceway and boxes are shown in approximate locations unless dimensioned. Provide raceway to complete wiring system.

B. All wiring shall be installed in raceway.

C. Provide raceway as follows:

1. Underground: Provide thickwall nonmetallic conduit. Provide cast metal boxes or nonmetallic handhole.
2. In Slab Above Grade: Not permitted.
3. Below Slab on Grade: Use thickwall nonmetallic conduit. Terminate with coated rigid steel elbows and short length of coated rigid steel conduit out of concrete.
4. Outdoor Locations, Above Grade: Provide galvanized rigid steel conduit. Provide cast metal outlet, pull, and junction boxes.
5. Wet and Damp Locations: Provide galvanized rigid steel conduit. Provide cast metal outlet, junction, and pull boxes. Provide flush mounting outlet box in finished areas.

6. Concealed Dry Locations: Provide electrical metallic tubing. Provide sheet-metal boxes. Provide flush mounting outlet box in finished areas. Provide hinged enclosure for large pull boxes where shown on drawings. Provide J-hooks when shown on plans.
7. Exposed Interior Dry Locations: Use rigid steel conduit or intermediate metal conduit below eight feet or where subject to damage. Use rigid steel conduit, intermediate metal conduit, or electrical metallic tubing above eight feet or in electrical, mechanical or telecommunication rooms. Provide cast metal outlet, junction, and pull boxes. Use flush mounting outlet box in finished areas. Provide hinged enclosure for large pull boxes.

1.4 DESIGN REQUIREMENTS

A. Minimum Raceway Size: 0.75 inch unless otherwise specified.

B. Minimum Raceway Size for Data Communications: 1.00 inch unless otherwise specified.

C. Minimum Raceway Size for Telecommunications: 1.00 inch unless otherwise specified.

D. Minimum Raceway Size for AV Systems: 1.00 inch unless otherwise specified.

1.5 SUBMITTALS

A. Refer to Section 26 0000.

1.6 CLOSEOUT SUBMITTALS

A. Project Record Documents:

1. Record actual routing of conduits larger than 2 inches.
2. Record actual locations and mounting heights of outlet, pull, and junction boxes.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Protect conduit from corrosion and entrance of debris by storing above grade. Provide appropriate covering.

B. Protect PVC conduit from sunlight.

1.8 COORDINATION

A. Coordinate mounting heights, orientation and locations of outlets mounted above counters, benches, and backsplashes.

B. Coordinate Work of this Division and Work of other Divisions in advance of installation. Provide additional Work to overcome tight conditions at no increase in Contract Sum.

C. Coordinate installation of outlet boxes for equipment specified in other divisions.

PART 2 - PRODUCTS

2.1 METAL CONDUIT

A. Rigid Steel Conduit: ANSI C80.1.

B. Rigid Aluminum Conduit: ANSI C80.5.

C. Intermediate Metal Conduit (IMC): Rigid steel.

D. Fittings and Conduit Bodies: NEMA FB 1. Fittings shall be steel/malleable iron with threaded fittings. Use insulated metallic bushings with lug where ground connections are required. Use plastic bushing for non-bonding applications.

2.2 PVC COATED METAL CONDUIT

A. Product Description: NEMA RN 1; rigid steel conduit with external PVC coating, 40 mil thick.

B. Fittings and Conduit Bodies: NEMA FB 1; steel fittings with external PVC coating to match conduit.

2.3 FLEXIBLE METAL CONDUIT

A. Product Description: Interlocked steel construction.

B. Fittings: NEMA FB 1.

2.4 LIQUIDTIGHT FLEXIBLE METAL CONDUIT

A. Product Description: Interlocked steel construction with PVC jacket.

B. Fittings: NEMA FB 1.

2.5 ELECTRICAL METALLIC TUBING (EMT)

A. Product Description: ANSI C80.3; galvanized tubing.

B. Fittings and Conduit Bodies: NEMA FB 1; steel couplings and connectors. Box connectors shall have with insulated throat. Set screw type couplings.

2.6 NONMETALLIC CONDUIT

A. Product Description: NEMA TC 2; Schedule 40 PVC.

B. Fittings and Conduit Bodies: NEMA TC 3.

2.7 SURFACE RACEWAY (WIREMOLD)

A. Product Description: Surface raceway as shown on plans. Raceway shall be Wiremold or equal.

B. Fittings: Provide all supports, adapters, clips, elbows, covers, device fittings, and other hardware as required for a complete installation. Provide B-Line “transition” boxes to clear offset surfaces. Supports shall be concealed, exposed straps are not allowed.

C. Finish:

1. Steel raceway and associated transition boxes and exposed hardware shall be spray painted with two coats of semi-gloss acrylic enamel paint, color as directed by Architect.
2. Aluminum raceway shall be provided with factory finish, color as directed by Architect. Transition boxes shall be spray painted with two coats of semi-gloss acrylic enamel paint, color as directed by Architect.
3. Plastic raceway shall be provided with factory finish, color as directed by Architect. Transition boxes shall be spray painted with two coats of semi-gloss acrylic enamel paint, color as directed by Architect.
4. Coordinate all colors with Architect prior to ordering.

2.8 J-HOOKS

A. Product Description: Low voltage signal cable J-Hooks shall be Caddy CableCat CAT425 for main runs. From main runs, provide Caddy CableCat CAT21 or CAT32 J-Hooks. Provide with support device for construction encountered.

2.9 WIREWAY

A. Product Description: General purpose for indoor applications and raintight type for outdoor locations wire way.

B. Knockouts: Manufacturer's standard.

C. Cover: Hinged cover with full gaskets.

D. Connector: Flanged.

E. Fittings: Lay-in type with removable top, bottom, and side; captive screws and drip shield for outdoor.

F. Finish: Rust inhibiting primer coating with gray enamel finish.

2.10 OUTLET BOXES

A. All boxes shall be suitable for the environment in which they are installed.

B. Sheet Metal Outlet Boxes: NEMA OS 1, galvanized steel.

1. Luminaire and Equipment Supporting Boxes: Rated for weight of equipment supported; furnish 0.5-inch male fixture studs where required.
2. Boxes for shall be 1.5-inch-deep by 4-inch square minimum for single devices.
3. Boxes for shall be 1.5-inch-deep by 4-11/16 inch square minimum for two devices.
4. Boxes for data and signal outlets shall be 2-1/8-inch-deep by 4-11/16-inch square minimum.
5. Concrete Ceiling Boxes: Concrete type.
6. Provide rings as required.

C. Cast Boxes: NEMA FB 1, Type FD, aluminum. Furnish gasketed cover by box manufacturer. Furnish threaded hubs.

2.11 BOX EXTENSIONS

A. At rooms being remodeled and where existing walls are to receive new finish material, replace existing plaster rings with new rings.

2.12 PULL AND JUNCTION BOXES

A. Boxes having an internal volume less than 100 cubic inches shall be as specified for outlet boxes. Boxes having internal volume greater than 100 cubic inches shall be of panelboard type construction except that covers shall be secured by screws or bolts.

B. Boxes exposed to rain or installed in wet locations shall be specifically designed for the purpose.

C. All boxes shall be installed so that covers are accessible after completion of the installation.

D. Boxes shall not be installed in finished areas unless specific approval for such installation is granted by Architect.

2.13 CONCRETE PULLBOXES AND VAULTS

A. Boxes: Boxes shall be precast, high density reinforced concrete. In areas of vehicular traffic, boxes shall be H20 rated.

B. Extensions: Extensions shall be provided at each pullbox. Provide a minimum of (1) extension. Provide additional extension(s) as required to provide space in box for code required cable bending.

C. Covers: Covers in concrete or asphalt shall be galvanized. In all other areas, covers shall be steel checker plate. In areas of vehicular traffic, lids shall be galvanized steel, H20 rated. All covers shall be provided with hold-down bolts.

D. Floor: Provide poured concrete slab as detailed on plans. At H20 rated boxes, provide manufacturer's concrete slab.

E. Size: Provide size as noted on plans. If size is not shown, provide boxes sized per codes.

F. Labeling: Covers shall be factory marked as shown on plans.

2.14 FLUSH MULTI SERVICE FLOOR BOXES (4 PORT)

A. Floor boxes shall be cast iron, fully adjustable, Walker RFB4-CI-1 with FPBTCAL cover. Provide brackets required to mount devices shown on plans. Provide blank plates at unused ports.

2.15 FLUSH MULTI SERVICE FLOOR BOXES (11 GANG):

A. Floor boxes shall be steel, fully adjustable, Walker RFB11 with RFB119BTCAL cover. Provide brackets required to mount devices shown on plans. Provide blank plates at unused ports.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify outlet locations and routing and termination locations of raceway prior to rough-in.

3.2 EXISTING WORK

A. Remove exposed abandoned raceway, including abandoned raceway above accessible ceiling finishes. Cut raceway flush with walls and floors, and patch surfaces.

B. Remove concealed abandoned raceway to its source.

C. Disconnect abandoned outlets and remove devices. Remove abandoned outlets when raceway is abandoned and removed. Install blank cover for abandoned outlets not removed.

D. Maintain access to existing boxes and other installations remaining active and requiring access. Modify installation or provide access panel.

E. Extend existing raceway and box installations using materials and methods [compatible with existing electrical installations, or] as specified.

F. Clean and repair existing raceway and boxes to remain or to be reinstalled.

G. At rooms being remodeled and where existing walls are to receive new finish material, replace existing plaster rings with new rings with depth required to bring box flush with new finish. Contractor shall review Architectural drawings prior to bid to note walls receiving new finishes (tackboards, sheetrock, etc.) and include the necessary work in bid.

3.3 INSTALLATION

A. Ground and bond raceway and boxes.

B. Fasten raceway and box supports to structure and finishes.

C. Identify raceway and boxes.

D. Arrange raceway and boxes to maintain headroom and present neat appearance.

3.4 INSTALLATION - RACEWAY

A. Raceway routing is shown in approximate locations unless dimensioned. Route to complete wiring system.

B. Unless otherwise specified, all raceway shall be installed concealed. Raceway may be run exposed on unfinished walls, in attic spaces, in electrical rooms and when routed to surface panels, cabinets or gutters.

C. Arrange raceway supports to prevent misalignment during wiring installation.

D. Support raceway using coated steel or malleable iron straps, lay-in adjustable hangers, clevis hangers, and split hangers.

E. Group related raceway; support using conduit rack. Construct rack using steel channel and provide space on each for 25 percent additional raceways.

F. Do not support raceway with wire or perforated pipe straps. Remove wire used for temporary supports

G. Do not attach raceway to ceiling support wires or other piping systems.

H. Construct wire way supports from steel channel.

I. Route exposed raceway parallel and perpendicular to walls.

J. Route raceway installed above accessible ceilings parallel and perpendicular to walls.

K. Route conduit in and under slab from point-to-point.

L. Maintain clearance between raceway and piping for maintenance purposes.

M. Maintain 12-inch clearance between raceway and surfaces with temperatures exceeding 104 degrees F.

N. Cut conduit square using saw or pipe cutter; de-burr cut ends.

O. Bring conduit to shoulder of fittings; fasten securely.

P. 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 minimum 20 minutes.

Q. Install conduit hubs to fasten conduit to sheet metal boxes in damp and wet locations and to cast boxes.

R. Install no more than equivalent of three 90-degree bends between boxes. Install conduit bodies to make sharp changes in direction, as around beams. Install factory elbows for bends in metal conduit larger than 2-inch size.

S. Avoid moisture traps; install junction box with drain fitting at low points in conduit system.

T. Install fittings to accommodate expansion and deflection where raceway crosses seismic and expansion joints.

U. Install suitable pull string or cord in each empty raceway except sleeves and nipples.

V. Install suitable caps to protect installed conduit against entrance of dirt and moisture.

W. Surface Raceway:

1. Anchor raceway to structural members using screws. Supports shall be concealed. Space screws 24” maximum on center. Each run shall have a minimum of (2) screws.
2. Mount plumb and level.
3. Install insulating bushings and inserts at connections to outlets and corner fittings.
4. Raceway shown on plans is schematic. Contractor shall coordinate exact routing and installation with building conditions and provide all parts, pieces, elbows, transition boxes and other items as required for a complete, closed and professionally installed installation.
5. Coordinate exact routing with Architect prior to installation.

X. J-Hooks:

1. Provide J-hooks 48” maximum on center.
2. All cable to be run parallel and perpendicular to building lines.
3. Provide mounting hardware as required.
4. Provide Unistrut channels between structural members as required.
5. Provide 24” long 2” conduit sleeves through walls, draft stops, etc. Provide as many as necessary to accommodate cables in contract plus two extra capped at each end for future cabling. All conduits shall be provided with bushed ends.

Y. Existing Raceways

1. Where new wiring is shown to be installed in existing raceways, existing conductors shall be removed and repulled with new conductors if required.
2. When existing conductors are removed and repulled, they shall be tested prior to removal and tested again after reinstallation. Notify Owner in writing of any defects in existing wiring prior to removing.

Z. Close ends and unused openings in wire way.

AA. Excavating and trenching:

1. Perform all excavations as required for the installation of the work included under this Section, including shoring of earth banks to prevent cave-ins and to protect workmen and equipment.

2. Restore all surfaces, roadways, walks, curbs, walls, existing underground installation, etc., damaged or cut as a result of the excavations to their original condition in a manner approved by the Architect.
3. Stop machine excavation for trenches, in solid ground, several inches above required grade line, then trim trench bottom by hand to accurate grade so that a firm and uniform bearing throughout entire length of duct is provided. In lieu of above hand excavation in bottom of trench, Contractor may excavate to depth no less than 6" below required grade line and place a bed of sand or granular soil, properly compacted to provide a uniform grade and to provide a firm support for duct throughout its entire length.
4. Minimum conduit depth of pipe crown shall be 2'0" below finished or natural grade, unless detailed otherwise on Drawings. Conduits under parking lots, roadways, driveways, fire truck access routes, and other areas subject to vehicular traffic shall be installed a minimum of 24" below grade.

BB. Backfilling:

1. No backfilling operations shall begin until the required tests and inspection has been made. Should any of the work be enclosed or covered up before it has been approved, Contractor shall, at his expense, uncover the work.
2. After it has been inspected, tested, and approved, he shall make all repairs necessary to restore the work of other contractors to the condition in which it was found at the time of uncovering.
3. Except under existing paved area, walks, roads, or similar surfaces, and in cases where rock is encountered, backfill more than 12" above the top of the pipe shall be made using suitable excavated material placed in 6" layers measured before compaction, and tamped by machine.
4. Surface work shall be replaced to match the existing.
5. Entire backfill for bored excavations under existing pavement, walks, roads, or similar surfaces, shall be made with clean sand compacted by flooding.
6. The contractor shall install a marking tape 6” below grade and directly above all electrical conduits. The tape shall consist of a 4 mil insert plastic film specifically formulated for prolonged use underground. It shall be highly resistant to alkalis, acids and other destructive agents found in the soil. Tape shall have a minimum tensile strength of 20 lbs. per 3” with strips and a minimum elongation of 500%. Tape shall bear a continuous painted message repeated every 16” to 36” warning of the installation buried below. The message shall read “CAUTION – ELECTRICAL POWER LINE BURIED BELOW” or “CAUTION – ELECTRICAL SIGNAL LINES BURIED BELOW” as applies. Installation instruction for the tape shall be printed with each message along the entire length. The tape shall be as that manufactured by Reef Industries, Inc., or approved equal. For those installations involving non-metallic pipe, tape shall be aluminum foil encased in two layers of inert plastic film enabling the tape to be inductively located. Terre Tape “D” Warning Tapes are acceptable. When conduit below is plastic, tape shall have metallic content and shall respond to metal detectors. Do not exclude this. It will be required to verify the installation of this tape.

CC. Flashing and Sealing:

1. Flash and counterflash roof and wall penetrations in manner described under other applicable sections of this Specification and as approved by the Architect.
2. Conduits, ducts, etc., passing through finished walls and ceilings shall be fitted with steel escutcheon plates, chrome or paint finish as directed.
3. Conduits which penetrate floor slabs and concrete or masonry walls shall be grouted and sealed watertight at penetration.

4. Conduits penetrating exterior walls other than concrete or masonry shall be sealed watertight with polyurethane sealant.
5. Underground conduits stubbing up into a room shall be sealed around cables or pullstring with foam sealant.
6. All flashing and sealing shall be provided by this Contractor.

3.5 INSTALLATION – BOXES

A. Boxes shall be accurately placed as shown on Drawings or as close thereto as possible. Contractor shall refer to Drawings, specifications, and submittals covering work of the other trades to coordinate outlet location. In the event of conflict between planned locations of outlet and other equipment or furnishing, Contractor shall not proceed until direction has been given by Architect.

B. Unless otherwise specified or shown on Drawings, boxes shall be flush mounted with front edge of box or ring flush with wall or ceiling finish. Use plaster ring of appropriate depth in plastered or gypboard applications. Contractor shall review architectural drawings and note wall and ceiling construction and finishes for each wall.

C. Boxes shall not be installed back-to-back in walls. To prevent sound transfer, outlets, switches, etc. shown on opposing sides of the same wall shall be installed in separate stud spaces, except that outlets installed at different elevations may occupy the same stud space when box separation exceeds 18". Where these requirements cannot be met, Contractor shall provide insulation material between boxes.

D. Orient boxes to accommodate wiring devices.

E. Install pull boxes and junction boxes above accessible ceilings and in unfinished areas only.

F. In Accessible Ceiling Areas: Install outlet and junction boxes no more than 6 inches from ceiling access panel or from removable recessed luminaire.

G. Locate flush mounting box in masonry wall to require cutting of masonry unit corner only. Coordinate masonry cutting to achieve neat opening.

H. Install stamped steel bridges to fasten flush mounting outlet box between studs.

I. Install flush mounting box without damaging wall insulation or reducing its effectiveness.

J. Install adjustable steel channel fasteners for hung ceiling outlet box.

K. Do not fasten boxes to ceiling support wires or other piping systems.

L. Support boxes independently of conduit.

M. Install gang box where more than one device is mounted together. Do not use sectional box.

N. Install gang box with plaster ring for single device outlets.

3.6 INSTALLATION CONCRETE PULLBOXES AND VAULTS

A. Install boxes flush with finished grade or surface material.

B. Install hold down bolts for all covers.

C. Ground bond steel cover plate with insulated green grounding conductor.

D. Grout between box and extension(s).

E. Any box installed in areas of vehicular traffic shall be H20 rated. Contractor shall verify this requirement prior to ordering.

3.7 INTERFACE WITH OTHER PRODUCTS

A. Install conduit to preserve fire resistance rating of partitions and other elements.

B. Route conduit through roof openings for piping and ductwork or through suitable roof jack with pitch pocket. Coordinate location with roofing installation.

C. Locate outlet boxes to allow luminaires positioned as indicated on reflected ceiling plan.

D. Align adjacent wall mounted outlet boxes for switches, thermostats, and similar devices.

3.8 ADJUSTING

A. Adjust flush-mounting outlets to make front flush with finished wall material.

B. Install knockout closures in unused openings in boxes.

3.9 CLEANING

A. Clean interior of boxes to remove dust, debris, and other material.

B. Clean exposed surfaces and restore finish.

END OF SECTION 26 05 33

SECTION 26 05 53
IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Nameplates.
2. Device labels.
3. Wire markers.
4. Low voltage cable markers.
5. Underground warning tape.
6. Brass tags.

1.2 SUBMITTALS

A. Product Data:

1. Refer to section 26 0000.

1.3 QUALITY ASSURANCE

A. Perform Work in accordance with State, Municipality, Highways, Public Work's standard.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Accept identification products on site in original containers. Inspect for damage.

B. Protect insulation from weather and construction traffic, dirt, water, chemical, and mechanical damage, by storing in original wrapping.

1.5 ENVIRONMENTAL REQUIREMENTS

A. Install labels and nameplates only when ambient temperature and humidity conditions for adhesive are within range recommended by manufacturer.

PART 2 - PRODUCTS

2.1 NAMEPLATES

A. Product Description: Laminated three-layer plastic with engraved white letters on black contrasting background color.

B. Letter Size:

1. 0.125 inch high letters for identifying individual equipment and loads.
2. 0.25 inch high letters for identifying grouped equipment and loads.

C. Minimum nameplate thickness: 0.125 inch.

2.2 DEVICE LABELS

A. Labels: Embossed adhesive tape, with 0.125 inch white letters on black background.

2.3 WIRE MARKERS

A. Description: Self-adhering, pre-printed, machine printable or write-on, self-laminating vinyl wrap around strips. Blank markers shall be inscribed using the printer or pen recommended by manufacturer for this purpose.

2.4 LOW VOLTAGE CABLE MARKERS

A. Small markers: Open marker sleeve with label pocket for snap mounting on cable, yellow with white label, T&B PTC Series or as noted on Plans.

B. Large markers: Nomex, yellow, Brady B-508.

2.5 UNDERGROUND WARNING TAPE

A. Refer to applicable specification section for underground conduit or detail on plans.

2.6 BRASS TAGS

A. Description: 2” Round, 20 gauge brass.

B. Letter Size: 0.25 inch minimum.

PART 3 - EXECUTION

3.1 PREPARATION

A. Degrease and clean surfaces to receive adhesive for identification materials.

3.2 EXISTING WORK

A. Install identification on existing equipment to remain in accordance with this section.

B. Install identification on unmarked existing equipment.

C. Replace lost nameplates, labels, and markers.

3.3 INSTALLATION

A. Install identifying devices after completion of painting.

B. Nameplates

1. Install nameplate parallel to equipment lines.
2. Install nameplates with screws or rivets.
3. Secure nameplate to the front of equipment.
4. Install nameplates for the following:
    a. Switchboards.
    b. Switchgear.
    c. Motor Control Centers.

d. Distribution Panelboards.
e. Breakers at individual breakers in switchboards, switchgear and distribution panelboards.
f. Panelboards.
g. Transformers.
h. Service Disconnects.
i. Fused and Non-Fused Disconnects.
j. Automatic Transfer Switches.
k. Signal terminal backboards.
l. Signal terminal cabinets.
m. Terminal blocks at terminal backboards and cabinets.
n. Boxes and cabinets containing control equipment.
o. Signal system control panels, power supplies, amplifiers, etc.

5. Provide nameplates that present, as applicable, the following information:
   a. Equipment or device designation.
   b. Amperage, kVA, or horsepower rating where applicable.
   c. Voltage or signal system name.
   d. Source or power or control.
   e. Examples:
      1) Boards: PANEL HA; 1000A; 277/480V, 3-Phase, 4-Wire.
      2) Transformers: TRANSFORMER T-1; 112.5kVA; 480V to 120/208V, 3-Phase, 4-Wire; Served from H2A; Load Served L2A.
      3) Disconnects and Individual Motor Starters: AC-A1; 25HP; 480V, 3-Phase, 3-Wires; Served from HA-4/6/8.
      4) Available Fault Current: XX,XXX Amperes. Date Calculated: XX/XX/XX.
      5) Breakers: 200A; 3-POLE.
      6) Terminal Backboards: SIGNAL TERMINAL BACKBOARD STB-A.
      7) Terminal Cabinets: SIGNAL TERMINAL CABINET STC-A.

C. Device Labels

1. Install label parallel to equipment lines.
2. Install labels for permanent adhesion and seal with clear lacquer.
3. Install labels on device faceplate.
4. Install labels to indicate the circuit number of device.
5. Install labels for the following:
   a. Receptacles
   b. Controlled receptacles
   c. Fire alarm devices located above ceilings. Install label on access door or on t-bay at lay-in ceilings.
   d. As noted on plans.
6. Examples:
   a. Receptacle: LA1-15.
   b. Controlled Receptacle: CONTROLLED.
   c. FA device above ceiling: DETECTOR ABOVE CEILING.

D. Wire Markers

1. Install wire marker for each conductor at panelboard gutters, pull boxes, outlet and junction boxes, and each load connection.
2. Power and Lighting Circuits: Branch circuit or feeder number as indicated on Drawings.
3. Signal and Control Circuits: Control wire number as indicated on shop drawings.

E. Low Voltage Cable Markers

1. Install at each cable in terminal cabinets and terminal backboards.
2. Install at each bundle of cables in each underground vault or pullbox. Provide one marker for each system.

F. Junction Boxes

1. Identify all junction boxes located above suspended ceilings and below ceilings in non-public areas.
2. Boxes shall be identified with permanent felt tip marker on cover indicating panel and circuit numbers or signal system.

G. Underground Warning Tape

1. Refer to applicable specification section for underground conduit or to detail on plans.

H. Brass Tags:

1. Provide brass tags for all feeder cables in underground vaults and pull boxes.
2. Example: PANEL LA FEEDER.

END OF SECTION 26 05 53

SECTION 26 24 00
SWITCHBOARDS AND PANELBOARDS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:

1. Main and distribution switchboards.
2. Distribution and branch circuit panelboards.

1.2 REFERENCES

A. American National Standards Institute:

1. ANSI C12.1 - Code for Electricity Metering.
2. ANSI C39.1 - Requirements, Electrical Analog Indicating Instruments.

B. Institute of Electrical and Electronics Engineers:

1. IEEE C57.13 - Standard Requirements for Instrument Transformers.
2. IEEE C62.41 - Recommended Practice on Surge Voltages in Low-Voltage AC Power Circuits.

C. National Electrical Manufacturers Association:

1. NEMA FU 1 - Low Voltage Cartridge Fuses.
2. NEMA KS 1 - Enclosed and Miscellaneous Distribution Equipment Switches (600 Volts Maximum).
3. NEMA PB 2 - Deadfront Distribution Switchboards.
4. NEMA PB 2.1 - General Instructions for Proper Handling, Installation, Operation, and Maintenance of Deadfront Distribution Switchboards Rated 600 Volts or Less.
5. NEMA ICS 2 - Industrial Control and Systems: Controllers, Contactors, and Overload Relays, Rated Not More Than 2000 Volts AC or 750 Volts DC.
6. NEMA ICS 5 - Industrial Control and Systems: Control Circuit and Pilot Devices.
7. NEMA PB 1 - Panelboards.
8. NEMA PB 1.1 - General Instructions for Proper Installation, Operation, and Maintenance of Panelboards Rated 600 Volts or Less.

D. International Electrical Testing Association:

1. NETA ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.

E. National Fire Protection Association:

1. NFPA 70 - National Electrical Code with California Amendments.

F. Underwriters Laboratories Inc.:

1. UL 489 - Molded-Case Circuit Breakers, Molded-Case Switches, and Circuit-Breaker Enclosures.
2. UL 891 - Dead-Front Switchboards.
3. UL 50 - Cabinets and Boxes
4. UL 67 - Safety for Panelboards.
5. UL 489 - Molded-Case Circuit Breakers, Molded-Case Switches, and Circuit-Breaker Enclosures.
6. UL 1283 - Electromagnetic Interference Filters.
7. UL 1449 - Transient Voltage Surge Suppressors.
8. UL 1699 - Arc-Fault Circuit Interrupters.

