



STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

**NOTICE TO BIDDERS
AND
SPECIAL PROVISIONS**

**FOR BUILDING CONSTRUCTION IN FRESNO COUNTY IN FRESNO AT WEST
AVENUE MAINTENANCE STATION AT 1283 NORTH WEST AVENUE**

In District 06 On Route 5725

Under

Bid book dated September 15, 2025

Standard Specifications dated 2024

Project plans approved May 27, 2025

Standard Plans dated 2024

Identified by

Contract No. 06-0X4304

06-Fre-5725--

Project ID 0618000065

SPECIAL NOTICES

- See sections 2 and 3 for contractors' registration requirements.
- The Department advises bidders that potential claim records must be submitted by the contractor using the Department's Internet potential claim system.
- See section 2 for submittal requirements for DBE quotes, DVBE quotes, and Non-Small Business Subcontractor Preference.
- For work plan for local material from (1) a noncommercial source or (2) a source not regulated under California jurisdiction, see section 6-1.03B(2).
- See section 7-1.02K(3) for the requirements for electronic submittal of certified payroll records using LCPTracker Pro.
- The flagging and temporary traffic control requirements have been revised. See sections 7-1.03, 7-1.04, and 12.
- See sections 2-1.11 and 2-1.33B for in-use off-road diesel-fueled vehicle requirements regarding Certificate of Reported Compliance submittals.
- See section 14-11.14 for changes to the management of treated wood waste.
- See sections 1-1.06, 1-1.07B, 2-1.17, 2-1.18, 2-1.33B, 5-1.13D, and 5-1.13F for "Small Business Enterprise Participation Goal Requirement" and "Small Business and Non-Small Business Subcontractor Preferences."
- See section 6-1.08 for the requirements for environmental product declarations for hot mix asphalt and concrete materials and products.

CONTRACT NO. 06-0X4304

The special provisions contained herein
have been prepared by or under the
direction of the following Registered/
Licensed Persons.

HIGHWAYS

Axel Cantu 4/8/25
REGISTERED CIVIL ENGINEER date



ELECTRICAL

Ryad H. Hafeez 3/25/25
REGISTERED ELECTRICAL ENGINEER date



TRAFFIC

Chase J. Fidler 3/25/25
REGISTERED CIVIL ENGINEER date



LANDSCAPE

Brad Cole April 07, 2025
LICENSED LANDSCAPE ARCHITECT Date
Brad Cole



ARCHITECT

Frank Thomas

5/20/25

LICENSED ARCHITECT

DATE



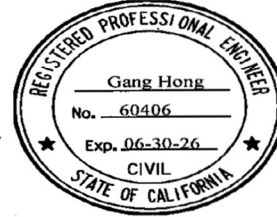
STRUCTURES

Gang Hong

5/20/25

REGISTERED CIVIL ENGINEER

DATE



MECHANICAL

Shahjahan Ali

5/20/25

REGISTERED MECHANICAL ENGINEER

DATE



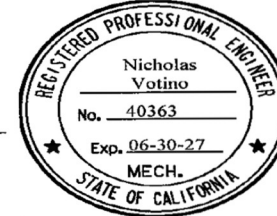
MECHANICAL

Nicholas Votino

5/20/25

REGISTERED MECHANICAL ENGINEER

DATE



ELECTRICAL

Javid Amirazodi

5/20/25

REGISTERED ELECTRICAL ENGINEER DATE



WATER AND WASTEWATER

Jessica Chander

5/20/25

REGISTERED CIVIL ENGINEER DATE



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STANDARD PLANS LIST

The standard plan sheets applicable to this Contract include those listed below. The applicable revised standard plans (RSPs) listed below are included in the project plans.

RSP A3A	Abbreviations (Sheet 1 of 3)
A3B	Abbreviations (Sheet 2 of 3)
A3C	Abbreviations (Sheet 3 of 3)
A10A	Legend - Lines and Symbols (Sheet 1 of 5)
A10B	Legend - Lines and Symbols (Sheet 2 of 5)
A10C	Legend - Lines and Symbols (Sheet 3 of 5)
A10D	Legend - Lines and Symbols (Sheet 4 of 5)
A10E	Legend - Lines and Symbols (Sheet 5 of 5)
A10F	Legend - Soil (Sheet 1 of 2)
A10G	Legend - Soil (Sheet 2 of 2)
A10H	Legend - Rock
A24A	Pavement Markings - Arrows
A24E	Pavement Markings - Words
A62A	Excavation and Backfill - Miscellaneous Details
A85	Chain Link Fence
A85A	Chain Link Fence Details
A85B	Chain Link Fence Details
A87A	Curbs and Driveways
A88A	Curb Ramp Details
A90A	Accessible Parking Off-Street
A90B	Accessible Parking On-Street
T1A	Temporary Crash Cushion, Sand Filled (Unidirectional)
T1A1	Temporary Crash Cushion, Sand Filled (Unidirectional)
T1B	Temporary Crash Cushion, Sand Filled (Bidirectional)
T2	Temporary Crash Cushion, Sand Filled (Shoulder Installations)
T3A	Temporary Railing (Type K)
T3B	Temporary Railing (Type K)
T3C	Temporary Barrier System (Cross Bolt)
T3D	Temporary Barrier System (Cross Bolt)
T3E	Temporary Barrier System (Cross Bolt)
RSP T3F	Temporary Barrier System (Cal F-23)

RSP T3F2	Temporary Barrier System (Cal F-23)
RSP T3G	Temporary Barrier System (Staking or Anchoring)
RSP T3G2	Temporary Barrier System (Staking or Anchoring)
T9	Traffic Control System Tables for Lane and Ramp Closures
T13	Traffic Control System with Reversible Control on Two Lane Conventional Highways
T13A	Traffic Control System Two Lane Conventional Highways
T13B	Traffic Control System Two Lane Conventional Highways
T30	Temporary Pedestrian Access Routes - Typical Sidewalk Closure and Pedestrian Detour
T31	Temporary Pedestrian Access Routes - Typical Sidewalk Diversion Within Roadbed
T32	Temporary Pedestrian Access Routes - Typical Sidewalk/Crosswalk Closure and Pedestrian Detour
T33	Temporary Pedestrian Access Routes - Ramp
T34	Temporary Pedestrian Access Routes - Curb Ramp Options
T59	Temporary Water Pollution Control Details (Temporary Concrete Washout Facility)
T61	Temporary Water Pollution Control Details (Temporary Drainage Inlet Protection)
T62	Temporary Water Pollution Control Details (Temporary Drainage Inlet Protection)
T63	Temporary Water Pollution Control Details (Temporary Drainage Inlet Protection)
T64	Temporary Water Pollution Control Details (Temporary Drainage Inlet Protection)
RS1	Roadside Signs - Typical Installation Details No. 1
RS2	Roadside Signs - Wood Post - Typical Installation Details No. 2
RS4	Roadside Signs - Typical Installation Details No. 4
ES-1A	Electrical Systems (Legend)
ES-1B	Electrical Systems (Legend)
ES-1C	Electrical Systems (Legend)
RSP ES-6A	Electrical Systems (Lighting Standard, Types 15 and 21)
RSP ES-7M	Electrical Systems (Signal and Lighting Standard, Details No. 1)
ES-7N	Electrical Systems (Signal and Lighting Standard, Details No. 2)
ES-7O	Electrical Systems (Signal and Lighting Standard, Details No. 3)
ES-8B	Electrical Systems (Traffic Pull Box)
ES-8C	Electrical Systems (Vaults)
ES-8D	Electrical Systems (Vaults)
ES-11	Electrical Systems (Foundation Installations)
ES-13A	Electrical Systems (Splice Insulation Methods Details)
ES-15D	Electrical Systems (Lighting and Sign Illumination Control)

CANCELED STANDARD PLANS LIST

The standard plan sheets listed below are canceled and not applicable to this contract.

Plan No.	Date Canceled	Plan No.	Date Canceled	Plan No.	Date Canceled
S1	04-21-25				
S2	04-21-25				
S3	04-21-25				
S4	04-21-25				
S5	04-21-25				
S6	04-21-25				
S8	04-21-25				
S9	04-21-25				
S10	04-21-25				
S11	04-21-25				
S12	04-21-25				
S13	04-21-25				
S15	04-21-25				
S17A	04-21-25				

NOTICE TO BIDDERS

Bids open Thursday, October 16, 2025

Dated September 15, 2025

General work description: Tree crew and special crews building.

The Department will receive sealed bids for BUILDING CONSTRUCTION IN FRESNO COUNTY IN FRESNO AT WEST AVENUE MAINTENANCE STATION AT 1283 NORTH WEST AVENUE.

District-County-Route-Post Mile: 06-Fre-5725--

Contract No. 06-0X4304

The Contractor must have either a Class A license or Class B license or a combination of Class C licenses which constitutes a majority of the work.

The Department establishes no DVBE Contract goal but encourages bidders to obtain DVBE participation.

The SBE Contract goal is 5 percent.

Bids must be on a unit price basis.

Complete the work within 335 working days.

The estimated cost of the project is \$17,700,000.

The Department will receive bids until 2:00 p.m. on the bid open date via Bid Express website. Bids received after this time will not be accepted. For more information refer to the Electronic Bidding Guide at the Office Engineer's website.

The Department will open and publicly read the bids through webcast/teleconference services immediately after the specified closing time.

For bid results go to:

<http://ppmoe.dot.ca.gov/des/oe/contractor-info.html>

Select *Electronic Bidding* under the *Bidding* tab.

District office addresses are provided in the *Standard Specifications*.

Present bidders' inquiries to the Department and view the Department's responses at:

<http://ppmoe.dot.ca.gov/des/oe/bid-inquiries.php>

Questions about alleged patent ambiguity of the plans, specifications, or estimate must be asked before bid opening. After bid opening, the Department does not consider these questions as bid protests.

Submit your bid with bidder's security equal to at least 10 percent of the bid.

Under Govt Code § 14835 et seq. and 2 CA Code of Regs § 1896 et seq., the Department gives preference to certified small businesses and non-small businesses who commit to 25 percent certified small business participation.

Under Pub Cont Code § 6107, the Department gives preference to a "California company," as defined, for bid comparison purposes over a nonresident contractor from any state that gives or requires a preference to be given to contractors from that state on its public entity construction contracts.

Prevailing wages are required on this Contract. The Director of the California Department of Industrial Relations determines the general prevailing wage rates. Obtain the wage rates at the DIR website, <http://www.dir.ca.gov>, or from the Department's Labor Compliance Office of the district in which the work is located.

The Department has made available Notices of Suspension and Proposed Debarment from the Federal Highway Administration. For a copy of the notices, go to http://www.dot.ca.gov/hq/esc/oe/contractor_info. Additional information is provided in the Excluded Parties List System at <https://sam.gov/content/home>.

Caltrans and the Construction Industry are committed to making partnering the way we do business. For more information, go to <https://dot.ca.gov/programs/construction/partnering>.

Department of Transportation

BID ITEM LIST

Item No.	Item Code	Item Description	Unit of Measure	Estimated Quantity
0001	070030	LEAD COMPLIANCE PLAN	LS	LUMP SUM
0002	080060	LEVEL 2 CRITICAL PATH METHOD SCHEDULE	LS	LUMP SUM
0003	090100	TIME-RELATED OVERHEAD (WDAY)	WDAY	335
0004	090205	DISPUTE RESOLUTION BOARD ON-SITE MEETING	EA	8
0005	090210	HOURLY OFF-SITE DISPUTE-RESOLUTION-BOARD-RELATED TASKS	HR	20
0006	120090	CONSTRUCTION AREA SIGNS	LS	LUMP SUM
0007	120100	TRAFFIC CONTROL SYSTEM	LS	LUMP SUM
0008	120151	TEMPORARY TRAFFIC STRIPE (TAPE)	LF	910
0009	120152	TEMPORARY PAVEMENT MARKING (TAPE)	SQFT	71
0010	128652	PORTABLE CHANGEABLE MESSAGE SIGN (LS)	LS	LUMP SUM
0011	130100	JOB SITE MANAGEMENT	LS	LUMP SUM
0012	130201	WATER POLLUTION CONTROL PROGRAM	LS	LUMP SUM
0013	130620	TEMPORARY DRAINAGE INLET PROTECTION	EA	2
0014	130900	TEMPORARY CONCRETE WASHOUT	LS	LUMP SUM
0015	140003	ASBESTOS COMPLIANCE PLAN	LS	LUMP SUM
0016	170103	CLEARING AND GRUBBING (LS)	LS	LUMP SUM
0017	190101	ROADWAY EXCAVATION	CY	1,310
0018	200111	DECORATIVE BOULDERS	EA	18
0019	205033	GRAVEL MULCH	SQFT	4,290
0020	260203	CLASS 2 AGGREGATE BASE (CY)	CY	780

Item No.	Item Code	Item Description	Unit of Measure	Estimated Quantity
0021	390132	HOT MIX ASPHALT (TYPE A)	TON	1,150
0022	394090	PLACE HOT MIX ASPHALT (MISCELLANEOUS AREA)	SQYD	90
0023	397005	TACK COAT	TON	0.2
0024	730070	DETECTABLE WARNING SURFACE	SQFT	14
0025	731502	MINOR CONCRETE (MISCELLANEOUS CONSTRUCTION)	CY	30
0026	731720	REMOVE CONCRETE CURB (CY)	CY	10
0027	731760	REMOVE CONCRETE CURB AND SIDEWALK (SQYD)	SQYD	85
0028	731780	REMOVE CONCRETE SIDEWALK (SQYD)	SQYD	15
0029	733000	PRE/POST CONSTRUCTION SURVEYS	EA	6
0030	800103	TEMPORARY FENCE (TYPE CL-6)	LF	1,430
0031	800360	CHAIN LINK FENCE (TYPE CL-6)	LF	210
0032	014209	WROUGHT IRON GATE	EA	1
0033	803020	REMOVE FENCE	LF	250
0034	820750	FURNISH SINGLE SHEET ALUMINUM SIGN (0.063"-UNFRAMED)	SQFT	8
0035	820840	ROADSIDE SIGN - ONE POST	EA	4
0036	820860	INSTALL SIGN (STRAP AND SADDLE BRACKET METHOD)	EA	1
0037	840656	PAINT TRAFFIC STRIPE (2-COAT)	LF	2,340
0038	840666	PAINT PAVEMENT MARKING (2-COAT)	SQFT	93
0039	846020	REMOVE PAINTED TRAFFIC STRIPE	LF	17
0040	846025	REMOVE PAINTED PAVEMENT MARKING	SQFT	71

Item No.	Item Code	Item Description	Unit of Measure	Estimated Quantity
0041	039162	MODIFYING FIBER OPTIC CABLE SYSTEMS	LS	LUMP SUM
0042	013306	MODIFYING EXISTING ELECTRICAL SYSTEM	LS	LUMP SUM
0043	872131	MODIFYING LIGHTING SYSTEMS	LS	LUMP SUM
0044	994650	BUILDING WORK	LS	LUMP SUM

SPECIAL PROVISIONS

ORGANIZATION

Special provisions are under headings that correspond with the main-section headings of the *Standard Specifications*. A main-section heading is a heading shown in the table of contents of the *Standard Specifications*.

Each special provision begins with a revision clause that describes or introduces a revision to the *Standard Specifications*.

Any paragraph added or deleted by a revision clause does not change the paragraph numbering of the *Standard Specifications* for any other reference to a paragraph of the *Standard Specifications*.

AA

DIVISION I GENERAL PROVISIONS

1 GENERAL

Add to section 1-1.01:

Bid Items and Applicable Sections

Item code	Item description	Applicable section
090205	DISPUTE RESOLUTION BOARD ON-SITE MEETING	5
090210	HOURLY OFF-SITE DISPUTE-RESOLUTION-BOARD-RELATED TASKS	5
014209	WROUGHT IRON GATE	80
013973	REMOVE FENCE (WROUGHT IRON)	80
039162	MODIFYING FIBER OPTIC CABLE SYSTEMS	87
013306	MODIFYING EXISTING LIGHTING SYSTEM	87

Add to the table in the 1st paragraph of section 1-1.06:

SBE	Small Business Enterprise
-----	---------------------------

Add to section 1-1.07B:

small business enterprise: Small business or small business for the purpose of public works, as certified by the Department of General Services, Office of Small Business and DVBE Services, and as defined in Govt Code § 14835 et seq. and 2 CA Code of Regs § 1896 et seq.

AA

2 BIDDING

Add between the 1st and 2nd paragraphs of section 2-1.06B:

The Department makes the following supplemental project information available:

Supplemental Project Information

Means	Description
Included in the <i>Information Handout</i>	1. Foundation Report for An Office and Maintenance Building at The West Avenue Maintenance Station Upgrade, April 14, 2023 2. Asbestos Containing Materials and Lead-Based Paint Survey Report Dated January 28, 2021. 3. Form OCR-SBE03 4. Fire Service Install Fee 5. SFM Building Permits
Available as specified in the <i>Standard Specifications</i>	1. Digital terrain model in 3D DGN or LandXML format 2. Alignments and profiles in LandXML format 3. Digital design model in LandXML format

Replace section 2-1.17 with:

2-1.17 SMALL BUSINESS ENTERPRISE PARTICIPATION GOAL REQUIREMENT

2-1.17A General

Section 2-1.17 applies if an SBE participation goal requirement is shown on the *Notice to Bidders*.

The SBE participation goal requirement is in addition to any DVBE goal shown on the *Notice to Bidders* and the DVBE requirements in section 2-1.15.

Make work available to SBEs and select work parts consistent with the available SBEs, including subcontractors, suppliers, service providers, and truckers.

Meet the SBE participation goal requirement shown on the *Notice to Bidders*. A bid that demonstrates an SBE participation commitment less than the SBE participation goal requirement is nonresponsive.

Each listed SBE must be certified as a small business or small business for the purpose of public works by 5:00 p.m. on the bid opening date. The complete application and any required substantiating documentation must be received by the Department of General Services by 5:00 p.m. on the bid opening date.

The Department of General Services determines whether an SBE was certified on the bid opening date. The Department of Transportation confirms an SBE's certification status.

2-1.17B SBE Submittals

Submit SBE information under section 2-1.33.

For the SBE participation goal requirement, submit the following:

1. Completed Small Business Enterprise – Commitment form. Failure to submit the completed form by 4 p.m. on the 4th business day after bid opening may result in a nonresponsive bid.
2. Copy of the quote for each SBE shown on the Small Business Enterprise – Commitment form that describes the type and dollar amount of work shown on the form. Quotes are not required for work that will be completed by SBE prime bidders. Failure to submit a copy of the quote for each SBE listed on the Commitment form by 4 p.m. on the 4th business day after bid opening may result in disallowance of the SBE's participation.
3. Completed Small Business Enterprise – Confirmation form from each SBE listed on the Commitment form. The form for each SBE is required to establish that the SBE will be participating in the Contract for the type and dollar amount of work shown on the form. Failure to submit completed Confirmation forms for each SBE listed on the Commitment form by 4 p.m. on the 4th business day after bid opening may result in disallowance of the SBE's participation.
4. If an SBE is participating as a joint venture partner, submit a copy of the joint venture agreement.

The Department may contact you and SBEs to clarify quotes and supporting documentation.

If you elect, at time of bid, to pursue the optional small business or non-small business preference, see section 2-1.18 for the requirements arising from your request for the preference. SBE participation listed to meet the SBE participation goal requirement should not be listed for the preference.

Replace section 2-1.18 with:

2-1.18 SMALL BUSINESS AND NON–SMALL BUSINESS SUBCONTRACTOR PREFERENCES

2-1.18A General

Section 2-1.18 applies to a non-federal-aid contract.

The Department applies small business preferences and non–small business preferences under Govt Code § 14835 et seq. and 2 CA Code of Regs § 1896 et seq.

Any contractor, subcontractor, supplier, or service provider who qualifies as a small business or small business for the purpose of public works is encouraged to apply for certification as an SBE by submitting its application to the Department of General Services, Office of Small Business and DVBE Services.

The Department of General Services determines whether an SBE was certified on the bid opening date. The Department of Transportation confirms an SBE's certification status before applying the small business or non-small business preference.

Contract award is based on the total bid, not the reduced bid.

Pursuant to Govt Code § 14838, SBE participation listed on the Small Business Enterprise – Commitment form used to meet the SBE participation goal requirement should not be listed on the Certified Small Business Listing for the Non-Small Business Preference form. Listing the same SBE participation on both the Small Business Enterprise – Commitment form and on the Certified Small Business Listing for the Non-Small Business Preference form may result in disallowance of the SBE's participation toward the small business or non-small business preference.

2-1.18B Small Business Preference

The Department allows a bidder certified as an SBE by the Department of General Services, Office of Small Business and DVBE Services, a preference if:

1. Bidder submitted a completed Request for Small Business Preference or Non–Small Business Preference form with its bid
2. Low bidder did not request the preference or is not certified as a small business

The Bidder's signature on the Request for Small Business Preference or Non–Small Business Preference form certifies that the Bidder is certified as an SBE at the date and time of bid or has submitted a complete application to the Department of General Services. The complete application and any required substantiating documentation must be received by the Department of General Services by 5:00 p.m. on the bid opening date.

The small business preference is a reduction for bid comparison in the total bid submitted by the small business contractor by the lesser of the following amounts:

1. 5 percent of the verified total bid of the low bidder
2. \$50,000

If the Department determines that a certified small business bidder is the low bidder after the application of the small business preference, the Department does not consider a request for non–small business preference.

2-1.18C Non–Small Business Subcontractor Preference

At time of bid, the Department allows a bidder not certified as an SBE by the Department of General Services, Office of Small Business and DVBE Services, the option of requesting the non-small business subcontractor preference. If a bidder elects to pursue that option at the time of bid, the bidder is required to meet the corresponding commitment.

For the non-small business subcontractor preference, submit the following:

1. Completed Request for Small Business Preference or Non–Small Business Preference form with your bid
2. Completed Certified Small Business Listing for the Non–Small Business Preference form which shows you are subcontracting at least 25 percent to certified SBEs

Each listed SBE must be certified as a small business or small business for the purpose of public works by 5:00 p.m. on the bid opening date. The complete application and any required substantiating documentation must be received by the Department of General Services by 5:00 p.m. on the bid opening date.

Failure to submit a completed Certified Small Business Listing for the Non–Small Business Preference form by 4 p.m. on the 4th business day after bid opening will result in a nonresponsive bid.

The non–small business subcontractor preference is a reduction for bid comparison in the total bid submitted by the non–small business contractor requesting the preference by the lesser of the following amounts:

1. 5 percent of the verified total bid of the low bidder
2. \$50,000

Replace section 2-1.33B with:

2-1.33B Bid Form Submittal Schedules

2-1.33B(1) General

The *Bid* book includes forms specific to the Contract. The deadlines for the submittal of the forms vary depending on the requirements of each Contract. Determine the requirements of the Contract and submit the forms based on the applicable schedule specified in section 2-1.33B.

Bid forms and information on the form that are due after the time of bid may be submitted at the time of bid.

2-1.33B(2) Federal-Aid Contracts

2-1.33B(2)(a) General

Section 2-1.33B(2) applies to a federal-aid contract.

2-1.33B(2)(b) Contracts with a DBE Goal**2-1.33B(2)(b)(i) General**

Section 2-1.33B(2)(b) applies if a DBE goal is shown on the *Notice to Bidders*.

2-1.33B(2)(b)(ii) Bid Form Submittal

Submit the bid forms according to the schedule shown in the following table:

Bid Form Submittal Schedule for a Federal-Aid Contract with a DBE Goal

Form	Submittal deadline
Bid to the Department of Transportation	Time of bid except for the public works contractor registration number
Copy of the Bid to the Department of Transportation as submitted at the time of bid with the public works contractor registration number	10 days after bid opening
Subcontractor List	Time of bid except for the public works contractor registration number
Copy of the Subcontractor List as submitted at the time of bid with the public works contractor registration number	10 days after bid opening
In-Use Off-Road Diesel-Fueled Vehicle List	10 days after bid opening
Small Business/DVBE/DBE Certification Status	Time of bid
Opt Out of Payment Adjustments for Price Index Fluctuations ^a	Time of bid
DBE Commitment	No later than 4 p.m. on the 5th day after bid opening ^b
DBE Confirmation	No later than 4 p.m. on the 5th day after bid opening ^b
DBE Good Faith Efforts Documentation	No later than 4 p.m. on the 5th day after bid opening ^b

^aSubmit only if you choose the option.

^bIf the last day for submitting the bid form falls on a Saturday or holiday, it may be submitted on the next business day with the same effect as if it had been submitted on the day specified.

2-1.33B(2)(b)(iii) Reserved**2-1.33B(2)(c) Contracts without a DBE Goal****2-1.33B(2)(c)(i) General**

Section 2-1.33B(2)(c) applies if a DBE goal is not shown on the *Notice to Bidders*.

2-1.33B(2)(c)(ii) Bid Form Schedule

Submit the bid forms according to the schedule shown in the following table:

Bid Form Submittal Schedule for a Federal-Aid Contract without a DBE Goal

Form	Submittal deadline
Bid to the Department of Transportation	Time of bid except for the public works contractor registration number
Copy of the Bid to the Department of Transportation as submitted at the time of bid with the public works contractor registration number	10 days after bid opening
Subcontractor List	Time of bid except for the public works contractor registration number
Copy of the Subcontractor List as submitted at the time of bid with the public works contractor registration numbers	10 days after bid opening
In-Use Off-Road Diesel-Fueled Vehicle List	10 days after bid opening
Small Business /DVBE/DBE Certification Status	Time of bid
Opt Out of Payment Adjustments for Price Index Fluctuations ^a	Time of bid

^aSubmit only if you choose the option.

2-1.33B(2)(c)(iii) Reserved**2-1.33B(2)(d)–2-1.33B(2)(h) Reserved****2-1.33B(3) Non-Federal-Aid Contracts****2-1.33B(3)(a) General**

Section 2-1.33B(3) applies to non-federal-aid contracts.

2-1.33B(3)(b) Contracts with a DVBE Goal**2-1.33B(3)(b)(i) General**

Section 2-1.33B(3)(b) applies if a DVBE goal is shown on the *Notice to Bidders*.

2-1.33B(3)(b)(ii) Bid Form Submittal

Submit the bid forms according to the schedule shown in the following table:

Bid Form Submittal Schedule for a Non-Federal-Aid Contract with a DVBE Goal

Form	Submittal deadline
Bid to the Department of Transportation	Time of bid except for the public works contractor registration number for a joint-venture contract
For a joint-venture contract, copy of the Bid to the Department of Transportation as submitted at the time of bid with the public works contractor registration number	10 days after bid opening
Subcontractor List	Time of bid
In-Use Off-Road Diesel-Fueled Vehicle List	10 days after bid opening
Opt Out of Payment Adjustments for Price Index Fluctuations ^a	Time of bid
Certified DVBE Summary	No later than 4 p.m. on the 4th business day after bid opening
California Company Preference	Time of bid
Small Business Enterprise – Commitment	No later than 4 p.m. on the 4th business day after bid opening
Small Business Enterprise – Confirmation	No later than 4 p.m. on the 4th business day after bid opening
Request for Small Business Preference or Non–Small Business Preference ^a	Time of bid
Certified Small Business Listing for the Non–Small Business Preference ^a	No later than 4 p.m. on the 4th business day after bid opening

^aSubmit only if you choose the option or preference.

2-1.33B(3)(b)(iii) Reserved**2-1.33B(3)(c) Contracts without a DVBE Goal****2-1.33B(3)(c)(i) General**

Section 2-1.33B(3)(c) applies if a DVBE goal is not shown on the *Notice to Bidders*.

2-1.33B(3)(c)(ii) Bid Form Submittal

Submit the bid forms according to the schedule shown in the following table:

Bid Form Submittal Schedule for a Non-Federal-Aid Contract without a DVBE Goal	
Form	Submittal deadline
Bid to the Department of Transportation	Time of bid except for the public works contractor registration number for a joint-venture contract
For a joint-venture contract, copy of the Bid to the Department of Transportation as submitted at the time of bid with the public works contractor registration number	10 days after bid opening
Subcontractor List	Time of bid
In-Use Off-Road Diesel-Fueled Vehicle List	10 days after bid opening
Opt Out of Payment Adjustments for Price Index Fluctuations ^a	Time of bid
California Company Preference	Time of bid
Certified DVBE Summary ^b	No later than 4 p.m. on the 4th business day after bid opening
Small Business Enterprise – Commitment	No later than 4 p.m. on the 4th business day after bid opening
Small Business Enterprise – Confirmation	No later than 4 p.m. on the 4th business day after bid opening
Request for Small Business Preference or Non–Small Business Preference ^a	Time of bid
Certified Small Business Listing for the Non–Small Business Preference ^a	No later than 4 p.m. on the 4th business day after bid opening

^aSubmit only if you choose the option or preference.

^bSubmit only if you obtain DVBE participation or you are the apparent low bidder, 2nd low bidder, or 3rd low bidder and you choose to receive the specified incentive.

2-1.33B(3)(c)(iii) Reserved**2-1.33B(3)(d)–2-1.33B(3)(h) Reserved****2-1.33B(4)–2-1.33B(9) Reserved**

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5 CONTROL OF WORK

Replace the 2nd and 3rd paragraphs of section 5-1.09A with:

Professionally facilitated project partnering is required.

Replace section 5-1.13D with:

5-1.13D Non-Small Business Preference**5-1.13D(1) General**

Section 5-1.13D applies to a non-federal-aid contract when you have obtained a non-small business subcontractor preference under section 2-1.18.

Use each SBE as shown on the Certified Small Business Listing for the Non-Small Business Preference form unless you receive authorization for a substitution under section 5-1.13D(3).

Maintain records of subcontracts and agreements made with each SBE. Include in the records:

1. SBE subcontract or agreement
2. Name and business address of each business
3. Proof of each payment made to an SBE

Upon reasonable notice and during normal business hours, permit access to the SBE premises for the purpose of:

1. Interviewing employees.
2. Inspecting and copying books, records, accounts, and other material that may be relevant to a matter under investigation.

Upon work completion, complete a Final Report – Utilization of Small Business Enterprise form and submit within 10 days of Contract acceptance. The Department withholds the greater of 10 percent of the SBE work amount or \$10,000 until the form is submitted. The Department releases the withhold upon submission of the completed form. If additional payments are made to an SBE after submittal of the completed form, submit an updated form to reflect such payments.

5-1.13D(2) Commercially Useful Function

SBEs must perform a commercially useful function under 2 CA Code Regs § 1896.15 when performing tasks listed on the Certified Small Business Listing for the Non-Small Business Preference form and as a Department authorized substitute SBE. The SBE's value of work will only count toward the non-small business preference if the SBE performs a commercially useful function under 2 CA Code Regs § 1896.15.

Provide written notification to the Engineer at least 15 days in advance of each SBE's initial performance of work on the Contract. Include the SBE's name, contract work to be performed, and the location, date, and time of where the SBE's work will take place.

Monitor each SBE's performance of a commercially useful function throughout their duration of work on the Contract. Maintain supporting documentation of commercially useful function related records. Provide copies of the following to the Department within 5 business days of a specific SBE request:

1. Subcontract or agreement with the SBE
2. Purchase orders
3. Bills of lading
4. Invoices
5. Proof of payment

You and your SBEs must submit any commercially useful function related records and documents within 5 business days of Department request such as:

1. Proof of ownership or lease and rental agreements for equipment
2. Tax records
3. Employee rosters
4. Certified payroll records
5. Inventory rosters

Notify the Engineer immediately if you believe an SBE may not be performing a commercially useful function.

Failure to submit requested records and documents, or failure of an SBE to perform a commercially useful function, will be a violation of these specifications. Such violations will result in referral to the Department of General Services, and you may be subject to sanctions under Govt Code § 14842 et seq.

5-1.13D(3) Substitutions

Substitution of an SBE may be requested for the reasons listed in Pub Cont Code § 4107. The Department will consider your SBE substitution request under 2 CA Code Regs § 1896.10. The substitute must be another SBE.

The requirement that an SBE be certified by the bid opening date does not apply to SBE substitutions after contract award.

Include in your substitution request:

1. Copy of the written notice issued to the SBE with proof of delivery
2. Copy of the SBE response to the notice
3. Your explanation of the reason for the substitution request
4. Names and certification numbers of the listed SBE and the proposed substitute SBE
5. Description of the work to be performed including dollar amount or percentage of overall contract the proposed substitute SBE will perform
6. If an SBE substitution cannot occur, written justification and the steps that were taken to try to acquire a new SBE and how that non-small business preference portion of the Contract will be fulfilled

Upon receipt of the substitution request, the listed SBE will be notified by the Department of the substitution request. The listed SBE will have 5 business days to respond. Where the listed SBE objects to the substitution, the Department will schedule a hearing.

If the Department authorizes your SBE substitution request, it will do so in writing.

Work performed by a firm other than the listed SBE or authorized substitute will be a violation of these specifications. Such violations will result in notification of the Department of General Services, and you may be subject to sanctions under Govt Code § 14842 et seq.

Replace section 5-1.13E with:

5-1.13E Prompt Payment

Section 5-1.13E applies to all contracts.

Pay your subcontractors within 7 days of receipt of each progress payment under Pub Cont Code §§ 10262 and 10262.5. Pay duly authorized motor carriers of property in dump trucks for transportation charges under Bus & Prof Code § 7108.6. Pay other entities, such as material suppliers, within 30 days of receipt of each progress payment.

Each month, after the 15th and prior to 20th, submit the following payment information through the Department's prompt payment monitoring system at <https://caltrans.dbesystem.com>:

1. Subcontractor's or entity's business name
2. Description of work performed
 - 2.1. Bid item numbers or change order numbers
 - 2.2. Written narrative of work performed
3. Value of work performed
4. Amount paid to subcontractor or entity
5. Withhold amount, if applicable
6. Explanation of withhold reasoning, if applicable

Your subcontractors and other entities may validate payments received using the prompt payment monitoring system.

If a subcontractor's or other entity's work is in dispute, provide a written withhold notification to the subcontractor or entity and the Engineer no later than 7 days after receipt of the corresponding progress payment that includes the following:

1. Value of the disputed work
2. Amount of the withhold being taken
3. Bid item numbers or change order numbers associated with the disputed work
4. Explanation of the deficiencies of the disputed work and how the corresponding value was calculated
5. Corrective actions to be taken for release of withheld amount

The Department may request additional documentation from you to evaluate whether you applied the withhold in good faith. Submit requested documents within 10 days of receipt of request.

The Department may withhold the same amount of your withhold from a future progress pay estimate if the Department determines any of the following has occurred:

1. Withhold was not applied in good faith
2. Requested additional withhold documentation records were not provided
3. Payment information was not submitted through the prompt payment monitoring system
4. Required withhold notification was not provided

The Department may also apply a 2 percent penalty on the withhold amount for every month payment is not made.

Replace section 5-1.13F with:

5-1.13F Small Business Enterprise Participation Goal Requirement

5-1.13F(1) General

Section 5-1.13F applies to a non-federal-aid contract if an SBE participation goal requirement is shown on the *Notice to Bidders*.

Use each SBE as shown on the Small Business Enterprise – Commitment form unless you receive authorization for a substitution under section 5-1.13F(3).

Maintain records of subcontracts and agreements made with each SBE. Include in the records:

1. SBE subcontract or agreement
2. Name and business address of each business
3. Proof of each payment made to an SBE

Upon reasonable notice and during normal business hours, permit access to the SBE premises for the purpose of:

1. Interviewing employees.
2. Inspecting and copying books, records, accounts, and other material that may be relevant to a matter under investigation.

Upon work completion, complete a Final Report – Utilization of Small Business Enterprise form and submit within 10 days of Contract acceptance. The Department withholds the greater of 10 percent of the SBE work amount or \$10,000 until the form is submitted. The Department releases the withhold upon submission of the completed form. If additional payments are made to an SBE after submittal of the completed form, submit an updated form to reflect such payments.

5-1.13F(2) Commercially Useful Function

SBEs must perform a commercially useful function under 2 CA Code Regs § 1896.15 when performing tasks listed on the Small Business Enterprise – Commitment form and as a Department authorized substitute SBE. The SBE's value of work will only count toward the SBE participation goal requirement if the SBE performs a commercially useful function under 2 CA Code Regs § 1896.15.

Provide written notification to the Engineer at least 15 days in advance of each SBE's initial performance of work on the Contract. Include the SBE's name, contract work to be performed, and the location, date, and time of where the SBE's work will take place.

Monitor each SBE's performance of a commercially useful function throughout their duration of work on the Contract. Maintain supporting documentation of commercially useful function related records. Provide copies of the following to the Department within 5 business days of a specific SBE request:

1. Subcontract or agreement with the SBE
2. Purchase orders
3. Bills of lading
4. Invoices
5. Proof of payment

You and your SBEs must submit any commercially useful function related records and documents within 5 business days of Department request such as:

1. Proof of ownership or lease and rental agreements for equipment
2. Tax records
3. Employee rosters
4. Certified payroll records
5. Inventory rosters

Notify the Engineer immediately if you believe an SBE may not be performing a commercially useful function.

Failure to submit requested records and documents, or failure of an SBE to perform a commercially useful function, will be a violation of these specifications. Such violations will result in referral to the Department of General Services, and you may be subject to sanctions under Govt Code § 14842 et seq.

5-1.13F(3) Substitutions

Substitution of an SBE may be requested for the reasons listed in Pub Cont Code § 4107. The Department will consider your SBE substitution request under 2 CA Code Regs § 1896.10. The substitute must be another SBE.

The requirement that an SBE be certified by the bid opening date does not apply to SBE substitutions after contract award.

Include in your substitution request:

1. Copy of the written notice issued to the SBE with proof of delivery
2. Copy of the SBE response to the notice
3. Your explanation of the reason for the substitution request
4. Names and certification numbers of the listed SBE and the proposed substitute SBE
5. Description of the work to be performed including dollar amount or percentage of overall contract the proposed substitute SBE will perform
6. If an SBE substitution cannot occur, written justification and the steps that were taken to try to acquire a new SBE and how that SBE participation goal requirement portion of the Contract will be fulfilled

Upon receipt of the substitution request, the listed SBE will be notified by the Department of the substitution request. The listed SBE will have 5 business days to respond. Where the listed SBE objects to the substitution, the Department will schedule a hearing.

If the Department authorizes your SBE substitution request, it will do so in writing.

Work performed by a firm other than the listed SBE or authorized substitute will be a violation of these specifications. Such violations will result in notification of the Department of General Services, and you may be subject to sanctions under Govt Code § 14842 et seq.

Replace section 5-1.15 with:

5-1.15 SAFETY REPRESENTATIVE

5-1.15A General

Designate an on-site safety representative to superintend project safety for the duration of this Contract. The safety representative may perform other non-safety related work if safety responsibilities are fulfilled. The safety representative must be available after work hours as needed. The safety representative is not required to be on-site during plant establishment period, erosion control establishment period, or temporary suspensions when no other Contract work is being performed.

Develop a written site-specific safety program (SSSP) that incorporates known hazards associated with the project.

5-1.15A(1) Submittals

Submit a resume of the safety representative before starting work on the project, including education, completed safety training, and safety experience in heavy construction, heavy industrial, or oil and energy industry.

Submit a copy of the safety representative's certificate for the Cal/OSHA 30-hour – Cal/OSHA Standards for the Construction Industry or OSHA 510 - OSHA Standards for the Construction Industry training course as an informational submittal. The certificate must include:

1. Name of the entity providing certification
2. Name of the individual receiving certification
3. Date when the certification was provided
4. Expiration date, if applicable

Submit a copy of the SSSP as an informational submittal:

1. At least 15 days before starting work
2. At least 48 hours before starting work whenever a revision is made to the SSSP

5-1.15A(2) Quality Assurance

5-1.15A(2)(a) General

Not Used

5-1.15A(2)(b) Certifications

The safety representative must have completed training and received a certificate of completion for the Cal/OSHA 30-hour - Cal/OSHA Standards for the Construction Industry or OSHA 510 – OSHA Standards for the Construction Industry training course.

The safety representative must have one of the following certifications:

1. Certified Safety Professional from the Board of Certified Safety Professionals
2. Construction Health and Safety Technician from the Board of Certified Safety Professionals
3. Occupational Hygiene and Safety Technician from the Board of Certified Safety Professionals
4. Safety Trained Supervisor from the Board of Certified Safety Professionals
5. Safety Trained Supervisor Construction from the Board of Certified Safety Professionals
6. Associate Safety Professional from the Board of Certified Safety Professionals
7. Master Safety Professional from the National Association of Safety Professionals
8. Certified Safety Director from the National Association of Safety Professionals

5-1.15A(2)(c) Qualifications

The safety representative must be a competent and qualified person, as defined by Cal/OSHA, and must provide safety oversight on the project. The safety representative must have:

1. At least 3 years of safety experience in heavy construction, heavy industrial, or oil and energy industry
2. Knowledge in the area of safety procedure for all types of work being performed on this project
3. Knowledge of Department specifications and plans, Cal/OSHA policy and procedures, and 8 CA Code of Regs safety requirements

The safety representative must have completed safety training and maintain valid certifications for:

1. First aid
2. Cardiopulmonary resuscitation

5-1.15B Materials

Not Used

5-1.15C Construction

The safety representative must be available by:

1. Cellular telephone
2. Two-way radio
3. Mobile internet access

The safety representative must:

1. Develop the SSSP
2. Conduct the on-site new project orientation for each worker assigned to the project
3. Review the construction work plans for each subcontractor before starting work
4. Conduct or attend pre-planning sessions for high hazard work such as excavations, demolition, confined space entry, falsework, crane hoisting, high-risk utilities such as high-pressure pipelines with fuel or natural gas, and tunneling or boring
5. Conduct weekly job site safety meetings
6. Review work schedules, including subcontractors' work schedules, to ensure adequacy of job hazard analyses and address all safety concerns and issues
7. Ensure safety data sheets are available on-site for all materials and have a hazard communication program for informing workers of material hazards
8. Verify compliance with hazardous waste requirements under section 14-11, including spill prevention and control measures
9. Conduct daily safety inspections of the job site for hazards and compliance with safety requirements in the specifications and 8 CA Code of Regs
10. Report all incidents to the Engineer immediately, including the investigation of any close calls

When monitoring the job site, including work zones with certified flaggers or traffic control technicians, take immediate corrective action and notify the Engineer if an imminent danger is identified.

If the Engineer determines the safety representative is not meeting the intended duties and responsibilities, you must replace the safety representative within 30 days of written notice from the Engineer. If you need to replace the safety representative, notify the Engineer and provide replacement safety representative resume and required certifications at least 15 days before the replacement.

You may submit a secondary safety representative to act on behalf of the designated safety representative during extended shifts, continuous operations, or short-term absences that will not exceed 14 days in duration. The secondary safety representative must meet the same required qualifications and certifications as the designated safety representative.

5-1.15D Payment

Not Used

6-1.03B(3) Analytical Test Results

At least 15 days before placing local material, submit analytical test results for each local material obtained from a noncommercial source or a source not regulated under CA jurisdiction. The analytical test results must include:

1. Certification signed by an engineer who is registered as a civil engineer in the State or a professional geologist licensed as a professional geologist by the State stating:

The analytical testing described in the local material plan has been performed. I performed a statistical analysis of the test results using the US EPA's ProUCL software with the applicable 95 percent upper confidence limit. I certify that the material from the local material source is suitable for unrestricted use at the job site, it has a pH above 5.0, does not contain soluble lead in concentrations equal to or greater than 5mg/l as determined by the Waste Extraction Test (WET) Procedures, 22 CA Code of Regs § 66261.24(a)(2) App II, does not contain lead in concentrations above 80 mg/kg total lead, is free from all other contaminants identified in the local material plan, and will comply with the job site's basin plan and water quality objectives of the RWQCB.

2. Chain of custody of samples
3. Analytical results no older than 1 year
4. Statistical analysis of the data using US EPA's ProUCL software with a 95 percent upper confidence limit
5. Comparison of sample results to hazardous waste concentration thresholds and the RWQCB's basin plan requirements and water quality objectives for the job site location

6-1.03B(4) Sample and Analysis

Sample and analyze local material from a (1) noncommercial source or (2) a source not regulated under CA jurisdiction:

1. Before bringing the local material to the job site
2. As described in the local material plan
3. Under US EPA Test Methods for Evaluating Solid Waste, Physical/Chemical Methods (SW-846)

The sample collection must be designed to generate a data set representative of the entire volume of proposed local material.

Before excavating at the (1) noncommercial material source or (2) a source not regulated under CA jurisdiction, collect the minimum number of samples and perform the minimum number of analytical tests for the corresponding maximum volume of local material as shown in the following table:

Minimum Number of Samples and Analytical Tests for Local Material

Maximum volume of imported borrow (cu yd)	Minimum number of samples and analytical tests
< 5,000	8
5,000–10,000	12 for the first 5,000 cu yd plus 1 for each additional 1,000 cu yd or portion thereof
10,000–20,000	17 for the first 10,000 cu yd plus 1 for each additional 2,500 cu yd or portion thereof
20,000–40,000	21 for the first 20,000 cu yd plus 1 for each additional 5,000 cu yd or portion thereof
40,000–80,000	25 for the first 40,000 cu yd plus 1 for each additional 10,000 cu yd or portion thereof
> 80,000	29 for the first 80,000 cu yd plus 1 for each additional 20,000 cu yd or portion thereof

Do not collect composite samples or mix individual samples to form a composite sample.

Analyze the samples using the US EPA's ProUCL software with a 95 percent upper confidence limit. All chemical analysis must be performed by a laboratory certified by the SWRCB's Environmental Laboratory Accreditation Program (ELAP).

The analytical test results must demonstrate that the local material:

1. Is not a hazardous waste
2. Has a pH above 5.0
3. Has an average total lead concentration, based upon the 95 percent upper confidence limit, at or below 80 mg/kg
4. Is free of possible contaminants identified in the local material plan
5. Complies with the RWQCB's basin plan for the job site location
6. Complies with the RWQCB's water quality objectives for the job site location

6-1.03C Local Material Management

Do not place local material until authorized.

If the Engineer determines the appearance, odor, or texture of any delivered local material suggests possible contamination, sample and analyze the material. The sampling and analysis is change order work unless (1) hazardous waste is discovered or (2) the analytical test results indicate the material does not comply with section 6-1.03B(3).

Dispose of noncompliant local material at an appropriately permitted CA Class I, CA Class II or CA Class III facility. You are the generator of noncompliant local materials.

Replace section 6-1.04 with:

6-1.04 BUY AMERICA

6-1.04A General

Buy America requirements do not apply to the following:

1. Tools and construction equipment used in performing the work
2. Temporary work that is not incorporated into the finished project

6-1.04B Crumb Rubber (Pub Res Code § 42703(d))

Furnish crumb rubber with a certificate of compliance. Crumb rubber must be:

1. Produced in the United States
2. Derived from waste tires taken from vehicles owned and operated in the United States

6-1.04C Steel and Iron Materials

Steel and iron materials must be melted and manufactured in the United States except:

1. Foreign pig iron and processed, pelletized, and reduced iron ore may be used in the domestic production of the steel and iron materials
2. If the total combined cost of the materials produced outside the United States does not exceed the greater of 0.1 percent of the total bid or \$2,500, the material may be used if authorized

Furnish steel and iron materials to be incorporated into the work with certificates of compliance and certified mill test reports. Mill test reports must indicate where the steel and iron were melted and manufactured.

All melting and manufacturing processes for these materials, including an application of a coating, must occur in the United States. Coating includes all processes that protect or enhance the value of the material to which the coating is applied.

6-1.04D Manufactured Products

Iron and steel used in precast concrete manufactured products must meet the requirements of section 6-1.04C regardless of the amount used.

Iron and steel used in other manufactured products must meet the requirements of section 6-1.04C if the weight of steel and iron components constitute 90 percent or more of the total weight of the manufactured product.

6-1.04E Construction Materials

The following construction materials must be produced in the United States under standards in 2 CFR 184.6:

1. Non-ferrous metals
2. Plastic and polymer-based products such as:
 - 2.1. Polyvinylchloride
 - 2.2. Composite building materials
3. Glass
4. Fiber optic cable including drop cable
5. Optical fiber
6. Lumber
7. Engineered wood
8. Drywall

All manufacturing processes for these materials as defined in 2 CFR 184.6 must occur in the United States.

Furnish construction materials to be incorporated into the work with certificates of compliance with each project delivery. Manufacturer's certificate of compliance must identify where the construction material was manufactured and attest specifically to compliance with its 2 CFR 184.6 standard.

Minor additions of articles, materials, supplies, or binding agents to these construction materials do not change the categorization of the construction material.

Add to section 6-1:

6-1.08 ENVIRONMENTAL PRODUCT DECLARATIONS FOR HOT MIX ASPHALT AND CONCRETE

Section 6-1.08 includes specifications for environmental product declarations for hot mix asphalt and concrete materials and products.

See section 6-1.06B for definitions.

For projects with bid opening dates after February 1, 2025, with a total bid over \$1 million and 175 or more original working days, materials or products specified in the following table require facility-specific, product stage, environmental product declarations as informational submittals:

Material or product	Material specifications
Hot mix asphalt ^a	Section 39-2, "Hot Mix Asphalt" Excludes RHMA, OGFC, and BWC materials.
Concrete ^b	Section 28-2, "Lean Concrete Bases," Section 28-3, "Rapid Strength Concrete Base," Section 28-4, "Lean Concrete Base Rapid Setting," Section 28-5, "Concrete Base," Section 40, "Concrete Pavement," Section 47-5, "Type 6 Retaining Walls," Section 49-3, "Cast-In-Place Concrete Piling," Section 49-4, "Steel Soldier Piling," Section 51, "Concrete Structures," Section 58-2, "Masonry Block," Section 73, "Concrete Curbs and Sidewalks," Section 83, "Railings and Barriers," and Section 99, "Building Construction." Excludes volumetric-proportioned rapid strength concrete and Section 90-4 PC concrete members.

^aFor each hot mix asphalt plant providing 2,250 tons or more on the project by job mix formula.

^bFor each concrete plant providing 250 cubic yards or more on the project by mix design.

The requirements in section 6-1.08 do not apply to seasonal plants operating fewer than 6 months per year.

The requirements in section 6-1.08 do not apply to informal-bid contracts.

For product category rules for hot mix asphalt or concrete, go to the METS website. Use the product category rule in effect on the date of bid opening unless otherwise authorized. An environmental product declaration for hot mix asphalt or concrete is not required for either of the following conditions:

1. Applicable product category rule has expired without replacement as of the bid opening date.
2. Applicable product category rule was issued less than 50 days before the bid opening date.

Immediately notify the Engineer if a program operator has determined their product category rule does not allow for development of a facility-specific environmental product declaration. Include written correspondence from the program operator with your notification to the Engineer. If the Engineer determines the development of a facility-specific environmental product declaration cannot be achieved, an environmental product declaration will not be required for that material or product.

You must register on the Department's Data Interchange for Materials Engineering (DIME) at least 15 days before submitting environmental product declarations. Follow the registration process at:

<https://dime.dot.ca.gov/>

Within 30 days of initial placement of each applicable material or product, submit a facility-specific, product stage, environmental product declaration informational submittal to DIME and provide proof of submission in PDF file format to the Engineer. The DIME entry information must include intended use of materials and estimated quantities of materials to be used as represented by the environmental product declaration.

Failure to provide a required environmental product declaration informational submittal will result in a \$6,000 performance failure withhold for each missing declaration. The Department returns the withhold within 30 days after receipt of the compliant declaration if submitted prior to Contract acceptance. Withholds become permanent deductions if the declaration is not submitted before Contract acceptance.

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7 LEGAL RELATIONS AND RESPONSIBILITY TO THE PUBLIC

Replace Section 7-1.02K(6)(j)(iii) with:

7-1.02K(6)(j)(iii) Unregulated Earth Material Containing Lead

Section 7-1.02K(6)(j)(iii) includes specifications for handling, removing, and disposing of unregulated earth material containing lead. Management of this material exposes workers to health hazards that must be addressed in your lead compliance plan. This material contains average lead concentrations below 80 mg/kg total lead and below 5 mg/L soluble lead and is not regulated by DTSC as a hazardous substance or a hazardous waste. This material does not require disposal at a permitted landfill or solid waste disposal facility. The RWQCB has jurisdiction over reuse of this material at locations outside the job site limits.

Unregulated earth material exists throughout the job site.

Lead is typically found within the top 2 feet of material within the parking lot. Reuse all of the excavated material on the right-of-way.

Handle the material under all applicable laws, rules, and regulations, including those of the following agencies:

1. Cal/OSHA
2. CA RWQCB, Region 5F (Central Region)

Delete the 24th paragraph of section 7-1.04.

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8 PROSECUTION AND PROGRESS

Replace the row for *Schedule* in the table in the 2nd paragraph of section 8-1.03 with:

Schedule	Baseline schedule and weekly statement of working days report
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Replace section 8-1.04C with:

8-1.04C Delayed Start

Section 8-1.04B does not apply.

Start job site activities within 420 days after receiving notice that the Contract has been approved by the Attorney General or the attorney appointed and authorized to represent the Department.

Do not start job site activities until the Department authorizes or accepts your submittal for:

1. CPM baseline schedule
2. WPCP or SWPPP, whichever applies
3. Notification of DRA or DRB nominee and disclosure statement

You may enter the job site only to measure controlling field dimensions and locate utilities.

Do not start other job site activities until all the submittals from the above list are authorized or accepted and the following information is received by the Engineer:

1. Notice of Materials To Be Used form.
2. Written statement from the vendor that the order for electrical material has been received and accepted by the vendor. The statement must show the dates that the materials will be shipped.

You may start job site activities before the 420th day after Contract approval if you:

1. Obtain specified authorization or acceptance for each submittal before the 420th day
2. Receive authorization to start

Submit a notice 72 hours before starting job site activities. If the project has more than 1 location of work, submit a separate notice for each location.

Replace the 4th and 5th paragraphs of section 8-1.05 with:

The Engineer issues a weekly statement of working days report by the end of the following week. If you disagree with a weekly statement of working days report, submit an RFI within 5 business days of receipt of the report.

The weekly statement of working days report shows:

1. Working days and non-working days during the reporting week
2. Time adjustments
3. Calculations of work completion dates, including working days remaining
4. Controlling activities

Delete the 6th paragraph of section 8-1.05.

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9 PAYMENT

Replace section 9-1.07A with:

9-1.07A General

Section 9-1.07 applies to asphalt contained in materials for pavement structures and pavement surface treatments such as HMA, tack coat, asphaltic emulsions, bituminous seals, asphalt binders, and modified asphalt binders placed in the work. Section 9-1.07 does not apply if you opted out of payment adjustments for price index fluctuations at the time of bid.

The Engineer adjusts payment whenever the California statewide crude oil price index for the month the material is placed is more than 5 percent higher or lower than the price index at the time of bid.

The Department determines the California statewide crude oil price index each month on or about the 1st business day of the month. This is determined by averaging the daily Brent crude oil posted prices from the previous month, as reported by Business Insider. The daily closing price of oil will be used for the corresponding date. If Brent crude oil data is not posted on a given day, the last posted closing price will be used instead.

The Brent monthly average is converted to a California statewide crude oil price index using the following formula:

$$Yc = 0.9975 \times Xb - 2.2565$$

Where:

Yc = California statewide crude oil price index for each month

12-3.20A(2) Definitions

approach zone: Area immediately upstream of the work area and buffer space.

clear area width: Minimum width throughout the length of the barrier system that must be maintained clear of obstructions, objects, and work resources during non-working hours. The width is measured perpendicular from the non-traffic side toe.

departure zone: Area past the work area and the trailing end of the construction area.

height differential: May be an excavation, a downward slope greater than 4:1, or a difference in elevation. The height differential is measured down from the top of pavement.

set back distance: Space measured between the closest toe of temporary barrier and the edge of traveled way for each direction of traffic.

12-3.20A(3) Submittals

Submit as informational submittal for each type of temporary barrier system:

1. Certificate of compliance.
2. Manufacturer's installation instructions except for temporary concrete barriers with loop and pin and temporary concrete barriers with cross bolt.
3. Manufacturer's concrete QC test results and daily production log of precast concrete activities, under section 90-4. QC test results must include the concrete mix design number and barrier stamped ID.

Submit test reports for cross bolts that certify compliance with the applicable ASTM requirements. The test reports must be from a laboratory that is accredited to International Standards Organization/International Electrotechnical Commission 17025 by the American Association for Laboratory Accreditation (A2LA) or the ANSI-ASQ National Accreditation Board.

Submit a signed manufacturer's replacement evaluation report within 10 days of damage to a temporary steel barrier system.

12-3.20A(4) Quality Assurance

12-3.20A(4)(a) General

Temporary barrier systems must comply with MASH Test Level 3 except for Type K temporary railing.

Except for temporary concrete barriers with loop and pin and temporary concrete barriers with cross bolt, temporary barrier systems must:

1. Be on the Authorized Materials List for highway safety features
2. Comply with the manufacturer's drawings shown on the Department's Division of Safety Programs website and the manufacturer's installation instructions

If a discrepancy exists, governing ranking in descending order is:

1. These specifications
2. Manufacturer's drawings
3. Manufacturer's installation instructions

QC sampling, testing, and inspection personnel must have an ACI Concrete Field-Testing Technician, Grade 1 certification.

Temporary concrete barrier segments must:

1. Comply with the requirements for tier 3 precast concrete in section 90-4
2. Be fabricated at a plant on the Authorized Facility Audit List

Concrete must be sampled and tested as shown in the following table.

Concrete QC Tests		
Quality characteristic	Test method	Minimum testing frequency
Compressive strength	ASTM C172/C172M, ASTM C31/C31M, and ASTM C39/C39M	Once per 300 cu yd of concrete cast, or every day of casting, whichever is more frequent
Slump	ASTM C143/C143M	
Temperature at time of mixing	ASTM C1064/C1064M	
Density	ASTM C138	Once per 600 cu yd of concrete cast or every 7 days of batching, whichever is more frequent
Air content	ASTM C231/C231M or ASTM C173/C173M	If concrete is air entrained, once for each set of cylinders, and when conditions warrant

A daily production log of precast concrete activities must be maintained under section 90-4.01C(4).

12-3.20A(4)(b) Quality Control

Replace damaged temporary concrete barrier segments with exposed reinforcing steel or concrete spalls 1-1/2 inches in depth and 4 inches in width or greater. Repair minor damage under section 51-1.03F(2), for temporary concrete barriers with loop and pin and temporary concrete barriers with cross bolt.

Replace damaged temporary steel barrier segments with permanent bends, tearing, or buckling as described in the signed manufacturer's replacement evaluation report.

Realign temporary barrier system within 2 days of impact or displacement when displaced more than 3 inches except when the temporary barrier system is displaced into a traveled lane realign immediately.

12-3.20B Materials

12-3.20B(1) General

Temporary barrier segment must:

1. Be a minimum 31-1/2 inches in height
2. Have at least two lifting holes
3. Be designed to be used with temporary traffic screen when required

Temporary barrier segment may have your name or logo on each barrier segment. The name or logo must be no more than 4 inches in height and must be located no more than 12 inches above the bottom of the barrier segment.

12-3.20B(2) Temporary Concrete Barriers

12-3.20B(2)(a) General

Temporary concrete barrier segment must:

1. Be precast concrete with a minimum 5,000-psi compressive strength, except for Type K Temporary Railing.
2. Have reinforcement steel that complies with section 52.
3. Have a finished surface that complies with section 51-1.03F(2).
4. Include the manufacturer's name, lot number, and month and year of manufacture stamped on the top of each barrier segment except for Type K temporary railing. The stamped information must be:
 - 4.1. No more than 6 inches in height
 - 4.2. From 3/16 to 1/4 inch in depth
 - 4.3. Centered on the top width of the barrier segment
5. Use one of the following segment connections:
 - 5.1. Loop and pin
 - 5.2. "J" hook
 - 5.3. Cross bolt
6. Comply with the tolerances shown in the following table:

Precast Barrier Tolerances

Dimension	Tolerance(\pm)
Length (in)	1
Insert placement (in)	1/2
Horizontal alignment (in)	1/8 per 10 feet of length
Deviation of ends (in):	
Horizontal skew	1/4
Vertical batter	1/8 per foot of depth

Reinforcement steel must:

1. Comply with ASTM A615 or ASTM A706, Grade 60
2. Be galvanized under section 52-3, when required

Combinations of reinforcing steel and welded wire reinforcement are allowed. Welded wire reinforcement must comply with ASTM A1064.

Stake must:

1. Comply with ASTM A36/A36M-14 or ASTM A529-14, Grade 50
2. Be 1-1/2 inches in diameter and 36 inches long, except "J" Hook must be 48 inches long
3. Have a 1/2-by-3-1/2-by-3-1/2-inch plate welded 2 inches down from the upper end using a 3/8-inch fillet weld under AWS D1.1 or D1.4

Anchor bolt must:

1. Be a bolt or threaded rod 1-1/8 inches in diameter
2. Comply with ASTM A307
3. Include a 1/2-by-3-1/2-by-3-1/2-inch plate washer:
 - 3.1. With a 1-3/8-inch-diameter hole in the center
 - 3.2. Complying with ASTM A36/A36M
 - 3.3. Galvanized post fabrication under section 75-1.02B

Threaded rod must include a nut complying with ASTM A563.

Anchor steel plate must:

1. Be 1/2 inch thick
2. Comply with ASTM A572, Grade 50
3. Be galvanized post fabrication under section 75-1.02B

Chemical adhesive must be on the Authorized Materials List for chemical adhesives and must be for a threaded rod at least 1 inch in diameter.

12-3.20B(2)(b) Temporary Concrete Barriers with Cross Bolt

Cross bolt hardware includes:

1. Cross bolt
2. Nut complying with ASTM A563
3. Hardened washer complying with ASTM F436, Type 1
4. Plate washer complying with ASTM A36/A36M and galvanized post fabrication under section 75-1.02B

Cross bolt must:

1. Be a 7/8-inch bolt or threaded rod and comply with one of the following:
 - 1.1. HS threaded rod ASTM A193, Grade B7
 - 1.2. HS threaded rod ASTM A449, Type 1
 - 1.3. HS nonheaded anchor bolt ASTM F1554, Grade 105, Class 2A
2. Have a permanent grade symbol and manufacturer's identifier

12-3.20B(2)(c) Temporary Concrete Barriers with Loop and Pin

12-3.20B(2)(c)(i) General

Not Used

12-3.20B(2)(c)(ii) Temporary Barrier Systems CAL F-23

Connecting loop must:

1. Be a steel bar 3/4 inch in diameter
2. Comply with ASTM A36/A36M, cold roll
3. Be galvanized after fabrication

Connecting pin must:

1. Comply with ASTM A449
2. Be forged, no welds
3. Be 1 inch in diameter and a minimum 30-1/4 inches long
4. Be galvanized under ASTM F2329 and A153

12-3.20B(2)(c)(iii) Type K Temporary Railings

Connecting pin must comply with ASTM A307, be 1-1/4 inch in diameter, and be a minimum 26 inches long. A round bar of the same diameter and length may be substituted for the connecting bolt. The round bar must:

1. Comply with ASTM A36/A36M
2. Have a 3-inch-diameter, 3/8-inch-thick plate welded on the upper end using a 3/16-inch fillet weld

Stake must:

1. Comply with ASTM A706, Grade 60
2. Be 1 inch in diameter and 24 inches long
3. Have a 2-3/4-inch-diameter, 1/2-inch-thick plate, welded 1 inch down from the upper end using a 3/8-inch fillet welds under AWS D1.1 or D1.4

Anchor bolt must:

1. Be a threaded rod, 1 inch in diameter and 15-1/2 inches long
2. Comply with ASTM A307
3. Include a nut complying with ASTM A563
4. Include a 3/8-by-2-1/2-by-3-inch plate washer:
 - 4.1. With a 1-1/8-inch-diameter hole in the center
 - 4.2. Complying with ASTM A36/A36M
 - 4.3. Galvanized post fabrication under section 75-1.02B

12-3.20B(2)(d) Temporary Concrete Barriers with "J" Hook

"J" hook must:

1. Comply with ASTM A36/A36M
2. Be 3/8-inch-thick steel plate
3. Be a minimum 18 inches in height

Anchor hardware must include:

1. Anchor bolt insert 1 inch in diameter and 6 inches long
2. Hex head bolt 1 inch in diameter with a minimum length of 11 inches plus thickness of asphalt overlay
3. 3/8-by-3-by-3-inch plate washer
4. Retainer ring

12-3.20B(3) Temporary Steel Barriers

Temporary steel barrier segment must:

1. Be galvanized steel.
2. Have a joint connection.
3. Include permanent identification information with no more than 6 inches in height and 12 inches in length and centered on the top width of the segment. The identification information must include:
 - 3.1. Manufacturer's name
 - 3.2. Serial number
 - 3.3. Lot number
 - 3.4. Month and year of manufacture

Temporary steel barrier 19-foot segment must be filled to a depth of 11-13/16 inches with concrete ballast.

12-3.20C Construction

12-3.20C(1) General

Install the minimum length of application for temporary barrier systems, including:

1. Approach zone
2. Work area
3. Departure zone

Clean temporary barrier segments at time of installation and at least every 6 months thereafter.

Install temporary barrier systems based on the requirements shown in the following table:

Minimum Clear Area Width

Barriers	Configuration	Height differentials 3 feet or less (ft)	Height differentials greater than 3 feet up to 8 feet (ft)	Edge of deck or height differentials greater than 8 feet (ft)	Fixed objects, falsework members, or temporary supports ^a (ft)
10-foot & 30-foot temporary concrete barrier with cross bolt	Freestanding	1	2	5	5
	3 stakes or anchor bolts per segment traffic side	1	1	2	3
20-foot temporary concrete barrier with cross bolt	Freestanding	1	2	5	5
	4 stakes or anchor bolts per segment traffic side	1	1	2	3
12-foot temporary concrete barrier CAL F-23	Freestanding	4	5	8	8
	3 stakes or anchor bolts per segment traffic side	1	1	2	3
20-foot temporary concrete barrier CAL F-23	Freestanding	4	5	8	8
	4 stakes or anchor bolts per segment traffic side	1	1	2	3
12.5-foot temporary concrete barriers with "J" hook	Freestanding	3	4	8	7
	3 stakes per segment traffic side	1	1	2	3
	2 anchor bolts per segment traffic side	1	1	2	3
20-foot temporary concrete barriers with "J" hook	Freestanding	3	4	8	7
	4 stakes per segment traffic side	1	1	2	3
	3 anchor bolts per segment traffic side	1	1	2	3
50-foot temporary steel barriers	Staked or anchored at both ends only	6	7	9	10
	Staked or anchored every 250 feet	5	6	8	9
	Staked or anchored every 33 feet	1	1	3	4
19-foot temporary steel barriers	Freestanding	4	5	7	8
12-foot-9-inch temporary steel barriers	Staked every 30 feet	1	2	4	5
	Freestanding	2	3	8	7

20-foot Type K temporary railings (NCHRP 350)	2 stakes or 2 anchor bolts per segment traffic side	1	1	3	4
	4 stakes or 4 anchor bolts per segment	N/A	N/A	3	3

^aThe minimum clear area width to a falsework or temporary support footing can be 2 feet less than the clear area width shown. Measure clear area width to the footing edge closest to traffic.