1.3 SUBMITTALS

A. Shop Drawings: Indicate front and side views of enclosures with overall dimensions shown; conduit entrance locations and requirements; nameplate legends; size and number of bus bars for each phase, neutral, and ground; and switchboard instrument details.

B. Product Data: Submit electrical characteristics including voltage, frame size and trip ratings, fault current withstand ratings, and time-current curves of equipment and components.

C. Test Reports: Indicate results of factory production and field tests.

1.4 CLOSEOUT SUBMITTALS

A. Project Record Documents: Record actual locations, configurations, and ratings of switchboards and their components on single line diagrams and plan layouts.

B. Operation and Maintenance Data: Submit spare parts data listing; source and current prices of replacement parts and supplies; and recommended maintenance procedures and intervals.

1.5 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented experience.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver in 48-inch maximum width shipping splits, individually wrapped for protection and mounted on shipping skids.

B. Accept switchboards on site. Inspect for damage.

C. Store in clean, dry space. Maintain factory wrapping or provide additional canvas or plastic cover to protect units from dirt, water, construction debris, and traffic.

D. Handle in accordance with NEMA PB 2.1. Lift only with lugs provided. Handle carefully to avoid damage to switchboard internal components, enclosure, and finish.

1.7 ENVIRONMENTAL REQUIREMENTS

A. Conform to NEMA PB 2 service conditions during and after installation of switchboards.

1.8 FIELD MEASUREMENTS

A. Verify field measurements prior to fabrication.

1.9 SEQUENCING

A. Sequence Work to avoid interferences with building finishes and installation of other products.

PART 2 - PRODUCTS

2.1 DISTRIBUTION PANELS

A. Product Description: NEMA PB 2, enclosed switchboard with electrical ratings and configurations as indicated on Drawings.

B. Device Mounting:
   1. Distribution Section: Individually mounted.

C. Bus:
   1. Material: Copper standard size.
   2. Connections: Bolted, accessible from front for maintenance.
   3. Insulation: Fully insulate load side bus bars. Do not reduce spacing of insulated bus.

D. Ground Bus: Insulated, extend length of switchboard.

E. Minimum Short Circuit Rating: 65,000 symmetrical amperes rms, fully rated or as indicated on drawing.

F. Line and Load Terminations: Accessible from front of switchboard, suitable for conductor materials and sizes as indicated on Drawings.

G. Future Provisions: Fully equip spaces for future devices with bussing and bus connections, insulated and braced for short circuit currents. Furnish continuous current rating as indicated on Drawings.

H. Enclosure: Type 1 - General Purpose for indoor and Type 3R – Raintight for outdoor.

I. Switchboard Height: 90 inches, excluding floor sills, lifting members and pull boxes, or as detailed on plans.

J. Finish: Manufacturer's standard light gray enamel over external surfaces. Coat internal surfaces with minimum one coat corrosion-resisting paint, or plate with cadmium or zinc.

2.2 DISTRIBUTION PANELBOARDS

A. Description: NEMA PB 1, circuit breaker type panelboard.

B. Operation:
   1. Minimum integrated short circuit rating as indicated on Drawings.

C. Materials
   1. Panelboard Bus: Copper current carrying components, ratings as indicated on Drawings. Furnish copper ground bus in each panelboard.
   2. Molded Case Circuit Breakers: UL 489, circuit breakers with integral thermal and instantaneous magnetic trip in each pole. Furnish circuit breakers UL listed as Type HACR for air conditioning equipment branch circuits.

3. Molded Case Circuit Breakers with Current Limiters: UL 489, circuit breakers with replaceable current limiting elements, in addition to integral thermal and instantaneous magnetic trip in each pole.
4. Current Limiting Molded Case Circuit Breakers: UL 489, circuit breakers with integral thermal and instantaneous magnetic trip in each pole, coordinated with automatically resetting current limiting elements in each pole. Interrupting rating 100,000 symmetrical A, let-through current and energy level less than permitted for same size NEMA FU 1, Class RK-5 fuse.
5. Circuit Breaker Accessories: Trip units and auxiliary switches as indicated on Drawings.
6. Surge Suppressers: Integrated in panelboard.
7. Enclosure: NEMA PB 1, Type 1 for indoor and 3R for outdoor applications.
8. Cabinet Front: Surface door-in-door type, fastened with concealed trim clamps, hinged door with flush lock, and metal directory frame.

D. Finishes:

1. Manufacturer's standard gray enamel.

2.3 BRANCH CIRCUIT PANELBOARDS

A. Description: NEMA PB1, circuit breaker type, lighting and appliance branch circuit panelboard.

B. Materials:

1. Panelboard Bus: Copper current carrying components, ratings as indicated on Drawings. Furnish copper ground bus in each panelboard.
2. For non-linear load applications subject to harmonics furnish 200 percent rated, plated copper, solid neutral.
3. Minimum Integrated Short Circuit Rating or as indicated on Drawings.
4. Molded Case Circuit Breakers: UL 489, bolt-on type thermal magnetic trip circuit breakers, with common trip handle for all poles, listed as Type SWD for lighting circuits, Type HACR for air conditioning equipment circuits, Class A ground fault interrupter circuit breakers as indicated on Drawings. Provide UL class 760 arc-fault interrupter circuit breakers as indicated on Drawings. Do not use tandem circuit breakers..
5. Current Limiting Molded Case Circuit Breakers: UL 489, circuit breakers with integral thermal and instantaneous magnetic trip in each pole, coordinated with automatically resetting current limiting elements in each pole. Interrupting rating 100,000 symmetrical A, let-through current and energy level less than permitted for same size NEMA FU 1, Class RK-5 fuse.
6. Surge Suppresser: Integrated in panelboard.
7. Directory holder shall be metal with clear plastic cover. Holder shall be welded to the inside of the door or epoxied in place by the contractor.
8. Directories shall be type-written
9. Circuit breaker numbers shall be adhesive backed engraved or stamped into deadfront. Snap-in plastic numbers or stick-on labels are not acceptable.
10. Provide panel skirts when called for on plans.

C. Enclosure:

a. NEMA PB 1, Type 1 for indoor and Type 3R outdoor applications.
b. 6 inches deep, 20 inches.
c. Finish in manufacturer’s standard gray enamel.

d. Exterior of surface mounted enclosures shall be factory painted to match the front.

D. Cabinet Front: Flush or surface cabinet front as indicated on drawings with door-in-door concealed trim clamps, concealed hinge, metal directory frame, and flush lock keyed alike. Finishes:

1. Finish in manufacturer's standard gray enamel.

2.4 CIRCUIT BREAKERS

A. Product Description: UL 489, molded-case circuit breaker.

B. All circuit breakers shall be bolt-on type.

C. Field-Adjustable Trip Circuit Breaker: Circuit breakers with frame sizes 200 amperes and larger have mechanism for adjusting long time delay, short time delay, continuous current, short time pickup, long time pickup, instantaneous pickup setting for automatic operation. Range of Adjustment: seconds, amperes, percent.

D. Field-Changeable Ampere Rating Circuit Breaker: Circuit breakers with frame sizes 200 amperes and larger have changeable trip units.

E. Current Limiting Circuit Breaker: Circuit breaker indicated as current-limiting have automatically-resetting current limiting elements in each pole. Let-through Current and Energy: Less than permitted for same size Class RK-5 fuse.

F. Solid-State Circuit Breaker: Electronic sensing, timing, and tripping circuits for adjustable current settings; ground fault trip with integral ground fault sensing and zero sequence type ground fault sensor; instantaneous trip; and adjustable short time trip.

G. Current Limiter: Designed for application with molded case circuit breaker.

1. Coordinate limiter size with trip rating of circuit breaker to prevent nuisance tripping and to achieve interrupting current rating specified for circuit breaker.
2. Interlocks trip circuit breaker and prevent closing circuit breaker when limiter compartment cover is removed or when one or more limiter is not in place or has operated.

2.5 SOURCE QUALITY CONTROL

A. Furnish shop inspection and testing in accordance with NEMA PB 2.

B. Make completed switchboard available for inspection at manufacturer's factory prior to packaging for shipment. Notify Owner at least seven days before inspection is allowed.

C. Allow witnessing of factory inspections and tests at manufacturer's test facility. Notify Owner at least seven days before inspections and tests are scheduled.

PART 3 - EXECUTION

3.1 DEMOLITION

A. Disconnect abandoned panelboards. Remove abandoned panelboards and load centers.

B. Maintain access to existing panelboard and load centers remaining active and requiring access. Modify installation or provide access panel.

3.2 EXISTING WORK

A. Disconnect and remove abandoned switchboards.

B. Maintain access to existing switchboards and other installations remaining active.

C. Clean and repair existing switchboards to remain or to be reinstalled.

3.3 INSTALLATION

A. Install in accordance with NEMA PB 2.1.

B. Tighten accessible bus connections and mechanical fasteners after placing switchboard.

C. Install engraved plastic nameplates.

D. Install breaker circuit directory.

E. Ground and bond switchboards.

F. Install panelboards according to NEMA PB 1.1.

G. Install panelboards plumb.

H. Install recessed panelboards flush with wall finishes.

I. Height: 6 feet to top of panelboard; install panelboards taller than 6 feet with bottom no more than 4 inches above floor.

J. Install filler plates for unused spaces in panelboards.

K. Provide typed circuit directory for each branch circuit panelboard. Revise directory to reflect circuiting changes to balance phase loads. Identify each circuit as to its clear, evident and specific purpose of use.

L. Install spare conduits out of each recessed panelboard to accessible location above ceiling. Minimum spare conduits: five empty 1 inch. Identify each as spare.

M. Ground and bond panelboard enclosure. Connect equipment ground bars of panels according to NFPA 70.

N. Modifications to existing equipment shall be as indicated on the Drawings. New equipment shall match existing where possible and in all cases be compatible with existing. Where new breakers are installed in existing equipment, provide all hardware and trim pieces as required for a complete closed installation. Provide new nameplates at equipment where existing breakers are identified by nameplates and provide new breaker identification in directory where existing breakers are identified in a directory.

O. Where new breakers are indicated to be installed in existing equipment, but insufficient space exists, provide enclosed circuit breakers externally and tap existing bussing. Tap conduit and wire sizes shall be same as breaker line side conduit and wire.

3.4 FIELD QUALITY CONTROL

A. Inspect and test in accordance with NETA ATS, except Section 4.

B. Perform inspections and tests listed in NETA ATS, Section 7.1.

C. Perform circuit breaker inspections and tests listed in NETA ATS, Section 7.6.

D. Perform switch inspections and tests listed in NETA ATS, Section 7.5.

E. Perform controller inspections and tests listed in NETA ATS, Section 7.16.1.

3.5 ADJUSTING

A. Adjust operating mechanisms for free mechanical movement.

B. Tighten bolted bus connections.

C. Measure steady state load currents at each panelboard feeder; rearrange circuits in panelboard to balance phase loads to within 20 percent of each other. Maintain proper phasing for multi-wire branch circuits.

3.6 CLEANING

A. Touch up scratched or marred surfaces to match original finish.

B. Clean existing panelboards and load centers to remain or to be reinstalled.

END OF SECTION 26 24 00

SECTION 26 27 16
ELECTRICAL CABINETS AND ENCLOSURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Hinged cover enclosures.
2. Terminal and control equipment cabinets.
3. Terminal backboards.

1.2 REFERENCE STANDARDS

A. National Electrical Manufacturers Association:

1. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).
2. NEMA ICS 4 - Industrial Control and Systems: Terminal Blocks.

1.3 SUBMITTALS

A. Product Data: Submit manufacturer's standard data for enclosures, and terminal cabinets.

B. Manufacturer's Instructions: Submit application conditions and limitations of use stipulated by product testing agency specified under Regulatory Requirements. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

PART 2 - PRODUCTS

2.1 HINGED COVER ENCLOSURES

A. Description: NEMA 250, Type 1 (Interior) and 3R (Exterior) steel enclosure.

1. Covers: Continuous hinge, held closed by flush latch operable by key.
2. Furnish interior plywood panel for mounting terminal blocks and electrical components; finish with white enamel.
3. Enclosure Finish: Manufacturer's standard enamel.

2.2 TERMINAL AND CONTROL EQUIPMENT CABINETS

A. Description:

1. Interior locations: NEMA 1.
2. Exterior locations: NEMA 3R.
3. Boxes: Steel.
4. Box Size: As required to house all conduits, wiring terminal blocks, modules, etc. or as indicated on drawings.
5. Backboard: Furnish 5/8-inch-thick plywood backboard for mounting terminal blocks. Paint with (3) coats of fire retardant white paint.

6. Fronts: Hinged steel, flush or surface type with concealed trim clamps door with concealed hinge, to match branch circuit panelboard. Provide key lock at interior cabinets. Provide padlock hasp at exterior locations.

B. Finish: Finish with gray baked enamel.

PART 3 - EXECUTION

3.1 DEMOLITION

A. Remove abandoned cabinets and enclosures, including abandoned cabinets and enclosures above accessible ceiling finishes. Patch surfaces.

B. Maintain access to existing cabinets and enclosures and other installations remaining active and requiring access. Modify installation or provide access panel.

C. Extend existing cabinets and enclosures using materials and methods as specified.

3.2 REPAIR/RESTORATION

A. Repair existing cabinets and enclosures to remain or to be reinstalled.

3.3 INSTALLATION

A. Install enclosures and boxes plumb. Anchor securely to wall and structural supports at each corner.

B. Install cabinet fronts plumb.

C. Install interior cabinets with top of enclosure 6’6” above finished floor.

D. Install exterior cabinets with top of enclosure 6’6” above finished grade.

E. Install terminal backboards with sanded side exposed.

F. Provide ground bus at each terminal backboard.

3.4 CLEANING

A. Clean existing cabinets and enclosures to remain or to be reinstalled.

B. Clean electrical parts to remove conductive and harmful materials.

C. Remove dirt and debris from enclosure.

D. Clean finishes and touch up damage.

END OF SECTION 26 27 16

SECTION 26 27 26
WIRING DEVICES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes wall switches; receptacles; device plates; and decorative box covers.

1.2 REFERENCES

A. National Electrical Manufacturers Association:

1. NEMA WD 1 - General Requirements for Wiring Devices.
2. NEMA WD 6 - Wiring Devices-Dimensional Requirements.

1.3 SUBMITTALS

A. Product Data: Submit manufacturer's catalog information showing dimensions, colors, and configurations.

PART 2 - PRODUCTS

2.1 LOW VOLTAGE SWITCHES/DIMMERS

A. Refer to lighting control details and/or specifications.

B. Color: Gray.

2.2 RECEPTACLES

A. Product Description: NEMA 5-20, 20 amp, decora, unless noted otherwise.

B. Color: Gray, unless noted otherwise.

C. Wiring: Back and side wired. Back wiring with clamp type terminals suitable for stranded or solid wire.

D. Standard Receptacles: Commercial Grade, Heavy-Duty, Tamper-Resistant, Leviton TDR20-GY.

E. Ground Fault Interrupting (GFI) Receptacles: Commercial Grade, Tamper-Resistant, Lockout Feature (disables receptacle when GFI protection is compromised), Self Testing, LED Indicator Light

1. Interior Dry Locations: Leviton GFTR2-GY
2. Exterior, Wet or Damp Locations: Weather-Resistant, Leviton GFWT2-GY
3. Receptacles for Refrigerators and Freezers: Audible Trip Alert, Ivory, Leviton GFTA2-I.

F. Special Purpose Receptacles: Type and rating and number of poles indicated or required for the anticipated purpose.

2.3 WALL PLATES

A. Decorative Cover Plates: Stainless Steel.

B. Weatherproof Cover Plates:

1. For devices at grade or areas accessible to pedestrians: Cast aluminum cover with spring-loaded door and appropriate mounting plate, Legrand 4600-26.
2. For devices on roof or where not accessible to pedestrians: While-in-use cover, metal, Cooper WIUMV-1.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify outlet boxes are installed at proper height.

B. Verify wall openings are neatly cut and completely covered by wall plates.

C. Verify branch circuit wiring installation is completed, tested, and ready for connection to wiring devices.

3.2 PREPARATION

A. Clean debris from outlet boxes.

3.3 EXISTING WORK

A. Disconnect and remove abandoned wiring devices.

B. Modify installation to maintain access to existing wiring devices to remain active.

C. Clean and repair existing wiring devices to remain or to be reinstalled.

3.4 INSTALLATION

A. Install devices plumb and level.

B. Install switches with OFF position down.

C. Install receptacles with grounding pole on top.

D. Connect wiring device grounding terminal to outlet box with bonding jumper and branch circuit equipment grounding conductor.

E. Install wall plates on flush mounted switches, receptacles, and blank outlets.

F. Install decorative plates on switch, receptacle, and blank outlets in finished areas.

G. Connect wiring devices by wrapping solid conductor around screw terminal. Install stranded conductor for branch circuits 10 AWG and smaller. When stranded conductors are used in lieu of solid, use crimp on fork terminals for device terminations. Do not place bare stranded conductors directly under device screws.

H. Install galvanized steel plates on outlet boxes and junction boxes in unfinished areas, above accessible ceilings, and on surface mounted outlets.

I. Provide weather resistant GFI receptacles with specified weatherproof covers for all receptacles installed outdoors or in damp or wet locations.

J. Whether indicated on the plans or not, provide GFI receptacles for the following conditions:

1. Within 6 feet of sinks.
2. In toilet rooms.
3. In kitchens.
4. Serving electric drinking fountains.

K. Where receptacles are to be GFI type or surge suppression, each receptacle shall be GFI or surge suppression. Contractor may not use standard receptacles connected for “downstream” protection.

L. Unless noted otherwise, do not use combination switch/receptacle devices.

3.5 INTERFACE WITH OTHER PRODUCTS

A. Coordinate locations of outlet boxes to obtain mounting heights as specified and as indicated on Architectural elevations.

B. Install wall switch 44 inches to center of box above finished floor.

C. Install convenience receptacle 18 inches to center of box above finished floor.

D. Install convenience receptacle 6 inches to center of box above counter or back splash of counter.

3.6 FIELD QUALITY CONTROL

A. Inspect each wiring device for defects.

B. Operate each wall switch with circuit energized and verify proper operation.

C. Verify each receptacle device is energized.

D. Test each receptacle device for proper polarity.

E. Test each GFCI receptacle device for proper operation.

3.7 ADJUSTING

A. Adjust devices and wall plates to be flush and level.

3.8 CLEANING

A. Clean exposed surfaces to remove splatters and restore finish.

END OF SECTION 26 27 26

SECTION 26 28 16
ENCLOSED SWITCHES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Fusible Disconnect Switches.
2. Nonfusible Disconnect Switches.

1.2 REFERENCE STANDARDS

A. National Electrical Manufacturers Association:

1. NEMA FU 1 - Low Voltage Cartridge Fuses.
2. NEMA KS 1 - Enclosed and Miscellaneous Distribution Equipment Switches (600 Volts Maximum).

B. International Electrical Testing Association:

1. NETA ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.

1.3 SUBMITTALS

A. Product Data: Submit switch ratings and enclosure dimensions.

1.4 CLOSEOUT SUBMITTALS

A. Project Record Documents: Record actual locations of enclosed switches and ratings of installed fuses.

1.5 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented experience.

PART 2 - PRODUCTS

2.1 FUSIBLE SWITCH ASSEMBLIES

A. Description: NEMA KS 1, Type HD with externally operable handle interlocked to prevent opening front cover with switch in ON position, enclosed load interrupter knife switch. Handle lockable in OFF position.

B. Operation:

1. Switch Ratings
   a. Switch Rating: Horsepower rated for AC or DC as indicated on Drawings.

b. Short Circuit Current Rating: UL listed for 10,000 rms symmetrical amperes when used with or protected by Class H or K fuses (30-600 ampere). 200,000 rms symmetrical amperes when used with or protected by Class R or Class J fuses 30-600 ampere switches employing appropriate fuse rejection schemes). 200,000 rms symmetrical amperes when used with or protected by Class L fuses (800-1200 ampere).

C. Materials:

1. Fuse clips: Designed to accommodate NEMA FU 1, Class R fuses.
2. Enclosure: NEMA KS 1, to meet conditions. Fabricate enclosure from steel finished with manufacturer's standard gray enamel.
   a. Interior Dry Locations: Type 1.
   b. Exterior Locations: Type 3R.
   c. Industrial Locations: Type 12.
3. Service Entrance: Switches identified for use as service equipment are to be labeled for this application. Furnish solid neutral assembly and equipment ground bar.
4. Furnish switches with entirely copper current carrying parts.

2.2 NONFUSIBLE SWITCH ASSEMBLIES

A. Description: NEMA KS 1, Type HD with externally operable handle interlocked to prevent opening front cover with switch in ON position enclosed load interrupter knife switch. Handle lockable in OFF position.

B. Operation:

1. Switch Ratings
   a. Switch Rating: Horsepower rated for AC or DC as indicated on Drawings.
   b. Short Circuit Current Rating: UL listed for 10,000 rms symmetrical amperes when used with or protected by Class H or K fuses (30-600 ampere). 200,000 rms symmetrical amperes when used with or protected by Class R or Class J fuses 30-600 ampere switches employing appropriate fuse rejection schemes). 200,000 rms symmetrical amperes when used with or protected by Class L fuses (800-1200 ampere).

C. Materials:

1. Enclosure: NEMA KS 1, to meet conditions. Fabricate enclosure from steel finished with manufacturer's standard gray enamel.
   a. Interior Dry Locations: Type 1.
   b. Exterior Locations: Type 3R.
   c. Industrial Locations: Type 12.
2. Service Entrance: Switches identified for use as service equipment are to be labeled for this application. Furnish solid neutral assembly and equipment ground bar.
3. Furnish switches with entirely copper current carrying parts.

PART 3 - EXECUTION

3.1 DEMOLITION

A. Disconnect and remove abandoned enclosed switches.

B. Maintain access to existing enclosed switches and other installations remaining active and requiring access. Modify installation or provide access panel.

3.2 INSTALLATION

A. Install enclosed switches where indicated.

B. Install enclosed switches plumb. Provide supports.

C. Height: 5 feet to operating handle.

D. Install fuses for fusible disconnect switches.

E. Install engraved plastic nameplates. Engrave nameplates with the equipment served and the panel and circuit number supplying the switch.

F. Apply adhesive tag on inside door of each fused switch indicating NEMA fuse class and size installed.

3.3 REPAIR/RESTORATION

A. Repair existing enclosed switches to remain or to be reinstalled.

3.4 FIELD QUALITY CONTROL

A. Inspect and test in accordance with NETA ATS, except Section 4.

B. Perform inspections and tests listed in NETA ATS, Section 7.5.

3.5 CLEANING

A. Clean existing enclosed switches to remain or to be reinstalled.

END OF SECTION 26 28 16

SECTION 27 10 00
DATA COMMUNICATIONS

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Drawings and requirements of Division 01 and Section 26 00 00 apply to all work of this Section.

B. Furnish and install a Data Communications System including all wiring and connections and other materials as shown on Plans and specified herein.

1. Report percentage of work complete on a weekly basis.
2. Completely coordinate with work of all other trades.
3. Provide all supplementary or miscellaneous items, appurtenances and devices incidental to or necessary for a sound, secure and complete installation, whether or not specifically indicated in the Contract Documents.

C. The work covered by the Contract Drawings and the specifications covers a complete installation, including both basic and channel links, for a Data Communications Network utilizing copper and optical fiber transmission media, including but not limited to:

1. Category 6 horizontal cabling.
2. Optical fiber cables for data network backbones.
3. Telecommunications outlets and connectors.
4. Equipment mounting racks and cabinets.
5. Category 6 modular patch panels.
6. Optical fiber cabinets.
7. Optical fiber connectors.
8. Category 6 patch cables.
9. Category 6 station cables.
10. Optical fiber jumpers.
11. Optical fiber and copper cable installation, testing and documentation.
12. All wireless access points will be furnished by the District and installed by the contractor.

1.2 RELATED DOCUMENTS

A. Code Requirements: Components and installation to meet latest rules and regulations for telecommunications cable systems of the California Building Code and California Code of Regulations, Title 24, Part 3, California Electrical Code.

B. Applicable Standards (including all addenda, errata, amendments, etc.):

1. TIA-455-78, FOTP-78 IEC 60793-1-40 Optical Fibers – Part 1-40: Measurement Methods and Test Procedures – Attenuation, 11-2002
2. ANSI/TIA-568-C.1, Commercial Building Telecommunications Cabling Standard, 05-2012
3. ANSI/TIA-568-C.2, Balanced Twisted-Pair Telecommunication Cabling and Components Standards, 11-2014
4. ANSI/TIA-568-C.3, Optical Fiber Cabling Components Standard, 10-2011
5. TIA-569, Telecommunications Pathways and Spaces, 04-2015

6. ANSI/TIA-570, Telecommunications Infrastructure Standard, 08-2012
7. ANSI/TIA-606, Administration Standard for Telecommunications Infrastructure, 06-2012
8. ANSI/BICSI/NECA-607, Standard for Telecommunications Bonding and Grounding Planning and Installation Methods for Commercial Buildings, 2011
9. ANSI/TIA-758, Customer-Owned Outside Plant Telecommunications Infrastructure Standard, 03-2012
10. IEEE 802.3, Ethernet, 02-2015
11. ANSI/TIA TSB 62, Informative Test Methods (ITMS) for Fiber-Optic Fibers, Cables Opto-Electronic Sources and Detectors, Sensors, Connecting and Terminating Devices and Other Fiber-Optic Components, 8-2002
12. EIA TSB 63, Reference Guide for Fiber Optic Test Procedures, 8-1993
13. BISCI ITSIMM, Information Technology Systems Installation Methods Manual, 3-2011
14. BICSI TDMM, Telecommunications Distribution Methods Manual, 13th Edition, 2014

1.3 GENERAL REQUIREMENTS

A. The owner reserves the right to require the Contractor to remove from the project any such employee the Owner deems to be incompetent, careless or insubordinate.

B. All clean up activity related to work performed will be the responsibility of the Low Voltage Contractor and must be completed daily before leaving the site.

1.4 CONTRACTOR QUALIFICATIONS

A. In order to qualify for installation of the data communications extensions, the Contractor must possess the required license classification, trade certifications, a performance history, experience in the installation and termination of fiber optics cable systems, and proof of time in business.