Place temporary barrier systems on concrete or asphalt concrete pavement.

When required, stake temporary barrier systems placed on asphalt concrete pavement.

When required, anchor temporary barrier systems placed on concrete pavement. For bridge decks, confirm the anchor will not penetrate closer than 1-1/2 inches from the bottom of the deck before placement. When temporary barrier is not shown, request the Engineer to verify the bridge deck thickness.

For installations on concrete pavement, drill holes and bond anchor bolts, threaded rods, or dowels under section 51-1.03E(5). Do not drill the top of supporting beams or girders, bridge expansion joints, or drains.

Install stakes and anchor bolts so the heads do not project above the top of the temporary barrier pocket profile.

Offset the approach zone of temporary barrier systems a minimum of 15 feet from the edge of an open traffic lane and stake or anchor barrier ends as shown. Taper the temporary barrier approach zone toward the edge of the open traffic lane at the rate shown in the following table:

Temporary Barrier System Taper Rate

Posted speed (mph)	Rate ^a
0 to 45	10:1
46 to 60	15:1
61 to 65	20:1

^aRate is longitudinally to transversely with respect to the edge of the traveled way

When a 15-foot minimum tapered offset cannot be achieved, offset temporary barrier systems the maximum distance available, place the first segment at the approach end parallel to the road, and install an authorized temporary crash cushion system at each barrier approach end. Ensure the temporary barrier approach zone length is a minimum:

1. 60 feet on facilities with a posted speed of 45 mph or less
2. 100 feet on facilities with a posted speed greater than 45 mph

Place a minimum 60 feet temporary barrier departure zone length.

Install a reflector on the top or face of barrier segments placed within 10 feet of a traffic lane. Space reflectors at approximately 20-foot intervals. Apply adhesive for mounting the reflector under the reflector manufacturer's instructions.

Install a Type P marker panel complying with section 82 at:

1. Each end of a temporary barrier system placed adjacent to a two-lane, two-way highway
2. The end facing traffic for a temporary barrier system installed adjacent to a one-way roadbed
3. The end of the skew nearest the traveled way when a temporary barrier system is placed on a skew

Maintain a minimum height of 31-1/2 inches above pavement for temporary barrier systems. For paving activities adjacent to temporary barriers, do not pave within 2 feet of the barrier segments unless authorized. For paving under the temporary barrier, remove and reset the barrier.

Remove temporary barrier systems when no longer required for the work. Remove stakes and anchor bolts so that minimal damage is done to pavement.

After removing the temporary barrier systems:

1. Restore the area to its previous condition or construct it to its planned condition if temporary excavation or embankment was used to accommodate the temporary barrier.
2. Remove all threaded rods or dowels to a depth of at least 1 inch below the top of concrete pavement. Fill the resulting holes with mortar under section 51-1 except cure the mortar by the water method or by the curing compound method using curing compound no. 6.
3. Repair damaged asphalt pavement by providing a clean, smooth edge around the damaged area. Repair any heaving caused by stake removal to provide a uniform surface. Remove loose debris and use compressed air to clean out the stake hole. Comply with manufacturer's requirements except fill the stake hole with grout to existing pavement elevation under section 51-1.

If the Engineer orders a lateral move of a temporary barrier system and repositioning is not shown, the lateral move is change order work except for work area access, clear area width compliance, or because of your means and methods to perform the work.

12-3.20C(2) Temporary Concrete Barriers

12-3.20C(2)(a) General

Before placing temporary barrier systems on the job site and after each described relocation, paint the exposed surfaces of the segments with white paint complying with specifications for acrylic emulsion paint for exterior masonry.

Place and maintain the abutting ends of segments in alignment without substantial offset from each other.

For freestanding temporary barrier systems, you may extend the taper by 60 feet beyond the required 15-foot tapered offset instead of anchoring the barrier ends.

Install stakes or anchors as shown and maintain a minimum 1-foot set back distance on both sides of barrier, when temporary barrier systems are placed with traffic on both sides.

12-3.20C(2)(b) Temporary Concrete Barriers with Cross Bolt

Intermix segments of different lengths within a temporary barrier system when necessary.

For temporary barrier systems placed on a curved layout, maintain the minimum curve radius shown in the following table:

Minimum Curve Radius	
Segment length (ft)	Curve radius (ft)
10	125
20	265
30	400

12-3.20C(2)(c) Temporary Concrete Barriers with Loop and Pin

12-3.20C(2)(c)(i) General

Not Used

12-3.20C(2)(c)(ii) Temporary Concrete Barriers CAL F-23

Intermix segments of different lengths within a temporary barrier system when necessary.

For temporary barrier systems placed on a curved layout, maintain the minimum curve radius shown in the following table:

Minimum Curve Radius	
Segment length (ft)	Curve radius (ft)
12	100
20	165

12-3.20C(2)(c)(iii) Type K Temporary Railings

Do not install Type K temporary railings on projects advertised after December 31, 2026.

Install a minimum 160 feet of Type K temporary railing.

Excavate and backfill under section 19-3.

Do not compact earth fill placed behind Type K temporary railings in a curved layout.

Place temporary barrier systems on a firm, stable surface. Grade the area to provide a uniform bearing surface throughout the entire length of the system.

12-3.20C(2)(d) Temporary Concrete Barriers with "J" Hook

When temporary barrier systems are placed with traffic on both sides, install on each side:

1. 2 anchors or stakes for 12.5-foot segments
2. 3 anchors or stakes for 20-foot segments

12-3.20C(3) Temporary Steel Barriers**12-3.20C(3)(a) General**

Install temporary barrier systems under manufacturer's instructions.

12-3.20C(3)(b) 50-Foot Temporary Steel Barriers

Use 50-foot temporary steel barriers with or without rubber pads.

Install a minimum 250 feet of 50-foot temporary steel barrier.

Maintain a minimum radius of 800 feet for segments placed on a curved layout. For tighter curves down to a 250-foot radius, contact the manufacturer before installation and provide manufacturer's written recommendation for the installation.

Stake or anchor segments every 33 feet and maintain a minimum 2-foot set back distance on both sides of barrier, when temporary barrier systems are placed with traffic on both sides.

12-3.20C(3)(c) 19-Foot Temporary Steel Barriers

Install a minimum 323 feet of 19-foot temporary steel barrier.

Maintain a minimum radius of 262 feet for segments placed on a curved layout.

Maintain a minimum 5-foot set back distance on both sides of barrier, when temporary barrier systems are placed with traffic on both sides.

12-3.20C(3)(d) 12-Foot-9-Inch Temporary Steel Barriers

Install a minimum 260 feet of 12-foot-9-inch temporary steel barrier.

Maintain a minimum radius of 755 feet for segments placed on a curved layout.

Stake or anchor segments and maintain a minimum 2-foot set back distance on both sides of barrier, when temporary barrier systems are placed with traffic on both sides.

12-3.20D Payment

The payment quantity for temporary barrier systems is the length measured along the top of the barrier segments.

Add to the beginning of section 12-3.32C:

Place one (1) portable changeable message sign for each shoulder closure. For one-way reversing lane closures, place one (1) portable changeable message sign for each direction of travel. The exact locations will be designated by the Engineer.

Add between the 9th and 10th paragraphs of section 12-3.32C:

Start displaying the message on the sign 5 minutes before closing the lane or shoulder or when directed by the Engineer.

Replace section 12-3.36 with:

12-3.36 PORTABLE TRANSVERSE RUMBLE STRIPS

12-3.36A General

12-3.36A(1) Summary

Section 12-3.36 includes specifications for providing portable transverse rumble strips.

12-3.36A(2) Definitions

Not Used

12-3.36A(3) Submittals

Submit a copy of the manufacturer's instructions as an informational submittal before using portable transverse rumble strips.

12-3.36A(4) Quality Assurance

Not Used

12-3.36B Materials

Portable transverse rumble strips must:

1. Be on the Authorized Material List for signing and delineation materials
2. Be rated for ambient temperatures from 0 to 150 degrees F
3. Have a minimum weight of 75 pounds and withstand vehicles up to 80,000 pounds with minimal movement
4. Not degrade due to weather or traffic conditions
5. Have a non-slip textured surface
6. Have a drainage design that efficiently removes liquid without displacing the unit
7. Be black or orange in color

12-3.36C Construction

Install portable transverse rumble strips under the manufacturer's installation instructions.

Before installation of portable transverse rumble strips, the roadway must be cleaned and free of dust, sand, and other materials that may cause slippage. Place each portable transverse rumble strip on a uniform paved surface free of defects, including potholes, excessive rutting, separated transverse joints, and utility structures.

Portable transverse rumble strips, whether comprised of one segment or interlocking segments, must extend to the full lane width, and be configured in accordance with the manufacturer's recommendations. Use 2 arrays where each array consists of 3 rumble strips.

Portable transverse rumble strips must not be placed at any of the following locations:

1. On sharp horizontal curves
2. On vertical curves
3. Through pedestrian crossings

Portable transverse rumble strips are not required if:

1. Duration of work in a work zone is 4 hours or less
2. Posted speed limit is below 45 mph
3. Work is of emergency nature
4. Work zone is in snow or icy weather conditions

Portable transverse rumble strips must be installed without adhesive or bolts.

When a portable transverse rumble strip consists of multiple sections, connect sections under the manufacturer's instructions before placing them in the traffic lane.

If a portable transverse rumble strip is displaced out of alignment or skewed by more than 6 inches, as measured from one end to the other, immediately readjust position to original location.

Portable transverse rumble strips that no longer provide audible or vibratory alerts must be replaced immediately.

12-3.36D Payment

Not Used

Add to section 12-4.02A(2):

special days: Martin Luther King Jr Day, Cesar Chavez Day, and Easter Sunday Weekend including Friday prior.

Add to the end of section 12-4.02C(1):

Keep the full width of the traveled way open to traffic when no active construction activities are occurring in the traveled way or within 6 feet of the traveled way.

Add to the end of section 12-4.02C(3)(a):

If work vehicles or equipment is parked on the shoulder within 6 feet of a traffic lane, close the shoulder area with fluorescent-orange traffic cones or portable delineators. Place the cones or delineators on a taper in advance of the parked vehicles or equipment and along the edge of the traveled way at 25-foot intervals to a point not less than 25 feet past the last vehicle or piece of equipment. Use at least 9 cones or delineators for the taper. Place advance warning signs as specified in section 12-4.02C(8).

Replace section 12-4.02C(3)(d) with:

12-4.02C(3)(d) City Street Closure Requirements

Inform motorists of a temporary closure of a City or County street using a Portable Changeable Message Sign (PCMS) in each direction of traffic. The PCMS must be located as designated by the Engineer and must remain in place and visible to motorists during the roadway closure. Notify the Engineer at least 2 business days before installing the PCMS. The PCMS must be installed 7 to 15 days before the closure.

Replace section 12-4.02C(3)(f) with:

12-4.02C(3)(f) Closure Restrictions for Designated Holidays and Special Days

Closure restrictions for designated holidays and special days are shown in the following table:

Lane Closure Restrictions For Designated Holidays And Special Days											
Thu	Fri	Sat	Sun	Mon	Tues	Wed	Thu	Fri	Sat	Sun	Mon
x	H xx	xx	xx								
	SD xx										
x	xx	H xx	xx								
		SD xx									
	x	xx	H xx	xx							
			SD xx								
	x	xx	xx	H xx	xxx						
	x	xx	xx	SD xx	xxx						
				x	H xx						
				x	SD xx						
					x	H xx					
						SD xx					
						x	H xx	xx	xx	xx	
							SD xx				
Legend:											
	Refer to lane requirement charts.										
x	The full width of the traveled way and shoulders must be open for use by traffic after 12:00 noon.										
xx	The full width of the traveled way and shoulders must be open for use by traffic.										
xxx	The full width of the traveled way and shoulders must be open for use by traffic until 12:00 noon.										
H	Designated holiday										
SD	Special day										

Replace section 12-4.02C(3)(m) with:

12-4.02C(3)(m) City Street Closure Hour Charts and City Street Lane Requirement Charts

Comply with the requirements for a city street lane closure shown in the following charts:

Chart No. M1																									
City Street Lane Requirements and Hours of Work																									
Location: West Avenue													Direction: Northbound/Southbound												
Closure limits: From Olive Avenue to Golden State Boulevard																									
Hour	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Mon– Thu								R	R	R	R	R	R	R	R	R	R	R							
Fri								R	R	R	R	R	R	R	R	R	R	R							
Sat																									
Sun																									
Legend: <div style="display: flex; margin-bottom: 10px;"> <div style="border: 1px solid black; width: 30px; height: 20px; display: flex; align-items: center; justify-content: center; margin-right: 5px;"> </div> No work is allowed. </div> <div style="display: flex; margin-bottom: 10px;"> <div style="border: 1px solid black; width: 30px; height: 20px; display: flex; align-items: center; justify-content: center; margin-right: 5px;">R</div> Provide at least 1 through traffic lane not less than 12 feet in width for use by both directions of travel. (Reversing Control) </div>																									
REMARKS: The number of through traffic lanes in each direction of travel is 1.																									

Add to the end of section 12-4.02C(7)(b):

Except for one-way-reversing traffic-control lane closures, the maximum length of the work area inside a closure is 0.5 mile.

Not more than 1 stationary closure is allowed in each direction of travel at one time.

For a stationary one-way-reversing traffic-control lane closure, you may stop traffic in 1 direction for periods not to exceed 10 minutes. After each stoppage, all accumulated traffic for that direction must pass through the work zone before another stoppage is made.

The maximum length of a single stationary one-way-reversing traffic-control lane closure is 0.5 mile between flaggers.

Not more than 1 stationary one-way-reversing traffic-control lane closure will be allowed at one time. You may use a pilot car to control traffic. If a pilot car is used to control traffic, the cones shown along the centerline are not required. Pilot cars must have cellular or radio contact with other pilot cars and personnel in the work zone. The maximum speed of the pilot cars conveying or controlling traffic through the traffic control zone is 25 mph. Pilot cars must only use traffic lanes open to traffic.

AA

14 ENVIRONMENTAL STEWARDSHIP

Add to the 1st paragraph of section 14-6.03A:

This project is within or near habitat for the regulated species shown in the following table:

Regulated Species

Migratory nesting birds, and other avian species
Raptor Species (Hawks)

Replace item 1 in the list in the 2nd paragraph of section 14-6.03A with:

1. Stop all work within a 100-foot radius of the discovery except as shown in the following table:

Regulated species	Protective radius (feet)
Avian Nests	250
Raptor Nests	500

Add to section 14-6.03A:

Species protection areas within the project limits are as specified in the following table:

Species Protection Areas

Identification name	Location
Species Protection Area 1	Entire project limits

Comply with the following biological resource information requirements:

1. Before performing activity or work, Department biologist provides Worker Environmental Awareness Training (WEAT) to workers. Workers specified here, includes laborers, tradesmen, material suppliers, equipment maintenance personnel, supervisors, foremen, office personnel, food vendors, and other personnel who stay on the project longer than 60 minutes. The training session will be approximately 30 minutes or less in duration.
2. Subsequent WEAT sessions are required for all new workers prior to their performing work.
3. Notify the Engineer no less than 5 working days prior to schedule WEAT sessions.
4. Do not schedule more than 1 WEAT session within a week.
5. The contractor must notify the Resident Engineer no less than 30 working days before the beginning of any construction activity at all project locations to allow the biologist(s) to conduct pre-construction surveys.

Within Species Protection Area 1, implement the following protection measures:

1. Keep all construction-related access within the project limits and to existing highway and associated paved or graded shoulders or other designated areas clearly marked on the ground. Prohibit off-road travel outside of project site.
2. A Department Biologist must survey for sensitive species prior to beginning any construction-related activities. Notify the Engineer 30 days prior to any construction activities to request surveys.

3. Project-related traffic must observe a 20 mile per hour speed limit except on roads or highways open for public use.
4. Should any wildlife be encountered during the course of project activities, allow the wildlife to leave the area unharmed and on their own volition.
5. Remove all materials resulting from the Project from the site and dispose of properly.
6. Trash Monitoring: contain trash and food items in animal-proof containers and remove daily to avoid attracting wildlife to the project site.
7. Remove invasive species from the work area. Remove, bag and dispose invasive species identified by the project biologist at an appropriate location. Do not use such material in mulching, composting or otherwise place in or around the work area.
8. Do not remove trees within the nesting season without prior approval by a Caltrans biologist.

Monitor regulated species according to the schedule shown in the following table:

Monitoring type	Schedule
Trash Monitoring	Daily

Replace the 2nd paragraph of section 14-6.03B with:

Replace item 1 in the list in the 6th paragraph of section 14-6.03B with:

1. Stop all work within a 100-foot radius of the discovery except as shown in the following table:

Species	Protective radius (feet)
Bird of Prey nest	500
Other avian species nest	250

Add to the end of section 14-9.02:

The US EPA has established the National Emission Standards for Hazardous Air Pollutants (NESHAP). Under the Health & Safety Code § 39658(b)(1), your demolition and rehabilitation activities must comply with 40 CFR 61, Subpart M (National Emission Standard for Asbestos). The asbestos survey and sampling report for this project is included in the *Information Handout*.

You must notify the San Joaquin Valley Air Pollution Control District of your demolition activities even if the activities will not disturb asbestos-containing material.

You must process the notification form, submittal instructions, and other information from:

San Joaquin Valley Air Pollution Control District
1900 East Gettysburg Avenue
Fresno, California 93726

Instead of the 10 days specified at the website, submit a notification form to the San Joaquin Valley Air Pollution Control District at least 15 days before starting demolition or rehabilitation activities.

Submit a copy of the notification form and the necessary attachments as informational submittals before starting demolition or rehabilitation activities.

Notify the San Joaquin Valley Air Pollution Control District of a change to your demolition or rehabilitation activities, including a revised work plan or the discovery of unanticipated asbestos-containing materials, within 2 business days of the change or discovery.

Replace section 14-11.17 with:

14-11.17 REMOVAL AND MANAGEMENT OF LEAD PAINT ON BUILDINGS TO BE DEMOLISHED

14-11.17A General

Section 14-11.17 includes specifications for removing and managing lead paint and materials painted with lead paint during the demolition of buildings. Paint waste that exceeds hazardous-waste thresholds for lead is a Department-generated hazardous waste.

Remove, package, store, transport, and dispose of materials painted with lead paint as well as lead-containing debris when those materials are disturbed under all applicable federal, state, and local laws and regulations. Laws and regulations that govern this work include:

1. Health and Safety Code, Division 20, Chapter 6.5 (California Hazardous Waste Control Act).
2. 22 CA Code of Regulations, Division 4.5, (Environmental Health Standards for the Management of Hazardous Waste)
3. 8 CA Code of Regulations section 1532.1
4. 17 CA Code of Regulations, Division 1, Chapter 8

Removal and management of lead paint exposes workers to health hazards that must be addressed in your lead compliance plan.

14-11.17B Site Conditions

Hazardous waste concentrations of lead were detected in samples from intact, well-adhered paint on the following structures to be demolished:

1. West Avenue Maintenance Station – Building B
2. West Avenue Maintenance Station – Building D-F

Concentration and location of paints containing hazardous waste levels of lead are as follows:

Structure	Paint location	Paint description	Total lead in mg/kg	Cal WET ^a in mg/L	TCLP in mg/L ^b	Paint waste classification
Building B	HVAC Ceiling	Tan/drywall	530	N/A*	N/A*	Assume CA, Non-RCRA Hazardous
Building D-F	Exterior Roll-up Door Frame	White/metal	1,600	N/A*	N/A*	Assume CA, Non-RCRA Hazardous

^aCal WET = California Waste Extraction Test

^bTCLP = Toxicity Characteristic Leaching Procedure

N/A* = Not enough sample material remaining to run additional analysis

The relevant portions of the lead-based paint survey report are included in the Information Handout.

14-11.17C Submittals

14-11.17C(1) General

Not used

14-11.17C(2) Removal Work Plan

Submit a work plan for the removal, storage, transportation, and disposal of lead-containing paint and construction debris painted with lead-containing paint. The work plan must include:

1. Installing warning signs at perimeters of abatement work areas
2. Removing peeling and flaking paint containing hazardous waste concentrations of lead before demolition activities
3. Methods to avoid generating paint debris while disturbing surfaces with intact, well-adhered lead paint
4. Methods for containing and collecting hazardous-waste lead paint debris that breaks or chips off during demolition activities
5. Paint waste characterization
6. Containerizing, labeling, and temporary storage methods for hazardous-waste lead paint debris under section 14-11.07
7. Providing hazardous-waste disposal manifests upon completion for the Engineer to sign
8. Providing transporters registered with the DTSC to transport hazardous waste
9. Performing a lead waste analysis for construction debris with intact, well-adhered lead paint in accordance with section 14-11.17F (volume analysis) to determine appropriate and legal disposal
10. Disposing of construction debris with intact, well-adhered lead paint determined to be nonhazardous waste at a disposal facility permitted to receive it by the California Environmental Protection Agency
11. Compliance with federal, state, and local requirements for lead-related construction work and transport and disposal of lead paint and materials painted with lead paint

Allow 5 business days for the Engineer to review and authorize the work plan. Make any changes requested for acceptance within business 5 days. Submit 4 copies of the final work plan.

14-11.17C(3) Safety Training Certification

Submit a written certification of completion of safety training for all personnel before performing any work in areas containing lead paint.

14-11.17C(4) Paint Waste Characterization Report

Submit waste characterization results of debris removed from deteriorated, flaking, or peeling painted surfaces and from debris that breaks off or chips from any surface during demolition activities, including sample chain-of-custody documentation, for review and acceptance before:

1. Requesting the Engineer's signature on the waste profile document for the disposal facility
2. Requesting the Department's EPA Identification Number for hazardous-waste disposal
3. Removing the debris from the job site

14-11.17D Health and Safety

Supply medical surveillance required under your lead compliance plan to 5 state employees.

14-11.17E Removal of Deteriorated Lead Paint and Paint Debris Management

14-11.17E(1) General

Remove deteriorated, flaking, or peeling paint containing hazardous-waste concentrations of lead from all surfaces before demolition. Avoid generating paint debris while disturbing surfaces with intact, well-adhered paint containing hazardous waste levels of lead. Collect and contain paint debris generated during disturbance of surfaces with paint containing hazardous waste levels of lead. Manage, store, transport, and dispose of the generated paint waste under section 14-11.07.

14-11.17E(2) Paint Waste Characterization

Perform waste characterization testing on the paint debris removed from deteriorated, flaking, or peeling surfaces and on paint debris generated during surface disturbance as required by the receiving disposal facility, including:

1. Total lead by US EPA Method 6010B
2. Soluble lead by CA Waste Extraction Test (CA WET)
3. Soluble lead by Toxicity Characteristic Leaching Procedure (TCLP)

From the first 220 gal of hazardous waste or portion thereof, if less than 220 gal of hazardous waste are produced, a minimum of 4 randomly selected samples must be taken and analyzed individually. Samples must not be composited. From each additional 880 gal of hazardous waste or portion thereof, if less than 880 gal are produced, a minimum of 1 additional random sample must be taken and analyzed.

Use chain-of-custody procedures consistent with chapter 9 of US EPA Test Methods for Evaluating Solid Waste, Physical/Chemical Methods (SW-846) while transporting samples from the job site to the analytical laboratory. The laboratory must be certified by the State Water Resources Control Board Environmental Laboratory Accreditation Program for all analyses to be performed.

Before performing the analyses, the laboratory must homogenize each sample. The homogenization process must not include grinding of the samples. A sample aliquot must be:

1. Obtained in an amount large enough for all analyses to be performed
2. Homogenized a second time
3. Used for the total and soluble analyses after the 2nd homogenization

14-11.17F Construction Debris With Intact, Well-Adhered Lead Paint

14-11.17F(1) General

Manage construction debris with intact, well-adhered lead paint under all applicable regulations. Apply the most stringent requirements if there is a conflict or overlap of requirements.

Perform a waste analysis for lead on construction debris with intact, well-adhered lead paint to determine whether the debris is a hazardous waste under 22 CA Code of Regulations, Division 4.5 before disposal (volume analysis).

14-11.17F(2) Nonhazardous Lead-Containing Construction Debris

If the results of the waste analysis demonstrate that the lead-containing construction debris contains lead below hazardous waste concentrations and the Engineer authorizes the results, dispose of the debris at an appropriately permitted CA Class II or CA Class III disposal facility.

14-11.17F(3) Hazardous Waste Lead-Containing Construction Debris

If the results of the waste analysis demonstrate that the lead-containing construction debris is a hazardous waste, manage the debris under section 14-11.07.

14-11.17G Transportation and Disposal

Dispose of hazardous waste paint debris under section 14-11.07 at a California disposal site operating under a DTSC permit and permitted to accept waste regulated under the Federal Resource Conservation and Recovery Act, 42 USC § 6901 et seq.

Make arrangements with the operators of the disposal facilities and perform any additional testing of debris required by the operator.

Replace section 14-11.18 with:

14-11.18 REMOVAL AND MANAGEMENT OF ASBESTOS IN BUILDINGS TO BE DEMOLISHED

14-11.18A General

Section 14-11.18 includes specifications for removing and disposing of asbestos from buildings to be demolished.

State forces will not occupy the building until asbestos removal is complete and certification for reentry has been received.

This project involves the removal and disposal of ACM.

The removal and disposal of asbestos must comply with:

1. Health and Safety Code Division 20 Ch 6.5, Hazardous Waste Control
2. 8 CA Code of Regulations § 5208
3. 8 CA Code of Regulations §§ 1529 and 341.6-341.17
4. 22 CA Code of Regulations Division 4.5
5. 29 CFR 1926
6. 40 CFR 61 Subpart M – National Emissions Standard for Asbestos
7. Business & Professions Code §§ 7058.5-7058.6, 7180-7189.7, and 7028.1
8. 40 CFR part 763 Asbestos Hazard Emergency Response Act (AHERA)
9. US EPA's "Asbestos/NESHAP Regulated Asbestos Containing Materials Guidance"

Friable ACM generated as part of this project is a Department-generated hazardous waste as specified in section 14-11.07.

14-11.18B Definitions

asbestos: Any of several minerals that readily separate into long flexible fibers. Includes chrysotile, amosite, crocidolite, tremolite, anthophyllite, actinolite, and any of these minerals that has been chemically treated, altered, or both.

asbestos-containing construction material (ACCM): Manufactured construction material which contains more than 1/10th of 1 percent asbestos by weight under 8 CCR § 341.6.

asbestos-containing material (ACM): Building material, including asbestos cement pipe and concrete, containing more than 1 percent asbestos by weight, area, or count under 40 CFR §61.145.

Category I nonfriable ACM: Asbestos-containing packings, gaskets, resilient floor covering, and asphalt roofing products containing more than 1 percent asbestos under 40 CFR § 61.141. Nonfriable ACM is not a hazardous waste but is still regulated.

Category II nonfriable ACM: Any material, excluding Category I nonfriable ACM, containing more than 1 percent asbestos that, when dry, cannot be crumbled, pulverized, or reduced to powder by hand pressure under 40 CFR § 61.141. Nonfriable ACM is not a hazardous waste but is still regulated.

certified asbestos consultant (CAC): Asbestos consultant certified by Cal/OSHA under 8 CA Code of Regulations §§ 341.15 and 1529. A certified asbestos consultant must be registered or working for a company registered under Labor Code § 6501.5 and certified under Business & Professions Code § 7058.6.

friable ACM: Material containing more than 1 percent asbestos, as determined by polarized light microscopy, that can be crumbled, pulverized, or reduced to powder by hand pressure when dry as defined under 22 CCR § 66261.24. Friable ACM is a hazardous waste.

nonfriable ACM: Material containing more than 1 percent asbestos by area with asbestos fibers that:

1. Are tightly bound into the matrix of the material
2. Should not become an airborne hazard as long as the material remains intact and undamaged and is not sawed, sanded, drilled, or otherwise abraded during removal

nonhazardous asbestos waste: ACCM with an asbestos concentration less than or equal to 1 percent by weight or nonfriable ACM. These wastes are not hazardous wastes under 22 CA Code of Regulations Division 4.5.

regulated asbestos-containing material (RACM): Under 40 CFR § 61.141, RACM is identified as any of the following:

1. Friable ACM
2. Category I nonfriable ACM that has become friable or will be or has been subjected to sanding, grinding, cutting or abrading
3. Category II nonfriable ACM that may become, has become, or has a high probability of becoming friable

14-11.18C Site Conditions

An asbestos survey was performed for Building B and Buildings D-F of the West Avenue Special Crews Maintenance Station located at 1283 North West Avenue in Fresno.

The relevant portions of the asbestos survey report are included in the *Information Handout*.

Asbestos is present at the locations and in the types and amounts shown in the following table:

Building	Asbestos location/ Description	Friable or nonfriable	Percent asbestos and type	Estimated Amount of asbestos
B	Roof Penetrations/Sealant, Black	Nonfriable	5%, Chrysotile	10 SF
B	HVAC Ducting/Paint Tan	Friable	2.2%, Chrysotile	greater than 100 SF
D-F	Exterior Wall and Roof/Transite, Gray	Nonfriable	15%, Chrysotile	12,000 SF
D-F	Exterior Panel Joints and Penetrations/Sealant, White	Nonfriable	10%, Chrysotile	120 SF

14-11.18D Submittals

14-11.18D(1) General

Not Used

14-11.18D(2) Asbestos Compliance Plan

Submit an asbestos compliance plan for preventing or minimizing workers' exposure to asbestos during demolition activities. Submit the plan at least 15 days before starting demolition activities in areas containing or suspected to contain asbestos. The plan must be prepared by a certified industrial hygienist (CIH) with experience and knowledge of asbestos removal work and by the CAC who will direct the removal, storage, transportation, and disposal of asbestos. The plan must include:

1. Identification of key personnel for the project
2. Scope of work and equipment to be used
3. Job hazard analysis for work assignments
4. Summary of risk assessment
5. Description of personal protective equipment
6. Delineation of work zones at the job site
7. Decontamination procedures
8. General safe work practices
9. Security measures
10. Emergency response plans
11. Safety training program
12. Re-entry certification testing

14-11.18D(3) Asbestos Removal Work Plan

Submit a work plan for the removal, storage, transportation, and disposal of asbestos 15 days before starting demolition activities in areas containing or suspected to contain asbestos. The work plan must be prepared and signed by a CAC and include:

1. Name of the CAC who will direct the removal, storage, transportation, and disposal of asbestos.
2. Locations at the perimeters of abatement work areas where asbestos warning signs will be installed.
3. Summary of the methods and techniques for removal, handling, packaging, labeling, storing, transporting, and disposing of waste materials.
4. Instructions for wetting asbestos materials with sprayers.
5. Description and locations of disposal bins for temporary storage of asbestos until removal from the job site.
6. Name and address of the hazardous waste transporter that will transport friable ACM to a DTSC-permitted hazardous waste facility. The transporter must be registered with the DTSC to transport hazardous waste under the Health and Safety Code Division 20 Ch 6.5 and 22 CA Code of Regulations Division 4.5.
7. Name and address of the California disposal facility permitted for the disposal of ACM.
8. Documentation of compliance with federal, State, and local requirements for asbestos work, transport, and disposal.

14-11.18D(4) Certification of Completed Safety Training

Submit certification of completed safety training for all personnel before starting work in areas containing or suspected to contain asbestos.

14-11.18D(5) Asbestos Removal Report

Submit an asbestos removal report documenting your compliance with the asbestos removal work plan. Submit the report to the Engineer and the APCD or AQMD within 30 days after removing asbestos from the job site.

14-11.18D(6) Disposal Documentation

Submit a copy of the hazardous waste manifest for each shipment of friable ACM. Submit a copy of the shipping document for each shipment of nonhazardous asbestos waste that has concentrations below the hazardous waste threshold.

Within 5 business days of transporting hazardous and nonhazardous asbestos waste, submit documentation of proper disposal from the receiving disposal facility.

14-11.18D(7) Clearance Testing Documentation and Certification

Submit a copy of the final visual inspection and air clearance sampling. For the purpose of this work, clearance shall be defined as an air sample showing fiber counts at or below 70s/mm² by Transmission Electron Microscopy (TEM) analysis following the Asbestos Hazard Emergency Response Act (AHERA) 40 CFR Part 763 Appendix A to Subpart E (Transmission Electron Microscopy Analytical Method).

Submit laboratory analysis report and chain of custody (COC) of the Contractor's personal monitoring results within 48 hours following completion of that work shift. Personal air monitoring results shall not exceed the maximum use level (MUL) of the respiratory protection factor (PF) in use for asbestos.

14-11.18E Health and Safety

Before starting work in areas containing or suspected to contain asbestos provide safety training complying with 8 CA Code of Regulations § 1529 to State employees who may enter the work area.

Provide training, personal protective equipment, and medical surveillance as required by the asbestos compliance plan for 3 State employees.

14-11.18F Removal and Disposal of Unanticipated Asbestos

If you discover unanticipated asbestos during demolition activities, immediately stop work in that area and notify the Engineer.

The removal and disposal of asbestos not identified in the asbestos survey report is change order work.

14-11.18G Removal of Asbestos

Remove asbestos before starting other demolition work under the direction of a CAC. Remove asbestos under 8 CA Code of Regulations §§ 1529 and 341 et seq. Remove friable asbestos using the wetting method. Remove and handle nonfriable asbestos such that you prevent breakage.

You are not required to remove asbestos encased in concrete or similar structural material before starting demolition. Keep the asbestos wet whenever it is exposed during demolition activities. Prevent airborne emissions from asbestos removal activities.

Mark the regulated work areas with warning signs that read, *Danger, Asbestos, Cancer and Lung Disease Hazard, Authorized Personnel Only*. The message must be legible from a distance of 20 feet by persons with 20/20 vision or vision corrected to 20/20.

14-11.18H Packaging and Temporary Storage of Asbestos-Containing Material

Package and label removed ACM under 22 CA Code of Regulations § 66262.30 et seq. Place the removed ACM in minimum, 0.006-inch-thick, double-ply, plastic bags with clearly visible and legible labels affixed to the bags. The labels must read, *Danger/ Contains Asbestos Fibers/ Avoid Creating Dust/ Cancer and Lung Disease Hazard*. Wet the waste before placing it in the plastic bag to prevent asbestos fibers from becoming airborne if the bag is broken.

Do not break apart bulk waste that will not fit inside a plastic bag. Instead, wet the waste, wrap it in plastic, and seal it with packaging or duct tape until it is leak-proof. Place the wrapped and sealed ACM directly into a covered, lockable, roll-off or drop box lined with plastic sheeting and labeled on all sides. The labels must be legible and read, *Danger/ Contains Asbestos Fibers/ Avoid Creating Dust/ Cancer and Lung Disease Hazard*.

14-11.18I Transport and Disposal of Asbestos-Containing Material

14-11.18I(1) General

Dispose of asbestos at a California disposal facility operating under a RWQCB permit to accept the asbestos waste. Notify the facility at least 5 business days before the delivery.

14-11.18I(2) Friable Asbestos-Containing Material

Transport and dispose of friable ACM as a hazardous waste under section 14-11.07C. The Engineer provides the Department's EPA Identification Number for hazardous waste disposal. The Engineer signs the hazardous waste manifests. Notify the Engineer 5 business days before the manifests are to be signed.

Use a transporter for friable ACM with:

1. Current DTSC registration for transporting hazardous waste
2. US EPA Identification number
3. Proof of completion of the California Highway Patrol's Basic Inspection of Terminals Program with a satisfactory rating

The transporter's vehicles must carry a valid DTSC registration when transporting friable ACM.

14-11.18I(3) Nonhazardous Asbestos Waste

Transport nonhazardous asbestos waste to an appropriate permitted disposal facility with a shipping document.

14-11.18J Quality Assurance

14-11.18J(1) General

Not Used

14-11.18J(2) Notifications, Communications and Postings

The Contractor shall notify the Engineer 15 working days before the start of any abatement work. Before starting operations involving the removal of material containing asbestos, provide written notification to the following agencies:

Replace section 20-5.06 with:

20-5.06 DECORATIVE BOULDERS

20-5.06A General

20-5.06A(1) Summary

Section 20-5.06 includes specifications for placing decorative boulders.

20-5.06A(2) Definitions

Not Used

20-5.06A(3) Submittals

At least 30 days before delivery to the job site, submit the name, address, and telephone number of the boulder source. Submit digital photographs of the front, back, and side of each boulder.

20-5.06A(4) Quality Assurance

Not Used

20-5.06B Materials

Notify the Engineer at least 5 business days before delivery of the boulders to the job site.

Boulders must:

1. Be clean
2. Have no sharp edges, or cracks
3. Obtained from a single source
4. Be the color gold, tan and pallid beige
5. Be composed of granite
6. Not have blast holes

Boulders must comply with the minimum requirements shown in the following table for each axis measurement:

Diameter Requirements	
Diameter (feet)	Quantity
1 to 2	18

Boulders may show surface chipping or scarring if the boulder is placed such that the chipped or scarred areas are not visible.

20-5.06C Construction

Mark proposed locations for placement of boulders. Final location and orientation of the boulder must be authorized at least 5 business days prior to installation. Place surplus excavated material throughout the job site under section 19-2.03B. Compact subgrade under the boulder to not less than 90 percent relative compaction.

Place boulder as shown or so that approximately 1/3 of the boulder height is buried below the finished grade. Backfill and tamp remaining soil voids around the boulder until finished grade is level with the surrounding area. If backfill area has settled, refill with additional soil and tamp.

20-5.06D Payment

Not Used

[illegible]

26 AGGREGATE BASES

The compacted thickness of any one layer must not exceed 0.5 foot.

[illegible]

39 ASPHALT CONCRETE

8. Any pavement widths less than 3-ft in width

Add to the table in the 1st paragraph of section 39-2.01A(4)(h)(iii)(B):

Coarse durability index	AASHTO T 210	1 per 3,000 tons or 1 per paving day, whichever is greater
Fine durability index	AASHTO T 210	1 per 3,000 tons or 1 per paving day, whichever is greater

Replace section 39-2.01C(3)(c) with:

39-2.01C(3)(c) Prime Coat

Apply a slow-setting asphaltic emulsion as a prime coat to AB areas designated by the Engineer and at a spread rate from 0.15 to 0.40 gal/sq yd. Do not apply more prime coat than can be absorbed completely by the AB in 24 hours.

You may modify the prime coat application rates if authorized.

Close areas receiving prime coat to traffic. Do not allow tracking the prime coat onto pavement surfaces beyond the job site.

Add to the table in the 1st paragraph of section 39-2.02A(4)(b)(ii):

Coarse durability index, D_c	AASHTO T 210	1 per 3,000 tons or 1 per paving day, whichever is greater
Fine durability index, D_f	AASHTO T 210	1 per 3,000 tons or 1 per paving day, whichever is greater

Add to the table in item 1 in the list in the paragraph of section 39-2.02A(4)(e):

Coarse durability index, D_c (min)	AASHTO T 210	65
Fine durability index, D_f (min)	AASHTO T 210	50

The grade of asphalt binder for Type A HMA must be PG 70-10.

For Type A HMA using RAP substitution of 15 percent or less of the aggregate blend, the grade of the virgin binder must comply with the PG binder grade specified above.

Coarse durability index, D _c (min)	AASHTO T 210	65
Fine durability index, D _f (min)	AASHTO T 210	50

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Each on-site foremen and drill rig operator must have 2 years of experience installing CIDH concrete piles on at least 3 projects. The CIDH pile foundations must be of similar or larger diameter and depth, and installed under similar subsurface conditions to this contract.

On-site foremen experience must be supervising construction of CIDH concrete pile foundations. Indirect supervision of on-site CIDH concrete pile construction operations is not acceptable.

Drill rig operator experience must be in construction of CIDH concrete pile foundations.

Add to section 49-3.02B(6)(c):

The synthetic slurry must be one of the materials shown in the following table:

Material	Manufacturer
SlurryPro CDP	KB INTERNATIONAL LLC 735 BOARD ST STE 209 CHATTANOOGA TN 37402 (423) 266-6964
Super Mud	PDS CO INC 105 W SHARP ST EL DORADO AR 71731 (870) 863-5707
Shore Pac	CETCO 2870 FORBS AVE HOFFMAN ESTATES IL 60192 (800) 527-9948
Terragel or Novagel Polymer	GEO-TECH SERVICES LLC 220 N. ZAPATA HWY STE 11A-449A LAREDO TX 78043 (210) 259-6386
BIG FOOT	MATRIX CONSTRUCTION PRODUCTS 50 S MAIN ST STE 200 NAPERVILLE IL 60540 (877) 591-3137
POLY-BORE	BAROID INDUSTRIAL DRILLING PRODUCTS 3000 N SAM HOUSTON PKWY EAST HOUSTON TX 77032 (877) 379-7412

Use synthetic slurries in compliance with the manufacturer's instructions. Synthetic slurries shown in the above table may not be appropriate for a given job site.

Synthetic slurries must comply with the Department's requirements for synthetic slurries to be included in the above table. The requirements are available from:

OFFICES OF BRIDGE DESIGN
P.O. BOX 168041
MS# 9-4/11G
SACRAMENTO, CA 95816-8041

SlurryPro CDP synthetic slurry must comply with the requirements shown in the following table:

SlurryPro CDP

Quality characteristic	Test method	Requirement
Density: During drilling (pcf) Before final cleaning and immediately before placing concrete (pcf)	Mud weight (density), API RP 13B-1, section 5	$\leq 67.0^a$ $\leq 64.0^a$
Viscosity: During drilling (sec/qt) Before final cleaning and immediately before placing concrete (sec/qt)	Marsh funnel and cup, API RP 13B-1, section 7.2	50–120 ≤ 70
pH	Glass electrode pH meter or pH paper	6.0–11.5
Sand content, percent by volume: Before final cleaning and immediately before placing concrete (%)	Sand, API RP 13B-1, section 10	≤ 1.0

NOTE: Slurry temperature must be at least 40 °F when tested.

^aIf authorized, you may use slurry in a salt water environment. The allowable density of slurry in a salt water environment may be increased by 2 pcf.

Super Mud synthetic slurry must comply with the requirements shown in the following table:

Super Mud

Quality characteristic	Test method	Requirement
Density: During drilling (pcf) Before final cleaning and immediately before placing concrete (pcf)	Mud weight (density), API RP 13B-1, section 5	$\leq 64.0^a$ $\leq 64.0^a$
Viscosity: During drilling (sec/qt) Before final cleaning and immediately before placing concrete (sec/qt)	Marsh funnel and cup, API RP 13B-1, section 7.2	32–60 ≤ 60
pH	Glass electrode pH meter or pH paper	8.0–10.0
Sand content, percent by volume: Before final cleaning and immediately before placing concrete (%)	Sand, API RP 13B-1, section 10	≤ 1.0

NOTE: Slurry temperature must be at least 40 °F when tested.

^aIf authorized, you may use slurry in a salt water environment. The allowable density of slurry in a salt water environment may be increased by 2 pcf.

Shore Pac synthetic slurry must comply with the requirements shown in the following table:

Shore Pac

Quality characteristic	Test method	Requirement
Density: During drilling (pcf) Before final cleaning and immediately before placing concrete (pcf)	Mud weight (density), API RP 13B-1, section 5	$\leq 64.0^a$ $\leq 64.0^a$
Viscosity: During drilling (sec/qt) Before final cleaning and immediately before placing concrete (sec/qt)	Marsh funnel and cup, API RP 13B-1, section 7.2	33–132 ≤ 118
pH	Glass electrode pH meter or pH paper	8.0–11.0
Sand content, percent by volume: Before final cleaning and immediately before placing concrete (%)	Sand, API RP 13B-1, section 10	≤ 1.0

NOTE: Slurry temperature must be at least 40 °F when tested.

^aIf authorized, you may use slurry in a salt water environment. The allowable density of slurry in a salt water environment may be increased by 2 pcf.

Terragel or Novagel Polymer synthetic slurry must comply with the requirements shown in the following table:

Terragel or Novagel Polymer

Quality characteristic	Test method	Requirement
Density: During drilling (pcf) Before final cleaning and immediately before placing concrete (pcf)	Mud weight (density), API RP 13B-1, section 5	$\leq 67.0^a$ $\leq 64.0^a$
Viscosity: During drilling (sec/qt) Before final cleaning and immediately before placing concrete (sec/qt)	Marsh funnel and cup, API RP 13B-1, section 7.2	45–104 ≤ 104
pH	Glass electrode pH meter or pH paper	6.0–11.5
Sand content, percent by volume: Before final cleaning and immediately before placing concrete (%)	Sand, API RP 13B-1, section 10	≤ 1.0

NOTE: Slurry temperature must be at least 40 °F when tested.

^aIf authorized, you may use slurry in a salt water environment. The allowable density of slurry in a salt water environment may be increased by 2 pcf.

BIG-FOOT synthetic slurry must comply with the requirements shown in the following table:

BIG-FOOT

Quality characteristic	Test method	Requirement
Density: During drilling (pcf) Before final cleaning and immediately before placing concrete (pcf)	Mud weight (density), API RP 13B-1, section 5	$\leq 64.0^a$ $\leq 64.0^a$
Viscosity: During drilling (sec/qt) Before final cleaning and immediately before placing concrete (sec/qt)	Marsh funnel and cup, API RP 13B-1, section 7.2	30–125 55–114
pH	Glass electrode pH meter or pH paper	8.5–10.5
Sand content, percent by volume: Before final cleaning and immediately before placing concrete (%)	Sand, API RP 13B-1, section 10	≤ 1.0

NOTE: Slurry temperature must be at least 40 °F when tested.

^aIf authorized, you may use slurry in a salt water environment. The allowable density of slurry in a salt water environment may be increased by 2 pcf.

POLY-BORE synthetic slurry must comply with the requirements shown in the following table:

POLY-BORE

Quality characteristic	Test method	Requirement
Density: During drilling (pcf) Before final cleaning and immediately before placing concrete (pcf)	Mud weight (density), API RP 13B-1, section 5	62.8–65.8 ^a 62.8–64.0 ^a
Viscosity: During drilling (sec/qt) Before final cleaning and immediately before placing concrete (sec/qt)	Marsh funnel and cup, API RP 13B-1, section 7.2	50–80 50–80
pH	Glass electrode pH meter or pH paper	7.0–10.0
Sand content, percent by volume: Before final cleaning and immediately before placing concrete (%)	Sand, API RP 13B-1, section 10	≤ 1.0

NOTE: Slurry temperature must be at least 40 °F when tested.

^aIf authorized, you may use slurry in a salt water environment. The allowable density of slurry in a salt water environment may be increased by 2 pcf.

AA

55 STEEL STRUCTURES

Add to section 55-1.02E(6)(a):

Zinc coat HS fastener assemblies and other fasteners attached to structural steel. If direct tension indicators are used, all components of these fastener assemblies must be zinc coated by mechanical deposition.

AA

DIVISION VIII MISCELLANEOUS CONSTRUCTION

73 CONCRETE CURBS AND SIDEWALKS

Add to section 73-1.02A:

Concrete must be minor concrete complying with section 90-2 and may contain returned plastic concrete complying with section 90-9.

Add to section 73-3.01C:

Within 2 business days of completing the surveys, submit preconstruction and post-construction surveys sealed and signed by one of the following:

- 1. Land surveyor licensed in the State
- 2. Engineer who is registered as a civil engineer in the State

Replace section 73-3.01D(3) with:

73-3.01D(3) Quality Control

For locations shown, perform a preconstruction survey to ensure forms and job site constraints will allow for compliance with required design dimensions and slopes shown. Upon completing the work, perform a post-construction survey to verify design dimensions and slopes requirements are met. The post-construction survey must include a minimum of 3 measurements for each dimension and slope requirement shown. Individual measurements must be equally distributed across the specified slope or dimensional surface. Document and submit these measurements on the Americans with Disabilities Act Compliance Inspection Report form for the facility type shown. Include the equipment and control used to conduct the survey.

Add to the beginning of section 73-3.03:

Before placing concrete, verify that forms and job site constraints allow the required dimensioning and slopes shown. Immediately notify the Engineer if you encounter job site conditions that will not accommodate the design details. Ordered modifications are change order work.

AA

80 FENCES

Replace section 80-11 with:

80-11 WROUGHT IRON GATE

80-11.01 GENERAL

80-11.01A Summary

Section 80-11 includes specifications for furnishing and constructing wrought iron gates including fittings, hardware, hasp, hidden shackle padlock, gate posts and braces.

80-11.01B Definitions

Not Used

80-11.01C Submittals

Prior to construction submit:

1. Fabrication process descriptions for gate panels
2. Plans specific to each location that include:
 - 2.1. Elevation and plan views locating gates openings, bracing, fittings, hardware, lock hasp, etc. to assemble the swing gate.
 - 2.2. Gate post locations
 - 2.3. List of fabrication processes utilized at this location
3. A test panel for each fabrication process
4. Powder coating color chips or samples, at least 2 by 2 inches in size
5. Powder coating and primer material specification sheets
6. Laminated enclosure label for each location with manufacturer information including the following:
 - 6.1 Name, address, and technical support phone number of the manufacturer for the wrought iron gate used for enclosure
 - 6.2 Date of manufacture

80-11.01D Quality Control and Assurance

Not Used

80-11.02 MATERIALS

Each wrought iron gate must be 84.5 inches wide and have vertical stays.

Finish color of materials must match color number 37038 of the AMS-STD 595 colors, matte black.

Gate post must be a minimum of 4-inch square tubing with a wall thickness of 3/16 inch. Post caps must be shop welded to the posts and have a minimum wall thickness of 3/16 inch. Gate posts must comply with specifications for posts and braces in section 80-3.02B. All other requirements for structural tubing must conform to ASTM A501.

A wrought iron gate frame must be made with 2-inch square tubing with a wall thickness of 3/16 inch.

Pickets must be a minimum of 1-inch square tubing with a wall thickness of 14 gauge.

Spear-top pickets must have pinch spear tip or approved alternate. Surface must be free of burrs and sharp edges prior to coating.

Each wrought iron gate frame panel must be cross trussed with adjustable truss rods at least 3/8 inch in diameter. Fasten and reinforce each corner of a gate frame with a malleable iron or pressed steel fitting or by welding.

Each pressed steel fitting must:

1. Have a nominal thickness before galvanizing of at least 0.135 inch
2. Be fastened to develop the strength of connected members

Welds must be smooth and develop the strength of the connected member.

Galvanize fittings, latches, rods, and other gates hardware under section 75-1.02B.

Each gate must have a hidden shackle padlock and hasp. The padlock must be the hidden shackle type. The padlock must be compatible with the hasp dimensions shown on the plan sheets. Each padlock must be master keyed to the Department key. Each padlock must be constructed from hardened steel and chrome plated. The padlock must have a flat back body. Shackle material must be hardened boron alloy with a diameter of 3/8 inch.

80-11.03A General

Hang each gate on at least 2 steel or malleable iron hinges at least 3 inches in width. Install hinges such that the gate is securely clamped to the gate post and permits the gate to be swung back against the fence. The bottom hinge must have a socket to take the ball end of the gate frame.

Install the hidden shackle padlock with an accommodating hasp as shown. Hasp mechanism must be welded to post and gate upright and be able to accommodate hidden shackle padlock. Demonstrate proper operation of the hidden shackle padlock by successfully opening and closing the lock after installation. If the Department rejects the functionality of the hidden shackle padlock and/or hasp, recheck and test after repair. The hidden shackle padlock must be capable of being removed without force.

After construction, inspect all surfaces, welds, and gates for abrasions, scratches, or damage. Repair all damage immediately. Repair paint must comply with section 59-3.

Not used

[illegible]

84 MARKINGS

84-9.03B Remove Traffic Stripes and Pavement Markings Containing Lead

1. Is a nonhazardous waste
2. Does not contain heavy metals in concentrations exceeding the thresholds established by the Health and Safety Code and 22 CA Code of Regs
3. Is not regulated under the Federal Resource Conservation and Recovery Act (RCRA), 42 USC § 6901 et seq.

Management of this material exposes workers to health hazards that must be addressed in your lead compliance plan.

AA

DIVISION X ELECTRICAL WORK

86 GENERAL

Add between the 7th and 8th paragraphs of section 86-1.01C(1):

The schedule of values must include material and installation methods, by plan sheet, for:

1. Foundations by type and quantity
2. Pull boxes by type and quantity
3. Cabinets and enclosures by type and quantity
4. Standards and poles by type and quantity
5. Luminaires by type and quantity
6. Conduit by type, size, in linear feet
7. Cables and conductors by type in linear feet
8. Conduit by type, size, in linear feet
9. Cables and conductors by type in linear feet

Replace the 7th paragraph of section 86-1.02B(1) with:

Conduit used for horizontal directional drilling must be Type 3 and UL 651 compliant, unless otherwise noted.

Add between the 2nd and 3rd paragraphs of section 86-1.02C(2)(c):

An extended pull box must be a minimum 22 inches deep and may be a single box or a box with an extension made of the same material as the pull box.

Add between the 2nd and 3rd paragraphs of section 86-1.02C(2)(c):

Hold down bolts must have a personalized anti-theft, tamper proof design approved by the Engineer. Provide ten unique keys and hold down bolts only to the Engineer.

Replace the 4th paragraph of section 86-1.02F(1) with:

Conductors must be copper.

Replace the 13th list item in the 1st paragraph of section 86-1.02K(1) with:

13. Be on the Authorized Material List for LED luminaires and one of the following:
 - 13.3. Intersection Large B:
 - 13.3.1. Leotek Electronics USA, LLC, Model No. GC2-96G-xx*-WW-3R-GY-700-PCR7-CR-WL-DSC-CF-CT
 - 13.3.2. Cooper Lighting, Model No. VERD-M-CA4-190-730-U-T4-AP-10MSP-4B-HA-PSC-PR7

Replace the 1st sentence in the 16th paragraph of section 86-1.02P(2) with:

The interior of the enclosure must accept cable-in/cable-out circuit breakers. The circuit breakers must be mounted on nonenergized clips and vertically with the up position of the handle being the *ON* position.

AA

87 ELECTRICAL SYSTEMS

Replace the 11th paragraph of section 87-1.03B(1) with:

Use Type 1 conduit:

1. On all exposed surfaces
2. In concrete structures
3. Between a structure and the nearest pull box
4. Between a foundation and the nearest pull box

Replace the 20th paragraph of section 87-1.03B(1) with:

Terminate conduit through the bottom of a nonmetallic pull box 2 inches above the bottom and 2 inches from the wall closest to the direction of the run.

Add to the beginning of section 87-1.03B(3)(a):

Use Type 3 conduit complying with UL 651 for underground installation.

Replace the 1st and 2nd paragraphs of section 87-1.03B(3)(b)(i) with:

Backfill trench with native material.

Replace the 2nd paragraph of section 87-1.03H(2) with:

Use Method B to insulate a splice.

Add between the 2nd and 3rd paragraphs of section 87-1.03N:

When existing conductors entering a pull box are replaced, the existing fuse splice connector must be replaced.

Replace the 2nd paragraph of section 87-19.01A with:

A fiber optic cable system includes:

1. Conduit and accessories
2. Vaults
3. Warning tape
4. Pull boxes

Add to section 87-19.01D:

87-19.01D(3) Department Acceptance

87-19.01D(3)(a) General

Not Used

Add to the list in the 1st paragraph of section 87-19.02H:

4. Labeled as shown, including phone number (559) 445-6166.

Add to the end of section 87-21.03C:

Modifying a lighting system includes removing, adjusting, or adding:

1. Foundations
2. Pull boxes
3. Conduit
4. Conductors
5. Standards
6. Luminaires
7. Photoelectric control
8. Fuse splice connectors
9. Guard posts

Modifying existing electrical system includes removing, adjusting, or adding:

1. Pull boxes
2. Conduit
3. Conductors
4. Enclosure for the disconnect circuit breaker
5. Wood poles
6. Junction box

Modifying fiber optic cable system includes removing, adjusting, or adding:

1. Vaults
2. Conduit
3. Warning tape
4. Pull rope
5. Pull Boxes

AA

DIVISION XII BUILDING CONSTRUCTION

99 BUILDING CONSTRUCTION

Replace "Reserved" in section 99 with:

99-1 GENERAL REQUIREMENTS

99-010000 GENERAL REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section 99-1 includes general specifications for performing building construction work.
- B. Building construction work includes removing existing buildings and constructing new facilities as shown on the sheets labeled *GP*, *GI*, *A*, *ST*, *M*, *EE*, *SS*, and *W*.
- C. Sections 15 through 98 do not apply to building construction work except where a specific reference is made to one of these sections.
- D. The styles of section 99 differ from the styles of the other sections in that:
 1. The 5-digit number that follows "99-" and the title of each correlate with the 16-division CSI MasterFormat number and title except as specified below.
 2. Within section 99, the Department is gradually changing the specifications to align with CSI's MasterFormat styles and 50-division CSI MasterFormat numbers. Because of this transition,

the format, organization, and language may vary between sections. Until the transition is complete, a 50-division section number, that follows "99-" will be located in the division that correlates with the 16-division CSI MasterFormat.

3. Some section 99 specifications are in a streamlined form. In these specifications, interpret a colon as "must be."

E. Section 99 specifications are located in the divisions as shown in the following table of contents:

Section 99 Specifications Table of Contents	
99-1	GENERAL REQUIREMENTS 99-010000 - GENERAL REQUIREMENTS 99-01050 - FIELD ENGINEERING
99-2	SITEWORK 99-02071 - REMOVING PORTIONS OF EXISTING FACILITIES 99-02075 - ABANDON PORTIONS OF WASTE DISPOSAL SYSTEM 99-02110 - CLEARING AND GRUBBING 99-02220 - EARTHWORK FOR BUILDING WORK 99-02236 - FREE DRAINING GRANULAR MATERIAL 99-02585 - PAINTED PAVEMENT MARKINGS 99-02731 - SEWAGE LIFT STATION 99-221329.10 - SEWAGE HANDLING PUMPS 99-331116 - SITE WATER UTILITY DISTRIBUTION PIPING 99-333100 - SANITARY UTILITY SEWERAGE PIPING 99-02842 - GUARD POSTS 99-02844 - PARKING BUMPERS 99-02846 - ACCESSIBLE PARKING SIGNS
99-3	CONCRETE AND REINFORCEMENT 99-03300 - CAST-IN-PLACE CONCRETE 99-033543 - POLISHED CONCRETE FINISH
99-4	MASONRY (Not Used)
99-5	METALS 99-05420 - COLD FORMED STEEL FRAMING 99-05440 - COLD FORMED STEEL TRUSSES 99-05500 - BUILDING MISCELLANEOUS METAL
99-6	WOOD AND PLASTICS 99-06100 - ROUGH CARPENTRY 99-06200 - FINISH CARPENTRY 99-06414 - CABINETS
99-7	THERMAL AND MOISTURE PROTECTION 99-07112 - BITUMINOUS WATERPROOFING 99-07115 - SHEET WATERPROOFING 99-07190 - VAPOR BARRIER 99-07210 - INSULATION (GENERAL) 99-07212 - BATT AND BLANKET INSULATION 99-07221 - RIGID ROOF INSULATION 99-072419 - WATER-DRAINAGE EXTERIOR INSULATION AND FINISH SYSTEM (EIFS) 99-07270 - THROUGH-PENETRATION FIRESTOPPING 99-07411 - METAL ROOFING 99-07415 - ALUMINUM COMPOSITE CEILING PANELS 99-07620 - SHEET METAL FLASHING 99-07720 - ROOF SPECIALTIES 99-07810 - SKYLIGHTS 99-07910 - JOINT SEALANT 99-07920 - SEALANTS

99-8	DOORS AND WINDOWS 99-08100 - HOLLOW METAL DOORS AND FRAMES 99-08312 - OVERHEAD COILING DOORS 99-084113 - ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS 99-08520 - WINDOWS 99-08710 - DOOR HARDWARE 99-08810 - GLAZING
99-9	FINISHES 99-09250 - GYPSUM WALLBOARD 99-09315 - CERAMIC AND QUARRY TILE 99-09614 - DETECTABLE WARNING SURFACE 99-096519 - STATIC DISSIPATIVE TILE 99-09661 - VINYL COMPOSITION TILE 99-09670 - FLUID-APPLIED URETHANE CEMENT RESINOUS FLOORING 99-09680 - CARPETING 99-09900 - PAINTING 99-09953 - FIBERGLASS REINFORCED PLASTIC PANELS 99-09957 - ACOUSTIC CEILING TILE 99-09959 - SUSPENDED CEILINGS
99-10	SPECIALTIES 99-10162 - METAL TOILET PARTITIONS 99-10443 - METAL SIGNS 99-10445 - SIGNS 99-10501 - WARDROBE LOCKERS 99-10502 - WOOD BENCHES 99-10522 - FIRE EXTINGUISHERS AND CABINETS 99-10560 - FIRE ACCESS KEY BOX 99-10674 - CANTILEVER STEEL SHELVING 99-10801 - TOILET AND SHOWER ACCESSORIES
99-11	EQUIPMENT 99-11146 - LUBRICATION AND COMPRESSED AIR SYSTEMS
99-12	FURNISHINGS 99-12520 - ROLLER SHADES
99-13	SPECIAL CONSTRUCTION (Not Used)
99-14	CONVEYING SYSTEMS (Not Used)
99-15	MECHANICAL 99-15050 - MECHANICAL WORK 99-15060 - PIPE, FITTINGS, AND VALVES 99-15250 - MECHANICAL INSULATION 99-15330 - AUTOMATIC FIRE SPRINKLER SYSTEM 99-15441 - PLUMBING FIXTURES 99-15443 - WHEELCHAIR ACCESSIBLE SHOWER UNIT 99-15500 - HEATING, VENTILATING AND AIR CONDITIONING EQUIPMENT AND SYSTEMS

99-16	ELECTRICAL 99-16010 - ELECTRICAL WORK 99-16050 - BASIC MATERIALS AND METHODS 99-260553 - IDENTIFICATION FOR ELECTRICAL SYSTEMS 99-260573.13 - SHORT CIRCUIT STUDIES 99-260573.19 - ARC-FLASH HAZARD ANALYSIS 99-16420 - BUILDING SWITCHBOARD 99-16432 - ELECTRICAL EQUIPMENT 99-263100 - PHOTOVOLTAIC SYSTEMS 99-16500 - LIGHTING 99-16722 - FIRE ALARM AND DETECTION SYSTEM 99-16724 - INTRUSION ALARM AND ACCESS CONTROL SYSTEM 99-16912 - SEWAGE LIFT STATION CONTROL PANEL 99-16920 - ELECTRICAL VEHICLE CHARGING SYSTEM
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1.2 ABBREVIATIONS

- A. Industry Organizations: Where abbreviations and acronyms are used in Specifications, they must mean the recognized name of the entities in the following list. The information in this list is subject to change.

AABC - Associated Air Balance Council; www.aabc.com.
AAMA - American Architectural Manufacturers Association; www.aamanet.org.
AAPFCO - Association of American Plant Food Control Officials; www.aapfco.org.
AASHTO - American Association of State Highway and Transportation Officials; www.transportation.org.
AATCC - American Association of Textile Chemists and Colorists; www.aatcc.org.
ABMA - American Bearing Manufacturers Association; www.americanbearings.org.
ABMA - American Boiler Manufacturers Association; www.abma.com.
ACI - American Concrete Institute; (Formerly: ACI International); www.concrete.org.
ACPA - American Concrete Pipe Association; www.concrete-pipe.org.
ADAAG - ADA Accessibility Guidelines for Buildings and Facilities
AEIC - Association of Edison Illuminating Companies, Inc. (The); www.aeic.org.
AF&PA - American Forest & Paper Association; www.afandpa.org.
AGA - American Gas Association; www.aga.org.
AHAM - Association of Home Appliance Manufacturers; www.aham.org.
AHRI - Air-Conditioning, Heating, and Refrigeration Institute (The); www.ahrinet.org.
AI - Asphalt Institute; www.asphaltinstitute.org.
AIA - American Institute of Architects (The); www.aia.org.
AISC - American Institute of Steel Construction; www.aisc.org.
AISI - American Iron and Steel Institute; www.steel.org.
AITC - American Institute of Timber Construction; www.aitc-glulam.org.
ALSC - American Lumber Standard Committee
AMCA - Air Movement and Control Association International, Inc.; www.amca.org.
ANSI - American National Standards Institute; www.ansi.org.
AOSA - Association of Official Seed Analysts, Inc.; www.aosaseed.com.
APA - APA - The Engineered Wood Association; www.apawood.org.
APA - Architectural Precast Association; www.archprecast.org.
API - American Petroleum Institute; www.api.org.
ARI - Air-Conditioning & Refrigeration Institute; (See AHRI).
ARI - American Refrigeration Institute; (See AHRI).
ARMA - Asphalt Roofing Manufacturers Association; www.asphaltroofing.org.
ASCE - American Society of Civil Engineers; www.asce.org.
ASCE/SEI - American Society of Civil Engineers/Structural Engineering Institute; (See ASCE).
ASHRAE - American Society of Heating, Refrigerating and Air-Conditioning Engineers; www.ashrae.org.
ASME - ASME International; (American Society of Mechanical Engineers); www.asme.org.
ASSE - American Society of Sanitary Engineering; www.asse-plumbing.org.