B. License Classification: Contractor must possess a valid C-7 or C-10 California State Contractor's License. This license must have been issued two years prior to the date of this bid. No other license classification in acceptable.

C. Performance History: Contractor must have successfully performed at least three projects of similar scope, within two years of the date of this bid. Proof of performance shall be in the form of reference sheets which shall include a brief description of the project, the beginning and ending contract price, the project foreman or superintendent's name, and the name, address, and telephone number of a project contact.

D. Fiber Optics Experience: Contractor must be able to prove to the satisfaction of Owner that they have had significant experience in the installation of fiber optics cable systems. Installation must include installation of fiber optics cable in innerduct, fiber breakout systems, fiber termination, a knowledge of interconnect equipment, and a thorough knowledge of testing procedures. Contractor must provide a minimum of three references supporting its claim of experience for similar projects within the two years prior to this bid. Documentation must be included with the submittal documents.

E. Time in Business: Contractor must have been in business, and in the business of installing telecommunications/data communications systems, continuously, for a period of at least three years, prior to the date of this bid. Contractor must submit at least one project reference for each of the three years prior to the date of this bid. The contractor must also maintain a full time staff at an established business location having appropriate parts and service facilities and the ability to provide a one-hour response time to Folsom Cordova Unified School District. Any contractor that is not able to meet these requirements will not be considered as an acceptable contractor for this project.

1.5 DEFINITIONS

A. Main Distribution Facility (MDF): The MDF is the location, within a building or complex of buildings, where the entire data communications system originates. It may include the physical location, enclosure, wire and cable management hardware, termination hardware, distribution hardware, and equipment racks. The MDF exists where shown on plans.

B. Intermediate Distribution Facility (IDF): The IDF is the location in a building where a transition between the backbone or vertical riser system and the horizontal distribution system occurs. It may include the physical location, enclosure, wire and cable management hardware, termination hardware, distribution hardware, and equipment racks. In this case, the IDFs are collocated with the CTBs (Computer Terminal Backboards) and provide the interface location between fiber distribution cable (backbone) and station cable (horizontal distribution).

C. Backbone Pathway: The backbone pathway consists of a series of conduits of chases, which connect the MDF to IDFs or IDFs to IDFs. It generally houses the vertical or backbone system.

D. Backboard: Backboard generally refers to the plywood sheeting lining the walls of data communications facilities. Backboard may also refer to the entire wall-mounted assembly, including wire management, wiring blocks, and equipment racks. In this case, the term Backboard is fully interchangeable with CTB and the equipment required to fulfill the scope of work below.

1.6 SYSTEM DESCRIPTION

A. The data and telephone structured cabling communications system shall consist of three components: termination equipment, a fiber optics backbone, and copper twisted-pair Category 6 workstation cabling (voice and data). The central location houses the MDF and each of the other locations shall house an IDF. Each fiber optics cable shall originate in the MDF and shall be terminated in its respective IDF. All fiber optic cables shall be enclosed in innerduct. The combination of innerduct with fiber optic cable shall be routed through a system of conduits and raceway installed by the responsible contractor for that discipline, in accordance with the drawings. The drawings depict a typical conduit layout and fiber cable routing. From each IDF, one or more twisted-pair copper cables shall be routed to each data and telephone outlet location, either via routing established by the installing contractor or provided by Owner, within its respective building or buildings. These cables shall originate in an IDF and terminate in its respective data outlet location.

1.7 SCOPE OF WORK

A. Contractor shall provide materials for and install complete wiring/cabling and conduit extensions in accordance with this specification and the drawings and include all necessary components, whether included in this specification or not.

B. The installation shall include cable (fiber optic and twisted-pair copper), innerduct, fiber interconnect equipment, connectors (fiber and copper), jumpers, patch cables, station cables, wiring blocks, and data communications outlets. The necessary material and equipment are depicted throughout the specifications and applicable drawings. Contractor is responsible to supply Owner with all necessary components, whether included in the specifications and drawings or not.

C. The work performed under this specification shall be of good quality and performed in a workmanlike manner. In this context, "good quality" means the work shall meet industry technical standards and quality of appearance. The Owner reserves the right to reject all or a portion of the work performed, either on technical or aesthetic grounds.

1.8 MANUFACTURER

A. Contractor shall furnish and install all equipment, accessories, and materials necessary for a complete, functional fiber optics data distribution system in accordance with these Specifications and Drawings.

B. Throughout this specification, Leviton and other manufacturers are cited, along with specific part numbers. These products are District standards. Contractor may not provide alternates.

C. Unless specified otherwise in the following, the equipment furnished shall fall into five classes. Exceptions are annotated [CLASS EXEMPT]. The five classes are as follows:

1. Class One: Fiber optics cable, copper cable (both station and backbone), fiber optic jumpers, copper patch cables, blocking kits, interconnection devices, wiring blocks, connectors (fiber and copper), and telecommunications outlets.
2. Class Two: Fiber innerduct.
3. Class Three: Equipment racks and cabinets.
4. Class Four: Wire management panels.
5. Class Five: Wire ties, printed labels, "D" rings, nuts, bolts, screws, and other miscellaneous hardware [CLASS EXEMPT].

1.9 SUBMITTALS AND SUBSTITUTIONS

A. The submission shall consist of six major sections with each section separated with insertable index tabs.

1. The first section shall be the "Index" which shall include the project title and address, name of the firm submitting the proposal, and name of the Architect. Each page in the submission shall be numbered chronologically and shall be summarized in the index.
2. The second section shall include a copy of the Contractor's valid C-7 California State Contractor's License, the contractor qualifications information required above, and a list of instrumentation to be used for system testing.
3. The third section shall contain the comparative specification listing of any substitutions and a complete listing of the characteristics of the equipment in the specifications.
4. The fourth section shall contain samples of proposed cable markers and labeling.
5. The fifth section shall contain a complete, detailed satellite closet count, proposed floor plan and backboard plan, workstation count, and bill-of-materials.
6. The sixth section shall contain shop drawings showing front and side elevations of backboard and rack mounted equipment and interconnections. Drawings shall be computer drafted and shall be part of submittals. Drawings shall show layout of all equipment at each location.

B. Refer also to Section 26 00 00 for other submittal requirements. Any contractor failing to include all of the required information shall be deemed non-responsive and may be disqualified, at the discretion of the Owner.

C. For purposes of determining conformity, technical and general information set forth on the respective data sheets by manufacturers named in Section 1.8 for each specified item shall be considered as part of these specifications and binding herein.

1.10 RECORD DRAWINGS

A. Refer to General Conditions. Final Inspection will not be made until drawings are received and approved. Record Drawings shall include "As-Built" one-line and wiring diagrams, with terminations identified, wire color coding schedule, pull box locations, and conduit routing plans.

1.11 PRE-INSTALLATION CONFERENCE

A. Schedule a conference a minimum of five calendar days prior to beginning work of this Section.

B. Agenda: Clarify questions related to work to be performed, scheduling, coordination, etc.

C. Attendance: Communications system installer foreperson, Owner's Representatives, and other parties affected by the work of this Section.

1.12 GUARANTEE

A. One firm to assume full responsibility for performance on all work of this section. Guarantee all equipment against defects in material and workmanship for two years, and provide on-the-premises service during normal working hours for two years, at no cost to purchaser if trouble is not caused by misuse, abuse, or accident, or at current labor rates if so caused. Provide manufacturer's written guarantee for equipment and parts to Owner.

B. Service shall normally be available within 24 hours from service department of authorized distributor of manufacturer by factory trained servicemen.

C. On-the-premises service at other than normal working hours to also be available, but labor charges for such calls to be paid by purchaser at current labor rates.

1.13 FUNCTION AND OPERATION

A. Upon completion of the work outlined in this specification, the system shall be capable of transmitting data at a rate of 1gb/s (Category 6).

B. The fiber optics cable system shall be capable of transmitting signals with a bandwidth of up to 600 MHz at either 850 or 1300 nm. The cumulative signal loss through connectors, jumpers, couplers, and fiber cable shall be less than 10dB.

C. Work station cable, commencing at the wiring blocks, shall be installed in accordance with ANSI/EIA/TIA TSB standards and shall be capable of transmitting a signal at Category 6 level with acceptable attenuation losses and cross-talk attenuation. The entire workstation cable system, including wiring blocks, cable, and telecommunications outlets shall be tested for Category 6 compliance. The cabling system shall be channel tested to the standard for Cat 6.

PART 2 - PRODUCT AND INSTALLATION SPECIFICATIONS

2.1 GENERAL

A. Throughout this Part 2, material quantities and minimum installation practices are given. These quantities and instructions are given for reference purposes only. It is the responsibility of the Contractor to provide appropriate quantities of materials and install them to manufacturer specifications as to provide a complete, functional system.

2.2 FIBER INNERDUCT

A. Description: From the MDF to each IDF, segments of fiber optics innerduct shall be installed in the conduit system.

1. Product: Carlon Riser-Guard DG4X1C-500, 1-1/4" Outside Plant Fiber Optics Innerduct with pull tape.

2.3 FIBER DISTRIBUTION

A. Description: From the MDF to each IDF, a continuous segment of fiber cable(s) shall be installed. Routing shall be via conduit in accordance with electrical drawings. The cable shall not be extended more than 50' into the building interior unless enclosed in conduit.

1. Products:
   a. Multimode: Optical Cable Corp., DX012DALT9QR, 12-strand multimode (50/125µm).
   b. Single Mode: Optical Cable Corp., DX012DSL9YR, 12-strand single mode.
   c. Provide both multimode and single mode at each fiber run.
2. All fibers shall be terminated and connected at each computer rack location.
3. All fibers shall be terminated in type SC connectors (one SC connector for each end of fiber.):
   a. Multimode: Leviton SC Fast Cure Connector, Multimode, 49990-LSC.
   b. Single Mode: Leviton SC Fast Cure Connector, Single Mode, 49990-SSC.

2.4 COPPER BACKBONE CABLE (EXCHANGE CABLE)

A. Description: From the MDF to each IDF, a continuous segment 25 or 50 pair (or as required) outside plant cable shall be installed. This cable shall be routed along with the fiber optics cable. The cable shall be suitable for underground installation. Each end of each cable shall be "dammed", at the breakout point, to halt the flow of gel. Refer to Signal Cable Schedule on construction drawings for specified cable.

2.5 WORK STATION CABLE

A. Description: From each IDF, 4-pair, Category 6 or 6a cables shall be routed to each work station (data outlets) served by the IDF. Cables shall be routed from the MDF to each workstation located in its building. Data outlet locations are depicted in the drawings and in the Outlet Summary.

1. Product:
   a. Cat 6: Superior Essex NextGain Category 6+ cable, 54-246-2A (riser/blue) and 54-246-9B (plenum/red). Where cable is to be installed in "wet" environments (underground conduit, conduit installed in or under concrete slabs, etc.), utilize Superior Essex OSP Broadband Category-6 BBD6, 04-001-68.

2.6 WALL PLATE

A. Leviton QuickPort 2, 4, or 6-port wall plate with Designation ID Window, Stainless Steel, single-gang faceplate, 43080-1L2, 43080-1L4, or 43080-1L6. Provide blank filler for all unused ports.

2.7 MODULAR OUTLETS

A. Cat 6: Leviton Category-6 eXtreme 6+ Connector, Crimson, 61110-RC6.

2.8 MAIN DISTRIBUTION FACILITY (MDF)

A. Description: An MDF shall consist of a "fire-rated" plywood backboard, equipment rack, fiber interconnect equipment, wire management, and wiring blocks. Contractor shall submit a floor plan and backboard/cabinet plan to Technology Services for approval prior to installation.

1. Products:
    a. Equipment Rack: Existing to remain.
    b. Fiber Interconnect: Leviton Rack-Mount Fiber Optic Patch Panel, 4RU, with a transparent door, #5R4UH-S12. One unit is required for each 96 fibers entering the MDF.
2. Required Accessories and Quantities:
    a. Coupling Panels/Couplers:
        1) Multimode Coupling Panels/Couplers: Leviton SDX Precision Molded Plate (AQUA), 50/125µm multimode laser optimized OM3/4, duplex SC, 12 fibers, zirconia ceramic sleeve, 5F100-2QC. Four multimode coupling panels are required for each MDF fiber interconnect unit installed.
        2) Single Mode Coupling Panels/Couplers: Leviton SDX Precision Molded Plate (BLUE), single mode OS2, duplex SC, six fibers, zirconia ceramic sleeve, 5F100-6LC. Eight single mode coupling panels are required for each MDF fiber interconnect unit installed.
    b. Fiber Jumpers: One 3-meter SC/SC multimode fiber jumper is required for each IDF (i.e., if the MDF serves five IDFs, five jumpers are required). Provide two spare jumpers in addition to the required count (total of seven, using the example above). Jumpers need not be provided for single mode fiber. CP Technologies, SC/LC 50-micron laser-optimized fiber jumper, LCSC-03-10G-5Q; or Leviton SC-LC 50-micron laser-optimized OM3 fiber jumper, 5LDCL-M03. Contact owner prior to purchase of fiber jumpers for exact connector requirements (i.e., SC vs. LC).
    c. "D" Rings: Provide and install sufficient quantities of 2", 3", and 4" metallic "D" rings to conform to the drawings. Allen Tel GB13a (2"), GB13b (3"), and GB13c (4").

2.9 INTERMEDIATE DISTRIBUTION FACILITY (IDF)

A. Description: An IDF shall consist of a "fire-rated" plywood backboard, equipment rack or cabinet, fiber interconnect equipment, wire management, and wiring blocks. Contractor shall submit a floor plan and backboard/cabinet plan to Technology Services for approval prior to installation.

1. Products:
    a. Dependent upon the amount of equipment necessary in a particular IDF cabinet, the District has three standard sized cabinets:
        1) Equipment Cabinets: Great Lakes, GL24WD, 24"H x 24"W x 32.13"D (24-48 data ports).
        2) Equipment Cabinets: Great Lakes, GL36WD, 36"H x 24"W x 32.13"D (49-96 data ports).
        3) Equipment Cabinets: Great Lakes, GL48WD, 48"H x 24"W x 32.13"D (97-above data ports).
    b. Fiber Interconnect: Leviton 1000i SDX 1RU Distribution and Splice Enclosure, empty, with sliding tray; accepts up to three SDX adapter plates or three SDX MTP cassettes and accepts up to three splice trays. 5R1UM-S03. One interconnect unit is required for each IDF.
    c. Modular Patch Panels:

1) Cat 6: Leviton QuickPort Patch Panel, 48-port, 49255-H48. All patch panels shall be fully populated with Cat 6 modular outlets. One port for each Cat 6 workstation served from the IDF with a minimum of 12 spare ports required. If the number of workstation cables, plus required spare count (12) is greater than 48, then an additional 48-port patch panel is required. Supply and install as many patch panels in the IDF as necessary to service all workstation cables plus the required spare count. Supply and install sufficient modular outlets (see "Workstation Outlets" below) to meet required data outlet count plus six spare.

d. Patch Cables:

1) Cat 6 Patch Cables: Leviton Atlas-X1 Cat 6 SlimLine boot patch cable, 5', orange, 6D560-050.

2) Contractor shall purchase patch cables. (One patch cable is required for each patch panel termination.)

2. Required Accessories and Quantities:

a. Coupling Panels/Couplers:

1) Multimode Coupling Panels/Couplers: Leviton SDX Precision Molded Plate (AQUA), 50/125µm multimode laser optimized OM3/4, duplex SC, 12 fibers, zirconia ceramic sleeve, 5F100-2QC. One multimode coupling panel is required for each IDF fiber interconnect unit installed.

2) Single Mode Coupling Panels/Couplers: Leviton SDX Precision Molded Plate (BLUE), single mode OS2, duplex SC, six fibers, zirconia ceramic sleeve, 5F100-6LC. Two single mode coupling panels are required for each IDF fiber interconnect unit installed.

b. Fiber Jumpers: One 2-meter SC/SC duplex multimode fiber jumpers is required for each IDF. Jumpers need not be provided for single mode fiber. CP Technologies, SC/LC 50-micron laser-optimized fiber jumper, LCSC-02-10G-AQ; or Leviton SC-LC 50-micron laser-optimized OM3 fiber jumper, 5LDCL-M02.

c. Contact owner prior to purchase of fiber jumpers for exact connector requirements (i.e., SC vs. LC).

d. Horizontal Wire Management: Panduit WMPH2E Closed Cover Wire Management Panel (19" covers). (One unit is required for each fiber interconnection).

e. Vertical Wire Management (for Equipment Racks Only): Panduit WMPV45E Closed Cover Wire Management Panel. (Two units are required for each floor-mounted relay rack.)

f. "D" Rings: Provide and install sufficient quantities of 2", 3", and 4" metallic "D" rings to conform to the drawings. Allen Tel GB13a (2"), GB13b (3"), and GB13c (4").

2.10 MISCELLANEOUS PRODUCTS

A. Station Cables: Contractor shall purchase station cables. Station cables shall be 7' in length, blue in color, conforming to Category 6 protocol. (One station cable is required for each patch panel termination.) Leviton eXtreme Cat 6 SlimLine boot patch cable 6D460-7L.

B. Data Terminal Backboard: Architectural grade, APA type A-C, Group 1, Exposure 1, with sanded side exposed, and shall be painted with three coats of fire-retardant white paint. It shall be 3/4" in thickness, height/width determined by location and/or scope of work. Backboards shall be installed at MDF and IDF locations.

C. Fire Pathways: Specified Technologies Inc. (STI) EX Path Fire Rated Pathway, EZDP33FW.

D. Cable Pathways: CPI FastTrac Cable Tray and accessories required for complete installation as specified by the manufacturer. Such accessories include, but are not limited to, underfloor,

trapeze, or wall-mount supports as well as bend radii protection and earth grounding. Minimum tray size shall be 2"H x 6"W and in 5' or 10' sections as determined by field conditions. Increase tray dimensions as necessary to conform to cable fill with a 50% margin for future additions.

E. Hook and Loop Cable Ties: Panduit Tak-Ty hook and loop cable ties, .75", TTS-20R0.

F. Miscellaneous Hardware: Furnish and install all wire ties, D-rings, cable hangers, labels, nuts, bolts, screws, cable ties, etc. for a complete and functioning system.

PART 3 - EXECUTION

3.1 DIVISION OF WORK

A. Contractor shall install the data communications system as described in this section. Installation shall result in a functional system pursuant to Section 3.3 below. The scope of work includes: (1) All necessary data components; (2) Repair of damage to structures incidental to installation; (3) Supply and install all material discussed in this specification; (4) Test and document system, upon completion; (5) Supply and install all material necessary, whether or not discussed in this specification, to result in a complete and functional system (except for electronic components, unless otherwise specified).

3.2 GENERAL

A. Equipment shall be installed in accordance with drawings. General installation provisions are as follows:

1. Fiber Innerduct:
    a. Quantities Required: Innerduct runs do not have to be continuous throughout, breaks are expected at the pullboxes. Contractor is responsible for determination of actual lengths of innerduct required. Enough innerduct shall be provided and installed to extend from the fiber service loop in the MDF to the fiber service loop in each IDF. If the route passes through a pullbox, the segments of innerduct shall extend 12" into the pullbox. If the route passes through an in-route IDF, each segment of innerduct shall extend at least 12" beyond the end of the service conduit. Seal all ends of the innerduct after the installation of the fiber is complete.
    b. Fiber innerduct shall be installed in conduit in accordance with manufacturer's instructions and industry standards. Within the equipment rooms, the innerduct shall extend from the end of conduit to 4' above the floor or 2' from the ceiling and shall be affixed to the backboard by means of clamps designed for that purpose or 4" D-rings. Care shall be taken to avoid kinking the innerduct or applying excessive tension during the installation process.
2. Fiber Distribution: Installation shall be conducted following guidelines established by the product manufacturer and industry standards. Installation includes complete assembly.
    a. Fiber Optic Cable:
        1) All fiber optic cable shall be installed in innerduct.
        2) Installation shall be conducted following guidelines established by the product manufacturer and industry standards. Installation includes complete assembly.
        3) The optical fiber backbone shall be installed in a single, unbroken run, without splices or breaks.
        4) There shall be no more than two 90° bends in any run of conduit for a single pull.
            a) Conduits shall enter into pullboxes at 45° (no 90° bends).

b) Provide a 10' service loop at each pullbox.

c) Cable shall be pulled independently down each conduit segment between pullboxes.

5) During installation of the fiber optic cable segments into the conduit system, special care shall be taken to avoid damage to the cable. While under pulling tension, the cable shall not be bent into a curve with a radius of less than 20 times the cable diameter. Pulling tension shall not exceed manufacturer's recommended maximum tensile load.

6) Contractor shall utilize a winch with tension control or a "break-away" link designed to break away at or below the recommended maximum tension.

7) The fiber optic cable shall be routed through the conduit and innerduct and onto the appropriate IDF backboard. Routing on the backboard shall be straight and plumb. A minimum 15' service loop shall be provided at each terminal location. Cable shall be routed on the backboard D-rings and secured to D-rings with cable ties. All cable shall be neatly bundled, combed, and tied.

3. Equipment Racks:

a. Equipment racks shall be assembled and mounted in each building as described in the following. Each rack shall be assembled in accordance with the manufacturer's instructions and recommendations. Each rack shall be mounted such that the side rails are plumb. Each rack shall be affixed to the computer terminal backboard (CTB) at each of the mounting holes provided. Attachment shall be by 1/2" x 1-1/4" lag bolts. A 3/8" pilot hole shall be drilled for each lag bolt. Each bolt shall be tightened to the extent that it holds the mounting hardware firmly to the backboard, but not so tight as to distort the hardware or strip the threads.

b. Installation: Installation shall be conducted in accordance with manufacturer's recommendations, industry standards, and this specification. Installation includes complete assembly and mounting of the fiber interconnect equipment, dressing the fiber and copper cables, and mounting of the patch panels and wiring blocks. Equipment shall be mounted to conform to existing conditions and spaces.

4. Wiring Blocks and Wire Management Components: Should copper exchange cable be required by the drawings, it shall be terminated on rack mounted patch panels located on a dedicated equipment rack in such a manner that allows for neat and orderly cross connections. Standard 568 will be used for all terminations.

5. Fiber Optics Interconnect Equipment: Interconnect equipment shall be mounted in the equipment racks. Interconnect equipment mounted in racks shall be affixed to the rack by at least four screws. The screws shall be of the correct size and thread configuration for the holes in the rack. They shall be tightened to the extent that they hold the equipment firmly to the rack, without distorting the equipment or stripping the threads. All fiber optics interconnect devices shall be assembled and installed in accordance with the manufacturer's instructions and recommendations.

6. Patch Panels and Wire Management Components: Patch panels and wire management components shall be mounted on the equipment rack. Each device shall be mounted such that its horizontal dimension is level. Each device shall be affixed by means of screws suitable for fastening to the rack. The screws shall be of the correct size and thread configuration for the holes in the rack. A minimum of four of the mounting holes provided shall be utilized for fastening. Screws shall be tightened to the extent that they hold the device snug to the rack, but not so tight as to distort or damage the device. Patch panels shall be terminated in accordance with the manufacturer's instructions and recommendations. Installation of accessories shall also be conducted in accordance with the manufacturer's instructions and recommendations.

7. Labeling:

a. With the exception of work station cables, hand written labels are not acceptable. All labels shall be machine printed on clear or opaque tape, stenciled onto adhesive

labels, or typewritten onto adhesive labels. The font shall be at least 1/8" in height, block characters, and legible. The text shall be of a color contrasting with the label such that it may be easily read. If labeling tape is utilized, the font color shall contrast with the background. Patch panels shall exhibit workstation numbers, per District labeling scheme, for all workstations served by the MDF or IDF.

b. Each fiber optics cable segment shall be labeled at each end with its respective IDF identifier on both the cable ends and interconnect device coupling panel. Each fiber interconnect device shall be labeled with its respective IDF identifier as well as fiber optic cable type (62.5µm or 50µm). Fiber-optic interconnects shall be labeled utilizing template provided by owner.

c. Each data communications outlet shall be labeled with its respective workstation number (machine labels only). Workstation numbers shall be comprised of the IDF designator-station number (e.g., 1.3-12). Communication outlet labels shall be applied using pressure-sensitive adhesive under the faceplate ID window. Labels shall not be affixed on top of the window.

d. Each workstation cable shall be neatly hand labeled, using permanent ink or other permanent labeling medium, at each end with its respective workstation number. Each copper backbone cable shall be machine labeled at each end with its respective IDF number. Each binder group shall be tied off with its respective identifying ribbon at each break out point.

e. Data outlets terminated in an accessible ceiling space for wireless access points shall have a label affixed to both the data outlet box as well as the T-bar grid proximal to the data outlet.

f. There is to be no difference in the designation of data outlets used for wireless access, video surveillance systems, or voice over IP applications.

8. Warning Tags: At each location where the fiber cable is exposed to human intrusion, it shall be marked with warning tags. These tags shall be yellow or orange in color, and shall contain the warning: "CAUTION FIBER OPTIC CABLE." The text shall be permanent, black, block characters, and at least 3/16" high. A warning tag shall be permanently affixed to each exposed cable or bundle of cables, at intervals of not less than 5'. Any section of exposed cable which is less than 5' in length shall have at least one warning tag affixed to it. In pullboxes, affix tag to innerduct. All tags should be labeled noting type of cable (i.e. 12-strand 62.5µm) and end points (i.e. MDF 1.1 to IDF 1.2).

9. In-ground Pullboxes and Vaults: All low-voltage cabling shall be neatly bundled, coiled, labeled, and affixed to the sides of in-ground pullboxes and vaults. Services should be separated and labeled as such (e.g., CATV, fire, clock/speaker, etc.) Attach J-hooks, spaced every 2' below the inside rim of the box such that the cable is protected from damage by the box cover. Hooks should be fastened with appropriately-sized concrete lag bolts or anchors. Bend radii precautions shall be observed for cables entering boxes as well as for service loops. No cable should touch the bottom of the box or vault.