ASSP - American Society of Safety Professionals (The); www.assp.org.
 ASTM - ASTM International; www.astm.org.
 ATIS - Alliance for Telecommunications Industry Solutions; www.atis.org.
 AVIXA - Audiovisual and Integrated Experience Association; (Formerly: Infocomm International);
www.soundandcommunications.com.
 AWEA - American Wind Energy Association; www.awea.org.
 AWI - Architectural Woodwork Institute; www.awinet.org.
 AWMAC - Architectural Woodwork Manufacturers Association of Canada; www.awmac.com.
 AWPA - American Wood Protection Association; www.awpa.com.
 AWS - American Welding Society; www.aws.org.
 AWWA - American Water Works Association; www.awwa.org.
 BHMA - Builders Hardware Manufacturers Association; www.buildershardware.com.
 BIA - Brick Industry Association (The); www.gobrick.com.
 BICSI - BICSI, Inc.; www.bicsi.org.
 BIFMA - BIFMA International; (Business and Institutional Furniture Manufacturer's Association);
www.bifma.org.
 BISSC - Baking Industry Sanitation Standards Committee; www.bissc.org.
 BWF - Badminton World Federation; (Formerly: International Badminton Federation);
www.bissc.org.
 CBC - California Building Code
 CCR - California Code of Regulations
 CFC - California Fire Code
 CDA - Copper Development Association; www.copper.org.
 CE - Conformite Europeenne; www.ec.europa.eu/growth/single-market/ce-marking/.
 CEA - Canadian Electricity Association; www.electricity.ca.
 CEC - California Electrical Code
 CFFA - Chemical Fabrics and Film Association, Inc.; www.chemicalfabricsandfilm.com.
 CFSEI - Cold-Formed Steel Engineers Institute; www.cfsei.org.
 CGA - Compressed Gas Association; www.cganet.com.
 CIMA - Cellulose Insulation Manufacturers Association; www.cellulose.org.
 CISCA - Ceilings & Interior Systems Construction Association; www.cisca.org.
 CISPI - Cast Iron Soil Pipe Institute; www.cispi.org.
 CLFMI - Chain Link Fence Manufacturers Institute; www.chainlinkinfo.org.
 CMC - California Mechanical Code
 CPA - Composite Panel Association; www.compositepanel.org.
 CPC - California Plumbing Code
 CRI - Carpet and Rug Institute (The); www.carpet-rug.org.
 CRRC - Cool Roof Rating Council; www.coolroofs.org.
 CRSI - Concrete Reinforcing Steel Institute; www.crsi.org.
 CSA - CSA Group; www.csa-group.org.
 CSI - Construction Specifications Institute (The); www.csiresources.org.
 CSSB - Cedar Shake & Shingle Bureau; www.cedarbureau.org.
 CTA - Consumer Technology Association; www.cta.tech.
 CTI - Cooling Technology Institute; (Formerly: Cooling Tower Institute);
www.coolingtechnology.org.
 CWC - Composite Wood Council; (See CPA).
 DASMA - Door and Access Systems Manufacturers Association; www.dasma.com.
 DHA - Decorative Hardwoods Association; (Formerly: Hardwood Plywood & Veneer Association);
www.decorativehardwoods.org.
 DHI - Door and Hardware Institute; www.dhi.org.
 ECA - Electronic Components Association; (See ECIA).
 ECAMA - Electronic Components Assemblies & Materials Association; (See ECIA).
 ECIA - Electronic Components Industry Association; www.ecianow.org.
 EIA - Electronic Industries Alliance; (See TIA).
 EIMA - EIFS Industry Members Association; www.eima.com.
 EJMA - Expansion Joint Manufacturers Association, Inc.; www.ejma.org.
 EOS/ESD Association; (Electrostatic Discharge Association); www.esda.org.
 ESTA - Entertainment Services and Technology Association; (See PLASA).
 ESO - Electrical Safety Orders

ETL - Intertek (See Intertek); www.intertek.com.
 EVO - Efficiency Valuation Organization; www.evo-world.org.
 FCI - Fluid Controls Institute; www.fluidcontrolsintstitute.org.
 FIBA - Federation Internationale de Basketball; (The International Basketball Federation); www.fiba.com.
 FIVB - Federation Internationale de Volleyball; (The International Volleyball Federation); www.fivb.org.
 FM Approvals - FM Approvals LLC; www.fmglobal.com.
 FM Global - FM Global; (Formerly: FMG - FM Global); www.fmglobal.com.
 FRSA - Florida Roofing, Sheet Metal Contractors Association, Inc.; www.floridarroof.com.
 FS - Federal Specification
 FSA - Fluid Sealing Association; www.fluidsealing.com.
 FSC - Forest Stewardship Council U.S.; www.fscus.org.
 GA - Gypsum Association; www.gypsum.org.
 GANA - Glass Association of North America; (See NGA).
 GS - Green Seal; www.greenseal.org.
 HI - Hydraulic Institute; www.pumps.org.
 HI/GAMA - Hydronics Institute/Gas Appliance Manufacturers Association; (See AHRI).
 HMMA - Hollow Metal Manufacturers Association; (See NAAMM).
 HPVA - Hardwood Plywood & Veneer Association; (See DHA).
 HPW - H. P. White Laboratory, Inc.; www.hpwhite.com.
 IAPSC - International Association of Professional Security Consultants; www.iapsc.org.
 IAS - International Accreditation Service; www.iasonline.org.
 IBC - International Building Code
 ICBO - International Conference of Building Officials; (See ICC).
 ICC - International Code Council; www.iccsafe.org.
 ICEA - Insulated Cable Engineers Association, Inc.; www.icea.net.
 ICPA - International Cast Polymer Association; www.theicpa.com.
 ICRI - International Concrete Repair Institute, Inc.; www.icri.org.
 IEC - International Electrotechnical Commission; www.iec.ch.
 IEEE - Institute of Electrical and Electronics Engineers, Inc. (The); www.ieee.org.
 IES - Illuminating Engineering Society; (Formerly: Illuminating Engineering Society of North America); www.ies.org.
 IESNA - Illuminating Engineering Society of North America; (See IES).
 IEST - Institute of Environmental Sciences and Technology; www.iest.org.
 IGMA - Insulating Glass Manufacturers Alliance; www.igmaonline.org.
 IGSHPA - International Ground Source Heat Pump Association; www.igshpa.org.
 II - Infocomm International; (See AVIXA).
 ILI - Indiana Limestone Institute of America, Inc.; www.iliai.com.
 Intertek - Intertek Group; (Formerly: ETL SEMCO; Intertek Testing Service NA); www.intertek.com.
 ISA - International Society of Automation (The); (Formerly: Instrumentation, Systems, and Automation Society); www.isa.org.
 ISAS - Instrumentation, Systems, and Automation Society (The); (See ISA).
 ISFA - International Surface Fabricators Association; (Formerly: International Solid Surface Fabricators Association); www.isfanow.org.
 ISO - International Organization for Standardization; www.iso.org.
 ISSFA - International Solid Surface Fabricators Association; (See ISFA).
 ITU - International Telecommunication Union; www.itu.int.
 KCMA - Kitchen Cabinet Manufacturers Association; www.kcma.org.
 LMA - Laminating Materials Association; (See CPA).
 LPI - Lightning Protection Institute; www.lightning.org.
 MBMA - Metal Building Manufacturers Association; www.mbma.com.
 MCA - Metal Construction Association; www.metalconstruction.org.
 MFMA - Maple Flooring Manufacturers Association, Inc.; www.maplefloor.org.
 MFMA - Metal Framing Manufacturers Association, Inc.; www.metalframingmfg.org.
 MHIA - Material Handling Industry of America; www.mhia.org.
 MIA - Marble Institute of America; (See NSI).
 MMPA - Moulding & Millwork Producers Association; www.wmmpa.com.

MPI - Master Painters Institute; www.paintinfo.com.
 MSS - Manufacturers Standardization Society of The Valve and Fittings Industry Inc.; www.mss-hq.org.
 NAAMM - National Association of Architectural Metal Manufacturers; www.naamm.org.
 NACE - NACE International; (National Association of Corrosion Engineers International); www.nace.org.
 NADCA - National Air Duct Cleaners Association; www.nadca.com.
 NAIMA - North American Insulation Manufacturers Association; www.naima.org.
 NALP - National Association of Landscape Professionals; www.landscapeprofessionals.org.
 NBGQA - National Building Granite Quarries Association, Inc.; www.nbgqa.com.
 NBI - New Buildings Institute; www.newbuildings.org.
 NCAA - National Collegiate Athletic Association (The); www.ncaa.org.
 NCMA - National Concrete Masonry Association; www.ncma.org.
 NEBB - National Environmental Balancing Bureau; www.nebb.org.
 NECA - National Electrical Contractors Association; www.necanet.org.
 NeLMA - Northeastern Lumber Manufacturers Association; www.nelma.org.
 NEMA - National Electrical Manufacturers Association; www.nema.org.
 NETA - InterNational Electrical Testing Association; www.netaworld.org.
 NFHS - National Federation of State High School Associations; www.nfhs.org.
 NFPA - National Fire Protection Association; www.nfpa.org.
 NFPA - NFPA International; (See NFPA).
 NFRC - National Fenestration Rating Council; www.nfrc.org.
 NGA - National Glass Association (The); (Formerly: Glass Association of North America); www.glass.org.
 NHLA - National Hardwood Lumber Association; www.nhla.com.
 NLGA - National Lumber Grades Authority; www.nlga.org.
 NOFMA - National Oak Flooring Manufacturers Association; (See NWFA).
 NOMMA - National Ornamental & Miscellaneous Metals Association; www.nomma.org.
 NRCA - National Roofing Contractors Association; www.nrca.net.
 NRMCA - National Ready Mixed Concrete Association; www.nrmca.org.
 NSF - NSF International; www.nsf.org.
 NSI - National Stone Institute; (Formerly: Marble Institute of America); www.naturalstoneinstitute.org.
 NSPE - National Society of Professional Engineers; www.nspe.org.
 NSSGA - National Stone, Sand & Gravel Association; www.nssga.org.
 NTMA - National Terrazzo & Mosaic Association, Inc. (The); www.ntma.com.
 NWFA - National Wood Flooring Association; www.nwfa.org.
 PCI - Precast/Prestressed Concrete Institute; www.pci.org.
 PDI - Plumbing & Drainage Institute; www.pdionline.org.
 PEI - Porcelain Enamel Institute
 PLASA - PLASA; (Formerly: ESTA - Entertainment Services and Technology Association); www.plasa.org.
 RCSC - Research Council on Structural Connections; www.boltcouncil.org.
 RFCI - Resilient Floor Covering Institute; www.rfci.com.
 RIS - Redwood Inspection Service; www.redwoodinspection.com.
 SAE - SAE International; www.sae.org.
 SCTE - Society of Cable Telecommunications Engineers; www.scte.org.
 SDI - Steel Deck Institute; www.sdi.org.
 SDI - Steel Door Institute; www.steeldoor.org.
 SEFA - Scientific Equipment and Furniture Association (The); www.sefalabs.com.
 SEI/ASCE - Structural Engineering Institute/American Society of Civil Engineers; (See ASCE).
 SIA - Security Industry Association; www.siaonline.org.
 SJI - Steel Joist Institute; www.steeljoist.org.
 SMA - Screen Manufacturers Association; www.smainfo.org.
 SMACNA - Sheet Metal and Air Conditioning Contractors' National Association; www.smacna.org.
 SMPTE - Society of Motion Picture and Television Engineers; www.smpite.org.
 SPFA - Spray Polyurethane Foam Alliance; www.sprayfoam.org.
 SPIB - Southern Pine Inspection Bureau; www.spib.org.

SPRI - Single Ply Roofing Industry; www.spri.org.
 SRCC - Solar Rating & Certification Corporation; www.solar-rating.org.
 SSINA - Specialty Steel Industry of North America; www.ssina.com.
 SSPC - SSPC: The Society for Protective Coatings; www.sspc.org.
 STI - Steel Tank Institute; www.steeltank.com.
 SWI - Steel Window Institute; www.steelwindows.com.
 SWPA - Submersible Wastewater Pump Association; www.swpa.org.
 TCA - Tilt-Up Concrete Association; www.tilt-up.org.
 TCNA - Tile Council of North America, Inc.; www.tileusa.com.
 TEMA - Tubular Exchanger Manufacturers Association, Inc.; www.tema.org.
 TIA - Telecommunications Industry Association (The); (Formerly: TIA/EIA - Telecommunications Industry Association/Electronic Industries Alliance); www.tiaonline.org.
 TIA/EIA - Telecommunications Industry Association/Electronic Industries Alliance; (See TIA).
 TMS - The Masonry Society; www.masonrysociety.org.
 TPI - Truss Plate Institute; www.tpinst.org.
 TPI - Turfgrass Producers International; www.turfgrasssod.org.
 TRI - Tile Roofing Institute; www.tilerroofing.org.
 UL - Underwriters Laboratories Inc.; www.ul.com.
 UNI - Uni-Bell PVC Pipe Association; www.uni-bell.org.
 USAV - USA Volleyball; www.usavolleyball.org.
 USGBC - U.S. Green Building Council; www.usgbc.org.
 USITT - United States Institute for Theatre Technology, Inc.; www.usitt.org.
 WA - Wallcoverings Association; www.wallcoverings.org.
 WCLIB - West Coast Lumber Inspection Bureau; www.wclib.org.
 WCMA - Window Covering Manufacturers Association; www.wcmanet.org.
 WDMA - Window & Door Manufacturers Association; www.wdma.com.
 WI - Woodwork Institute; www.wicnet.org.
 WSRCA - Western States Roofing Contractors Association; www.wsrca.com.
 WWPA - Western Wood Products Association

B. Code Agencies: Where abbreviations and acronyms are used in Specifications, they must mean the recognized name of the entities in the following list.

1. DIN - Deutsches Institut fuer Normung e.V.; www.din.de.
2. IAPMO - International Association of Plumbing and Mechanical Officials; www.iapmo.org.
3. ICC - International Code Council; www.iccsafe.org.
4. ICC-ES - ICC Evaluation Service, LLC; www.icc-es.org.

C. Federal Government Agencies: Where abbreviations and acronyms are used in Specifications, they must mean the recognized name of the entities in the following list. Information is subject to change.

1. COE - Army Corps of Engineers; www.usace.army.mil.
2. CPSC - Consumer Product Safety Commission; www.cpsc.gov.
3. DOC - Department of Commerce; National Institute of Standards and Technology; www.nist.gov.
4. DOD - Department of Defense; www.quicksearch.dla.mil.
5. DOE - Department of Energy; www.energy.gov.
6. EPA - Environmental Protection Agency; www.epa.gov.
7. FAA - Federal Aviation Administration; www.faa.gov.
8. FG - Federal Government Publications; www.gpo.gov/fdsys.
9. GSA - General Services Administration; www.gsa.gov.
10. HUD - Department of Housing and Urban Development; www.hud.gov.
11. LBL - Lawrence Berkeley National Laboratory; Environmental Energy Technologies Division; www.eetd.lbl.gov.
12. OSHA - Occupational Safety & Health Administration; www.osha.gov.
13. SD - Department of State; www.state.gov.
14. TRB - Transportation Research Board; National Cooperative Highway Research Program; The National Academies; www.trb.org.

15. USDA - Department of Agriculture; Agriculture Research Service; U.S. Salinity Laboratory; www.ars.usda.gov.
16. USDA - Department of Agriculture; Rural Utilities Service; www.usda.gov.
17. USDOJ - Department of Justice; Office of Justice Programs; National Institute of Justice; www.ojp.usdoj.gov.
18. USP - U.S. Pharmacopeial Convention; www.usp.org.
19. USPS - United States Postal Service; www.usps.com.

D. Standards and Regulations: Where abbreviations and acronyms are used in Specifications, they must mean the recognized name of the standards and regulations in the following list. This information is subject to change.

1. AMS-STD - Aerospace Material Specification Standard (See AMS)
2. CFR - Code of Federal Regulations; Available from Government Printing Office; www.govinfo.gov.
3. DOD - Department of Defense; Military Specifications and Standards; Available from DLA Document Services; www.quicksearch.dla.mil.
4. DSCC - Defense Supply Center Columbus; (See FS).
5. FED-STD - Federal Standard; (See FS).
6. FS - Federal Specification; Available from DLA Document Services; www.quicksearch.dla.mil.
 - a. Available from Defense Standardization Program; www.dsp.dla.mil.
 - b. Available from General Services Administration; www.gsa.gov.
 - c. Available from National Institute of Building Sciences/Whole Building Design Guide; www.wbdg.org.
7. MILSPEC - Military Specification and Standards; (See DOD).
8. USAB - United States Access Board; www.access-board.gov.
9. USATBCB - U.S. Architectural & Transportation Barriers Compliance Board; (See USAB).

E. State Government Agencies: Where abbreviations and acronyms are used in Specifications, they must mean the recognized name of the entities in the following list. This information is subject to change.

1. CBHF; State of California; Department of Consumer Affairs; Bureau of Electronic and Appliance Repair, Home Furnishings and Thermal Insulation; www.bearhfti.ca.gov.
2. CCR; California Code of Regulations; Office of Administrative Law; California Title 24 Energy Code; www.calregs.com.
3. CDHS; California Department of Health Services; (See CDPH).
4. CDPH; California Department of Public Health; Indoor Air Quality Program; www.cal-iaq.org.
5. CPUC; California Public Utilities Commission; www.cpuc.ca.gov.
6. APCD - Air Pollution Control Districts
7. AQMD - Air Quality Management Districts.
8. SFM - State Fire Marshal

1.3 DEFINITIONS

- A. Indicated: Interpret as an equivalent term to shown, specified, or described.
- B. Project: Interpret as an equivalent term to job site.
- C. Material Certificates: Interpret as an equivalent term to certificates of compliance.
- D. Product Certificates: Interpret as an equivalent term to certificates of compliance.

1.4 COORDINATION WITH THE DEPARTMENT

- A. Comply with security policies of the Department facility.

- B. Submit a request for authorization before interrupting any service for the purpose of making or breaking a connection. Include in the request the proposed time necessary to complete the work. Allow 5 days for the review of each request.
- C. You may obtain electrical power and water from existing Department electrical power and water outlets on the job site for Contract operations at no cost to you. The Engineer determines which outlets you may use. You must not modify outlets.
- D. Do not use Department telephones.
- E. The Department will be working at or near the job site. Coordinate activities with the Department to avoid delays.

1.5 SUBMITTALS

- A. In addition to specified submittals, submit any other submittal the Engineer requests.
- B. Within 50 days of Contract approval, submit building construction work action submittals, including:
 - 1. Shop drawings
 - 2. Material lists
 - 3. Product and descriptive data
 - 4. Samples
- C. Submit at least 5 sets or samples for each action submittal unless submitting electronically. Except for samples, the Department returns one of the following:
 - 1. One electronic copy with the date of authorization
 - 2. Two hard copies with the date of authorization
 - 3. Request for correction and resubmittal
- D. Submit the schedule of values within 20 days of Contract approval. Submit at least 2 sets.
- E. Each shop drawing page size must be at least 11 by 17 inches and at most 24 by 36 inches.
- F. Each material list must include the name of manufacturer, catalog number, size, capacity, finish, all pertinent ratings, and identification symbols described.
- G. You may submit building construction work submittals electronically. Email electronic submittals to sc.office.associates@dot.ca.gov and notify the Engineer of the submittal. Include the date and contents of the submittal in the notification. Prepare submittals as a PDF package, incorporating complete information into each PDF file with the submittal number in the PDF file name and submit the package.
 - 1. Email: Transmit PDF package by sending via email to sc.office.associates@dot.ca.gov. Include PDF transmittal form. Include submittal information in the email subject line. Each PDF e-mail attachment must not exceed 25 MB in size. The e-mail message must not exceed 50 MB in size.
 - 2. Web-Based Project Management Software: If authorized, upload PDF package to web-based Project management software website. Enter required data in web-based software site to fully identify submittal.
- H. Allow 30 days for the review.
- I. Dispose of samples not incorporated in the work.
- J. Submit 3 copies, unless submitting electronically, of the following items as informational submittals:

1. Part lists and service instructions packaged with or accompanying the equipment
 2. Operating and maintenance instructions
 3. Manufacturer's warranties
 4. Qualification data
- K. State Fire Marshal: Comply with the requirements under the Fire and Life Safety Division found at <https://osfm.fire.ca.gov/>, including the following:
1. Construction Inspections and Other Related Processes: Comply with SFM Information Bulletin 24-010 and utilize the specific permitting, plan review, and inspection software platforms specified in the bulletin.
 2. Site Safety Plan:
 - a. State Fire Marshal Approval: Submit a site safety plan to the SFM as specified under CFC, Fire Safety During Construction and Demolition, before the start of job site activities. The required SFM submittal has been deferred by the Department to this Contract.
 - b. Department Notification: Notify the Engineer and electronically notify sc.office.associates@dot.ca.gov within 2 business days of SFM submittals and the SFM approval. Include in the notification the date and contents of the SFM submittal or the SFM approval.
 - c. Site Safety Director: Designate a site safety director as specified under CFC, Fire Safety During Construction and Demolition. The site safety director must be responsible for ensuring compliance with the site safety plan, completion of a daily fire safety inspection at the project site, and other duties as specified in the CFC.
 3. Plan Review:
 - a. If specified in section 99, you must submit complete plan review drawings and supporting documents to the SFM. The required SFM submittals have been deferred by the Department to this Contract and may include the following components:
 - i. Fire alarms, fire sprinklers, and fire pumps
 - ii. Smoke control
 - iii. Emergency responder radio coverage
 - iv. Standby generators
 - b. Initial Department Review Submittals: For initial Department review, submit SFM plan review drawings and supporting documents electronically to sc.office.associates@dot.ca.gov as an informational submittal at least 10 business days before submitting to the SFM. The initial Department review does not relieve you of your responsibilities with the SFM or with subsequent submittals to the Department.
 - c. State Fire Marshal Approval: After initial Department review, you must submit plan review drawings and supporting documents to the SFM.
 - d. Department Notification: Notify the Engineer and electronically notify sc.office.associates@dot.ca.gov within 2 business days of SFM submittals, SFM approvals, and SFM Change Orders. Include in each notification the date and contents, and submit notification for the following SFM reviews and SFM approvals:
 - i. Initial SFM Reviews and SFM Approvals
 - ii. Backcheck SFM Reviews and SFM Approvals
 - iii. Final SFM Approval: Submit final drawings to the Engineer and electronically to sc.office.associates@dot.ca.gov that are stamped with "APPROVED" by the SFM as an action submittal.
 - iv. SFM Change Orders
 4. After SFM approval, a copy of the approved site safety plan and approved drawings must be available at the job site for the SFM. After an SFM Change Order, a copy of the most recent approved drawings must be available at the jobsite.

- L. Buy America, Manufactured Products: If the weight of steel and iron components constitute less than 90 percent of the total weight of the manufactured product, submit a certificate of compliance. The certificate must state the manufactured product is exempt from the requirements of Section 6-1.04 based on the weight of the steel and iron components.

1.6 QUALITY ASSURANCE

A. Regulatory Requirements:

1. Buy America: Steel and iron materials, manufactured products, and construction materials may be subject to the Buy America requirements under Section 6-1.04.
2. Sustainability: Structural steel and flat glass may be subject to the Buy Clean California Act requirements under Section 6-1.06. Concrete may be subject to the Environmental Product Declarations For Hot Mix Asphalt And Concrete requirements under Section 6-1.08.
3. California Building Standards Code (California Code of Regulations, Title 24):
 - a. Codes are available online at <http://www.bsc.ca.gov/codes.aspx>
 - b. For California Green Building Standards Code, California Code of Regulations, Title 24, Part 11:
 - i. Comply with the Tier 1 requirements of Appendix A5, "Nonresidential Voluntary Measures," in addition to all other requirements.
 - ii. Use the sample forms referenced in Section 5.408.1.4, "Documentation," to comply with the documentation requirements of Section 5.408, "Construction Waste Reduction, Disposal and Recycling."
 - iii. Prepare all verification of compliances required in Section 5.504, "Pollutant Control."

B. Preconstruction Conference:

1. You must invite the local SFM Deputy, or their representative to attend, and have your site safety director attend the preconstruction conference.
2. At the preconstruction conference, be prepared to discuss the following topics and documents that apply to this Contract:
 - a. State Fire Marshal Coordination:
 - i. The submittal and inspection processes
 - ii. The site safety plan
 - iii. The required plan review submittals
 - iv. The required building inspection milestones
 - v. SFM Change Order procedures
 - b. Buy America, Buy Clean California Act, and Environmental Product Declaration requirements that apply to Section 99, including:
 - i. The applicable Buy America materials and products
 - ii. The Buy Clean California Act procedures
 - iii. The required environmental product declaration submittals
 - iv. Carbon steel rebar on the Notice of Materials to be Used form
 - v. Any issues establishing compliance with the Buy Clean California Act
 - c. California Energy Code, California Code of Regulations Title 24, Part 6
 - d. California Green Building Standards Code, California Code of Regulations, Title 24, Part 11

1.7 SCHEDULE OF VALUES

- A. Section 9-1.16B does not apply.

- B. Divide the schedule of values into sections representing the cost of each separate building or structure. Do not include work that is not part of the building or structure, such as excavation, grading, curbs, gutters, sidewalks, paving, sewer and storm drainage, or utility distribution lines, in the building or structure cost. Include this work in a section titled "General Work."
- C. List indirect costs and bond premiums as separate line items of work.
- D. Identify the sections representing each building or structure as to the building or structure they represent and break them down to show the corresponding value of each craft, trade, or other significant portion of the work. Provide a subtotal for each section.
- E. Obtain authorization of a schedule of values before you perform work shown on the schedule. The Department does not process a progress payment for building work without an authorized schedule of values.
- F. The sum of the items listed in the schedule of values must equal the contract lump sum price for building work. Distribute overhead and profit proportionally across all line items of cost.

1.8 UTILITY CONNECTIONS

- A. Make arrangements and obtain PLACs required for the extension of and connection to each utility service. For extensions not furnished by the utility, furnish the extensions, and install any intermediate equipment required by the serving utilities.
- B. The costs incurred by you for the following items is change order work:
 - 1. Utility permits, licenses, connection charges, and excess length charges
 - 2. Extensions of utilities beyond the limits shown
 - 3. Furnishing and installing any intermediate equipment required by the serving utilities

1.9 SANITARY FACILITIES

- A. Furnish separate temporary toilet units for your personnel.
- B. Temporary toilet units must be (1) single-occupant units of the chemical type, (2) properly vented, and (3) fully enclosed with a glass-fiber-reinforced polyester shell or similar nonabsorbent material.
- C. Perform periodic flushing, waste removal, and cleaning of temporary toilet units. Maintain units in a clean and sanitary condition, including a supply of toilet paper, toilet seat covers, and paper towels.
- D. During toilet room renovation or other periods when Department sanitary facilities are not operational, furnish the following for Department forces:
 - 1. Wash facilities
 - 2. Drinking water fixtures
 - 3. At least 2 temporary toilet units

1.10 AS-BUILT DRAWINGS

- A. Prepare and maintain 1 set of as-built drawings using an unaltered set of original project plans, to show all as-constructed information, including:
 - 1. Any plan clarifications or *Change Order* changes
 - 2. Locations of any underground utilities
 - 3. Location, size, type, and manufacturer of major products or components used in the work
- B. Neatly prepare as-built drawings as follows:
 - 1. Place markings on the project record drawings using red ink or red pencil.

2. Do not eradicate or write over original figures.
 3. Line out superseded material.
 4. Submit additional drawings if the required information cannot be clearly shown on the original set of project plans. The additional drawings must be at least 11 by 17 inches and at most 24 by 36 inches.
 5. Sign and date each sheet verifying that all as-built information shown on the drawings is correct.
- C. Review the as-built drawings and shop drawings monthly with the Engineer during the progress of the work to assure that all changes and other required information are being recorded.
- D. Before completion of the work, request a review of the as-built drawings and shop drawings to determine the completeness and adequacy of them. If the as-built drawings are unacceptable, you must inspect, measure, and survey the work as necessary to record the required additional information.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 INSPECTION

- A. Any work that will be covered or not visible in the completed work must be inspected and accepted by the Engineer before progress of work conceals portions to be inspected. Notify the Engineer at least 3 business days before needing inspection.

PART 4 - PAYMENT (Not Used)

END OF 99-010000

99-01050 FIELD ENGINEERING

99-01050A GENERAL

99-01050A(1) Summary

Scope: This work includes administrative and procedural requirements for field engineering services to be performed by you.

99-01050A(2) Definitions

Not Used

99-01050A(3) Submittals

Not Used

99-01050A(4) Quality Assurance

Lines and Grades:

Such stakes or marks will be set by the Department as determined by the Engineer to be necessary to establish the lines and grades required for the completion of the work shown and as described. In general, these will consist of the primary vertical and horizontal control points.

Stakes and marks set by the Department must be carefully preserved. In case such stakes and marks are destroyed or damaged they will be replaced at the Department's earliest convenience. You will be charged for the cost of necessary replacement or restoration of such stakes and marks which in the judgment of the Engineer were carelessly or willfully destroyed or damaged by your operations. This charge will be deducted from any moneys due or to become due to you.

All other stakes or marks required to establish the lines and grades required for the completion of the work are your responsibility.

Existing Utilities and Equipment:

The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, you must investigate and verify the existence and location of underground utilities and other construction.

Prior to construction, you must verify the location and invert elevation at points of connection of sanitary and septic sewers, storm sewer, and water or fire service piping.

99-01050B MATERIALS

Not Used

99-01050C CONSTRUCTION

Surveys for Layout and Performance:

You must perform all surveys for layout and performance, reduce field notes, and make all necessary calculations and drawings necessary to carry out the work.

You must locate and layout site improvements, and other work requiring field engineering services, including pavements, stakes for grading, fill and topsoil placement, utility slopes and invert elevations by instrumentation and similar appropriate means.

Batter boards must be located and laid out for structures, building foundations, column grids and locations, floor levels, and control lines and levels required for mechanical and electrical work.

Survey Accuracy and Tolerances:

The tolerances generally applicable in setting survey stakes for foundations, slabs, and underground work must not exceed the following:

Survey Stakes or Markers	Tolerance
Rough grading or excavation	0.10-foot
Trimming or preparation of subgrade for roadways	0.05-foot
Roadway surfacing, steel or concrete pipe	0.02-foot
Structures or building construction	0.01-foot

Such tolerance must not supersede stricter tolerances required by the plans or special provisions, and does not otherwise relieve you of responsibility for measurements in compliance therein.

99-01050D PAYMENT

Not Used

99-2 SITEWORK

99-02071 REMOVING PORTIONS OF EXISTING FACILITIES

99-02071A GENERAL

99-02071A(1) Summary

Scope: This work consists of removing portions of the existing facilities, including removal of existing work to gain access to or for new work.

99-02071A(2) Definitions

Not Used

99-02071A(3) Submittals

Work Plan: Submit a complete building removal plan. The plan must provide the safe conduct of the work, including procedures and methods to provide necessary support, lateral bracing and shoring when required, careful removal and transmittal of materials specified to be salvaged, protection of property which is to remain undisturbed, coordination with other work in progress, and timely disconnection of

utility services. The plan must include a detailed description of the methods and equipment to be used for each operation and the sequence of operations.

99-02071(4) Quality Assurance

Necessary precaution must be taken to avoid damage to existing items to remain in place, to be reused, or to remain the property of the State. Damaged items must be repaired or replaced at your expense. You must coordinate demolition with all other work.

99-02071B MATERIALS

Not Used

99-02071C CONSTRUCTION

99-02071C(1) Preparation

The limits of removal must be located and identified. Items to be removed and the interface of items to be removed and items to remain intact must be identified and marked.

Prior to removing concrete or masonry, a saw cut approximately one inch deep must be made along the limits of removal on all faces that will be visible in the completed work.

At new door openings in concrete or masonry, full depth saw cuts must be made from both faces. Overcuts must not be made at corners. Remaining material at corners must be chipped out and the surfaces ground smooth.

99-02071C(2) Removal

Removal must be to the limits shown. Removal must be done carefully to minimize damage to the portions to remain. Remaining portions that are damaged by your operation must be restored to original condition at your expense.

Assemblies to be salvaged which require dismantling for removal must be matchmarked before dismantling.

Existing apparatuses, devices, or accessories that would be functionally impaired by new construction or remodeling must be moved, brought out to new surfaces, or provided with new access covers, as necessary to restore apparatuses, devices, or accessories to their original usefulness.

Abandoning Structures:

Each pipe entering or exiting the sewage disposal system to be abandoned must be closed by a tight fitting plug or wall of concrete not less than 0.5 foot thick. Such concrete must be commercial quality concrete and must contain not less than 505 pounds of cement per cubic yard of concrete.

Surfaces that are exposed to view at the limits of removal work must be patched, bumps must be removed and depressions filled, and the surface must be finished to match the existing surrounding surfaces. Depressions in concrete less than one inch deep must be deepened to one-inch minimum depth before filling with cement mortar.

Anchor bolts and reinforcement must be removed at least one inch below the surrounding surfaces, and the resulting hole must be patched with cement mortar.

Existing reinforcement that is to be incorporated into the new work must be protected from damage and thoroughly cleaned before being embedded in new concrete.

99-02071C(3) Disposal

Materials that are to be removed must be handled under section 14-10 or section 14-11 as applicable.

Equipment containing chlorine must comply with AWWA C655-09, "Field Dechlorination," prior to disposal of equipment.

99-02071C(4) Salvage

Not Used

99-02071D PAYMENT

Not Used

99-02075 ABANDON PORTIONS OF WASTE DISPOSAL SYSTEM**99-02075A GENERAL****99-02075A(1) Summary**

Scope: This work consists of abandoning portions of the existing waste disposal system.

99-02075A(2) Definitions

Not Used

99-02075A(3) Submittals

Not Used

99-02075A(4) Quality Assurance

Not Used

99-02075B MATERIALS

Not Used

99-02075C CONSTRUCTION

Staging of Work: Work that will curtail the use of the waste disposal system must not be done until the facilities utilizing the system are closed and are no longer required.

Disposal: Sewage facilities to be abandoned must be pumped out and the sewage and sediment removed from such facilities must be disposed of.

Abandoning Facilities:

Each pipe entering or exiting the sewage disposal system to be abandoned must be closed by a tight fitting plug or wall of concrete not less than 0.5 foot thick. Such concrete must be commercial quality concrete and must contain not less than 505 pounds of cement per cubic yard of concrete.

The top cover of the structure must be removed and the bases must be broken to prevent entrapment of water. The sewage structures to be abandoned must be backfilled with sand, unless otherwise shown. Sand backfill must be consolidated by vibrating or other methods.

Lift station to be abandoned must have the waste, lid, piping, equipment, accessories, wiring, and concrete slab removed. Break the base or core at least ten 4-inch holes on side walls near bottom to prevent entrapment of water. Surplus material from the excavation may be used for backfill with light compaction up to existing grade.

99-02075D PAYMENT

Not Used

99-02110 CLEARING AND GRUBBING**99-02110A GENERAL****99-02110A(1) Summary**

Scope: This work consists of removing all objectionable material from the building site.

Clearing and grubbing must be performed in advance of any other grading or construction operations.

The area to be cleared and grubbed must be within the building work construction area.

99-02110A(2) Definitions

Not Used

99-02110A(3) Submittals

Not Used

99-02110A(4) Quality Assurance**99-02110A(5) Site Conditions**

Traffic: Clearing and grubbing must be conducted to ensure minimum interference with roads, street, walks, or other occupied areas.

Protection of Existing Landscaping and Trees: Existing landscaping and trees which are to remain in place must be protected from injury or damage. Existing trees must be protected with a temporary fence around the drip line.

99-02110B MATERIALS

Not Used

99-02110C CONSTRUCTION**99-02110C(1) Site Clearing**

Remove trees, shrubs, grass, and other vegetation, concrete and masonry, improvements, or obstructions interfering with the new construction.

Trees to be removed must be grubbed to a depth of not less than 2 feet below finished grade.

99-02110C(2) Removal of Waste Material

Hauling: When hauling is done over highways or city streets, and when directed by the Engineer, the loads must be trimmed and all material removed from shelf areas of the vehicles.

Disposal: Trees, shrubs, grass, weeds and other vegetation, debris, and any obstructions above or below the ground surface that interfere with the building work, must be removed and disposed of.

99-02110D PAYMENT

Not Used

99-02220 EARTHWORK FOR BUILDING WORK**99-02220A GENERAL****99-02220A(1) Summary**

Scope: This work consists of performing earthwork for building work.

Earthwork for building work consists of structure excavation and structure backfill. Structure excavation includes excavation for footings, foundations, walls, slabs. Structure backfill includes backfilling under slabs; backfilling under and around footings; backfilling for walls, backfilling for pipes and conduits; backfilling holes resulting from removal of existing facilities. In addition to structure excavation and structure backfill, earthwork for building work includes any other earthwork, not mentioned, but necessary to complete the building work.

The Information Handout includes information regarding foundation recommendations and reports that were prepared for use during the design of this project.

Related Work: Leach lines must be excavated and backfilled under section 99-02740.

99-02220A(2) Definitions

Not Used

99-02220A(3) Submittals

Samples: Submit samples of sand, pea gravel, or crushed stone, weighing not less than 25 pounds.

99-02220A(4) Quality Assurance

Not used.

99-02220A(5) Site Conditions

Existing Underground Piping and Conduit: The location of existing underground piping and conduit is based on the best records available. Before beginning work, you must accurately locate the piping and conduit involved in the work. If the location of the existing piping or conduit deviates from the location shown by more than 5 feet, or, if no elevations are indicated and the piping or conduit is more than 3 feet

below grade, the cost of the additional excavation, backfill, piping or conduit, and removal and replacement of concrete, if any, will be change order work.

Existing Surfaced or Planted Areas:

Existing surfaced or planted areas that are removed, broken, or damaged by your operations must be restored to their original condition except as otherwise shown or described.

Restoration materials must be equal to or better than the original materials. Surfacing must be replaced to match the material thickness, grades, and finish of the adjacent surrounding surfaces.

99-02220B MATERIALS

Structure Backfill: Structure and trench backfill must be free of organic and other deleterious material and must be suitable for the required compaction. Gravel without sand matrix must not be used except as free draining granular material beneath slabs and footings.

Sand: Sand must be clean, washed sand, free from clay or organic material graded such that 100 percent passes the 1/4-inch sieve, 90 percent to 100 percent passes the No. 4 sieve and not more than 5 percent passes the No. 200 sieve size.

Pea Gravel (Naturally Rounded):

Pea gravel (naturally rounded) must be clean, washed, dry density of not less than 95 pounds per cubic foot, free from clay or organic material and must comply with the following grading as determined by California Test 202:

Sieve or Screen Size	Percentage Passing
3/4"	100
1/2"	90-100
3/8"	40-70
No. 4	0-15
No. 8	0-3

Pea gravel must comply with the following requirements:

Test	California Test No.	Test Requirements
Durability Index	229	35 Min.

Crushed Stone:

Crushed stone must be clean, washed, dry density of not less than 95 pounds per cubic foot, crushed stone or crushed gravel with an angular particle size not less than 1/8 inch or more than 1/2 inch.

Sieve or Screen Size	Percentage Passing
1/2"	100
3/8"	85-100
No. 4	10-30
No. 8	0-3

Crushed stone must comply with the following requirements:

Test	California Test No.	Test Requirements
Durability Index	229	35 Min.

99-02220C CONSTRUCTION

99-02220C(1) Preparation and Restoration

Sawcutting: Prior to excavation or trenching, existing surfacing must be removed to saw cut lines, or to existing wood dividers or expansion joints, if any. The saw cut must be to a neat line and have a depth not less than one inch.

Restoration: Surfacing must be replaced to match the thickness, grades and finish of the adjacent surrounding surfaces.

99-02220C(2) Structure Excavation

Unless otherwise noted, all excavation for building work is classified as structure excavation.

Footing Excavation:

The bottom of excavation must not be disturbed. You must excavate by hand to the final grade. The bottom of concrete footings must be poured against undisturbed material. Unless otherwise noted, compaction of the bottom of footing excavation is not required unless the material is disturbed. The footing depths shown must be changed to suit field conditions when directed by the Engineer. Solid rock at or near required depths must not be disturbed. Unsuitable material must be excavated down to firm bearing as directed by the Engineer. Work and materials required because of excavation in excess of the depths shown, when such excavation has been ordered by the Engineer, will be change order work.

Excavate to the elevations and dimensions within a tolerance of $\pm 1/2$ inch. Limits of the excavation must allow for adequate working space for installing materials and as required for safety of personnel. Such working space excavation must be replaced in kind and compacted at your expense.

Overdepth excavation for footings must be backfilled with concrete or such other material recommended by you and authorized by the Engineer. Relative compaction must be not less than 95 percent.

At locations and to the limits shown, material below the bottom of the foundation or footing must be removed and replaced with select backfill under the placing and compacting requirements for backfill.

Excavation for Pipes and Conduits:

Pipes or conduits in the same trench must have a minimum clear distance between pipes or conduits of 6 inches. Pipes or conduits must have not less than 2½ feet of cover from top of pipes or conduits to finished grade unless otherwise shown or described.

Trenching must be of sufficient depth to permit placing a minimum depth of 4 inches of compacted sand under all pipes and conduits.

Excavation adjacent to trees must be performed by hand methods where necessary to avoid injury to trees and roots. Roots 2 inches in diameter and larger must be protected with heavy burlap. Roots smaller than 2 inches in diameter adjacent to trees must be hand trimmed. Cuts through roots 1/2 inch in diameter and larger must be sealed with tree trimmers' asphaltic emulsion. If trenches remain open more than 24 hours, the side of the trench adjacent to the tree must be shaded with burlap and kept damp. Materials must not be stockpiled within the drip line of trees.

Dewatering: Excavations must be kept clear of standing water. Water must be removed by pumping if necessary. Water removed from excavation must be carried away from the building site and disposed of.

99-02220C(3) Structure Backfilling

Unless otherwise noted, all backfill for building work must be classified as structure backfill. Backfill must be placed and compacted in horizontal layers, not more than 6 inches thick prior to compaction, and to the lines and grades shown or to original ground.

Structure Backfill: After structures are in place and forms are removed, wood and other debris must be removed from excavations before placing structure backfill.

Backfilling Pipes and Conduits:

Backfill placed under pipe and conduits must be compacted sand, 4 inches minimum depth. Backfill material placed to a level 6 inches above tops of pipes and conduits must be sand or fine earth and particles must not exceed 1/2 inch in greatest dimension. For wrapped, coated, or plastic pipe or conduits, sand must be used for backfill. Backfill material placed higher than 6 inches above tops of pipes or conduits must consist of material free of stones or lumps exceeding 4 inches in greatest dimension except:

1. The top 12 inches of backfill under roads, walks or paving must consist of aggregate base material.
2. The top 6 inches of backfill in planted areas must consist of topsoil.

Unless otherwise shown, pipe under roads, with less than 2½ feet of cover over the top of pipe, must be backfilled with concrete to a level 4 inches above the top of pipe. Concrete for backfill must be commercial quality concrete containing not less than 590 pounds of cement per cubic yard.

99-02220C(4) Compaction

Relative compaction must be determined under California Test 216 or 231.

Unless otherwise noted below, all backfill must be compacted to a minimum relative compaction of 90 percent.

Unless authorized, compaction by jetting or ponding will not be permitted.

Compact Original Ground: Original ground surface under fill with surfacing of concrete and asphalt concrete must be compacted to a relative compaction of not less than 95 percent for a minimum depth of 6 inches.

Subgrade Preparation:

Preparation of subgrade material for placing aggregate base, surfacing, or slabs thereon must include fine grading, compaction, reworking as necessary. The upper 6 inches of the subgrade must have the same compaction as the fill to be placed over it.

The prism of backfill directly underneath the building foundation and sloping downward at 1:1 must be compacted to 95 percent.

Structure Backfill: Structure backfill must be compacted to not less than 95 percent relative compaction.

A relative compaction of not less than 95 percent must be obtained for a minimum depth of 6 inches below the bottom of the excavation before placing select backfill.

Trench Backfill: Trench backfill placed beneath slabs or paved areas must be compacted to a relative compaction of not less than 95 percent.

99-02220C(5) Disposal

Surplus Material: Surplus material from the excavation must be removed and disposed of.

99-02220C(6) Field Quality Control and Assurance

Inspection: When the excavation is substantially completed to grade, you must notify the Engineer. No concrete must be placed until the foundation has been authorized by the Engineer.

Testing: The Department will conduct compaction tests during the backfilling and compacting operations.

99-02220D PAYMENT

Not Used

99-02236 FREE DRAINING GRANULAR MATERIAL**99-02236A GENERAL****99-02236A(1) Summary**

Scope: This work consists of furnishing and placing free draining granular material beneath slabs.

99-02236A(2) Definitions

Not Used

99-02236A(3) Submittals

Not Used

99-02236A(4) Quality Assurance

Not Used

99-02236B MATERIALS

Free Draining Granular Material: Free draining granular material must be clean, hard, durable, free-draining rock. The material gradation must be such that all passes the one-inch screen, and not more than 10 percent passes the No. 4 sieve as determined by California Test 202. Granular material must be free from organic material, clay balls, or other deleterious substances.

99-02236C CONSTRUCTION

Free draining granular material must be placed, spread, and consolidated by tamping or vibrating.

99-02236D PAYMENT

Not Used

99-02585 PAINTED PAVEMENT MARKINGS**99-02585A GENERAL****99-02585A(1) Summary**

Scope: This work consists of applying paint, temporary striping, and pavement marking tape for pavement markings.

Pavement markings include word and symbol markings, and parking stall markings.

99-02585A(2) Definitions

Not Used

99-02585A(3) Submittals

Not Used

99-02585A(4) Quality Assurance

Not Used

99-02585B MATERIALS

Paint:

Paint must be acrylic, waterborne emulsion, lead and chromate free, ready mixed, complying with FS TT-P-1952F, Type II, with drying time of less than 45 minutes.

Traffic paint must comply with the rules for control of volatile organic compound (VOC) emissions adopted by the air quality control district in the air basin in which the coatings are applied.

Temporary (Removable) Striping and Pavement Marking Tape (180 days or less): Products used for temporary (removable) striping and pavement marking tape (180 days or less) must be on the Authorized Material List for signing and delineation materials.

99-02585C CONSTRUCTION

Alignment and Layout:

All necessary alignment and layout work must be performed by you, in a manner that will not damage the pavement.

Unless otherwise shown, the width of parking stall markings must be 4 inches.

Equipment and Operation:

Mechanical means must be used to paint pavement markings.

All equipment used in the application of paint must produce pavement markings of uniform quality.

All spray equipment must be the proper type and of adequate capacity for the work involved.

Air atomized spray equipment must be equipped with oil and water extractors and pressure regulators, and must have adequate air volume and compressor recovery capacity. Spray gun tip needle assemblies and orifices must be the proper size.

Stencils and hand spray equipment must be used to paint word and symbol markings. Stencils must be furnished by you. The stencil layout must comply with the dimensions shown.

Surface Preparation: Surfaces to receive paint, temporary striping, or pavement marking tape must be cleaned of all dirt and loose material.

Application:

Paint must be applied only on dry surfaces, and only during periods of favorable weather, under the manufacturer's instructions.

On new surfacing, paint must be applied in 2 coats. The first coat must be dry before application of the second coat is applied.

On existing surfacing, paint must be applied in one coat.

Completed pavement markings must have clean and well-defined edges, and must comply with the dimensions shown or as described.

Drips, oversprays, improper markings, and paint material tracked by traffic must be immediately removed from the pavement by methods authorized by the Engineer. All such removal must be at the Contractor's expense.

Temporary striping and pavement marking tape must be applied under the manufacturer's instructions.

Application Rates: Each application of paint must be applied at the rates recommended by the paint manufacturer for the type of surface involved.

Protection: Newly placed pavement markings must be protected from damage by traffic or other causes until the paint is thoroughly dry.

Disabled Accessible Parking Stall Symbol: Each parking space reserved for persons with physical disabilities must have a minimum 3' x 3' surface identification with the international symbol of accessibility. The symbol and border must be white, and the background must be blue complying with color no. 15090 of AMS-STD-595.

99-02585D PAYMENT

Not Used

99-02731 SEWAGE LIFT STATION

99-02731A GENERAL

99-02731A(1) Summary

Scope: This work consists of installing a sewage lift station. Sewage lift station consists of fiber-reinforced plastic basin, cast-in-place concrete top base, bolted flanged aluminum cover, access door & frame, vent pipe, ground rod, fall protection grating, and other work as necessary for a complete installation.

Related work:

Sewage pipe, fittings, and similar equipment must comply with Section 99-333100.

Excavation, trenching, and backfill must comply with Section 99-02220.

Concrete must comply with Section 99-03300.

Reinforcement in concrete must comply with Section 52.

Sewage pumping equipment and accessories must comply with Section 99-221329.10.

99-02731A(2) Submittals

Product data: Manufacturer's product data must be submitted for all manufactured materials and equipment. Manufacturer's product data must include catalog cuts, anti-floatation calculations, complete description, performance data, and installation instructions.

Manufacturer's descriptive data must be submitted for the following:

1. Access doors and frames.
2. Basins
3. Fall protection grating

Shop Drawings: Shop drawings for basins must be submitted for approval. Drawings must show elevations, size, installed equipment, and method of installation for each component used in the work.

99-02731A(3) Quality Control and Assurance

Delivery, Storage, and Handling: Do not drop or impact the basin. Use chocks if stored horizontally. To move the basin, install lifting lugs, sling, or choker as recommended by manufacturer. Use of chains or cables is prohibited.

99-02731A(4) Warranty

Warranties and Guarantees: Manufacturer's warranties and guarantees for materials or equipment used in the work must be delivered to the Engineer at the job site prior to acceptance of the Contract.

99-02731B MATERIALS

Fiber-Reinforced Plastic Basin:

Basin must be manufactured from commercial grade polyester resin or vinyl ester resin with fiberglass reinforcements. The resin system must be suitable for atmospheres containing hydrogen sulfide and dilute sulfuric acid as well as other gases associated with wastewater collection systems. Materials must conform to ASTM D3753. No fillers or extenders must be used. The resin must be suitable for continuous immersion in sewage in the pH range of 3 to 11 and concentrations of hydrogen sulfide found in municipal sewer systems.

Reinforcing materials must be commercial E-glass in the form of a mat of continuous or chopped strands or roving fabric, with a coupling agent that provides a suitable bond between glass reinforcement and resin. If reinforcing materials are used on the surface exposed to the contained substance, they must be commercial grade chemical-resistant glass that will bond with the resin and leave a resin-rich surface.

Basin must be at least 72 inches in diameter and conform to the requirements in ASTM Designation: C 478 and D 3753. Basin must have a bolted flanged aluminum cover with access door or as shown.

Fiberglass reinforced basin base section must be integral with sidewalls. Base must extend to form an anti-floatation flange to assist in anchoring the basin.

The fiberglass reinforced bottom must be attached to the basin with fiberglass layup in compliance with ASTM D 3299.

The basin must have an internal sloped fillet at the bottom and wall interface. The fillet must be constructed of the same fiberglass material as the basin and must be integral with the basin. The fiberglass fillet must be constructed so it does not interfere with the pump mounting in the basin.

Stub-outs for inlet, outlet, or discharge lines must be factory installed with fiberglass layup in conformance with ASTM D 3299.

The exterior surface must be smooth with no sharp projections.

The interior surface must be resin rich with no exposed fibers and no wrinkles of 1/8 inch or greater in depth.

Basin must be permanently marked with manufacturer's name or trademark, product number, total length, and nominal diameter.

The complete basin must have a dynamic load rating of not less than 16,000 ft-lbs when tested in accordance with ASTM D 3753. To establish this rating, the complete basin must not leak, crack, or suffer other damage when load tested to 40,000 ft-lbs and must not deflect vertically downward more than 1/4 inch at the point of load application when loaded to 24,000 lbs.

The basin must have a minimum pipe stiffness value as follows when flexural strength is tested in accordance with ASTM D 3753:

Length (feet)	Stiffness (F/ΔY, psi)
10-20	2.01
21-30	3.02
31-40	5.24

Compressive strength, flexural strength, and modulus of elasticity of the basin must be not less than the following values when tested in accordance with ASTM D 3753:

	In Hoop Direction	In Axial Direction
Tensile Strength (psi)	18,000	5,000
Tensile Modulus	0.8×10^6	0.7×10^6
Flexural Strength (psi)	26,000	4,500
Flexural Modulus:		
No ribs: 48", 60", 72"	1.4×10^6	0.7×10^6
With ribs: 96", 144"	0.7×10^6	0.7×10^6

Access Door and Frame:

Access door must be single or double leaf, 1/4-inch minimum extruded aluminum frame. Door must be aluminum diamond plate reinforced with aluminum stiffeners as required. Steel hinges must be bolted to underside and pivot on tension bars for easy opening. Door to withstand a load of not less than 150 pounds per square foot, open to 90 degrees and lock open in that position, and equipped with snap lock and removable handle. Door hardware must be corrosion resistant. Aluminum must be mill finish.

Fall protection grating: single or double leaf, aluminum grating with a coat paint finish, lock separate from the access cover. Hardware must be corrosion resistant and flush mounted.

99-02731C CONSTRUCTION

Fiber-reinforced plastic basin must be installed in compliance with the manufacturer's instructions.

Install piping connections in compliance with manufacturer's instructions.

All joints and penetrations of the basin must be sealed watertight.

Testing:

Fiber-reinforced plastic basin must be hydrostatically tested after installation. Basin that does not meet the hydrostatic test must be repaired or replaced and retested until there are no leaks.

Inlets and outlets must be plugged and the basin filled a minimum of 1 foot above the upper most basin penetration.

No visible loss of water must occur after 24 hour test period.

99-02731D PAYMENT

Not Used

99-221329.10 - SEWAGE HANDLING PUMPS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Sewage handling pumps.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.
- B. Wiring Diagrams: For power, signal, and control wiring.

1.3 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For pumps and controls, to include in operation and maintenance manuals.

1.4 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. UL Compliance: Comply with UL 778 for motor-operated water pumps.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Retain shipping flange protective covers and protective coatings during storage.
- B. Protect bearings and couplings against damage.
- C. Comply with pump manufacturer's written rigging instructions for handling.

PART 2 - PRODUCTS

2.1 SEWAGE HANDLING PUMPS

A. Submersible, Quick-Disconnect, Double-Seal Sewage Pumps:

1. Description: Factory-assembled and -tested sewage-pump unit with guide-rail supports.
2. Pump type: Submersible, duplex, end-suction, single-stage, close-coupled, overhung-impeller, centrifugal sewage pump, capable of operating un-submerged without damage to pump.
3. Pump Casing: Cast iron, with open inlet, legs that elevate pump to permit flow into impeller, and vertical discharge for piping connection. Powder coated epoxy finish. All fasteners exposed to liquid must be 300-series stainless steel. Provide stainless steel lifting handle. Provide lift ring (of stainless steel) and self-sealing discharge fittings for connection to guide-rail support.
4. Impeller: Vortex style, uncoated, capable of passing spherical solids 3 inch in diameter or greater. Statically and dynamically balanced cast or ductile iron, bronze, or stainless steel; keyed and secured to shaft.
5. Pump and Motor Shaft: Stainless steel, with factory-sealed, grease-lubricated ball bearings.
6. Shaft Seals: Double mechanical seals. Upper and lower seals must be silicon carbide.
7. Moisture-Sensing Probe: Internal moisture sensor and moisture alarm.
8. Motor: Hermetically sealed, capacitor-start type; with built-in overload protection; lifting eye or lug; and three-conductor, waterproof power cable of length required and with grounding plug and cable-sealing assembly for connection at pump. Non-overloading through the length of the curve.

a. Motor Housing Fluid: Oil.

9. Controls:

a. Pump controls must be as specified in Section 99-16912.

10. Guide-Rail Supports:

- a. Guide Rails: Two vertical pipes or structural members, made of 300-series stainless steel or other corrosion-resistant metal, attached to baseplate and basin sidewall or cover.
- b. Baseplate: Corrosion-resistant metal plate, attached to basin floor, supporting guide rails and stationary elbow.
- c. Pump Yoke: Motor-mounted or casing-mounted yokes or other attachments for aligning pump during connection of flanges.
- d. Movable Elbow: Pump discharge-elbow fitting with flange, seal, and positioning device.
- e. Stationary Elbow: Fixed discharge-elbow fitting with flange that mates to movable-elbow flange and support attached to baseplate.
- f. Lifting Chain: Stainless steel.

B. Capacities and Characteristics:

1. Each Pump:

- a. Capacity: As shown.
- b. Solids Handling Capability: 3 inches minimum.
- c. Total Dynamic Head: As shown.
- d. Speed: As shown.
- e. Discharge Pipe Size: 4-inch horizontal.
- f. Motor Horsepower: As shown.
- g. Electrical Characteristics:
 - 1) Volts: As shown.
 - 2) Phases: As shown.
 - 3) Hertz: 60.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine roughing-in for plumbing piping to verify actual locations of sanitary drainage and vent piping connections before sewage pump installation.

3.2 INSTALLATION

- A. Pump Installation:
 - 1. Comply with manufacturer's written instructions and the details as shown.

3.3 CONNECTIONS

- A. Comply with requirements for piping specified in Section 333100. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Install piping adjacent to equipment to allow service and maintenance.

3.4 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.
- B. Perform tests and inspections.
 - 1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.
- C. Tests and Inspections:
 - 1. Perform each visual and mechanical inspection.
 - 2. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
 - 3. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
 - 4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- D. Pumps and controls will be considered defective if they do not pass tests and inspections.
- E. Prepare test and inspection reports.

END OF SECTION 99-221329

SECTION 99-331116 - SITE WATER UTILITY DISTRIBUTION PIPING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes, for work shown on the sheets labeled W:
 - 1. Water pipe and fittings.
 - 2. Piping joining materials.
 - 3. Transition fittings.
 - 4. Dielectric fittings.
 - 5. Water Meters.
 - 6. Pressure reducing valves.
 - 7. Gate valves
 - 8. Ball valves

9. Check valves
10. Double check detector assembly backflow preventers.
11. Pipe identification.
12. Utility boxes.
13. Valve boxes.

1.2 DEFINITIONS

- A. EPDM: Ethylene propylene diene monomer rubber.
- B. PE: Polyethylene plastic.
- C. PP: Polypropylene plastic.
- D. PVC: Polyvinyl chloride plastic.
- E. GSP: Galvanized steel pipe.
- F. HDPE: High Density Polyethylene.

1.3 REFERENCE STANDARDS

- A. ASTM International:
 1. ASTM D1785 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120.
 2. ASTM D2241 - Standard Specification for Poly(Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series).
 3. ASTM D2466 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40.
 4. ASTM D2855 - Standard Practice for Making Solvent-Cemented Joints with Poly(Vinyl Chloride) (PVC) Pipe and Fittings.
- B. American Water Works Association:
 1. AWWA C504 - Rubber-Seated Butterfly Valves, 3 In. (75 mm) Through 72 In. (1,800 mm).
 2. AWWA C508 - Swing-Check Valves for Waterworks Service, 2-In. Through 24-In. (50-mm Through 600-mm) NPS.
 3. AWWA C509 - Resilient-Seated Gate Valves for Water Supply Service.
 4. AWWA C700 - Cold-Water Meters - Displacement Type, Bronze Main Case.
 5. AWWA M6 - Water Meters - Selection, Installation, Testing, and Maintenance.

1.4 ACTION SUBMITTALS

- A. Product Data: Submit manufacturer information of the products to be used, including shop drawings.
- B. Manufacturer Instructions: Indicate special procedures required to install specified products.
- C. Coordination Drawings: For piping and specialties including relation to other services in same area, drawn to scale. Show piping and specialty sizes and valves, meter and specialty locations, and elevations.
- D. System purging and disinfecting activities report.
- E. Field Quality-Control Submittals: Indicate results of Contractor-furnished tests and inspections.

1.5 QUALITY ASSURANCE

- A. Regulatory Requirements:

1. Comply with latest standards of 22 CA Code of Regs and 24 CA Code of Regs for potable-water-service piping, including materials, installation, testing, and disinfection.
 2. Comply with latest standards of 17 CA Code of Regs for backflow preventer testing.
 3. Comply with AWWA C651-14 - Disinfecting Water Mains and C655-09 - Field Dechlorination.
- B. Piping materials shall bear label, stamp, or other markings of specified testing agency.
- C. Comply with ASTM F 645 for selection, design, and installation of thermoplastic water piping.
- D. NSF Compliance:
1. Comply with NSF 61 Annex G for materials for water-service piping and specialties for domestic water.
 2. Comply with NSF Standard 372 for low lead.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Preparation for Transport: Prepare valves according to the following:
1. Ensure that valves are dry and internally protected against rust and corrosion.
 2. Protect valves against damage to threaded ends and flange faces.
 3. Set valves in best position for handling. Set valves closed to prevent rattling.
- B. During Storage: Use precautions for valves according to the following:
1. Do not remove end protectors unless necessary for inspection; then reinstall for storage.
 2. Protect from weather. Store indoors and maintain temperature higher than ambient dew-point temperature. Support off the ground or pavement in watertight enclosures when outdoor storage is necessary.
- C. Handling: Use sling to handle valves if size requires handling by crane or lift. Rig valves to avoid damage to exposed parts. Do not use handwheels or stems as lifting or rigging points.
- D. Deliver piping with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe-end damage and to prevent entrance of dirt, debris, and moisture.
- E. Protect stored piping from moisture and dirt. Elevate above grade. Do not exceed structural capacity of floor when storing inside.
- F. Protect flanges, fittings, and specialties from moisture and dirt.
- G. Store plastic piping protected from direct sunlight. Support to prevent sagging and bending.

1.7 EXISTING CONDITIONS

- A. Field Measurements:
1. Verify field measurements prior to fabrication.
 2. Indicate field measurements on shop drawings.

PART 2 - PRODUCTS

2.1 WATER PIPES AND FITTINGS

- A. Water pipes, fittings, valves, and appurtenances in contact with water must be NSF-61 certified. Use GSP for pipes, and fittings installed above ground except as noted.
- B. PVC Pipe and Fittings for 6" and smaller water pipes:
1. ASTM D1785, Schedule 80
 2. Fittings: ASTM D2467, PVC Schedule 80.
 3. Joints:

- a. Comply with ASTM D2855.
- b. Type: Solvent weld.

C. PVC Pipe and Fittings for 8" and larger water pipes:

PVC pipe and fittings must have bell ends conforming with the requirements in ANSI/AWWA C 900, Class 200, DR 14, and NSF 61 for potable water applications. Pipe bell end must have a solid cross section elastomeric ring conforming to the requirements in ASTM D 3139 and F 477. Fittings must be rubber-gasket, push-on joint conforming to the requirements of ASTM D 1784.

D. Galvanized Steel Pipe and Fittings:

1. Galvanized Steel Pipe:

- a. ASTM A 53/A 53M, Type E, Grade B, Standard Weight.
- b. Include ends matching joining method.

2. Galvanized, Gray-Iron Threaded Fittings: ASME B16.4, Class 125, standard pattern.

3. Malleable-Iron Unions:

- a. ASME B16.39, Class 150.
- b. Hexagonal-stock body.
- c. Ball-and-socket, metal-to-metal, bronze seating surface.
- d. Threaded ends.

4. Flanges: ASME B16.1, Class 125, cast iron.

E. HDPE Pipe and Fittings:

1. HDPE Casing:

- a. Coil or Roll Pipe: Comply with AWWA C906, ASTM D3035, DR 11 for 200 psig pressure rating.
- b. Fittings: Comply with AWWA C906, molded.
- c. Joints: Butt fusion, internal bead removal if required for installation.
- d. Materials: Comply with ASTM D3350, minimum cell classification 324433-C.

2. HDPE carrier water pipe:

- a. Coil or Roll Pipe: Comply with AWWA C901, ASTM D3035, DR 11 for 200 psig pressure rating.
- b. Fittings: Comply with AWWA C901, molded [or fabricated].
- c. Joints: Butt fusion, bead removal if required for installation.
- d. Materials: Comply with ASTM D3350, minimum cell classification 324433-C.

3. Centralizer between casing pipe and carrier pipe:

- a. Comply with AWWA C901/906 fitting requirements.
- b. Suitable for butt welding to pipe manufactured.
- c. Must be press fit end centralizer and loose fit middle centralizer.

2.2 PIPING JOING MATERIALS

A. Pipe-Flange Gasket Materials:

- 1. AWWA C110/A21.10, rubber, flat face, 1/8-inch-thick or ASME B16.21, nonmetallic and asbestos free unless otherwise indicated.

2. Full-face or ring type unless otherwise indicated.
- B. Metal, Pipe-Flange Bolts and Nuts: ASME B18.2.2, stainless steel unless otherwise indicated.
- C. Solvent Cements for Joining PVC Piping: ASTM D 2564. Include primer according to ASTM F 656.
- D. Plastic, Pipe-Flange Gaskets, Bolts, and Nuts: Type and material recommended by piping system manufacturer unless otherwise indicated.

2.3 PIPING SPECIALTIES

- A. Transition Fittings: Manufactured fitting or coupling same size as, with pressure rating at least equal to and ends compatible with, piping to be joined.
- B. Sleeve-Type Transition Couplings:
 1. Description: Metal, bolted, sleeve-type, reducing or transition coupling, with center sleeve, gaskets, end rings, and bolt fasteners and with ends of same sizes as piping to be joined.
 - a. Standard: AWWA C219.
 - b. Center-Sleeve Material: Manufacturer's standard.
 - c. Gasket Material: Natural or synthetic rubber.
 - d. Pressure Rating: 150 psig minimum.
 - e. Metal Component Finish: Corrosion-resistant coating or material.
- C. Flexible Connectors:
 1. Nonferrous-Metal Piping: Bronze hose covered with bronze wire braid; with copper-tube, pressure-type, solder-joint ends or bronze flanged ends brazed to hose.
 2. Ferrous-Metal Piping: Stainless-steel hose covered with stainless-steel wire braid; with ASME B1.20.1, threaded steel pipe nipples or ASME B16.5, steel pipe flanges welded to hose.
- D. Plastic-to-Metal Transition Fittings:
 1. Description:
 - a. PVC one-piece fitting with manufacturer's Schedule 80 equivalent dimensions.
 - b. One end with threaded brass insert and one solvent-cement-socket [or threaded] end.
- E. Plastic-to-Metal Transition Unions:
 1. Description:
 - a. PVC four-part union.
 - b. Brass or stainless-steel threaded end.
 - c. Solvent-cement-joint or threaded plastic end.
 - d. Rubber O-ring.
 - e. Union nut.
- F. Dielectric Fittings:
 1. General Requirements: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined.
 2. Dielectric Unions:
 - a. Description:

- 1) Standard: ASSE 1079.
- 2) Pressure Rating: 125 psig minimum at 180 deg F.
- 3) End Connections: Solder-joint copper alloy and threaded ferrous.

3. Dielectric Flanges:

a. Description:

- 1) Standard: ASSE 1079.
- 2) Factory-fabricated, bolted, companion-flange assembly.
- 3) Pressure Rating: 125 psig minimum at 180 deg F.
- 4) End Connections: Solder-joint copper alloy and threaded ferrous; threaded solder-joint copper alloy and threaded ferrous.

2.4 GATE VALVES

- A. 2-1/2 Inch and Smaller: Brass or bronze body, non-rising stem, inside screw, single wedge or disc, IPS ends, with control rod, valve box and valve key.
- B. 3 Inch and Larger: AWWA C509, iron body, bronze trim, non-rising stem with square nut, single wedge, resilient seat, mechanical joint ends, control rod, valve box, and valve key.
- C. Mark manufacturer's name and pressure rating on valve body.