10. Workstation Cable and Outlets: Installation shall be conducted in accordance with guidelines established by the product manufacturer and industry standards. Category-6 compliant cable hangers shall be utilized for accessible ceiling space installations. Wall plates shall be mounted such that their vertical dimension is plumb. Each wall plate shall be labeled with its respective workstation number. Each modular mounting frame shall be labeled with its respective workstation number. Workstation cable shall be terminated to the patch panel in accordance with manufacturer's recommendations and TSB-40.

a. Install cables in consistent consecutive order. Arrangement of cables on patch panels shall be in ascending order of outlet numbers. This includes cables installed for video surveillance, digital message boards, wireless access, etc. They should be installed on the patch panel at the next available termination point.

b. Do not bind cables tightly together with wraps. Wraps shall slip loosely around cable. The Contractor shall replace or rework cables showing evidence of improper

handling including stretches, kinks, short radius bends, over-tightened bindings, loosely twisted and over twisted pairs at terminals, and sheath removed too far (> 1").

c. Do not crimp or bend cables into a tighter radius than recommended by the manufacturer.

d. Do not support cables from ceiling suspension system.

e. Provide 36" service loop for cables at each IDF. Locate loop at ceiling or on wall above IDF cabinet.

f. Provide 12" service loop at each telecommunications outlet/connector, above drop location.

g. Label each cable on both ends using a Sharpie Ultra-Point Series 37000 marker pen, on a self-laminating cable labels. Labels shall match the outlet and patch panel identification labels, and shall be located on the jacket not less than 3" nor more than 10" back from the point where the jacket is cut and stripped for cable termination.

h. Vertical runs of cable in the MDF/IDF should be routed on the backboard via D-rings and secured to D-rings with cable ties. D-rings should be placed 12" O.C. Cable should be neatly bundled, combed, and tied.

i. When utilizing new or existing conduit, do not exceed 40% fill. If new conduit is required, provide minimum 1" EMT, bushings, and all necessary appurtenances. Pull string or rope shall be installed/re-installed in all conduits utilized for this project.

j. Data outlets identified for wireless access points and located above the T-bar ceiling grid shall be terminated and installed in a two-port surface-mount block and mounted such that the outlet is no more than 2' above the T-bar grid. Data outlets identified for wireless access and located in inaccessible, hard ceilings shall be terminated in a single-gang backbox and standard 2-port faceplate.

k. The trade contractor shall make every effort possible to avoid running cables in "wet" environments. Should be limited to floor boxes and other locations where overhead routing is not practical. "Wet" environment is defined as cable routed through underground conduit, conduit installed in or under concrete slabs (on grade slabs, above the first floor, are not to be considered "wet," etc.).

11. Fiber optic and workstation cable shall be continuous without splices, breaks, or connectors, between equipment racks (MDF and IDFs) and equipment rack to outlets.

12. Pull string or rope shall be installed/re-installed in all conduits utilized for this project, excluding intra-building conduit sleeves, 3' to 4' in length installed in accessible ceiling spaces.

13. Active Distribution Equipment (hubs, switches, etc.):

    a. Contractor shall install owner-provided active distribution equipment at MDF and IDF locations. Contractor will be responsible for mounting equipment on relay rack or in communications cabinet and providing necessary power. Owner shall be responsible for purchasing, configuring, and providing equipment to contractor as needed.

    b. In addition, contractor shall be responsible for patching in all active patch panel drops and fiber connections (one pair per IDF) to active distribution equipment. Connections to be sequential (i.e., patch panel port #1 to switch port #1), dressed, and routed through horizontal and vertical wire management units. Neatly bundle cable at the MDF/IDF utilizing Panduit Tak-Ty hook and loop cable ties. No cable zip ties are to be used in the IDF. Patch cables, fiber jumpers, and wire management units provided by contractor, as specified under Part 2 of this document.

3.3 TESTING AND DOCUMENTATION

A. After all equipment specified herein has been installed and is in operating condition, performance tests shall be conducted to determine that installation and components comply with these specifications. Contractor shall furnish competent personnel for these tests. Tests shall be conducted through the entire copper pathway, including workstation cable and data outlets.

B. Testing: Contractor shall test each fiber strand and each pair of each twisted pair copper cable. The Owner reserves the right to have a representative present during all or a portion of the testing process. If the Owner elects to be present during testing, test results will only be acceptable when conducted in the presence of the Owner.

C. Testing UTP Cable and Links:

1. All UTP cabling will be certified to meet and or exceed the specifications as set forth in ANSI/TIA-568-C.2, for permanent links. Certifications shall include the following parameters for each pair of each cable installed:
   a. Wire map (pin to pin connectivity)
   b. Length (in feet)
   c. Attenuation
   d. Near End Crosstalk (NEXT)
   e. Far End Crosstalk (FEXT)
   f. Equal-Length Far End Crosstalk (ELFEXT)
   g. PowerSum Equal-Length Far End Cross Talk (PSELFEXT)
   h. Attenuation/Crosstalk Ratio (ACR)
   i. Return Loss
   j. Propagation Delay
   k. Delay Skew
2. Owner reserves the right to spot check the test results (either by owner or by hiring an independent testing company). If the results vary more than 10% from the results provided by the Contractor, the Contractor will be required to prove his results are correct or retest the entire system.

D. Optical Fiber Testing:

1. Acceptance Testing: Test each strand of every optical fiber cable on the reel with an OTDR, to verify length and continuity. Fiber cables that have been damaged in transit must be replaced. Contractor-installed fiber cable that proves to be defective will be replaced at the contractor's expense.
2. Final Testing: After terminating optical fiber cables one of the individual fibers of each cable segment will be tested using an OTDR, both to determine the installed length and continuity. All individual fibers of each cable segment will be tested using a power meter to determine the actual loss. These readings will be taken at the 850 nm and 1300 nm windows for multimode and 1310 nm and 1550 nm windows for single mode (if applicable). Testing will be in both directions. The final readings will be listed on the Optical Fiber Test Form. These readings must not be higher than the "Optimal Attenuation Loss". The OAL will be calculated using the manufacturer's factory certified test results, (dB/km) converted to the actual installed lengths plus the manufacturer's best published attenuation losses for the connector and/or splice installed on this project. (0.20 for connectors and 0.10 for splices.) The OAL shall be used for comparison with the end to end power loss test results prior to acceptance by the Owner.

E. Documentation: Contractor shall provide documentation to include test results and as-built drawings. All test results shall be submitted via CD-ROM, formatted as PDF files from the test equipment. Summary reports are not acceptable.

1. Fiber Test Results: The results of the fiber optic cable tests shall be provided in the form of print-outs from the test equipment. Only original signed copies will be acceptable. Test results to include at least: date/time of test, test type, number of connectors, number of splices, fiber type, fiber length (feet), loss (in dB for both fiber and connectors) at all tested windows (see above), and margins (dB and/or percentages).
2. Workstation Cable: The results of the workstation cable tests shall be provided in the form of print-outs from the test equipment as PDF documents.
3. As-Built Drawings: As-Built one-line and wiring diagrams, with terminations identified, wire color coding schedule, pullbox locations, and full conduit/cable routing plans shall be provided as electronic AutoCAD .dwg file markups.
4. All documentation in this section must be provided to the Owner's IT department within 14 calendar days of substantial job completion. This timeline is independent of other contract sections.

3.4 OWNER FURNISHED CONTRACTOR INSTALLED (OFCI) ITEMS

A. All wireless access points, MDF and IDF switches shall be furnished by the Owner and installed by the contractor.

B. All classroom wireless access points shall be installed on the ceiling, in the center of the room, unless noted otherwise on the drawings.

3.5 ACCEPTANCE

A. Acceptance of the Data Communications System, by Owner, shall be based on the results of testing, functionality, and the receipt of documentation. With regard to testing, all fiber segments and all work station data cables must meet the criteria established in Section 3.3 above. With regard to functionality, Contractor must demonstrate to Owner that 1 Gbps data signals can be successfully transmitted, bi-directionally, from the MDF to and from some number of individual data outlets. The number of outlet locations to be tested shall be determined by Owner. With regard to documentation, all required documentation shall be submitted to Owner.

B. Owner will not consider system complete and ready for use until all backbone and horizontal cable is terminated and successfully tested, all patch cables have been provided and installed, and all station cables turned over to owner.

END OF SECTION 27 10 00

SECTION 27 51 23
SOUND AND COMMUNICATIONS

PART 1 - GENERAL

1.1 WORK INCLUDED

A. General Conditions and requirements of Division 1 and Section 26 00 00 apply to work hereunder.

B. Furnish and install extensions to the existing Sound/Communications System with clock subsystem, including all wiring and connections and other materials as shown on Plans and specified herein. It is the intent that complete operating systems be installed and that any power supplies, transformers, modules, cards, cages, programming, or other items required to achieve this end result shall be furnished whether or not such item or items are specified herein.

C. Site and System Investigation: Sound/Communications System bidder shall visit site prior to bid and become thoroughly knowledgeable about existing system and work required to perform work of this section. Failure to discover the equipment, materials, and labor required to complete the extensions will not relieve the contractor from completing the work at no additional cost.

1.2 GENERAL REQUIREMENTS

A. System Requirements: All of various equipment components to be complete with all appurtenant accessories required to provide specified facilities and perform specified functions throughout presently planned construction and space; and provisions for expanding system to provide same facilities, and perform same functions in all future planned construction, including space and mountings in consoles and terminal backboards.

B. Equipment Tests and Standards:

1. For all equipment operating at 26 volts or more, or utilizing over 50 watts, Contractor to submit proof within time allowed for submittals that all items of equipment will conform to requirements of U.L. Label or listing of equipment by U.L. to be accepted as evidence of conformance.
2. For all items of equipment operating at 25 volts or less, and utilizing less than 50 watts, Contractor may submit, in lieu of such label or listing, written certificate from any nationally recognized testing agency, adequately equipped and competent to perform such services, that each item has been tested and conforms to U.L. standards, including method of test of U.L.

C. Instructions and Manuals:

1. Equipment supplier of systems to demonstrate operation of systems to satisfaction of Owner and furnish Owner three (3) wiring schematics for all items of equipment, installation instructions, and details of all routine maintenance and servicing which must be given systems by Owner. Manuals shall be provided in 3-ring binders, with title page, list of contents, and conspicuous label on cover and shall be delivered to District. Refer to Section 26 00 00 for additional requirements. Submit copy to Architect for approval before delivering to Owner.
2. Supplier shall demonstrate operation of systems and provide training to all end users, administrative staff, and system administrator. Coordinate times of instruction with District, at District’s convenience. Supplier shall provide a minimum of 2 hours of user instructions to clerical staff and 4 hours of user/maintenance instructions to District maintenance

personnel. Instruction periods shall not coincide and shall be scheduled with District, not school staff. District shall provide list of authorized personnel for training sessions.

D. Submittals:

1. Refer to Section 26 00 00.
2. Contractor shall submit name of firms he proposes to do work under this Section, addresses, phone numbers, and name of firm's contact, for approval. Such firms shall be factory authorized representatives of the existing system and submittal shall include manufacturer's letter of confirmation. Proposed firm shall furnish all equipment and specialty cables, make all connections to same, and place the systems in operation. Such firms shall have offices and service departments within a 100 mile radius of project and shall have been in business of this type for at least five years.

E. Record Drawings: Refer to Section 26 00 00. Final Inspection will not be made until drawings are received and approved. Record Drawings shall include "As-Built" one-line and wiring diagrams, with terminations identified, wire color coding schedule, pullbox locations, and conduit routing plans.

F. Guarantee:

1. One firm to assume full responsibility for performance on all work of this section. Guarantee all equipment against defects in material and workmanship for two (2) years, and provide on-the-premises service during normal working hours for two years, at no cost to Owner if trouble is not caused by misuse, abuse, or accident, or at current labor rates if so caused. Provide manufacturer's written one-year guarantee for equipment and parts to Owner.
2. Service shall normally be available within 24 hours from service department of authorized distributor of manufacturer by factory trained servicemen.
3. On-the-premises service at other than normal working hours to also be available, but labor charges for such calls to be paid by Owner at current labor rates.

PART 2 - DETAIL REQUIREMENTS AND PRODUCTS

2.1 SOUND/COMMUNICATIONS SYSTEM

A. General: Furnish and install extensions to the existing Intercommunications System. Extensions shall be complete and fully operational. New equipment shall be compatible with existing system.

B. Equipment Standards:

1. Oscillators and amplifiers shall be solid state.
2. All relays which switch electronic circuits to have precious metal contacts with minimum engineered life of 1,000,000 trouble-free operations.
3. All Speaker circuits to be 25 volt lines with individual speakers matched thereto by use of matching transformers with adjustable impedance taps.
4. All annunciator functions to be by LED or LCD.
5. All enclosures for all equipment to be of metal throughout system. Enclosures other than metal are not acceptable.
6. Speaker grilles to be non-directional diffusion type insulated from speaker by fiber mounting board. Dampening material to be installed between mounting board and grille to prevent metallic resonance.

C. System Function: All functions provided by the existing system shall be extended to the new construction.

2.2 REMOTE EQUIPMENT

A. All equipment shall be compatible with the system. Contractor shall verify compatibility prior to preparing submittals and order equipment.

B. Interior Speaker: Speakers shall be flush unless noted as surface on plans.

1. Speaker: 8” speaker for wall mounting, line matching 5 watt 25/70 volt transformer with secondary taps to provide 5 steps of volume adjustments, frequency range of approximately 65-17,000 Hz, 1" minimum diameter voice coil and minimum 10 oz. ceramic magnet. Speaker shall be Quam 8C10PAX/TBLU.
2. Enclosure: Speaker grille and backbox and all audio components shall be acoustically and electrically matched. Speaker grilles to be non-directional diffusion type insulated from speaker by fiber mounting board. Dampening material to be installed between mounting board and grille to prevent metallic resonance.
    a. Flush Enclosure Lowell P875X-4 backbox and Lowell JG-8X grille.
    b. Surface Enclosure: Lowell CB84 backbox and Lowell JG-8X grille.
    c. Flush Combination Clock/Speaker Enclosure: Lowell PC312 backbox and Lowell SCB-300 grille.
    d. Surface Combination Clock/Speaker Enclosure Lowell PC712 backbox and Lowell SCB-700 grille.

C. Exterior Speaker: Speakers shall be flush unless noted as surface on plans.

1. Speaker: Weather resistant, 15 watt power handling capacity, frequency range of 600-12,000 Hz, built-in line matching 25/70 volt transformer with screwdriver adjustable switch to provide 5 steps of volume adjustment. Speaker shall be Lowell LUH-15T.
2. Flush Enclosure: Lowell P875X-4 backbox and SQLK-8 APF grille.
3. Surface Enclosure: Lowell CB84 backbox and SQLK-8 APF grille.

D. Secondary Clock:

1. 12" round or as shown on the plans for semi-flush mounting. Clocks shall be of contemporary design with modern styled satin white dials with black numerals, black hour and minute hands, and red sweep second hand. Case of clocks shall be all metal with black finish. Crystal shall be shatterproof. Clocks shall operate on 24V AC, 60 cycles. Clocks shall be National Time #030-12EX-LL-SP or equal. Provide #143 backbox for clocks that are not mounted in a combination clock/speaker backbox.
2. 12" round or as shown on the plans for semi-flush mounting. Clocks shall be of contemporary design with modern styled satin white dials with black numerals, black hour and minute hands, and red sweep second hand. Case of clocks shall be all metal with black finish. Crystal shall be shatterproof. Provide replacement clocks from American Time as required to be compatible with the existing system. Provide required backbox for clocks that are not mounted in a combination clock/speaker backbox.
3. Clocks in multipurpose rooms, gymnasiums, team rooms, and locker rooms shall be provided with wire guards.

PART 3 - EXECUTION

3.1 INSTALLATION REQUIREMENTS

A. Electrical Contractor shall retain the services of the duly appointed representative as specified hereinbefore, who shall furnish all equipment, make all connections to same, and place system in operation. Technician and workman employed shall be particularly skilled in this type of work. Workmanship on installed systems shall be of professional quality, best commercial practice.

B. Existing system shall be tested as soon as possible after award of contract and prior to preparing submittals. Contractor shall test entire system to insure proper operation. Any defects of deficiencies found shall be listed and presented to Owner in letter form. It will be assumed that existing equipment is fully functional unless identified otherwise by Contractor.

1. Testing shall be scheduled by the Contractor and shall be conducted at time least disruptive to school activities and as approved by District. Contractor shall provide technicians to conduct all testing (from same firm preparing submittals and performing sound/communication system work). Testing shall be coordinated to include the Project Inspector and a representative from Engineer's office.
2. At time of testing, Contractor shall insure that his submittal will reflect all materials and work necessary to make new equipment function properly with existing.

C. All wiring throughout entire system shall be installed in conformance with standard industry practice. Each equipment cabinet shall be provided with terminations as follows:

1. Communications signal system conductors shall be terminated on wire slot terminals. Terminal blocks shall be Siemens S66M1 Series, AMP Modular Connecting Block, or approved equal, with mounting base.
2. Clock circuits shall be terminated on screw terminals. Terminal blocks shall be Allen-Bradley Bulletin 1492 with 600V screw terminals for #22 to #10 conductors, mounted to type N22 channel, or approved equal.
3. Submittal shall show internal elevation of terminal cabinets with equipment laid out.

D. All cables shall be run through fanning strip to terminals of terminal blocks.

E. All audio cables within terminal cabinets shall be bound with plastic cable ties so that cables are in tight contact for their entire length.

F. All audio circuit wiring external to equipment cabinets shall be of type of cable that will allow shields to be insulated from ground and audio circuits. Shields shall be grounded at point of lowest audio level only and shall be free of any other ground for their entire length. Where two (2) cables join or connect together on terminal strip, shields shall be insulated from all other conductors and connected together in manner similar to cable conductors.

G. All cables entering terminal cabinets and pullboxes shall be labeled.

H. Each cable run on as-built wiring diagrams shall be identified with exact wire marker code (numerical or alphabetical) as appears in terminal cabinets.

I. Station locations shall be identified by location and school's actual room numbers as furnished by District, and in all ways shall relate as closely as possible to record wiring drawings. Prior to performing final labeling and programming, coordinate information with District.

J. No splices shall occur in underground pullboxes. Signal system wiring shall be continuous, without splices, from backboard to backboard and backboard to devices. All interior pullboxes shall be accessible and locations shall be recorded on "As-Built" drawings.

3.2 CONSTRUCTION MEETINGS

A. The Contractor shall schedule construction meetings at the jobsite as follows:

1. Prewire meeting shall occur after raceways are installed and prior to pulling of any wire or cable.
2. Pre-termination meeting shall occur after wire and cable has been installed and prior to termination.

B. Meetings shall be scheduled by the Contractor on a building by building basis and shall include the Project Inspector, School's Representative, the electrical subcontractor, and the Signal System subcontractor as a minimum.

3.3 TESTS

A. After all equipment specified herein has been installed and is in operating condition, performance tests shall be conducted to determine that installation and components comply with these specifications. Contractor shall furnish competent personnel for these tests.

B. Testing shall be scheduled with the Owner and shall occur after receipt by Architect of Contractor's written certification of completion, record one-line diagram, wiring diagrams, maintenance and operation manuals, and other "As-Built" data required by these specifications. Tests shall be scheduled with School before occupancy occurs.

END OF SECTION 27 51 23

SECTION 27 51 26
ASSISTIVE LISTENING SYSTEM

PART 1 - GENERAL

1.01 SUMMARY

A. Work included: Labor, materials, and equipment necessary to complete the installation required for the item specified under this Division, including but not limited to:

1. Portable Assistive Listening System.

B. Related Work: Consult all other Sections, determine the extent and character of related Work, and properly coordinate Work specified herein with that specified elsewhere to produce a complete installation.

1.02 REFERENCES

A. Comply with the latest edition of the following applicable Specifications and standards except as otherwise indicated or specified:

1. Electronic Industries Association (EIA):

EIA REC 127-49;	Power Supplies.
EIA RS 160-51	Sound Systems.
EIA SE 101-A--49;	Amplifiers for Sound Equipment.
EIA SE 103-49;	Speakers for Sound Equipment.

2. Underwriters Laboratories, Inc. (UL):

UL 50;	Enclosures for Electrical Equipment.

1.03 SYSTEM DESCRIPTION

A. Provide a portable assistive listening system for the multipurpose room as indicated on the Drawings and specified herein.

B. Portable system shall include wireless FM base station transmitter, portable transmitters, antenna wiring, personal receivers, microphones, carrying case, and miscellaneous accessories required for a complete system.

C. Digital audio processing and direct digital synthesis for superior FM transmission, sound clarity and channel flexibility; wide-band and narrow-band compatible; bass cut adjustment; line, microphone and speaker level inputs; lightweight and comfortable receivers; easy to install and operate.

D. Include charging cases for housing portable system components.

E. The transmitter shall be a portable belt transmitter with lavaliere microphone.

F. Personal receivers shall be body-worn and furnished with pouch and belt clips. Receiver models shall be narrow-band, 72 to 76mHz frequency with 6-channels.

G. Range shall be 700,000 square feet of unobstructed coverage with standard antenna or higher as required to cover the entire floor area per CBC.

1.04 SUBMITTALS

A. Submit in accordance with the requirements of Division 0 and 1 including but not limited to the following items:

1. Data/catalog cuts for each product and component specified herein, listing all physical and communications characteristics and ratings indicating compliance with all listed standards.

2. Describe system operation, equipment, dimensions and indicate features of each component.
3. Clearly mark on each data sheet the specific item(s) being submitted and the proposed application.
4. Total number of personal receivers and accessories including pouch with belt clip to be provided (confirm with Architectural Plans).
5. Local frequency usage, from frequency scanning survey with proposed frequency for this Project.
6. Submit Manufacturer's installation instructions.
7. Complete Bill of Materials listing all components.
8. Warranty.

1.05 OPERATION AND MAINTENANCE MANUAL

A. Supply operation and maintenance manuals in accordance with the requirements of Section 260000, to include the following:

1. A detailed explanation of the operation of the system.
2. Instructions for routine maintenance.
3. Pictorial parts list and part numbers.
4. Schematic wiring diagrams.
5. Telephone numbers for the authorized parts and service distributor.
6. Final testing reports.

1.06 QUALITY ASSURANCE

A. Only products and applications listed in this Section may be used on the Project unless otherwise submitted.

B. All materials, equipment and parts comprising the units specified herein shall be new, unused, and currently under production.

C. The installation contractor shall be licensed and bonded contractor holding a valid Electrical Contractor's License (C-7) as prescribed by State of California.

D. The installation contractor shall be in business for a minimum of 7-years and have had experience with seven or more installation of Assistive Listening Systems of comparable type and size, as specified in the drawings and specifications. Each of these installations shall have performed satisfactorily for at least 2-years in operation after final acceptance by the user.

E. The installation contractor shall maintain a fully staffed and equipped service facility, as well as have trained and certified journeyman level personnel for the products specified.

F. Installation Contractor’s Engineers and Technicians shall be fully trained, qualified, and certified by the OEM on the engineering, installation, operation, and testing of the System.

1.07 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Delivery: Assistive listening system components shall not be delivered to the Project site until protected storage space is available. Storage outdoors covered by rainproof material is not acceptable. Equipment damaged during shipping shall be replaced and returned to Manufacturer at no cost to Owner. Components shall be properly packaged in factory-fabricated containers.

B. Storage: Store in clean, dry, ventilated space free from temperature extremes. Maintain factory wrapping or provide a heavy canvas/plastic cover to protect units from dirt, water, construction debris and traffic. Provide heat where required to prevent condensation.

C. Handling: Handle in accordance with Manufacturer's written instructions. Be careful to prevent internal components damage, breakage, denting and scoring. Damaged units shall not be installed. Replace damaged units and return equipment to Manufacturer.

1.08 WARRANTY

A. Units and components offered under this Section shall be covered by a 2-year parts and labor warranty for malfunctions resulting from defects in materials and workmanship. Warranty shall begin upon acceptance by the Owner.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Products furnished by the following Manufacturers shall be acceptable if in compliance with all features specified herein and indicated on the Drawings.

1. ***Listen Technologies***
2. ***Williams Sound, Corp.***

2.02 PORTABLE TRANSMITTER

A. The portable RF display transmitter shall be capable of broadcasting on 57-channels.

B. The unit shall incorporate a microphone sensitivity switch.

C. The device shall broadcast on both wide and narrow band channels with a SNR of 80dB or greater.

D. The device shall have an audio frequency response of 50Hz to 15kHz, ±3dB at 72mHz.

E. The device will incorporate a mute switch.

F. The battery door shall be capable of being mechanically locked.

G. The device shall incorporate an LCD display that indicates channel, battery level, low battery, battery charging, and RF signal strength.

H. The portable transmitter shall incorporate automatic battery charging circuitry for recharging of NiMH batteries, with the ability to charge via a wall transformer or drop in charging case.

I. The portable transmitter shall come with behind the head microphone.

2.03 RECEIVER

A. The receiver shall operate in the Auditory Assistance Band as approved by the FCC. It shall be digitally tunable to one of 37 frequencies within that band by concealed rotary switches.

B. The receiver shall be housed in a high-strength, plastic case with integral pocket clip. The on/off/volume control shall be properly marked and the only control that is exposed. There shall be a standard 1/8” mono headphone jack for audio output. The jack shall be recessed to provide stress protection for the headphone plug.

C. The receiver shall operate on two standard AA batteries, and contain built-in recharging contacts for operation with rechargeable batteries and a suitable drop-in recharger.

D. Technical Specifications:

1. Type: FM, medium bandwidth (60kHz)
2. Audio frequency range: 100Hz to 10kHz
3. Audio output level: 140mW into 32ohm

4. Signal-to-noise ratio: >55dB
5. Distortion: <2%
6. RF frequency range: 37 channels, 72 to 76mHz
7. Sensitivity: 0.8uV typical, 1mV max for 12dB SINAD
8. Controls: On/off/volume, channel selector (hidden)
9. Earphone jack: Standard 1/8” mono
10. Power requirements: 2 x AA batteries
11. Battery life: 40-hours with alkaline types
12. Peak clipping: Shall not exceed 18 dB of clipping relative to the peaks of speech
13. Sound pressure level: 110 dB minimum and 118 dB maximum with dynamic range on the volume control of 50 dB
14. Signal-to-noise ratio: 18 dB minimum.

E. Provide a minimum of eight (16) receivers for each portable unit.

F. Provide a minimum of twelve (12) ear speakers.

G. Provide a minimum of four (4) hearing aid compatible neck loops that interface with the telecoils in hearing aids.

2.04 BATTERY CASES

A. Cases shall be able to charge 4, 8, 12, or 16 portable devices and shall be sized per the number of devices per room requirements.

B. The case shall have hard foam interionimumnimumr and durable steel latches.

C. The case shall have pockets to store earphones and prevent tangling.

D. Earphones shall be able to stay attached to receivers while storing and charging.

E. The case shall be lockable.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Contractor shall thoroughly examine Project site conditions for acceptance of the assistive listening system installation to verify conformance with Manufacturer and Specification tolerances. Do not commence with installation until all conditions are made satisfactory.

3.02 INSTALLATION

A. General:

1. Install system in accordance with Manufacturer's written instructions, as indicated on the Drawings and as specified herein.
2. Carefully match input and output impedances and signal levels at signal interfaces. Provide matching networks where required.