2.5 BALL VALVES

- A. 2 Inch and Smaller:
 1. Brass ball valves: Brass body, TEFC-coated brass ball, rubber seats and stem seals, tee stem pre-drilled for control rod, IPS inlet end, IPS outlet, with control rod, valve box, and valve key.
 2. PVC ball valves: ASTM D 1784, PVC body, true union, socket or threaded ends, Ethylene Propylene Diene Monomer (EPDM) seals, Fluorocarbon rubber O-rings.
- B. Mark manufacturer's name and pressure rating on valve body.

2.6 CHECK VALVES

- A. Bronze check valves:
 1. Less than 2 inches: ASTM B 584, bronze, lead-free body, MSS SP-80, horizontal flow body design, threaded ends, Polytetrafluoroethylene (PTFE) disc and 316SS hinge pin.
 2. 2 Inches to 24 Inches: AWWA C508, iron body, bronze trim, 45-degree swing disc, renewable disc and seat, and flanged ends
- B. PVC check valves:
 1. Description: ASTM D 1784, 150 psi pressure rating, true union, socket or threaded ends, EPDM seat seals.
- C. Mark manufacturer's name and pressure rating on valve body.

2.7 BUTTERFLY VALVES

- A. 2 Inches to 24 Inches: AWWA C504, iron body, bronze disc, resilient replaceable seat, water or lug ends, [10] [infinite]-position lever handle.
- B. Mark manufacturer's name and pressure rating on valve body.

2.8 PRESSURE-REDUCING VALVES

A. Water Regulators:

1. Standard: ASSE 1003.
2. Pressure Rating: The outlet pressure of the pressure reducing valve (PRV) must be adjustable within a range of 25 psi to 75 psi.
3. PRV must be direct acting, spring loaded diaphragm type control valve with balanced single seat, bronze body, bronze trim and screwed connection
4. Body: Bronze for NPS 2 and smaller; cast iron with interior lining complying with AWWA C550 or that is FDA approved for NPS 2-1/2 and NPS 3.
5. End Connections: Threaded for NPS 2 and smaller; flanged for NPS 2-1/2 and NPS 3.

2.9 DOUBLE CHECK DETECTOR ASSEMBLY BACKFLOW PREVENTER

A. Description: Backflow prevention for fire applications.

1. Standards: ASSE listed 1048, AWWA C510, FM approved, NSF 61 certified.
2. End Connections: Flanged.
3. Blanket: As specified in Section 20-2.02B(3) of the Standard Specifications.
4. Cage: As specified in Section 20-2.02B(4) of the Standard Specifications.

2.10 UNDERGROUND PIPE MARKERS

A. Plastic Warning Tape: 1. Brightly colored, detectable, continuously printed.

1. Minimum 6 inches wide by 4 mil thick.
2. Manufactured for direct burial service.
3. Lettered "CAUTION WATERLINE BURIED BELOW"

2.11 UTILITY BOXES

- A.** Utility boxes must be concrete body with a polyethylene rim and concrete cover; non-setting shoulders; rectangular enclosure; with lettering "WATER" or equal on cover; and with slotted, open-bottom base section of length and width to fit over service piping or as indicated. Include vertical and lateral design loadings for incidental H-20 loading. Provide manufacturer's extensions as required. Sizes as shown.
- B.** Traffic-rated utility boxes must be H-20 rated, reinforced concrete body with steel rim and bolted steel cover; non-setting shoulders; rectangular enclosure; with lettering "WATER" or equal on cover. Provide manufacturer's extensions as required. Sizes as shown.

2.12 VALVE BOXES

A. Description:

1. Valve boxes and covers, including position indicators and valve extensions, as indicated on Drawings.
2. Material: Traffic rated Precast concrete box with cast iron cover.
3. Type: Extension, with slide adjustment.
4. Covers marked WATER SERVICE.

2.13 ACCESSORIES

- A.** Concrete for Thrust Restraints: Minor concrete as specified in Section 90-2 of the Standard Specifications.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Remove large stones or other hard materials that could damage pipe or impede consistent backfilling or compaction.
- B. Cut pipe ends square, ream pipe and tube end to full pipe diameter, and remove burrs.
- C. Remove scale and dirt on inside and outside before assembly.
- D. Prepare pipe connections to equipment with flanges or unions.
- E. Protect and support existing distribution piping and appurtenances as Work progresses.
- F. Notify the Engineer if crossing conflicts occur.

3.2 EARTHWORK

- A. Refer to Section 99-02220 "Earthwork for Building Work" for excavating, trenching, and backfilling.

3.3 PIPING APPLICATIONS

- A. General: Use pipe, fittings, and joining methods for piping systems according to the following applications.
- B. Transition couplings and special fittings with pressure ratings at least equal to piping pressure rating may be used, unless otherwise indicated.
- C. Do not use flanges or unions for underground piping, except inside utility boxes.
- D. Underground water-service piping NPS 3/4 to NPS 3 shall be the following:
 - 1. PVC pipe and fittings; and solvent-cemented joints, unless otherwise indicated.
- E. Aboveground Water-Service Piping shall be the following:
 - 1. Galvanized steel pipe and fittings, unless otherwise indicated.

3.4 VALVE APPLICATIONS

- A. General Application: Use mechanical-joint-end valves for NPS 3 and larger underground installation. Use UL/FMG, nonrising-stem gate valves for installation with indicator posts. Use corporation valves and curb valves with ends compatible with piping, for NPS 2 and smaller installation.
- B. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:
 - 1. Pressure-Reducing Valves: Use for water-service piping aboveground to control water pressure.
 - 2. PVC valves: Only use for indoor piping, unless otherwise indicated.
 - 3. Ball valves: Use for 2" or smaller piping, otherwise use gate valves.

3.5 INSTALLATION

- A. Piping:
 - 1. Maintain minimum 10-foot separation of water main from parallel sewer piping according to the California Plumbing Code.
 - 2. Group piping with other Site piping work whenever practical.
 - 3. Route pipe in straight line.

4. Install access fittings to permit disinfection of water system.
5. Thrust Restraints:
 - a. Form and place concrete for pipe thrust restraints at each elbow or change of pipe direction.
 - b. Place concrete to permit full access to pipe and pipe accessories.
6. Pipe Markers:
 - a. Install plastic warning tape continuous over top of pipe.
- B. Valves:
 1. Set valves on compacted soil.
 2. Valve Box:
 - a. Center and plumb valve box over valve.
 - b. Set box cover flush with finished grade.
- C. Meters:
 1. Install water meters according to AWWA M6 with isolating valves on inlet and outlet.
- D. Service Connections:
 1. Install water service with backflow preventer.
 2. Install water service to 5 feet of building and connect to building water.
 3. Pipe Sleeve:
 - a. Install PVC pipe sleeves where each pipe will pass through concrete slabs, footings, or walls. Inside diameter of sleeves must be at least 1-inch larger than outside diameter of pipe. Pipes must be installed to provide at least 3/8-inch space all around the full depth of concrete. Caulk space between pipes and pipe sleeves watertight with silicone caulk. Backer rod may be installed, but the caulk shall be at least 1-inch deep on both sides.
 - b. Core holes for pipes passing through existing concrete slabs, footings, or walls. Holes cored through concrete must be cored by methods that will not shatter or damage the concrete adjacent to the hole. Water for core drilling operations must be from the local domestic water supply. Pipes must be installed to provide at least 3/8-inch space all around the full depth of concrete. Caulk space between pipe and pipe sleeves watertight with silicone caulk. Backer rod may be installed, but the caulk must be at least 1-inch deep on both sides.

3.6 JOINT CONSTRUCTION

- A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- B. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.
- C. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
 1. Apply appropriate tape or thread compound to external pipe threads.
 2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.
- D. Make pipe joints according to the following:

1. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.
2. Install plastic-to-metal transition fittings in underground water piping.

3.7 ANCHORAGE INSTALLATION

- A. Anchorage, General: Install water-distribution piping with restrained joints. Anchorages and restrained-joint types that may be used include the following:
 1. Concrete thrust blocks.
 2. Locking mechanical joints.
 3. Pipe clamps and tie rods.
- B. Install anchorages for tees, plugs and caps, bends, crosses, valves, and hydrant branches.
- C. Apply full coat of asphalt or other acceptable corrosion-resistant material to surfaces of installed ferrous anchorage devices.

3.8 BACKFLOW PREVENTER INSTALLATION

- A. Install backflow preventers of type, size, and capacity indicated. Include valves and test cocks. Install according to-24 CA Code of Regs.
- B. Do not install backflow preventers that have relief drain in vault or in other spaces subject to flooding.
- C. Do not install bypass piping around backflow preventers.
- D. Install backflow preventer with a minimum of 12 inches clearance between the lowest portion of the assembly and finished grade or slab, or with the clearance as shown.

3.9 CONNECTIONS

- A. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. When installing piping adjacent to equipment and machines, allow space for service and maintenance.

3.10 FIELD QUALITY CONTROL

- A. Pressure test system according to following:
 1. Test Pressure: Not less than 200 psig or 50 psi in excess of maximum static pressure, whichever is greater.
 2. Conduct hydrostatic test for at least two hours.
 3. Slowly fill with water section to be tested and expel air from piping by installing corporation cocks at high points.
 4. Close air vents and corporation cocks after air is expelled and raise pressure to specified test pressure.
 5. Observe joints, fittings, and valves under test. Remove and renew cracked pipes, joints, fittings, and valves showing visible leakage and retest.
 6. Correct visible deficiencies and continue testing at same test pressure for additional two hours to determine leakage rate.
 7. Maintain pressure within plus or minus 5 psi of test pressure.
 8. If test of pipe indicates leakage, locate source of leakage, make corrections, and retest.
- B. Perform pressure test on piping according to 24 CA Code of Regs standards.
- C. Perform backflow preventer certification according to Section 20-2.02A(4) of the Standard Specifications.

3.11 DISINFECTION

- A. Clean and disinfect water-distribution piping as follows:
 - 1. Purge water-distribution piping systems, from water well to all lavatories.
 - 2. Use purging and disinfecting procedure prescribed as follows:
 - a. Fill system or part of system with water/chlorine solution (comply with AWWA B300) containing at least 25 ppm of chlorine; isolate and allow to stand for 24 hours.
 - b. Or fill system or part of system with water/chlorine solution (comply with AWWA B300) containing at least 100 ppm of chlorine; isolate and allow to stand for 3 hours.
 - c. At the end of this 24-hr period, the treated water in all portions of the water pipe must have a residual of not less than 10 mg/L of free chlorine.
 - d. After standing time, flush system with clean, potable water until no chlorine remains in water coming from system.
 - e. Dispose of the chlorinated water in compliance with AWWA C655-09.
- B. Prepare reports of purging and disinfecting activities.

END OF SECTION 99-331116

99-333100 - SANITARY UTILITY SEWERAGE PIPING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes, for work shown on the sheets labeled SS:
 - 1. Sewage pipe and fittings.
 - 2. Force main and fittings.
 - 3. Nonpressure-type pipe couplings.
 - 4. Pressure-type pipe couplings.
 - 5. Pipe identification.
 - 6. Cleanouts.
 - 7. Manholes.
 - 8. Utility boxes.
 - 9. Valve boxes.
 - 10. Sewage meters.
 - 11. Ball valves.
 - 12. Check valves.
 - 13. Air vacuum release valves.
 - 14. Effluent filters.

- B. Related Requirements:
 - 1. Section 99-02220 – Earthwork for Building Work.

1.2 DEFINITIONS

- A. PVC: Polyvinyl chloride plastic.
- B. HDPE: High Density Polyethylene.

1.3 ACTION SUBMITTALS

- A. Product Data: Submit manufacturer information of the products to be used, including shop drawings. For manholes and effluent filters, include plans, elevations, sections, details, and frames and covers.
- B. Manufacturer Instructions: Indicate special procedures required to install specified products

- C. Field Quality-Control Submittals: Indicate results of Contractor-furnished tests and inspections.

1.4 QUALITY ASSURANCE

- A. Regulatory Requirements: Comply with latest standards of 24 CA Code of Regs, Part 5 for sanitary sewage piping work, including materials, installation, and testing.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Do not store plastic manholes, effluent filters, pipes, and fittings in direct sunlight.
- B. Protect pipes, pipe fittings, and seals from dirt and damage.
- C. Handle manholes according to manufacturer's written instructions.

1.6 CLOSEOUT SUBMITTALS

- A. Section 99-02085 – System Start Up, Testing, Operation and Maintenance Manual, and Training.
- B. Project Record Documents: Record locations of pipe runs, connections, manholes, effluent filters, cleanouts, and invert elevations.
- C. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

1.7 EXISTING CONDITIONS

- A. Field Measurements:
 - 1. Verify field measurements prior to fabrication.
 - 2. Indicate field measurements on shop drawings.

PART 2 - PRODUCTS

2.1 PIPES AND FITTINGS

- A. Sewage Pipe:
 - 1. Material: PVC
 - 2. Comply with ASTM D3034, SDR-35.
 - 3. End Connections: Bell and spigot style, with rubber-ring-sealed gasket joint.
 - 4. Fittings: PVC.
 - 5. Joints:
 - a. Elastomeric gaskets.
 - b. Comply with ASTM F477.
- B. Force Main:
 - 1. Material: PVC, Schedule 40.
 - 2. Comply with ASTM D1785.
 - 3. End Connections: Bell and spigot style, with solvent-sealed ends.
 - 4. Fittings:
 - a. Material: PVC.
 - b. Comply with ASTM D2466.
 - 5. Joints:
 - a. Solvent welded with solvent cement conforming to ASTM D2564.
 - b. Comply with ASTM D2855.
- C. HDPE

1. HDPE Casing:
 - a. Coil or Roll Pipe: Comply with AWWA C906, ASTM D3035, DR 11 for 200 psig pressure rating.
 - b. Fittings: Comply with AWWA C906, molded.
 - c. Joints: Butt fusion, internal bead removal if required for installation.
 - d. Materials: Comply with ASTM D3350, minimum cell classification 324433-C.
2. HDPE carrier Force main:
 - a. Coil or Roll Pipe: Comply with AWWA C901, ASTM D3035, DR 11 for 200 psig pressure rating.
 - b. Fittings: Comply with AWWA C901, molded [or fabricated].
 - c. Joints: Butt fusion, bead removal if required for installation.
 - d. Materials: Comply with ASTM D3350, minimum cell classification 324433-C.
3. Centralizer between casing pipe and carrier pipe:
 - a. Comply with AWWA C901/906 fitting requirements.
 - b. Suitable for butt welding to pipe manufactured.
 - c. Must be press fit end centralizer and loose fit middle centralizer.

2.2 NONPRESSURE-TYPE PIPE COUPLINGS

- A. Comply with ASTM C 1173, elastomeric, sleeve-type, reducing or transition coupling; for joining underground nonpressure-type piping. Include ends of same sizes as piping to be joined and include corrosion-resistant-metal tension band and tightening mechanism on each end.
- B. Sleeve Materials:
 1. For Plastic Pipes: ASTM F 477, elastomeric seal or ASTM D 5926, PVC.
 2. For Dissimilar Pipes: ASTM D 5926, PVC or other material compatible with pipe materials being joined.
- C. Unshielded, Flexible Couplings:
 1. Description: Elastomeric sleeve with stainless-steel shear ring and corrosion-resistant-metal tension band and tightening mechanism on each end.
- D. Shielded, Flexible Couplings:
 1. Description: ASTM C 1460, elastomeric or rubber sleeve with full-length, corrosion-resistant outer shield and corrosion-resistant-metal tension band and tightening mechanism on each end.
- E. Ring-Type, Flexible Couplings:
 1. Description: Elastomeric compression seal with dimensions to fit inside bell of larger pipe and for spigot of smaller pipe to fit inside ring.
- F. Nonpressure-Type, Rigid Couplings:
 1. Description: ASTM C 1461, sleeve-type, reducing-type or transition-type mechanical coupling; molded from ASTM C 1440, thermoplastic elastomer material; with corrosion-resistant-metal tension band and tightening mechanism on each end.

2.3 PRESSURE-TYPE PIPE COUPLINGS

- A. Tubular-Sleeve Couplings: AWWA C219, with center sleeve, gaskets, end rings, and bolt fasteners.
- B. Metal, bolted, sleeve-type, reducing or transition coupling; for joining underground pressure piping. Include 150-psig minimum pressure rating and ends of same sizes as piping to be joined.
- C. Center-Sleeve Material: Manufacturer's standard.
- D. Gasket Material: Natural or synthetic rubber.
- E. Metal Component Finish: Corrosion-resistant coating or material.

2.4 PIPE IDENTIFICATION

- A. Tracer Tape:
 - 1. Description:
 - a. Material: Acid- and alkali-resistant polyethylene film with metallic core.
 - b. Green colored, continuously printed.
 - c. Minimum Size: 3 inches wide by 4 mils thick.
 - d. Manufactured for direct burial service.
 - e. Imprint: "CAUTION BURIED SEWER LINE BELOW" or equal.

2.5 CLEANOUTS

- A. Gravity cleanout (Clean out to grade): PVC body with PVC threaded plug. Include PVC sewer pipe fitting and riser to cleanout of same material as sewer piping.
- B. Force main cleanout: Force main cleanout must terminate with an appropriately sized removable PVC cap (screw fitting). Rubber coupling and cap will not be allowed.
- C. Cleanouts must be installed 90 degrees for gravity lines and 45 degrees for force main to finished grade and must terminate in valve box. A concrete pad must be provided full width of the trench under the wye branch.

2.6 MANHOLES

- A. Standard Precast Concrete Manholes:
 - 1. Description: ASTM C 478, precast, traffic-rated, reinforced concrete, of depth indicated, with provision for sealant joints.
 - 2. Diameter: 48 inches minimum unless otherwise indicated.
 - 3. Ballast: Increase thickness of precast concrete sections or add concrete to base section, as required to prevent flotation.
 - 4. Base Section: 6-inch minimum thickness for floor slab and 4-inch minimum thickness for walls and base riser section; with separate base slab or base section with integral floor.
 - 5. Riser Sections: 4-inch minimum thickness, of length to provide depth indicated.
 - 6. Top Section: Eccentric-cone type unless concentric-cone or flat-slab-top type is indicated; with top of cone of size that matches grade rings.
 - 7. Joint Sealant: ASTM C 990, bitumen, or butyl rubber.
 - 8. Resilient Pipe Connectors: ASTM C 923, cast or fitted into manhole walls, for each pipe connection.
 - 9. Adjusting Rings: Interlocking HDPE rings, with level or sloped edge in thickness and diameter matching manhole frame and cover, and with height as required to adjust manhole frame and cover to indicated elevation and slope. Include sealant recommended by ring manufacturer.
 - 10. Grade Rings: Reinforced-concrete rings, 6- to 9-inch total thickness, with diameter matching manhole frame and cover, and with height as required to adjust manhole frame and cover to indicated elevation and slope.

11. Ladder Rungs: Supply internally mounted fiberglass ladder with non-slip traction surface (meet or exceed OSHA General Industry Standards, Part 1910.27 for "Fixed Ladders").

B. Manhole covers and frames:

1. Composite cover and frame: cover and riser frame must be round, H-20 or greater (traffic type), and sizes as indicated. Fasteners must be stainless steel. Cover must be marked "SS", "SEWER", or "SANITARY SEWER".

2.7 SEWAGE FLOW METERS

- A. Sewage flow meter must be of flanged electromagnetic, hard rubber lined flow meter, 316L stainless steel electrodes, suitable for wastewater.
- B. Meter must have zero pressure loss through the unit. Flow meter must be same size as pipe.
- C. Meter must consist of two units. A detector to detect the flow and determines the flow rates and a transmitter which converts the flow rates from detectors into a 4-20 mA current signals or communication signals. The transmitter must be either combined type mounted with the detector as one unit or remote transmitter to the detector as shown.
- D. The meter flow direction can be set in either direction.
- E. Transmitter must be equipped with a backlit LCD display. The readout must be in gallons.
- F. At a minimum, flow meter must contain the following:
 1. Flow range of 0 to 150 gpm
 2. Steel flange sized for the pipe
 3. Polyurethane resin coating for detector
 4. 1.0 percent accuracy
 5. Fluid temperature range: 23 to 176 degrees F
 6. Ambient temperature range: -4 to 140 degrees F
 7. Pressure limit: 150 psi
 8. IP 67 rated and NEMA 4X watertight enclosure
 9. Approved for use in Class 1, Division 2, Groups A-G classified hazardous locations
 10. Integral or remote digital display as shown for local indication of instantaneous flow, totalized flow, and fluid temperature
 11. Selectable units, standard and metric, including gpm
 12. 120 V(ac) power or 24V(dc) as shown
 13. 4-20 mA flow output
 14. Flow totalizer with programmable pulse output, dry contact type
 15. Transmitter with analog signal inputs from detectors
 16. Transmitter with available digital input and digital outputs
 17. Grounding electrodes and rings
 18. Non-conductive, long-life, corrosion resistant lining
 19. Empty pipe indication/alarm
 20. Communication output protocol as required for MODBUS communication with PLC
 21. Cables for remote transmitter as required
 22. A transducer junction box must be provided near the valve box to mount the transmitter.

2.8 UTILITY BOXES

- A. Description: Reinforced concrete body with a polyethylene rim and reinforced concrete cover; non-setting shoulders; rectangular enclosure; with lettering "SANITARY SEWER" or equal on cover; and with slotted, open-bottom base section of length and width to fit over service piping or as indicated. Include vertical and lateral design loadings for incidental H-20 loading.

2.9 VALVE BOXES

- A. Description: Reinforced concrete body with a cast-iron cover and ring; round enclosure; with lettering "SANITARY SEWER" or equal on cover; and with slotted, open-bottom base section of diameter to fit over service piping or as indicated. Include vertical and lateral design loadings for incidental H-20 loading.

2.10 VALVE BOXES (PLASTIC)

- A. Description: UV-resistant fiberglass, HDPE, or PVC body and composite cover; round enclosure; with lettering "SANITARY SEWER" or equal on cover; supply extensions as required.

2.11 BALL VALVES

- A. Description: ASTM D 1784, PVC body, true union, socket or threaded ends, Ethylene Propylene Diene Monomer (EPDM) seals, Fluorocarbon rubber O-rings.
- B. Mark manufacturer's name and pressure rating on valve body.

2.12 CHECK VALVES

- A. Description: must be ball type with removable bolted top, ANSI B16.1 Class 125 flanges, with hollow steel ball with rubber cover.

2.13 AIR/ VACUUM RELEASE VALVES

- A. Description:
 - 1. Type: Fully automatic, float operated.
 - 2. Comply with AWWA C512.
 - 3. Size: As indicated on Drawings.
 - 4. Suitable for sewage service.
 - 5. Valve Body Connections: As indicated on Drawings.
 - 6. Pressure Rating: 150 psig.
 - 7. Two floats, directly connected with float guide
 - 8. Protect top to prevent debris
 - 9. Backflush option with the valve
- B. Materials:
 - 1. Body and Cover: Cast iron, ASTM A126.
 - 2. Float, Seat, and Trim: Type stainless steel.
 - 3. Seats: Buna-N.
- C. End Connections:
 - 1. Size 3 Inches and Smaller:
 - a. Threaded, NPT.
 - b. 1-Inch Valves: Furnish 2-inch inlet.
 - 2. Size 4 Inches and Larger: Flanged, ASME B16.1.
 - 3. Backwash Accessories: Furnish three additional NPT connections.
- D. Valve Body Connections:
 - 1. Threaded, NPT.
 - 2. Cleanout: 2 inches.
 - 3. Drain: 1 inch.
- E. Accessories:

1. Backwash accessories, including inlet shutoff valve, blow off valve, rubber supply hose, and quick-disconnect couplings.

2.14 EFFLUENT FILTER

- A. Description: PVC ribbed riser with a fiberglass base, inlet grommet, a polyethylene screen filter vault, screen filter assembly, and PVC handle, as shown. The screen filter assembly consists of 1/8-inch mesh filters and must have the equivalent of XXX square feet minimum filter surface area.
- B. Install effluent filter according to manufacturer's written instructions and as shown.

2.15 MIXES

- A. Grout must be non-shrink grout complying with ASTM C1107/C1107M.

2.16 ACCESSORIES

- A. Sewage Pipe Adapters: Sewage pipe adapters for PVC to cast iron soil pipe or clay piping must be appropriately sized PVC flexible coupling manufactured for connecting dissimilar pipes. Adapter must be attached to piping with adjustable stainless-steel band clamps with hex tightening screws. Rubber boots are not allowed.
- B. Epoxy mortar: Epoxy mortar must be a commercial quality, trowelable, 3-component epoxy mortar consisting of 2 pourable epoxy components and a chemically resistant aggregate filler of silica quartz sand with a maximum water absorption of 0.1 percent. Epoxy must have a pull-off strength of not less than 1,000 psi and a 90 percent cure in 24 hours. Epoxy mortar must be the type that requires no primer as a bonding agent.
- C. Cement Mortar: Cement mortar must be one part cement to 2 to 3 parts clean plaster or concrete sand mixed with just enough water for suitable consistency.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that trench cut and excavation base is ready to receive Work.
- B. Verify that excavations, dimensions, and elevations are as indicated on Drawings.

3.2 PREPARATION

- A. Remove large stones or other hard materials that could damage pipe or impede consistent backfilling or compaction.
- B. Protect and support existing sewer lines, utilities, and appurtenances.
- C. Utilities:
 1. Maintain profiles of utilities.
 2. Notify the Engineer if crossing conflicts occur.

3.3 EARTHWORK

- A. Refer to Section 99-02220 "Earthwork for Building Work" for excavating, trenching, and backfilling.

3.4 PIPING INSTALLATION

- A. General Locations and Arrangements: Drawing plans and details indicate general location and arrangement of underground sanitary sewer piping. Location and arrangement of piping layout

take into account design considerations. Install piping as indicated, to extent practical. Where specific installation is not indicated, follow piping manufacturer's written instructions.

- B. Install piping beginning at low point, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions for using lubricants, cements, and other installation requirements.
- C. Install manholes for changes in direction unless fittings are indicated. Use fittings for branch connections unless direct tap into existing sewer is indicated.
- D. Install proper size increasers, reducers, and couplings where different sizes or materials of pipes and fittings are connected. Reducing size of piping in direction of flow is prohibited.
- E. When installing pipe under streets or other obstructions that cannot be disturbed, use pipe-jacking process or horizontal directional drilling.
- F. Install sewage pipe according to the following:
 - 1. Install piping pitched down in direction of flow, at minimum slope of 2 percent unless otherwise indicated.
 - 2. Install piping with 24-inch minimum cover unless otherwise indicated.
 - 3. Piping must be installed upgrade (starting from utility connection back to the construction) unless otherwise authorized by the Engineer.
 - 4. Sewers near water pipes must be installed below water lines in the same trench, in parallel trenches less than 10 feet apart.
 - 5. When water pipes cross above a sewer line, a vertical separation of not less than 12 inches must be maintained between the top of the sewer pipe and the bottom of the water line.
 - 6. Connections between Differing Pipe Types: Joints between different types of pipes must be made with sewage pipe adapters intended for that purpose.
 - 7. Damaged pipe must be replaced prior to use. Misaligned pipe must be corrected or replaced prior to use.
 - 8. Interior of pipes must be cleaned of dirt and other materials as the work progresses.
 - 9. Lines between manholes must be flushed as necessary to remove collected material.
 - 10. Interiors of pipes must be inspected to determine displacement or damage during installation or backfilling.
 - 11. Install piping according to ASTM D 2321 and ASTM F 1668.
- G. Install force main according to the following:
 - 1. Install piping with restrained joints at tee fittings and at horizontal and vertical changes in direction. Use corrosion-resistant rods, pipe or fitting manufacturer's restraint system, or cast-in-place-concrete supports or anchors.
 - 2. Install piping with 24-inch minimum cover unless otherwise indicated.
 - 3. Install piping according to AWWA M23 or to ASTM D 2774 and ASTM F 1668.
- H. Clear interior of piping and manholes of dirt and superfluous material as work progresses. Maintain swab or drag in piping and pull past each joint as it is completed. Place plug in end of incomplete piping at end of day and when work stops.

3.5 PIPE JOINT CONSTRUCTION

- A. Join sewage pipe according to the following:
 - 1. Join piping according to ASTM D 2321 and ASTM D 3034 for elastomeric-seal joints or ASTM D 3034 for elastomeric-gasket joints.
 - 2. Join dissimilar pipe materials with nonpressure-type, flexible or rigid couplings.
- B. Join force main according to the following:

1. Join piping according to AWWA M23 for gasketed joints.
 2. Join dissimilar pipe materials with pressure-type couplings.
- C. Pipe couplings, expansion joints, and deflection fittings with pressure ratings at least equal to piping rating may be used in applications below ground unless otherwise indicated.
1. Use nonpressure flexible couplings where required to join sewage piping unless otherwise indicated.
 - a. Shielded flexible or rigid couplings for pipes of same or slightly different outside diameter.
 - b. Unshielded, increaser/reducer-pattern, flexible or rigid couplings for pipes with different outside diameter.
 - c. Ring-type flexible couplings for piping of different sizes where annular space between smaller piping's outside diameter and larger piping's inside diameter allows installation.
 2. Use pressure pipe couplings for force main joints.

3.6 CLEANOUT INSTALLATION

- A. Install cleanouts and riser extensions from sewage pipes to cleanouts at grade. Use PVC pipe fittings in sewage pipes at branches for cleanouts and use PVC pipe for riser extensions to cleanouts. Install piping so cleanouts open in direction of flow in sewage pipe.
1. Use Light-Duty, top-loading classification cleanouts in earth or unpaved foot-traffic areas.
 2. Use Medium-Duty, top-loading classification cleanouts in paved foot-traffic areas.
 3. Use Heavy-Duty, top-loading classification cleanouts in vehicle-traffic service areas.
 4. Use Extra-Heavy-Duty, top-loading classification cleanouts in roads.
- B. Set cleanout frames and covers in earth in thrust block, as shown on drawing details. Set with tops 1 inch above surrounding grade.
- C. Set cleanout frames and covers in concrete pavement and roads with tops flush with pavement surface.

3.7 MANHOLE INSTALLATION

- A. General: Install manholes complete with appurtenances and accessories indicated.
- B. Install precast concrete manhole sections with sealants according to ASTM C 891.
- C. Form continuous concrete channels and benches between inlets and outlet.
- D. Set tops of frames and covers flush with finished surface of manholes that occur in pavements. Set tops 2 inches above finished surface elsewhere unless otherwise indicated.
- E. Install manhole covers and frames complete with accessories in compliance with manufacturer's instructions and as shown.

3.8 CONNECTIONS

- A. Make connections to existing piping and underground manholes.
1. Use commercially manufactured wye fittings for piping branch connections. Remove section of existing pipe, install wye fitting into existing piping, and encase entire wye fitting plus 6-inch overlap with not less than 6 inches of concrete with 28-day compressive strength of 3000 psi.
 2. Make branch connections from side into existing piping, NPS 4 to NPS 20. Remove section of existing pipe, install wye fitting into existing piping, and encase entire wye with not less than 6 inches of concrete with 28-day compressive strength of 3000 psi.
 3. Protect existing piping and manholes to prevent concrete or debris from entering while making tap connections. Remove debris or other extraneous material that may accumulate.

3.9 IDENTIFICATION

A. Tracer Tape:

1. Continuous buried 6 to 8 inches below finish grade, directly above piping and over edges of underground manholes.
2. If multiple pipes occur in common trench, locate tape above centerline of trench.
3. Coordinate with trench work as specified in Section 99-02220.

3.10 UTILITY AND VALVE BOXES INSTALLATION

- A. Install utility and valve boxes in paved areas flush with surface.
- B. Install utility and valve boxes in grass or earth areas with top 2 inches above surface.
- C. Install extensions as required.

3.11 SEWAGE FLOW METER INSTALLATION

- A. Install flow meters, piping, and specialties according to manufacturer's written instructions.
- B. Install in utility boxes with unions and ball valves on inlets and as shown.

3.12 VALVE INSTALLATION

- A. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.
- B. Locate valves for easy access and provide separate support where necessary.
- C. Install valves in horizontal piping with stem at or above center of pipe.
- D. Install valves in position to allow full stem movement.
- E. Install valves according to manufacturer's written instructions.

3.13 FIELD QUALITY CONTROL

- A. Inspect interior of piping to determine whether line displacement or other damage has occurred. Inspect after approximately 24 inches of backfill is in place, and again at completion of Project.
 1. Submit separate report for each system inspection.
 2. Defects requiring correction include the following:
 - a. Alignment: Less than full diameter of inside of pipe is visible between structures.
 - b. Deflection: Flexible piping with deflection that prevents passage of ball or cylinder of size not less than 92.5 percent of piping diameter.
 - c. Damage: Crushed, broken, cracked, or otherwise damaged piping.
 - d. Infiltration: Water leakage into piping.
 - e. Exfiltration: Water leakage from or around piping.
 - f. Slope: Pipe is not laid to slope gradients as indicated on drawings.
 3. Replace defective piping using new materials, and repeat inspections until defects are within allowances specified.
 4. Reinspect and repeat procedure until results are satisfactory.
- B. Test new piping systems, and parts of existing systems that have been altered, extended, or repaired, for leaks and defects.
 1. Do not enclose, cover, or put into service before inspection and approval.
 2. Test completed piping systems according to requirements of 24 CA Code of Regs.
 3. Schedule tests and inspections with at least 24 hours advance notice.
 4. Submit separate report for each test.

5. Hydrostatic Tests: Test sanitary sewerage according to requirements of 24 CA Code of Regs and the following:
 - a. Close openings in system and fill with water.
 - b. Purge air and refill with water.
 - c. Disconnect water supply.
 - d. Test with pressure of at least 10-foot head of water and maintain such pressure without leakage for at least 15 minutes.
 6. Testing of force main piping: according to the following:
 - a. Hydrostatically test each portion of pressure piping, including valved section, at 15 times working pressure of piping, based on elevation of lowest point in piping corrected to elevation of test gage.
 - b. Conduct hydrostatic testing for at least two hours.
 - c. Slowly fill with water portion of piping to be tested, expelling air from piping at high points.
 - d. Install corporation cocks at high points.
 - e. Close air vents and corporation cocks after air is expelled.
 - f. Raise pressure to specified test pressure.
 - g. Observe joints, fittings, and valves undergoing testing.
 - h. Remove and renew cracked pipes, joints, fittings, and valves that show visible leakage.
 - i. Retest.
 - j. Correct visible deficiencies and continue testing at same test pressure for additional two hours to determine leakage rate.
 - k. Maintain pressure.
 7. Manholes: Perform hydraulic test according to ASTM C 969.
- C. Leaks and loss in test pressure constitute defects and must be repaired.
- D. Replace leaking piping using new materials, and repeat testing until there is no leakage.

3.14 CLEANING

- A. Clean dirt and superfluous material from interior of piping. Flush with potable water.

END OF 99-333100

99-02842 GUARD POSTS

99-02842A GENERAL

99-02842A(1) Summary

Scope: This work consists of constructing guard posts.

99-02842A(2) Definitions

Not Used

99-02842A(3) Submittals

Not Used

99-02842A(4) Quality Assurance

Not Used

99-02842B MATERIALS

Steel Posts: Steel posts for guard posts must comply with ASTM A53/A53M, Grade B, standard weight, galvanized steel pipe complying with the details shown.

Concrete: Concrete for guard posts must be commercial quality concrete, proportioned to provide a workable mix suitable for the intended use, with not less than 505 pounds of cement per cubic yard.

99-02842C CONSTRUCTION

Installation:

The length and diameter of the guard posts must comply with the details shown.

Guard posts must be placed in holes excavated to the depth and cross section shown and must be installed plumb.

Excavations for guard posts must be backfilled with concrete as shown. Guard posts must be filled with concrete.

Painting: Guard posts must be prepared and painted under section 99-09900.

99-02842D PAYMENT

Not Used

99-02844 PARKING BUMPERS

99-02844A GENERAL

99-02844A(1) Summary

Scope: This work consists of installing precast concrete parking bumpers.

99-02844A(2) Definitions

Not Used

99-02844A(3) Submittals

Not Used

99-02844A(4) Quality Assurance

Not Used

99-02844B MATERIALS

Parking Bumpers:

Parking bumpers must be commercially available precast parking bumpers.

Parking Bumpers must be 48 inches long, nominal 8 inches wide, and 6 inches high with both top longitudinal corners continuously chamfered, and anchor holes 9 inches from each end.

99-02844C CONSTRUCTION

Layout:

Arrangement of parking bumpers must be coordinated with the layout of parking stalls and traffic aisles, providing the proper angle to engage wheels and proper location to prevent overtravel of vehicles.

Parking bumpers must be anchored with two 3/4- inch diameter reinforcing bars 15 inches in length. The reinforcing bars must be installed such that the top of the bars is flush with the top of the parking bumper.

99-02844D PAYMENT

Not Used

99-02846 ACCESSIBLE PARKING SIGNS

99-02846A GENERAL

99-02846A(1) Summary

Scope: This work consists of installing accessible and unauthorized parking signs.

99-02846A(2) Definitions

Not Used

99-02846A(3) Submittals

Product Data: Manufacturer's descriptive data for sign materials, colors, graphics, and sign fastening details must be submitted.

Certificate of Compliance: Submit a certificate of compliance for the sheet aluminum.

99-02846A(4) Quality Assurance

Regulatory Requirements: Accessible parking signs must comply with the requirements in CBC Sections 11B-502.6, 11B-502.8, 11B-812.8, and CA Veh Code §§ 22500 through 22526.

99-02846B MATERIALS

Sign Colors: The color white must comply with the requirements of AMS-STD-595, Color No. 17886. The color blue must comply with the requirements of AMS-STD-595, Color No. 15090.

Signs:

Single sheet aluminum signs must be fabricated from sheet aluminum alloy 6061-T6 or 5052-H38, not less than 0.063-inch thick (14-gauge) with rounded corners. Alloy and temper designations for sheet aluminum must comply with the requirements in ASTM B 209.

Sheet aluminum must be cleaned and pretreated under ASTM B 449, Class 2.

You must furnish Type III retroreflective sheeting under ASTM D 4956. The adhesive backing must be pressure sensitive and fungus resistant. Retroreflective sheeting must be applied to sign panels as recommended by the retroreflective sheeting manufacturer without stretching, tearing, or damage.

A protective overlay film of the type, kind, and product that is approved by the manufacturer of the retroreflective sheeting must be applied. Protective overlay film must be premium quality.

The face of each finished sign must be uniform, flat, smooth, and free of defects, scratches, wrinkles, gel, hard spots, streaks, extrusion marks, and air bubbles. The front, back, and edges of the sign panels must be free of router chatter marks, burns, sharp edges, delaminated skins, excessive adhesive over spray and aluminum marks.

Signs must be protected by thorough wrapping, or other methods to ensure that signs are not damaged by weather conditions and during transit. Padding and protective materials must be placed between signs as appropriate. Finished sign panels must be transported and stored by method that protects the face of signs from damage. You must replace wet, damaged, or defective signs.

Sign Post: Sign post must be commercial quality, standard weight, galvanized steel pipe complying with the requirements in ASTM F 1083. Post must be supplied with galvanized steel post top.

Fastening Hardware: Fastening hardware must be galvanized or cadmium plated.

Concrete: Concrete for sign posts must be commercial quality concrete, proportioned to provide a workable mix suitable for the intended use, with not less than 505 pounds of cement per cubic yard.

99-02846C CONSTRUCTION

Sign posts must be set vertically in concrete, in holes excavated to the depth and cross-section shown.

Signs must be fastened rigidly and securely to the sign post.

99-02846D PAYMENT

Not Used

99-3 CONCRETE AND REINFORCEMENT

99-03300 CAST-IN-PLACE CONCRETE

99-03300A GENERAL

99-03300A(1) Summary

Scope: This work consists of constructing cast-in-place concrete facilities.

Concrete:

Except for concrete used for minor work, concrete must comply with section 90. The minimum required compressive strength must be as described or 3,600 psi at 28 days, whichever is greater.

Concrete for minor work must comply with section 90-2.

Reinforcement: Reinforcement must comply with section 52, except you may use deformed bars complying with ASTM A615/A615M, Grade 60.

99-03300A(2) Definitions

Not Used

99-03300A(3) Submittals

Product Data:

Manufacturer's descriptive data, installation and use instructions for admixtures, expansion joint material, vapor barrier, curing compound, hardener, and sealer must be submitted.

Descriptive data must be delivered to the Engineer at the job site.

Concrete Mix Designs: Submit copies of concrete mix designs.

Certificates of Compliance: Submit a certificate of compliance when required.

99-03300A(4) Quality Assurance

Not Used

99-03300B MATERIALS

99-03300B(1) Concrete Mixes

The amount of cementitious material used per cubic yard of concrete for each building element must comply with the following:

Type	Cementitious Material Content (Pounds/CY)
Concrete (Structural Work): Footings, foundation walls, floor slabs,	590 min. ^a
Concrete (Sewer Structures): Sewer structures	658 min. ^b
Concrete (Minor Work): Concrete curbs, sidewalks, driveways, gutter depressions, and collars	505 min.

Notes:

^aFor concrete designated by compressive strength, the maximum amount of cementitious material must be 800 pounds per cubic yard.

^bConcrete must be air entrained under section 90-1.02E. The air content at time of mixing and prior to placing must be $6 \pm 1\frac{1}{2}$ percent.

99-03300B(2) Colored Concrete

Not Used

99-03300B(3) Form Materials

Forms for Exposed Finish Concrete:

Forms for exposed surfaces must be plywood, metal or other panel type materials. Plywood must be not less than 5/8 inch thick and without scars, dents, and delaminations. Forms must be furnished in largest practical pieces to minimize number of joints.

Plywood must comply with the requirements of U. S. Product Standard PS-1 for Exterior B-B (Concrete Form) Class I.

Forms for edges of slabs must be nominal 2-inch solid stock lumber, plywood, or metal forms.

Forms for Unexposed Finish Concrete: Forms for unexposed finish concrete surfaces must be plywood, lumber, metal, or other acceptable material.

Forms for Cylindrical Columns or Supports: Forms for cylindrical columns must be metal, fiberglass reinforced plastic, paper, or fiber tubes. Paper or fiber tubes must be constructed of laminated plies using water-resistant adhesive with wax-impregnated exterior for protection against weather or moisture.

Form Ties: Form ties must be factory fabricated, removable or snapoff metal ties for use as necessary to prevent spreading of forms during concrete placement.

Form Oil: Form oil must be commercial quality form oil which will permit the ready release of the forms and will not discolor the concrete.

99-03300B(4) Reinforcement

Not Used

99-03300B(5) Epoxy

Not Used

99-03300B(6) Related Materials

Anchor Bolts and Anchor Rods, Nuts and Washers:

Headed and Unheaded Anchor Bolts and Anchor Rods: Comply with ASTM F1554. Use Grade 36 unless a higher grade is shown.

Nuts: Comply with ASTM A563.

Washers:

1. Washers bearing on wood surfaces must be commercial quality.
2. Washers bearing on steel surfaces must comply with ASTM F436, Type 1.
3. Plate washers must comply with ASTM A36/A36M.

Exposed anchor bolts and anchor rods, nuts and washers must be hot-dipped galvanized.

Expansion Joint Material: Expansion joint material must be commercial quality asphalt impregnated pressed fiber sheets, 1/2-inch minimum thickness.

Vapor Barrier: Vapor barrier must be not less than 15 mils thick and must comply with the requirements of ASTM E1745, Grade A. Tape for overlapped seams must be as recommended by the manufacturer of the vapor barrier.

Bond Breaker: Bond breaker must be Type I asphalt saturated organic felt or such other material authorized by the Engineer.

Nonskid Abrasive Aggregate: Nonskid abrasive aggregate must be commercial quality aluminum oxide, silicon carbide, or almandite garnet grit particles; screen size 12-30 or 14-36.

Type A Control Joints: Type A control joints must be commercial quality, preformed, T-shaped plastic strips with detachable top flange.

Keyed Construction Joint Forms: Keyed construction joint forms must be commercial quality, galvanized metal or plastic, factory fabricated construction joint forms. Forms must produce a rabbeted key type joint.

Divider and Edger Strips: Divider and edger strips must be foundation grade redwood.

Mortar: Mortar must consist of one part cement to 2 parts clean sand and only enough water to permit placing and packing.

Curing Compound: Curing compound must be curing compound no. 6.

Concrete Hardener: Concrete hardener must be clear, chemically reactive, waterborne solution of inorganic silicate or silicate materials and proprietary components; odorless; that penetrates, hardens, and densifies concrete surfaces.

Concrete Sealer: Concrete sealer must be commercial quality VOC-compliant, silane type sealer with hydrophobic and oleophobic properties.

Splash Block: Splash blocks must be precast concrete splash blocks with depressed runoff trough. Splash blocks must be 12" x 24" x 3½" in size unless otherwise shown.

99-03300C CONSTRUCTION

99-03300C(1) Preparation

Existing Concrete Construction:

Where fresh concrete joins existing or previously placed concrete or masonry, the contact surfaces of the existing or previously placed material must be roughened, cleaned, flushed with water and allowed to dry to a surface dry condition immediately prior to placing the fresh concrete. The roughened surface must be no smoother than a wood trowelled surface. Cleaning of the contact surfaces must remove laitance, curing compounds, debris, dirt and such other substances or materials which would prevent bonding of the fresh concrete.

Abrasive blast methods must be used to clean horizontal construction joints to the extent that clean aggregate is exposed.

Exposed reinforcing steel located at the contact surfaces which is to be encased in the fresh concrete must be cleaned to remove any substance or material that would prevent bonding of the fresh concrete.

Forms:

Forms must be mortar tight, true to the dimensions, lines, and grades shown, securely fastened and supported, and of adequate rigidity to prevent distortion during placing of concrete.

Forms for exposed surfaces must be constructed with triangular fillets not less than 3/4" x 3/4" attached so as to prevent mortar runs and to produce smooth straight chamfers at all sharp edges of the concrete.

Form fasteners must be removable without chipping, spalling, heating or otherwise damaging the concrete surface. Form ties must be removed to a depth of at least one inch below the surface of the concrete.

The inside surfaces of forms must be cleaned of all dirt, mortar and foreign material. Forms must be thoroughly coated with form oil prior to use.

Forms must not be stripped until at least 40 hours after placing concrete, except soffit forms and supports must not be released or removed until at least 10 days after placing concrete.

Anchorage and embedded items must be placed and rigidly secured at their planned locations prior to placing concrete.

Reglets or embedded flashing must be installed on concrete forms before the concrete is placed.

Redwood dividers must have 16d galvanized nails partially driven into both vertical faces at 18 inches on center.

Vapor Barrier:

Vapor barrier must be installed under the manufacturer's instructions and must be protected with a 3-inch layer of clean uncompacted sand cover.

Unless otherwise shown, vapor barrier must be placed under portions of the floor slab scheduled to receive finish flooring.

Placing Reinforcement:

If authorized, you may use plastic supports to hold reinforcement in position.

Set wire ties with ends directed into concrete, away from exposed concrete surfaces.

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

Ground Bar: A continuous reinforcing steel bar must be installed in the building foundation at the location shown for the electrical ground bar. The use of epoxy coated reinforcing bar is not permitted. The end of the ground bar must extend beyond the concrete surface and must be protected from damage by construction operations.

99-03300C(2) Placing Concrete

Concrete must be placed under section 51-1.03D.

Concrete must be deposited and consolidated in a continuous operation within limits of construction joints, until the placing of the panel or section is completed.

When concrete is to be placed in large areas requiring more than two pours, concrete must be placed in alternate long strips between construction joints and the final slab infilled.

99-03300C(3) Colored Concrete

Not Used

99-03300C(4) Finishing Concrete Surfaces

Finishing Unformed Surfaces:

Slabs must be placed full thickness to finish elevation and leveled to screeds by use of long straightedges. The screeds must be set to grade at approximately 6-foot centers. After leveling, screeds must be removed, and the surface must be floated with wooden floats.

Type A control joint strips must be inserted into the floated concrete so that the bottom of the top flange is flush with the finish elevation. Strips must be standard manufactured lengths and must be placed on an approximate straight line. The top flange of the strips must be removed after the concrete has set and cured.

The floated surface must be trowelled with steel trowels. Troweling must form a dense, smooth and true finish. Walkways, pedestrian ramps, stairs and outdoor slabs for pedestrian traffic must be given a non-slip broom finish unless a different finish is described.

The application of cement dust coat will not be permitted.

Steel trowel finish and broom finish will not be required for slabs to receive exposed aggregate finish nor for slabs to be covered with ceramic tile.

Concrete floor surfaces to receive ceramic tile must be floated to grade and then, before final set of the concrete, the floated surfaces must be roughened with stiff bristled brushes or rakes.

Finished surfaces of floor slabs must not deviate more than 1/8 inch from the lower edge of a 10-foot long straight edge.

Finishing Formed Surfaces:

Formed concrete surfaces must be finished by filling holes or depressions in the surface, repairing all rock pockets, and removing fins. All surfaces of formed concrete exposed to view must have stains and discolorations removed, unsightly bulges removed, and all areas which do not exhibit the required smooth, even surface of uniform texture and appearance must be sanded with power

sanders or other authorized abrasive means until smooth, even surfaces of uniform texture and appearance are obtained.

Cement mortar, patching and finishing materials used to finish exposed surfaces of concrete must closely match the color of surrounding surfaces.

Nonskid Abrasive Aggregate Finish: Where shown, walkways must receive a nonskid abrasive aggregate (grit) finish. The grit must be applied uniformly at the rate of not less than 0.3 pound per square foot and tamped into the floated concrete surface while the concrete is plastic. The grit must be buried about 0.7 diameter of each particle into the concrete.

99-03300C(5) Curing Concrete

Freshly placed concrete must be protected from premature drying and excessive cold or hot temperatures.

Floor slabs must be cured by the water method as specified for structures. Initial curing of floor slabs must start as soon as free water has disappeared from the concrete surface.

Concrete surfaces, other than floor slabs, must be cured by the forms-in-place method or the water method as specified for structures.

Concrete curbs, sidewalks, collars, and gutter depressions may be cured by the curing compound method.

99-03300C(6) Protecting Concrete

Vehicles, equipment, or concentrated loads weighing more than 300 pounds individually and material stockpiles weighing more than 50 pounds per square foot will not be permitted on the concrete within 10 calendar days after placing.

99-03300C(7) Special Treatments

Concrete Hardener:

Chemical concrete hardener must be applied to the floor surfaces shown, prior to the application of concrete sealer. Surfaces must be clean and dry before the application of hardener.

The solution must be applied under the manufacturer's instructions.

After the hardener has dried, the surface must be mopped with water to remove encrusted salts.

Concrete Sealer: Concrete sealer must be applied to the concrete surfaces designated on the plans under the manufacturer's instructions for heavy duty use. The sealer must be applied to dry concrete surfaces.

99-03300D PAYMENT

Not Used

99-033543 POLISHED CONCRETE FINISH

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Stain materials.
2. Liquid floor treatments.
3. Polished concrete surface finish requirements.

B. Related Requirements:

1. Section 99-03300 "Cast-in-Place Concrete" for new concrete designed for polished concrete finishing, including concrete materials, mixture design, placement procedures, initial finishing, and curing.

1.2 DEFINITIONS

- A. Aggregate Exposure Class: Visual observation of polished floor aggregate surface exposure area after grinding and polishing operations. Aggregate exposure class ranges are A, B, and C.
- B. Referee Sample: Sample designated in the Contract that reflects acceptable surface quality and appearance of polished concrete.
- C. Distinctness of Image (DOI): The distinctness (clarity) of images reflected by the glossy coating surface appearance of the polished concrete finish appearance levels. The transmission of this reflection is measured under ASTM D5767.
- D. Haze: The cloudiness or milky appearance of images from objects produced by reflection in a polished concrete surface. The measurement of this appearance is defined under ASTM D4039. The test method reading is put into a calculation resulting in a Haze Index value.
- E. Specular Gloss: A reflectance value determined by a single measurement of gloss from shining a known amount of light at a surface within a specific angle of illumination under ASTM D523.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Polishing Schedule: Submit plan showing polished concrete surfaces and schedule of polishing operations for each area of polished concrete before start of polishing operations. Include locations of all joints, including construction joints.
- C. Samples: Actual sample of finished products for each type of exposed color.
- D. Test and Inspection Reports: For each field quality control test and inspection performed.

1.4 QUALITY ASSURANCE

- A. Polished Concrete Standards: Comply with ACI 310.1.

1.5 TEST PANELS

- A. Build a test panel 6 feet by 6 feet with a minimum depth of 5 inches for each type of polished concrete finish to demonstrate typical joints, surface finish, tolerances, and standard of workmanship. Build test panels to comply with the following requirements, using materials indicated for the completed Work:
 - 1. Build test panels in the location of the Work and of the size indicated or, if not indicated, as directed by Engineer for polished concrete.
 - 2. Demonstrate surface preparation, coloring, curing, tested aggregate exposure, tested polish appearance, tested slip resistance, sealing and protecting of polished concrete.
 - 3. Approval of test panels does not constitute approval of deviations from the Contract Documents contained in test panels unless the Engineer specifically approves such deviations by Change Order.

1.6 FIELD CONDITIONS

- A. Traffic Control: Maintain access for vehicular and pedestrian traffic as needed if there are public use areas and for other construction activities.

1.7 MAINTENANCE STOCK

- A. Upon completion of coating work, deliver a full one-gallon container of each type and color of stain and liquid floor treatment used to the Engineer. Containers must be tightly sealed, have the manufacturer's standard product label, and be labeled with color and room locations where used.

PART 2 PRODUCTS

2.1 STAIN MATERIALS

- A. Penetrating Stain: Coloring agents used to add consistent color to polished concrete surfaces without coloring the aggregates.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Americrete, Inc.
 - b. AmeriPolish
 - c. Bomanite Co
 - d. Bon Tool Co.
 - e. Brickform; a division of Solomon Colors
 - f. Butterfield Color, Inc.
 - g. Duckback Products
 - h. H&C Decorative Concrete Products; a brand of Sherwin-Williams Co.
 - i. Scofield, a Business Unit of Sika Corporation
 - j. Super Stone, Inc.
- B. Material Emissions and Pollutant Control: Verify not less than 85 percent of field-applied paints and coatings that are inside the weatherproofing system comply with the following:
 - 1. Low-Emitting Materials: Verify VOC emissions comply with requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." Verify formaldehyde emissions do not exceed 9 mcg/cu. m or 7 ppb, whichever is less.

2.2 LIQUID FLOOR TREATMENTS

- A. Penetrating Liquid Floor Treatments for Polished Concrete Finish: Clear liquid materials for the applications of cleaning solutions, densifiers, and sealers that strengthen or protect polished concrete surfaces.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Advanced Floor Products
 - b. AmeriPolish
 - c. ARDEX Americas
 - d. AWRC Corporation
 - e. Euclid Chemical Company (The); a subsidiary of RPM International, Inc.
 - f. H&C Decorative Concrete Products; a brand of Sherwin-Williams Co.
 - g. Laticrete International, Inc.
 - h. MAPEI Corporation
 - i. Moxie International
 - j. NewLook International, Inc.
 - k. Nox-Crete Products Group
 - l. PROSOCO, Inc
 - m. QuestMark
 - n. Vexcon Chemicals Inc.
 - 2. Verify products comply with requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." Verify formaldehyde emissions do not exceed 16.5 mcg/cu. m or 13.5 ppb, whichever is less.

2.3 POLISHED CONCRETE SURFACE FINISH REQUIREMENTS

- A. Aggregate Exposure Class: Class B Fine Aggregate 85 to 95 percent fine aggregate; 5 to 15 percent blend of fines and coarse aggregate
- B. Polish Concrete Appearance Levels: Level 2: Satin (Honed) up to 200- to 400-grit polish; DOI 10 to 39; Haze Reading less than 10; Reflective Sheen: Low to medium
- C. Slip Resistance: Meet minimum ADA Dynamic Coefficient of Friction (DCOF) of at least 0.42. Provide required slip resistance based on final gloss level and determined by the Concrete Polishing Council.

2.4 ACCESSORIES

- A. Repair Materials: As recommended in writing by manufacturer to repair and fill cracks, and repair surfaces compatible with polishing materials.
- B. Water: Potable.
- C. Cleaning Agents: As recommended in writing by manufacturer.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that concrete substrates are acceptable for grinding, polishing and product installation as recommended by manufacturer.
- B. Do not begin Work until unsatisfactory conditions have been addressed and corrected.

3.2 PREPARATION

- A. Verify that concrete substrate preparation is under manufacturer's written instructions.
- B. Clean surfaces free of dust, dirt and other contaminants incompatible with liquids applied products and polishing.
- C. Clean and seal cracks as recommended by manufacturer.
- D. Prepare, clean and fill joints with joint filler as recommended in writing by manufacturer.
- E. Clean surface completely of any dust with cleaning solution as recommended in writing by manufacturer.

3.3 APPLICATION

- A. Machine grind floor surfaces progressively to receive aggregate and polish appearance levels indicated to match approved test panels.
- B. Apply penetrating stain densifier treatment for polished concrete in polishing sequence and under manufacturer's written instructions, allowing recommended drying time between successive coats.
- C. Apply sealers to polished concrete in polishing sequence and under manufacturers' written instructions.
- D. Continue progressively polishing to aggregate and polish appearance levels to match approved test panels for final finish appearance.
- E. Visually inspect to remove defects and repolish areas that are defective. Repolish those areas that do not meet specified aggregate and polish levels per approved test panels.

- F. Complete edges of floor finish that adjoins surrounding floor areas in a sharp and clean manner.
- G. Neutralize and clean polished floor surfaces.

3.4 FIELD QUALITY CONTROL

- A. Perform tests and inspections at three locations every 500 sq ft or portion thereof to demonstrate compliance with polished concrete surface finish requirements. The Engineer chooses the locations.
- B. Measure polish specular gloss level, DOI, and haze as specified; repolish if required to achieve Project requirements.
- C. Verify aggregate exposure as specified. Machine surfaces if required to achieve Project requirements.
- D. Verify compliance of slip resistance to comply with specified slip-resistance rating.
- E. Prepare test and inspection reports.

3.5 CLEANING AND PROTECTION

- A. Control and dispose of waste products produced by grinding and polishing operations.
 - 1. Wet Polishing: Control, collect, and legally dispose of runoff.
 - 2. Dry Polishing: Use HEPA filter-equipped vacuum attachment operated concurrently with polishing or other equivalent approved method for collection of dust.
- B. Protect installed polished concrete surfaces from damage during construction under manufacturer's written instructions.

END OF 99-033543

99-4 MASONRY

Not Used

99-5 METALS

99-05420 COLD FORMED STEEL FRAMING

99-05420A GENERAL

99-05420A(1) Summary

Scope: This work consists of installing cold formed steel framing, including load-bearing and non-bearing studs, joists, rafters, track, anchors, fasteners, and framing accessories.

Section 11-2 does not apply to cold formed steel framing.

99-05420A(2) Definitions

Not Used

99-05420A(3) Submittals

Product Data:

Submit manufacturer's descriptive data and installation instructions for each item of cold formed steel framing and accessories.

Installation instructions must include instructions for securing studs to tracks and other framing connections.

Steel Stud Manufacturers Association (SSMA): Submit a copy of the manufacturer's certificate for the SSMA's Code Compliance Certification Program as an informational submittal.

Certificates of Compliance: Submit a certificate of compliance for cold formed steel framing.

99-05420A(4) Quality Assurance

Fire-rated Assemblies: Where cold formed steel framing units are components of assemblies indicated to be fire-rated, provide units which have been approved for the rating indicated on the plans.

American Iron and Steel Institute (AISI) Specifications and Standards: Cold formed steel framing materials and installation must comply with AISI S200-12, "General Provisions," and AISI S201-17, "Product Data."

SSMA: You must provide cold formed steel framing from a manufacturer that is certified by the SSMA's Code Compliance Certification Program.

99-05420A(5) Delivery, Storage, and Handling

Cold formed steel framing components must be protected from rusting and damage. Components must be delivered to the job site in manufacturer's unopened containers or bundles, fully identified with name, brand, type and grade. Components must be stored off ground in a dry, ventilated space.

99-05420B MATERIALS

99-05420B(1) Cold Formed Steel Framing

Studs, Joists and Rafters:

Load-bearing studs must be formed to channel shape, punched web, and knurled faces, under a A1003/1003M, Grade ST50H. Load-bearing studs must have the thickness and size as shown.

Non load-bearing studs, including partition and plumbing wall studs, must be formed to channel shape, punched web, and knurled faces, under ASTM A1003/1003M, Grade ST33H. Non load-bearing studs must have the thickness and size as shown.

Joists, rafters, and other framing components, 43 mil (0.0428 inch, or 18-gage) or lighter, must be fabricated of commercial quality galvanized steel sheets; under ASTM A1003/1003M, Grade ST33H. Joists, rafters, and other framing components, 54 mil (0.0528 inch, or 16-gage) or heavier, must be fabricated of commercial quality galvanized steel sheets; under ASTM A1003/1003M, Grade ST50H.

Track: Track must be formed steel, channel shape, and same width as studs; solid unpunched web; not less than 43 mil (0.0428 inch, or 18-gage) thickness.

99-05420B(2) Accessories

Anchorage: Anchorages must be ICC approved for the purpose intended, integral stud type, powder driven or drilled expansion bolts.

Fasteners: Fasteners must be corrosion-resistant coated, self-drilling, self-tapping screws, or bolts, nuts and washers. Screws must comply with ASTM C1513.

Fasteners for Plywood Shear Walls: Fasteners for plywood shear walls must have a modified truss or wafer head and must be one of the following:

1. Screws with a pilot or driller point longer than the thickness of the plywood.
2. Screws with winged tips that detach when contact is made with the cold formed steel framing.

Framing Accessories: Framing accessories, including holdowns, ties, hangers connectors, straps, and clips must be ICC approved and of commercial quality.

99-05420B(3) Shop Finishes

Studs, Track, and Headers: Studs, track, and headers must be hot-dipped galvanized under ASTM A1003/A1003M, Coating Designation G60.

Miscellaneous Metal Parts: Miscellaneous parts, including, bracing, furring, plates, gussets, and bridging, must be hot dipped galvanized to not less than [0.6]ounces per square foot.

99-05420B(4) Shop Fabrication

Cold formed steel framing components must be fabricated in place or prefabricated into panels to the maximum extent possible prior to erection. Panels must be fabricated plumb, square, true to line and braced against racking with joints welded. Lifting of prefabricated panels must be performed in a manner to prevent damage or distortion.

Panels must be fabricated in jig or templates to hold members in proper alignment and position to assure accurate placement.

Fastenings: Components must be fastened by shop welding, bolting or screw fasteners as shown.

99-05420C CONSTRUCTION

99-05420C(1) Installation

Studs:

Studs must be erected plumb, except as needed for diagonal bracing or similar requirements. Channel tracks must be aligned accurately to the wall layout at both floor and roof. Tracks of partition wall must be secured to floor and ceiling with fasteners spaced at not more than 16-inch intervals. Fasteners must be provided at corners and ends of track.

Studs must extend from floor to underside of roof except at wall openings. Each stud must be secured to tracks at both top and bottom by bolting or screw fastening at both inside and outside flanges. Field welding will not be permitted. A ½-inch clearance must be provided at the top shoes. Door openings must have double studs continuous across head and from floor to roof on each jamb.

Studs at openings must be fastened solidly and securely to floor clips. Floor clips must be fastened to the floor with 2 anchors unless otherwise shown.

Supplemental framing, blocking and bracing must be installed in steel stud system wherever walls or partitions are to support fixtures, equipment, services, casework, heavy trim and furnishings, and similar work requiring attachment to the wall or partition.

Joists and Rafters:

Joists and rafters must be installed directly over bearing studs or a load distribution member must be installed at the top track.

Ends of joists must be reinforced with end clips, steel hangers, steel angle clips, steel stud section, or as recommended by the manufacturer.

Joists must be secured to interior support systems to prevent lateral movement of bottom flanges.

99-05420C(2) Repairs and Protection

Galvanizing Repairs: Damaged galvanized coatings on framing, anchors, clips, fasteners, or framing accessories must be prepared and repaired with paints containing zinc dust under ASTM A780/A780M and the manufacturer's instructions.

Structural Repairs: Damaged framing, anchors, clips, fasteners, or framing accessories must be repaired or replaced.

99-05420D PAYMENT

Not Used

99-05440 - COLD-FORMED STEEL TRUSSES

99-05440A - GENERAL

99-05440A(1) Summary

Section 99-05440 includes specifications for designing, factory-fabricating, furnishing, and erecting pre-engineered CFS roof trusses, including truss-to-truss connections, permanent and temporary bracing, strapping, splices, bridging, and other accessories required for a proper and complete installation, in accordance with the details shown on the plans and these special provisions.

99-05440A(2) Definitions

CFS: Cold-formed Steel

99-05440A(3) Submittals

Product Data: Manufacturer's descriptive data for CFS framing members, fasteners, hardware, and fabrication process shall be submitted for approval.

Installation Instructions: The truss manufacturer's printed instructions shall be provided for temporary bracing, handling, storage, and installation of the trusses and accessories.

Shop drawings:

Submit shop drawings and design calculations for the CFS trusses, connection details and permanent bracing. Include the following:

1. Truss profile, span and spacing
2. Component thicknesses, section properties, and ASTM Designation and grade for all truss and bracing members
3. Joint and connection details for each truss in the roof system
4. Gusset plate locations, sizes and material specifications, fastener type, size, quantities and locations, shape and material specification for each connection
5. The method of attachment to supporting members including minimum bearing length
6. The method of connecting member-to-member, truss-to-truss, ply-to -ply, and truss-to-structure
7. The maximum nominal (unfactored) reactions and member forces
8. Camber
9. An erection plan showing field assembly and erection details, including location and identification of each truss, truss connections and support locations, permanent and temporary bracing, strapping, splices, bridging, and other accessories and details required for a proper and complete installation.
10. Shop drawings and design calculations must be sealed and signed by an engineer who is registered as a Civil or Structural Engineer in the State of California.
11. Calculations for the design of the trusses and bracing, with the design criteria and assumptions clearly indicated. Clearly indicate material sizes and gages, splices, joint design, and truss to truss connections, permanent truss web bracing, and splices as required for a complete installation
12. A list of applied loads and load combinations, including fire sprinkler system or other collateral loads if required, and the resulting member forces , nominal support reactions, member stresses, and deflections
13. For calculations that contain or consist of computerized or tabulated calculations, the values pertaining to the design clearly identified, described or indexed in such a manner that a design review can be performed,
14. Submittals must be approved prior to the start of fabrication.