B. Transmitter: Install transmitter in sound rack or on top of sound rack. Coordinate exact location with sound system Sub-contractor.

C. Antenna and ground plane: Install antenna and ground plane on the ceiling in accordance with Manufacturer's written instructions and as indicated on the Drawings.

D. Receivers: Deliver the receivers to the Owner after system has been installed and tested.

3.03 FIELD QUALITY CONTROL

A. Manufacturer's field service: Contractor shall arrange and pay for the services of a factory-authorized service representative to supervise the initial start-up, pretesting and adjustment of the system. Testing Agencies objectives shall be to:

1. Assure assistive listening system installation conforms to specified requirements and operates within specified tolerances.
2. Field test and inspect to ensure operation in accordance with Manufacturer's recommendations and Specifications.
3. Verify settings and make final adjustments. Settings and adjustments shall be performed on the transmitters and all the receivers.

B. Prefunctional testing:

1. Visual and mechanical inspection:
   a. Inspect for physical damage, defects alignment and fit.
   b. Perform mechanical operational tests in accordance with Manufacturer's instructions.
   c. Compare nameplate information and connections to Contract Documents.
   d. Check tightness of all connections.
   e. Check that all covers, barriers, and doors are secure.
2. Communications tests:
   a. Perform complete testing to determine conformance with the requirements of the Contract Documents.
   b. Operational test: Perform an operational test to verify conformance of system performance and conditions to Contract Document within Manufacturer's tolerances.

C. In the event that the system fails to function properly during the testing as a result of inadequate pretesting or preparation, the Contractor shall bear all costs incurred by the necessity for retesting including test equipment, transportation, subsistence and Engineer's hourly rate.

D. Contractor shall replace at no cost to the Owner all devices which are found defective or do not operate within factory specified tolerances.

E. Contractor shall submit the testing final report to the Engineer for review prior to Project closeout and final acceptance by the Owner. Test report shall indicate test dates, devices tested, results, observations, deficiencies, and remedies. Include a copy of the test report in the Owner’s operation and maintenance manuals.

3.04 CLEANING

A. Upon completion of Project prior to final acceptance the Contractor shall thoroughly clean the system components per Manufacturer's approved methods and materials. Remove all paint splatters spots, dirt, and debris.

3.05 TRAINING

A. Factory authorized service representative shall conduct a *4*-hour training seminar for Owner's representative upon completion and acceptance of system. Instructions shall include safe operation, maintenance and testing of equipment.

B. Contractor shall schedule training with a minimum of *7*-days advance notice.

END OF SECTION 27 51 26

SECTION 28 31 00
INTRUSION ALARM SYSTEM

PART 1 - GENERAL

1.1 WORK INCLUDED

A. General Conditions and requirements of Division 1 and Section 26 0000 apply to work hereunder.

B. Furnish and install extensions to the existing Intrusion Alarm System including all wiring and connections and other materials as shown on Plans and specified herein. It is the intent that a complete operating system be installed and that any power supplies, relays, resistors, cards, modules, programming, or other items required to achieve this end result shall be furnished whether or not such item or items are specified herein.

C. Site and System Investigation: System bidder shall visit site prior to bid and become thoroughly knowledgeable about all aspects of the existing system and work required to perform work of this section. Bidder shall verify the manufacturer and model of the existing system and all components/devices required. Failure to discover the equipment, materials, and labor required to complete the extensions will not relieve the contractor from completing the work at no additional cost.

D. Proprietary Systems: Where school is protected and monitored by a proprietary system, such as ADT or Sonitrol, Contractor shall coordinate the exact requirements with those firms. If the Division 26 Contractor elects to use a sound and signal firm other than the proprietary company, the sound and signal firm must include in bid, the materials, equipment, and labor required by the proprietary company to make the extensions complete and fully functional.

1.2 GENERAL REQUIREMENTS

A. System Requirements: All of various equipment components to be complete with all appurtenant accessories required to provide specified facilities and perform specified functions throughout presently planned construction and space; and provisions for expanding system to provide same facilities, and perform same functions in all future planned construction, including space and mountings in control panels and terminal backboards.

B. Interruption of Service: Existing intrusion alarm system must be kept operational during unoccupied hours. In the event that the system or portion of system is nonoperational during off-hour periods as a result of work of this contract, the Contractor must provide guard(s) to patrol the campus. Guard(s) and guard duties proposed by Contractor must be acceptable to District and District Police (local enforcement if District does not have its own Police Services). All costs for security guard(s) shall be Contractor's responsibility.

1.3 QUALITY ASSURANCE

A. Latest applicable publications listed below form a part of this Specification:

CEC	California Electrical Code
CFC	California Fire Code
NFPA 72	National Fire Alarm Code with California Amendments
ADA	Title 3 of the Americans with Disabilities Act
CCR	Titles 19 and 24 of the California Code of Regulations

1.4 CONTRACTOR QUALIFICATIONS

A. Fabricator/Installer/Vendor shall be licensed contractor and servicing agent, as well as installer for all components and systems in this System, and be acceptable to manufacturer of the major components of the system. Service personnel shall be capable of serving any and/or all components of the System.

B. Fabricator/Installer/Vendor must be able to present evidence of technical expertise, be a firm who has successfully installed projects of a similar scope to this project for a minimum of five (5) years, and shall maintain service office within 100 miles of the project site.

C. All equipment is to be manufactured by a firm/firms who have successfully fabricated elements/systems of a scope similar to this project for a minimum of ten (10) years.

D. Have a valid State of California Contractor's license in classification C10 - Electrical.

E. Provide authorized dealer service on-site at facility within four (4) hours of a problem being reported, with this response time available twenty-four (24) hours per day, seven (7) days per week.

F. Affirm that he maintains, or will maintain, or has access to, a stock of system spares sufficient to insure that no element of the System will be out of service for more than twenty-four (24) hours due to lack of proper spares.

1.5 SUBMITTALS, O&M'S AND RECORD DRAWINGS

A. Submittals:

1. Refer to Section 26 0000.
2. Contractor shall submit name of firm he proposes to do work under this Section, addresses, phone numbers, and name of firm's contact, for approval. Such firms shall be factory authorized representatives of the system and submittal shall include manufacturer's letter of confirmation. Proposed firm shall furnish all equipment and specialty cables, make all connections to same, and place the systems in operation. Such firms shall have offices and service departments within a 100 mile radius of project and shall have been in business of this type for at least five years.
3. Submittals shall be complete and include catalog data, shop drawings, one-line diagrams, battery calculations, voltage drop calculations, and scaled plan drawings. Building plans shall be 1/8"=1'-0", and site plans shall be no smaller than 1"=40'.
4. Shop Drawings shall contain complete wiring and schematic diagrams for equipment furnished, equipment layout, conduit and wiring layout drawings, and any other details required to demonstrate that system has been coordinated and will properly function as a unit. Equipment Vendor shall check Drawings for adequacy of conductors and raceways for proposed system. Include in Bid Amount all required raceways, conductors and material necessary to suit proposed system.

B. Operation and Maintenance Manuals:

1. Operating Instruction Manuals outlining the step-by-step procedures required for system start-up and operations shall be furnished. The instructions shall include manufacturer's name, model number, service manual parts list, and brief description of all equipment and their basic operating features.
2. Maintenance Instruction Manuals outlining maintenance procedures shall be furnished. The manual shall include a troubleshooting guide listing possible breakdowns and repairs and a simplified connection wiring diagram for the system as installed.

C. Record Drawings: Refer to Section 26 0000. Final Inspection will not be made until drawings are received and approved. Record Drawings shall include "As-Built" one-line and wiring diagrams, with terminations identified, wire color coding schedule, pullbox locations, and conduit routing plans.

D. Furnish to District a printed copy of the control panel programming upon completion of final system programming.

E. Performance Test Reports: Upon completion of installed system, submit in booklet form all field tests performed to prove compliance with the specified performance criteria. Each test report shall indicate the final position of controls.

1.6 TRAINING

A. Supplier shall demonstrate operation of systems and provide training to all end users, administrative staff, and system administrator. Coordinate times of instruction with District, at District's convenience. Supplier shall provide a minimum of 1 hour of user instructions to clerical staff and 2 hours of user/maintenance instructions to District maintenance personnel. Instruction periods shall not coincide and shall be scheduled with District, not school staff. Deliver to Owner at time of demonstration, all settings and codes programmed into system. Furnish three copies on manufacturer's standard programming worksheets. District shall provide list of authorized personnel for training sessions.

1.7 GUARANTEE

A. One firm to assume full responsibility for performance on all work of this section. Guarantee all equipment against defects in material and workmanship for two (2) years, and provide on-the-premises service during normal working hours for two years, at no cost to Owner if trouble is not caused by misuse, abuse, or accident, or at current labor rates if so caused. Provide manufacturer's written one-year guarantee for equipment and parts.

B. Service shall normally be available within 24 hours from service department of authorized distributor of manufacturer by factory trained servicemen.

C. On-the-premises service at other than normal working hours to also be available, but labor charges for such calls to be paid by Owner at current labor rates.

PART 2 - DETAIL REQUIREMENTS AND PRODUCTS

2.1 SYSTEM OPERATION

A. Activation of an intrusion alarm sensor shall cause a signal to be transmitted to a Central Station via telephone lines. Signal transmission shall be initiated by a built-in dialer unit. In addition to alarm reporting, system shall report trouble, low battery, and shunted zone indications.

2.2 SYSTEM DESCRIPTION

A. The system is existing.

2.3 ACCESSORIES

A. Equipment and accessories furnished under the terms of these specifications shall be the standard products of the manufacturers specified or required. All equipment shall be listed by U.L. All equipment and accessories shall be compatible with the system. The existing system manufacturer and model shall be verified by the contractor prior to ordering materials.

B. Keypads:

1. Keypads: Keypads shall match existing keypads on site.
2. Where surface conduit is used, provide keypad manufacturer's surface mount box.

C. Room Detectors:

1. Wall or Ceiling Mounted: Shall match existing if currently available or currently available product compatible with existing system. Provide motion, glass-break, glass-break/microphone, or other device to match existing system protection type.
2. Provide wire guards at detectors in student toilet rooms, multi-purpose rooms, gymnasiums, locker rooms, team rooms and where called for on plans.

D. Door Contacts:

1. Entry Doors: Provide 1" diameter concealed steel door contact with magnet, off-white color, Sentrol 1076-D, DPDT (one pole to be used for EMS wiring).
2. Roof Access Hatches (RA): Provide surface mounted magnetic contacts with screw terminals, Sentrol 1045T.
3. Roll-Up Doors (RU): Provide surface mounted contact, Sentrol 2205AU.

E. Single Zone Multiplex Input Modules (Popits): Provide one for each detector. Provide one for each door contact, unless shown as grouped on plans.

F. Alarm Bells: 12V DC motor Bell and box, Amseco ABB-1033.

G. End of line resistors, as required.

H. Power Supplies: Altronics SMP Series with output voltage and capacity as required. Provide with appropriate transformer, enclosure(s), and battery(s). Battery(s) shall be sized to provide 24 hours of backup power. Provide power supplies as necessary.

PART 3 - EXECUTION

3.1 INSTALLATION REQUIREMENTS

A. Work shall be installed as shown on the Drawings in accordance with the manufacturer's diagrams and recommendations, except where otherwise indicated.

B. Electrical Contractor shall retain the services of the duly appointed representative as specified hereinbefore, who shall furnish all equipment, make all connections to same, and place system in operation. Technician and workman employed shall be particularly skilled in this type of work.

C. At existing sites, the existing system shall be tested as soon as possible after award of contract and prior to preparing submittals. Contractor shall test entire system to insure proper operation. Any defects of deficiencies found shall be listed and presented to Owner in letter form. It will be assumed that existing equipment is fully functional unless identified otherwise by Contractor.

D. Control panel shall be mounted with sufficient clearance for observation and testing.

E. All junction boxes must be clearly marked for distinct identification.

F. Panel enclosures shall comply with the Requirements of UL 864. Enclosures having doors over forty-eight inches (48") in height shall be provided with a three (3) point catch and lock; all other doors shall contain a cabinet type cylinder lock. Inserts shall be blind fastened so that no screws show on panel front.

G. Detectors shall be installed in accordance with manufacturer's written instructions in areas as indicated on the Drawings.

H. Circuits shall be terminated on screw terminals. Terminal blocks shall be Allen-Bradley Bulletin 1492 with 600 volt screw terminals for #22 to #10 conductors, mounted to type N22 channel, or approved equal. Submittal shall show internal elevation of terminal cabinets with equipment laid out.

I. All cables shall be run through fanning strip to terminals of terminal blocks.

J. All cables entering terminal cabinets and pullboxes shall be labeled.

K. Each cable run on as-built wiring diagrams shall be identified with exact wire marker code (numerical or alphabetical) as appears in terminal cabinets.

L. Detector locations shown on drawings are approximate only. Exact locations shall be coordinated with lighting and mechanical equipment and shall be placed in accordance with manufacturer's recommendations (with respect to supply air diffusers, etc.).

M. Station locations shall be identified by school's actual room numbers and system shall be programmed accordingly. Coordinate actual room numbers with District. Coordinate final programming with District. Contractor shall furnish a printed copy of final programming to District.

N. End-of-line resistors shall be installed at locations readily accessible, not above an elevation of 10 feet above finish floor or grade, or as shown on Drawings.

O. No splices shall occur in underground pullboxes. System wiring shall be continuous, without splices, from terminal cabinet to terminal cabinet and control panel to devices. All interior pullboxes shall be accessible and locations shall be recorded on "As-Built" drawings.

P. Door contacts shall be located 6" from strike side of door and both the switch and magnet shall be "glued" in place with clear silicone. Wiring shall enter door frame through jamb. Do not drill headers.

Q. Each detector installed in this contract shall have a popit. Each door contact installed in this contract shall have a popit, unless door contacts are shown grouped on drawings. In rooms with accessible ceilings, mount popit in junction box above ceiling. Where hard ceilings occur, provide flush box high on wall or on ceiling with blank finish plate. Wiring shall go to popits, then down to detectors.

R. Protected areas accessing remote keypads shall be wired and connected on delay zone, separate from all other protected areas.

S. After all equipment is installed and is operational, Intrusion Alarm System subcontractor shall set angle settings, sensitivity settings, etc., of each detector to insure optimum performance and minimal false alarms. Mask out areas of each motion type detector to remove sources of false alarms (windows, heaters, air diffusers, etc.) from detection zones.

3.2 CONSTRUCTION MEETINGS

A. The Contractor shall schedule construction meetings at the jobsite as follows:

1. Pre-rough-in meeting shall occur before installation of any boxes, raceways, etc. Exact locations of all detectors shall be established as recommended by the Intrusion Alarm System subcontractor.
2. Prewire meeting shall occur after raceways are installed and prior to pulling of any wire or cable.
3. Pre-termination meeting shall occur after wire and cable has been installed and prior to termination.

B. Meetings shall be scheduled by the Contractor on a building by building basis and shall include the Project Inspector, School's Representative, the electrical subcontractor, and the Intrusion Alarm System subcontractor as a minimum.

C. One-half to three-quarters of the way through project, District Facilities will set up a meeting (preferably at the school site) with decision makers from Facilities, Police Services, Maintenance, Maintenance Alarm Tech, General Contractor, Alarm Sub-contractor, and School Administrator to review the alarm protocol and to identify responsible personnel and timelines.

3.3 TESTS

A. After all equipment specified herein has been installed and is in operating condition, performance tests shall be conducted to determine that installation and components comply with these specifications.

1. Testing shall be scheduled by the Contractor and shall be conducted at time least disruptive to school activities and as approved by District. Contractor shall provide technicians to conduct all testing (from same firm preparing submittals and performing intrusion alarm work). Testing shall be coordinated to include the Project Inspector and a representative from Engineer’s office.
2. At time of testing, Contractor shall insure that his submittal will reflect all materials and work necessary to make new equipment function properly with existing.
3. Contractor shall furnish all instruments and personnel required for tests.
4. Conduct tests for following:
    a. Verify that the system is free of grounds or open circuits. The central control board shall indicate when a ground or open circuit exists.
    b. Verify that devices are functioning as specified.

B. Testing shall be reconducted to verify correction of any defect found in initial testing.

C. After system is completely tested, the Contractor shall take the following actions with the Owner:

1. The Contractor will schedule a meeting with the Alarm Sub-contractors and Owner’s Representatives to determine alarm zone and device nomenclature. The Contractor shall insure that the alarm zone and device nomenclature matches the actual building and door or room numbers used by the school. Architectural numbering shall not be used. Once confirmed, the Contractor shall demonstrate this to Owner’s Representatives.

END OF SECTION 28 31 00

SECTION 28 46 00
FIRE ALARM SYSTEM

PART 1 - GENERAL

1.1 WORK INCLUDED

A. General Conditions and requirements of Division 1 and Section 26 0000 apply to work hereunder.

B. Furnish and install extensions to the existing Fire Alarm System including all wiring and connections and other materials as shown on Plans and specified herein. It is the intent that a complete operating system be installed and that any power supplies, relays, resistors, cards, modules, programming, or other items required to achieve this end result shall be furnished whether or not such item or items are specified herein.

C. Site and System Investigation: System bidder shall visit site prior to bid and become thoroughly knowledgeable about existing system and work required to perform work of this section. Failure to discover the equipment, materials, and labor required to complete the extensions will not relieve the contractor from completing the work at no additional cost.

1.2 GENERAL REQUIREMENTS

A. System Requirements: All of various equipment components to be complete with all appurtenant accessories required to provide specified facilities and perform specified functions throughout presently planned construction and space; and provisions for expanding system to provide same facilities, and perform same functions in all future planned construction, including space and mountings in control panels and terminal backboards.

B. Interruption of Service: Existing fire alarm system must be kept operational during work of this contract. If operation of existing system or portion of existing system is disrupted for connections into system or cutoff for any reason by work of this project, Contractor must provide fire watch. Fire watch must occur 24 hours per day and every day system is down. Fire watch proposed by Contractor must be acceptable to local fire authority and Owner. All costs for fire watch shall be Contractor's responsibility.

1.3 QUALITY ASSURANCE:

A. Latest applicable publications listed below form a part of this Specification:

CEC	California Electrical Code
CFC	California Fire Code
NFPA 72	National Fire Alarm Code with California Amendments
ADA	Title 3 of the Americans with Disabilities Act
CCR	Titles 19 and 24 of the California Code of Regulations
CMC	2016 Uniform Mechanical Code with 2016 California Amendments

1.4 CONTRACTOR QUALIFICATIONS:

A. Fabricator/Installer/Vendor shall be licensed contractor and servicing agent, as well as installer for all components and systems in this System, and be acceptable to manufacturer of the major components of the system. Service personnel shall be capable of serving any and/or all components of the System.

B. Fabricator/Installer/Vendor must be able to present evidence of technical expertise, be a firm who has successfully installed projects of a similar scope to this project for a minimum of five (5) years, and shall maintain service office within 100 miles of the project site.

C. All equipment is to be manufactured by a firm/firms who have successfully fabricated elements/systems of a scope similar to this project for a minimum of ten (10) years.

D. Have a valid State of California Contractor's license in classification C10 - Electrical.

E. Provide authorized dealer service on-site at facility within four (4) hours of a problem being reported, with this response time available twenty-four (24) hours per day, seven (7) days per week.

F. Affirm that he maintains, or will maintain, or has access to, a stock of system spares sufficient to insure that no element of the System will be out of service for more than twenty-four (24) hours due to lack of proper spares.

1.5 SUBMITTALS, O&M'S AND RECORD DRAWINGS:

A. Submittals:

1. Refer to Section 26 0000.
2. Contractor shall submit name of firm he proposes to do work under this Section, addresses, phone numbers, and name of firm's contact, for approval. Such firms shall be factory authorized representatives of the system and submittal shall include manufacturer's letter of confirmation. Proposed firm shall furnish all equipment and specialty cables, make all connections to same, and place the systems in operation. Such firms shall have offices and service departments within a 100 mile radius of project and shall have been in business of this type for at least five years.
3. Submittals shall be complete and include catalog data, shop drawings, one-line diagrams, battery calculations, voltage drop calculations, and scaled plan drawings. Building plans shall be 1/8"=1'-0", and site plans shall be no smaller than 1"=40'.
4. Shop Drawings shall contain complete wiring and schematic diagrams for equipment furnished, equipment layout, conduit and wiring layout drawings, and any other details required to demonstrate that system has been coordinated and will properly function as a unit. Equipment Vendor shall check Drawings for adequacy of conductors and raceways for proposed system. Include in Bid Amount all required raceways, conductors and material necessary to suit proposed system.
5. Battery Capacity Calculations: Complete battery calculation sheet showing all the electrical requirements of the entire fire alarm system, including the power consumption of the individual devices, both in alarm and supervisory modes shall be submitted.
6. Voltage Drop Calculations: Submit voltage drop calculations for all fire alarm signal circuits.

B. Operation and Maintenance Manuals:

1. Operating Instruction Manuals outlining the step-by-step procedures required for system start-up and operations shall be furnished. The instructions shall include manufacturer's name, model number, service manual parts list, and brief description of all equipment and their basic operating features.
2. Maintenance Instruction Manuals outlining maintenance procedures shall be furnished. The manual shall include a troubleshooting guide listing possible breakdowns and repairs and a simplified connection wiring diagram for the system as installed.

C. Record Drawings: Refer to Section 26 0000. Final Inspection will not be made until drawings are received and approved. Record Drawings shall include "As-Built" one-line and wiring diagrams, with terminations identified, wire color coding schedule, pullbox locations, and conduit routing plans.

D. Furnish to District a printed copy of the control panel programming upon completion of final system programming.

E. Performance Test Reports: Upon completion of installed system, submit in booklet form all field tests performed to prove compliance with the specified performance criteria. Each test report shall indicate the final position of controls.

1.6 TRAINING:

A. Supplier shall demonstrate operation of systems and provide training to all end users, administrative staff, and system administrator. Coordinate times of instruction with District, at District's convenience. Supplier shall provide a minimum of 1 hour of user instructions to clerical staff and 2 hours of user/maintenance instructions to District maintenance personnel. Instruction periods shall not coincide and shall be scheduled with District, not school staff. Deliver to Owner at time of demonstration, all settings and codes programmed into system. Furnish three copies on manufacturer's standard programming worksheets. District shall provide list of authorized personnel for training sessions.

1.7 GUARANTEE:

A. One firm to assume full responsibility for performance on all work of this section. Guarantee all equipment against defects in material and workmanship for two (2) years, and provide on-the-premises service during normal working hours for two years, at no cost to Owner if trouble is not caused by misuse, abuse, or accident, or at current labor rates if so caused. Provide manufacturer's written one-year guarantee for equipment and parts.

B. Service shall normally be available within 24 hours from service department of authorized distributor of manufacturer by factory trained servicemen.

C. On-the-premises service at other than normal working hours to also be available, but labor charges for such calls to be paid by Owner at current labor rates.

PART 2 - DETAIL REQUIREMENTS AND PRODUCTS

2.1 SYSTEM OPERATION

A. Activation of any manual station or automatic detector shall cause the operation of all audible and visual signals.

B. In addition to sounding local alarm signals, operation of manual stations or automatic detectors shall activate a digital communicator for telephone leased line reporting to remote SB575 compliant supervisory station. Telephone company leased lines and remote station monitoring shall be arranged by the Owner.

C. Contractor to ensure synchronization of visual devices where required by NFPA 72.

D. The system shall be electrically supervised against open circuits and grounds on the wiring to the alarm and initiating devices. An open or ground in the system shall cause a trouble signal to sound continuously until the system is restored to normal or until the signal is silenced by means of a cut-off switch. When the cut-off switch is thrown to the "off" position, a white pilot light shall

be illuminated to show that the trouble signal is off. When the system is restored to normal operation, the trouble signal shall sound again and shall be silenced only by restoring the cut-off switch to its normal position, thereby also extinguishing the pilot light. Open and grounded circuits in the system shall not cause the sounding of false alarms. System shall be capable of initiating fire drill signal from master location. Fire drill signal shall not activate relay for remote reporting facilities.

2.2 ACCESSORIES

A. Equipment and accessories furnished under the terms of these specifications shall be the standard products of the manufacturers specified or required. All equipment shall be listed by U.L. All equipment and accessories shall be compatible with the system. Existing system is EST.

B. Refer to drawings for accessories and devices used.

C. Each duct detector shall be provided with a key-activated remote test station.

D. At ceilings other than lay-in ceilings, provide access doors in ceiling directly below above-ceiling mounted detectors. Access doors shall be KARP, Milcor, Newman, or approved equal, with concealed hinges, prime coated with rust inhibitive paint, screwdriver locks at interior and key operated cylinder locks at exterior locations. Style of door shall suit ceiling or wall construction, including fire rating. Doors shall be 14 gauge C.R. steel minimum.

PART 3 - EXECUTION

3.1 INSTALLATION REQUIREMENTS

A. Work shall be installed as shown on the Drawings in accordance with the manufacturer's diagrams and recommendations, except where otherwise indicated.

B. Electrical Contractor shall retain the services of the duly appointed representative as specified hereinbefore, who shall furnish all equipment, make all connections to same, and place system in operation. Technician and workman employed shall be particularly skilled in this type of work.

C. At existing sites, the existing system shall be tested as soon as possible after award of contract and prior to preparing submittals. Contractor shall test entire system to insure proper operation. Any defects of deficiencies found shall be listed and presented to Owner in letter form. It will be assumed that existing equipment is fully functional unless identified otherwise by Contractor. Control panel shall be mounted with sufficient clearance for observation and testing.

D. All junction boxes must be clearly marked for distinct identification.

E. Panel enclosures shall comply with the Requirements of UL 864. Enclosures having doors over forty-eight inches (48") in height shall be provided with a three (3) point catch and lock; all other doors shall contain a cabinet type cylinder lock. Inserts shall be blind fastened so that no screws show on panel front.

F. Detectors shall be installed in accordance with manufacturer's written instructions in areas as indicated on the Drawings.

G. Locate detectors with pilot light visible from floor. Do not conceal behind HVAC duct work.

H. Do not locate detectors in direct air stream from supply air outlets (minimum of four feet (4') from air grille).

I. At locations other than t-bar ceilings, provide access door in ceiling directly below above-ceiling mounted detectors.

J. Circuits shall be terminated on screw terminals. Terminal blocks shall be Allen-Bradley Bulletin 1492 with 600 volt screw terminals for #22 to #10 conductors, mounted to type N22 channel, or approved equal. Submittal shall show internal elevation of terminal cabinets with equipment laid out.

K. All cables shall be run through fanning strip to terminals of terminal blocks.

L. All cables entering terminal cabinets and pullboxes shall be labeled.

M. Each cable run on as-built wiring diagrams shall be identified with exact wire marker code (numerical or alphabetical) as appears in terminal cabinets.

N. Detector locations shown on drawings are approximate only. Exact locations shall be coordinated with lighting and mechanical equipment and shall be placed in accordance with manufacturer's recommendations (with respect to supply air diffusers, etc.).

O. Detectors and notification devices in student toilet rooms, multi-purpose rooms, gymnasiums, locker rooms, team rooms and where shown on plans shall be provided with wire guards.

P. Station locations shall be identified by school’s actual room numbers and system shall be programmed accordingly. Coordinate actual room numbers with District. Coordinate final programming with District. Contractor shall furnish a printed copy of final programming to District.

Q. End-of-line resistors shall be installed at locations readily accessible, not above an elevation of 10 feet above finish floor or grade, or as shown on Drawings.

R. No splices shall occur in underground pullboxes. System wiring shall be continuous, without splices, from terminal cabinet to terminal cabinet and control panel to devices. All interior pullboxes shall be accessible and locations shall be recorded on "As-Built" drawings.

3.2 ACCESS DOORS

A. Furnish and install access doors wherever required whether shown or not for easy maintenance of fire alarm detectors above ceilings. Access doors shall be sized to allow access to equipment for complete removal and replacement of device.

3.3 CONSTRUCTION MEETINGS

A. The Contractor shall schedule construction meetings at the jobsite as follows:

1. Pre-rough-in meeting shall occur before installation of any boxes, raceways, etc. Exact locations of all detectors shall be established as recommended by the Intrusion Alarm System subcontractor.
2. Prewire meeting shall occur after raceways are installed and prior to pulling of any wire or cable.
3. Pre-termination meeting shall occur after wire and cable has been installed and prior to termination.

B. Meetings shall be scheduled by the Contractor on a building by building basis and shall include the Project Inspector, School's Representative, the electrical subcontractor, and the Intrusion Alarm System subcontractor as a minimum.

C. One-half to three-quarters of the way through project, District Facilities will set up a meeting (preferably at the school site) with decision makers from Facilities, Police Services, Maintenance, Maintenance Alarm Tech, General Contractor, Alarm Sub-contractor, and School Administrator to review the alarm protocol and to identify responsible personnel and timelines.

3.4 TESTS

A. After all equipment specified herein has been installed and is in operating condition, performance tests shall be conducted to determine that installation and components comply with these specifications.

1. Testing shall be scheduled by the Contractor and shall be conducted at time least disruptive to school activities and as approved by District. Contractor shall provide technicians to conduct all testing (from same firm preparing submittals and performing intrusion alarm work). Testing shall be coordinated to include the Project Inspector and a representative from Engineer's office.
2. At time of testing, Contractor shall insure that his submittal will reflect all materials and work necessary to make new equipment function properly with existing.
3. Contractor shall furnish all instruments and personnel required for tests.
4. Conduct tests for following:
    a. Verify that the system is free of grounds or open circuits. The central control board shall indicate when a ground or open circuit exists.
    b. Verify that notification devices, pull stations, transmitters, automatic detectors and supervisory devices are functioning as specified. Criteria for testing shall be as follows:
        1) Audibles shall deliver the sound pressure levels (decibels) of the specified device.
        2) Pull stations shall close the circuits specified and deliver specified alarm signal.
        3) Automatic detectors shall actuate the specified zones when the appropriate fire or smoke conditions are generated.
            a) Calibrate and adjust all photoelectric detectors to manufacturer's standards in place and under dynamic field operating conditions using testing equipment built by manufacturer specifically for this purpose.
    c. Panels and supervisory devices shall display and control functions as specified.
5. The "End of Line Resistance" for each circuit shall be tested in the presence of the project inspector and shall not exceed a maximum of 10% of the 24 volt system. Each component in the circuit shall not exceed the listed manufacturer's minimum operating voltages. See NFPA 72, loop resistance. This section requires that all initiating and indicating (notification appliance) circuits to be measured and recorded.
6. The actual fire alarm notification circuit voltage drop shall be witnessed and recorded by the project inspector during the testing of the circuit under full load.

B. Testing shall be performed under the supervision of Fire Alarm System supplier's qualified representative.

C. Testing shall be reconducted to verify correction of any defect found in initial testing.

D. Upon completion of detector installation and system tests, certified technician shall submit three (3) copies of written report on manufacturer's Inspection and Test Forms to indicate system has been fully tested in supervision, trouble and alarm modes, and is fully operational conforming to letter of these Specifications.

1. Test report shall contain, but is not limited to, the following:
    a. A complete test of equipment installed and wired.
    b. Indication that all equipment is properly installed.
    c. Tests of individual zones as applicable.
    d. Serial numbers, locations by zone and model number for each installed detector.
    e. Voltage (sensitivity) settings for each photoelectric detector as measured in place with the air conditioning system operating.
    f. Technician's name, certificate number, and date.
    g. Written certification by manufacturer stating that system and its component parts are as listed and approved by California State Fire Marshal and that installation conforms in all respects to requirements of applicable Codes.

E. After system is completely tested, the Contractor shall take the following actions with the Owner:

1. The Contractor will schedule a meeting with the Alarm Sub-contractors and Owner’s Representatives to determine alarm zone and device nomenclature. The Contractor shall insure that the alarm zone and device nomenclature matches the actual building and door or room numbers used by the school. Architectural numbering shall not be used. Once confirmed, the Contractor shall demonstrate this to Owner’s Representatives.

3.5 FIRE ALARM SYSTEM CERTIFICATION

A. Fire Alarm System Certification: Written certification on the form found in Figure 10.18.2.1.1, NFPA 72 shall be submitted by the Contractor to Project Inspector stating for himself and the equipment manufacturer that component parts are as LISTED AND APPROVED BY State Fire Marshal, that the installation conforms in all respects to requirements as set forth in the California Electrical Code, that acceptance testing has been performed in the presence of the Project Inspector. Contractor shall complete and sign form and submit to Project Inspector.

END OF SECTION 28 46 00

SECTION 31 00 00
EARTHWORK

PART 1 - GENERAL

1.01 INCLUSION OF OTHER CONTRACT DOCUMENTS

A. The General Conditions, Supplementary Conditions and Division 1 are fully applicable to this Section, as if repeated herein.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 31 23 33: Trenching and Backfilling.

1.03 QUALITY ASSURANCE

A. Use only new materials and products, unless existing materials or products are specifically shown otherwise on the Drawings to be salvaged and re-used.

B. All materials, components, assemblies, workmanship and installation are to be observed by the Owner's Inspector of Record. Work not so inspected is subject to uncovering and replacement.

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. Tests (See Part 3 for Compaction Testing).

E. 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.

1.04 SUBMITTALS

A. Refer to Division 1, General Requirements.

B. Manufacturer's Data: Submit list and complete descriptive data of all products proposed for use. Include manufacturer's specifications, published warranty or guarantee, installation instructions, and maintenance instructions.

1.05 WARRANTY

A. Refer to Division 1, General Requirements.

1.06 REFERENCES AND STANDARDS

A. General: Site survey, included in the drawings, was prepared by Warren Consulting Engineers, Inc., 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.

B. ANSI/ASTM 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.

C. ANSI/ASTM D1556-00 - Test Method for Density of Soil in Place by the Sand-Cone Method.

D. ANSI/ASTM 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.

E. ANSI/ASTM D 3017-05 Test Methods for Moisture Content of Soils and Soil-Aggregate Mixture by Nuclear Methods (Shallow Depth).

F. ANSI/ASTM D 422-63(2007) E1 Test Method for Particle Size Analysis of Soil.

G. ANSI/ASTM D 4318-05 Test Method for Liquid Limit, Plastic Limit, and Plasticity Limit.

H. CALTRANS Standard Specifications Section 17.

I. CAL-OSHA, Title 8, Section 1590 (e).

1.07 DELIVERY, STORAGE AND HANDLING

A. Transport, store and handle in strict accord with the local jurisdiction.

B. Make delivery to job when notified by Contractor verifying that the job is ready to receive the work of this Section and that arrangements have been made to properly store, handle and protect such materials and work.

1.08 PROJECT CONDITIONS

A. 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.

1.09 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.

1.10 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. Provide shoring, sheeting, sheet piles and or bracing to prevent caving, erosion or gullying of sides of excavation.

D. 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.

E. Adjacent streets and sidewalks shall be kept free of mud, dirt or similar nuisances resulting from earthwork operations.

F. 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.

1.11 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 section 3.08, B.

1.12 TESTING

A. Refer to the requirements of Division 1, General Requirements..

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 back charged to Contractor.

1. If Contractor elects to process or mine onsite materials for use as Suitable Fill, Aggregate Subbase, 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

2.01 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 6-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 12-inches of any fill.

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 less than 15; an Expansion Index of less than 20; be free of particles greater than 6-inches in largest dimension. Material shall be free of contaminants and have corrosion characteristics within the acceptable limits. <u>All import fill material shall be tested and approved by Soils Engineer prior to transportation to the site.</u> 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 the 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). Soils shall be tested prior to import to the project site.
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.

3. Frequency of testing shall be conducted in accordance with DTSC's Imported Fill Advisory as follows;

Fill Material Sampling 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

4. 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. Water: Furnish all required water for construction purposes, including compaction and dust control. Water shall be potable.

D. Aggregate Base: Provide Class 2, 3/4" Aggregate Base conforming to standard gradation as specified in Cal Trans Standard Specifications, Section 26-1.02A.

PART 3 – EXECUTION

3.01 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.

3.02 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.

3.03 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-inches, moisture-conditioned to 3% over optimum moisture content, and recompacted to between 87% and 92% relative compaction.

3.04 TESTING AND OBSERVATION

A. All grading and earthwork operations shall be observed by the Inspector of Record.

B. Field compaction tests shall be made by the Contractor and witnessed by the Inspector of Record.

C. Earthwork shall not be performed without the notification of the Inspector of Record.

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 Inspector of Record.

E. After each rain event Contractor shall test fill material for optimum moisture and report to Inspector of Record. Do not place any fill material until desired moisture is achieved.

3.05 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 or the removal of footings, foundations or other debris should be prepared and backfilled in accordance with this Section. 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 and to a minimum depth of 4 inches.

3.06 CUTTING

A. Do all cutting necessary to bring finish grade to elevations shown on Drawings.

B. When excavation through roots is necessary, cut roots by hand.

C. 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 cost to the Owner.

3.07 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 between 87% and 92% relative compaction.

3.08 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 6-inches, until surface is free from ruts, hummocks or other uneven features and uniform and free from large clods. Moisture condition to 3% above optimum moisture content and between 87% and 92% relative compaction 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 disking 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. Subgrade in areas to receive landscaping shall be compacted to 90%.

D. Where Contractor over-excavates building pads through error, resulting excavation shall be recompacted as engineered fill at Contractor's expense.

3.09 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 90% 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 (optimum) (2% above optimum) moisture content, and compact to a minimum of 90% 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. Building Pads: At new floor slab infill, existing base rock shall be removed to a depth required to provide new base rock and slab thickness as identified on Drawings. Existing subgrade shall be compacted prior to installation of new base rock.

B. Paved Areas: At new paving areas, existing base rock shall be removed to a depth required to provide new base rock and paving thickness as identified on Drawings. Existing subgrade shall be compacted prior to installation of new base rock.

C. Other Fill and Backfill: Upper 6-inches of all other final subgrades or finish grades shall be compacted to 90% of maximum dry density.

D. 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 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 +-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.

3.12 SURPLUS MATERIAL

A. Excavated material not required for grading or backfill shall be removed from site at contractor’s expense.

3.13 CLEANING

A. Refer to Division 1, General Requirements.

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 31 00 00

PART 1 – GENERAL

1.01 INCLUSION OF OTHER CONTRACT DOCUMENTS

A. The general conditions, supplementary conditions and Division 1 are fully applicable to this section as if repeated herein.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 31 00 00: Earthwork.

B. Section 32 12 00: Asphalt Concrete Paving.

C. Section 32 16 00: Site Concrete.

1.03 QUALITY ASSURANCE

A. Use only new materials and products, unless existing materials or products are specifically shown otherwise on the Drawings to be salvaged and re-used.

B. All materials, components, assemblies, workmanship and installation are to be observed by the Owner's Inspector of Record. Work not so inspected is subject to uncovering and replacement.

C. Contractor / Installer shall have been in business for five (5) years providing/finishing similar size projects and complexity.

1.04 SUBMITTALS

A. Submit per the requirements of Division 1, General Requirements.

B. Submit Manufacturers data and shop drawings.

1.05 WARRANTY

A. Submit per the requirements of Division 1, General Requirements.

1.06 REFERENCES AND STANDARDS

A. California Building Code, CBC 2022.

B. California Plumbing Code current edition, CMC 2022.

1.07 DELIVERY, STORAGE AND HANDLING

A. Transport, store and handle in strict accord with the local jurisdiction.

B. Make delivery to job when notified by Contractor verifying that the job is ready to receive the work of this Section and that arrangements have been made to properly store, handle and protect such materials and work.

1.08 PROJECT 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. Field verify that all components, backing, etc. by others are installed correctly to proceed with installation of products as herein specified.

C. 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.

1.09 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 gullying 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.

1.10 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.

1.11 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.

1.12 TESTING

A. Refer to the requirements of Division 1, General Requirements.

PART 2 – PRODUCTS

2.01 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 3-inches.
3. Sand: Fine granular material, free of organic matter, mica, loam or clay.
4. Lean Mix Concrete/Controlled Density Backfill: 3 sacks of cement per yard plus sand.
5. Class 2 aggregate base, ¾" rock, per Caltrans Section 26-1.02B.

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 Mechanical, Electrical and Plumbing specification sections.

PART 3 – EXECUTION

3.01 INSPECTION

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.

3.02 COORDINATION

A. General Contractor shall coordinate work as herein specified, in accordance with drawings and as required to complete scope of work with all related trades.

3.03 INSTALLATION

A. Perform work in accordance with pipe manufacturer's recommendations, as herein specified and in accordance with drawings.

3.04 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

E. Where trench through existing pavement saw cut existing pavement in straight lines. Grind existing asphalt on each side of trench 3” wide x ½ the depth of the section. Apply tact coat to vertical surfaces before installing new asphalt. Replace asphalt and concrete pavement sections to matched existing conditions. In concrete pavement provide expansion and control joints to match existing joint layout.

3.05 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.
3. After each layer has been placed, mixed and spread evenly, it shall be thoroughly compacted to 90% of maximum dry density while at specified moisture content. Compact each layer over its entire area until desired density has been obtained.
4. The top 12-inches of subgrade under pavement or building shall be per compacted to 90%
5. 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. If trenching is necessary in areas that have been previously lime treated the contractor shall backfill the trench with Class 2 aggregate base, with minimum section equal to the lime treated section and compacted to 95%.

3.06 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.

3.07 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 cute neatly and replaced with new materials.

D. Any existing materials removed or damaged due to trenching to be returned to new condition.

3.08 SURPLUS MATERIAL

A. Remove excess excavated material, unused materials, damaged or unsuitable materials from site.

3.09 CLEANING

A. Refer to Division 1, General Requirements.

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 31 23 33

SECTION 32 12 00
ASPHALT CONCRETE PAVING

PART 1 - GENERAL

1.01 INCLUSION OF OTHER CONTRACT DOCUMENTS

A. The General Conditions, Supplementary Conditions and Division 1 are fully applicable to this Section, as if repeated herein.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 31 00 00: Earthwork.

B. Section 31 23 33: Trenching and Backfilling.

C. Section 32 16 00: Portland Cement Concrete Paving.

1.03 QUALITY ASSURANCE

A. Use only new materials and products unless existing materials or products are specifically shown otherwise on the Drawings to be salvaged and re-used.

B. All materials, components, assemblies, workmanship and installation are to be observed by the Owner's Inspector of Record. Work not so inspected is subject to uncovering and replacement.

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. Contractor shall provide verification that asphalt mix temperature meets the requirements of this specification at time of application.

E. Contractor shall be solely responsible for all subgrades built. Any repairs resulting from inadequate compaction are the responsibility of the contractor.

1.04 SUBMITTALS

A. Refer to requirements of Division 1, General Requirements.

B. Manufacturer's Data: Submit list and complete descriptive data of all products proposed for use. Include manufacturer's specifications, published warranty or guarantee, installation instructions, and maintenance instructions.

1.05 WARRANTY

A. Refer to requirements of Division 1, General Requirements.

1.06 REFERENCES AND STANDARDS

A. ANSI/ASTM D698-00 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures, using 5.5 lb Rammer and 12 inch Drop.

B. ANSI/ASTM D1556-00 - Test Method for Density of Soil in Place by the Sand-Cone Method.

C. ANSI/ASTM D1557-02 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10 lb. Rammer and 18 inch Drop.

D. ANSI/ASTM D 3017-05 Test Methods for Moisture Content of Soils and Soil-Aggregate Mixture by Nuclear Methods (Shallow Depth).

E. ANSI/ASTM D 422-63 Test Method for Particle Size Analysis of Soil.

F. ANSI/ASTM D 4318-05 Test Method for Liquid Limit, Plastic Limit, and Plasticity Limit.

G. CALTRANS Standard Specifications.

H. CAL-OSHA, Title 8, Section 1590 (e).

1.07 DELIVERY, STORAGE AND HANDLING

A. Transport, store and handle in strict accord with the local jurisdiction.

B. Make delivery to job when notified by Contractor verifying that the job is ready to receive the work of this Section and that arrangements have been made to properly store, handle and protect such materials and work.

1.08 PROJECT CONDITIONS

A. Environmental Requirements:

1. Base Course: Do not lay base course on muddy subgrade, during wet weather, or when atmospheric temperature is below 40 degrees F.

2. Asphalt Surfacing: Do not apply asphaltic surfacing on wet base, during wet weather, or when atmospheric temperature is below 50 degrees F.

1.09 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.

1.10 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 owner’s

representative is not intended to include review of the adequacy of the Contractor's safety measures, in, on, or near the construction site.

D. 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.

E. Adjacent streets and sidewalks shall be kept free of mud, dirt or similar nuisances resulting from earthwork operations.

F. 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.

1.11 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.

1.12 TESTING

A. Refer to requirements of Division 1, General Requirements.

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.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Sterilant: Soil sterilizer shall be CIBA GEIGY's Pramatol 25-E, Treflan EC or Thompson-Hayward Casoron.

1. Soil sterilizer shall be applied in strict accordance with manufacturer's instructions.

B. Base Course Aggregate: State Specifications, Section 26, Class 2 aggregate base (3/4" max.).

C. Asphalt Binder: Steam-refined paving asphalt conforming to State Specifications, Section 92, viscosity grade PG 64-10. Asphalt binder additives for WMA per Caltrans approved list of manufacturers.

D. Liquid Asphalt Tack Coat: Per CALTRANS section 94.

E. Surface Course Aggregate: Mineral aggregates for Type "B" asphalt concrete, conforming to State Specifications 39-2.02, Type B, ½” maximum, medium grading. 3/8" maximum grading at playcourt areas.

F. Seal Coat: shall be a pre-mixed asphalt emulsion blended with select fillers and fibers such as:

1. “Park-Top No. 302”, Western Colloid Products.

2. "OverKote", Reed and Gram.
3. "Drivewalk", Conoco Oil.

G. Wood Headers and Stakes: Pressure treated.

H. Pavement Marking: Colors as directed by Architect. Colors of painted traffic stripes and pavement markings must comply with ASTM D 6628.

1. Waterborne traffic line - colors white, yellow and red, State specification PTWB-01R3.

2. Waterborne traffic line for the international symbol of accessibility and other curb markings – blue, red and green, Federal specification TT-P-1952F.

I. Precast Concrete Bumpers: 3000 psi at 28 day minimum strength; 48" length unless otherwise indicated; provide with steel dowel anchors and concrete epoxy.

J. Pavement Epoxy; K-Lite; Ktepx-590; Ennis Epoxy HPS2 or an approved equal.

K. Crack Filler;

1. Cracks up to ½": QPR model CAR08, 10oz asphalt crack filler; Star STA-FLEX Trowel Grade crack filler or approved equal.

2. Cracks ¼" – 1": "Docal 1100 Viscolastic, distributed by Conoco, Inc., Elk Grove, CA, (916) 685-9253, or approved equal.

3. Cracks greater than 1": Hot Mix, Topeka.

L. Reclaimed Asphalt Pavement (RAP). HMA Type A or Type B may be produced using RAP providing it does not exceed 15% of the aggregate blend.

2.02 MIXES

A. General: Plant mixed conforming to State Specifications, Section 39, Type B, ½" maximum, medium grading. 3/8" maximum grading shall be used at hardcourt play areas.

B. Temperature of Hot Mix Asphalt: Not less than 275 degrees F nor more than 325 degrees F when added to aggregate.

C. Temperature of Hot Mix Aggregate: Not less than 250 degrees F nor more than 325 degrees F when asphalt is added.

D. Temperature of Hot Mix Asphalt Concrete: Asphalt shall be not less than 285 degrees at time of application, nor more than 350 degrees. Asphalt not meeting the required temperature shall not be used.

E. Temperature of Warm Mix Asphalt: Mixing and placement; Per the approved manufactures heat range recommendations for mixing and placement.

PART 3 - EXECUTION

3.01 EXAMINATION OF CONDITIONS

A. Conditions of Work in Place: Subsurfaces which are to receive materials specified under

this Section shall be carefully examined before beginning work hereunder, and any defects therein shall be reported, in writing, to the Architect. Work shall not be started until such defects have been corrected. Starting of work shall imply acceptance of conditions as they exist.

3.02 PREPARATION

A. Sub-Grade: Clean, shape and compact to hard surface free from elevations or depressions exceeding 0.05’ in 10' from true plan. Compact per Section 31 00 00. Compaction and moisture content shall be verified immediately prior to placement of aggregate base. Proof roll subbase in presence of geotechnical engineer prior to placement of aggregate base.

B. Cleaning: Existing surfaces and new surface shall be clean of all dirt, sand, oil or grease. All cracks shall be cleaned and free of all debris and vegetation. Hose down entire area with a strong jet of water to remove all debris.

3.03 INSTALLATION

A. Headers:

1. General: Install as edging to asphalt paving, except where adjoining existing pavement, concrete curbs, walks or building.

2. Existing Headers: Remove existing headers where new paving will join existing. Saw cut existing asphalt to provide clean edge.

3. Lines and Levels: Install true to line and grade. Cut off tops of stakes 2-inches below top of header so they will not be visible on completion of job.

B. Asphalt Paving:

1. Base Course: Install in accord with State Specifications, Section 26. Compact to relative compaction of not less than 95%, ASTM D1557. The material shall be deposited on the subgrade in such a manner as to provide a uniform section of material within five percent tolerance of the predetermined required depth. Deposition will be by spreader box or bottom dump truck to prevent segregation of the material. The material so deposited on the subgrade shall have sufficient moisture which, in the opinion of the Architect is adequate to prevent excessive segregation. It shall then be immediately spread to its planned grade and cross section. Undue segregation of material, excessive drifting or spotting of material will not be permitted. If in the opinion of the site geotechnical engineer, the material is unsuitably segregated, it shall be removed or completely reworked to provide the desired uniformity of the material.

    a. Moisture content and compaction of base material shall be tested immediately prior to placement of asphalt paving.

2. Sterilant: Apply specified material at manufacturer's recommended rate. Applicator of sterilant material shall be responsible for determining location of all planter areas. Apply specified material over entire base course area just prior to application of asphalt. Follow manufacturer's printed directions.

3. Liquid Asphalt Tack Coat: Apply as "tack coat" to all vertical surfaces of existing paving, curbs, walks, and construction joints in surfacing against which paving is to be placed.

4. Asphalt Concrete Surface Course:

   a. Comply with State Specifications, 39-6 except as modified below.

      1) Final gradation shall be smooth, uniform and free of ruts, humps, depressions or irregularities, with a minimum density of 95% of the test maximum density determined by California Test Methods #304 and 375. Maximum variation 1/8 inch in 10' when measured with steel straightedge in any one direction. Test paved areas for proper drainage by applying water to cover area. Correct portions that do not drain properly by patching with plant mix. In no case shall accessible parking spaces or loading and unloading areas exceed 2% slope in any direction.
      2) Asphalt material shall be delivered to the project site in a covered condition to maintain acceptable temperature. Onsite inspector shall verify temperature of asphalt upon truck arrival to the site.

5. Placement and adjustment of Frames, Covers, Boxes and Grates: The Contractor shall set and adjust to finish grade all proposed and existing frames, covers, boxes, and grates of all manholes, drop inlets, drain boxes, valves, cleanouts, electrical boxes and other appurtenant structures prior to placement of asphaltic concrete.

6. Water Testing: All paved areas shall be water tested, to check drainage, in the presence of the project inspector prior to placement of seal coat. The surface of asphalt paving shall not vary more than 1/8 inch above or below the grade established on the plans. If variations in grade are present, they will be corrected by overlaying paving and/or pavement removal and replacement as directed by the Architect.

7. Patching: Cut existing paving square and plumb at all edges to be joined by new paving. In trenches; grind existing asphalt on each side of trench 3” wide x ½ the depth of the section. Apply tact coat to vertical surfaces before installing new work. Warp carefully to flush surface, with seal over joints, and feather edge. Sawcut, remove and patch existing paving where cutting is necessary for installation of piping or conduits under Divisions 2, 22, 26, 27 and 28.

C. Seal Coat:

1. Seal coat shall be applied no sooner than 30 days from time of asphalt placement, no exceptions.

2. Surface Preparation: surface and cracks shall be clean of all dirt, sand, oil or grease. All cracks shall be filled to a level condition after curing. Make multiple fill applications until a level condition is achieved. Failure to do so will be the reason for rejection. Hose down entire area with a strong jet of water to remove all debris. Remove soft, loose, or otherwise damaged areas of asphalt concrete to full depth of damage and replace with compacted hot mix asphalt concrete as specified herein. Minor holes and imperfections may be patched using hot mix asphalt or mastic using sand/SS-1-H. Use wire brush for removal of oil and grease; prime with shellac or synthetic resin as recommended by manufacturer of pavement sealer material.

3. Seal Coat Seal Application: Thoroughly mix materials and apply in the presence

of the onsite inspector. Failure to do so will be cause for rejection. Apply in accordance with manufacturer's written instructions.

a. The minimum application rate for each applied coat shall be 30gals per 1000 sq. ft. Two coats of sealcoat will be required.
b. Clean-Up and Precautions: As recommended by pavement sealer material manufacturer.