Welding Certificates: Certificates and qualifications for welding procedures and personnel shall be submitted.

Manufacturer and Installer Qualifications: The qualifications of the truss manufacturer and the truss installer shall be submitted.

99-05440A(4) Quality Control and Assurance

Manufacturer Qualifications: The truss manufacturer must have successfully fabricated trusses equal in material, design, and extent to the trusses shown on the plans for at least 3 projects, in addition to being in business for at least 5 years.

Installer Qualifications: The installation of trusses, including permanent and temporary bracing, strapping, splices, bridging, and other accessories required for a proper and complete installation, must be by an experienced installer approved, in writing, by the truss manufacturer.

Identification: Each truss shall be stamped or marked with a location identification mark or symbol, the name and address of the manufacturer, and the vertical bearing points and lateral brace points.

Codes and Standards: Design, fabricate and install CFS truss in compliance with:

1. AISI S214-07, "North American Standard for Cold-formed Steel Framing-Truss Design"
2. AISI S200-07, "North American Standard for Cold-formed Steel Framing-General Provisions"
3. AISI S201-07, "North American Standard for Cold-formed Steel Framing-Product Data"

Welding: Weld under AWS D1.3/D1.3M, "Structural Welding Code - Sheet St29

Welding Qualifications:

Qualify procedures and personnel under:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
2. AWS D1.3/D1.3M, "Structural Welding Code - Sheet Steel."

Certificates of Compliance: Submit a certificate of Compliance for the CFS trusses in conformance with the provisions in Section 6-2.03 B, "Certificates of Compliance," of the Standard Specifications.

99-05440B - MATERIALS

99-05440B(1) Performance Requirements

Delegated Design: Engage a qualified professional engineer, as defined in Section 99-05440A(3) to design cold-formed steel trusses.

Structural Performance: Provide cold-formed steel trusses capable of withstanding design loads within limits and under conditions indicated.

1. Design Loads and Deflection Limits: As indicated on Drawings.
2. Design trusses to provide for movement of truss members located outside the insulated building envelope without damage or overstressing, sheathing failure, connection failure, undue strain on fasteners and anchors, or other detrimental effects when subject to a maximum ambient temperature change of 120 deg F.
3. With the camber shown on the plans.
4. All eccentricities shall be considered in joint and connection design.
5. All truss to truss connections shall be designed by the Engineer responsible for the truss design.

Cold-Formed Steel Truss Standards: Unless more stringent requirements are indicated, trusses shall comply with the following:

1. Floor and Roof Systems: AISI S210.
2. Lateral Design: AISI S213.
3. Roof Trusses: AISI S214.

Fire-Resistance Ratings: Comply with ASTM E 119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Indicate design designations from UL or from the listings of another qualified testing agency acceptable to 24 CA Code of Regs.

99-05440B(2) Cold-Formed Steel Truss Materials

Truss Members: Manufacturer's standard CFS sections.

1. Minimum Base-Metal Thickness: 0.0428 inch
2. Cold-formed steel shapes shall be fabricated from galvanized sheet steel conforming to ASTM Designation: A 1003/1003M, Grade ST50H.
3. All shapes shall have a current ICC Evaluation Report showing the structural properties of the members.

4. Steel tubing: Steel tubing shall be conforming to ASTM Designation: A 500.
5. Finish: All components of truss system shall be coated in conformance with ASTM Designation: A 1003/1003M, G60.

99-05440B(3) Truss Accessories

Fabricate steel-truss accessories from steel sheet, ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated steel sheet, of same grade and coating designation used for truss members.

Provide accessories of manufacturer's standard thickness and configuration unless otherwise indicated.

99-05440B(4) Anchors, Clips, And Fasteners

Steel Shapes and Clips: ASTM A 36/A 36M, zinc coated by hot-dip process according to ASTM A 123/A 123M.

Mechanical Fasteners: A Manufacturer recommended, STM C 1513, corrosion-resistant-coated, self-drilling, self-tapping steel drill screws.

1. Head Type: Low-profile head beneath sheathing; manufacturer's standard elsewhere.
2. Screws shall have a current ICC Evaluation Report showing the design capacity of the screws.

Welding Electrodes: Comply with AWS standards.

99-05440B(5) Miscellaneous Materials

Galvanizing Repair Paint: ASTM A 780/A 780M

Shims: Load-bearing, high-density multimonomer, nonleaching plastic; or cold-formed steel of same grade and metallic coating as truss members supported by shims.

99-05440B(6) Fabrication

Fabricate cold-formed steel trusses and accessories plumb, square, and true to line, and with connections securely fastened, according to referenced AISI's specifications and standards, manufacturer's written instructions, and requirements in this Section.

1. Fabricate trusses using jigs or templates.
2. Cut truss members by sawing or shearing; do not torch cut.
3. Fasten cold-formed steel truss members by welding, screw fastening, clinch fastening, pneumatic pin fastening, or riveting as standard with fabricator.
4. Comply with AWS D1.3/D1.3M requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
5. Fasten other materials to cold-formed steel trusses by welding, bolting, pneumatic pin fastening, or screw fastening, according to Shop Drawings.

Reinforce, stiffen, and brace trusses to withstand handling, delivery, and erection stresses. Lift fabricated trusses by means that prevent damage or permanent distortion.

Tolerances: Fabricate assemblies level, plumb, and true to line to a maximum allowable variation of 1/8 inch in 10 feet and as follows:

99-05440B(7) Delivery, Storage And Handling

The trusses must be:

Transported and handled in accordance with the truss manufacturer's recommendations and in manner necessary to prevent damage from warping, distortion or corrosion

Delivered in the manufacturer's unopened containers or bundles, fully identified by manufacturer's name, job number, and truss number.

Stored off the ground in a dry, ventilated space in such a manner to prevent warping, distortion or corrosion prevent, and kept free of dirt or other foreign matter.

99-05440C - CONSTRUCTION

99-05440C(1) Examination

Examine substrates, areas, conditions, and abutting trusses and framing for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

Proceed with installation only after unsatisfactory conditions have been corrected.

99-05440C(2) Installation

Proper lifting equipment shall be provided, including spreader bar, suited to sizes and types of trusses required, applied at lift points recommended by truss fabricator. Care shall be taken to avoid damage to truss members during erection and to keep horizontal bending of the trusses to a minimum.

Install, bridge, and brace CFS trusses according to AISI S200, AISI S202, AISI S214, and manufacturer's written instructions unless more stringent requirements are indicated.

1. Coordinate with wall framing to align webs of bottom chords and load-bearing studs or continuously reinforce track to transfer loads to structure.
2. Anchor trusses securely at all bearing points.
3. Install continuous bridging and permanently brace trusses as indicated on Working Drawings.

Install CFS trusses and accessories true to line and location, and with connections securely fastened.

1. Erect trusses with plane of truss webs plumb and parallel to each other. Align and accurately position trusses at required spacing.
2. Erect trusses without damaging truss members or connections.
3. Fasten trusses by welding or mechanical fasteners.

Comply with AWS D1.3/D1.3M requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.

Locate mechanical fasteners, install according to Shop Drawings, and comply with requirements for spacing, edge distances, and screw penetration.

Install temporary bracing and supports to secure trusses and support loads equal to those for which structure was designed. Provide bracing that holds trusses straight and plumb and in safe condition until decking and permanent truss bracing has been fastened to form a structurally sound framing system. All bearing connections and permanent bracing must be secured in place before any sustained permanent loads are applied to the roof truss system.

Disassembly, removal, cutting, or alteration of any truss chord, web or bracing member in the field is prohibited, unless approved in advance in writing by the Architect/Building Designer and the Truss Design Engineer.

99-05440C(3) Erection Tolerances

Install cold-formed steel trusses level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:

1. Space individual trusses no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

99-05440C(4) Repairs And Protection

Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed steel trusses with galvanized repair paint according to ASTM A 780/A 780M and manufacturer's written instructions.

Structural Repairs: Damaged chords, webs, or complete trusses shall be repaired or replaced as directed by the truss manufacturer and with the advanced approval of the truss designer.

Provide final protection and maintain conditions, in a manner acceptable to manufacturer, to ensure that CFS trusses are without damage or deterioration at time of Substantial Completion.

END OF SECTION 99-05440

99-05500 BUILDING MISCELLANEOUS METAL

99-05500A GENERAL

99-05500A(1) Summary

Scope: This work consists of fabricating and installing building miscellaneous metal.

Building miscellaneous metal consists of the following:

1. Plate
2. HSS
3. Metal vertical ladders
4. Metal Aluminum Canopy

4.1 Provide canopies which have been manufactured, fabricated and installed to withstand loads from ASCE – 7, or local requirements of Authority Having Jurisdiction, whichever is more restrictive

4.2 Canopies shall be designed to perform under conditions herein or required by site conditions with no permanent damage to or deforming of the sunshade blades or assembly, noise or metal fatigue caused by sunshade blade rattle or flutter, or permanent damage to fasteners or anchors

Including all anchors, fastenings, hardware, accessories, and other supplementary parts necessary to complete the work.

Section 11-2 does not apply to building miscellaneous metal.

99-05500A(2) Definitions

Not Used

99-05500A(3) Submittals

Product Data: Submit manufacturer's specifications, anchor details, and installation instructions for products used in miscellaneous metal fabrications.

Shop Drawings: Shop drawings of fabricated items must be submitted.

Samples: submit color chip samples for units with factory applied paint

Welding Certificates: Submit certificates for welding procedures and personnel as an informational submittal.

99-05500A(4) Quality Assurance

Shop Assembly: Preassemble items in shop to the greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark all units for reassembly and installation.

Inspection and Tests: Materials and fabrication procedures must be subject to inspection and tests by the Engineer, in mill, shop, and field.

Welding must comply with AWS D1.1, "Structural Welding Code - Steel," and AWS D1.3, "Structural Welding Code - Sheet Steel."

99-05500B MATERIALS

99-05500B(1) General

Steel Bars, Plates, and Hot-rolled Shapes: Steel bars, plates, and hot-rolled shapes must comply with ASTM A36/A36M.

Galvanized Sheet Steel: Galvanized sheet steel must comply with ASTM A653/A653M. Galvanizing must be G60.

Checkered Floor Plates: Checkered floor plates must be commercial quality steel with standard raised pattern.

Pipe: Pipe must be commercial quality standard steel pipe.

Hollow Structural Sections: Hollow structural sections must comply with ASTM A500/A500M, Grade B, or A 501.

Bolts, Studs, Threaded Rods, Nuts, and Washers:

Bolts, studs, and threaded rods for general application must comply with ASTM A307 or F1554, Grade 36.

Nuts must comply with ASTM A563.

Washers bearing on wood surfaces must be commercial quality. Washers bearing on steel surfaces must comply with ASTM F844 or F436.

Fittings: Brackets, bolt, threaded studs, nuts, washers, and other fittings for railings and handrailings must be commercial quality pipe and fittings.

Powder Driven Anchors: Powder driven anchors must be plated, spring steel alloy drive pin or threaded stud type anchors for use in concrete or steel. Spring steel must comply with ASTM A227, Class 1. The diameter, length, and type of shank and the number and type of washer must be as recommended by the manufacturer for the types and thickness of material being anchored or fastened.

Drainage Grates: Drainage grates must be fabricated from steel bars as specified herein; ductile iron castings complying with ASTM A536, Grade 65-45-12; or carbon steel castings complying with ASTM A27, Grade 65-35.

Mortar: Mortar must consist of one part cement, measured by volume, to 2 parts clean sand and only enough water to permit placing and packing.

99-05500B(2) Shop Fabrication

Workmanship and Finish:

Workmanship and finish must be equal to the best general practice in modern shops.

Miscellaneous metal must be clean and free from loose mill scale, flake rust and rust pitting, and must be well formed and finished to shape and size with sharp lines and angles. Bends from shearing or punching must be straightened.

The thickness of metal and details of assembly and support must give ample strength and stiffness.

Built-up parts must be true to line and without sharp bends, twists, and kinks. Exposed ends and edges of metal must be milled or ground smooth, with corners slightly rounded.

Joints exposed to the weather must be made up to exclude water.

Galvanizing: Items indicated on the plans to be galvanized must be hot-dip galvanized after fabrication. The weight of galvanized coating must be at least 1½ ounces per square foot of surface area, except drainage grates must have at least 2 ounces per square foot of surface area.

Painting: Building miscellaneous metal items that are not galvanized must be cleaned and coated with 1 prime coat prior to erection under section 99-09900. After erection, surfaces must be coated with a second prime coat, and finish coats when specified, to comply with the requirements specified under section 99-09900.

Loose Bearing and Leveling Plates: Loose bearing and leveling plates must be provided for steel items bearing on masonry or concrete construction, made flat, free from warps or twists, and of required thickness and bearing area. Plates must be drilled to receive anchor bolts. Galvanize after fabrication.

Drainage Pipes, Frames and Grates:

Drain piping must have connections sealed watertight.

Drainage grates must have end bars of the same cross section as support bars. Connections between end bars and support bars of structural steel must be welded all around.

Drainage frames must be angles and plates as shown.

Drainage grates and frames must be match marked.

Steel Pipe Railings and Handrailings:

Pipe handrailing must consist of handrailing elements supported by metal brackets (wall type) or handrailing elements supported by tubular steel posts (post type).

Ends of railing pipe must be closed, except for a 1/8-inch diameter weep hole at the low point.

All corners on railings must be rounded. Simple and compound curves must be formed by bending pipe in jigs to produce uniform curvature; maintain cylindrical cross-section of pipe throughout the bend without buckling, twisting or otherwise deforming exposed surfaces of the pipe.

Wall brackets, end closures, flanges, miscellaneous fitting and anchors must be provided for interconnections of pipe and attachment of railings and handrails to other work. Inserts and other anchorage devices must be provided for connecting railings and handrails to concrete or masonry.

Steel railing must be galvanized after fabrication. After galvanizing, all elements of the railing must be free of fins, abrasions, rough or sharp edges, and other surface defects and must not be kinked, twisted, or bent.

Canopy Components:

Blades & Fascia shall be fabricated from a minimum .125 (1/8") wall thickness extruded aluminum. Blades shall be of design as indicated on drawings.

Outrigger material shall be fabricated from a minimum .250 (1/4") wall thickness plate aluminum.

Mounting brackets shall be fabricated from a minimum .375 (3/8") wall thickness.

Aluminum Extrusions: ASTM B221, Alloy 6063-T6.

Aluminum Sheet: Top and bottom canopy cover shall be .125 thick sheet in Alloy 5005.

Fully mechanically fastened construction.

99-05500C CONSTRUCTION

99-05500C(1) General

Anchorage:

Anchorage devices and fasteners must be provided for securing miscellaneous metal in-place construction; including threaded fasteners for concrete and masonry inserts, toggle bolts, through bolts, lag bolts, wood screws, and other connectors.

Cutting, drilling, and fitting must be performed as required for installation of miscellaneous metal fabrications. Work is to set accurately in location, alignment and elevation, plumb, level, true and free of rack, measured from established lines and levels.

Loose Leveling and Bearing Plates: Plates must be set on wedges or other adjustable devices. Anchor bolts must be snug tightened after the plates have been positioned and plumbed. Mortar must be packed solidly between bearing surfaces and plates to ensure that no voids remain.

Steel Pipe Railings and Handrailings:

Railings must be adjusted prior to anchoring to ensure matching alignment at abutting joints. Secure posts and railing ends to building construction.

Resin capsule anchors must not to be used for anchoring railings and handrailings.

Powder Driven Anchors: Powder driven anchors must be installed with low velocity powder actuated equipment to comply with the manufacturer's instructions and State and Federal OSHA regulations.

Canopy Components:

- A - Examine substrates for compliance with requirements for installation tolerances and other conditions affecting performance
- B - Proceed with installation only after unsatisfactory conditions have been corrected
- C - Clean surfaces thoroughly prior to installation
- D - Prepare surfaces using methods recommended by the manufacturer for achieving the best results for the substrate under the project conditions
- E - Install sun control devices at locations as indicated on the drawings and in accordance with the manufacturer's instructions

Bolted connections not otherwise specified or shown on drawings must be snug-tightened.

99-05500C(2) Damaged Surfaces

Galvanized surfaces that are abraded or damaged must be repaired by thoroughly wire brushing the damaged areas and removing all loose and cracked coating. The clean areas must then be painted with 2 spot applications of a coating complying with the requirements in the Detailed Performance Standards of the Master Painters Institute (MPI) and listed on MPI List Number 18, Primer, Zinc Rich, Organic, and meeting the requirements under section 99-09900.

99-05500D PAYMENT

Not Used

99-6 WOOD AND PLASTICS

99-06100 ROUGH CARPENTRY

99-06100A GENERAL

99-06100A(1) Summary

Scope: This work must consist of furnishing and installing materials and performing rough carpentry work including sheathing.

Rough carpentry includes carpentry work not specified as part of other sections and which is generally not exposed.

99-06100A(2) Definitions

wood structural panel: Structural sheathing meeting the requirements of the Voluntary Product Standard and is either plywood that complies with PS 1 or oriented strand board (OSB) that complies with PS 2.

99-06100A(3) Submittals

Product Data: Manufacturer's material data and installation instructions must be submitted for gypsum sheathing, framing hardware, and underlayments.

Wood Treatment Data:

Chemical treatment manufacturer's instructions must be submitted for the handling, sorting, installation, and finishing of treated materials.

For each type of preservative treatment used, certification by treating plant must include type of preservative solution and pressure process used, net amount of preservative retained and conformance with the applicable standards of the American Wood Protection Association.

For each type of fire-retardant treatment, include certification by treating plant that the treated material complies with the applicable standards and other requirements.

99-06100A(4) Quality Assurance

Not Used

99-06100A(5) Delivery, Handling, and Storage

Delivery and Storage: Materials must be kept under cover and dry. All materials must be protected from exposure to weather and contact with damp or wet surfaces with blocking and stickers. All wood structural panels, plywood, and other panels must be stacked in such a manner to provide air circulation within and around the stacks.

99-06100B MATERIALS**99-06100B(1) Lumber**

Not Used

99-06100B(2) Dimension Lumber

Not Used

99-06100B(3) Timbers

Not Used

99-06100B(4) Wood Structural Panel

Oriented strand board must comply with the current version of the Voluntary Product Standard PS 2.

Plywood must comply with the current version of the Voluntary Product Standard PS 1, "Structural Plywood," or its predecessor, "Construction and Industrial Plywood."

Wood structural panels must be Group 1 unless otherwise noted.

Each wood structural panel must be factory marked with APA or other trademark evidencing compliance with grade requirements.

Wood Structural Panel, Wall Sheathing: Wood structural panels for walls must be APA RATED SHEATHING, Exposure 1. Thickness and grade must be as shown.

Wood Structural Panel, Roof Sheathing:

Wood structural panels for roof sheathing must be APA RATED SHEATHING, Exposure 1. Span rating, thickness and grade must be as shown.

Wood structural panels in exposed overhangs must be APA RATED SHEATHING, A-C, Exterior, Group 1. Thickness must be the same as the remainder of the sheathing.

99-06100B(5) Miscellaneous Materials

Rough Carpentry Hardware:

Steel plates and rolled sections must be mild, weldable steel, complying with AISI grades 1016 through 1030 except 1017.

screws, bolts, nuts, washers must be commercial quality. Exposed fasteners must be hot dipped galvanized or stainless steel. Fasteners for use with preservative treated wood must be hot dip galvanized.

Joist hangers, clips and other standard framing hardware must be ICC approved, commercial quality, galvanized sheet steel or hot dipped galvanized, of the size shown.

Expansion anchors and powder driven anchors must comply with section 99-05500.

Building Paper: Building paper must be kraft type waterproofing building paper, Type I (No. 15) asphalt saturated roofing felt or high density, bonded polyethylene fiber building paper.

Adhesive: Adhesive for plywood glue-nailed systems must comply with APA Specification: AFG-01.

99-06100B(6) Wood Treatment By Pressure Process

Preservative Treatment:

Preservative treatment must comply with AWP A U1, Use Category UC3B.

The following items must be treated:

Wood cants, nailers, curbs, equipment support bases, blocking, stripping and similar members in connection with roofing, flashing, vapor barriers and waterproofing.
Wood sills, sleepers, blocking, furring and other similar members in contact with concrete or masonry.
All holes, daps and cut ends of treated lumber must be thoroughly swabbed with 2 applications of copper naphthenate.

Fire Retardant Treatment: Fire retardant treatment must be paintable, odorless fire retardant preservative applied by pressure treating methods.

99-06100C CONSTRUCTION

Wood Structural Panels:

Wood structural panels must be attached to the framing as described. Wood structural panels must be screwed to the framing system and must be continuous over 2 or more supports. Roof and floor panels must be installed with the long dimension across the supports, with end joints staggered 4 feet. Wall sheathing must have all edges blocked. Spacing between panels must be 1/8 inch.

99-06100D PAYMENT

Not Used

99-06200 FINISH CARPENTRY

99-06200A GENERAL

99-06200A(1) Summary

Scope: This work consists of installing materials and performing finish carpentry, including exterior and interior trim, plywood soffits and panels and plywood and softwood paneling.

Finish carpentry includes carpentry work not specified as part of other sections and which is generally exposed to view.

99-06200A(2) Definitions

Not Used

99-06200A(3) Submittals

Product Data: Submit manufacturer's specifications and installation instructions for each item of factory-fabricated siding and paneling.

Samples: One sample must be submitted to the Engineer at the job site for each species and cut or pattern of finish carpentry as shown below:

Exterior standing and running trim: 2 feet long by full board or molding width, finished on one side and one edge.

Interior standing and running trim: 2 feet long by full board or molding width, finished on one side and one edge.

Plywood paneling: 2 feet long by full panel width, finished on one side.

99-06200A(4) Quality Assurance

Factory Marks: Each piece of lumber and plywood must be marked with type, grade, mill and grading agency identification. Marks must be omitted from surfaces to receive transparent finish. A mill certificate stating that material has been inspected and graded complying with the requirements must be furnished if marks cannot be placed on concealed surfaces.

99-06200A(5) Delivery, Storage, and Handling

Delivery: Carpentry materials must be delivered after painting, wet work and similar operations have been completed.

Protection: Finish carpentry materials must be protected during transit, delivery, storage and handling to prevent damage, soiling and deterioration.

99-06200B MATERIALS

Softwood Lumber: Softwood lumber must comply with PS 20, "American Softwood Lumber Standard," with applicable grading rules of inspection.

Plywood: Plywood must comply with Voluntary Product Standard PS 1, "Structural Plywood," or its predecessor, "Construction and Industrial Plywood."

Hardwood Lumber: Hardwood lumber must comply with the National Hardwood Lumber Association (NHLA) rules.

Woodworking: Woodworking must comply with WI "Architectural Woodwork Standards," custom grade

Lumber sizes indicated must be nominal sizes except as indicated by detailed dimensions. Lumber which is to be dressed or worked and dressed must be manufactured to the actual sizes as required by PS 20.

Lumber that is to receive a transparent finish (stained or clear) must be made of solid lumber stock.

Lumber that is to be painted may be solid or glued-up lumber at your option.

Glued-up lumber for exterior finish work must comply with ASTM D 2559 for "wet use" and be so certified by the inspection agency.

Exterior Standing and Running Trim:

Standing and running trim in the form of boards or worked products must be clear, all heart Redwood.

Trim to be painted must be finished smooth.

Trim which is to be exposed to view and to receive transparent finish (stained or clear) must be saw textured.

Plywood Paneling and Wainscoting: Plywood paneling and wainscoting must be APA Interior Grade A-C, Group 1, Exposure 1 plywood. Thickness must be as shown.

Interior Standing and Running Trim:

Standing and running trim to be painted must be paint-grade pine, solid stock or finger jointed.

Railings:

Exterior railings must be S4S, Select heart structural redwood.

Miscellaneous Materials:

Nails, screws and other anchoring devices of the type, size, material and finish required must be provided for secure attachment, concealed where possible.

Fasteners and anchorages for exterior use and for use with preservative treated wood must be hot dip galvanized.

Screens for soffit vents must be 4 x 4 or 8 x 8 mesh, galvanized screen. Open area must be not less than 50 percent.

Preservative Treatment:

Preservative treatment must comply with AWP A U1, Use Category UC3B.

Wood members, except those of redwood, in contact with mortar setting beds, concrete block walls, slab on grade and other concrete work, and wood used for roofing cant and curbs must be pressure

treated with leach resistant preservative. Each piece of pressure treated lumber must bear the AWPA label.

All holes, daps, or cuts made after treating must be thoroughly swabbed with copper naphthenate.

Fire Retardant Treatment: Fire retardant treatment must be paintable, odorless fire retardant preservative applied by pressure treating methods.

99-06200C CONSTRUCTION

99-06200C(1) Installation

All work must be installed plumb, level, and true with no distortions.

Standing and Running Trim:

Standing and running trim must be installed with minimum number of joints possible, using full length pieces to the greatest extent possible.

Anchor Finish Carpentry:

Finish carpentry must be anchored to framing or blocking built in or attached directly to the substrate.

Interior carpentry must be attached to grounds, stripping and blocking with countersunk, concealed fasteners and blind nailing where required for complete installation. Fine finish nails must be used for exposed nailing, countersunk and filled flush with finished surface and matching final finish where transparent finish is indicated.

Finish exterior siding must be fastened with corrosion resistant nails. The size and spacing of the siding fasteners must be as shown. Nails must be driven flush with the surrounding surfaces, not countersunk. Nails must be located in the grooves of grooved siding whenever possible.

99-06200C(2) Adjustment, Cleaning, Finishing, and Protection

Damaged and defective finish carpentry work must be repaired or replaced.

All exposed or semi-exposed surfaces must be cleaned.

Finish carpentry must be finished under section 99-09900.

99-06200D PAYMENT

Not Used

99-06414 CABINETS

99-06414A GENERAL

99-06414A(1) Summary

Scope: This work consists of installing wood cabinets and plastic laminate tops, and splashes and returns, including tops, ledges, supporting structures, filler panels and knee space panels.

99-06414A(2) Definitions

Not Used

99-06414A(3) Submittals

Product Data: Manufacturer's product data for plastic laminates and cabinet hardware must be submitted.

Samples: Three samples must be submitted for each of the items shown below:

Edge Molding: Standard manufacturer's color and sample palette.

Countertop Support Bracket.

Plastic laminate, 8" by 10" for each type, color, pattern and surface finish.

Shop Drawings: Shop drawings for cabinets showing location of cabinets, dimensioned plans and elevations, attachment devices, and other components must be submitted. Shop drawings must bear the "WI Certified Compliance Label" on the first sheet of the drawings. Roughing-in for mechanical and electrical services must be included in shop drawings, where required.

99-06414A(4) Quality Assurance

Codes and Standards: Cabinets and swinging gates must be manufactured and installed in under the "Architectural Woodwork Standards" of the Woodwork Institute (WI) requirements for the grade or grades specified or shown.

99-06414A(5) Delivery, Storage, and Handling

Protection: Cabinets must be protected during transit, delivery, storage and handling to prevent damage, soiling, and deterioration.

99-06414B MATERIALS

99-06414B(1) Acceptable Manufacturers

Manufacturers: High pressure decorative laminates must be Wilsonart; Formica Corp.; Nevamar Corp.; or equal.

99-06414B(2) Manufactured Units

Cabinets must be fabricated to the dimensions, profiles, and details shown with openings and mortises precut, where possible to receive hardware and other items and work.

Fabrication, assembly, finishing, hardware application, and other work must be completed to the maximum extent possible prior to shipment to the job site.

Laminate Clad Cabinets:

Laminate clad cabinets must be custom grade, flush overlay construction.

Laminate cladding must be high pressure decorative laminate complying with NEMA LD 3. Color, pattern and finish must be as shown. Laminate surface and grade must be as follows:

1. Horizontal and vertical surfaces other than tops must comply with NEMA LD 3, general purpose grade GP-50 (50-mil nominal thickness).
2. Postformed surfaces must comply with NEMA LD 3, postformed grade PF-42 (42-mil nominal thickness).

Laminated Counter Tops and Splashes:

Laminated counter tops and splashes must be WI custom grade.

Surface material must be high pressure laminated plastic complying with NEMA LD-3, 50-mil thickness.

Unless otherwise shown, splashes must be 6 inches high from the surface of the deck. Back splashes must be continuous formed and coved. Side splashes must be top set.

Laminated counter tops must be self edged. Counter tops to receive sinks or plumbing fixtures must have a bullnose.

The underside of tops and backsides of splashes must be covered with an authorized backing sheet.

99-06414B(3) Cabinet Hardware and Accessory Materials

Cabinet hardware and accessory materials must be provided for cabinets.

Hardware must be provided with standard US 32D metal plated finish, unless noted otherwise on plans. .

Drawer Slides: Drawer slides must be side mounting full extension with fully enclosed rolling balls and rollers, concealed slides and bearings, and positive stop. Capacity must be not less than 75 pounds, except capacity must be not less than 100 pounds for heavy duty drawers.

Door Guides: Sliding door guides must be continuous, dual channel, metal guides, top and bottom. Bottom guide must have crowned track.

Shelf Supports: Shelf supports must be adjustable, semi-recessed, chrome finished pressed metal, heavy duty standards and support clip, with one inch adjustment increments.

Cabinet Hinges:

Cabinet hinges must be stainless steel. Concealed European-style hinge self-closing action, 3-way adjustable.

Cabinet hinge manufacturers must be Stanley, Hager, McKinney, or equal.

Cabinet Pulls:

Cabinet pulls must be 5/16-inch diameter stainless steel rod, with 1 5/16-inch projection and 4-inch center to center fastening.

Cabinet pull manufacturers must be Stanley, Hager, McKinney, or equal.

Cabinet Grommets Knobs:

Cabinet knobs must be cast brass with plated finish, must be one-inch diameter with 3/4-inch projection.

Cabinet knobs manufacturers must be Stanley, Hager, McKinney, or equal.

99-06414B(4) Shop Fabrication

Shop Assembly:

Nails must be countersunk and the holes filled, molds must be neatly mitered and all joints must be tight and true.

As far as practicable, work must be assembled at the mill and delivered to the building ready to be set in place. Parts must be smoothly dressed and interior work must be belt sanded at the mill and hand sanded at the building. After assembly, work must be cleaned and made ready for the specified finish.

Veneer sequence matching must be maintained for cabinets with transparent finish.

All work must be prepared to receive finish hardware. Finish hardware must be accurately fitted and securely fastened as instructed by the manufacturer. Finish hardware must not be fastened with adhesives.

Drawers must be fitted with dust covers of 1/4-inch plywood or hardboard above compartments and drawers except where located directly under tops.

Precut Openings: Openings for hardware, appliances, plumbing fixtures, and similar items must be precut where possible. Openings must be accurately located and templates used for proper size and shape. Edges of cutouts must be smoothed and edges sealed with a water-resistant coating.

99-06414C CONSTRUCTION

Cabinets: Cabinets must be installed without distortion so that doors and drawers fit openings properly and are accurately aligned. Hardware must be adjusted to center doors and drawers in openings and to provide unencumbered operation. Installation of hardware and accessory items must be completed as indicated on the authorized drawings.

Laminate Tops: Laminate tops must be securely fastened to base units and other support systems as indicated on the authorized drawings.

Cabinet Hardware:

Doors for cabinets must be equipped with one pair of hinges, unless otherwise shown. Each door leaf must be equipped with one pull.

99-06414D PAYMENT

Not Used

99-7 THERMAL AND MOISTURE PROTECTION**99-07112 BITUMINOUS WATERPROOFING****99-07112A GENERAL****99-07112A(1) Summary**

Scope: This work consists of furnishing and applying a bituminous waterproofing membrane.

Bituminous waterproofing membrane must consist of a coating of primer, a bonded, continuous membrane composed of 2 layers of asphalt saturated glass fabric and 3 moppings of waterproofing asphalt.

99-07112A(2) Definitions

Not Used

99-07112A(3) Submittals

Product Data: Manufacturer's descriptive data and installation instructions for each waterproofing material must be submitted.

99-07112A(4) Quality Control and Assurance

The Contractor must obtain primary materials from a single manufacturer. Secondary materials must be only as instructed by the primary manufacturer.

Labels: Materials must be furnished which have factory applied labels affixed to each container or roll of material certifying compliance with ASTM standards specified.

99-07112B MATERIALS

Asphalt Primer: Asphalt primer must be cut-back type complying with ASTM D 41.

Waterproofing Asphalt: Waterproofing asphalt must comply with ASTM D 449, Type I, suitable for vertical surfaces below grade.

Glass Fiber Fabric: Glass fiber fabric must comply with ASTM D 1668, Type I, for woven glass fabric treated with asphalt and weighs about 1.5 pounds per 100 square feet.

Plastic Cement: Plastic cement must be suitable for use with bituminous materials.

Protection Board: Protection board must be organic fiberboard treated for resistance to fungus and insects, asphalt impregnated and asphalt coated on both faces; ½ inch thick unless otherwise noted.

99-07112C CONSTRUCTION**99-07112C(1) Preparation**

Protection: Liquid or mastic compounds must not be permitted to enter or clog drains and conductors. Spillage or migration onto other surfaces of work must be prevented by masking or otherwise protect adjoining work.

Surface Preparation: All concrete surfaces which are to be waterproofed must be reasonably smooth and free from holes and projections which might puncture the membrane. The surface must be dry and thoroughly cleaned of dust and loose materials.

The primer must be applied to the surface and allowed to dry before applying asphalt.

99-07112C(2) Installation

Installation must comply with manufacturer's instructions, except where more stringent requirements are shown or specified, and except where proper conditions require extra precautions or provisions to ensure satisfactory performance of work.

Application:

No primer or asphalt must be applied in wet weather, nor when the temperature is below 65°F. Heating must comply with the manufacturer's instructions.

Multiply-courses of bitumen and felts or fabrics must be installed in individual courses, unless manufacturer recommends shingle-fashion courses. Courses must be laid in direction or directions recommended.

Membrane must be extended as flashing at edges, openings and projections, so as to complete waterproof enclosure as required for leakproof installation.

Protection Board: Protection board must be set into last course of asphalt before it cools.

99-07112D PAYMENT

Not Used

99-07115 SHEET WATERPROOFING

99-07115A GENERAL

99-07115A(1) Summary

Scope: This work consists of installing a premolded bituminous sheet waterproofing system.

The premolded membrane waterproofing system includes an adhesive or primer coating, a premolded bituminous sheet, mastic for sealing the edges of the sheet, and a protective covering attached to the exposed bituminous sheet.

99-07115A(2) Definitions

Not Used

99-07115A(3) Submittals

Product Data: Manufacturer's descriptive data and installation instructions for each waterproofing material must be submitted.

99-07115A(4) Quality Assurance

Single Source Responsibility: Primary waterproofing materials must be obtained from a single manufacturer and secondary materials must be only as instructed by the manufacturer of the primary materials.

Labels: Materials must be furnished which have factory-applied labels affixed to each container or roll of material certifying compliance with ASTM standards specified.

99-07115B MATERIALS

Premolded Membrane: Preformed membrane must be premolded sheets of bitumen and other compounds, laminated between sheets consisting of a rubberized-asphalt membrane, reinforced with glass fiber or similar fabrics or mats, coated with bitumen and covered with plastic anti-stick film. Vapor transmission rating must be not more than 0.05 perm when tested under ASTM E96 and nominal thickness of the membrane must be at least 60 mils.

Adhesives: Adhesives must be types of adhesive compounds and tapes recommended by the waterproofing manufacturer, for bonding to substrate, for waterproof sealing of seams in membrane and for waterproof joints between membrane and flashings, adjoining surfaces and projections through membrane.

Primer: Primer must be type of concrete primer recommended by the manufacturer of the sheet waterproofing.

Protective Covering: Protective covering must be hardboard, 1/8 inch thick or such other material that will furnish equivalent protection to the preformed membrane. Protective covering must prevent cutting, scratching, depression or any other damage to the membrane caused by concrete, backfill material or equipment.

99-07115C CONSTRUCTION

99-07115C(1) General

Preformed membrane waterproofing must not be applied to any surface until you are prepared to follow its application with the placing of the protective covering and concrete or backfill within a sufficiently short time that the membrane will not be damaged by workers, equipment, exposure to weathering or from any other cause. Damaged membrane or protective covering must be repaired or replaced by you.

99-07115C(2) Preparation

Surface Preparation: All surfaces which are to receive waterproofing must be reasonably smooth and free from holes and projections which might puncture the membrane. The surface must be dry and thoroughly cleaned of dust and loose materials.

Prime Coat:

The primer must be applied in one coat to the entire area to be sealed by spray or roller methods. The rate must be as instructed by the primer manufacturer.

All primers must be thoroughly mixed and continuously agitated during application. Primers and adhesive must be allowed to dry to a tack free condition prior to placing membrane sheets.

99-07115C(3) Installation

Application:

Preformed membrane material must be placed vertically with each successive sheet lapped to the preceding by a minimum of 3 inches. Horizontal splices must be lapped by a minimum of 6 inches.

Exposed edges of membrane sheets must have a trowelled bead of manufacturer's recommended mastic applied after the membrane is placed.

Holes or tears in the preformed membrane sheeting must be patched with an additional layer of membrane sheet of sufficient size to provide a 5-inch minimum lap outside the edge of the defect.

Protective Covering:

The surface of the waterproofing membrane must be cleaned free of all dirt and other deleterious material before the protective covering is placed.

The protective covering must be placed on a coating of adhesive of a type recommended by the manufacturer. The adhesive must be applied at a rate sufficient to hold the protective covering in position until the concrete or backfill is placed.

99-07115D PAYMENT

Not Used

99-07190 VAPOR BARRIER

99-07190A GENERAL

99-07190A(1) Summary

Scope: This work consists of applying polyethylene vapor barrier under interior metal wall panels.

99-07190A(2) Definitions

Not Used

99-07190A(3) Submittals

Product Data: Submit manufacturer's descriptive data and installation instruction.

Product Test Reports: Submit test reports for tests performed by a qualified testing agency.

99-07190B MATERIALS

Polyethylene Vapor Barrier: ASTM D 4397, 10-mil thick sheet with maximum permeance rating of 0.1 perm.

Accessories:

Vapor Barrier Tape: Pressure-sensitive tape of type recommended by vapor barrier manufacturer for sealing joints and penetrations in vapor barrier.

Adhesive: Product recommended by vapor barrier manufacturer and has demonstrated capability to bond vapor barrier securely to substrates indicated.

Vapor Barrier Fasteners: Pancake-head, self-tapping steel drill screws, with fender washers.

99-07190C CONSTRUCTION

Preparation:

Clean substrates of substances that are harmful to vapor barriers, including removing projections capable of puncturing vapor barrier.

Installation:

Place vapor barrier on side of construction indicated on drawings.

Extend vapor barrier to extremities of areas to protect from vapor transmission. Secure vapor barrier in place with adhesives, vapor barrier fasteners, or other anchorage system as recommended by manufacturer. Extend vapor barrier to cover miscellaneous voids in insulated substrates, including those filled with loose fiber insulation.

Seal vertical joints in vapor barrier over substrates by lapping no fewer than two studs and sealing with vapor barrier tape according to vapor barrier manufacturer's written instructions. Locate all joints over substrates.

Seal joints caused by pipes, conduits, electrical boxes, and similar items penetrating vapor barriers with vapor barrier tape to create an airtight seal between penetrating objects and vapor barriers.

Repair tears or punctures in vapor barriers immediately before concealment by other work. Cover with vapor barrier tape or another layer of vapor barriers.

Protection: Protect vapor barriers from damage until concealed by permanent construction.

99-07190D PAYMENT

Not Used

99-07210 INSULATION (GENERAL)

99-07210A GENERAL

99-07210A(1) Summary

Scope: This work consists of installing insulation. Insulation includes related materials such as substrate boards, underlayments, vapor retarders, and cover boards.

Insulation materials must be compatible with existing or new materials incorporated in the building.

99-07210A(2) Definitions

Not Used

99-07210A(3) Submittals

Product Data:

A list of materials, manufacturer's descriptive data, location schedule, and time schedule must be submitted.

The list of materials to be used must include the trade name, manufacturer's name, smoke developed and flame spread classification, resistance rating and thickness for the insulation materials and accessories.

Schedules:

A location schedule and time schedule must be submitted.

The location schedule must show where each material is to be installed.

Provide the Engineer an accurate time schedule of the areas of the building to be insulated each day. The time schedule must be submitted 3 working days in advance of the work.

Samples: Samples of insulation material must be submitted to the Engineer at the job site.

99-07210A(4) Quality Assurance

Codes and Standards: All insulating materials must be certified to comply with the California Quality Standards for Insulating Materials and must be listed in the Department of Consumer Affairs publication "Consumer Guide and Directory of Certified Insulation Material."

99-07210A(5) Delivery, Storage, and Handling

Insulating materials must be delivered to the job site and stored in a safe dry location with labels intact and legible.

Insulating materials must be protected from physical damage and from becoming wet or soiled.

In the event of damage, materials must be repaired or replaced.

99-07210B MATERIALS

Not Used

99-07210C CONSTRUCTION

Not Used

99-07210D PAYMENT

Not Used

99-07212 BATT AND BLANKET INSULATION

99-07212A GENERAL

99-07212A(1) Summary

Scope: This work consists of installing batt or blanket insulation.

Batt insulation includes faced and unfaced batts in walls and ceilings and acoustical batts for sound control.

99-07212A(2) Definitions

Not Used

99-07212A(3) Submittals

Not Used

99-07212A(4) Quality Assurance

Laminator's Qualifications:

Laminator for bonding polyethylene vapor-retarder to insulating batts must be approved by the insulation manufacturer.

The name of the laminator must be submitted with the Product Data.

Codes and Standards:

All batt or blanket insulation, including facings such as vapor barriers, must have a flame-spread rating not to exceed 25 and a smoke density not to exceed 450 when tested under ASTM E 84. .

The flame-spread and smoke density limitations do not apply to facings on batt insulation installed between ceiling joists, or in roof-ceiling or wall cavities, provided the facing is installed in substantial contact with the surface of the ceiling or wall finish.

99-07212B MATERIALS

99-07212B(1) Insulating Materials

Fiberglass batts must be thermal insulation produced by combining glass fibers with thermosetting resins to comply with ASTM C 665.

Wall Insulation: Wall insulation must be R-19 fiberglass batts with paper-laminate vapor-retarder membrane on one face. Insulation must comply with ASTM C 665, Type II, Class C.

Ceiling Insulation: Ceiling insulation must be R-30 fiberglass batts with paper-laminate vapor-retarder membrane on one face. Insulation must comply with ASTM C 665, Type II, Class C.

Acoustical Insulation: Acoustical insulation must be 3½ inches, unfaced fiberglass insulation batts. Insulation must comply with ASTM C 665, Type I.

99-07212B(2) Vapor Retarders

Paper-laminate Vapor-retarder: Paper-laminate vapor-retarder must be kraft paper sheets laminated together with asphalt or other vapor retarding compounds, scrim reinforced at edges of sheets.

Foil-paper Vapor-retarder: Foil-paper vapor-retarder must be 0.3 mil reflective aluminum foil laminated with scrim reinforcing to plastic-coated kraft paper.

Polyethylene Vapor-retarder: Polyethylene vapor-retarder must be factory-applied, 3 mils, white polyethylene film, a blend of fiberglass and polyester yarn reinforcement, and metallized polyester film laminated with a flame resistant adhesive, and a Class I flame-spread classification.

99-07212B(3) Auxiliary Insulation Materials

Insulation Tape: Insulation tape must be that recommended by the insulation manufacturer.

Insulation Adhesive: Insulation adhesive must be the type recommended by the insulation manufacturer and complying with the requirements for fire resistance and VOC content.

Impaling Pins: Impaling pins must be self-adhering wire pins with sheet metal retaining clips and protective rubber tips. Adhesive for pins must be that recommended by the pin manufacturer.

Line Wire: Line wire must be commercial quality 20-gage galvanized steel wire.

99-07212B(4) Shop Fabrication

Polyethylene must be factory laminated to fiberglass batts or blankets by an applicator approved by the manufacturer of the batts or blankets.

99-07212C CONSTRUCTION

The vapor retarder on faced batts must be toward the interior and must be fastened to provide a sealed retarder. Punctures and holes in the retarder must be repaired.

Unless otherwise described, insulation must be kept at minimum 3 inches clear of lighting fixtures and heat producing electrical appliances and equipment.

Installing Batt Type Insulation: Insulation batts must be installed to completely fill the space between framing members. Apply a single layer of insulation of required thickness, unless otherwise shown or required to make up total thickness. Installation must comply with the manufacturer's instructions and these special provisions.

99-07212D PAYMENT

Not Used

99-07221 RIGID ROOF INSULATION

99-07221A GENERAL

99-07221A(1) Summary

Scope: This work consists of installing rigid roof insulation.

Rigid insulation includes rigid insulation, underlayment, , cover boards, wood nailers, fasteners, and other materials required for the complete installation of the rigid insulation system. Materials and installation must be coordinated with the roof covering system to meet the requirements for a Class 1 Factory Mutual approved assembly.

99-07221A(2) Definitions

Not Used

99-07221A(3) Submittals

Not Used

99-07221A(4) Quality Assurance

Not Used

99-07221B MATERIALS

Underlayment: Underlayment must be building paper, Type I (No. 15) asphalt roofing felt, or rosin-sized paper.

Rigid Roof Insulation: Rigid roof insulation must be multilayer, preformed board roof insulation. of one of the following types:

1. Extruded polystyrene (XPS) board complying with ASTM Designation: C578, Type IV

Rigid roof insulation must have R value of at least 5.5 per inch and compressive strength of at least 25 psi.

Cover Board:

Glass-mat, water-resistant gypsum substrate, ASTM C 1177, 1/2 inchthick,factory primedwith low permeance coating, as recommended by manufacturer for intended application.

Cellulosic fiber reinforced, water-resistant gypsum substrate, ASTM C 1278, 1/2 inchthick.

Insulation Tape: Insulation tape must be that recommended by the insulation manufacturer.

Adhesives, Sealants, and Primers: Adhesives, sealants, and primers must be those recommended by manufacturer for intended use.

Wood Nailers: Wood nailers must be Douglas fir, hem-fir or equivalent western softwood pressure treated after fabrication. Wood preservatives must be waterborne type.

Fastener (Metal Decking): Fastener (metal decking) must be galvanized spring steel barbed clip driven through galvanized one-inch minimum nominal diameter caps; galvanized hardened steel nail with one-inch minimum nominal diameter head and serrated shank to provide backout resistance; or threaded self tapping screw driven through 3-inch minimum nominal diameter galvanized cap.

99-07221C CONSTRUCTION

Preparation:

The preparation of the deck surfaces must comply with the manufacturer's instructions and these special provisions.

The deck surface must be made smooth and level.

Installation:

Underlayment must be fastened to nailable decks with randomly located roofing nails.

Insulation panels must be placed in at least 2 layers with end joints staggered and with joints of the second layer offset at least 6 inches from joints in the first layer.

Insulation panels must be oriented with the long side perpendicular to the direction roofing felts are to be laid. End joints between panels must be staggered.

Insulation clips and fasteners must resist the wind uplift classification specified for the roof covering.

Wood nailers must be thick enough so the tops are flush with surrounding insulation. Perimeter nailers must extend at least 2 inches beyond flanges of metal flashings or gravel stops. On roofs that are steeper than 2 inches per foot, perimeter wood nailers must be supplemented by nominal 4-inch wide wood nailers installed parallel to eaves (horizontal) at a maximum spacing of 8 feet. Wood nailers must be securely fastened using at least two 16d nails to each framing member.

The first layer of insulation must be mechanically fastened as instructed by the manufacturer to meet the requirements of Factory Mutual Loss Prevention Data Sheets 1-28 and 1-29. At least one fastener per 2 square feet of insulation panel must be used. Panels that are cracked or broken by the installation of the mechanical fasteners must be replaced.

The completed layer of insulation must be smooth and level, and suitable for the proper bedding of succeeding layers of roofing material.

Insulation must be laid just before application of roofing felts. Units must be laid in parallel courses with transverse joints staggered, in moderate contact with adjoining surfaces.

Continuous joints between insulation units and parallel to decking flutes must not occur over the flute openings. Both units must have full edge bearing on rib tops.

Insulation panels with broken or crushed corners or edges must be trimmed free of such defects or must be discarded. Replacement boards less than 12 inches wide must not be used.

Damaged insulation in the completed work must be removed and replaced. Insulation that has been wet or is wet must be considered damaged.

Install cover board with joints staggered from joints in insulation units. Attach under the manufacturer's instructions.

99-07221D PAYMENT

Not Used

99-072419 - WATER-DRAINAGE EXTERIOR INSULATION AND FINISH SYSTEM (EIFS)

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. EIFS-clad drainage-wall assemblies that are field applied over substrate.
 - 2. Water-resistive barrier coatings.

1.2 DEFINITIONS

- A. Definitions in ASTM E2110 apply to Work of this Section.
- B. EIFS: Exterior insulation and finish system(s).
- C. IBC: International Building Code.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site

1.4 ACTION SUBMITTALS

- A. Product Data: For each EIFS component, trim, and accessory including water-resistive barrier coatings.
- B. Shop Drawings:
 - 1. Include details for EIFS buildouts.
 - 2. Include details for parapet cap flashing.
- C. Samples: For each exposed product and for each color and texture specified, 8 inches square in size.
- D. Samples for Initial Selection: For each type of finish-coat color and texture indicated.
 - 1. Include similar Samples of exposed accessories involving color selection.

- E. Samples for Verification: 24-inch- square panels for each type of finish-coat color and texture indicated, prepared using same tools and techniques intended for actual work, including custom trim, and an aesthetic reveal.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Manufacturer Certificates: Signed by EIFS manufacturer, certifying the following:
 - 1. EIFS complies with requirements.
 - 2. Substrates to which EIFS is indicated to be attached are acceptable to EIFS manufacturer.
 - 3. Accessory products installed with EIFS, including joint sealants, flashing, water-resistive barrier coatings, trim, whether or not furnished by EIFS manufacturer and whether or not specified in this Section, are acceptable to EIFS manufacturer.
- C. Product Certificates: For cementitious materials and aggregates and for insulation and joint sealant, from manufacturer.
- D. Product Test Reports: For each EIFS assembly and component, and for water-resistive barrier coatings, for tests performed by a qualified testing agency.
- E. Field quality-control reports.
- F. Sample Warranty: For manufacturer's special warranty.

1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For EIFS to include in maintenance manuals.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: An installer who is certified in writing by AWCI International as qualified to install Class PB EIFS using trained workers
- B. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, to set quality standards for materials and execution, and to set quality standards for fabrication and installation.
 - 1. Build mockup of typical wall area as determined by the Engineer.
 - 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 - 3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in original, unopened packages with manufacturers' labels intact and clearly identifying products.
- B. Store materials inside and under cover; keep them dry and protected from weather, direct sunlight, surface contamination, aging, corrosion, damaging temperatures, construction traffic, and other causes.
 - 1. Stack insulation board flat and off the ground.
 - 2. Protect plastic insulation against ignition at all times. Do not deliver plastic insulating materials to Project site before installation time.
 - 3. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

1.9 FIELD CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions and ambient outdoor air, humidity, and substrate temperatures permit EIFS to be applied, dried, and cured according to manufacturers' written instructions and warranty requirements.
 - 1. Proceed with installation of adhesives or coatings only when ambient temperatures have remained, or are forecast to remain, above 40 deg F (4.4 deg C) for a minimum of 24 hours before, during, and after application. Do not apply EIFS adhesives or coatings during rainfall.

1.10 WARRANTY

- A. Manufacturer's Special Warranty: Manufacturer agrees to repair or replace components of EIFS-clad drainage-wall assemblies that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Bond integrity and weathertightness.
 - b. Deterioration of EIFS finishes and other EIFS materials beyond normal weathering.
 - 2. Warranty coverage includes the following components of EIFS-clad drainage-wall assemblies:
 - a. EIFS finish, including base coats, finish coats, and reinforcing mesh.
 - b. Insulation installed as part of EIFS[including foam buildouts].
 - c. Insulation adhesive[and mechanical fasteners].
 - d. EIFS accessories, including trim components and flashing.
 - e. Water-resistive barrier coatings.
 - f. EIFS drainage components.
 - 3. Warranty Period: Five [5] years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Dryvit System, Inc.; Outsulation, or equal.
- B. Source Limitations: Obtain EIFS from single source from single EIFS manufacturer and from sources approved by EIFS manufacturer as compatible with EIFS components.

2.2 PERFORMANCE REQUIREMENTS

- A. EIFS Performance: Comply with ASTM E2568 and with the following:
 - 1. Weathertightness: Resistant to uncontrolled water penetration from exterior, with a means to drain water entering EIFS to the exterior.
 - 2. Impact Performance: ASTM E2568, Ultra High impact resistance.
 - 3. Abrasion Resistance of Finish Coat: Sample consisting of 1-inch- (25.4-mm-) thick EIFS mounted on 1/2-inch- (12.7-mm-) thick gypsum board; cured for a minimum of 28 days and shows no cracking, checking, or loss of film integrity after exposure to 528 quarts (500 L) of sand when tested according to ASTM D968, Method A.
 - 4. Mildew Resistance of Finish Coat: Sample applied to 2-by-2-inch (50.8-by-50.8-mm) clean glass substrate; cured for 28 days and shows no growth when tested according to ASTM D3273 and evaluated according to ASTM D3274.
 - 5. Drainage Efficiency: 90 percent average minimum when tested according to ASTM E2273.

2.3 EIFS MATERIALS

- A. Water-Resistive Barrier Coating: EIFS manufacturer's standard formulation and accessories for use as water-resistive barrier coating; compatible with substrate.
 - 1. Water-Resistance: Comply with physical and performance criteria of ASTM E2570/E2570M.
- B. Flexible-Membrane Flashing: Cold-applied, self-adhering, self-healing, rubberized-asphalt, and polyethylene-film composite sheet or tape and primer; EIFS manufacturer's standard or product recommended in writing by EIFS manufacturer.
- C. Insulation Adhesive: EIFS manufacturer's standard formulation designed for indicated use; compatible with substrate; and complying with one of the following:
 - 1. Job-mixed formulation of portland cement complying with ASTM C150/C150M, Type I, and polymer-based adhesive specified for base coat.
 - 2. Factory-blended dry formulation of portland cement, dry polymer admixture, and fillers specified for base coat.
 - 3. Factory-mixed noncementitious formulation designed for adhesive attachment of insulation to substrates of type indicated, as recommended by EIFS manufacturer.
- D. Expanded Rigid Cellular Polystyrene Board Insulation: Comply with ASTM E2430/E2430M, unless otherwise noted, and the following:
 - 1. Flame-Spread and Smoke-Developed Indexes: 25 and 450 or less, respectively, according to ASTM E84.
 - 2. Dimensions: Provide insulation boards of not more than 24 by 48 inches (610 by 1219 mm), with thickness indicated on Drawings.

- E. Reinforcing Mesh: Balanced, alkali-resistant, open-weave, glass-fiber mesh treated for compatibility with other EIFS materials, made from continuous multiend strands with retained mesh tensile strength of not less than 120 lbf/in. (21 dN/cm) according to ASTM E2098/E2098M and the following:
 - 1. Reinforcing Mesh for EIFS, General: Not less than weight required to comply with impact-performance level specified in "Performance Requirements" Article.
 - 2. Strip-Reinforcing Mesh: Not less than 3.75 oz./sq. yd. .
 - 3. Detail-Reinforcing Mesh: Not less than 4.0 oz./sq. yd. .
 - 4. Corner-Reinforcing Mesh: Not less than 7.2 oz./sq. yd. .
- F. Water-Resistant Base Coat: EIFS manufacturer's standard water-resistant formulation complying with one of the following:
 - 1. Job-mixed formulation of portland cement complying with ASTM C150/C150M, Type I, white or natural color; and manufacturer's standard polymer-emulsion adhesive designed for use with portland cement.
 - 2. Job-combined formulation of manufacturer's standard polymer-emulsion adhesive and manufacturer's standard dry mix containing portland cement.
- G. Primer: EIFS manufacturer's standard factory-mixed, elastomeric-polymer primer for preparing base-coat surface for application of finish coat.
- H. Finish Coat: EIFS manufacturer's standard acrylic-based coating complying with the following:
 - 1. Factory-mixed formulation of polymer-emulsion binder, colorfast mineral pigments, sound stone particles, and fillers.
 - 2. Factory-mixed formulation of polymer-emulsion binder, colorfast mineral pigments, and fillers used with stone particles for embedding in finish coat to produce an applied-aggregate finish.
 - a. Aggregate: Marble chips of size and color as selected by Engineer from manufacturer's full range.
 - 3. Colors: [As indicated by manufacturer's designations] [Match Architect's sample] [As selected by Architect Engineer from manufacturer's full range].
 - 4. Textures: [As indicated by manufacturer's designations] [Match Architect's sample] [As selected by Architect Engineer from manufacturer's full range].
- I. Sealer: Manufacturer's waterproof, clear acrylic-based sealer for protecting finish coat.
- J. Water: Potable.
- K. Trim Accessories:
 - 1. Casing Bead: Prefabricated, one-piece type for attachment behind insulation, of depth required to suit thickness of coating and insulation, with face leg perforated for bonding to coating and back leg.
 - 2. Drip Screed/Track: Prefabricated, one-piece type for attachment behind insulation with face leg extended to form a drip, of depth required to suit thickness of coating and insulation, with face leg perforated for bonding to coating and back leg.
 - 3. Weep Screed/Track: Prefabricated, one-piece type for attachment behind insulation with perforated face leg[extended to form a drip] and weep holes in track bottom, of depth required to suit thickness of coating and insulation, with face leg perforated for bonding to coating and back leg; designed to drain incidental moisture that gets into wall construction to the exterior at terminations of EIFS with drainage.
 - 4. Expansion Joint: Closed-cell polyethylene backer rod and elastomeric sealant 3/4-inch- (19-mm-) minimum.
 - 5. Windowsill Flashing: Prefabricated type for both flashing and sloping sill over framing beneath windows; with end and back dams; designed to direct water to exterior.
 - 6. Parapet Cap Flashing: Type for both flashing and covering parapet top, with design complying with ASTM C1397 and ANSI/SPRI/FM 4435/ES-1.

2.4 MIXING

- A. Comply with EIFS manufacturer's requirements for combining and mixing materials. Do not introduce admixtures, water, or other materials, except as recommended by EIFS manufacturer. Mix materials in clean containers. Use materials within time period specified by EIFS manufacturer or discard.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine roof edges, wall framing, flashings, openings, substrates, and junctures at other construction for suitable conditions where EIFS will be installed.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.
 - 1. Begin coating application only after surfaces are dry.
 - 2. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Protect contiguous work from moisture deterioration and soiling caused by application of EIFS. Provide temporary covering and other protection needed to prevent spattering of exterior finish coats on other work.
- B. Protect EIFS, substrates, and wall construction behind them from inclement weather during installation. Prevent penetration of moisture behind drainage plane of EIFS and deterioration of substrates.
- C. Prepare and clean substrates to comply with EIFS manufacturer's written instructions to obtain optimum bond between substrate and adhesive for insulation.

3.3 EIFS INSTALLATION, GENERAL

- A. Comply with ASTM C1397, ASTM E2511, and EIFS manufacturer's written instructions for installation of EIFS as applicable to each type of substrate indicated.

3.4 SUBSTRATE PROTECTION APPLICATION

- A. Water-Resistive Barrier Coating: Apply over sheathing to provide a water-resistive barrier.
 - 1. Tape and seal joints, exposed edges, terminations, and inside and outside corners of sheathing unless otherwise indicated by EIFS manufacturer's written instructions.
- B. Flexible-Membrane Flashing: Install over water-resistive barrier coating, applied and lapped to shed water; seal at openings, penetrations, and terminations. Prime substrates with flashing primer if required and install flashing.

3.5 TRIM INSTALLATION

- A. Trim: Apply trim accessories at perimeter of EIFS, at expansion joints, at windowsills, and elsewhere as indicated. Coordinate with installation of insulation.
 - 1. Weep Screed/Track: Use at bottom termination edges, at window and door heads, and at floor line expansion joints of water-drainage EIFS unless otherwise indicated.
 - 2. Windowsill Flashing: Use at windows unless otherwise indicated.
 - 3. Expansion Joint: Use where indicated on Drawings.
 - 4. Casing Bead: Use at other locations.
 - 5. Parapet Cap Flashing: Use where indicated on Drawings.

3.6 DRAINAGE MAT INSTALLATION

- A. Drainage Mat: Apply wrinkle free, continuously, with edges overlapped and mechanically secured with fasteners over water-resistive barrier coating.

3.7 INSULATION INSTALLATION

- A. Board Insulation: Adhesively attach insulation to substrate in compliance with ASTM C1397 :
 - 1. Press and slide insulation into place. Apply pressure over entire surface of insulation to accomplish uniform contact, high initial grab, and overall level surface.
 - 2. Allow adhered insulation to remain undisturbed for not less than 24 hours, before[installing mechanical fasteners,] beginning rasping and sanding insulation or applying base coat and reinforcing mesh.
 - 3. Apply insulation over substrates in courses with long edges of boards oriented horizontally.
 - 4. Begin first course of insulation from a level base line and work upward.
 - 5. Begin first course of insulation from screed/track and work upward. Work from perimeter casing beads toward interior of panels if possible.

6. Stagger vertical joints of insulation boards in successive courses to produce running bond pattern. Locate joints, so no piece of insulation is less than 12 inches (300 mm) wide or 6 inches (150 mm) high. Offset joints not less than 6 inches (150 mm) from corners of window and door openings and not less than 4 inches (100 mm) from aesthetic reveals.
 - a. Adhesive Attachment: Offset joints of insulation not less than 6 inches (150 mm) from horizontal and 4 inches (100 mm) from vertical joints in sheathing.
7. Interlock ends at internal and external corners.
8. Abut insulation tightly at joints within and between each course to produce flush, continuously even surfaces without gaps or raised edges between boards. If gaps greater than 1/16 inch (1.6 mm) occur, fill with insulation cut to fit gaps exactly; insert insulation without using adhesive or other material.
9. Cut insulation to fit openings, corners, and projections precisely and to produce edges and shapes complying with details indicated.
10. Rasp or sand flush entire surface of insulation to remove irregularities projecting more than [1/32 inch (0.8 mm)] [1/16 inch (1.6 mm)] from surface of insulation and to remove yellowed areas due to sun exposure; do not create depressions deeper than 1/16 inch (1.6 mm). Prevent airborne dispersal and immediately collect insulation raspings or sandings.
11. Cut aesthetic reveals in outside face of insulation with high-speed router and bit configured to produce grooves, rabbets, and other features that comply with profiles and locations indicated. Do not reduce insulation thickness at aesthetic reveals to less than 3/4 inch (19 mm).
12. Interrupt insulation for expansion joints where indicated.
13. Form joints for sealant application by leaving gaps between adjoining insulation edges and between insulation edges and dissimilar adjoining surfaces. Make gaps wide enough to produce joint widths indicated after encapsulating joint substrates with base coat and reinforcing mesh.
14. Before installing insulation and before applying field-applied reinforcing mesh, fully wrap board edges. Cover edges of board and extend encapsulating mesh not less than 2-1/2 inches (64 mm) over front and back face unless otherwise indicated on Drawings.
15. Treat exposed edges of insulation as follows:
 - a. Except for edges forming substrates of sealant joints, encapsulate with base coat, reinforcing mesh, and finish coat.
 - b. Encapsulate edges forming substrates of sealant joints within EIFS or between EIFS and other work with base coat and reinforcing mesh.
16. Coordinate installation of flashing and insulation to produce wall assembly that does not allow water to penetrate behind flashing and water-resistive barrier coating.
- B. Expansion Joints: Install at locations indicated, where required by EIFS manufacturer, and as follows:
 1. At expansion joints in substrates behind EIFS.
 2. Where EIFS adjoin dissimilar substrates, materials, and construction, including other EIFS.
 3. At floor lines in multilevel wood-framed construction.
 4. Where wall height or building shape changes.
 5. Where EIFS manufacturer requires joints in long continuous elevations.

3.8 BASE-COAT APPLICATION

- A. Water-Resistant Base Coat: Apply full-thickness coverage to exposed insulation and to exposed surfaces of window sills, parapets, and to other surfaces indicated on Drawings.
- B. Reinforcing Mesh: Embed reinforcing mesh in wet base coat to produce wrinkle-free installation with mesh continuous at corners, overlapped not less than 2-1/2 inches (64 mm) or otherwise treated at joints to comply with ASTM C1397. Do not lap reinforcing mesh within 8 inches (200 mm) of corners. Completely embed mesh, applying additional base-coat material if necessary, so reinforcing-mesh color and pattern are invisible.
- C. Double-Layer Reinforcing-Mesh Application: Where indicated or required, apply second base coat and second layer of reinforcing mesh, overlapped not less than 2-1/2 inches (64 mm) or otherwise treated at joints to comply with ASTM C1397 in same manner as first application. Do not apply until first base coat has cured.
- D. Additional Reinforcing Mesh: Apply strip-reinforcing mesh around openings, extending 4 inches (100 mm) beyond perimeter. Apply additional 9-by-12-inch (230-by-300-mm) strip-reinforcing mesh diagonally at corners of openings (re-entrant corners). Apply 8-inch- (200-mm-) wide, strip-

reinforcing mesh at both inside and outside corners unless base layer of mesh is lapped not less than 4 inches (100 mm) on each side of corners.

1. At aesthetic reveals, apply strip-reinforcing mesh not less than 8 inches (200 mm) wide.
 2. Embed strip-reinforcing mesh in base coat before applying first layer of reinforcing mesh.
- E. Double Base-Coat Application: Where indicated, apply second base coat in same manner and thickness as first application, except without reinforcing mesh. Do not apply until first base coat has cured.

3.9 FINISH-COAT APPLICATION

- A. Primer: Apply over dry base coat.
- B. Finish Coat: Apply full-thickness coverage over dry primed base coat, maintaining a wet edge at all times for uniform appearance, to produce a uniform finish of color and texture matching approved sample and free of cold joints, shadow lines, and variations.
1. Embed aggregate in finish coat to produce a uniform applied-aggregate finish of color and texture matching approved sample.
- C. Sealer Coat: Apply over dry finish coat, in number of coats and thickness required by EIFS manufacturer.

3.10 FIELD QUALITY CONTROL

- A. Special Inspections: Owner will engage a qualified special inspector to perform the following special inspections:
1. Water-resistive barrier coatings applied over sheathing.
- B. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- C. EIFS Tests and Inspections: According to ASTM E2359/E2359M .
- D. EIFS will be considered defective if it does not pass tests and inspections.
- E. Prepare test and inspection reports.

3.11 CLEANING AND PROTECTION

- A. Remove temporary covering and protection of other work. Promptly remove coating materials from window and door frames and other surfaces outside areas indicated to receive EIFS coatings.

END OF SECTION 072419

99-07270 THROUGH-PENETRATION FIRESTOPPING

99-07270A GENERAL

99-07270A(1) Summary

Scope: This work consists of installing firestopping materials at penetrations in fire-rated walls, floors, and ceilings.

99-7.04A(2) Definitions

Not Used

99-07270A(3) Submittals

Product Data:

A list of materials, manufacturer's descriptive data, and location schedule must be submitted.

Descriptive data must include trade names, manufacturers' names, complete information on the materials to be applied, California State Fire Marshal Listing, the material thickness for the required fire resistance ratings, and the manufacturer's printed instructions for installation. Manufacturer's assembly must be California State Fire Marshal approved.

Certificates of Compliance: Submit a certificate of compliance with each shipment of firestopping materials.

99-07270A(4) Quality Assurance

Not Used

99-07270A(5) Delivery, Storage, and Handling

Delivery: Materials to be applied must be delivered in original unopened packages. Packages must be identified by the manufacturer's label and must bear proper labels for fire resistance classification.

Storage: Materials must be stored above ground, under cover, and in a dry location until ready for use. Packages which have been exposed to moisture before use must be discarded.

99-07270B MATERIALS

Fire-rated Caulk: Fire-rated caulk must comply with ASTM E814 and must be rated for use in fire-rated assemblies. Fire-rated caulk must be 3M Brand, Fire Barrier Caulk; Dow Corning, Fire Stop Sealant; Standard Oil, Fyre Putty; or equal.

Wrap Strip: Wrap strip must be nominal ¼-inch thick intumescent elastomeric material in 2-inch wide strips, faced one side with aluminum foil, and rated for use in 1-hour and 2-hour fire-rated systems.

Packing Material: Packing material must be polyethylene backer rod or nominal one-inch thickness of tightly packed ceramic (alumina silica) fiber blanket, mineral-wool batt or glass fiber insulation material.

Fire-rated Mortar: Fire-rated mortar must be non-asbestos, 47 to 57 pounds per cubic foot air dried density portland cement fly ash through-penetration firestopping mortar. Fire-rated mortar must comply with ASTM E814 and must be rated for use in 3-hour fire-rated systems at 3-inch minimum thickness.

Fire Safing Insulation: Fire safing insulation must be inorganic 3.5 pounds per cubic foot minimum density, non-combustible fiber insulation complying with Federal Specifications HH-1-521F, when tested under ASTM E119 and ASTM E136 for 3-hour fire resistance.

99-07270C CONSTRUCTION

Installation: Firestopping materials must be installed under the California State Fire Marshal Listing and the manufacturer's instructions.

99-07270D PAYMENT

Not Used

99-07411 METAL ROOFING**99-07411A GENERAL****99-07411A(1) Summary**

Scope: This work consists of installing preformed metal roofing.

Metal roofing system consists of underlayment, prefinished metal roof panels, gutters, downspouts, concealed fasteners, sealants, and other accessories and components required for a complete, securely fastened, and weathertight installation.

99-07411A(2) System Description

Design Requirements: The roofing system must comply with the wind design requirements for uplift or outward pressure listed in Chapter 16 of the CBC for the wind speed and exposure shown. Metal roof panels must be designed for roof live loads.

The roofing system must meet the requirements for a structural standing seam metal panel roof system under ASTM E1514.

99-07411A(3) Definitions

Not Used

99-07411A(4) Submittals

Product Data:

Manufacturer's technical product data, installation instructions, and recommendations for each type of roofing material must be submitted.

Product data must include the manufacturer's name and a complete material description of all components of the metal roofing system.

Samples:

Material samples must include a 12" x 12" sample of the roofing panel for each color to be installed and a sample of each anchor clip and fastening device.

Shop Drawings:

Shop drawings showing the layout and details of the metal roofing must be submitted.

Shop drawings must show the shape, size, thickness, and method of attachment for each component used in the work; the layout and spacing of fasteners; details of connections and closures; and details for expansion joints and weathertight joints.

Design calculations for the fastening system with the substrate shown must be submitted to verify compliance with the design requirements.

Shop drawings and calculations must be sealed and signed by an engineer who is registered as a civil engineer in the State.

Certificates of Compliance: Submit a certificate of compliance for the metal roofing system.

99-07411A(5) Quality Assurance

Not Used

99-07411A(6) Delivery, Storage, and Handling

Delivery and Handling: Panels must be protected against damage and discoloration.

Storage: Panels must be stored above ground, with one end elevated for drainage and protected against standing water and condensation between adjacent surfaces.

99-07411B MATERIALS

99-07411B(1) Sheet Material

Base Metal: Base metal must be cold formed, 0.04-inch nominal (20-gage), galvanized sheet steel complying with ASTM A653/A653M, Grade 33 [230] with G90 [Z275] coating, except where a higher strength is required for performance, extra smooth; or cold formed aluminum-zinc alloy-coated, commercial quality, sheet steel complying with ASTM A792/A792M, Grade 40 [275] with AZ55 [AZM 165], coating extra smooth.

Configuration: Metal roofing system must be a standing seam system with standing rib a minimum of 1¾ inches high and spaced not less than 12 inches nor more than 18 inches on center.

99-07411B(2) Metal Finishes

Coatings must be applied before or after forming and fabricating panels, as required for maximum coating performance capability.

Colors or color matches must be as shown or, if not otherwise shown, must be as selected by the Engineer from the manufacturer's standard color palette.

Fluoropolymer Coating:

Finish must be the manufacturer's standard 70 percent polyvinylidene fluoride (Kynar or Hylar) coating with a baked on primer (0.2-mil) and a finish coat of 0.8-mil nominal for a total dry film thickness of approximately 1.0-mil nominal. Coating must comply with requirements of AAMA 621.

Interior finish must consist of a 0.15-mil epoxy primer and a backer coat.

99-07411B(3) Miscellaneous Metal Shapes

Flashings, Gutters, and Downspouts: Flashings, gutters, and downspouts must be formed from the same material, gage and in the same finish as the roofing panels.

Perforated Soffit: Perforated soffit must be formed from the same material, gage and in the same finish as the roof panels.

99-07411B(4) Miscellaneous Materials

Fastener Clips: Fastener clips must be noncorrosive ferrous metal fasteners as recommended by the metal roofing system manufacturer to resist the design loads.

Fasteners: Fasteners must be as recommended by the metal roofing system manufacturer. Sheet metal screws must not be used except to fasten trim and flashings.

Underlayment: Underlayment must be as recommended by the metal roofing system manufacturer, but not less than 30-pound minimum asphalt impregnated fiber glass mat roofing felt.

Sealant and Sealant Tape: Sealant and sealant tape must be as recommended by the roofing manufacturer.

Closures: Closures must be rubber, neoprene, closed cell plastic or prefinished metal.

99-07411B(5) Shop Fabrication

Unless otherwise shown, roof panels must be fabricated in continuous lengths for the length of the roof, from ridge or peak to eave, except such length must not exceed the manufacturer's maximum production length.

Flashings must be fabricated in the longest practical lengths.

Roofing panels must be factory formed. Field formed panels are not acceptable.

99-07411C CONSTRUCTION

99-07411C(1) Installation

Underlayment: The roof and fascia panels must be installed over underlayment. Underlayment must be laid parallel to the eaves, shingle fashion with 6-inch edge laps and 12-inch end laps and must be fastened as instructed by the metal roofing system manufacturer.

Roof Panels:

The roof system must be installed and fastened complying with the details shown and the authorized shop drawings. Cutting and fitting must present a neat and true appearance with exposed burrs removed. Openings through roof panels must be cut square and must be reinforced as instructed by the metal roofing system manufacturer.

Roof panels must be adjusted in place and properly aligned for the detailed conditions before fastening. Panels must not be warped, bowed or twisted. The surface finish on the panels must not be cracked, blemished or otherwise damaged.

Gaskets, joint fillers, sealants and sealing tape must be installed where indicated on the authorized drawings or as required for weatherproof performance of panel systems.

Fasteners must be concealed and must not be driven through roof panels or batten covers.

Miscellaneous Metal Shapes:

Trim, fascia, flashings, gutters, downspouts, scuppers, caps, and other prefinished metal work must be positioned to the correct alignment for each detailed condition. Metal work must be securely attached to backing construction using fasteners at the spacing shown on authorized shop drawings. Prefinished metal to be installed over concrete, masonry or plaster must be back-coated with asphaltic paint as instructed by the metal roofing system manufacturer.

Roof panels, trim, gutters, and other prefinished metal that are marred, punctured, incorrectly bent, or incorrectly installed will be considered damaged and must be replaced with undamaged units.

Gutters must be fabricated by the metal roofing system manufacturer to the shape and lengths shown. Expansion joints must comply with the manufacturer's instructions and to SMACNA "Architectural Sheet Metal Manual."

The metal roofing system must be installed weathertight. Closures must be tight fitting and must be provided at the ends of panels, at the boundary of the roof, and as indicated on the authorized shop drawings.

99-07411C(2) Clean Up and Close Out

Clean up:

Adjacent surfaces must be protected during the roofing system installation and sealant work. Excess sealant must be removed as the installation progresses.

Roof panels, molding, trim, and other prefinished metal surfaces must be cleaned after installation as instructed by the manufacturer. Exposed cuts must be touched-up with a matching durable primer and paint as instructed by the metal roofing system manufacturer.

Touch up: Damaged paint surfaces must be touched up by using an air dry touch up paint supplied by the metal roofing system manufacturer. Only a small brush must be used for touching up. No spraying of touch up paint is to be performed.

Damaged Units: Panels and other components of the work which have been damaged or have deteriorated beyond successful repair must be removed and replaced.

99-07411D PAYMENT

Not Used

99-07415 ALUMINUM COMPOSITE CEILING PANELS

99-07415A GENERAL

99-07415A(1) Summary

Scope: This work consists of installing a water-tight route and return dry aluminum composite wall panel system.

Aluminum composite wall panel system consists of aluminum faced composite panels with mounting system. Panel mounting system including anchorages, shims, furring, fasteners, gaskets and sealants, related flashing adapters, and masking as required for a complete watertight installation.

Parapet coping, soffits, sills, border, and filler items indicated as integral components of the panel system.

99-07415A(2) System Description

Design Requirements: The aluminum composite wall panel system must comply with the wind design requirements for uplift or outward pressures complying with Chapter 16 of the CBC for the wind speed and exposure shown. The joints must provide watertight and structurally sound wall panels system that allows no uncontrolled water penetration on the inside face of the panel system as determined by ASTM E 331.

99-07415A(3) Pre-Installation Meetings

Pre-installation Conference: Conduct conference at Project Site.

1. Meet with the Engineer, aluminum composite panel installer, aluminum composite panel manufacturer's representative, structural-support installer, and installer whose work interfaces with or affects aluminum composite panels, including installers of doors, windows and louvers.
2. Review and finalize construction schedule and verify availability of materials, installer's personnel, equipment, and facilities needed to make progress and avoid delays.
3. Review methods and procedures related to aluminum composite panel installation, including manufacturer's written instructions.
4. Examine support conditions for compliance with requirements, including alignment between and attachment to structural members.
5. Review flashings, special siding details, wall penetrations, openings, and condition of other construction that affect aluminum composite panels.
6. Review governing regulations and requirements for insurance, certificates, and tests and inspections if applicable.

7. Review temporary protection requirements for aluminum composite panel assembly during and after installation.
8. Review procedures for repair of panels damaged after installation.
9. Review testing procedures to ensure proper installation.

99-07415A(4) Submittals

Product Data:

Manufacturer's technical product data, installation instructions, and recommendations for each type of material must be submitted.

Product data must include the manufacturer's name and a complete material description of all components of the metal sheathing system.

Samples:

Wall Panel System Assembly: Minimum 12" by 12" samples of the panel system assembly including color or finish to be installed.

Shop Drawings:

Shop drawings must include project layout and elevations; fastening and anchoring methods; detail and location of joints, sealants and gaskets, including joints necessary to accommodate thermal movement; trim; flashing; and accessories.

Certificates of Compliance: Submit a certificates of compliance for the aluminum composite wall panel system showing compliance with the national and local building code and appropriate evaluation report and test report supporting the use of the product.

99-07415A(5) Quality Control and Assurance

Single Source Responsibility: Materials used and finish application in the composite panel system must be the products of a single manufacturer.

Manufacturer Qualification: Composite panel manufacturer must have a minimum of 20 years' experience in the manufacturing of this product.

Fabricator/installer Qualification: Fabricator or installer must have a minimum of 5 years' experience of aluminum composite panel work similar in scope and size to this project. Fabricator or installer must be acceptable to the composite panel manufacturer.

Field measurements must be taken prior to the completion of shop fabrication. Fabrication schedule must be coordinated with construction progress to avoid delay of work. Field fabrication may be allowed only to ensure proper fit with the majority of the fabrication being done under controlled shop conditions.

99-07415A(6) Delivery, Storage, and Handling

Delivery and Handling: Aluminum composite panels must be protected against damage and discoloration in accordance with panel manufacturer's recommendations.

Storage: Aluminum composite panels must be stored above ground, with one end elevated for drainage and protected against standing water and condensation between adjacent surfaces.

99-07415B MATERIALS

99-07415B(1) Composite Panels

Thickness: 0.236 inch

Product Performance:

Bond Integrity: Tested in accordance with ASTM D 1781, no adhesive failure of the bond between core and the skin, nor cohesive failure of the core itself below the following value:

1. Peel Strength: 22.5 in lb/in as manufactured, and after 21 days soaking in water at 70°F.

Fire Performance:

1. ASTM E 84: Flame Spread Index must be less than 25. Smoke Developed Index must be less than 450.
2. ASTM D 1929: A self-ignition temperature of 650°F or greater.
3. ASTM D 635: Requires a CC1 classification.

Finishes: Coil coated Polyvinylidene Fluoride (PVDF) resin in conformance with the following:

1. Color: Standard color as selected from the submittal by the Engineer.
2. Coating Thickness: 1.0 mil.
3. Hardness: ASTM D 3363; HB minimum using Eagle Turquoise Pencil.
4. Impact:
 - a. ASTM D 2749; Gardner Variable Impact Tester with 5/8-inch mandrel.
 - b. Coating must withstand reverse impact of 1.5 inch/pound per mil substrate thickness.
 - c. Coating must adhere tightly to metal when subjected to #600 Scotch Tape pick-off test. Slight minute cracking permissible. No removal of film to substrate.
5. Adhesion:
 - a. ASTM D 3359.
 - b. Coating must not pick-off when subjected to an 11" by 11" by 1/16" grid and taped with #600 Scotch Tape.
6. Humidity Resistance:
 - a. ASTM D 2247.
 - b. No formation of blisters when subject to condensing water fog at 100% relative humidity and 100°F for 4,000 hours.
7. Salt Spray Resistance:
 - a. ASTM B 117; exposed coating system to 4,000 hours, using 5% NaCl solution.
 - b. Corrosion creepage from scribe line: 1/16 inch maximum.
 - c. Minimum blister rating of 8 within the test specimen field.
8. Weather Exposure:
 - a. Ten-year exposure at 45° angle facing south exposure.
 - b. Maximum color change of 5 Delta E units as calculated in accordance with ASTM D 2244.
 - c. Maximum chalk rating of 8 in accordance with ASTM D 4214.
 - d. No checking, crazing, adhesion loss.
9. Chemical Resistance:
 - a. ASTM D 1308 utilizing 10% Muriatic Acid for exposure time of 15 minutes. No loss of film adhesion or visual change when viewed by the unaided eye.
 - b. ASTM D 1308 utilizing 20% Sulfuric Acid for an exposure time of 18 hours. No loss of film adhesion or visual change when viewed by the unaided eye.
 - c. AAMA 2605 utilizing 70% reagent grade Nitric Acid vapor for an exposure time of 30 minutes. Maximum color change of 5 Delta E units as calculated in accordance with ASTM D 2244.

99-07415B(2) Panel Fabrication

Composition:

Two sheets of aluminum sandwiching a solid core of extruded thermoplastic material formed in a continuous process with no glues or adhesives between dissimilar materials. The core material must be free of voids and/or air spaces and not contain foamed insulation material. Products laminated sheet by sheet in a batch process using glues or adhesives between materials must not be acceptable.

Tolerances:

1. Panel Bow: Maximum 0.8% of any 72-inch panel dimension.
2. Panel Dimensions: Field fabrication must be allowed where necessary, but must be kept to an absolute minimum. All fabrication must be done under controlled shop conditions when possible.
3. Panel lines, breaks, and angles must be sharp, true, and surfaces free from warp and buckle.
4. Maximum deviation from panel flatness must be 1/8-inch in 5-foot on panel in any direction for assembled unit.

System Characteristics:

1. Plans, elevations, details, characteristics, and other requirements indicated are based upon standards by one manufacturer. It is intended that other manufacturers, receiving prior approval, may be acceptable, provided their details and characteristics comply with size and profile requirements, and material/performance standards.
2. System must not generally have any visible fasteners, telegraphing or fastening on the panel faces or any other compromise of a neat and flat appearance.
3. System must comply with the applicable provisions of ANSI/AAMA 302.9 "Metal Curtain Wall, Window, Storefront, and Entrance Guide Specifications Manual".
4. Fabricate panel system to dimension, size, and profile indicated on the drawings based on a design temperature of 70°F.
5. Fabricate panel system so that no restraint can be placed on the panel, which might result in compressive skin stresses. The installation detailing must be such that the panels remain flat regardless of temperature change and at all times remain air and water tight.
6. The finish side of the panel must have a removable plastic film applied prior to fabrication, which must remain on the panel during fabrication, shipping, and erection to protect the surface from damage.

System Type: Rout and Return Dry:

System must provide a perimeter aluminum extrusion with integral weather-stripping as detailed on the drawings.

System Performance:

Composite panels must be capable of withstanding building movements and weather exposures based on the following test standards required by the Engineer and the local building code.

1. Wind Load:
 - a. Panel must be designed to withstand the Design Wind Load based upon the local building code, but not less than 20 psf and 30 psf on parapet and corner panels. Wind load testing must be in compliance with ASTM E 330.
 - b. Normal to the plane of the wall between supports, deflection of the secured perimeter-framing member must not exceed L/175 or 3/4-inch, whichever is less.
 - c. Normal to the plane of the wall, the maximum panel deflection must not exceed L/60 of the full span.
 - d. Maximum anchor deflection must not exceed 1/16-inch.
 - e. At 1-1/2 times design pressure, permanent deflections of framing members must not exceed L/100 of span length and components must not experience failure or gross permanent distortion. At connection points of framing members to anchors, permanent set must not exceed 1/16-inch.
2. Air/Water System Test:
 - a. Air infiltration: 1.57 psf not exceed 0.06 cfm/ft² of wall area in accordance with ASTM E 283.
 - b. Water infiltration: No water infiltration shall occur in any system under a differential static pressure of 6.24 psf after 15 minutes of exposure in accordance with ASTM E 331.

99-07415B(3) Accessories

Extrusions, formed members, sheet, and plate must conform to ASTM B 209 and the recommendations of the manufacturer.

Panel stiffeners must be structurally fastened or restrained at the ends and must be secured to the rear face of the composite panel with silicone of sufficient size and strength to maintain panel flatness. Stiffener material and/or finish must be compatible with the silicone.

Sealants and gaskets within the panel system must be as per manufacturer's standards to meet performance requirements.

Fabricate flashing materials from 0.030" minimum thickness aluminum sheet painted to match the adjacent wall system where exposed. Provide a lap strap under the flashing at abutted conditions and seal lapped surfaces with a full bed of non-hardening sealant.

Fasteners (concealed/exposed/non-corrosive): Fasteners as recommended by panel manufacturer. Do not expose fasteners except where unavoidable and then match finish of adjoining metal.

99-07415C CONSTRUCTION

99-07415C(1) Inspection

Surfaces to receive panels must be even, smooth, sound, clean, dry and free from defects detrimental to work. Do not proceed with erection until unsatisfactory conditions have been corrected.

99-07415C(2) Installation

Erect panels plumb, level and true.

Attachment system must allow for the free and noiseless vertical and horizontal thermal movement due to expansion and contraction for a material temperature range of -20°F to +180°F. Buckling of panels, opening of joints, undue stress on fasteners, failure of sealant or any other detrimental effects due to thermal movement will not be permitted. Fabrication, assembly, and erection procedure must account for the ambient temperature at the time of the respective operation.

Panels must be erected in accordance with an approved set of shop drawings.

Anchor panels securely per engineering recommendations and in accordance with approved shop drawings to allow for necessary thermal movement and structural support.

Conform to panel fabricator's instructions for installation of concealed fasteners.

Do not install components parts that are observed to be defective, including warped, bowed, dented, abraded, and broken members.

Do not cut, trim, weld, or braze component parts during erection in a manner which would damage the finish, decrease strength, or result in visual imperfection or a failure in performance. Return component part which require alteration to shop for refabrication, if possible, or for replacement with new parts.

Separate dissimilar metals and use gasketed fasteners where needed to eliminate the possibility of corrosive or electrolytic action between metals.

99-07415C(3) Adjusting and Cleaning

Remove and replace panels damaged beyond repair as a direct result of the panel installation. After installation, panel repair and replacement must become the responsibility of the Contractor.

Repair panels with minor damage.

Remove masking as soon as possible after installation. Masking intentionally left in place after panel installation on an elevation, must become the responsibility of the Contractor.

Any additional protection, after installation, must be the responsibility of the Contractor.

Weep holes and drainage channels must be unobstructed and free of dirt and sealants.

99-07415D PAYMENT

Not Used

99-07620 SHEET METAL FLASHING

99-07620A GENERAL

99-07620A(1) Summary

Scope: This work consists of fabricating and installing sheet metal flashing.

Sheet metal includes metal flashings, counterflashings, straps, roof jacks, reglets, copings, scuppers, conductor heads, and screen type vents.

Alternatives: Premolded roof flashings may be used in lieu of sheet metal flashings where shown or required.

99-07620A(2) Definitions

Not Used

99-07620A(3) Submittals

Product Data: Submit manufacturer's material and finish data, installation instructions, and general recommendations for each specified flashing material and fabricated products.

Sample for Initial Selection Purpose: Submit manufacturer's color charts and texture variations for specified sheet materials to be exposed as finished surfaces.

99-07620A(4) Quality Assurance

Codes and Standards: Sheet metal work must comply with the following:

Latest edition of the SMACNA "Architectural Sheet Metal Manual."

International Nickel Company, "Stainless Steel Roofing, Flashing and Accessories Volume 3."

Wind Resistance: Fabricate and install flashing at edges of roof in accordance with FM Loss Prevention Data Sheet 1-49 for specific wind zone. Ensure that substrate construction is also in compliance.

Thermal Movements:

Provide sheet metal flashing and trim that allows 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 and trim thermal movement.

Based engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime sky heat loss.

Temperature Change Range: 100 degrees F ambient, 150 degree F material surfaces.

99-07620B MATERIALS

99-07620B(1) General

Aluminum-Zinc Alloy-Coated Steel Sheet: ASTM A 792, Class AZ-50 coating grade 40, or to suit project conditions, with 55 percent aluminum, not less than 0.0336 inch thick, mill finish.

Sheet Lead: Sheet lead must be not less than 0.062 inch thick, complying with ASTM B749.

Premolded Roof Flashing: Premolded flashing must be polyvinyl chloride (PVC) flashing, designed for heat welding to PVC roof membrane.

Exposed Flashings: Low slope roof or waterproofing must be aluminum zinc alloy-coated steel sheet, 24 gage, including formed copings and scuppers.

Semi-Concealed Flashing: Low slope roof or waterproofing must be aluminum-zinc alloy-coated steel sheet, 24 gage, including counter flashing, equipment support flashing, roof area joint and roof expansion joint cover and pipe/conduit penetration flashing.

Miscellaneous Flashing: Aluminum-zinc alloy-coated steel sheet, 24 gage.

Hardware and Fastenings: Hardware and fastening for premolded roof flashings must be stainless steel.

Solder for Zinc-Coated Steel: Solder must comply with ASTM B 32, Alloy Grade Sn50.

Soldering Flux: Soldering flux must be acid type, complying with Federal Specification: A-A-51145D, Type I, Form A.

Insect Screen: Insect screen must be industrial wire cloth and screen, medium grade, 18 mesh, 0.009-inch diameter, 0.0466-inch openings, plain weave, stainless steel, T-316, conforming to ASTM E 2016.

Lap Joint Sealant: Lap joint sealant for concealed locations must be a non-drying butyl complying with ASTM C 1311.

Flashing Cement: Flashing cement must be a bituminous plastic cement, asbestos free, complying with ASTM D 4586, Type II.

Sealant: Sealant for exposed locations must be a silicone sealant complying with ASTM C920.

Primer: Primer must be that recommended by the sealant manufacturer.

Bituminous Coating: Bituminous coating must be a cold-applied asphalt emulsion complying with ASTM D1187.

99-07620B(2) Shop Fabrication

Sheet metal must be assembled to SMACNA standards.

Sheet metal must be formed to the sizes, shapes and dimensions shown or as described with angles and lines straight, sharp and in true alignment. The number of joints must be kept to a minimum.

Angle bends and folds for interlocking the metal must be made with full regard for expansion and contraction to avoid buckling or fullness in the metal after it is installed.

Joints in sheet metal work must be closed watertight unless slip joints are specifically required. Watertight joints must be mechanically interlocked and then thoroughly soldered for metals other than aluminum. Watertight joints in aluminum or between aluminum and other metals must be sealed with acrylic sealant.

Sheet metal joints to be soldered must be cleaned with steel wool or other means, pre-tinned and soldered watertight.

All joints must be wiped clean of flux after soldering. Acid flux must be neutralized by washing the joints with sodium bicarbonate.

Flashings must have a 45 degree drip return at bottom edges. Unless otherwise shown, counterflashing must extend not less than 4 inches over roofing or other materials protected by the counterflashing and must be arranged so that roofing or materials can be repaired without damage to the counterflashing. Where reglets are indicated, counterflashing must be fastened by lead wedges or snap-in flashing.

99-07620C CONSTRUCTION

99-07620C(1) General

Preparation: Surfaces to receive sheet metal must be clean, smooth and free from defects.

Protection: Aluminum surfaces to be in contact with concrete, mortar, or dissimilar metals must be given a heavy coat of coal tar paint.

99-07620C(2) Installation

Roof Penetration Flashings:

All pipes, ducts, vents and flues passing through roofs must be made waterproof with flashings of storm collars or counterflashings.

Roof penetration flashings must be fabricated from stainless steel, type 304, vandal proof, provide isolator to avoid contact between dissimilar metal, not less than 24-gage. Size and shape must be as shown.

The lower flashing must be stainless sheet metal, 24-gage, and extend 6 inches minimum from outside of the pipe in all directions and 1-1/2 inches above the top of the roofing.

The top flashing must be stainless sheet steel or sheet lead as shown.

Hung Gutters:

Hung gutters must be fabricated from galvanized sheet steel, not less than 24-gage. Gutters must be size and shape as shown.

Gutters must be fabricated in sections not less than 10 feet in length. Use sections as long as practicable for lengths over 10 feet.

Joints must be lapped at least 1½ inches, rivet and solder watertight. Butt type expansion joints, ¾ inch wide, must be provided at midpoint between down spouts and where expansion joints occur in the structure.

Downspouts:

Downspouts must be fabricated from galvanized sheet steel, not less than 24-gage. Size and shape must be as shown.

Downspouts must be installed as shown, secured to the wall with straps near top, bottom and at intermediate points not more than 8 feet apart. Straps must extend 2 inches out on wall and be secured with suitable anchors.

Unless otherwise shown, the lower end of downspout must terminate with mitered 45 degree elbow.

Premolded Roof Flashings: Premolded roof flashings must be installed under the manufacturer's instructions.

99-07620D PAYMENT

Not Used

99-07720 ROOF SPECIALTIES

99-07720A GENERAL

99-07720A(1) Summary

Scope: This work consists of installing roof specialties.

Roof specialties include , roof hatches, and prefabricated curb, equipment support units, underlayment and miscellaneous materials.

99-07720A(2) Definitions

Not Used

99-07720A(3) Submittals

Product Data: Manufacturer's descriptive data, rough-in diagrams, installation instructions, and general product recommendations must be submitted.

Samples: Two samples, minimum 8 inches square, of each exposed metal and plastic sheet materials, and 2 samples, minimum 24 inches long, of formed or extruded metal member each color and finish specified must be submitted.

Coordination Drawings: Coordination drawings for items interfacing with or supporting mechanical or electrical equipment, ductwork, piping or conduit, must be submitted. Drawings must indicate dimensions and locations of items provided, together with relationship and methods of attachment to adjacent construction and to mechanical and electrical items.

99-07720A(4) Quality Assurance

Labels: Units must be provided which have been tested, listed, and bear the label of UL, FM or other recognized testing agency.

Codes and Standards: Prefabricated units must comply with the requirements of SMACNA, "Architectural Sheet Metal Manual," details for fabrication of units, including flanges and cap flashing to coordinate with types of roofing involved.

99-07720B MATERIALS

99-07720B(1) General

Manufacturer's standard units, modified as necessary, must be provided to comply with the contract requirements. Each unit must be shop fabricated to the greatest extent possible.

Aluminum-Zinc Alloy-Coated Steel Sheet: ASTM A 792, Class AZ-50 coating, grade 40 or to suit project conditions, with 55 percent aluminum, not less than 0.0336 inch thick, unless otherwise indicated, mill finish.

Sheet Steel: Sheet steel must be structural quality complying with the requirements of ASTM A570.

Stainless Steel: Stainless steel must comply with ASTM A 167, Type 304 or Type 316, with annealed finish. Stainless steel must be tempered as required for forming and performance.

Aluminum Sheet: Aluminum sheet must comply with the requirements of ASTM B209, tempered as required, anodized finish, except furnish mill finish where field painting is required.

Extruded Aluminum: Extruded aluminum must be the manufacturer's standard extrusions of sizes and profiles required, clear anodized finish unless otherwise shown.

Insulation: Insulation must be the manufacturer's standard rigid or semi-rigid board of glass fiber and must be the thickness required.

Wood Nailers: Wood nailers must be softwood, pressure treated with copper naphthenate, pentachlorophenol, or water-borne arsenicals (ACA, CCA or ACZA); not less than 2-inch nominal thickness.

Fasteners: Fasteners must be the same metal as the metal to be fastened, or other non-corrosive metal as recommended by the unit manufacturer. Finish of the fastener must be the same finish as the metal being fastened.

Bituminous Coating: Bituminous coating must be as recommended by the unit manufacturer for the use specified.

Gaskets: Gaskets must be tubular or fingered design of neoprene or polyvinyl chloride as recommended by the unit manufacturer.

99-07720B(2) Prefabricated Roof Hatches

Cover for roof hatch or scuttle must be stainless steel, welded to support a live load of 40 pounds per square foot and beaded flange. Insulation must be glass fiber, not less than one inch in thickness, fully covered by metal liner. Unit must have a roof flange for attaching to roof deck. Curb insulation must be fiberboard or glass not less than one inch thick. Unit must be equipped with hinges, positive latch with turn handles, inside and outside, and padlock hasp on inside, with gaskets. Cover must be equipped with automatic hold open arm with handle to permit easy release.

99-07720B(3) Prefabricated Curb and Equipment Supports

Curb and equipment support must comply with the loading and strength requirements of the equipment to be supported. Dimensions must comply with the dimensions shown on the coordination drawings of equipment to be supported. Unit must be fabricated from sheet steel complying with ASTM A570 and galvanized after fabrication.

Units must be fabricated with welded or sealed mechanical corner joints, complete with cant strips and base profile coordinated with roof insulation thickness. Wood nailers must be provided at top of curb tapered as necessary to compensate for roof slopes of 2 percent.

Where roof slope is more than 2 percent, curb or equipment supports must be fabricated with height tapered to provide a level installation.

99-07720C CONSTRUCTION

99-07720C(1) Installation

Prefabricated units must be installed under the manufacturer's instructions and authorized coordination drawings.

Installation of the units must be coordinated with installation of the roof decking and other substrates to receive accessory units, vapor barriers, insulation, roof and flashing materials.

Units must be securely fastened to supporting members, adequate to withstand all lateral, inward or outward loading pressures.

Where metal surfaces are to be installed in contact with non-compatible metals or other corrosive substrates, including wood decking, bituminous coatings must be applied to metal surfaces.

Except as noted above, roof flanges must be set in a thick bed of roofing cement to form a watertight seal.

Operational Testing: Units with operational components must be fully tested. Joints and hardware must be cleaned and lubricated. All units must be adjusted for proper operation.

99-07720C(2) Cleaning and Protection

All exposed metal and plastic surfaces must be cleaned under the manufacturer's instructions. Damaged metal coatings must be repaired.

99-07720D PAYMENT

Not Used

99-07810 SKYLIGHTS

99-07810A GENERAL

99-07810A(1) Summary

Scope: This work consists of installing skylights.

99-07810A(2) System Description

Design Requirements:

Skylights must comply with sections 2405.5 and 2610 of the CBC.

Skylights must be rated by the manufacturer to withstand a 40 pounds per square foot live loading.

Skylights have a U-factor not to exceed 0.70 and SHGC not to exceed 0.42.

99-07810A(3) Definitions

Not Used

99-07810A(4) Submittals

Product Data: Manufacturer's descriptive data and installation instructions must be submitted.

Samples: A sample of the acrylic or fiberglass plastic and the anodized framing must be submitted.

Certificates of Compliance: Submit certificates of compliance for the skylights.

99-07810A(5) Quality Assurance

Not Used

99-07810B MATERIALS

Skylight:

Skylight must be pre-fabricated, industrial type, curb mounted skylight with double-pane, light bronze colored acrylic plastic dome mounted in dark bronze colored anodized extruded aluminum framing. Dome must be distortion free.

Retaining and curb framing must have full welded corners and condensation weeps to the outside.

99-07810C CONSTRUCTION

Installation: Skylights must be installed rigidly and securely under the manufacturer's instructions. The installation must be flashed and must be weathertight.

Cleaning and Protection: Plastic skylight units must be cleaned and polished inside and out.

99-07810D PAYMENT

Not Used

99-07910 JOINT SEALANT

99-07910A GENERAL

99-07910A(1) Summary

Scope: This work consists of preparing and placing a joint sealant.

The sealed joint consists of tempered hardboard, expanded polystyrene, and a pourable joint seal.

99-07910A(2) Definitions

Not Used

99-07910A(3) Submittals

Product Data: Manufacturer's descriptive data, specifications, and installation instructions must be submitted.

99-07910A(4) Quality Assurance

Not Used

99-07910B MATERIALS

Tempered Hardboard: Tempered hardboard must be 1/8-inch minimum thickness, commercial quality suitable for the use intended. Other facing materials may be used provided they furnish equivalent protection.

Expanded Polystyrene: Expanded polystyrene must be commercially available polystyrene board.

Polyethylene Foam: Polyethylene foam must be commercial quality, with a continuous, impervious, glazed top surface, suitable for retaining the liquid sealant in the joint while hardening.

Primer: Primer must be as recommended by the sealant manufacturer.

Joint Sealant: Joint sealant must be a commercial quality, 2 component polyurethane sealant, which must be self-levelling and withstand up to 25 percent movement.

99-07910C CONSTRUCTION

99-07910C(1) Preparation

Forming:

Groove for joint seal must be formed to a uniform width and depth and to the alignment shown or as ordered by the Engineer. The completed groove must have a top width within 1/8 inch of the width shown and the bottom width must not vary from the top width by more than 1/16 inch.

At least 24 hours prior to installing the joint seal, you must repair all spalls, fractures, breaks, or voids in the concrete surfaces of the joint groove.

The lip of the joint must be beveled by grinding as shown.

Cleaning:

Prior to sealing joints, expanded polystyrene, hardboard, concrete spillage, and all foreign material must be removed from the deck to the bottom of the formed joint.

Prior to placing the joint seal, the joint must be cleaned by a method which must include abrasive blast cleaning and then be cleaned with a high pressure air jets to remove all residue and foreign material.

99-07910C(2) Installation

Materials:

No material must be used which has skinned over or which has settled in the container to the extent that it cannot be easily redispersed by hand stirring to form a smooth uniform product.

Each container of material must be clearly labeled or each delivery of material in the tanks of 2-component equipment must be accompanied with a ticket showing designation (Component A or B), the manufacturer's name, lot or batch number, date of manufacture, date of packaging, and date, if any, beyond which the sealant must not be used.

Primer: A primer must be applied to the sides of the groove and all exposed vertical surfaces in the joint prior to placing the sealant. Primer must be dry at the time of placing the sealant. Contaminated primer must be removed and replaced.

Joint Sealant: The 2-component sealant must be mixed and placed in the groove under manufacturer's instructions. Unmixed liquid components which have been exposed to the atmosphere for more than 24 hours, must not be used.

99-07910D PAYMENT

Not Used

99-07920 SEALANTS

99-07920A GENERAL

99-07920A(1) Summary

Scope: This work consists of applying sealants which are required for this project, but not described elsewhere.

Related Work: Pourable polyurethane joint sealant for joints in concrete decks must comply with "Joint Sealant."

99-07920A(2) Definitions

Not Used

99-07920A(3) Submittals

Product Data: Manufacturer's descriptive data and installation instructions for all sealants must be submitted.

Samples: Color samples of all sealants must be submitted. Unless otherwise shown, colors will be selected by the Engineer from the manufacturer's standard colors.

Compatibility and Adhesion Test Reports:

Submit evidence that materials forming joint substrates and joint sealant backings have been tested for compatibility with and adhesion to joint sealants.

Submit interpretation of test results and written recommendations for primers and substrate preparation needed for adhesion.

Certificates of Compliance: Submit certificates of compliance for the sealants.

99-07920A(4) Quality Assurance

Preconstruction Field Adhesion Testing: Before installing sealants, field test adhesion to joint substrates:

Locate test joints where indicated by Engineer.

Conduct field tests for each type of sealant and joint substrate. Test method: Hand pull method under the sealant manufacturer's instructions.

99-07920B MATERIALS

All sealants, primers and accessories must be non-staining to adjacent exposed surfaces. Products having similar applications and usage must be of the same type and same manufacturer. Gun consistency compound must be used unless otherwise required by the job conditions.

Nonstaining: Products that have undergone testing under ASTM C1248 or ASTM C510 and have not stained porous substrates.

Compatibility: Provide joint sealants, backings, and related materials compatible with one another and with joint substrates under conditions of service and application as demonstrated by sealant manufacturer based on testing and field experience.

Acrylic Sealant: Acrylic sealant must be one compound, solvent release acrylic sealant.

Polyurethane Sealant: Multicomponent, nonsag, capable of 50 percent extension and contraction without failure, complying with ASTM C920. Provide BASF, Sika, Tremco, or equal.

Butyl Sealant: Butyl sealant must be single-component, solvent-release, polyisobutylene sealant complying with ASTM C1311.

Silicone Sealant: Silicone sealant must be one component, low modulus, non-acid curing building sealant complying with ASTM C920 and formulated for reduced dirt pickup. Sealant must be tack-free in one hour, must not sag or flow, must be ozone resistant and capable of 100 percent extension and 50 percent contraction without failure. Provide BASF Sonneborn Sonolastic 150, Dow Corning 790 Silicone Building Sealant, GE Silicones SilPruf LM SCS 2700, or equal.

Mildew Resistant Silicone Sealant: One component, sanitary type, mildew resistant, formulated with fungicide, intended for damp areas and complying with ASTM C920. Provide Pecora 898, GE Sealants SCS 1700, Dow Corning 786, or equal.

Acoustical Sealant: Single component, latex, ASTM C834, nondrying, nonhardening, nonsag, nonstaining, acoustically tested under ASTM E90, paintable by acrylic or alkyd paints. Provide USG Sheetrock, Pecora AC-20, Owens Corning QuietZone, or equal.

Polysulfide Sealant: Polysulfide sealant must be a two-part, non sag polysulfide base, synthetic rubber sealant formulated from liquid polysulfide polymer.

Backer Rod: ASTM C1330, Type C (closed-cell material with a surface skin) or Type B (consisting of both open- and closed-cell material) as recommended by manufacturer for application, of size and density to control sealant depth; polyurethane or polyethylene as recommended by sealant manufacturer. Backer rod must be sized such that it must be compressed between 25 percent and 75 percent of its uncompressed diameter during installation in the joint.

Bond Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint filler materials or joint surfaces at back of joint.

Primer: Material recommended by joint sealant manufacturer where required for adhesion of sealant to joint substrates indicated under anticipated service conditions, as determined from preconstruction joint sealant substrate tests and field tests.

Neoprene: Neoprene must comply with the requirements of ASTM C542.

99-07920C CONSTRUCTION

Unless otherwise shown, sealants must be applied under the manufacturer's instructions and ASTM C1193.

When silicone sealants (or mildew-resistant silicone sealants) are used in locations where painting is required, use sealants formulated to accept paint satisfactorily and demonstrated to do so in preconstruction mockups, or sealants tinted to match adjoining painted surfaces.

Sealants must be applied in a continuous operation for the full length of the joint. Immediately following the application of the sealant, the sealant must be tooled smooth using a tool similar to that used to produce concave masonry joints. Following tooling, the sealant must remain undisturbed for not less than 48 hours.

99-07920D PAYMENT

Not Used

99-8 DOORS AND WINDOWS

99-08100 HOLLOW METAL DOORS AND FRAMES

99-08100A GENERAL

99-08100A(1) Summary

This work consists of installing hollow metal doors and frames.

99-08100A(2) Definitions

ANSI/SDI: American National Standards Institute/Steel Door Institute.

ANSI/NAAMM-HMMA: American National Standards Institute/National Association of Architectural Metal Manufacturers-Hollow Metal Manufacturers Association.

99-08100A(3) Submittals

Product Data: Submit for all products. Include the following:

1. Material descriptions
2. Core descriptions
3. Fire-resistance rating
4. Installation instructions
5. Finishes
6. Construction details

Shop Drawings: Include the following:

1. Elevations of each door design
2. Details of doors, including vertical and horizontal edge details and metal thicknesses
3. Frame details for each frame type, including dimensioned profiles and metal thicknesses
4. Locations of reinforcement and preparations for hardware
5. Details of each different wall opening condition
6. Details of anchorages, joints, field splices, and connections
7. Details of accessories
8. Details of moldings, removable stops, and glazing

Door Schedule: Submit a schedule of hollow metal doors and frames using same reference numbers for details and openings shown. Include a description of the type, location, and size of each door and frame. Coordinate with door hardware schedule.

99-08100A(4) Quality Assurance

Single Source Responsibility: Obtain hollow metal doors and frames from single manufacturer.

Hollow Metal Doors and Frames: Fabricate hollow metal doors and frames under ANSI/SDI A250.8 or ANSI/NAAMM-HMMA 861.

Hardware Reinforcement: Fabricate hardware reinforcement under ANSI/SDI A250.6 with reinforcing plates from same material as door face sheets.

Fire-Rated Door Assemblies: Furnish assemblies complying with NFPA 80, with all components listed and labeled by a NRTL, for fire-protection ratings shown. Assemblies must be listed by the California State Fire Marshal.

99-08100A(5) Delivery, Storage, and Handling

Deliver hollow metal doors palletized, wrapped, or crated to provide protection during transit and job site storage. Do not use nonvented plastic. Furnish additional protection to prevent damage to finish.

Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.

Store hollow metal doors and frames under cover at the job site. Place in stacks of five units maximum in a vertical position with heads up, spaced by blocking, on at least 4-inch high wood blocking. Do not store in a way that traps excess humidity.

Furnish at least 1/4-inch space between each stacked door to allow air circulation.

99-08100A(6) Coordination

Coordinate installation of anchorages for hollow metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors.

99-08100B MATERIALS

99-08100B(1) General

Hollow metal door faces and hollow metal door frames must be constructed of steel sheet.

Thickness dimensions must be minimum thickness of base metal without coatings.

Steel sheet must comply with the following:

1. Cold rolled must be commercial steel, Type B, ASTM A1008/A 1008M
2. Hot-rolled must be commercial steel, Type B, ASTM A1011/A1011M; free of scale, pitting, surface defects, and pickled and oiled
3. Metallic coated must be commercial steel, Type B, ASTM A1008/A1008M with at least A60 metallic coating complying with ASTM A653/A653M

Frame anchors must be commercial steel, hot dip galvanized complying with ASTM A153/A153M.

Inserts and fasteners must be commercial steel, hot dip galvanized complying with ASTM A153/A153M.

Glazing must comply with section 99-08810. Glazing must be at least 3/16-inch thick.

99-08100B(2) Steel Doors

99-08100B(2)(a) General

Steel doors must be at least 1-3/4 inches thick, full flush, seamless hollow metal construction unless otherwise shown. Construct doors with smooth surfaces without visible joints or seams on exposed faces, and the following:

1. Concealed stiffeners and hardware reinforcement from steel sheet, except use stainless steel to match stainless steel face sheets.
2. Furnish beveled edge, 1/8-inch in 2 inches, for single doors. Furnish round vertical edge with 2 1/8-inch radius for double doors.

99-08100B(2)(b) Exterior Doors

Exterior doors must comply with ANSI/SDI A250.4, physical endurance Level A, and the following:

1. Fabricate face sheets, vertical stiffeners, and top and bottom channels from at least 0.053-inch thick metallic-coated steel sheet.
2. Fabricate the steel-stiffened core using vertical stiffeners that extend full-door height. Install stiffeners not more than 6 inches apart and spot weld to both face sheets no more than 5 inches on center. Fill spaces between stiffeners with glass-fiber insulation or mineral-fiber insulation.
3. Top and bottom channels must be continuous and spot welded to both face sheets. The top channel must be flush and the bottom channel must be inverted.
4. Include moisture vents in the bottom channel.

99-08100B(2)(c) Interior Doors

Interior doors must comply with ANSI/SDI A250.4, physical endurance Level B, and the following:

1. Fabricate face sheets, vertical stiffeners, and top and bottom channels from at least 0.042-inch thick steel sheet unless metallic-coated sheet is described
2. Use the manufacturer's standard kraft-paper honeycomb core, polystyrene core, polyurethane core, or steel-stiffened core with glass-fiber or mineral-fiber insulation

3. Top and bottom channels must be at least 0.042 inch thick, same material as face sheets, and spot welded to both face sheets. The top channel must be flush and the bottom channel must be inverted.

99-08100B(3) Steel Frames

99-08100B(3)(a) General

Steel frames must comply with details shown for type and profile. Frames must be mitered corners, integral stop, and continuously welded unless otherwise shown.

Frames for fire rated doors must be listed and labeled for the same rating shown for the matching door.

Steel frames must be constructed as follows:

1. Interior frames from cold-rolled steel sheet unless metallic-coated sheet is described for door.
2. Exterior frames from metallic-coated steel sheet.
3. Sidelight and transom frames from same thickness material as adjacent door frame.
4. Frames for openings 48 inches and less from 0.053-inch thick steel sheet.

99-08100B(3)(b) Frame Anchors

Jamb Anchors: Select one of the following methods to suit the wall type shown:

1. Stud Wall Type: Designed to engage stud, welded to back of frames; at least 0.042-inch thick.
2. Drywall Slip-on Type: Adjustable compression anchors.

Floor Anchors: Furnish the same material as frame and at least 0.042-inch thick. Select one of the following attachment methods for the floor shown:

1. Monolithic Concrete Slab: Clip-type anchors, with two holes to receive fasteners.
2. Separate Topping Concrete Slab: Adjustable-type anchors with extension clips, allowing not less than 2-inch height adjustment. Terminate bottom of frames at finish floor surface.

99-08100B(3)(c) Stops And Moldings

Moldings for Glazed Lites in Doors: At least 0.032-inch thick, fabricate from same material as door face sheet in which installed.

Fixed Frame Moldings: Form integral with steel frames, at least 5/8 inch high unless otherwise shown.

Loose Stops for Glazed Lites in Frames: At least 0.032-inch thick, fabricate from same material as door face sheet in which installed.

99-08100B(4) Louvers

Louvers for interior doors must be non-vision inverted Y type. Frame must be cold rolled steel sheet at least 0.042 inches thick, mitered corners, with hidden welds. Frame screws must be on the inside.

Louvers in fire-rated assemblies must be factory fabricated, multi-blade adjustable fire damper type. Frame must be cold rolled steel sheet at least 0.053 inches thick, mitered corners, with hidden welds. Include a 160°F fusible link and removable bronze mesh insect screen mounted on the inside of exterior doors. Frame screws must be on the inside.

99-08100B(5) Accessories

Ceiling Struts: At least 1/4-inch thick by 1-inch wide steel.

Grout Guards: Form from same material as frames and at least 0.016-inch thick.

Sealants: Sealants must be ultraviolet and ozone resistant, gun grade polysulfide or polyurethane, multicomponent, complying with ASTM C920.

Grout: Furnish grout complying with ASTM C476, except with a maximum slump of 4 inches, as measured under ASTM C143.

99-08100B(6) Fabrication

99-08100B(6)(a) General

Fabricate steel doors and frames to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for thickness of metal. Where practical, fit and assemble units in manufacturer's plant. To ensure proper assembly at job site, clearly identify work that cannot be permanently factory assembled before shipment.

Fabricate steel doors and frames to tolerances under SDI 117 or ANSI/NAAMM-HMMA 861.

99-08100B(6)(b) Steel Doors

Fabricate concealed stiffeners, edge channels, and hardware reinforcement from either cold or hot-rolled steel sheet.

99-08100B(6)(c) Steel Frames

99-08100B(6)(d) Frame Anchors

Grout Guards: Weld guards to frame at back of hardware mortises in frames to be grouted.

Floor Anchors: Weld anchors to bottom of jambs and mullions with at least four spot welds per anchor.

Jamb Anchors: Unless otherwise shown, furnish number and spacing of anchors as follows:

1. Stud-Wall Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:
 - 1.1. Three anchors per jamb up to 60 inches high.

Compression Type Anchor: Not less than two anchors in each jamb.

Post Installed Expansion Type Anchor: Locate anchors not more than 6 inches from top and bottom of frame. Space anchors not more than 26 inches o.c.

99-08100B(6)(e) Stops and Moldings

Furnish stops and moldings around glazed lites as follows:

1. Form corners of stops and moldings with butted or mitered hairline joints.
2. Furnish fixed stops and moldings welded on the secure side of steel doors and frames for single glazed lites.
3. Furnish fixed and removable stops and moldings for multiple glazed lites so that each glazed lite can be removed independently.
4. Furnish fixed frame moldings on the secure side of interior doors and frames.
5. Furnish loose stops and moldings on the inside of steel doors and frames.
6. Coordinate rabbet width between fixed and removable stops with type of glazing and type of installation described.

99-08100B(7) Shop Finishes

Apply shop primer to steel doors, frames, and louvers. Use manufacturer's standard, fast-curing, lead-free and chromate-free primer complying with ANSI/SDI A250.10 acceptance criteria. Primer must be recommended by manufacturer for substrate; and compatible with field-applied coating.

99-08100C CONSTRUCTION

99-08100C(1) General

Examine rough-in for embedded and built-in anchors to verify actual locations before frame installation. Proceed with installation only after unsatisfactory conditions have been corrected.

99-08100C(2) Preparation

Check door frames for square, alignment, twist, and plumb before installation and adjust if necessary. Tolerances are $\pm 1/16$ inch.

Check the door frame as follows:

1. Squareness at door rabbet on a line 90 degrees from jamb perpendicular to frame head

2. Alignment at jambs on a horizontal line parallel to plane of wall
3. Twist at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall
4. Plumbness at jambs on a perpendicular line from head to floor

Drill and tap doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.

Doors, frames, stops, molding, louvers, and accessories must be cleaned, prepared, and painted under section 99-09900 before installation.

If grout contains an antifreezing agent, field apply a bituminous coating to the backside of frames.

99-08100C(3) Installation

99-08100C(3)(a) General

Install hollow metal doors and frames plumb, rigid, properly aligned, and securely fastened in place. Comply with manufacturer's written instructions. Install fire rated assemblies under NFPA 80, the SFM, and the manufacturer's written instructions.

After installation, measure frames for squareness, alignment, twist, and plumbness under section 99-08100C(2). Adjust to meet tolerances as required.

Remove grout and other bonding material from exposed surfaces of hollow metal doors and frames immediately after installation.

Install and fit fire rated assemblies under NFPA 80.

99-08100C(3)(b) Steel Frames

Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove spreaders and braces. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.

Where frames are fabricated in sections because of shipping or handling limitations, field splice at accepted locations by welding face joint continuously. Grind, fill, dress, and make splices smooth, flush, and invisible on exposed faces.

Install frames with removable glazing stops located on the secure side of opening.

Install floor anchors for each jamb and mullion that extends to the floor and secure with expansion anchors.

Solidly pack mineral-fiber insulation behind frames set in metal-stud partitions. Fill frames in masonry or concrete walls with grout. Hand trowel grout; do not pump in. Do not allow frames to be deformed or damaged by grout forces.

99-08100C(3)(c) Steel Doors

Fit steel doors accurately in frames. Shim as necessary. Clearances must be as follows:

1. Jambs and Head: 1/8 inch \pm 1/16 inch.
2. Between Edges of Pairs of Doors: 1/8 inch \pm 1/16 inch.
3. Between Bottom of Door and Top of Threshold: Maximum 3/8 inch.
4. Between Bottom of Door and Top of Finish Floor (No Threshold): Maximum 3/4 inch.

99-08100C(3)(d) Glazing

Install glazing under section 99-08810 and the door manufacturer's written instructions. Secure stops with countersunk machine screws spaced uniformly not more than 9 inches o.c. and not more than 2 inches o.c. from each corner.

99-08100C(4) Adjustments

Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Replace defective work, including steel doors and frames that are warped, bowed, or otherwise unacceptable.

99-08100C(5) Field Finish Repairs

After installation, clean field welds, bolted connections, and abraded areas of paint under SSPC-SP 2. Apply one coat of the same coating as applied for painting to the cleaned areas. Use galvanizing repair paint for metallic coated surfaces complying with manufacturer's written instructions.

99-08100D PAYMENT

Not Used

99-08312 OVERHEAD COILING DOORS

99-08312A GENERAL

99-08312A(1) Summary

This work consists of installing overhead coiling doors.

Overhead coiling doors must (1) be constructed for fire door use, (2) close automatically in the event of a fire, and (3) be listed and labeled for the fire rating shown.

99-08312A(2) Definitions

Not Used

99-08312A(3) Submittals

Submit manufacturer's descriptive data and installation instructions. Submit the manufacturer's powder coating color palette for finish color selection.

99-08312B MATERIALS

99-08312B(1) General

Overhead Coiling Doors:

Overhead coiling doors must be automatic closing, upward coiling, interlocking rolled slat, curtain type shutter fabricated of galvanized sheet steel at least 0.040 inch thick. Doors must have jamb guides, tubular bottom, end locks, counterbalance assembly, and hood. Guides at the jambs must be steel and must be fabricated under UL requirements. The hood must enclose the coiled, roll-up door and must be fabricated of galvanized sheet steel at least 0.025 inch thick.

Doors must be easily tested and reset without the use of ladders, tools, or equipment, and must not require resetting by a technician after testing.

Smoke Detectors: Smoke detectors must be factory fabricated units compatible with the overhead coiling doors. Smoke detectors must comply with section 99-16722.

99-08312B(2) Shop Finishes

Powder-Coated Finish: Powder-coated finish must be manufacturer's standard baked-on finish consisting of prime coat and thermosetting topcoat. Comply with coating manufacturer's written instructions for cleaning, pretreatment, application, and minimum dry film thickness.

99-08312C CONSTRUCTION

Overhead coiling doors must be installed under the manufacturer's instructions.

99-08312D PAYMENT

Not Used

99-084113 - ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Aluminum-framed storefront systems.

2. Aluminum-framed entrance door systems.

1.2 PREINSTALLATION MEETINGS

Not Used

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
- B. Shop Drawings: For aluminum-framed entrances and storefronts. Include plans, elevations, sections, full-size details, and attachments to other work.
 1. Include details of provisions for assembly expansion and contraction and for draining moisture occurring within the assembly to the exterior.
 2. Include full-size isometric details of each type of vertical-to-horizontal intersection of aluminum-framed entrances and storefronts, showing the following:
 - a. Joinery, including concealed welds.
 - b. Anchorage.
 - c. Expansion provisions.
 - d. Glazing.
 - e. Flashing and drainage.
 3. Show connection to and continuity with adjacent thermal, weather, air, and vapor barriers.
 4. Include point-to-point wiring diagrams showing the following:
 - a. Power requirements for each electrically operated door hardware.
 - b. Location and types of switches, signal device, conduit sizes, and number and size of wires.
- C. Samples for Initial Selection: For units with factory-applied color finishes.
- D. Samples for Verification: For each type of exposed finish required, in manufacturer's standard sizes.
- E. Fabrication Sample: Of each vertical-to-horizontal intersection of assemblies, made from 12-inch lengths of full-size components and showing details of the following:
 1. Joinery, including concealed welds.
 2. Anchorage.
 3. Expansion provisions.
 4. Glazing.
 5. Flashing and drainage.
- F. Entrance Door Hardware Schedule: Prepared by or under supervision of supplier, detailing fabrication and assembly of entrance door hardware, as well as procedures and diagrams. Coordinate final entrance door hardware schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of entrance door hardware.
- G. Delegated-Design Submittal: For aluminum-framed entrances and storefronts including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data:

1. For Installer.
- B. Energy Performance Certificates: For aluminum-framed entrances and storefronts, accessories, and components, from manufacturer.
 1. Basis for Certification: NFRC-certified energy performance values for each aluminum-framed entrance and storefront.
- C. Product Test Reports: For aluminum-framed entrances and storefronts, for tests performed by a qualified testing agency.
- D. Source quality-control reports.
- E. Field quality-control reports.
- F. Sample Warranties: For special warranties.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For aluminum-framed entrances and storefronts to include in maintenance manuals.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.
- B. Product Options: Information on Drawings and in Specifications establishes requirements for aesthetic effects and performance characteristics of assemblies. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction.
 1. Do not change intended aesthetic effects, as judged solely by Engineer, except with Engineer's approval. If changes are proposed, submit comprehensive explanatory data to Engineer for review.

1.7 WARRANTY

- A. Special Warranty: Installer agrees to repair or replace components of aluminum-framed entrances and storefronts that do not comply with requirements or that fail in materials or workmanship within specified warranty period.
 1. Failures include, but are not limited to, the following:
 - a. Structural failures, including, but not limited to, excessive deflection.
 - b. Noise or vibration created by wind and thermal and structural movements.
 - c. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
 - d. Water penetration through fixed glazing and framing areas.
 - e. Failure of operating components.
 2. Warranty Period: 10 years from date of Substantial Completion.
- B. Special Finish Warranty, Factory-Applied Finishes: Standard form in which manufacturer agrees to repair finishes or replace aluminum that shows evidence of deterioration of factory-applied finishes within specified warranty period.
 1. Deterioration includes, but is not limited to, the following:
 - a. Color fading more than 5 Delta E units when tested according to ASTM D2244.
 - b. Chalking in excess of a No. 8 rating when tested according to ASTM D4214.

- c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
- 2. Warranty Period: 10 years from date of Substantial Completion.
- C. Special Finish Warranty, Anodized Finishes: Standard form in which manufacturer agrees to repair finishes or replace aluminum that shows evidence of deterioration of anodized finishes within specified warranty period.
 - 1. Deterioration includes, but is not limited to, the following:
 - a. Color fading more than 5 Delta E units when tested according to ASTM D 2244.
 - b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
 - c. Cracking, peeling, or chipping.
 - 2. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain all components of aluminum-framed entrance and storefront system, including framing spandrel panels and accessories, from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design aluminum-framed entrances and storefronts.
- B. General Performance: Comply with performance requirements specified, as determined by testing of aluminum-framed entrances and storefronts representing those indicated for this Project without failure due to defective manufacture, fabrication, installation, or other defects in construction.
 - 1. Aluminum-framed entrances and storefronts must withstand movements of supporting structure, including, but not limited to, twist, column shortening, long-term creep, and deflection from uniformly distributed and concentrated live loads.
 - 2. Failure also includes the following:
 - a. Thermal stresses transferring to building structure.
 - b. Glass breakage.
 - c. Noise or vibration created by wind and thermal and structural movements.
 - d. Loosening or weakening of fasteners, attachments, and other components.
 - e. Failure of operating units.
- C. Structural Loads:
 - 1. Wind Loads: As indicated on Drawings.
 - 2. Other Design Loads: As indicated on Drawings
- D. Deflection of Framing Members: At design wind pressure, as follows:
 - 1. Deflection Normal to Wall Plane: Limited to [edge of glass in a direction perpendicular to glass plane not exceeding 1/175 of the glass edge length for each individual glazing lite] or an amount that restricts edge deflection of individual glazing lites to 3/4 inch, whichever is less.
 - 2. Deflection Parallel to Glazing Plane: Limited to 1/360 of clear span or 1/8 inch, whichever is smaller
 - a. Operable Units: Provide a minimum 1/16-inch clearance between framing members and operable units.

- E. Structural: Test according to ASTM E330/E330M as follows:
1. When tested at positive and negative wind-load design pressures, storefront assemblies, including entrance doors, do not evidence deflection exceeding specified limits.
 2. When tested at [150] <Insert number> percent of positive and negative wind-load design pressures, storefront assemblies, including entrance doors and anchorage, do not evidence material failures, structural distress, or permanent deformation of main framing members exceeding [0.2] <Insert number> percent of span.
 3. Test Durations: As required by design wind velocity, but not less than 10 seconds.
- F. Water Penetration under Static Pressure: Test according to ASTM E331 as follows:
1. No evidence of water penetration through fixed glazing and framing areas, including entrance doors, when tested according to a minimum static-air-pressure differential of 20 percent of positive wind-load design pressure, but not less than 6.24 lbf/sq. ft. [
- G. Seismic Performance: Aluminum-framed entrances and storefronts must withstand the effects of earthquake motions determined according to ASCE/SEI 7.
1. Seismic Drift Causing Glass Fallout: Complying with criteria for passing based on building occupancy type when tested according to AAMA 501.6 at design displacement and 1.5 times the design displacement.
- H. Energy Performance: Certified and labeled by manufacturer for energy performance as follows:
1. Thermal Transmittance (U-factor):
 - a. Fixed Glazing and Framing Areas: U-factor for the system of not more than 0.27 Btu/sq. ft. x h x deg Fas determined according to NFRC 100.
 - b. Entrance Doors: U-factor of not more than 0.3 Btu/sq. ft. x h x deg Fas determined according to NFRC 100.
 2. Solar Heat-Gain Coefficient (SHGC):
 - a. Fixed Glazing and Framing Areas: SHGC for the system of not more than 0.23 as determined according to NFRC 200.
 - b. Entrance Doors: SHGC of not more than 0.22 as determined according to NFRC 200.
 3. Air Leakage:
 - a. Fixed Glazing and Framing Areas: Air leakage for the system of not more than 0.06 cfm/sq. ft. at a static-air-pressure differential of 1.57 lbf/sq. ft. when tested according to ASTM E283.
 - b. Entrance Doors: Air leakage of not more than 1.0 cfm/sq. ft. at a static-air-pressure differential of 1.57 lbf/sq. ft.
 4. Condensation Resistance Factor (CRF):
 - a. Fixed Glazing and Framing Areas: CRF for the system of not less than 35 as determined according to AAMA 1503.
 - b. Entrance Doors: CRF of not less than 57 as determined according to AAMA 1503.
- I. Thermal Movements: Allow for thermal movements resulting from ambient and surface temperature changes.
1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.
 2. Thermal Cycling: No buckling; stress on glass; sealant failure; excess stress on framing, anchors, and fasteners; or reduction of performance when tested according to AAMA 501.5.
 - a. High Exterior Ambient-Air Temperature: That which produces an exterior metal-surface temperature of [180 deg F]

- b. Low Exterior Ambient-Air Temperature: [0 deg F] <.
- c. Interior Ambient-Air Temperature: [75 deg F]

2.3 STOREFRONT SYSTEMS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - 1. Oldcastle BuildingEnvelope.
 - 2. U.S. Aluminum; a brand of C.R. Laurence.
- B. Framing Members: Manufacturer's extruded- or formed-aluminum framing members of thickness required and reinforced as required to support imposed loads.
 - 1. Exterior Framing Construction: [Thermally broken]
 - 2. Interior Vestibule Framing Construction: [Nonthermal]
 - 3. Glazing System: [Retained mechanically with gaskets on four sides]
 - 4. Glazing Plane: [Front]
 - 5. Finish: [Baked-enamel or powder-coat finish.
 - 6. Fabrication Method: Field-fabricated stick system.
 - 7. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
 - 8. Steel Reinforcement: As required by manufacturer.
- C. Backer Plates: Manufacturer's standard, continuous backer plates for framing members, if not integral, where framing abuts adjacent construction.
- D. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.

2.4 ENTRANCE DOOR SYSTEMS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - 1. Oldcastle BuildingEnvelope.
 - 2. U.S. Aluminum; a brand of C.R. Laurence.
- B. Entrance Doors: Manufacturer's standard glazed entrance doors for manual-swing or automatic operation.
 - 1. Door Construction: 2-inch overall thickness, with minimum 0.188-inchthick, extruded-aluminum tubular rail and stile members. Mechanically fasten corners with reinforcing brackets that are deeply penetrated and fillet welded or that incorporate concealed tie rods.
 - a. Thermal Construction: High-performance plastic connectors separate aluminum members exposed to the exterior from members exposed to the interior.
 - 2. Door Design: [As indicated] [Medium stile; 3-1/2-inch nominal width]
 - 3. Glazing Stops and Gaskets: [Square] , snap-on, extruded-aluminum stops and preformed gaskets.
 - a. Provide nonremovable glazing stops on outside of door.
 - 4. Finish: Match adjacent storefront framing finish.