D. Asphalt Concrete Overlay Paving:

1. Comply with State Specifications, 39-6 except as modified below.

2. Grind or remove existing asphalt concrete paving at limits of overlay paving to provide a minimum 1 1/2" overlay thickness. Limits of grinding or removal shall be field verified to insure that finished paving surface will have a one percent minimum slope.

3. Thoroughly clean surface to remove vegetation, dirt, sand, gravel and water from surface and from cracks. Vegetation shall be treated 7 days prior to removal with an herbicide.

4. Cracks greater than 1 inch shall be filled with hot mix asphalt and rolled and compacted. Cracks less than one inch shall be filled with crack filler. Potholes shall be filled with hot-mix rolled and compacted. Contractor shall have Engineer approve crack and pothole repair prior to overlay. Provide leveling courses of hot mix asphalt as required to achieve finish grades shown on the drawings.

   a. Cracks less than one inch in width shall be level after curing. Contractor shall make multiple filling applications as necessary to achieve a level condition.

5. Place overlay when ambient air temperature is 40 degrees F. and rising, and when pavement is dry.

6. An asphalt tack coat shall be applied to existing surface area at a rate of 0.20 gallons per square yard. Application width shall be width of fabric plus 2 to 6 inches.

7. Place, spread and compact asphalt overlay to provide a minimum density of 95% of maximum theoretical unit weight as determined by California Test Method #304. Maximum variation 1/8" in 10' when measured with steel straight edge in any one direction. Test paved areas for proper drainage by applying water to cover area. Correct portions that do not drain properly by patching with plant mix. Minimum compacted overlay thickness 1 1/2 inches.

E. Pavement Marking: pavement markings shall be done only after the seal coat has thoroughly dried. Existing surfaces to be striped with traffic paint shall be cleaned of dust, dirt, grime, oil, rust or other contaminants which will impair the quality of work or interfere with proper bond of paint coats. Surfaces shall be thoroughly cleaned by whatever means necessary that will satisfactorily accomplish the purpose without damage to asphalt concrete. Provide measured layouts, temporary markings, templates, and other means necessary to provide required marking. Prepare and apply paint in accordance with manufacturer’s instructions; paint shall be applied by spray and shall achieve complete coverage free from voids and thin spots. Where indicated on the Drawings, paint parking stall strips, lettering, arrows, accessible symbols, playfield markings, etc. on asphalt concrete paving. Paint strips shall be 4 inches wide (except otherwise indicated) and

applied with two (2) coats of herein specified Traffic Line Paint; white (except as otherwise specified or indicated).

1. Paints shall be delivered to the site in unopened containers.

    a. Paint shall not be diluted, or watered down.
    b. Paint shall be applied in 10-12 wet mil thickness (4-6 mil dried). Each coat thickness shall be verified by the project inspector.

2. International Accessible Symbol: Symbol shall be white figures on a blue background. Blue shall be equal to color No. 15090 in Fed. Std. 595c. Lines and symbols shall be accurately formed and true to line and form; lines shall be straight and uniform in width. Painted edges shall be clean cut and free from raggedness, and corners shall be cut sharp and square. Tolerances: Apply striping within a tolerance 1/2 inch in 50 feet. Apply markings and striping to widths indicated with a tolerance of 1/4 inch on straight sections and 1/2 inch on curved sections.

F. Colors: As directed by Architect

G. Precast Concrete Bumpers: Install in location where shown, using steel rebar dowels, and epoxy.

3.04 DEFECTIVE ASPHALT; Defective asphalt is as described below.

A. Exposed rock pockets on the finished surface that lack the # 8- #200 fines that is required per the sieve analysis.

B. Asphalt not placed to the design grades.

C. Asphalt that ponds water.

D. Asphalt that was compacted below the minimum required temperature and is cracked.

E. Asphalt that fails to meet the minimum compaction requirements.

F. Asphalt that lacks the minimum thickness required per plan.

G. New asphalt contaminated by a petroleum product, or spilled paint.

H. Asphalt that has depressions, cracks, scored divits from dumpster wheels, heavy equipment use, heavy construction products,

I. Asphalt placed on pumping, unstable sub-grades.

3.05 CLEANING

A. Refer to requirements of Division 1, General Requirements.

B. Upon completion of work of this Section promptly remove from the working area all scraps, debris and surplus material of this Section.

C. Clean excess material from surface of all concrete walks and utility structures.

END OF SECTION 32 12 00

SECTION 32 16 00
PORTLAND CEMENT CONCRETE PAVING

PART 1 - GENERAL

1.01 WORK INCLUDES

A. Exterior non-structural flatwork including walks, vehicular paved surfaces, curbs, gutters, accessible ramps, mow strips, fence and sign post footings and other concrete of like nature.

B. For building related structural concrete, see Specification Section 03 30 00, Cast-in-Place Concrete.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. The General Conditions, Supplementary Conditions and Division 1 are fully applicable to this Section, as if repeated herein.

B. Section 07 90 00: Joint Sealants.

C. Section 31 00 00: Earthwork.

D. Section 32 17 26: Detectable Warning Surfaces.

1.03 QUALITY ASSURANCE

A. Use only new materials and products.

B. Use materials and products of one manufacturer whenever possible.

C. All materials, components, assemblies, workmanship and installation are to be observed by the Owner's Inspector of Record. Work not so inspected is subject to uncovering and replacement.

D. 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.

1.04 SUBMITTALS

A. Refer to requirements of Division 1, General Requirements.

B. Manufacturer's Data: Submit list and complete descriptive data of all products proposed for use. Include manufacturer's specifications, published warranty or guarantee, installation instructions, and maintenance instructions.

C. Materials list: Submit to the Architect a complete list of all materials proposed to be used in this portion of the work. Submitted items should include but are not limited to sand, gravel, admixtures, surface treatments, coloring agents, sealers, fibers, cast-in-place accessories, forming and curing products and concrete mix designs.

D. With concrete submittal, provide documented history of mix design performance.

1.05 WARRANTY

A. Refer to requirements of Division 1, General Requirements.

1.06 REFERENCES AND STANDARDS

A. California Building Code, 2022 edition.

B. ACI Standards, ACI 211.1, ACI 318-14, ACI 302, IR-04, ACI 301-16, ACI 305R-10, ACI 306R-16, ACI 308-16.

C. ASTM C-94, Specification for Ready-Mixed Concrete.

D. Concrete Reinforcing Steel Institute (CRSI) Manual of Standard Practice (latest edition).

E. ASTM – American Society for Testing and Materials.

1.07 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 accord with the manufacturer's written recommendations.

D. Make delivery to job when notified by Contractor verifying that the job is ready to receive the work of this Section and that arrangements have been made to properly store, handle and protect such materials and work.

E. Store cement in weather tight building, permitting easy inspection and identification. Protect from dampness. Lumpy or stale cement will be rejected.

F. Aggregates: Prevent excessive segregation, or contamination with other materials or other sizes of aggregate. Use only one supply source for each aggregate stockpile.

1.08 TESTING

A. Refer to requirements of Division 1, General Requirements.

B. 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 Structural Engineer and DSA.

1.09 ADEQUACY AND INSPECTION

A. Design, erect, support, brace and maintain formwork and shoring to safely support all vertical and lateral loads that might be applied until such loads can be carried by concrete.

B. Notify Inspector and Owner's Representative at least 48 hours prior to placing of

concrete.

1.10 PROTECTION

A. Finish surfaces shall be protected at all times from concrete pour. Inspect forming against such work and establish tight leak-proof seal before concrete is poured. Finish work damaged, defaced or vandalized during the course of construction shall be replaced by contractor at contractor expense.

1.11 FIELD MEASUREMENTS

A. Make and be responsible for all field dimensions necessary for proper fitting, slopes and completion of work. Report discrepancies to Architect before proceeding.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Cement: Portland cement, ASTM C150, Type II, per ACI 318-14 Section 26.4.

B. Concrete Aggregates: Normal weight aggregates shall conform to ASTM C33, except as modified by this section. Combined grading shall meet limits of ASTM C33. Lightweight aggregate shall conform to ASTM C330, suitably processed, washed and screened, and shall consist of durable particles without adherent coatings.

C. Water: Clean and free from deleterious amounts of acids, alkalis, scale, or organic materials and per ACI 318-14 Section 26.4.1.3.1.

D. Fly Ash: Western Fly Ash, conforming to ASTM C618 for Class N or Class F materials (Class C is not permitted). Not more than 15% (by mass) may be substituted for portland cement.

E. Water Reducing Admixture: Admixture to improve placing, reduce water cement ratio, and ultimate shrinkage may be used. Provide WRDA 64 by Grace Construction Products or approved equal. Admixture shall conform to ASTM C494 and ACI 318-14 Section 26.4.1.4.19(a). Such admixture must receive prior approval by the Architect, Structural Engineer, and the Testing Lab, and shall be included in original design mix.

F. Air-entraining Admixture: Daravair 1000 by Grace Construction Products or approved equal. Admixture must conform to ASTM C260 and ACI 318-14, section 26.4.1.4.

G. Exterior Flatwork Expansion Joint Sealant: 1-part polyurethane sealant, Sikaflex -1c SL or approved equal or as otherwise specified in Section 07 90 00, Joint Sealants.

H. Surface Retarder (for exposed aggregate finishes): Rugasol-S by Sika Corporation or approved equal.

I. Form Coating: Material which will leave no residue on concrete surface that will interfere with surface coating, as approved by the Architect.

J. Expansion Joint Material: Preformed 3/8" fiber material, full depth of concrete section, with bituminous binder manufactured for use as concrete expansion joint material, as accepted by the Architect.

K. Reinforcement Bars: New billet steel deformed bars conforming to requirements of ASTM A615 or ASTM A706; Grade 60. Dowels for installation through expansion joints or construction joints to existing sidewalks or concrete features shall be smooth or shall be sleeved on one end for slippage.

L. Reinforcing supports: Galvanized metal chairs or spacers or metal hangers, accurately placed 3'-0" O.C.E.W. Staggered and each support securely fastened to steel reinforcement in place. Bottom bars in footings may be supported with 3" concrete blocks with embedded wire ties. Concrete supports without wire ties will not be allowed.

M. Detectible Warning Surfaces – See Specification Section 32 17 16.

N. Curing Compound (for exterior slabs only): Burke Aqua Resin Cure by Burke by Edoco, 1100 Clear by W.R. Meadows or accepted equal. Water based membrane-forming concrete curing compound meeting ASTM C 309 and C1315.

O. Concrete Bonding Agent: Weld-Crete by Larson Products Corp., Daraweld C by Grace Construction Products or accepted equal.

P. Patching Mortar: Meadow-Crete GPS, one-component, trowel applied, polymer enhanced, shrinkage-compensated, fiber reinforced, cementitious repair mortar for horizontal, vertical and overhead applications as manufactured by W.R. Meadows or accepted equal.

Q. Non-shrink Grout: Masterflow 713 Plus by Master Builders or approved equal. Premixed,non-metallic, no chlorides, non-staining and non-shrinking per CRD-C621, Corps of Engineers Specification and ASTM C 1107, Grades B and C.

R. Aggregate Base: Class 2 AB per Caltrans specification section 26-1.02A.

S. Joint sealant: See specification section 07 90 00, Joint Sealants.

T. Pre- Formed plastic Expansion Joint; W.R. Meadows 3/8" "Snap Cap", Tex-Trude expansion joint cap, or an approved equal.

U. Adhesive Anchoring (Epoxy): Hilty HIT-HY 200 Safe Set or approved equal.

V. Colorant: Provide lamp black as required to lightly tone new concrete to best match existing.

2.02 CONCRETE DESIGN AND CLASS

A. Class "B": Concrete shall have 1" max. size aggregate, shall have 3,000 psi min. at 28-day strength with a maximum water to cementitious ratio no greater than 0.50. Use for exterior slabs, including walks, vehicular paved surfaces, manhole bases, poured-in-place drop inlets, curbs, valley gutters, curb & gutter, accessible ramps, fence and sign post footings and other concrete of like nature.

B. Slump Limits: Provide concrete, at point of final discharge, of proper consistency determined by Test Method ASTM C143 with a slumps of 4" plus or minus 1".

C. Mix Design: All concrete used in this work will be designed for strength in accordance with provisions of ASI 318-14 Section 26.4. Should the Contractor desire to pump concrete, a modified mix design will need to be submitted for review. Fly ash may be

used in concrete to improve workability in amounts up to 15% of the total cementitious weight.

D. Air Entrainment; Per the Local Jurisdiction minimum requirements, or 3% minimum.

2.03 MIXING OF CONCRETE

A. Conform to requirements of CBC, Chapter 19A.

B. All 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 and ACI 301. Batch Plant inspection may be waived in accordance with CBC Section 1705A.3.3.1, when approved by Structural Engineer and DSA.

1. Approved Testing Laboratory shall check the first batching at the start of the work and furnish mix proportions to the Licensed Weighmaster.

2. Licensed Weighmaster to positively identify materials as to quantity and to certify to each load by ticket.

3. 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.

4. At end of project, Weighmaster shall furnish affidavit to DSA on form satisfactory to DSA, certifying that all concrete furnished conforms in every particular and to proportions established by mix designs.

5. 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.

6. Water may be added to the mix only if neither the maximum permissible water-cement ratio nor the maximum slump is exceeded. In no case shall more than 10 gallons of water shall be added to a full 9 yard load, or 1 gal. per yard on remaining concrete within the drum providing load tag indicates at time of mixing at plant will allow for additional water.

2.04 MATERIALS TESTING

A. Materials testing of concrete and continuous batch plant inspection may be waived in accordance CBC Sections 1705A.3.3.1 when approved by Structural Engineer and DSA.

B. Testing of concrete shall be performed per article 3.12 of this specification.

2.05 EQUIPMENT

A. Handling and mixing of concrete: Project Inspector may order removal of any equipment

which in his opinion is insufficient or in any way unsuitable.

PART 3 - EXECUTION

3.01 APPROVAL OF FORMS AND REINFORCEMENTS

A. Forms and reinforcements are subject to approval by the Project Inspector, and notice of readiness to place first pour shall be given to DSA, Architect and Structural Engineer 48 hours prior to placement of concrete. Before placing concrete, clean tools, equipment and remove all debris from areas to receive concrete. Clean all reinforcing and other embedded items off all coatings oil, and mud that may impair bond with concrete.

B. All reinforcing steel shall be adequately supported by approved devices on centers close enough to prevent any sagging.

C. All reinforcing bar lap splices shall be staggered a minimum of 5 ft.

D. 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 ½” clearance and a maximum of 3” clearance. The reinforcing steel shall be placed mid-depth of concrete slab.

E. At all right angles or intersections of concrete walks, additional 2’x2’ #5, 90 degree bars shall be added at all inside corners for additional crack control. The bars shall be placed 2” from concrete forms and supports at mid-depth of slab.

3.02 PROTECTION

A. Protect work and materials of this Section prior to and during installation and protect the installed work and materials of other trades.

B. In the event of damage, make all repairs and replacements necessary to the approval of the Architect at no additional cost to the Owner.

C. Sub-Grade in vehicular concrete paved areas: Subgrade shall be clean, shaped and compact to hard surface free from elevations or depressions exceeding 0.05’ in 10' from true plan. Compact per Section 31 00 00. Compaction and moisture content shall be verified immediately prior to placement of concrete. Proof roll subbase in presence of geotechnical engineer prior to placement of aggregate base.

3.03 CLEANING

A. Reinforcement and all other embedded items at time of placing concrete to be free of rust, dirt oil or any other coatings that would impair bond to concrete.

B. Remove all 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.

3.04 FORMING

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 form work 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. Slope tie-wires downward to outside of wall.

G. Brace, anchor and support all cast-in items to prevent displacement or distortion.

H. During and immediately after concrete placing, tighten forms, posts and shores. Readjust to maintain grades, levels and camber.

I. Concrete paving, Curbs, Curb and Gutters, Ramps:

1. Expansion Joints: Install at locations indicated, and so that maximum distance between joints is 20’ for exterior concrete unless otherwise shown. Expansion joint material shall be full depth of concrete section. Recess for backer rod and sealant where required. Expansion joints shall not exceed ¼ inch depth measured from finish surface to top of felt or sealant, and ½ inch width.

2. Curbs, Valley Gutter, and Curb & Gutter: Install expansion joints at 60’ 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 backer rod and sealant will be required.

3. Isolation Joints: 3/8” 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’ 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 be placed in between with 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.

3.05 FORM COATING

A. 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.

B. Before re-using form material, inspect, clean thoroughly and recoat.

C. Seal all cut edges.

3.06 REINFORCEMENT INSTALLATION

A. General: Reinforcement 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. Keep a person on the job to maintain position of reinforcing as concrete is placed. Reinforcement must be in place before concreting is begun. Install dowels as shown on drawings. Give notice whenever pipes, conduits, sleeves, and other construction interferes with placement; obtain method of procedure to resolve interferences. All expansion and construction joints in concrete shall have dowels of size and spacing as shown, or as approved by Architect.

B. Placing Tolerances:

1. Per 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”, the maximum bar diameter not 1 ½ times the maximum size of coarse aggregate.

C. Splices:

1. General: Unless otherwise shown on drawings, splice top reinforcing at midspan between supports, splice bottom reinforcing at supports and stagger splices at adjacent splices 5 foot minimum. Bar laps shall be wired together. Reinforcing steel laps shall be as follows:

   a. Lap splices in concrete: Lap splice lengths shall not be less than 62 bar diameter for No. 5 bar, 56” minimum for No. 6 bars. No. 4 bar shall have a minimum of 24” splice. 93 bar diameters for No. 7 bars and larger.
   b. All splices shall be staggered at 5 feet minimum.

3.07 INSPECTION

A. Approval of reinforcing steel, after installation, must be received from Inspector. Architect, Structural Engineer and DSA must be notified 48 hrs. in advance of beginning of concrete placement operations.

B. Slope of concrete forms and finish condition shall be checked with a two foot (2’) digital level.

3.08 PLACING OF CONCRETE

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 the owner.

B. 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.

C. 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.

D. Remove form spreaders as placing of concrete progresses.

E. Place footings as monolithic and in one continuous pour.

F. Keep excavations free of standing water, but moisture condition sub-grade before concrete placement.

G. Compacting: All concrete shall be compacted by mechanical vibrators. Concrete shall be thoroughly worked around reinforcement and embedded fixtures and into corners of forms. Vibrating shall not be applied to concrete which has already begun to initially set nor shall it be continued so long as to cause segregation of materials.

H. Concrete Flatwork:

1. All flatwork shall be formed and finished to required line and grades. Flatwork shall be true and flat with a maximum tolerance of 1/8" in 10’ for flatness. Flatwork which is not flat and are outside of the maximum specified tolerances shall be made level by the Contractor at no additional expense to the Owner.

2. Thoroughly water and soak the flatwork subgrade as required to achieve required moisture content prior to the concrete pour. Provide damming as required to keep water within the formed area and to allow for proper saturation of the subgrade.

3. Concrete vibrator shall be used to assist concrete placement. Contractor shall have spare concrete vibrator on site during concrete placement.

I. Placing in hot weather: Comply with ACI 305R-10. Concrete shall not exceed 85 degrees F at time of placement. Concrete shall be delivered, placed and finished in a sufficiently short period of time to avoid surface dry checking. Concrete shall be kept wet continuously after tempering until implementation of curing compound procedure in accordance with this specification.

J. Placing in cold weather: Comply with ACI 306R-16. Protect from frost or freezing. No antifreeze admixtures are permitted. When deposited concrete during freezing or near-freezing weather, mix shall have temperature of at least 50 degrees F but not more than 90 degrees F. 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. Provide necessary thermal coverings for any flat work exposed to freezing temperatures.

K. Horizontal construction joint: 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. If contact surface becomes contaminated with soil, sawdust or other foreign matter, clean entire surface and re-chip entire surface to assure proper adhesion.

3.09 CONCRETE FINISHES

A. Concrete Slab Finishing: Finish slab as required by ACI 302.1R. Use manual screeds, vibrating screeds to place concrete level and smooth. 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. Surface shall be free from trowel marks, depressions, ridges or other blemishes. Tolerance for flatness shall be 1/8" in 10'. Provide final finish as follows:

1. Flatwork, medium broom finish: Typical finish to be used at all exterior walks and stairs.

2. Ramps, heavy broom finish: Concrete surfaces with slope greater than 5% including all ramps. Brooming direction shall run perpendicular to slope to form non-slip surface.

3. Under no circumstances can water be added to the top surface of freshly placed concrete.

B. Curb Finishing: Steel trowel.

C. Joints and Edges: Mark-off exposed joints, where indicated, with ¼” radius x 1” deep jointer or edging tool. Joints to be clean, cut straight, parallel or square with respect to concrete walk edge. Tool all edges of exposed expansion and contraction joints, walk edges, and wherever concrete walk adjoins other material or vertical surfaces.

1. The expansion joints shall be full depth as shown in the plan details. Failure to do so will result in non-compliance and shall be immediately machine cut by the contractor at his expense.

2. Joint Sealants: At exterior joints in concrete paving, joints larger than 3/8” in width shall be lightly sanded while sealant is still wet and tacky. Lightly broadcast sand evenly over sealant, allow sealant to cure completely then brush away excess sand. See specification section 07 90 00, Joint Sealers.

D. Exposed Concrete Surface Finishing (not including top surface of flatwork): 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. Tie wires are to be removed to below exposed surface and

holes pointed up with neat cement paste similar to procedure noted under "Patching" below. Removal of tie wires shall extend to distance of 2" below established grade lines. Ends of tie wires shall be cut off flush at all other, unexposed locations. Care shall be taken to match adjacent finishes of exposed concrete surface. After patching, all 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. 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. 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. Entire finishing operation of any area shall be completed on the same day. This treatment shall be carried to 4" below grade, and all patching and sacking shall be done immediately upon removal of the forms.

3.10 CURING

A. Cured Concrete in Forms: Keep forms and top on concrete between forms continuously wet until removal of forms, 7 days minimum. Maintain exposed concrete in a continuous wet condition for 14 days following removal of forms.

B. Flatwork/Variable Height Curbs, Curb and gutter, Valley Gutter: Cure utilizing Curing Compound. If applicable, the Contractor shall verify that the approved Curing Compound is compatible with the approved colorant system. Upon completion of job, wash clean per manufacturer’s recommendations.

1. 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, run ways, etc.

3.11 DEFECTIVE CONCRETE

A. Determination of defective concrete shall be made by the Architect or Engineer. His opinion shall be final in identifying areas to be replaced, repaired or patched.

B. The Owner reserves the right to survey the flatwork, if it is determined to be outside of the maximum tolerance for flatness. If the flatwork is found to be out of tolerance, then the Contractor will be required to replace concrete. The Contractor will be responsible for reimbursing the Owner for any surveying costs incurred. Determination of flatwork flatness, surveying and any 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.

C. As directed by Architect, cut out and replace defective concrete. All defective concrete shall be removed from the site. No patching is to be done until surfaces have been examined by Architect and permission to begin patching has been provided.

D. Permission to patch any 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.

E. 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.
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. Excessive Shrinkage, Traverse cracking, Crazing, Curling; or Defective Finish. Remove and replace if repair to an acceptable condition is not feasible.
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. Expansion joint felt that is not isolating the full depth of the concrete section, and 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. Control joints (weakened planed joints) that do not meet the required minimum depth shown on the drawings.

F. Patching: Install specified Patching Mortar per manufacturer’s recommendations.

3.12 CONCRETE TESTING

A. Comply with CBC Section 1903A, 1905A, 1910A and 1705A.3 and as specified in B. below. Costs of tests will be borne by the Owner.

B. 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. 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.

C. Strength tests will be conducted by the Testing Lab on one cylinder at seven (7) days and two cylinders at twenty-eight (28) days. The fourth remaining cylinder will be available for testing at fifty-six (56) days if the 28-day cylinder test results do not meet the required design strength.

D. On a given project, if the total volume of concrete is such that the frequency of testing required by paragraph B. above 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.

E. Cost of retests and coring due to low strength or defective concrete will be paid by Owner and back-charged to the Contractor.

F. Each truck shall be tested for slump before concrete is placed.

3.13 REMOVAL OF FORMS

A. Remove without damage to concrete surfaces.

B. Sequence and timing of form removal shall insure complete safety of concrete structure.

C. 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.

1. Vertical forms of foundations, walls and all other forms not covered below: 5 days.
2. Slab edge screeds or forms: 7 days.
3. Concrete columns and beam soffits: 28 days.

D. 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.

3.14 CLEANING

A. Refer to requirements of Division 1, General Requirements.

B. Upon completion of work of this Section promptly remove from the working area all scraps, debris and surplus material of this Section.

C. Clean excess material from surface of all concrete walks and utility structures.

D. Power wash all concrete surfaces to remove stains, dried mud, tire marks, and rust spots.

END OF SECTION 32 16 00

SECTION 32 17 26
DETECTABLE WARNING SURFACES

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. Cast in Place Tactile Detectable Warning Tiles where shown on Drawings.

1.02 RELATED SECTIONS

A. Section 32 16 00: Portland Cement Concrete Paving.

1.03 REFERENCES

A. California Building Code, CBC 2022 – Title 24

1.04 SUBMITTALS

A. Submit shop drawings of installation at each location indicated on the Drawings clearly showing full extent of area of work.

B. Provide product data on specified products, describing physical and performance characteristics, sizes, patterns and colors.

C. Submit color chart clearly indicating availability of specified color, “Federal Yellow”.

D. Submit manufacturer's installation instructions under the provisions of Division 1, General Requirements.

1.05 MAINTENANCE DATA

A. Submit cleaning and maintenance data under provisions of Division 1, General Requirements.

1.06 ENVIRONMENTAL REQUIREMENTS

A. Environmental Conditions and Protection: Maintain minimum temperature of 40 degrees F in spaces to receive tactile tiles for at least 48 hours prior to installations, during installation, and for not less than 48 hours after installation. Store the detectable/tactile tiles material in spaces where they will be installed for at least 48 hours before beginning installation. Subsequently, maintain minimum temperature of 40 degrees F in areas where work is completed.

PART 2 – PRODUCTS

2.01 MATERIALS

A. Cast in Place Tactile Detectable Warning Tiles:

1. Vitrified Polymer Composite (VPC) Cast in Place Detectable/Tactile Warning Surface Tiles shall be an epoxy polymer composition with an ultraviolet stabilized coating employing aluminum oxide particles in the truncated domes.

2. The tile shall incorporate an in-line pattern of truncated domes configuration conforming to the requirements of the DSA IR 11B-04.

3. For wheelchair safety the field area shall consist of a non-slip surface with truncated domes with a diameter of .9 inch at the base tapered to .45 inch at the top, with nominal height of .2 inch and spaced 2.35” apart when measured on the perpendicular. See detail on Drawings.