2.5 ENTRANCE DOOR HARDWARE

- A. Entrance Door Hardware: Hardware not specified in this Section is specified in Section 99-08710 DOOR HARDWARE

- B. General: Provide entrance door hardware and entrance door hardware sets indicated in door and frame schedule for each entrance door, to comply with requirements in this Section.
 - 1. Entrance Door Hardware Sets: Provide quantity, item, size, finish or color indicated, and products complying with BHMA standard referenced.
 - 2. Sequence of Operation: Provide electrified door hardware function, sequence of operation, and interface with other building control systems indicated.
 - 3. Opening-Force Requirements:
 - a. Egress Doors: Not more than 15 lbf to release the latch and not more than 30 lbf to set the door in motion.
 - b. Accessible Interior Doors: Not more than 5 lbf to fully open door.
- C. Designations: Requirements for design, grade, function, finish, quantity, size, and other distinctive qualities of each type of entrance door hardware are indicated in "Entrance Door Hardware Sets" Article. Products are identified by using entrance door hardware designations as follows:
 - 1. References to BHMA Standards: Provide products complying with these standards and requirements for description, quality, and function.
- D. Pivot Hinges: BHMA A156.4, Grade 1.
 - 1. Offset-Pivot Hinges: Provide top, bottom, and intermediate offset pivots at each door leaf.
- E. Butt Hinges: BHMA A156.1, Grade 1, radius corner.
 - 1. Nonremovable Pins: Provide setscrew in hinge barrel that, when tightened into a groove in hinge pin, prevents removal of pin while entrance door is closed.
 - 2. Exterior Hinges: Stainless steel, with stainless-steel pin.
 - 3. Quantities:
 - a. For doors up to 87 inches high, provide three hinges per leaf.
 - b. For doors more than 87 and up to 120 inches high, provide four hinges per leaf.
- F. Continuous-Gear Hinges: BHMA A156.26.
- G. Mortise Auxiliary Locks: BHMA A156.5, Grade 1.
- H. Manual Flush Bolts: BHMA A156.16, Grade 1.
- I. Automatic and Self-Latching Flush Bolts: BHMA A156.3, Grade 1.
- J. Panic Exit Devices: BHMA A156.3, Grade 1, listed and labeled by a testing and inspecting agency acceptable to 24 CA Code of Regs, for panic protection, based on testing according to UL 305.
- K. Cylinders:
 - 1. As specified in Section 99-08710 "Door Hardware."
- L. Strikes: Provide strike with black-plastic dust box for each latch or lock bolt; fabricated for aluminum framing.
- M. Operating Trim: BHMA A156.6.
- N. Removable Mullions: BHMA A156.3 extruded aluminum.
 - 1. When used with panic exit devices, provide[keyed] removable mullions listed and labeled by a testing and inspecting agency acceptable to 24 CA Code of Regs, for panic protection,

based on testing according to UL 305. Use only mullions that have been tested with exit devices to be used.

- O. Closers: BHMA A156.4, Grade 1, with accessories required for a complete installation, sized as required by door size, exposure to weather, and anticipated frequency of use; adjustable to comply with field conditions and requirements for opening force.
- P. Concealed Overhead Holders and Stops: BHMA A156.8, Grade 1.
- Q. Door Stops: BHMA A156.16, Grade 1, floor or wall mounted, as appropriate for door location indicated, with integral rubber bumper.
- R. Weather Stripping: Manufacturer's standard replaceable components.
 - 1. Compression Type: Made of ASTM D2000 molded neoprene or ASTM D2287 molded PVC.
 - 2. Sliding Type: AAMA 701/702, made of wool, polypropylene, or nylon woven pile with nylon-fabric or aluminum-strip backing.
- S. Weather Sweeps: Manufacturer's standard exterior-door bottom sweep with concealed fasteners on mounting strip.
- T. Thresholds: BHMA A156.21 raised thresholds beveled with a slope of not more than 1:2, with maximum height of 1/2 inch.
- U. Finger Guards: Manufacturer's standard collapsible neoprene or PVC gasket anchored to frame hinge-jamb at center-pivoted doors.

2.6 GLAZING

- A. Glazing: Comply with Section 99-08810 "Glazing."
- B. Glazing Gaskets: Comply with Section 99-08810 "Glazing."
- C. Glazing Sealants: As recommended by manufacturer.

2.7 MATERIALS

- A. Sheet and Plate: ASTM B209.
- B. Extruded Bars, Rods, Profiles, and Tubes: ASTM B221.
- C. Extruded Structural Pipe and Tubes: ASTM B429/B429M.
- D. Structural Profiles: ASTM B308/B308M.
- E. Steel Reinforcement:
 - 1. Structural Shapes, Plates, and Bars: ASTM A36/A36M.
 - 2. Cold-Rolled Sheet and Strip: ASTM A1008/A1008M.
 - 3. Hot-Rolled Sheet and Strip: ASTM A1011/A1011M.
- F. Steel Reinforcement Primer: Manufacturer's standard zinc-rich, corrosion-resistant primer complying with SSPC-PS Guide No. 12.00; applied immediately after surface preparation and pretreatment. Select surface preparation methods according to recommendations in SSPC-SP COM, and prepare surfaces according to applicable SSPC standard.

2.8 ACCESSORIES

- A. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.

1. Use self-locking devices where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration.
2. Reinforce members as required to receive fastener threads.
- B. Anchors: Three-way adjustable anchors with minimum adjustment of 1 inch that accommodate fabrication and installation tolerances in material and finish compatible with adjoining materials and recommended by manufacturer.
- C. Concealed Flashing: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding flashing compatible with adjacent materials.
- D. Bituminous Paint: Cold-applied asphalt-mastic paint containing no asbestos, formulated for 30-mil thickness per coat.
- E. Rigid PVC Filler.

2.9 FABRICATION

- A. Form or extrude aluminum shapes before finishing.
- B. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.
- C. Fabricate components that, when assembled, have the following characteristics:
 1. Profiles that are sharp, straight, and free of defects or deformations.
 2. Accurately fitted joints with ends coped or mitered.
 3. Physical and thermal isolation of glazing from framing members.
 4. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
 5. Provisions for field replacement of glazing from interior .
 6. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.
- D. Mechanically Glazed Framing Members: Fabricate for flush glazing without projecting stops.
- E. Entrance Door Frames: Reinforce as required to support loads imposed by door operation and for installing entrance door hardware.
 1. At interior and exterior doors, provide compression weather stripping at fixed stops.
- F. Entrance Doors: Reinforce doors as required for installing entrance door hardware.
 1. At pairs of exterior doors, provide sliding-type weather stripping retained in adjustable strip and mortised into door edge.
 2. At exterior doors, provide weather sweeps applied to door bottoms.
- G. Entrance Door Hardware Installation: Factory install entrance door hardware to the greatest extent possible. Cut, drill, and tap for factory-installed entrance door hardware before applying finishes.
- H. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

2.10 ALUMINUM FINISHES

- A. Baked-Enamel or Powder-Coat Finish: AAMA 2603 except with a minimum dry film thickness of 1.5 mils. Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.

1. Color and Gloss: FEDERAL STANDARD 595C #34088.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. Comply with manufacturer's written instructions.
- B. Do not install damaged components.
- C. Fit joints to produce hairline joints free of burrs and distortion.
- D. Rigidly secure nonmovement joints.
- E. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration and to prevent impeding movement of moving joints.
- F. Seal perimeter and other joints watertight unless otherwise indicated.
- G. Metal Protection:
 1. Where aluminum is in contact with dissimilar metals, protect against galvanic action by painting contact surfaces with materials recommended by manufacturer for this purpose or by installing nonconductive spacers.
 2. Where aluminum is in contact with concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.
- H. Set continuous sill members and flashing in full sealant bed, as specified in Section 99-07910 "Joint Sealants," to produce weathertight installation.
- I. Install joint filler behind sealant as recommended by sealant manufacturer.
- J. Install components plumb and true in alignment with established lines and grades.

3.3 INSTALLATION OF OPERABLE UNITS (Not Used)

3.4 INSTALLATION OF GLAZING

- A. Install glazing as specified in Section 99-08810 "Glazing."

3.5 INSTALLATION OF STRUCTURAL GLAZING (Not Used)

3.6 INSTALLATION OF WEATHERSEAL SEALANT (Not Used)

3.7 INSTALLATION OF ALUMINUM-FRAMED ENTRANCE DOORS

- A. Install entrance doors to produce smooth operation and tight fit at contact points.
 1. Exterior Doors: Install to produce weathertight enclosure and tight fit at weather stripping.
 2. Field-Installed Entrance Door Hardware: Install surface-mounted entrance door hardware according to entrance door hardware manufacturers' written instructions using concealed fasteners to greatest extent possible.

3.8 ERECTION TOLERANCES

- A. Install aluminum-framed entrances and storefronts to comply with the following maximum tolerances:
 - 1. Plumb: 1/8 inch in 10 feet; 1/4 inch in 40 feet.
 - 2. Level: 1/8 inch in 20 feet; 1/4 inch in 40 feet.
 - 3. Alignment:
 - a. Where surfaces abut in line or are separated by reveal or protruding element up to 1/2 inch wide, limit offset from true alignment to 1/16 inch.
 - b. Where surfaces are separated by reveal or protruding element from 1/2 to 1 inch wide, limit offset from true alignment to 1/8 inch.
 - c. Where surfaces are separated by reveal or protruding element of 1 inch wide or more, limit offset from true alignment to 1/4 inch.
 - 4. Location: Limit variation from plane to 1/8 inch in 12 feet; 1/2 inch over total length.

3.9 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Field Quality-Control Testing: Perform the following test on representative areas of aluminum-framed entrances and storefronts
 - 1. Water-Spray Test: Before installation of interior finishes has begun, areas designated by Engineer must be tested according to AAMA 501.2 and must not evidence water penetration.
 - a. Perform a minimum of three tests in areas as directed by Engineer.
 - 2. Air Leakage: ASTM E783 at 1.5 times the rate specified for laboratory testing in "Performance Requirements" Article but not more than 0.09 cfm/sq. ft. at a static-air-pressure differential of 1.57 lbf/sq. ft..
 - a. Perform a minimum of three tests in areas as directed by Engineer.
 - 3. Water Penetration: ASTM E1105 at a minimum uniform static-air-pressure differential of 0.67 times the static-air-pressure differential specified for laboratory testing in "Performance Requirements" Article, but not less than 6.24 lbf/sq. ft., and must not evidence water penetration.
- C. Aluminum-framed entrances and storefronts will be considered defective if they do not pass tests and inspections.
- D. Prepare test and inspection reports.

3.10 MAINTENANCE SERVICE

- A. Entrance Door Hardware Maintenance:
 - 1. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Department's continued adjustment, maintenance, and removal and replacement of entrance door hardware.
 - 2. Initial Maintenance Service: Beginning at Substantial Completion, provide six months' full maintenance by skilled employees of entrance door hardware Installer. Include quarterly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper entrance door hardware operation at rated speed and capacity. Use parts and supplies that are the same as those used in the manufacture and installation of original equipment.

END OF SECTION 99-084113

99-08520 WINDOWS

99-08520A GENERAL

99-08520A(1) Summary

Scope: This work consists of installing windows.

99-08520A(2) Definitions

CSA: Canadian Standards Association.

WDMA: Window and Door Manufacturers Association.

99-08520A(3) Submittals

Required submittals must be submitted for approval prior to fabrication.

Submit manufacturer's descriptive data, installation instructions, and schedule. Submit the manufacturer's color palette for finish color selection.

Manufacturer's descriptive data and installation instructions must show window elevations, plan views, full size sections, anchoring details to all substrates, anchors, and hardware.

Installation schedule must show location, size, and type for each window.

Product Test Reports: Submit product test reports based on evaluation of comprehensive tests performed by a qualified testing agency for each type, class, grade, and size of aluminum window.

Certificates of Compliance: Submit certificates of compliance for all windows.

99-08520A(4) Quality Assurance

Not Used

99-08520B MATERIALS

99-08520B(1) General

Windows must be Commercial Class aluminum prime windows unless otherwise shown.

Windows must comply with AAMA/WDMA/CSA 101/I.S.2/A440 and must meet C30 or CW30 Performance Class and Grade unless otherwise shown. Windows must bear the AAMA label.

Glazing for windows must be low E insulated laminated glass and comply with section 99-08810.

99-08520B(2) Delivery, Storage, and Handling

Windows must be delivered in original, unopened, unbroken containers, wrappings, or bags with labels bearing the brand name, name of manufacturer or supplier, standard of manufacture, and product description.

Windows and accessories must be stored off the ground, kept dry, and fully protected from weather and damage.

99-08520B(3) Windows

Door and Transom Windows: Door and transom windows must be door or door frame manufacturer's standard window framing, glazing stops, and glazing accessories.

Fixed Windows: Fixed windows must be non-operable glazed panel inserted into a frame to include muntins, glazing stops, and glazing accessories.

Aluminum: Aluminum must be aluminum alloy 6063-T5 complying with ASTM B221.

Screws, Fasteners, and Window Accessories: Screws, fasteners, and window accessories must be non-corrosive metals compatible with aluminum, except guides may be vinyl and rollers may be nylon. Locks, operators, strikes, keepers, and other metal hardware must match window finish.

Sealant: Sealant for installation of windows into wall openings must be single-component, polyurethane, self-leveling, non-sag, and must comply with ASTM C920.

Tape: Tape must be compatible with sealant.

99-08520B(4) Shop Fabrication

Framemust be accurately machined and fitted to hairline joinery that develops the members. Joints must be factory sealed weathertight.

Window finish must be a 3-coat high performance fluoropolymer finish complying with AAMA 2604 and containing 70 percent polyvinylidene fluoride resin.

99-08520C CONSTRUCTION

99-08520C(1) General

Not Used

99-08520C(1) Installation

Window units must be set straight, level, plumb and in true alignment in prepared openings. Windows must be centered in openings. Clearance between the window unit and the building framing must be from 3/16 to 1/4 inches at the sides and 1/2 inch at the top. The installation must be flashed and sealed weathertight.

All aluminum surfaces in contact with masonry, steel or other incompatible materials must be isolated with pressure sensitive tape, zinc chromate primer, bituminous paint or other material per the window manufacturer instructions and authorized by the Engineer.

99-08520D PAYMENT

Not Used

99-08710 DOOR HARDWARE

99-08710A GENERAL

99-08710A(1) Summary

Scope: This work consists of installing mechanical door hardware for swinging doors.

99-08710A(2) Design Requirements

Hardware must be free of defects, blemishes, and excessive play. Obtain each kind of hardware from 1 manufacturer for (1) latch and locksets, (2) exit devices, or (3) hinges and closers.

Furnish hardware items required to complete the work complying with performance level and design intent. Comply with the manufacturers' instructions for installation.

Furnish the manufacturer's updated item where specified item is now obsolete.

Furnish hardware with suitable fasteners to complete work.

Furnish ANSI/BHMA A156 Operational Grade 1 and Security Grade 1 for door hardware unless otherwise specified.

Fire-Rated Door Assemblies: Furnish door hardware (1) rated for use, (2) listed by the SFM, and (3) complying with NFPA 70, NFPA 80, UL305, UL10C and CBC..

Smoke-Control Assemblies: Furnish door hardware (1) rated for use, (2) listed by the SFM, (3) complying with UL 1784, and (4) installed under NFPA 105.

Maintenance Tools: Furnish a complete set of specialized tools for continued adjustment, maintenance, removal, and replacement of door hardware.

99-08710A(3) Definitions

BHMA: Builders Hardware Manufacturers Association.

NRP: Non-removable pin.

SFIC: Small format interchangeable core.

SFM: CA State Fire Marshall.

99-08710A(4) Submittals

Product Data: Submit for all products. Include the following:

1. Manufacturer's technical information and catalog cuts for each door hardware item. Include style, function or type, grades, size, and finish.
2. Fasteners and other pertinent information.
3. Explanation of abbreviations, symbols, and codes contained in schedules.
4. ANSI/BHMA certification.
5. SFM listing and UL approval where specified.
6. Installation details for door hardware.

Shop Drawings:

Submit locations of door hardware sets, cross-referenced to drawings, both on floor plans and in door schedule. Include identification number, location, hand, fire rating, and material of each door and frame.

Door Hardware Schedule: Submit door hardware sets with all items required for each door. Coordinate final door hardware schedule with doors, frames, and related work to ensure proper size, style, thickness, hand, function, and finish of door hardware.

Closeout Documents:

Include closeout documents in the "Maintenance and Operations Manual" before completion of the work. Submit an electronic copy as a PDF file on an Engineer-authorized data-storage device.

Closeout documents must include the following:

1. Index.
2. Parts list.
3. Operating instructions.
4. Maintenance instructions.

Incomplete or inadequate documentation will be returned for correction and resubmittal.

99-08710A(5) Quality Assurance

99-08710A(5)(a) General

Floor Stops must comply with California Access Compliance Reference Manual Policy No. 99-08, *Door Stops and Other Floor-Mounted Obstructions*.

99-08710A(5)(b) Regulatory Requirements

Door hardware and installation must comply with CBC and the following table:

Door hardware item	ANSI/BHMA Standard
Full mortise hinges	ANSI/BHMA A156.1
Cylindrical locksets	ANSI/BHMA A156.2
Door closers	ANSI/BHMA A156.4
Lock cylinders, single cylinder deadbolts and electric strikes	ANSI/BHMA A156.5
Push plates, pull plates, kick plates, and mop plates	ANSI/BHMA A156.6
Mortise locksets	ANSI/BHMA A156.13
Manual flush bolts, floor stops, wall stops, door stops, and wall bumpers	ANSI/BHMA A156.16
Materials and finishes	ANSI/BHMA A156.18
Thresholds	ANSI/BHMA A156.21
Door gasketing, automatic door bottoms, door shoes with rain drip, door sweeps, door top weatherstrips, and overhead door drips	ANSI/BHMA A156.22
Keying systems	ANSI/BHMA A156.28
Hardware preparation in steel doors and steel frames	ANSI/BHMA A156.115

99-08710B MATERIALS

99-08710B(1) General

Furnish door hardware sets for each door as described.

Exit doors must be operable from the inside at all times with single motion and without the use of a key, special knowledge, or effort.

Plans show direction of swing or hand of each door leaf. Furnish each item of hardware for proper door movement.

99-08710B(2) Hinges

Hinges must be full mortise, five knuckle, ball bearing construction and comply with the following:

1. Heavy Weight Hinges:
 - 1.1. Interior: Type 8111
 - 1.2. Exterior: Type 5111, use NRP with set screw on out swinging exterior doors
2. Continuous Gear Type Hinges: Exterior extruded aluminum, pinless, geared hinge leaves joined by a continuous extruded aluminum channel cap; with concealed, self-lubricating thrust bearing.

99-08710B(3) Mechanical Locks and Latches

99-08710B(3)(a) General

Lock Throw: Comply with length of bolts required for labeled fire-rated doors and the following:

1. Cylindrical Lockset: At least 1/2-inch latchbolt throw
2. Mortise Lockset: At least 3/4-inch latchbolt throw
3. Deadbolt: At least 1-inch bolt throw

Lock Backset: 2-3/4 inches, unless otherwise described.

Strike: Manufacturer's standard strike for each lock bolt or latchbolt, with strike box and curved lip extended to protect frame. Furnish (1) flat-lip strike for three-piece antifriction latchbolts where instructed by the lock manufacturer, (2) extra-long-lip strike for frames with applied wood casing trim, or (3) manufacturer's specific aluminum strike box for aluminum frames.

99-08710B(3)(b) Cylindrical Locksets

Cylindrical locksets must be series 4000, non handed steel lock chassis, SFIC, self aligning trim with concealed through bolts. Include the following:

1. Lever: Curved or contour with angled return to be within 1/2 inch of the door. On exterior doors, free wheeling exterior lever when locked.

2. Rose: Chromium, flat with rounded edge.
3. Latchbolt: Chrome, square corner. Same manufacturer as lockset.
4. Screws: Supplied with lockset.

Entrance lockset must be Function F109 with dual levers and roses. Passage lockset must be Function F75 with dual levers and roses. Privacy lockset must be Function F76A, dual levers and roses, with coin turn outside and thumbscrew turn inside.

99-08710B(3)(c) Mortise Locksets

Mortise locksets must be series 1000, non handed steel lock case, SFIC, self aligning trim with concealed screws. Include the following:

1. Lever: Curved or contour with angled return to be within 1/2 inch of the door. On exterior doors, free wheeling exterior lever when locked.
2. Escutcheon: Stainless steel with standard cylinder.
3. Rose: Stainless steel, flat with rounded edge.
4. Latchbolt: Anti friction latchbolt, supplied with lockset.
5. Screws: Supplied with lockset.

Exit lockset must be Function F12, dual levers with exterior escutcheon and interior rose, and 1-inch throw stainless steel deadbolt. Passage lockset must be Function F01 with dual levers and roses. Privacy lockset must be Function F22, dual levers and roses, with coin turn outside and thumbscrew turn inside.

99-08710B(3)(d) Auxiliary Locks

Single cylinder deadbolt must be Function E2151, free spinning solid brass cylinder collar and security shield, non handed, steel alloy deadbolt with anti-saw center, SFIC, with concealed through bolts.

99-08710B(3)(e) Lock Cylinders

Lock cylinders must be a master key system.

Lock cylinders must be tumbler type, constructed from nickel silver, and same manufacturer as locking devices. Cylinders must be SFIC type, interchangeable cores with six pin barrels, and face finished to match lockset.

Temporary cores must be SFIC type with interchangeable cores with six pin barrels. Temporary cores must be a change key system. Temporary cores and keys must not be the Department's permanent keying system or furnished on the same keyway or key section as the Department's permanent keying system. Temporary cores will remain Department property.

Keys must be nickel silver and same manufacturer as locking devices. Furnish 2 change keys per temporary core. Furnish 2 blank keys per permanent core. Stamp change key bows and blank key bows "State of California" and "Do Not Duplicate."

99-08710B(4) Accessories For Pairs Of Doors

Coordinators: Type 21A, flush bolts, manufacturer's coordinated channel or filler, active-leaf, hold-open lever and inactive-leaf release trigger; fabricated from steel with nylon-coated strike plates. Include built-in, adjustable safety release.

99-08710B(5) Surface Closer

Door Closers: Surface mounted, aluminum cover, non handed, field adjustable sizes 1 through 6, parallel arm set with hold open and stop. Include separate adjusting valves for closing, latching speed, and backcheck. Use drop brackets at narrow head rails. Dead stop arm at exterior doors.

99-08710B(6) Exit Devices

Panic Devices: Type 3 with push pad, mortise lockset with SFIC cylinder, Function 08 outside trim with free wheeling lever when locked and exterior escutcheon. UL and SFM listed for panic Exit. Use Type 2 with push pad for inactive leaf.

Exit Only Devices: Type 1 with push pad, Function 01 exit only trim. UL and SFM listed for panic Exit. Use Type 2 with push pad for inactive leaf.

99-08710B(7) Operating Trim

Push Plates and Pull Plates: Beveled edges, stainless steel, and size 16 by 4 inches. Push plate must be Type J301. Pull plate must be Type J405, with one-inch diameter round pull and 1 1/2-inch standoffs on 8-inch centers.

99-08710B(8) Protective Trim Unit

Kickplates and Mop Plates: Beveled edges, stainless steel, countersunk screw holes, width 2 inches less than door width for single doors, and 1-inch less than door width each for door pairs. Kickplate must be Type J102, 12 inches tall. Mop plate must be Type J103, 6 inches tall.

99-08710B(9) Mechanical Stops and Holders

Floor Stops: Dome type, Type L12141 or L12161 as required, countersunk screw holes, non marring rubber bumper, and height for threshold or non threshold door frame as required.

Wall Stops and Door Mounted Stops: Wall type, 3 1/2-inch projection, Type L12011 or L12021 as required, countersunk screw holes, and non marring rubber tip.

99-08710B(10) Door Gasketing

Automatic Door Bottoms: Heavy duty, full mortise, mill finished aluminum with silicone insert, end covers, and strike plates. Must meet performances tests for sound transmission, air leakage and smoke.

1. Air Leakage: Tested in accordance with UL 1784 "Standard for Air Leakage Tests of Door Assemblies and Other Opening Protective."
2. Smoke: Tested to meet or exceed NFPA 105 "Standard for the Installation of Smoke Control Door Assemblies and Other Opening Protective."

Door Shoe with Rain Drip: Mill-finished aluminum with neoprene insert, end covers, and formed rain drip.

Door Sweep: Mill-finished aluminum and neoprene.

Overhead Door Drip: Mill-finished aluminum 2-1/2 inches wide.

Door Gasketing: Bumper-type resilient inserts with retainer strips and surface applied. Perimeter seals must meet performance tests for sound transmission, heat, cold, air leakage, and smoke. At astragals, furnish a compression bulb resilient pressure sensitive door gasketing. Materials must be NRTL listed where used with labeled assemblies.

99-08710B(11) Thresholds

Thresholds must be in compliance with applicable accessibility requirements, include sound control gasket and concealed fastener, factory non-slip mill-finished aluminum, nominal 6 inches wide unless otherwise shown, and full width of opening described.

Threshold bedding sealant must be weatherproof silicone sealant and adhesive.

99-08710B(12) Shop Fabrication

Manufacturer's Nameplate: Do not use products that have manufacturer's name or trade name displayed in a visible location except with required fire-rated labeling. Manufacturer's identification will be permitted on lock cylinder rims.

Base Metals: Furnish door hardware items of base metal specified, fabricated by forming method indicated, using manufacturer's standard metal alloy, composition, temper, and hardness. Furnish metals of a quality equal to or greater than that of specified door hardware items. Do not use a manufacturer's standard materials or forming methods if different from the specified standard.

Fasteners: Screws must comply with commercially recognized industry standards for application intended. Furnish Phillips oval-head screws finished to match surface of door hardware. Furnish fire-rated fasteners for labeled assemblies for the following:

1. Hinges mortised to wood doors or frames.
2. Strike plates to wood frames.
3. Closers to wood doors and frames.
4. Surface hinges to steel doors.

5. Closers to steel doors and frames.
6. Surface-mounted exit devices to steel doors and frames.
7. Spacers or sex bolts for through bolting of hollow-metal doors.

Do not use aluminum fasteners. Furnish noncorrosive fasteners for exterior door gasketing applications.

99-08710B(13) Finishes

Interior Hardware: Standard Finish 626 (US 26D), satin chromium.

Exterior Hardware: Standard Stainless Steel Finish 630 (US 32D), satin stainless steel.

Factory Covering: Apply a strippable, temporary protective covering to exposed finishes before shipping.

99-08710C CONSTRUCTION

99-08710C(1) General

Doors and Frames: Doors and frames must be set square, plumb, and properly prepared before hardware installation.

99-08710C(2) Examination

Doors and Frames: Examine doors and frames for compliance with requirements for installation tolerances, labeled fire-rated door assembly construction, wall and floor construction, and other conditions affecting door hardware installation.

Electrified Door Hardware: Examine roughing-in for electrical power systems to verify actual locations of wiring connections before electrified door hardware installation.

99-08710C(3) Installation

Furnish heavy weight hinges for interior doors with closers and exterior doors. You must use 4 1/2-inch hinges unless otherwise described.

Furnish standard weight hinges for interior doors unless otherwise specified. For doors 2'-0" wide you must use 3-inch hinges. For doors wider than 2'-0" you must use 3 1/2-inch hinges.

Hardware items must be accurately fit, securely applied, adjusted, and lubricated to comply with the manufacturer's instructions. Hardware items must operate without binding or excessive play.

Hinges must be installed at equal spacing with the end hinges not more than 9 5/8 inches from the top and bottom of the door. Kickplates must be mounted on both side of the doors, 1 inch up from bottom edge.

Thresholds must be set in a continuous bed of bedding sealant.

Mechanical stops on concrete surfaces must be attached with expansion anchoring devices. Mechanical stops mounted elsewhere must be attached with wood screws. Do not locate stops in the path of travel.

Hardware, except hinges, must be removed from surfaces to be painted before painting. Do not install surface-mounted items until finishes have been completed on substrates involved. Painting must comply with section 99-09900.

Furnish all dogging keys, closer valve keys, lock spanner wrenches, other factory furnished installation aids, instructions, and maintenance guides to the Engineer.

Install continuous weatherstripping at each edge of exterior door leaf. Seal finish must match adjacent frame color.

99-08710C(4) Lock Cylinders

Install temporary cores in all lockable doors during construction.

Furnish permanent cores and keys to the Engineer before Contract acceptance. The Department will install permanent cores.

99-08710C(5) Cleaning and Protection

Clean adjacent surfaces soiled by door hardware installation.

Clean hardware items as necessary to restore proper function and finish.

Furnish final protection and maintain conditions that ensure that door hardware is without damage or deterioration before Contract acceptance.

99-08710C(6) Adjusting

Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of HVAC equipment.

Door Closer: Door closer must 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.

99-08710C(7) Door Hardware Schedule

Furnish hardware sets as specified in the following tables:

DOOR HARDWARE SET 1

(single exterior steel door with security access)

Doors # 101A, 121A, 122A, 123A. Conform with the requirements in section 99-08100 and section 99-16010

No.	Item	Description	Quantity
1	Hinges	middle electric hinge	3
2	Electrified Mortise lockset and latch	Electrified Mortise Lock Exit Device	1
3	Surface closer	Dead stop arm	1
4	Gasketing	integral weatherstrippings, rain drip, door gasketing	1
5	Threshold	Threshold with offset saddle	1
6	Protective trim unit	Kick plate on push side of door	1

DOOR HARDWARE SET 2

(single exterior aluminum storefront door with security access)

Doors # 104A, 130A, 136A. Conform with the requirements in section 99-84113 and section 99-16010. Hardware to be provided with Aluminum Framed Entrances and Storefronts system

No.	Item	Description	Quantity
1	HingesContinuous gear type hinge	1
2	Exit device	Electrified Concealed Vertical Rod Panic Device	1
3	Operating trim	Offset aluminum door pulls, night latch	1
4	Surface closer	Dead stop arm	1
5	Gasketing	Automatic door bottom, rain drip, door gasketing	1
6	Threshold	Threshold with offset saddle	1

DOOR HARDWARE SET 3

(single exterior aluminum storefront door with panic hardware and security access)

Door #104B. Conform with the requirements in section 99-84113 and section 99-16010. Hardware to be provided with Aluminum Framed Entrances and Storefronts system

No.	Item	Description	Quantity
1	HingesContinuous gear type hinge	1
2	Exit device	Electrified Concealed Vertical Rod Panic Device	1
3	Operating trim	Offset aluminum door pulls	1
4	Surface closer	Dead stop arm	
5	Gasketing	Automatic door bottom, rain drip, door gasketing	1
6	Threshold	Threshold with offset saddle	1

DOOR HARDWARE SET 4

(single exterior steel door with panic hardware and security access)

Door # 119A, Conform with the requirements in section99-08100 and section 99-16010

No.	Item	Description	Quantity
1	Hinges	middle electric hinge	3
2	Exit device	Electrified Mortise Lock Exit Panic Device	1
3	Lock cylinder		1
4	Surface closer	Dead stop arm	1
5	Gasketing	Automatic door bottom, rain drip, door gasketing	1
6	Threshold	Threshold with offset saddle	1
7	Protective trim unit	Kick plate on push side of door	1

DOOR HARDWARE SET 5

(double exterior steel door with panic hardware and security access)

Door # 124 Conform with the requirements in section99-08100 and section 99-16010

No.	Item	Description	Quantity
1	Hinges	middle electric hinge	6
2	Exit device	Electrified Mortise Lock Exit Panic Device	2
3	Lock cylinder		1
4	Accessories for pairs of doors	Double Door Exterior Astragal with weatherstripping	1
5	Surface closer	Dead stop arm	2
6	Gasketing	Automatic door bottom, rain drip, door gasketing	2
7	Threshold	Threshold with offset saddle	1
8	Protective trim unit	Kick plate on push side of door	2

DOOR HARDWARE SET 6

(Single interior door with passage and sound control hardware)

Door # 101C, 102A, 110A, 110B, 118B, 125A, 129, 130B, 141

No.	Item	Description	Quantity
1	Hinges	Heavy weight type 8111....	3
2	Cylindrical lockset and latch	passage	1
3	Surface closer	Door closer	1
4	Mechanical stops and holders	Floor stop and automatic holder	1
5	Gasketing	automatic door bottom, door gasketing	1
6	Threshold	Sound control threshold	1
7	Protective trim unit	Kick plate on push side of door	1

DOOR HARDWARE SET 7

(Single interior door with office entrance with push button lockset)

Door # 103, 111, 114, 115, 126, 127, 137, 138, 145, 146

No.	Item	Description	Quantity
1	Hinges	Heavy weight type 8111....	3
2	Cylindrical lockset and latch	Office entrance with push button	1
3	Surface closer	Door closer	1
4	Mechanical stops and holders	Floor stop and automatic holder	1
5	Gasketing	automatic door bottom, door gasketing	1
6	Threshold	Sound control threshold	1
7	Protective trim unit	Kick plate on push side of door	1

DOOR HARDWARE SET 8

(Single Interior door with storeroom lockset with security access)

Door # 109, 112, 135

No.	Item	Description	Quantity
1	Hinges	Heavy weight type 8111 with middle electrified hinge	3
2	Cylindrical lockset and latch	Electrified Storeroom lockset	1
3	Surface closer	Door closer	1
4	Mechanical stops and holders	Floor stop and automatic holder	1
5	Gasketing	automatic door bottom, door gasketing	1
6	Threshold	Sound control threshold	1
7	Protective trim unit	Kick plate on push side of door	1

DOOR HARDWARE SET 9

(Single interior door with privacy lockset)

Door # 106, 132

No.	Item	Description	Quantity
1	Hinges	Heavy weight type 8111	3
2	Cylindrical lockset and latch	Privacy lockset	1
3	Surface closer	Door closer	1
4	Gasketing	automatic door bottom, door gasketing	1
5	Threshold	Sound control threshold	1
6	Protective trim unit	Kick plate on push side of door	1

DOOR HARDWARE SET 10

(Single Interior door with push/pull plate)

Door # 107, 108, 133, 134

No.	Item	Description	Quantity
1	Hinges	Heavy weight type 8111....	3
2	Cylindrical lockset and latch	passage	1
3	Operating trim	Push pull plate	
4	Surface closer	Door closer	1
5	Mechanical stops and holders	Floor stop and automatic holder	1
6	Gasketing	automatic door bottom, door gasketing	1
7	Threshold	Sound control threshold	1
8	Protective trim unit	Kick plate on push side of door	1

DOOR HARDWARE SET 11

(Single Interior door with storeroom lockset)

Door # 105, 116, 117, 128, 131, 142, 144

No.	Item	Description	Quantity
1	Hinges	Heavy weight type 8111	3
2	Cylindrical lockset and latch	Storeroom lockset	1
3	Surface closer	Door closer	1
4	Mechanical stops and holders	Floor stop and automatic holder	1
5	Gasketing	automatic door bottom, door gasketing	1
6	Threshold	Sound control threshold	1
7	Protective trim unit	Kick plate on push side of door	1

DOOR HARDWARE SET 12

(Double interior door with passage lockset)

Door # 118A,

No.	Item	Description	Quantity
1	Hinges	Heavy weight type 8111....	6
2	Cylindrical lockset and latch	passage	2
3	Accessories for pairs of doors	Coordinator	1
4	Surface closer	Door closer	2
5	Mechanical stops and holders	Floor stop and automatic holder	2
6	Gasketing	automatic door bottom, door gasketing	2
7	Threshold	Sound control threshold	1
8	Protective trim unit	Kick plate on push side of door	2

DOOR HARDWARE SET 13

(Single interior door with panic and sound control hardware)

Door # 113A, 113B,

No.	Item	Description	Quantity
1	Hinges	Heavy weight type 8111....	3
2	Cylindrical lockset and latch	passage	1
3	Exit device	Panic Hardware	1
4	Surface closer	Door closer	1
5	Mechanical stops and holders	Floor stop and automatic holder	1
6	Gasketing	automatic door bottom, door gasketing	1
7	Threshold	Sound control threshold	1
8	Protective trim unit	Kick plate on push side of door	1

DOOR HARDWARE SET 14

(Single Interior door with storeroom lockset with security access)

Door # 124A

No.	Item	Description	Quantity
1	Hinges	Heavy duty stainless steel	1
2	Cylindrical lockset and latch	Passage	1
	Exit device	Panic Hardware	1
3	Surface closer	Door closer	1
4	Mechanical stops and holders	Floor stop and automatic holder	1
5	Gasketing	automatic door bottom, door gasketing	1
6	Threshold	Sound control threshold	1
7	Protective trim unit	Kick plate on push side of door	1

99-08710D PAYMENT

Not Used

99-08810 GLAZING

99-08810A GENERAL

99-08810A(1) Summary

Section 99-08810 includes specifications for installing glazing.

Glazing for windows, doors, and other glazed openings includes:

1. Glass
2. Polycarbonate and laminated sheets

99-08810A(2) Definitions

SHGC: Solar Heat Gain Coefficient.

Surface: Surfaces of lites numbered inward with the exterior surface being the 1st surface.

99-08810A(3) Submittals

Submit manufacturer's product data including catalog cuts, performance data, installation instructions, and additional documentation.

Submit delegated-design for glass indicated to comply with performance requirements and design criteria, including wind load calculations and analysis data must be sealed by California Structural Engineer.

Submit the installation schedule. Each location must include the location, size, and glazing type.

Submit adhesion and compatibility testing reports. Test each glazing material type, tape sealant, gasket, glazing accessory, and glass-framing member for adhesion to and compatibility with elastomeric glazing sealants. Testing will not be required if data is submitted based on previous testing of current sealant products and glazing materials matching those submitted.

For materials that fail tests, submit manufacturer's instructions for corrective measures, including use of specially formulated primers.

Submit glazing samples for each type of glazing product, 12-inch square minimum.

Submit samples of manufacture warranty.

99-08810A(4) Quality Assurance

Installed glazing system must withstand normal thermal movement, wind and impact loads, where applicable, without failure including loss or glass breakage attributable to the following: defective manufacture, fabrication or installation, failure of sealant or gaskets to remain watertight and airtight, deterioration of glazing materials or other defects in construction.

99-08810A(5) Labels

Each individual pane of heat strengthened or tempered glass must bear an identification label complying with ASTM C 1048.

Each individual pane of bullet-resistant glass or plastic must bear an identification label of performance complying with UL 752 or ASTM F 1233.

Safety glass must be permanently labeled under CBC Section 2406.

99-08810B MATERIALS

99-08810B(1) General

Glass must be clear glass unless otherwise shown and comply with ASTM C1036 and the following:

1. Tempered glass must also comply with ASTM C1048.
2. Laminated glass must also comply with ASTM C1172.
3. Polycarbonate sheet must comply with ASTM C 1349, Appendix XI, Type II (mar-resistant).

Furnish glass thicknesses specified unless otherwise shown.

Acrylic sheets must comply with ASTM D4802.

99-08810B(2) Glazing

Float Glass:

Float glass must be Type I, Class 1, Quality-Q3 glass. Tinted glass must be transparent, Type 1, Class 2, Quality-Q3 glass and all the same tint.

Float glass thickness must be:

1. 1/8-inch thick for panes less than 10 square feet
2. 3/16-inch thick for panes between 10 and 28 square feet
3. 1/4-inch thick for panes over 28 square feet

Tempered Glass: Tempered glass must be Kind-FT, Condition-_A_, Type 1, Class 1, and Quality-Q3 glass.

Heat Strengthened Glass: Heat strengthened glass must be Kind-HS, Condition A, Type 1, Class 1, and Quality-Q3 glass.

Laminated Glass: Laminated glass must be safety glass, Kind-_LT_, and fabricated from 2 pieces of float glass fused to clear interlayers. The outer lite must be clear. Laminated glass must be at least 1/4-inch thick.

Low-e Coated Glass: Low-e coated glass must be clear float glass complying with ASTM C1376 with a clear float coating.

Insulating Glass Assemblies:

Insulating glass assemblies must be clear, low-e coated, insulating glass.

Insulating glass assemblies must be factory assembled sealed lites of glass separated by a dehydrated interspace with desiccant, manufacturer's standard spacer with dual seals, and qualified under ASTM E2190.

Basic Assemblies: The outdoor lite must be clear float glass. The indoor lite must be clear float glass with hard coat low-e coating on the inner surface.

Bullet-Resistant Assemblies: The outdoor lite must be 1-1/4-inch clear bullet-resistant glass-glad polycarbonate glass. Airspace must be 1/2-inch thick. The indoor lite must be 1/4-inch heat strengthened clear float glass with hard coat low-e coating on the inner surface.

The insulated glass assemblies must have:

1. Maximum nighttime U-factor: 0.28.
2. Maximum daytime U-factor: 0.26.
3. Maximum SHGC: 0.27
4. Minimum visible light transmittance: 0.64.
5. Maximum shading coefficient: 0.32.

Bullet Resistant Glass: Bullet resistant glass must have a power rating of "Super – 0.44 Magnum" under UL 752 Level 3, or an equivalent rating under ASTM F 1233, Ballistics Class HG4, "Handgun – High." Exterior surface must be mar-resistant. Bullet resistant glass must meet the following:

1. Glass-clad polycarbonate complying with ASTM C 1349.
2. U-Value: 1.00 Maximum
3. Daylight Transmittance: 68 percent
4. Exterior Daylight Reflectance: 8 percent
5. Shading Coefficient: 0.50 percent
6. Ultraviolet Blockage: 99 percent

Miscellaneous Materials: Seals, caulks, putties, setting blocks, shims, tapes, compression seals, felt, spacers, and channels must be top grade, commercial quality, complying with the glass or sheet manufacturer instructions and complying with GANA *Glazing Manual* and the IGMA *North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial and Residential Use*.

99-08810C CONSTRUCTION

99-08810C(1) Installation

Glazing must be installed under the GANA *Glazing Manual* and the IGMA *North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial and Residential Use*.

Panes must be bedded fully and evenly, set straight and square within panels so that the pane is entirely free of any contact with metal edges and surfaces.

For panes on the exterior of buildings, the glazing on both sides of the panes must provide a watertight seal and watershed. Seals must extend no more than 1/16-inch beyond the holding members. A void must be left between the vertical edges of the panes and the glazing channel. Weep systems must be provided to drain condensation to the outside.

Panes in assemblies using extruded gasket glazing must be set under the assembly manufacturer's instructions using gaskets and stops supplied by the manufacturer.

Laminated glass must be set on setting blocks.

Whenever welding or burning of metal is in progress within 15 feet of glazing materials, a protective cover must be provided over exposed surfaces.

99-08810C(2) Replacement and Cleanup

Panes must be kept clean of cement and plaster products, cleansers, sealants, tapes and all other foreign material that may cause discoloration, etching, staining, or surface blemishes to the materials.

Excess sealant left on the surface of the glass or surrounding materials must be removed during the work life of the sealant.

Solvents and cleaning compounds must be chemically compatible with materials, coatings and glazing compounds. Cleaners must not have abrasives that scratch or mar the surfaces.

The protective covering on plastic sheet surfaces must not be removed until construction is completed or 2 weeks after glazing, whichever is shorter. The covering must be removed before adhesives dry sufficiently to adhere to the sheet during removal rather than the protective membrane.

All broken, scratched, or cracked glass must be replaced before Contract acceptance.

Paint, dirt, stains, labels, and surplus glazing compound must be removed without scratching or marring the surface of the panes or metal work, except do not remove etched labels.

99-08810D PAYMENT

Not Used

99-9 FINISHES

99-09250 GYPSUM WALLBOARD

99-09250A GENERAL

99-09250A(1) Summary

Scope: This work consists of installing and finishing gypsum wallboard.

99-09250A(2) Definitions

Not Used

99-09250A(3) Submittals

Product Data: Submit manufacturer's descriptive data and installation instructions.

99-09250A(4) Quality Assurance

Not Used

99-09250B MATERIALS

99-09250B(1) General

Gypsum wallboard must be mold-, mildew-, and moisture-resistant. Use mold- and moisture-resistant joint tape and compound. You may use cementitious backer board.

Use mold- and moisture-resistant joint tape and finishing compound with mold-, moisture-, and water-resistant gypsum board.

99-09250B(2) Delivery and Storage

Materials must be delivered in original packages, containers or bundles bearing brand name, applicable standard of manufacture, and name of manufacturer or supplier and must be kept dry and fully protected from weather and direct sunlight exposure. Gypsum wallboard must be stacked flat with adequate support to prevent sagging or damage to edges, ends and surfaces.

99-09250B(3) Gypsum Wallboard

Gypsum Wallboard: Gypsum wallboard must comply with ASTM C1396. Gypsum board must be Type X with tapered edges.

Gypsum Sheathing Board: Gypsum sheathing board must conform to ASTM C 79.

Mold-, Mildew-, and Moisture-Resistant Gypsum Board: Mold-, moisture-, and water-resistant resistant gypsum board must achieve a mold resistance rating of 10 under ASTM D3273 and evaluated under ASTM D3274. Furnish one of the following types:

1. Glass mat water-resistant gypsum panel with glass mat facings and water-resistant fiber-reinforced gypsum core, and complying with ASTM C1658/C1658M. Glass mat water-resistant gypsum panel must be Georgia-Pacific DensArmor Plus Fireguard Paperless Interior Drywall, or equal.
2. Fiber-reinforced water-resistant gypsum panel, unfaced with water-resistant core, and complying with ASTM C1278/C1278M. Fiber-reinforced water-resistant gypsum panel must be US Gypsum Fiberock Aqua-Tough Interior Gypsum Panel, or equal.
3. Gypsum panel with paper faces treated with an antimicrobial agent and containing core additives to add resistance to mold, mildew, and moisture and complying with ASTM C1396/C1396M. Gypsum panel must be National Gypsum Gold Bond XP Fire Shield Gypsum Wallboard, or equal.

Mold and Moisture Resistant Joint Tape and Finishing Compound: Mold and moisture resistant joint tape and finishing compound must comply with ASTM C475. Joint tape must be glass mesh or as recommended by gypsum board manufacturer. Joint compound must be setting-type joint or as recommended by gypsum board manufacturer. Compound must achieve a mold resistance rating of 10 under ASTM D3273 and evaluated under ASTM D3274.

Corner Beads, Metal Trim and Control Joints: Corner beads, metal trim and control joints must be galvanized steel of standard manufacture.

Resilient Metal Channel: Resilient metal channel must be galvanized sheet steel channels of standard manufacture designed to reduce sound transmission through wood frame partitions.

Fasteners: Fasteners must be gypsum wallboard nails complying with ASTM C514 or steel drill screws complying with ASTM C1002.

Cementitious Backer Board: Cementitious backer board must be non-asbestos fiber-mat reinforced cementitious backer board complying with ASTM C1325.

99-09250C CONSTRUCTION

Install wallboard panels on ceilings and soffits with the long dimension of the panels perpendicular to the framing members. Install wallboard panels on walls with the long dimension of the panels either parallel or perpendicular to the framing members. The direction of the panels must be the same on any 1 wall or partition assembly.

Edges of wallboard panels must be butted loosely together. All cut edges and ends must be smoothed as needed for neat fitting joints.

All edges and ends of gypsum wallboard panels must coincide with the framing members, except those edges and ends which are perpendicular to the framing members. End joints on ceilings and on the opposite side of partition assemblies must be staggered.

Gypsum wallboard panels for shear wall sheathing or fire resistive assemblies must be fastened to all framing members. Gypsum wallboard panels at other locations and gypsum wallboard finish over plywood sheathed shear walls must be fastened to all framing members except at the following locations:

At internal angles formed by ceiling and walls, first install ceiling panels with the fasteners terminating at a row 7 inches from the walls, except for walls parallel to ceiling framing. Wall panels must butt the ceiling panels. The top row of wall panel fasteners must terminate 8 inches from the ceiling.

At internal vertical angles formed by the walls, fasteners must not be installed along the edge or end of the panel that is installed first. Fasteners must be installed only along the edge or end of the panel that butts and overlaps the panel installed first.

Adhesives must not be used for securing wallboard to framing.

Except where closer spacing is shown, spacing of fasteners must not exceed (1) 7 inches for nails, (2) 12 inches for screws, and (3) 8 inches for screws at the perimeter of panels for fire resistive assemblies having metal framing.

Use Type S steel drill screws to fasten wallboard to metal framing. Use nails or Type W steel drill screws to fasten wallboard to wood framing. Screws must not be used in fire resistive assemblies unless otherwise shown.

Fasteners must be located at least 3/8 inch from wallboard panel edges and ends. Nails must penetrate into wood framing at least 1-1/8 inches. Screws must penetrate into wood framing at least 5/8 inch. All metal fasteners must be driven slightly below surface level without breaking the paper or fracturing the core.

Metal trim must be installed at all free edges of panels, where wallboard panels abut dissimilar materials and at locations shown. Corner beads must be installed at external corners. Control joints must be installed at the locations shown.

Joints in mold-, moisture-, and water-resistant resistant gypsum board must not be taped or filled and dimples at the fastener heads must not be patched. Edges of cuts and holes in backing board must be sealed with a primer or sealer that is compatible with the wall covering or wainscoting adhesive to be used.

All other joints must be filled and finished with joint tape and at least 3 coats of joint compound (1) between face panels, (2) the internal angles formed by ceiling and walls and (3) the internal vertical angles formed by walls. Tape in the corners must be folded to comply with the angle of the corner. Tape at joints and corners must be embedded in joint compound.

Dimples at nail and screw heads, dents, and voids or surface irregularities must be patched with joint compound. Each patch must consist of at least 3 coats and each coat must be applied in a different direction.

Flanges of corner beads, control joints and trim must be finished with a least 3 coats of joint compound.

Each coat of joint compound must be feathered out onto the panel surface and must be dry and lightly sanded before applying the next coat. The finished surfaces of joint compound at the panel joints, internal angles, patches and at the flanges of trim, corner beads and control joints must be flat and true to the plane of the surrounding surfaces and must be lightly sanded.

Good lighting of the work area must be provided during the final application and sanding of the joint compound.

Surfaces of wallboard to be textured must receive an orange peel texture, unless otherwise shown.

99-09250D PAYMENT

Not Used

99-09315 CERAMIC AND QUARRY TILE

99-09315A GENERAL

99-09315A(1) Summary

Scope: This work consists of installing ceramic and quarry tile.

Ceramic tile includes glazed wall tile, patterned porcelain tile, matte porcelain tile, textured porcelain tile, polished porcelain tile, trim tile, setting materials, grouts, and other materials required for a complete installation.

99-09315A(2) Definitions

Not Used

99-09315A(3) Submittals

Product Data:

Submit manufacturer's descriptive data, a list of materials to be used, and installation instructions.

Submit data for (1) each type of tile, (2) mortar and setting bed materials, (3) bond coat materials and additives, (4) grout materials, and (5) additives.

Submit friction reports for tile products to be used on floors and other pedestrian surfaces.

Samples: Samples must include 2 individual samples of each type and color of tile and trim to be installed and must be of the same size, shape, pattern and finish as the tile and trim to be installed.

99-09315A(4) Quality Assurance

Single Source Responsibility: Each type and color of tile, grout, and setting materials must be obtained from a single source.

Master Grade Certificates: Each shipment of tile to the job site must include a Master Grade Certificate issued by the tile manufacturer.

99-09315A(6) Project Conditions

Tile work must be protected and environmental conditions maintained during and after installation to comply with the reference standards and manufacturer's instructions.

99-09315B MATERIALS

99-09315B(1) General

Ceramic Tile: Ceramic tile must comply with ANSI A137.1 for types and grades of tile described. Ceramic tile must be Standard Grade.

Tile Installation Materials: Tile installation materials must comply with ANSI A108/A118/A136.1 with products and materials indicated for setting and grouting.

Tile Color and Size: Tile color must be as shown; tile size must be as specified herein.

Slip Resistant Tile: Slip resistant tile must have a static coefficient of friction of not less than 0.6 for walking surfaces and 0.8 for ramps under ASTM C1028.

99-09315B(2) Delivery, Storage, and Handling

Tile and packaged materials must be delivered to the job site in sealed, unbroken, unopened containers with the labels intact. Tile containers must bear the Standard Grade label.

Materials must be stored and handled in such a manner to prevent damage or contamination by water, freezing, or foreign matter.

99-09315B(3) Tile Products

Glazed Wall Tile:

Glazed wall tile must be machine made, dust pressed white body clay, plain face with cushion edges and a glossy glaze finish. Tile must be 5/16-inch nominal thickness.

Glazed wall tile trim must match material, size and finish of wall tile. Use bullnose trim on free edges of tiled wall areas. Use bullnose runner trim on outside corners. Do not use beads. Use cove trim on reentrant corners.

Patterned Porcelain Tile:

Patterned porcelain tile must be machine made, unpolished, dust pressed natural porcelain clay. Tiles must have less than 0.5 percent water absorption and be suitable for exterior use. Tiles must be 3/8-inch nominal thickness. Patterned porcelain must be slip resistant.

Tile must have truncated domes, 0.90-inch diameter, 0.20-inch nominal height, with center to center spacing of 2.35 inches. Arrangement of the domes must be such that there is no break in pattern or spacing when tiles are arranged side by side.

Matte Porcelain Tile:

Matte porcelain tile must be machine made, unpolished, dust pressed natural porcelain clay, and plain face. Tile must be 5/16-inch nominal thickness. Matte porcelain tile must be slip resistant.

Matte porcelain trim tile must include cove base at walls and single piece intersecting cove base at corners.

Textured Porcelain Tile: Textured porcelain tile must be machine made, unpolished, dust pressed natural porcelain clay. Tile must have less than 0.5 percent water retention and be suitable for exterior use. Tile must be 5/16-inch nominal thickness. Textured porcelain tile must be slip resistant.

Polished Porcelain Tile: Polished porcelain tile must be machine made, dust pressed natural porcelain clay. Tile must have less than 0.5 percent water absorption and be suitable for exterior use. Tile must have a glossy polished finish and plain face. Tile must be 5/16-inch nominal thickness.

Unglazed Quarry Tile: Unglazed quarry tile must be machine manufactured, plastic made, vitreous hard burned clay, graded shale type tile complying with ANSI A137.1. Tile must be 1/2-inch nominal thickness and must have square edges. Tile must have ribbed backs or such other bonding features authorized by the Engineer.

99-09315B(4) Setting Materials

Materials for portland cement mortar installation must comply with ANSI A108.1 for the installation method described, unless otherwise shown.

Membrane must be a waterproof membrane for ceramic tile installation complying with ANSI A118.10.

Reinforcement must be 2 by 2 inches, W0.3 by W0.3 galvanized welded wire reinforcement complying with ASTM A185 except for minimum wire size. Reinforcement must be furnished in flat sheets.

Metal lath must be self furring, galvanized, flat expanded type weighing at least 2.5 pounds per square yard and complying with ASTM C847. Factory assembled metal lath and paper backing may be used where reinforcement over paper is shown.

Tile Bond Coat: Tile bond coat must be latex-portland cement prepackaged mortar mix, incorporating a dry acrylic resin, and complying with ANSI A118.4. Mortar must be suitable for exterior use and be labeled for the type of tile to be placed. Only water must be added to the mortar.

Epoxy Bond Coat: Epoxy bond coat must be a 2 part prepackaged epoxy mortar mix complying with ANSI A118.3 and suitable for exterior use. Mortar must be labeled for the type of tile to be placed.

99-09315B(5) Grouting Materials

Tile Grout: Tile grout must be latex-portland cement prepackaged grout mix, incorporating a dry acrylic resin, and complying with ANSI A118.6. Grout must be suitable for exterior use and be labeled for the type of tile to be placed. Only water must be added to the grout.

Epoxy Grout: Epoxy grout must be a 2 part prepackaged epoxy grout complying with ANSI A118.3 and suitable for exterior use. Grout must be labeled for the type of tile to be placed.

Grout Pigment: Grout pigment must be chemically inert, fade resistant mineral oxide or synthetic type. Color must be as shown.

99-09315B(6) Sealants

Sealant for vertical expansion joints must be a medium modulus silicone or polyurethane. Match color of exposed sealant to grout color in adjoining tile sealed joints.

Sealant for horizontal joints must be a 2-part polyurethane type material with a Shore Hardness of 35 to 45. Match color of exposed sealant to grout color in adjoining tile sealed joints.

99-09315B(7) Mortar Beds

Mortar beds for walls must be proportioned of one part cement, 1/2 part hydrated lime, 6 parts damp sand by volume and only enough water to provide the necessary workability. Ingredients must be dry mixed, water added, and materials blended to produce a stiff mix. Mortar bed must be at least 3/4 inch thick.

Mortar beds for floors must be proportioned of one part cement, 1/10 part hydrated lime, 5 parts damp sand by volume and only enough water to provide the necessary workability. Ingredients must be dry mixed, water added, and materials blended to produce a stiff mix. Mortar bed must be at least 1-1/4 inch thick.

99-09315B(8) Miscellaneous Materials

Sand: Sand must be a natural or manufactured sand complying with ASTM C144, except that no more than 10 percent must pass the No. 100 sieve.

Sealers:

Sealers for unglazed quarry tile must be water repellent, clear solution of ammonium cementitious compound, silicone base material, or other commercially manufactured sealer.

Sealers for grout must be a penetrating proprietary compound designed for sealing grout. Silicone sealers must not be used.

Cement: Cement must comply with ASTM C150, Type I.

Hydrated Lime: Hydrated lime must comply with ASTM C206, Type S, or ASTM C207, Type S.

Water: Water must be clean and potable.

Metal Edge Strips: Metal edge strips must be stainless steel terrazzo strips, 1/8 inch wide at the top edge with integral provisions for anchorage to mortar bed or substrate.

Marble Thresholds:

Marble thresholds must comply with ASTM C503 for exterior use and be abrasion resistance.

Marble threshold must be uniform in color and finish and fabricated to sizes and profiles shown and must provide a smooth transition between tile surfaces and adjoining finished floor surfaces.

Cementitious Backer Board: Cementitious backer board must be non-asbestos fiber-mat reinforced cementitious backer board complying with ASTM C1325.

Shower Pan: Shower pan must be flexible PVC sheeting complying with ASTM D4551, Grade 40, and manufactured for use as a shower membrane. Solvent cement must be per the manufacturer's instructions.

99-09315C CONSTRUCTION

99-09315C(1) General

Temperatures:

Unless otherwise specified in the manufacturer's installation instructions, maintain the ambient temperature between 50 and 100 degrees F in tiled areas during installation and for 7 days after completion. Exterior work areas must be shaded from direct sunlight during installation.

Tile must not be installed when the temperature of the substrate is greater than 90 degrees F or is frost covered.

Illumination: Interior work areas must be illuminated to provide the same level and angle of illumination as will be available during final inspection.

99-09315C(2) Preparation

Concrete, mortar, or masonry substrate surfaces which are to receive a mortar bed must not vary more than 1/4-inch in 8 feet from the required plane and must be true, plumb at vertical surfaces, and square at intersection edges.

Surfaces to receive a mortar setting bed or a bond coat must be cleaned to assure a tight bond to the applied material. Cleaning must leave the surface thoroughly roughened and free from laitance, coatings, oil, sand, dust and loose particles.

Saturate the cleaned surfaces with water just before placing mortar or coat the cleaned surfaces with fresh neat cement slurry. If the surface is saturated with water, excess water must be removed and the wetted surfaces uniformly dusted with portland cement. The slurry or wetted cement dust must be broomed to completely coat the surface with a thin and uniform coating just before placing the mortar.

Substrates must be inspected to insure that grounds, anchors, plugs, recessed frames, bucks, drains, electrical work, mechanical work, and similar items in or behind the tile are installed before beginning placing tile.

99-09315C(3) Mixing

Mixing: Mortar and grout must be mechanically mixed under the referenced standards and manufacturer's instructions to accurately proportion materials and water or additive content. Mixing equipment and mixer speeds, mixing containers, mixing time, and other procedures need to produce mortars and grout of uniform quality with optimum performance characteristics must comply with the referenced standards and manufacturer's instructions.

99-09315C(4) Schedule

Wall Tile:

Wall tile must be as shown on drawings.

Install tile on mortar bed using a tile bond coat and grout under the *TCNA Handbook for Ceramic, Glass, and Stone Tile Installation*, Method W 222.

Install tile on gypsum wallboard using a tile bond coat and grout under the *TCNA Handbook for Ceramic, Glass, and Stone Tile Installation*, Method W 243.

Install tile on cementitious backer board using a tile bond coat and grout under the *TCNA Handbook for Ceramic, Glass, and Stone Tile Installation*, Method W 244.

Install tile on concrete and masonry must be on a mortar bed using tile bond coat and grout under the *TCNA Handbook for Ceramic, Glass, and Stone Tile Installation*, Method W 211.

Floor Tile: Floor tile must be as shown on drawings. Install tile on mortar bed using a tile bond coat and grout under the *TCNA Handbook for Ceramic, Glass, and Stone Tile Installation*, Method F 112.

99-09315C(5) Installation

99-09315C(5)(a) General

Tile installation must comply with applicable portions of ANSI A108/A118/A136.1 and *TCNA Handbook for Ceramic, Glass, and Stone Tile Installation*.

All tile must be installed on a bond coat over a setting bed. The setting bed must be (1) a cured cement mortar bed, (2) a prepared, dimensionally stable substrate of concrete, or masonry, or (3) cementitious backer board or other cementitious material.

The back face of the tile must be free of paper, adhesives, fiber mesh, resins, or other materials affecting the bond of the tile to the bedding material.

Tile sheets must have permanent edge bonding or temporary mounting materials on the exposed face. Water soluble or absorbent adhesives must not be used for edge bonding. Temporary mounting materials must allow observation during tile setting operations.

Tile work must extend into recesses and under or behind equipment and fixtures, to form a complete covering without interruptions unless otherwise shown. Work must be terminated neatly at obstructions, edges and corners without disrupting pattern or joint alignments.

Intersections and returns must be accurately formed. Cutting and drilling of tile must be performed without marring visible surfaces. Cut edges of tile abutting trim, finish or built-in items must be carefully ground to produce straight aligned joints. Tile must be closely fit to electrical outlets, piping, fixtures and other penetrations such that plates, collars, or covers overlap the tile.

Cementitious backer board must be installed under ANSI A118.11.

99-09315C(5)(b) Mortar Bed Placement

The mortar bed, including reinforcement if shown, must be placed, consolidated, and finished to the required thickness.

The mortar bed surface must be true and pitched as shown, without high or low spots. The mortar bed surface must not vary more than 1/8 inch in 8 feet from a plane parallel to the finished tile surface when tile is installed on a cured mortar bed.

In no case must the allowed tolerances result in offsets between adjoining tiles, low spots on finished tile surfaces than can pond water, or finished tile surfaces that are not plumb or not true.

Pea gravel mortar must be tightly compacted so as to fill all voids in the aggregate. Obtain compaction using a stand-up wooden tamper weighing not less than 35 pounds or using a motor driven tamper and leveler.

Pea gravel mortar beds must be damp cured under cover for not less than 72 hours at a temperature of at least 70 degrees F.

Cement mortar beds to receive a tile bond coat must be damp cured under cover for a minimum of 48 hours at a temperature of at least 70 degrees F.

Cement mortar beds to receive an epoxy bond coat must be damp cured under cover for a minimum of 96 hours at a temperature of at least 70 degrees F and allowed to dry thoroughly prior to setting tile.

99-09315C(5)(c) Shower Pan

Substrate must be thoroughly cleaned before forming the shower pan. Drain must be a bolt-down clamping ring type with weepholes, installed such that the lip of the drain is flush with the subfloor.

Shower pan must be turned up for a distance of at least 6 inches in room areas and 3 inches above curb level in curbed spaces, with sufficient material to fold over and fasten to outside face of curb. Corners must be dog-eared and folded between pan and studs. Material must be nailed in the top inch of the upstand only.

Shower pan material must be cut exactly to the size of the drain opening. Do not trim out to bolt holes. Pierce the pan material to accommodate bolts with a tight fit. Place adhesive or mastic between pan and subdrain.

99-09315C(5)(d) Tile Bond Coat

The tile bond coat mortar must be mixed under the manufacturer's instructions. The consistency of the mixture must be such that ridges formed with the recommended notched trowel must not flow or slump. Reworking will be allowed provided no water or materials are added. The setting bed surfaces must be dampened before placing the bond coat as necessary for tile installation, but the setting bed must not be soaked. Setting bed surfaces for epoxy bond coat must be dry.

The bond coat must be floated onto the cured mortar bed surface with sufficient pressure to cover the surface evenly with no bare spots. The surface area to be covered with the bond coat must be no greater than the area that can be tiled while the bond coat is still plastic. The bond coat must be combed with a notched trowel under the manufacturer's instructions no more than 10 minutes before installing tile. Tile must not be installed on a skinned-over bond coat.

99-09315C(5)(e) Installing Tile

Tile must be installed under the manufacturer's instructions and must be set solid and well bonded to the substrate.

Tile set on a tile bond coat must be installed under ANSI A108.5. Tile set on an epoxy mortar must be installed under ANSI A108.6.

Cut tiles must be made with saws. Cut edges must be rubbed with an abrasive stone to bring the edge of the glaze slightly back from the body of the tile. Cuts must be accurately made to neatly fit the tile in place. Cut edges must not be butted against other tile. Cut tile must be at least half the size of a full size tile.

Tile must completely cover wall areas behind mirrors and fixtures.

Tile must be installed so that the finished tile surface does not vary more than 1/8 inch in 8 feet from the finished tile surface shown. In no case must there be offsets in adjoining tiles, low spots on finished tile surfaces that can pond water, or finished tile surfaces that are not plumb or true in the completed tile work.

Tiles must be firmly pressed into the freshly notched bond coat. Tile on interior surfaces must be tapped and beat into a true surface and to obtain at least 80 percent coverage by the mortar on the back of each tile. Tile on exterior surfaces must have 100 percent coverage and must be back-buttered immediately before setting the tile.

If tile is face mounted, the paper and glue must be removed within one hour after tile is installed. All tiles that do not meet the requirements for joint and surface tolerances must be adjusted or replaced.

Mortar that exudes into the grout spaces between tiles must be removed to the bottom of tile.

Marble Thresholds: Marble thresholds must be set in same type of setting bed as abutting tile unless otherwise shown.

Joints: Joints between tile must be continuous both vertically and horizontally. Joints must be straight and of uniform and equal width. Where tiles on adjoining surface are the same size, the joints must also align. Joint width must be per the tile manufacturer's instructions.

99-09315C(5)(f) Grouting Tile

Grout must be mixed, applied and cured under the manufacturer's instructions and under ANSI A108.10 for cement grout and ANSI A108.9 for epoxy grout.

Spacers, strings, ropes, pegs, glue, paper, and face mounting material must be removed before grouting. Joints between glazed wall tile must be wetted if they have become dry. Joints for epoxy mortar must be dry.

Grouting must not begin until at least 48 hours after installing tile.

A maximum amount of grout must be forced into the joints between tiles under the manufacturer's instructions. The grout must be finished (1) to the depth of the cushion for cushion edge tile and (2) flush with the surface for square edge tile. All gaps and skips in the grout spaces must be filled.

Mortar or mounting mesh must not show through the grouted joints.

The finished grout must have a uniform color and must be smooth without voids, pinholes or low spots.

Expansion joints must be kept free of grout or mortar.

Grout must be protected from freezing or frost for a least 5 days after installation.

99-09315C(5)(g) Miscellaneous Materials

Expansion Joints:

Expansion joints must be installed at the perimeter of all tile floors and at all substrate control joints and changes in the substrate material. Exterior expansion joint spacing must not exceed 16 feet in any direction.