4. Color to be “Federal Yellow” (FS 33538, 11B-705.1.1.5 and 11B-705.1.2.5).

5. Tiles to be Nominal 3 ft. by 2 ft. by 1.375 inches thick; 1.575 inches thick at the domes, with 1-3/8” inch deep perimeter flange and seven 1 3/8” deep internal flanges and be designed for cast in place installation as manufactured by:

   a. Access Products, Inc.
   241 Main Street, Suite 100
   Buffalo, NY 14203
   888-679-4022
   sales@accessproducts.com

   b. Approved equal.

B. Surface Applied Tactile Detectable Warning Tiles:

1. Vitrified Polymer Composite (VPC) Surface Applied Detectable/Tactile Warning Surface Tiles shall be an epoxy polymer composition with an ultraviolet stabilized coating employing aluminum oxide particles in the truncated domes.

2. The tile shall incorporate an in-line pattern of truncated domes configuration conforming to the requirements of the California Building Code (2022) Title 24.

3. For wheelchair safety the field area shall consist of a non-slip surface with truncated domes with a diameter of .9 inch at the base tapered to .45 inch at the top, with nominal height of .2 inch and spaced 2.35” apart when measured on the perpendicular. See detail on Drawings.

4. Color to be “Federal Yellow” (FS 33538, 11B-705.1.1.5 and 11B-705.1.2.5).

5. Tiles to be Nominal 3 ft. by 2 ft. and be designed for cast in place installation as manufactured by:

   a. Access Products, Inc.
   241 Main Street, Suite 100
   Buffalo, NY 14203
   888-679-4022
   sales@accessproducts.com

   b. Approved equal.

PART 3 – EXECUTION

3.01 PREPARATION

A. Thoroughly clean new or existing surface. Remove all debris, dirt, grease, etc., at full

extent of area to receive tile application.

3.02 INSTALLATION

A. Cast in Place Tactile Detectable Warning Tiles:

1. During Cast-In-Place Detectable/Tactile Warning Tile installation procedures, ensure adequate safety guidelines are in place and that they are in accordance with the applicable industry and government standards.

2. The specifications of the structural embedment flange system and concrete sealants and related materials shall be in strict accordance with the contract documents and the guidelines set by their respective manufacturers.

3. The physical characteristics of the concrete shall be consistent with the contract specifications while maintaining a slump range of 4 - 7 to permit solid placement of the Cast-In-Place Detectable/Tactile Warning Tile system. An overly wet mix will cause the tile to float, therefore under all conditions, suitable weights such as concrete blocks or sandbags (25 lb) shall be placed on each tile module.

4. Prior to placement of the Cast In Place Detectable/Tactile Warning Tile system, the contract drawings shall be reviewed and a layout drawing prepared by the installation contractor to resolve the issues related to pattern repeat, tile cuts, expansion joints, control joints, platform curves, platform end returns and platform surface interferences.

5. The concrete pouring and finishing operations require typical mason's tools, however, a mason's line, radius edge (1/8 x 3/16" return) tool, 4' long x 2" wide x 1/8" thick steel straight edge, 25 lb. weights, vibrator wand and small sledge hammer with 2" x 6" x 20" wood tamping plate are specific to the installation of the Cast-In-Place System.

6. The concrete shall be poured and finished level, true and smooth to the required dimensions prior to tile placement. Immediately after pouring concrete, a mason's line should be strung parallel to track to act as a reference line for placement of tile, and then the tile assembly shall be placed true to the platform edge and to each other on the concrete. The Cast-In-Place tiles shall be tamped or vibrated into the fresh concrete to ensure that the field level of tile is flush to the adjacent concrete or platform edge surface. The shop drawings indicate that the tile field level (base of truncated dome) is flush to adjacent surfaces to permit proper water drainage and eliminate tripping hazards between adjacent finishes. The tolerance for elevation differences between tile and adjacent surface is 1/16".

7. Immediately after tile placement, the tile elevation is to be checked to adjacent concrete or rubbing board heights with a steel straight edge. The tile elevation should be set consistent with shop drawings to permit water drainage to or away from track as the platform design dictates.

8. While concrete is workable steel edging trowel 1/8" radius x 3/16" return is to be used to edge the tile to adjacent concrete surfaces running parallel to track. While edging, ensure that a clean edge definition is created between tile and adjacent concrete and that tile to concrete elevations meet the shop drawing tolerances.

9. The placement of Cast-In-Place Tile assemblies to each other and to the mason's line or form edge shall be true and parallel to develop a true line consistent with the platform edge. A tight tile to tile placement can best be achieved by raking out the concrete at the butting edge to avoid trapping concrete or aggregate between tiles and/or form edge.

10. During and after the tile installation and the concrete curing stage, it is imperative that there is no walking, leaning or external force placed on the tile to rock the tile, causing a void between the underside of tile and concrete.

11. Following tile placement, review installation tolerances to shop drawings and adjust tile before the concrete sets, suitable weights of 25 lb. shall be placed on each tile and additional weights at tile to tile assemblies as necessary to ensure solid contact of tile underside to concrete.

12. Following the curing of the concrete, the protective plastic wrap is to be removed from the tile face by cutting the plastic with a sharp knife tight to the concrete/tile interface. If concrete bleeding occurs between tiles, a wire brush will clean the residue without damage to the tile surface.

13. An elastomeric polyurethane sealant can be applied (not typical) to the tile edges running parallel to the track or curb. Proper surface preparation requires that the tile and adjacent surfaces are mechanically etched with sandpaper or a carbide burr and wiped clean and dry with acetone. Applications of the polyurethane sealant shall be level to the adjacent surface and a straight line formed to the tile edge. A quality installation of the sealant may require that the tile face be masked off with duct tape to ensure a clean definition of sealant to the adjacent surfaces.

14. Following the concrete curing stage, protective plastic wrap is to be removed from the tile surface by cutting the plastic with a sharp knife, tight to the concrete/tile interface. If concrete bled under the plastic, a soft brass wire brush will clean the residue without damage to the tile surface.

B. Surface Applied Tactile Detectable Warning Tiles:

1. The application of all tiles, adhesives, mechanical fasteners, and caulking shall be in strict accordance with the guidelines set by their respective manufacturers. Not recommended for asphalt applications.

2. Coordinate with the Contractor or Engineer to ensure that the surfaces being prepared & fabricated to receive the tiles are constructed correctly & adequately for tile installation.

3. Set the tile true & square to the curb ramp area or perpendicular to the path of travel as detailed in the design drawings, so that its location can be marked on the concrete surface. A thin permanent marker works well. Remove tile when done marking its location.

4. The surface to receive the Surface Applied Detectable/Tactile Warning Surface Tile is to be mechanically cleaned with a diamond cup grinder or shot blaster to remove any dirt or foreign material. This cleaning and roughening of the concrete surface should include at least 4 inches around the perimeter of the area to receive the tile, and also along the cross pattern established by the corresponding areas on the backside of the tile. Those same areas should then

be cleaned with a clean rag soaked in Acetone.

5. Immediately prior to installing the Surface Applied Detectable/Tactile Warning Surface Tile, the concrete surfaces must be inspected to ensure that they are clean, dry, free of voids, curing compounds, projections, loose material, dust, oil, grease, sealers and determined to be structurally sound and cured for a minimum of 30 days.

6. Using Acetone, wipe the backside of the tile around the perimeter and along the internal cross pattern, to remove any dirt or dust particles from the area to receive the adhesive.

7. Apply manufacturer's recommended adhesive to the backside of the tile, following the perimeter and internal cross pattern established by the tile manufacturer. Sufficient adhesive must be placed on the prescribed areas to have full coverage across the 2" width of the adhesive locator and shall be applied to within 1/4" continuously around the perimeter edge of the tile. The entire tube of adhesive shall be applied to the back of each tile, sizes 24" x 36" and greater.

8. Set the tile true and square to the curb ramp area or perpendicular to the path of travel as detailed in the design drawings.

9. Working from the center of the tile outwards, proceed to drill and install all fasteners in the tile's molded recesses.

10. Standing with both feet applying pressure around the molded recess provided in the tile, drill a hole true and straight to a depth of 3½" using a 1/4" masonry drill bit. Drill through the tile without hammer option (on the drill) until the tile has been successfully penetrated, then with hammer option (on the drill) to drill into the concrete. Maintaining foot pressure on both sides of the hole while drilling prevents concrete dust from accumulating between the tile and concrete which can affect the tile being installed flush and may compromise installation integrity.

11. Immediately after drilling each hole, before moving on to the next, and while still applying foot pressure, mechanically fasten tiles to the concrete substrate using a leather bound or hard plastic mallet to set the fasteners. Ensure the fastener has been placed to full depth in the dome, straight, and flush to the top of dome. Drive the pin of the fastener with the mallet, taking care to avoid any inadvertent blows to the truncated dome or tile surface.

12. Following the installation of the fasteners, the concrete dust should be vacuumed, brushed or blown away from the tile's surface and adjacent concrete. Using Acetone on a rag, wipe the concrete around the tile's perimeter to ensure a clean, dry surface to receive perimeter sealant.

13. Manufacturer's recommended perimeter caulking sealant should be applied following the sealant manufacturer's recommendations. Tape all perimeter edges of the tile back 1/16" from the tile's perimeter edge and tape the adjacent concrete back 1/2" from the tile's perimeter edge to maintain a straight and even caulking line. Apply sealant around tile perimeter using care to work sealant into any void between the tile and concrete interface. Tool the perimeter caulking with a rounded plastic applicator or spatula to create a cove profile between the tile and adjacent concrete. Remove tape immediately after tooling perimeter caulking

sealant.

14. Do not allow foot traffic on installed tiles until the perimeter caulking sealant has cured sufficiently to avoid tracking. Curing time is weather dependant (average cure time at 75° F is 30 minutes).

15. If installing adjacent tiles, note the orientation of each tile. Careful attention will reveal that one of the long edges of the tile is different than the other in regard to the tiny dotted texture. You may also note a larger perimeter margin before the tiny dotted texture pattern begins. Consistent orientation of each tile is required in order that the truncated domes on adjacent tiles line up with each other.

16. In order to maintain proper spacing between truncated domes on adjacent tiles, the tapered edge should be trimmed off using a continuous rim diamond blade in a circular saw or mini grinder. The use of a straightedge to guide the cut is required. All cuts should be made prior to installation of the tiles. If installing adjacent tiles, care should be taken to leave a 1/8-inch gap between each tile to allow for expansion and contraction.

17. If tiles are custom cut to size, if pre-molded recesses (to receive fasteners) are removed by the cut, or to maintain a tight installation to the substrate then any truncated dome can be center-drilled with a 1/4 inch masonry drill bit to create a through hole, and the through hole must be countersunk with a suitable carbide countersink bit to receive mechanical fasteners. Care should be taken to not countersink too widely or deeply. Fasteners should be flush with the top of the truncated dome when countersunk properly.

3.04 CLEANING AND PROTECTION

A. Protect tiles against damage during construction period to comply with manufacturer’s specification.

B. Protect tiles against damage from rolling loads following installation by covering with plywood.

C. Clean tiles not more than four days prior to date scheduled for inspection intended to establish date of substantial completion in each area of project. Clean tiles by method specified by tile manufacturer.

END OF SECTION 32 17 26

SECTION 32 31 13
CHAIN LINK FENCES AND GATES

PART 1 – GENERAL

1.01 SUMMARY

A. Furnish all labor, materials, equipment, facilities, transportation and services to complete all chain link fencing installations and related work as shown on the Drawings and/or specified herein.

B. Scope of work:
The general extent of the chain link fencing improvements is shown on the Drawings, and can include but is not necessarily limited to the following:

1. Galvanized chain link fabric, posts, gates, hardware, and related appurtenances.

2. Chain link fence with integrally woven privacy plastic "slats".

3. Concrete footings and mow bands.

1.02 RELATED SECTIONS

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

B. Section 05 50 00: Metal Fabrications (for custom accessible gate fabrication).

C. Section 08 71 00: Door Hardware (for additional hardware provided to this section for custom accessible gates).

D. Section 32 16 00: Portland Cement Concrete Paving.

1.03 REFERENCES

A. ANSI/ASTM A53/A53M-04a Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.

B. ANSI/ASTM A123/A123M-02 Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

C. ANSI/ASTM A123 / A123M-09 - Zinc (Hot Dip Galvanized) Coatings on Iron and Steel Products.

D. ANSI/ASTM F567- 07 - Installation of Chain Link Fence.

E. ANSI/ASTM A153/A153M-04 Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.

F. ASTM A153- A153M-09 - Zinc Coating (Hot-Dip) on Iron and Steel Hardware.

G. ASTM A392-03 Standard Specification for Zinc-Coated Steel Chain-Link Fence Fabric.

H. ASTM F1043 Standard Specification for Strength and Protective Coatings on Steel Industrial Chain Link Fence Framework.

I. ASTM F1083 Standard Specification for Pipe, Steel, Hot-Dipped Zinc-Coated (Galvanized) Welded, for Fence Structures.

J. ASTM A500 (HSS) Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.

K. ASTM C94 / C94M – 09a - Ready-mixed Concrete.

L. Chain Link Fence Manufacturers' Institute (CLFMI) - Product Manual.

M. Industrial Steel Guide for Fence, Rails, Posts, Gates and Accessories.

1.04 SYSTEM DESCRIPTION

A. Fence Height: 6'-0" unless otherwise noted on Drawings.

B. Gate Widths: As shown on Drawings.

C. Line Post Spacing: At intervals not exceeding 8 feet.

1.05 QUALITY ASSURANCE

A. Manufacturer: Company specializing in manufacturing the products specified in this section with minimum three years experience.

B. Installer: Company specializing in installations of chain-link fencing with a minimum of five years of experience. If any welding is required provide welders' certificates, verifying AWS qualification within the previous 12 months.

1.06 FIELD MEASUREMENTS

A. Verify field measurements are as indicated on shop drawings.

1.07 SUBMITTALS

A. Product Data: Submit manufacturer's descriptive literature and/or standard catalog "cut-sheets" of all materials, coatings, fittings and equipment proposed to be furnished and installed under this portion of the work. Include the manufacturer's name and catalog number for each item where applicable. Clearly annotate (star or asterisk-in black ink) which portions of "cut-sheets" are applicable if more than one product is shown.

B. Shop Drawings: Submit complete Shop Drawings for all different types and sizes of backstop unit(s), gates and fencing systems.

1. Shop Drawings shall include, but may not be limited to:

a. All information regarding clearances, connections, components and any miscellaneous related appurtenances.

b. Detailed fabrication drawings for all custom fabricated accessible gates.

c. Concrete footing and reinforcement information.

C. Installation Instructions and/or Drawings: Submit as applicable.

D. Samples: Privacy slats with all available colors for selection by Architect.

1.08 SEQUENCE AND SCHEDULING

A. Contractor shall coordinate construction timing of all chain link fencing and related work with installation of concrete work (Section 32 16 00 - Portland Cement Concrete Paving) and all other work.

1.09 WARRANTY

A. Manufacture of slats to provide a 25-year warranty against color fading and breakage of slats.

PART 2 – PRODUCTS

2.01 MATERIALS

A. General: Conform to CLFMI Product Manual

B. Fabric:

1. **Type A** - Privacy Slatted Fabric: Industrial grade. 3-1/2-inch x 5” diamond mesh interwoven wire with factory install 2.310” wide PDS “IDS” slats full height or approved equal. Secure slats with monel-clinch-lock staples. 9-gauge zinc coated steel wire, top selvage knuckled tight, bottom selvage knuckled end closed. Color as selected by architect from Manufacturer’s full range of standard colors at time of submittal. Slats to be fabricated of extruded high-density virgin polyethylene, containing color pigmentation and U.V. inhibitors. Height shall be 6”-0” unless otherwise noted.

2. **Type B** - Non-Slatted Fabric: Standard Industrial grade, 2” mesh, 9-gauge zinc coated steel wire, top selvage knuckled tight, bottom selvage knuckled end closed.

C. Selvage: Knuckled finish top and bottom.

D. Steel Fabric: Comply with Chain Link Fence Manufacturers Institute (CLFMI) Product Manual. Furnish one-piece fabric widths for fencing up to 16 feet high. Wire sizes includes zinc coating.

E. Galvanized Wire: Zinc coated wire-ASTM A 392, Class 1, with not less than 1.2 oz. zinc. per sq. ft.

F. Framing:

1. Strength requirements for posts and rails shall conform to ASTM F 1043.

2. Pipe shall be straight, true to section, material, and sizes specified, and shall conform to the following weights per foot:

NPS in inches	Outside Diameter (OD) in inches	Type 1 Steel	Type II Steel
1	1.315	1.68	1.35
1.25	1.660 (1-5/8")	2.27	1.84
1.5	1.900 (2")	2.72	2.28
2	2.375 (2-1/2")	3.65	3.12
2.5	2.875 (3")	5.79	4.64
3	3.500	7.58	5.71
3.5	4.000	9.11	6.56
4	4.500	10.79	---
6	6.625	18.97	---
8	8.625	28.55	---

G. Steel Framework – Provide the following unless otherwise indicated on the Drawings:

1. Posts, Rails, Braces, and Gate Frames:

   a. Type I Steel Pipe: Hot-dipped galvanized steel pipe conforming to ASTM F 1083, plain ends, standard weight (WT40) with not less than 1.8 oz. zinc per sq. ft. of surface area coated.

   b. Type II pipe: not applicable.

   c. Finish: Galvanized

2. End, corner, and pull posts for following fabric heights:

   a. Under 6 feet: 2.375" OD (2-1/2" OD)

   b. 6 feet to 10 feet: 2.875" OD (3" OD) (with privacy slats provide 3.5" OD)

   c. 10 feet to 15 feet: 3.5" OD

   d. 15 feet to 20 feet: 4" OD

   e. 20 feet to 25 feet: 4.5" OD

   f. 25 feet to 30 feet: 6.625" OD (6-5/8" OD)

3. Line or intermediate posts for following fabric heights:

   a. Under 6 feet: 1.90" OD (2" OD)

   b. 6 feet to 8 feet: 2.375" OD (2-1/2" OD) (with privacy slats provide 3" OD)

   c. 8 feet to 15 feet: 2.875" OD (3" OD)

   d. 15 feet to 20 feet: 3.5" OD

   e. 20 feet to 25 feet: 4" OD

   f. 25 feet to 30 feet: 6.625" OD (6-5/8" OD)

4. Top, Bottom and Horizontal Intermediate Rails:

    a. Top, bottom and horizontal intermediate rails (as applicable) shall be 1.66" OD (1-5/8"OD)

5. Gate Posts: Furnish posts for supporting single gate leaf, or one leaf of a double gate installation, for nominal gate widths as follows:

    a. All gate posts: 4" OD

6. Gate Frames: Furnish frames (single or double gate), for nominal gate widths as follows:

    a. 6 feet to 10 feet: 1.90" OD (2" OD)

    b. Under 6 feet:1.66" OD (1-5/8"OD)

7. For all custom fabricated accessible chain link fence gates, refer to details on the Drawings and the requirements of section 05 50 00, Metal Fabrications.

H. Concrete: ASTM C94 / C94M-09a; Portland Cement, 2,500 p.s.i. strength at 28 days, 3-inch slump; one-inch maximum sized coarse aggregate.

I. Fittings and Accessories

1. Material: Comply with ASTM F 626. Mill-finished aluminum or galvanized iron or steel, to suit manufacturer's standards.

    a. Zinc Coating: Unless specified otherwise, steel fence fittings and accessories shall be galvanized in accordance with ASTM A 153, with zinc weights per Table 1 of ASTM A153.

2. Tension Wire: 7-gauge (.177-inch diameter) steel single strand with black vinyl coating.

3. Tie Wires: 12-gauge (.148-inch diameter) aluminum alloy steel wire with black vinyl coating.

4. Caps: Cast steel galvanized; sized to post diameter, set screw retainer.

    a. Provide weather tight closure cap for each post. Provide line post caps with loop to receive wire or top rail with finish to match fabric.

    b. Tension Clips: Minimum 3/4-inch-wide 12-gauge (.105 inch) thick with finish to match fabric.

5. Truss Rods: Hot dipped galvanized steel rods with a minimum diameter of 5/16".

6. Fittings: Sleeves, bands, clips, rail ends, tension bars, fasteners and fittings; steel galvanized and powder coated black.

7. Gate Hardware: At all gates not specified to receive custom hardware, provide manufacturer’s heavy-duty fork latch with gravity drop mechanical keepers, (3) 180-degree gate hinges per leaf, cane bolts for each leaf and hardware to

accommodate padlock. Padlocks are provided by Owner. Refer to section 08 71 00 for hardware supplied for custom accessible gates.

J. Finishes

1. Fence posts, enclosures, other structural components: Galvanized to ANSI/ASTM A123 / A123M - 09; 1.2 oz./sq. ft. and powder coated.

2. Fabric: Zinc coated and/or vinyl coated. See drawings for locations.

3. Hardware: Galvanized to ASTM A153 / A153M-09, 1.2 oz./sq. ft. coating and powder coated to match vinyl color.

4. Accessories: As required for a complete and functioning installation.

K. Gate Hardware

1. See Drawings for custom fabricated accessible gate detail. See section 08 71 00 for accessible gate hardware groups.

2. Self-Closing Hinge System: LOCINOX USA – Mammoth-HD 180 Degree Closer and Hinge Kit for gates up to 440 lbs. Opening force shall be less than 5 lbs. For use at all accessible required gates along path of travel or along egress route with panic devices.

L. Mow strips: All new fence and gate locations shall be provided with concrete mow strips when installed in existing truff or landscape areas. Mow strips shall have a minimum 4” clearance from edge of post to edge of concrete and shall be a minimum of 4” deep set on compacted subgrade.

2.02 WARRANTY

A. Manufacture of slats to provide a 25-year warranty against color fading and breakage of slats.

PART 3 – EXECUTION

3.01 PREPARATION

A. Prior to excavation, layout all fencing locations for review and acceptance by Owner's Representative.

3.02 INSTALLATION

A. Conform to layout shown on Drawings, except as modified by the Owner's Representative.

B. Erect fencing in strict conformance with reviewed and accepted Drawings, Shop Drawings, and manufacturer's recommendations.

C. Install new footings and mow strips as shown on Drawings and as specified herein.

D. Posts shall be installed vertical and plumb.

E. General: Install fence in compliance with ASTM F 567. Do not begin installation and

erection before final grading is completed, unless otherwise permitted.

F. Excavation: Drill or hand-excavate holes for posts to diameter and spacing indicated in firm, undisturbed or compacted soil.

1. Unless noted otherwise on the Drawings, excavate holes for each post to minimum diameter recommended by fence manufacturer, but not less than 4 times largest cross section of post.

2. Unless noted otherwise on the Drawings, excavate hole depths approximately 3 inches lower than post bottom, with bottom of posts set not less than 36 inches below finish grade surface.

G. Setting Posts: Center and align posts in holes 3 inches above bottom of excavation. Space chain link posts maximum 8 feet o.c. unless noted otherwise. Surface mount posts with mounting plates where indicated. Fasten with lag bolts and shields. Set intermediate, terminal and gate posts plumb in concrete footings. Slope top of concrete for water runoff.

H. Top Rails: Run rail continuously through line posts caps, bending to radius for curved runs and at other posts termination into rail end attached to posts or post caps fabricated to receive rail. Provide expansion couplings as recommended by fencing manufacturer. Provide top rail through line post tops and splice with 6-inch-long rail sleeves.

I. Center and Bottom Rails: Install bottom rails between posts with fittings and accessories as shown in Drawings (as applicable). Install center and bottom brace rail at corner gate leaves and all-around enclosures where shown on drawings.

J. Brace Assemblies: Install braces so posts are plumb when diagonal rod is under proper tension. Install center brace for all fences higher than 6 feet.

K. Fabric: Leave approximately 2 inches between finish grade and bottom selvages (1 inch at backstops) unless otherwise indicated. Pull fabric taut and tie to posts, rails, and tension wires. Install fabric on infield or primary use side of fence (unless noted otherwise), and anchor to framework so that fabric remains in tension after pulling force is released.

1. Fasten fabric with tie wires to top rail, line posts and bottom tension wire with tie wire at maximum 12 inches on centers.

2. Attach fabric to end, corner and gate posts with tension bars and tension bar clips.

L. Tension Bars: Provide one bar for each gate and end post, and two for each corner and pull post, except where fabric integrally woven into post. Thread through fabric, and secure to end, corner, pull, and gate posts with tension clips spaced not over fifteen (15) inches on center.

M. Tie Wires: Use U-shaped wire of proper length to secure fabric firmly to posts and rails with ends twisted at least 2 full turns. Bend ends of wire to minimize hazard to persons or clothing. Tie fabrics to line posts with a minimum 4 ties, 15 inches maximum on center and to rails ad braces 15 inches maximum on center.

N. Fasteners: Install nuts for tension clips and hardware bolts on side of fence opposite fabric side. Peen ends of bolts or score threads to prevent removal of nuts. Cut all bolts within three threads of nut or less.

O. Terminal and Gate Post:

1. Line Terminal and Gate Post Footing Depth Below Finish Grade: 42 inches deep and 18 inches in diameter.

2. Brace each gate and corner post to adjacent line post with horizontal center brace rail and diagonal truss rods. Install brace rail, one bay from end and gate post.

3. Install bottom tension wire stretched taut between terminal posts.

4. Do not swing gate from building wall; provide gate posts.

5. Install gate with fabric to match fence. Install three hinges per leaf, latch, catches, retainer and locking clamp.

P. Welding: All welds shall be shop fabricated prior to galvanizing unless otherwise acceptable to Owner's Representative. Any and all field welds shall be completed by a Certified Structural Welder and shall be "spray-galvanized" or otherwise treated subject to the discretion of the Owner's Representative.

1. All field welding to be performed by certified welder and all welds are to be ground down smooth.

2. All areas of welds are to be thoroughly cleaned and treated with two coats of cold galvanized spray.

3. All hinges shall be spot welded to the gate post.

Q. All clamping bolts protruding from clamp shall be cut off flush to nut and exposed end of bolt shall be galvalumed. Galvanized acorn nut is also an acceptable means of protecting students from sharp edges.

R. All fence post caps and backstop caps shall be spot welded to post.

S. Fabricate custom gate components as indicated on the Drawings and per the requirements of specification section 05 50 00, Metal Fabrications.

3.03 ERECTION TOLERANCES

A. Maximum variation from plumb: 1/8 inch.

B. Maximum offset from true position: 3/8 inch.

C. Components shall not infringe adjacent property lines.

END OF SECTION 32 31 13