All expansion joints must be made with sealant over backer rods. The thickness of sealant at the center of expansion joints must not exceed the width of the joint. Joint edges must be primed under the sealant manufacturer's instructions.

Edge Strips: Edge strips must be installed at openings where thresholds have not been shown and the tile floor abuts other flooring materials at the same level. Edge strips must be installed centered under the closed door, or where there is no door, centered in the opening.

Sounding Tile: Tiled surfaces must be sounded with a metal bar or chain for improperly bonded tiles or setting beds. Tiles or setting beds that emit a hollow sound must be replaced.

Replacement: Cracked, chipped, broken, or otherwise defective tiles must be removed and replaced. All tiles that differ more than 1/16-inch in elevation from adjacent tile edges must be removed and replaced.

99-09315C(5)(h) Curing

After the installation of tile and the grouting of joints, the tile and grout must be cured by keeping the surface continuously damp for at least 72 hours. Curing materials must not stain the tile or grouted joints. Curing methods must not erode away the grout.

After grouting, horizontal tiled surfaces must be closed to traffic, and all tiled surfaces must be kept free from impact, vibration or shock for at least 72 hours.

Sealing Unglazed Quarry Tile: Sealer must be applied to unglazed quarry tile only. The sealer must be applied under the manufacturer's instructions.

99-09315C(6) Cleaning and Protection

Cleaning Tile Surfaces:

All exposed tile surfaces must be cleaned of all grout haze upon completion of grouting. Acids and chemicals used to clean tile must comply with the tile manufacturer's instructions. Cleaners must not be harmful to materials or surfaces of abutting floors, walls, and ceilings. Rinse tile work thoroughly with clean water before and after using acid or chemical cleaners. After cleaning and rinsing, polish tile surfaces using a soft cloth.

Tile work must be cleaned and polished immediately before Contract acceptance. All dirt, grime, stains, paints, grease, and other discoloring agents or foreign materials must be removed.

Protection: Tile surfaces damaged by construction operations must be retiled

99-09315D PAYMENT

Not Used

99-09614 DETECTABLE WARNING SURFACE

99-09614A GENERAL

99-09614A(1) Summary

This work consists of installing detectable warning surfaces.

99-09614A(2) Definitions

Not Used

99-09614A(3) Submittals

Submit manufacturer's descriptive data, color and texture samples, installation instructions, and warranty documentation. Submit 2 samples, each at least 6 by 6 inches.

99-09614A(4) Quality Assurance**Regulatory Requirements:**

2010 Americans with Disabilities Act Standards for Accessible Design, and 2004 ADAAG, Chapter 7, 705 "Detectable Warnings."

CBC, Section 11B-247 "Detectable Warnings and Detectable Directional Texture", and Section 11B-705 "Detectable Warnings and Detectable Directional Texture."

2022 California Reference Standard Code (CCR Title 24, Part 12), Chapter 12-11A and 12-11B "Building and Facility Access Specifications."

99-09614A(5) Warranty

The manufacturer must provide a 5-year warranty for the detectable warning surface, guaranteeing replacement when there is a defect in the dome shape, color fastness, conformation, sound-on-cane acoustic quality, resilience, and attachment. Begin warranty period upon Contract acceptance.

99-09614B MATERIALS**99-09614B(1) General**

Detectable warning surfaces must be listed on the Authorized Material List for detectable warning surfaces.

Detectable warning surface must be prefabricated, surface applied, truncated dome panels. Dimensions and spacing must be as shown. The color of the detectable warning must match color No. 33538 of AMS-STD-595.

When used, adhesives, fasteners, and sealant must comply with the manufacturer's instructions.

99-09614B(2) Delivery, Storage, and Handling

Deliver materials to the job site in the manufacturer's original and unopened containers that bear labels showing type of material. Package finished surfaces with protective wrappings to protect panels from residue before and during installation.

99-09614C CONSTRUCTION

Install securely under the manufacturer's installation instructions.

99-09614D PAYMENT

Not Used

99-096519 STATIC DISSIPATIVE TILE**99-096519A GENERAL****99-096519A(1) Summary**

Scope: This work consists of installing static dissipative tile.

Static dissipative tile consists of static dissipative tile, wall base, and accessories, supplied by same manufacturer and recommended primers and adhesives.

99-096519A(2) Definitions

Not Used

99-096519A(3) Submittals

Submit manufacturer's technical data, coving details, installation instructions, accessories, color and pattern samples must be submitted.

Samples of tile must be 12" x 12" in size.

Submit Safety Data Sheets (SDS) available for adhesives, moisture mitigation systems, primers, patching/leveling compounds, floor finishes (polishes) and cleaning agents and Material Information Sheets for flooring products.

99-096519A(4) Quality Assurance

Not used

99-096519B MATERIALS

Static dissipative vinyl tile must be semi-flexible, 1/8 inch minimum thickness, 12" x 12" tile complying with ASTM F 1066, Class 2. through pattern. Color and pattern must be as shown.

Wall base: 1/8 in. thick, 6 in. high wall base with a matte finish, conforming to ASTM F 1861, Type TP - Rubber, Thermoplastic, Group 1 - Solid, cove style.

Adhesives: Provide static dissipative tile adhesive with 2 in. wide x 24 in. long copper ground-connection strips for under the tile and wall base adhesive at the wall base as recommended by the flooring manufacturer

Accessories: Manufacture recommended accessories

Edger Strips: Edger strips must be commercial quality, stainless steel or aluminum.

99-096519C CONSTRUCTION

99-096519C(1) Preparation

Before placing adhesives, all surfaces to receive Static dissipative tile must be made free of localized depressions or bumps. Bumps must be ground flat. Holes, depressions, and cracks must be filled with crack filler or leveling compound.

Immediately prior to application of the tile flooring, the surface to be covered must be thoroughly dry, free of paint, oil, grease, mortar, plaster droppings, scaly surfaces, or other irregularities and must be broom clean. Primer, when recommended, must be thoroughly brushed on the surface at the rate recommended by the adhesive manufacturer and must be completely dry before the application of adhesives.

The rooms where tile is to be installed must be maintained at a temperature of at least 70°F for not less than 72 hours before installation, during installation and for 5 days after installation.

99-096519C(2) Application

Tile must be laid to a true, straight, smooth and even finished surface in accordance with the manufacturer's instructions. Joints must be tight fitting. Floor covering must be placed before floor mounted fixtures are installed. After tile has been set, the finished surface must be rolled and crossrolled with a roller weighing 100 pounds or more.

Where tile patterns between rooms differ, the pattern break at openings must occur at the centerline of the common wall.

Upon completion of the tile application, all stains, surplus adhesive, dirt and debris resulting from the work must be removed and the floor left broom clean. Tile must be protected from damage at all times during construction. As a last order of work, tile must be washed with soap and warm water, rinsed, and then polished under the tile manufacturer's instructions. Not less than 2 applications of wax must be placed on the tile flooring.

Patching Existing Tiled Floors:

Tile for patching existing floors must closely match the color and pattern of the existing adjacent floor tile, except tile of contrasting color and pattern may be used when authorized by the Engineer.

If the size of existing tile on floors which are to be patched can not be matched, enough existing tile must be removed to permit the installation of full sized 12" x 12" tiles. The limits of existing tile removal and new tile installation must be authorized by the Engineer.

Replacement of Existing Tile: Replacement of existing tile flooring where ordered by the Engineer is change order work.

99-096519D PAYMENT

Not Used

99-09661 VINYL COMPOSITION TILE

99-09661A GENERAL

99-09661A(1) Summary

Scope: This work consists of installing vinyl composition tile.

Vinyl composition tile consists of vinyl composition tile, edger strips, floor wax, and tile manufacturer's recommended primers and adhesives.

99-09661A(2) Definitions

Not Used

99-09661A(3) Submittals

Manufacturer's descriptive data, installation instructions, color and pattern samples must be submitted. Samples of tile must be 12" x 12" in size.

99-09661A(4) Quality Assurance

Not Used

99-09661B MATERIALS

Vinyl Composition Tile: Vinyl composition tile must be semi-flexible, 3/32-inch minimum thickness, 12" x 12" tile complying with ASTM F 1066, Type IV. Color and pattern must be as shown.

Primer, Leveling Compound Crack Filler and Adhesives: Primer, leveling compound crack filler and adhesives must be waterproof types as recommended by the tile manufacturer.

Wax: Wax must be water emulsion, self-polishing type containing not less than 16 percent wax solids, wetting agents, and a nonslip agent. The wax must meet UL antislip standards.

Edger Strips: Edger strips must be commercial quality, stainless steel.

99-09661C CONSTRUCTION

99-09661C(1) Preparation

Before placing adhesives, all surfaces to receive vinyl composition tile must be made free of localized depressions or bumps. Bumps must be ground flat. Holes, depressions, and cracks must be filled with crack filler or leveling compound.

Immediately prior to application of the tile flooring, the surface to be covered must be thoroughly dry, free of paint, oil, grease, mortar, plaster droppings, scaly surfaces, or other irregularities and must be broom clean. Primer, when recommended, must be thoroughly brushed on the surface at the rate recommended by the adhesive manufacturer and must be completely dry before the application of adhesives.

The rooms where tile is to be installed must be maintained at a temperature of at least 70°F for not less than 72 hours before installation, during installation and for 5 days after installation.

99-09661C(2) Application

Tile must be laid to a true, straight, smooth and even finished surface in accordance with the manufacturer's instructions. Joints must be tight fitting. Floor covering must be placed before floor mounted fixtures are installed. After tile has been set, the finished surface must be rolled and crossrolled with a roller weighing 100 pounds or more.

Edger strips must be installed at free edges.

Where tile patterns between rooms differ, the pattern break at openings must occur at the centerline of the common wall.

Upon completion of the tile application, all stains, surplus adhesive, dirt and debris resulting from the work must be removed and the floor left broom clean. Tile must be protected from damage at all times during construction. As a last order of work, tile must be washed with soap and warm water, rinsed, and then polished under the tile manufacturer's instructions. Not less than 2 applications of wax must be placed on the tile flooring.

99-09661D PAYMENT

Not Used

99-09670 FLUID-APPLIED URETHANE CEMENT RESINOUS FLOORING

99-09670A GENERAL

99-09670A(1) Summary

Scope: This work consists of installing fluid-applied urethane cement resinous flooring system with colored quartz aggregate broadcast finish and 6" integral formed epoxy cove base.

Related Work:

Section 99-03300 "Cast-in-Place Concrete":

1. Concrete sub-floor must be level (maximum variation not to exceed 1/4-inch in 10 feet) and to have a steel troweled finish. No curing agents or other additives which could prevent bonding must be used unless the mechanical surface preparation method used completely removes any curing agent residue or sealer.
2. Slab on grade must have an efficient puncture resistant vapor barrier a minimum thickness of 10 mils placed directly under the slab.

Section 99-07920 "Sealants"

Section 99-09250 "Gypsum Wallboard"

99-09670A(2) Definitions

UCRF: Urethane cement resinous flooring.

99-09670A(3) System Description

System must be 1/4-inch decorative, moisture vapor tolerant textured urethane modified cement system blended with a variety of graded silica, or ceramic fillers to form a slip-resistant surface. The system must be finished with clear catalyst-cured coats of epoxy, polyaspartic or urethane resin in a satin finish.

System must reduce porosity and produce a dense, skid-inhibiting sanitary finish that minimizes bacterial growth, dirt and chemical penetration. The decorative quartz aggregates are in pre-blended patterns or solid colors.

99-09670A(4) Submittals

Product Data: Submit manufacturer's descriptive data, surface preparation requirements, application instructions and maintenance instructions.

Colors, Textures and Finishes: Provide manufacturer color selection chart for Engineer's approval and selection.

Samples: Submit minimum 12" x 12" cured samples of flooring system indicating color, pattern and non-skid properties. Approved samples will be used during installation for product match.

Certificate of Compliance: Submit manufacturer's certificate of compliance certifying flooring system complied with requirements for the intended application.

Shop Drawings: Submit shop drawings showing installation of cove base, termination details and details at floor material transitions and where adjoining equipment.

1. Locate and provide written detailing of treatment for all types of concrete substrate joints and repair of cracks required for flooring in area of installation.

Applicator's Qualification: Submit applicator's qualification of minimum of 3 years' experience in work of similar nature and scope, and approved by the manufacturer of the floor surfacing materials.

Manufacturer Warranty: Submit manufacturer issued full one-year warranty against defects in materials.

Applicator Warranty: Submit applicator issued full one-year warranty against defects of materials and installation.

99-09670A(5) Quality Control and Assurance

Single Source Responsibility: Material used in the floor surfacing must be the products of a single manufacturer.

Applicator Qualification: Applicator must be trained or approved by floor surfacing manufacturer, and have a minimum of 3 years' experience.

Joints Locations: Verify location of all joints required by Section 99-03300 and by the manufacturer's recommendations.

Pre-application Meeting: Convene a pre-application meeting two weeks before start of application of floor systems. Require attendance of parties directly affecting work of this section, including Engineers, applicator, and manufacturer's representative.

99-09670A(6) Project Conditions

Room Condition: The ambient room and the floor temperatures must maintain at 60°F, or above, for a period extending from 72 hours before, during and 24 hours after floor installation. Concrete to receive surfacing must have cured for a least 28 days and must have been free of water for at least 7 days.

Dew Point: Substrate temperature must be minimum of 5 degrees above dew point prior to, during or up to 24 hours after application of flooring system.

Illumination: Flooring system must be applied only where a minimum of 30 foot-candles exist when measured 3 feet from surface.

Advise other trades of fixtures and fittings not to be installed until flooring is cured and protected.

99-09670A(7) Protection

Protect adjacent surfaces not scheduled to receive the flooring by masking, or by other means, to maintain these surfaces free of the flooring material.

Provide adequate ventilation and fire protection at all mixing and placing operations. Prohibit smoking or use of spark or flame producing devices within 50 feet of any mixing or placing operation.

Provide polyethylene or rubber gloves or protective creams for all workmen engaged in applying products.

99-09670A(8) Product Delivery, Storage, and Handling

Deliver all materials to project site in original manufacturer's sealed containers including type of material, batch numbers, date of manufacture, and pertinent labels intact and legible.

Store materials in dry protected area at a temperature between 60°F to 80°F.

Follow all manufacturer's specific instructions and prudent safety practices for storage and handling.

99-09670B MATERIALS

Urethane cement resinous flooring: Urethane cement resinous flooring must be heavy duty, three-component urethane resin modified cementitious topping broadcast with colored quartz aggregate and sealed with chemical resistant clear epoxy, not less than 1/4 inch thick. Color and pattern must be selected by Engineer.

Urethane cement resinous flooring must be a product for commercial use complying with the following:

ASTM C 307	Tensile Strength: 1,100 psi
ASTM C 531	Coefficient of Thermal Expansion: 2×10^{-5} per °F
ASTM C 579	7 days Compressive Strength: 7,500 psi
ASTM C 580	Flexural Strength: 2,600 psi
ASTM C 884	Thermal Shock Resistance: Pass

ASTM D 635	Flammability: Self Extinguishing
ASTM D 1308	Chemical Resistance: strong chemicals including acids, alkali and solvents
ASTM D 2240	Hardness: 80-85 Shore D
ACI COMM #403	Bond Strength: 100% concrete failure minimum, with 300 psi minimum tensile strength
MIL D 3134F	Impact Resistance: Withstands 16 ft/lbs without cracking, delamination or chipping
MIL F 52505	Fungus & Bacteria Growth: Will not support growth
Density	125-130 lbs/ft ³

Mixing: A complete three component unit consisting of reactive urethane ingredients and selected fillers and aggregates. Components are thoroughly blended according to manufacturer's recommendations.

Slip-Resistant Cleanable Textured Finish: Color and pattern to be selected by Engineer.

Coved Base: 6-inch integral coved base or as shown.

99-09670C CONSTRUCTION

99-09670C(1) Preparation

All surfaces to receive flooring must be made free of localized depressions or bumps. Bumps must be ground flat. Holes, depressions and cracks must be filled with crack filler or leveling compound.

Surface must be thoroughly dry, free of paint, oil, grease, mortar, plaster droppings, scaly surfaces, or other irregularities and must be broom clean.

Concrete: Concrete slab must be tested for moisture content and moisture vapor emission rate. Flooring must not be installed over concrete until the concrete has been cured and is sufficiently dry to achieve permanence with flooring as determined by material manufacturer's recommended bond and moisture tests.

Effectively remove concrete laitance by steel shop blasting or by diamond grinding with coarse stones. Surface profile must be a minimum CSP-3-CSP-5 profile according to International Concrete Repair Institute (ICRI) Technical Guideline No. 03732.

Concrete slab must have an efficient puncture-resistant moisture vapor barrier 10 mils thick minimum directly under the concrete slab. Do not use vapor barrier manufactured with recycled material. Testing must be done to verify that the moisture vapor emission rate of the slab does not exceed that as recommended by the manufacturer at time of installation of the flooring. Moisture vapor emission and moisture content testing must conform with the requirements of ASTM F-1869 (Calcium Chloride Test) and ASTM F-2170 (Relative Humidity Probe Test). If any test results shows excessive level of moisture content or vapor emission rate, apply manufacturer's recommended moisture vapor emission control material based on the highest reading.

Cracks in concrete must be treated using manufacturer's recommended practice. Crack must be rout out and fill with flooring materials. Do not coat surface with flexible crack isolation membrane treatment unless approved by flooring system of this section.

All free edges (perimeters or along gutters or drains) may require extra anchor to distribute mechanical and thermal stresses. All expansion joints and cold joints must be exposed through the system.

Exception: Control joints (saw cuts) may be filled with rigid epoxy or flooring materials of this section, reinforced with fiberglass cloth, and covered with flooring system of this section.

99-09670C(2) Installation

Install all floor materials in strict conformance with manufacturer's instructions.

Integral Cove Base: Provide integral epoxy cove base or cant formed from flooring up concrete wall or cement board if gypsum wall board is specified. Provide cove base cap trip at top of base as

recommended by flooring manufacturer and trowel material up wall to form smooth, integral transition and base 6 inches high unless otherwise indicated or schedule.

Apply temporary protection until floor is fully cured. Finished floor must be protected from the time that work is completed.

99-09670D PAYMENT

Not Used

99-09680 CARPETING

99-09680A GENERAL

99-09680A(1) Summary

Scope: This work consists of installing carpeting.

99-09680A(2) Definitions

Not Used

99-09680A(3) Submittals

Product Data: Submit manufacturer's descriptive data for carpet, pattern line, carpet cushion and adhesives, and installation instructions. Submit the manufacturer's standard colors for color selection.

Samples: Samples must include individual samples of each carpet and carpet cushion to be installed. After the color and pattern have been authorized, submit one sample at least 24 by 24 inches of the (1) carpet and (2) carpet cushion.

Maintenance Instructions: Submit the manufacturer's instructions for maintenance of the installed carpet. Include methods and frequency for maintaining optimum condition under anticipated traffic and use conditions.

99-09680A(4) Quality Assurance

Single Source Responsibility: Materials must be produced by a single manufacturer for each type of carpet.

99-09680B MATERIALS

99-09680B(1) General

Carpeting and carpeting materials must be rated by the manufacturer as suitable for heavy pedestrian traffic and as suitable for use under chairs with casters.

99-09680B(2) Delivery, Storage, and Handling

Materials must be delivered to the job site in original factory wrappings and containers, clearly labeled with manufacturer, brand name, quality or grade, fire hazard classification, and lot number.

Materials must be stored in original undamaged packages and containers inside well ventilated area protected from weather, moisture, soiling, extreme temperatures, and humidity.

99-09680B(3) Carpet

Carpet must be third generation nylon, continuous filament yarn with a woven polypropylene backing. Yarn must be solution dyed. Carpet construction must be textured loop, 1/8-inch gauge minimum, with pile height between 5/32 to 1/4 inch, and a yarn weight of at least 28 ounces per square yard. Carpet must be permanently anti-static.

99-09680B(4) Carpet Accessories

Carpet Cushion: Carpet cushion must be closed cell foamed rubber sheet, made from styrene-butadiene rubber, at least 5/32 inch thick, and weighing at least 62 ounces per square yard. Cushion must have a top and bottom facing that will prevent liquid from being absorbed into the cushion.

Adhesives:

Carpet cushion to floor adhesive must be pressure sensitive adhesive per the cushion manufacturer's instructions.

Carpet to carpet cushion adhesive must be a premium quality, multi-purpose carpet adhesive, compatible with the carpet backing and per the carpet cushion manufacturer's instructions.

Primer, Sealant, Leveling Compound and Crack Filler: Primer, sealant, leveling compound and crack filler must be per the carpet cushion manufacturer's instructions.

Seaming Adhesive: Hot-melt seaming adhesive or similar product per the carpet cushion manufacturer's instructions. Use for taping seams and butting cut edges at backing to form secure seams and to prevent pile loss at seams.

Edge Strips: Edge strips must be commercial quality stainless steel or aluminum.

99-09680C CONSTRUCTION

99-09680C(1) General

Protect the carpet from heavy traffic or wear for 24 hours after installation.

Furnish protective methods and materials to ensure that carpeting will be without deterioration or damage until Contract acceptance.

99-09680C(2) Preparation

Surfaces to receive carpet must be free of cracks, localized depressions and bumps. Bumps must be ground flat and holes, depressions, and cracks must be filled with leveling compound or crack filler.

Before installing carpet and carpet cushion, the surface must be dry broomed clean and free from paint, oil grease, mortar, plaster droppings, wax, or other materials that will interfere with the adhesives.

New concrete must be cured for at least 30 days and be free from parting or curing compound that interfere with the adhesives. Concrete surfaces must be checked for dusting. Sealer must be applied to dusting concrete surfaces.

Carpet, carpet cushion and adhesives must be stored at a temperature of at least 65 degrees F and a humidity of not more than 65 percent for at least 24 hours before installation. Locations where carpet is to installed must be maintained between 65 to 90 degrees F for at least 72 hours before and for 5 days following installation.

99-09680C(3) Installation

Applying Primer or Sealer: Primer or sealer must be thoroughly brushed on the surface under the adhesive manufacturer's instructions and must be thoroughly dry before application of adhesives.

Installing Cushion:

Install carpet cushion onto a continuous film of adhesive. Apply adhesive under the manufacturer's instructions. Cushion must be installed in the longest length possible with consideration for traffic patterns and seam placement.

When cushion adhesive is tacky, place cushion onto the adhesive and adjust as necessary to ensure there is no gap at seams and full contact is made with adhesive. Air bubbles must be smoothed out to provide a level surface.

Installing Carpet:

Install carpet, including seaming techniques and seaming cement, under the carpet manufacturer's instructions.

Spread the carpet full width on cushion for 24 hours before installation.

Trim seam edges using appropriate seam cutting tools before applying adhesives. Seams must not be cut where cutting tools will penetrate the carpet cushion. Carpet seams must be at right angles to the cushion seams and not directly over the cushion seams.

Spread carpet adhesive uniformly over the cushion under the manufacturer's instructions. After sufficient time, carpet must be firmly pressed into the adhesive using a roller weighing approximately 50 pounds to ensure carpet has full contact with adhesive. Carpet must be rolled in both directions.

Install carpet in wall to wall continuous lengths with widths as wide as possible. True cut edges and treat edges to form non-raveling seams where exposed. Trim excess carpet to the wall using a wall trimmer adjusted to net trim.

Where carpet patterns or floor finish between rooms differ, pattern or material break must occur at the centerline of the common wall, except at door openings the break must occur at the centerline of the closed door.

Install edge strips at free edges.

99-09680C(4) Cleaning

Debris and unusable scraps must be removed. Carpet must be vacuumed using a commercial machine with face-beater element.

Soiled spots, excessive adhesive or other unsightly material on the carpet must be removed under the carpet manufacturer's instructions. Where spots cannot be removed, replace the carpet. Trim protruding face yarns using sharp scissors.

99-09680C(5) Extra Materials

After completion of the work, at least 2 percent of each type and color of carpet and cushion, as well as usable scraps, must be delivered to the Engineer at the job site.

99-09680D PAYMENT

Not Used

99-09900 PAINTING

99-09900A GENERAL

99-09900A(1) Summary

Scope: This work consists of preparing surfaces to receive coatings and applying coatings.

The coatings specified in this section are in addition to any factory finishes, shop priming, or surface treatment described.

99-09900A(2) Definitions

Detergent Wash: Removal of dirt and water-soluble chemicals by scrubbing with a solution of detergent and water, and removal of all solution and residues with clean water.

Hand Cleaning: Removal of dirt, loose rust, mill scale, excess base material, filler, aluminum oxide, chalking paint, peeling paint, or paint that is not firmly bonded to the surfaces by using hand or powered wire brushes, hand scraping tools, power grinders, or sandpaper and removal of all loose particles and dust prior to coating.

Mildew Wash: Removal of mildew by scrubbing with a solution of detergent, hypochlorite-type household bleach, and warm water, and removal of all solution and residues with clean water.

Abrasive Blasting:

Removal of loosely adhering paint, dirt, rust, mill scale, efflorescence, weak concrete, or laitance, must be by the use of airborne abrasives. Loose particles, dust, and abrasives must be removed by blasting with clean, oil-free air.

Abrasives must be limited to mineral grit, steel grit, or steel shot, and must be graded to produce the surface profile recommended in the manufacturer's data sheet.

Steam Cleaning: Removal of oil, grease, dirt, or other foreign matter by using steam generated by commercial steam cleaning equipment, from a solution of water and steam cleaning compounds, and removal of all residues and cleaning compounds with clean water.

TSP Wash: Removal of oil, grease, dirt, paint gloss, and other foreign matter by scrubbing with a solution of trisodium phosphate and warm water, and removal of all solution and residues with clean water.

Water Blasting: Removal of dirt, loose scale, chalking, or peeling paint by low-pressure water cleaning. Water blasting must be performed under NACE WJ-4. Equipment used must have a minimum flow rate of 1.5 gpm. If a detergent solution is used, it must be biodegradable and must be removed from all surfaces with clean water.

99-09900A(3) Submittals

Product Data:

Manufacturer's descriptive data, a materials list, and color samples must be submitted.

Product descriptive data must include product description, manufacturer's instructions for product mixing, thinning, tinting, handling, site environmental requirements, product application, and drying time.

Materials list must include manufacturer's name, trade name, and product numbers for each type coating to be applied.

Samples: Submit color samples. Samples must be manufacturer's color cards, nominally 2 by 3 inches for each color of coating shown. Color samples for stains must be submitted on wood of the same species, color, and texture as the wood to receive the stain.

Certificates of Compliance: Submit certificates of compliance for products required to comply with SSPC standards.

99-09900A(4) Quality Assurance

Regulatory Requirements: Coatings and applications must comply with the rules for control of VOC emissions adopted by the AQMD in the air basin in which the coatings are applied.

99-09900A(5) Site Environmental Requirements

Coatings must be applied under the environmental constraints specified in the manufacturer's instructions. These conditions must be maintained until the coating has cured and is ready for recoat.

Continuous ventilation must be provided during application of the coatings.

Adequate lighting must be provided while surfaces are being prepared for coatings and during coating applications.

99-09900A(6) Maintenance Stock

Upon completion of coating work, deliver a full one-gallon container of each type and color of finish coat and stain used to the Engineer. Containers must be tightly sealed, have the manufacturer's standard product label, and be labeled with color, texture, and room locations where used.

99-09900B MATERIALS

99-09900B(1) General

Products for each coating system must be from a single manufacturer and must comply with the Detailed Performance Standards of the Master Painters Institute (MPI). Each product must be shown on the MPI Approved Products List unless otherwise specified.

99-09900B(2) Delivery, Storage, and Handling

Products must be delivered to the site in sealed, labeled containers and stored in a well-ventilated area at an ambient air temperature of at least 45 degrees F. Container labeling must include manufacturer's name, type of coating, trade name, color designation, drying time, and instructions for tinting, mixing, and thinning.

99-09900C CONSTRUCTION

99-09900C(1) Inspection

Coatings must not be applied until surface preparation has been accepted by QC and authorized by the Engineer. Notify the Engineer at least 3 business days before application of coatings.

99-09900C(2) Surface Preparation

Prepare surfaces for coating under the coating manufacturer's instructions unless otherwise specified.

Remove hardware, cover plates, light fixture trim, and similar items before preparing surfaces for coating. Following the application of the finish coating, the removed items must be reset in their original locations.

Wood:

Lightly sand exterior surfaces no more than 24 hours before applying coatings.

Apply a sealer under the coating manufacturer's instructions to knots, sap, pitch, tar, creosote, and other bleeding substances.

After applying the prime coat, all nail holes, cracks, open joints, dents, scars, and surface irregularities must be filled, hand cleaned, and spot primed to provide smooth surfaces before applying finish coats.

Irregularities in wood surfaces to receive a transparent stain finish must be filled and hand cleaned after the first coat of stain has been applied. The color of the filler must match the color of the stained wood.

Irregularities in wood surfaces to receive a clear finish must be filled and hand cleaned before applying coatings. The color of the filler must match the color of the coated wood.

Galvanized Metal:

Oils, grease, and fabrication lubricant must be removed by solvent wash.

New surfaces must be roughened by hand sanding or light abrasive blasting using an abrasive no larger than 30 mesh. Galvanizing must not be removed during cleaning or roughening.

Damaged or corroded areas must be cleaned and given 2 spot applications of a coating that complies with the Detailed Performance Standards of the MPI, and listed on MPI List "Number 18, Primer, Zinc Rich, Organic."

Steel and Other Ferrous Metals: Surface must be cleaned and prepared under SSPC-SP 6 as needed to ensure surface is free of rust, mill scale, and contaminants. Surface profile must be a minimum of 1.5 mils.

Aluminum and Other Non-ferrous Metals: Surface must be cleaned under SSPC-SP 1.

Gypsum Board: Holes, cracks, and other surface imperfections must be filled with joint compound or suitable filler before applying coatings. Taped joints and filled areas must be hand sanded to remove excess joint compound and filler.

Cement Plaster: New plaster must be cured at least 14 days before coating. Cracks, holes, and surface imperfections must be filled with patching plaster and hand textured to match adjacent surfaces.

99-09900C(3) Application

Coatings must be applied under the manufacturer's instructions and at the application rates recommended by the manufacturer to achieve the dry film thickness stated in the coating technical data sheet.

Mixing, thinning and tinting must comply with the manufacturer's instructions. After thinning, the coating must comply with the regulatory requirements.

Coatings must be applied only when surfaces are dry and properly prepared.

Cleaning and painting must be scheduled so that dust and other contaminants from the cleaning process do not fall on wet, newly coated surfaces.

Materials required to be coated must have coatings applied to all exposed surfaces, including the tops and bottoms of wood and metal doors, the insides of cabinets, and other surfaces not normally visible from eye level.

Surface Finish Application:

Each coat must be applied to a uniform finish. Finished surfaces must be free of surface deviations and imperfections such as skips, cloudiness, spotting, holidays, laps, brush marks, runs, sags, curtains, ropiness, improper cutting in, overspray, drips, ridges, waves, and variations in color and texture.

Each application of a multiple application finish system must closely resemble the final color coat, except each application must provide enough contrast in shade to distinguish the separate applications.

Work Required Between Applications:

Each application of material must be cured under the coating manufacturer's instructions before applying the next coating.

Enamels and clear finishes must be lightly sanded, dusted, and wiped clean between applications.

Stain blocking primer must be spot applied whenever bleeding substances are visible through the previous application of a coating.

Timing of Applications: The first application of the coating system must be during the same work shift that the final surface preparation was performed. Additional coats must be applied as soon as the required drying time of the preceding coat, specified in the coating manufacturer's instructions, has been met.

Application Methods:

Coatings must be applied by brush, roller or spray. Rollers must not leave a stippled texture in the paint film. Extension handles for rollers must not be greater than 6 feet in length.

If spray methods are used, surface deviations and imperfections such as overspray, thickness deviations, lap marks, and orange peel must be considered as evidence the work is unsatisfactory and you must apply the remainder of the coating by brush or roller, as authorized by the Engineer.

Back Priming: The first application of the coating system must be applied to all wood surfaces (face, back, edges, and ends) of wood materials that are not factory coated, immediately upon delivery to the job site. Surfaces of interior finish woodwork that adjoin concrete or masonry must be coated with one application of exterior wood primer before installation.

Patches in Previously Coated Surfaces: Where patches are made on surfaces of previously coated walls or ceilings, the entire surface to corners on every side of the patch must be coated with at least 1 application of the finish coat.

Finishing Mechanical and Electrical Components:

Shop primed mechanical and electrical components must be finish coated under the coating system specified for the substrate material. Louvers, grilles, covers, and access panels on mechanical and electrical components must be removed and coated separately.

Interior surfaces of air ducts which are visible through grilles or louvers must be coated with one application of flat black enamel, to the limit of the sight line.

Conduit, piping, and other mechanical and electrical components visible in the finished work must be painted.

Both sides and all surfaces, including edges and back of wood mounting panels for electrical and telephone equipment must be finish coated before installing equipment.

99-09900C(4) Cleaning

Upon completion of all operations, the coated surfaces must be thoroughly cleaned of dust, dirt, grease, or other unsightly materials or substances.

Surfaces marred or damaged as a result of your operations must be repaired, to match the condition of the surfaces before the beginning of your operations.

99-09900C(5) Protection

Provide protective devices, such as tarps, screens or covers, as necessary to prevent damage to the work and to other property or persons from all cleaning and painting operations.

Paint or paint stains on surfaces not designated to be painted must be removed at your expense and the original surface must be restored.

99-09900C(6) Coating System

The surfaces to be coated must be as described. When a coating system is not described for a surface to be finish coated, use the coating system as specified below for the substrate material. The number of applications specified for each coating system specified is a minimum. Additional coats must be applied if necessary to obtain a uniform color, texture, appearance, or required dry film thickness.

SYSTEM 1 - ALUMINUM AND OTHER NON-FERROUS METALS

2 Finish Coats:

Semi-Gloss: Light Industrial coating, Water Based, Exterior, MPI Gloss Level 5, MPI List Number 163

SYSTEM 2- CEMENT PLASTER One Prime Coat:

Primer: Alkali Resistant, Water Based, MPI List Number 3

2 Finish Coats:

Semi-Gloss: Latex, Exterior, MPI Gloss Level 5, MPI List Number 11

SYSTEM 3 - GALVANIZED METAL

One Pretreat Coat: Vinyl wash pretreatment.

One Prime Coat: Galvanized metal primer.

2 Finish Coats:

Semi-Gloss: Light Industrial coating, Water Based, Exterior, MPI Gloss Level 5, MPI List Number 163

SYSTEM 4- GYPSUM BOARD

One Prime Coat:

Primer Sealer: Latex, Interior, MPI List Number 50

2 Finish Coats:

Semi-Gloss: Latex, Interior, MPI Gloss Level 5, MPI List Number 54

SYSTEM 5 - STEEL AND OTHER FERROUS METALS, NON-CORROSIVE ENVIRONMENT

VISIBLE IN FINISHED WORK:

2 Prime Coats:

Shop Primer: Coating meeting the requirements of SSPC-Paint 15

Field Primer: Rust Inhibitive, Water Based, MPI List Number 107

2 Finish Coats:

Semi-Gloss: Light Industrial coating, Water Based, Exterior, MPI Gloss Level 5, MPI List Number 163

NOT VISIBLE IN FINISHED WORK:

2 Prime Coats:

Shop Primer: Coating meeting the requirements of SSPC-Paint 15

Field Primer: Rust Inhibitive, Water Based, MPI List Number 107

SYSTEM 6 - WOOD, CLEAR FINISH

2 Finish Coats:

Semi-Gloss: Varnish, Waterborne, Clear, MPI List Number 129

SYSTEM 7 - WOOD, PAINTED

1 Prime Coat:

Primer: Latex for Exterior Wood, MPI List Number 6

2 Finish Coats:

Semi-Gloss: Latex, Exterior, MPI Gloss Level 5, MPI List Number 11

99-09900C(7) Color Schedule

Colors must be as shown.

99-09900D PAYMENT

Not Used

99-09953 FIBERGLASS REINFORCED PLASTIC PANELS

99-09953A GENERAL

99-09953A(1) Summary

Scope: This work consists of installing FRP panels and trim molding.

99-09953A(2) Definitions

FRP: fiberglass reinforced plastic.

99-09953A(3) Submittals

Submit manufacturer's descriptive data, installation instructions, shop drawings, and finish options.

Installation instructions must show the FRP panel manufacturer's method of installation.

Shop Drawings must show layout, profiles and product components, including anchorage, accessories, finish colors, patterns and textures. Indicate location and dimension of joints and fastener attachment.

Submit the manufacturer's standard color palette for FRP panels and trim molding. Color will be selected from the manufacturer's standard color palette by the Engineer.

99-09953A(4) Quality Assurance

Installer Qualifications: Installer must have a minimum of 5 years' experience with composite wall panel work similar in scope and size to this project.

Field measurements: Verify actual measurements and opening by field measurements before fabrication; show recorded measurements on shop drawings. Coordinate field measurements and fabrication schedule with construction progress to avoid construction delays.

Wall and openings must be level, plumb, straight, in-line and square.

99-09953A(5) Site Condition

Installation must not begin until building is enclosed, permanent heating and cooling equipment is in operation and residual moisture from plaster, concrete work has dissipated.

Install panels between 60°F - 75°F and relative humidity below 55% ideally at the same conditions as the room's normal operating temperatures after building is occupied.

Provide ventilation to disperse fumes during application of adhesive as recommended by adhesive manufacturer.

Do not install wall system until normal lighting conditions exist. Normal lighting conditions are described as those in place when the project is finished.

99-09953A(6) Warranty

Manufacturer's Warranty: Submit manufacturer's standard limited warranty executed by authorized company official covering two years commencing on date of work completion to be free of substantial defects in material and workmanship.

99-09953B MATERIALS

FRP Panels: FRP panels must have a Class A flame-spread rating and minimum nominal thickness of 0.090 inch. FRP panels must be Marlite Induro Class A FRP; NUDO FiberLite Class A FRP; Crane Varietex Class A FRP; or equal.

Trim Molding: Trim molding must be the FRP manufacturer's standard PVC (polyvinyl chloride) molding with sufficient width to receive panels and sealant.

Adhesives and Sealants: Adhesives and sealants must be per the FRP panel manufacturer's instructions.

Fasteners: Provide appropriate fasteners and accessories as required to properly complete installation.

99-09953C CONSTRUCTION**99-09953C(1) Preparation**

Comply with the instructions and recommendations of the FRP panel manufacturer.

Site Verification of Conditions: Verify substrate conditions, which have been previously installed are acceptable for product installation in accordance with manufacturer's instructions. Do not proceed with FRP installation until unacceptable conditions are corrected.

Prior to installing FRP, remove packaging and allow FRP to acclimate to room temperature and humidity for at least 48 hours.

Inspect FRP for any defects immediately. Do not install FRP of unacceptable quality. Field cutting must be accomplished using a circular saw with fine tooth carbide blade.

99-09953C(2) Installation

Install the FRP panels and trim molding under the manufacturer's installation instructions.

FRP panels must be one continuous piece along each wall unless the wall length exceeds the manufacturer's standard panel length. If more than one panel piece is used on one wall, the panels must be approximately equal length and at least 4 feet in length.

99-09953C(3) Clean-up

Protect adjacent surfaces from adhesive and sealant. Remove excess adhesive and sealant as the installation progresses using a solvent or cleaning agent under the FRP panel manufacturer's instructions.

99-09953D PAYMENT

Not Used

99-09957 ACOUSTIC CEILING TILE

99-09957A GENERAL

99-09957A(1) Summary

Scope: This work consists of installing acoustic ceiling tile.

99-09957A(2) Definitions

Not Used

99-09957A(3) Submittals

Submit manufacturer's descriptive data and installation instructions. Submit the manufacturer's standard color palette for acoustic tiles. After the texture and color have been authorized, submit 2 samples.

99-09957A(4) Quality Assurance

Single Source Responsibility: Obtain acoustic ceiling tile from a single manufacturer.

99-09957B MATERIALS

Acoustic Ceiling Tile: Acoustic ceiling tile must be 12 by 12 inches, at least 5/8-inch thick, with square edges, nondirectional natural fissured texture, and a factory-applied, washable, off-white vinyl latex finish. Tile must comply with ASTM E1264, Type III, Form 2. Tile must have a Noise Reduction Coefficient of at least 0.65. Tile must have a Class A flame spread rating.

Adhesives: Adhesives must be per the acoustic ceiling tile manufacturer's instructions.

Acoustical Sealant: Acoustical sealant must comply section 99-07920.

99-09957C CONSTRUCTION

Surfaces to receive acoustic ceiling tile must be clean, dry, and level and must be prepared under the adhesive manufacturer's instructions.

Install acoustic ceiling tile under the manufacturer's instructions. Install tile only when the ambient room temperature is between 55 and 95 degrees F.

Upon completion of the suspended ceiling work, one unopened carton of acoustical ceiling tile must be delivered to the Engineer at the job site.

99-09957D PAYMENT

Not Used

99-09959 SUSPENDED CEILINGS

99-09959A GENERAL

99-09959A(1) Summary

Scope: This work consists of installing suspended ceilings.

Suspended ceilings consist of lay-in acoustical ceiling panels and an exposed grid suspension system. Listed fire rated assemblies must be installed where shown.

Design Requirements:

The suspension system must be designed to support the weight of ceiling panels, lighting fixtures, air terminals, service assemblies and such other items, not mentioned, that are supported by the suspended ceiling system.

The deflection of any component of the suspension system must not exceed 1/360 of the span.

The suspension system must be designed for seismic restraint complying with ASTM E 580.

Lighting fixture attachments must be designed for a capacity of 100 percent of the lighting fixture weight acting in any direction.

99-09959A(2) Definitions

Not Used

99-09959A(3) Submittals

Submit manufacturer's descriptive data and installation instructions. Submit shop drawings of all supporting details, lighting fixture attachments, lateral force bracing, partition bracing, and runner and panel layouts.

99-09959A(4) Quality Assurance

Single Source Responsibility: Obtain acoustic panels from a single manufacturer.

99-09959B MATERIALS

Acoustical Panels: Acoustical panels must be 24 by 48 inches, at least 5/8-inch thick, with square edges, with **non-directional natural fissured, random perforated** surface texture and a factory-applied, washable, off-white vinyl latex finish. Panels must comply with ASTM E1264, Type III, Form 2. Panels must have a Noise Reduction Coefficient of at least 0.65. Panels must have a Class A flame spread rating.

Suspension System: Suspension system must be galvanized steel, tee shaped main runners and cross runners and wall molding angles or channels complying with ASTM C635, intermediate duty or heavy duty. Runners must have exposed flanges approximately 1-inch wide and positive interlocks between main runners and cross runners. Wall moldings must have a 3/4-inch wide exposed face. Runners and moldings must be bonderized and must have a flat off-white color, factory painted finish unless otherwise shown.

Wire Hangers: Wire hangers must be 12-gauge minimum, galvanized, soft-annealed, mild steel wire.

Assembly Devices, Splices, Intersection Connectors and Expansion Devices: Assembly devices, splices, intersection connectors and expansion devices must be per the suspension system manufacturer's instructions.

Acoustical Sealant: Acoustical sealant must comply with section 99-07920.

99-09959C CONSTRUCTION**99-09959C(1) General**

Not Used

99-09959C(2) Installation

Install the suspended ceiling square, level and true under the authorized shop drawings, the manufacturer's instructions, and under ASTM C636, E 580, and UBC Standard No. 25-2.

Hangers for the suspension system must be spaced at not more than 48 inches on centers and must be saddle tied or wrapped around the main runner members.

Except as described, all lighting fixtures, air terminals, services or other ceiling supported items must be positively attached to the suspension system.

Lighting fixtures, air terminals, services or other items weighing less than 56 pounds must also have two 12-gauge hangers connected from the housing of the fixture, terminal, service or other items to the structure above. These hanger wires may be slack.

Lighting fixtures, air terminals, services or other items weighing more than 56 pounds must be supported directly from the structure above.

The ceiling must be leveled to within 1/8 inch in 12 feet.

99-09959C(3) Maintenance Stock

Upon completion of the suspended ceiling work, one unopened carton of acoustical panels must be delivered to the Engineer at the job site.

99-09959D PAYMENT

Not Used

99-10 SPECIALTIES

99-10162 METAL TOILET PARTITIONS

99-10162A GENERAL

99-10.04A(1) Summary

Scope: This work consists of installing metal toilet partitions.

99-10162A(2) System Description

Metal toilet partitions consists of panels, doors, pilasters and shoes, headrails, urinal screens, fasteners, anchorages, and hardware. Internal reinforcement must be provided at all fasteners, anchorages, hardware, and accessories.

Doors, panels, pilasters, and urinal screens must be stainless steel with a No. 4 satin finish.

99-10162A(3) Definitions

Not Used

99-10162A(4) Submittals

Manufacturer's descriptive data, catalog cuts, and installation instructions must be submitted.

Submit shop drawings that show the plan layout, door and panel elevations, and all details required for the complete installation and anchorage of the partition system.

99-10162B MATERIALS

Doors and Panels:

Doors and panels must be flush, one-inch thick, formed of two 0.030-inch (22-gage) Type 304 stainless steel sheets over a honeycomb core. Doors and panels must have formed edges sealed with a continuous oval crown locking strip, and must be mitered, welded, and finished at the corners.

Doors must have controlled action hinges, with vertical pintle and ball bearing roller operating on adjustable cams, or moving parts of nylon and stainless steel. Top pivots must be recessed into edges of doors.

Doors must be provided with slide bar latch and a combination coat/hat hook and door stop, except as otherwise specified.

Doors on stalls designated as accessible must be furnished with an automatic door closing device and U-shaped door pulls, located immediately below the latch on the inside and outside of the door.

Pilasters: Pilasters must be 1-1/4 inches thick, of the same construction as the doors and panels, except face sheets must be 0.036-inch (20-gage) minimum thickness, with adjustable, leveling base.

Headrails: Headrails must be anodized aluminum, 1" x 1-1/2" minimum, with exposed ends capped.

Urinal Screens: Urinal screens must be wedge type, wall-mounted, and of the same construction as the doors and panels, except face sheets must be 0.040-inch (20-gage) minimum thickness. All fasteners must be concealed.

Fasteners and Anchorages: Fasteners and anchorages must be stainless steel with vandal resistant heads.

Hardware: Hardware must be highly polished chromium plated, cast alloy, or heavy duty anodized aluminum.

Pilasters Anchors: Pilasters anchors must be integral stud anchor type or internally threaded expansion sleeve type with single cone expander. Self-drilling type anchorage must not be used.

Pilaster Shoes: Pilaster shoes must be one-piece, stainless steel, with concealed hold down clips, and of sufficient height to completely cover the base and anchors.

99-10162C CONSTRUCTION

99-10162C(1) Installation

Metal toilet partitions must be installed rigidly, securely, plumb, true, and under the manufacturer's instructions. Tops and bottoms of doors must align with tops and bottoms of panels, and all horizontal lines must be level.

Blocking must be provided in walls to receive anchorages.

Panels must be anchored with at least 3 brackets at each wall and pilaster. Two anchors must be used to fasten each pilaster base to the floor.

Doors must not bind during opening and closing. The clearance between the door edges and pilasters must be uniform, equidistant, and must not exceed 3/16 inch. Hinges must be adjusted to hold doors ajar when unlatched. Doors on stalls designated as accessible must return to the closed position.

Drilling, cutting, and fitting of wall and floor finishes must be concealed by the completed installation.

99-10162C(2) Clean-up

Toilet partitions must be cleaned, polished, and free of all defects. Chipped, dented, scratched, or otherwise damaged work must be replaced at your expense.

99-10162D PAYMENT

Not Used

99-10443 METAL SIGNS

99-10443A GENERAL

99-10443A(1) Summary

Scope: This work consists of installing metal signs.

99-10443A(2) Definitions

Not Used

99-10443A(3) Submittals

Manufacturer's descriptive data, colors, graphics, and fastening details must be submitted.

99-10443A(4) Quality Assurance

Not Used

99-10443B MATERIALS

Signs:

Signs must be sheet steel, not less than 0.048 inch thick (18-gage) with a baked-on enamel coating.

Signs must have a white background with contrasting red letters. Red letters must be 2 inches minimum in height.

Fasteners: Fasteners must be as recommended by the sign manufacturer.

99-10443C CONSTRUCTION

Sign inscriptions must read as shown.

Each sign must be located as shown and must be fastened in place with a minimum of 6 fasteners for each sign.

99-10443D PAYMENT

Not Used

99-10445 SIGNS

99-10445A GENERAL

99-10445A(1) Summary

Scope: This work consists of installing facility identification signs, building accessibility standard signs, and self-luminous signs.

99-10445A(2) Definitions

Not Used

99-10445A(3) Submittals

Product Data: Manufacturer's descriptive data for sign materials, graphics, and fastening hardware must be submitted.

Manufacturer's standard color palette for acrylic signs must be submitted. The Engineer will select background and character colors from the standard color palette.

99-10445A(4) Quality Assurance

Regulatory Requirements: Identification, directional, informational, exit, and accessibility signs and symbols (including tactile raised characters and Braille) must comply with the Identification symbols, CBC 11B-703 "Signs."

99-10445B MATERIALS

Sign Colors: The color white must comply with AMS-STD-595A Color, Federal Standard Color No. 17886. The color blue must comply with AMS-STD-595A Color, Federal Standard Color No. 15090. The color black must comply with AMS-STD-595A Color, Federal Standard Color No. 17038.

Signs:

Signs must be scratch resistant, non-static, fire retardant, washable acrylic laminate with a non-glare surface, not less than 1/8-inch thick.

International symbol of accessibility entrance sign may be a pressure sensitive decal.

Symbols: Symbols must be scratch resistant, non-static, fire retardant, washable acrylic. Symbol colors must be in contrast to door color.

Self-Luminous Sign (Exit):

Self-luminous sign must be powered by strontium oxide (photoluminescent) aluminate compound to store ambient light and release the stored energy when the light is removed. Photoluminescent exit sign must be code approved and listed in accordance with UL 924. Sign must be listed by the California State Fire Marshal.

Sign housing must be aluminum. Faceplate must be aluminum sheet with photoluminescent markings.

Fastening Hardware and Material: Fastening hardware and material must be as recommended by the sign manufacturer. Fasteners must be noncorrosive.

99-10445C CONSTRUCTION

Signs and symbols must be fastened or secured to clean, finished surfaces under the sign manufacturer's instructions. Signs must be installed at a location and height as shown.

Metal signs must be attached securely with galvanized or cadmium plated fasteners.

99-10445D PAYMENT

Not Used

99-10501 WARDROBE LOCKERS

99-10501A GENERAL

99-10501A(1) Summary

Scope: This work consists of installing wardrobe lockers.

99-10501A(2) Definitions

Not Used

99-10501A(3) Submittals

Product Data:

Manufacturer's descriptive data, installation instructions, and standard color palette must be submitted.

Unless otherwise shown, the color will be selected by the Engineer from the standard color palette after the award of the contract.

99-10501B MATERIALS

99-10501B(1) General

Available Manufacturers: Metal lockers must be Art Metal Products; Lyon Metal Products; Republic Storage Systems; or equal.

Lockers:

Lockers must be standard, factory fabricated steel units. Framing must be 0.060 inch thick (16-gage) and face sheets must be 0.024 inch (24-gage), except door face sheets must be 0.060 inch (16-gage).

Lockers must be equipped with the following: hat shelf located approximately 10 inches below the top of the wardrobe locker, side to side coat rod, coat hook, louver vents at top and bottom of door, nonbreakable grip and turn handle, provisions for a padlock, lockbar with 3-point latching contact with door frame and 1 1/2 pair full looped leaf hinges.

Accessible lockers must have coat rod and coat hook at maximum height of 48 inches, hat shelf at maximum height of 48 inches and minimum height of 15 inches, and accessible door hardware mounted between 34 inches and 44 inches from the ground.

The approximate dimensions of the wardrobe lockers must be 15 inches wide, 18 inches deep and 72 inches high for one-tier accessible locker and standard two-tier locker.

Closed Base: Closed base must be the manufacturer's standard continuous 6-inch base, fabricated of the same material and designed for use with the lockers provided. Bottoms must be flanged inward for stiffening. Bases must have the same finish as the locker units.

Top: Top must be the manufacturer's standard continuous sloping top with end closure as needed, fabricated of the same material and designed for use with the lockers provided. Tops must have the same finish as the locker units.

99-10501B(2) Shop Fabrication

Shop Assembly:

Lockers must be fabricated square, rigid, and without warp, with metal faces flat and free of dents or distortion.

Frame joints and seams must be welded. Exposed welds must be ground smooth. Hinge and latch connections must be welded or riveted.

Bolts must be used for assembly and mounting lockers components. Bolt or rivet heads on fronts of locker doors or frame must not be exposed.

Factory Finish: Lockers must be chemically pretreated with degreasing and phosphatizing process. Wardrobe lockers must have a baked enamel finish on all surfaces, exposed and concealed.

99-10501C CONSTRUCTION

Lockers must be mounted on closed bases at locations shown under the manufacturer's instructions for plumb, level, rigid, and flush installation.

Wardrobe lockers must be bolted together at tops and bottoms. The backs of the end lockers must be bolted to wall anchors with ¼-inch bolts installed near the tops of the wardrobe lockers as instructed by the locker manufacturer.

Trim, sloping tops, and metal filler panels, if required, must be installed using concealed fasteners to provide flush, hairline joints against adjacent surfaces.

The number of lockers must be as shown.

99-10501D PAYMENT

Not Used

99-10502 WOOD BENCHES

99-10502A GENERAL

99-10502A(1) Summary

Scope: This work consists of installing fixed wood benches.

99-10502A(2) Definitions

Not Used

99-10502A(3) Submittals

Manufacturer's descriptive data and installation instructions must be submitted.

99-10502A(4) Quality Assurance

Not Used

99-10502B MATERIALS

Acceptable Manufacturers: Manufacturers must be Penco Products, Inc.; Republic Storage Systems, Inc.; Interior Steel Equipment Co.; or equal.

Seat: Seat must be factory fabricated, laminated seat units of solid birch or other suitable, dense hardwood and manufacturer's standard two coats of clear lacquer. Seat units must be approximately 48 inches wide minimum, 20 inches to 24 inches deep, and 1¼ inches thick. Edges of the seat must be rounded and all surfaces must be smooth and free of splinters which would snag clothing or skin.

Supports Assemblies: Supports assemblies must be standard steel pedestal assemblies with continuously welded top and bottom flange fittings. Flanges must have provisions for fasteners to the floor and securing to the bench. Pedestal diameter must be not less than 2-¼ inches. Overall bench height must be between 17 inches and 19 inches. Pedestal color and finish must be selected from the manufacturer's standard colors.

Fasteners: Fasteners for fastening seat units and support assemblies must be the manufacturer's standard fasteners for the purpose intended.

99-10502C CONSTRUCTION

Bottom flange fittings of the support assemblies must bear solidly on the floor without rocking and must be fastened rigidly and securely to the floor under the manufacturer's instructions.

99-10502D PAYMENT

Not Used

99-10522 FIRE EXTINGUISHERS AND CABINETS

99-10522A GENERAL

99-10522A(1) Summary

Scope: This work consists of installing fire extinguishers with cabinets or mounting brackets.

99-10522A(2) References

Fire Extinguishers must comply with the requirements in California Code of Regulations, Title 19 Division 1, Chapter 3, "Portable Fire Extinguishers."

99-10522A(3) Definitions

Not Used

99-10522A(4) Submittals

Product Data: Manufacturer's descriptive data and installation instructions must be submitted.

99-10522A(5) Quality Assurance

Codes and Standards: Fire extinguishers must be Underwriters Laboratories approved for the type, rating, and classification of extinguisher specified.

99-10522B MATERIALS

99-10522B(1) Manufacturers

Acceptable Manufacturers: Manufacturers must be J. L. Industries; Larsen's Manufacturing; Potter-Roemer; or equal.

99-10522B(2) Components

Fire Extinguisher: Fire extinguisher must be fully charged, multi-purpose dry chemical type, with charge indicator, hose and nozzle, and attached service record tag. Fire extinguisher must be of the capacity and type rating shown.

Mounting Bracket: Mounting bracket must be the manufacturer's standard painted, surface mounted type.

Fire Extinguisher Cabinet:

Fire extinguisher cabinet must be factory fabricated, constructed of steel with a clear plastic panel in a steel door frame, and must have a baked enamel finish. Color to be selected by the Engineer from the manufacturer's standard colors.

Fire extinguisher cabinet must be fully recessed as shown.

99-10522C CONSTRUCTION

99-10522C(1) Installation

Fire extinguishers must be installed in locations and at mounting heights shown, or if not shown, at a height of 48 inches from the finished floor to the top of the fire extinguisher.

Fire extinguisher mounting brackets and cabinets must be attached to structure, square and plumb, under the manufacturer's instructions.

99-10522C(2) Identification

Bracket-mounted: Extinguishers must be identified with red letter decals spelling "FIRE EXTINGUISHER" applied to wall surface. Letter size, style, and location as selected by the Engineer.

Cabinet-mounted: Extinguishers in cabinets must be identified with letter spelling "FIRE EXTINGUISHER" applied to the cabinet door. Letter size, styles, and color must be selected by the Engineer from manufacturer's standard arrangements.

99-10522C(3) Servicing

Fire extinguishers must be serviced, charged, and tagged not more than 5 days prior to contract acceptance.

99-10522D PAYMENT

Not Used

99-10560 FIRE ACCESS KEY BOX**99-10560A GENERAL****99-10560A(1) Summary**

Scope: This work consists of installing fire access key box.

99-10560A(2) Definitions

Not Used

99-10560A(3) Submittals

Product Data: Manufacturer's descriptive data and installation instructions must be submitted.

99-10560A(4) Quality Assurance

Fire access key box must be type approved by the local fire authority.

99-10560B MATERIALS

Not Used

99-10560C CONSTRUCTION

Fire access key box must be installed rigidly, securely, plumb and true, and under the manufacturer's instruction at the location specified by the local fire authority and approved by the Engineer.

99-10560D PAYMENT

Not Used

99-10674 CANTILEVER STEEL SHELVING**99-10674A GENERAL****99-10674A(1) Summary**

This work consists of installing cantilever steel shelving.

99-10674A(2) Definitions

Not Used

99-10674A(3) Submittals

Manufacturer's descriptive data and installation instructions must be submitted.

99-10674A(4) Quality Assurance

Not Used

99-10674B MATERIALS

Shelving: Shelving must be factory fabricated shelves and supports capable of supporting loads of 50 pounds per linear foot of shelf area. Shelves must not deflect more than 5/16 inch when subjected to the loads specified herein and must show no permanent deflection after removal of such loads. Shelves must be adjustable in vertical increments of 3 inches or less. Shelving must be of the approximate dimensions and number shown and must be #4 satin brush finish. The color must be gray.

99-10674C CONSTRUCTION

Cantilever steel shelving must be installed and fastened under the manufacturer's instructions. The completed installation must be rigid and secure in compliance to CBC seismic requirements.

99-10674D PAYMENT

Not Used

99-10801 TOILET AND SHOWER ACCESSORIES

99-10801A GENERAL

99-10801A(1) Summary

Scope: This work consists of installing toilet and shower accessories.

99-10801A(2) Definitions

Not Used

99-10801A(3) Submittals

Product Data: Manufacturer's descriptive data, installation instructions, and details must be submitted.

Certificates of Compliance: Submit a certificate of compliance for grab bars and folding shower seats. Certificates of compliance must include written confirmation that the grab bars and folding shower seats, backing, mounting devices, fasteners and their installation comply with the accessibility requirements in 2022 CBC, 11B-609 Grab Bars and 11B-610 Seats, under Structural Strength.

99-10801A(4) Quality Assurance

Regulatory Requirements: Products must comply with the applicable accessibility requirements in

99-10801B MATERIALS

Toilet Tissue Dispenser: Toilet tissue dispenser must be dual roll, surface mounted, stainless steel with satin finish, and approximately 6 by 11-1/2 by 6 inches in size. Dispenser must utilize standard toilet tissue rolls. The top roll must automatically drop into place after the bottom roll is depleted. One dispenser per toilet stall.

Combination Paper Towel Dispenser and Waste Receptacle: Combination paper towel dispenser and waste receptacle must be semi-recessed, stainless steel with satin finish, and approximately 17 by 56 by 7-1/2 inches in size with 4-inch skirt. The paper towel dispenser must have a capacity of 1,000 single fold paper towels. The waste receptacle must have a capacity of at least 8 gallons. Quantity must be as shown.

Toilet Seat Cover Dispenser: Toilet seat cover dispenser must be surface mounted, stainless steel with satin finish, approximately 15 by 11-1/2 by 2 inches maximum in size. One dispenser per toilet stall and wheelchair accessible compartment.

Napkin Receptacle: Napkin receptacle must be surface mounted, stainless steel with satin finish, hinged top and bottom, approximately one-gallon capacity container with disposable liner. One receptacle per women's toilet stall.

Waste Receptacle: Waste receptacle must be surface mounted, stainless steel with satin finish, and a capacity of at least 12 gallons. One receptacle per toilet room.

Clothes Hook: Clothes hook must be stainless steel with two prongs. Quantity must be as shown.

Paper Towel Dispenser: Paper towel dispenser must be surface mounted, stainless steel with satin finish, with a capacity of 1,000 single fold paper towels. One dispenser per lavatory.

Liquid Soap Dispenser: Liquid soap dispenser must be surface mounted, heavy-duty plastic dispenser for industrial use with a capacity of at least 24 ounces. Maximum operating force must be 5 pounds. One dispenser per lavatory.

Mirror, Wall Hung: Mirror, wall hung must be Number 1 quality, 1/4-inch thick, electrolytically copper plated float or plate glass mirror with nonmoisture-absorbing filler. Mirror must have a heavy gage galvanized steel back and stainless steel frame. The frame must have a satin finish and must be mitered and welded and the corners must be ground smooth. Fasteners must not penetrate surfaces of the frame exposed to view. Mirror must be guaranteed against silver spoilage for not less than 10 years. Quantity must be as shown.

Grab Bar: Grab bar must be stainless steel with satin finish, and concealed, integral mounting flanges.

Combination Soap Dispenser-utility Shelf: Combination soap dispenser-utility shelf must be stainless steel with satin finish. Liquid soap dispenser must have a capacity of at least 100 ounces and an unbreakable refill indicator. Maximum operating force must be 5 pounds. Quantity must be as shown.

Folding Shower Seat: Folding shower seat must be factory fabricated in teakwood or solid phenolic with drainage slots, Type 304 stainless steel tube frame with satin finish, wall bracket, and hinge. Teakwood slats must be factory stained and varnished.

Shower Curtain: Shower curtain must be flame resistant, one-way draw, nylon reinforced, anti-bacterial vinyl fabric. Curtain must be approximately 72 inches x 72 inches.

Shower Curtain Rod: Shower curtain rod must be stainless steel, fixed mounted shower rod with stainless steel mounting plates.

99-10801C CONSTRUCTION

Toilet and shower accessories must be installed under the manufacturer's instructions. Fasteners for mounting accessories must be concealed and vandal resistant.

Expansion anchors must be used for mounting accessories on masonry or concrete walls.

Toilet and shower accessories must be mounted after painting work is complete.

All toilet room accessories must be mounted plumb, secure, and rigid.

Grab bars shall comply with 2022 CBC 11B-604 and 11B-609; and shower seats shall comply with 11B-608 through 11B-610.

99-10801D PAYMENT

Not Used

99-11 EQUIPMENT

99-11146 LUBRICATION AND COMPRESSED AIR SYSTEMS

99-11146A GENERAL

99-11146A(1) Summary

Scope: This work consists of installing compressed air systems as shown.

The compressed air system must include a compressor, regulators, gauges, air water separator, air filter, valves, quick couplers, compressed air piping, and an outdoor weather proof enclosure.

Pipes and fittings must comply with the requirements specified under section 99-15060.

Permits to Operate:

Comply with the latest Division of Industrial Safety (DIS) regulations regarding tank mounted air compressors.

You must provide all permits to operate pressure vessels under the requirements of the DIS and must pay all costs for such permits. Such permits must be posted under glass at the work site.

99-11146A(2) Definitions

Not Used

99-11146A(3) Submittals

Product Data:

Manufacturer's descriptive data must be submitted.

Manufacturer's descriptive data must include a complete description, performance data, and installation instructions for the materials and equipment described herein. Performance data must include the product delivery rate and discharge pressure for each type of pump assembly.

Operation and Maintenance Manuals: Prior to the completion of the contract, 3 identified copies of the operation and maintenance instructions with parts lists for the equipment described herein must be

delivered to the Engineer at the job site. The instructions and parts lists must be in a bound manual form and must be complete and adequate for the equipment installed. Inadequate or incomplete material must be returned. You must resubmit adequate and complete manuals at no expense to the Department.

99-11146A(4) Quality Assurance

Not Used

99-11146A(5) Warranty

Warranties and Guarantees: Manufacturer's warranties and guarantees for materials or equipment used in the work must be delivered to the Engineer at the job site prior to acceptance of the contract.

99-11146B MATERIALS

99-11146B(1) Overhead Hose Reel Assemblies

Hose reel assemblies must be heavy duty assemblies of steel construction with connecting hoses, locking automatic ratchets, guide rollers, and heavy duty spring activated hose pickups. Reels must have bushings, swivels, ball stops, delivery hoses, and control valves. The reels must have a baked enamel finish. Manufacturer's reel mounting brackets must be supplied with reels.

99-11146B(2) Pump Assemblies

Not Used

99-11146B(3) Miscellaneous Components

Air Compressor: Air compressor must be 2-stage, 175 psig design, 125 psi output, 24 cfm min, mounted on an ASME code vertical 80-gallontype receiver. The air compressor must be complete with unloader, V-belt drive, belt guard, oil and air pressure gauges, automatic pressure controller, outlet valve, ASME relief valve, air intake filter, ball valve drain, drain pan, and an automatic tank drain operated by either the compressor unloader or a governor. Motor must be high efficiency type, capable of receiving 208V-3ph-60Hz power supply, open drip proof with class B insulation. Air compressor must be Champion, Ingersol Rand, Kellogg, or equal.

Air Compressor Enclosure:

An outdoor weather proof enclosure must be provided to house the air compressor and its associated components. The enclosure must be at minimum 5ft wide by 5 ft long and 8 ft tall. The weatherproof enclosure must be one piece construction with integral lift off door. Enclosure must be fiberglass constructed to meet or exceed requirements of ANSI C 57.12.28 and be completely absent of ferrous material. Enclosure must have UV stabilized gelcoat finish. Enclosure must have ventilation louvers with stainless steel bug screen. Door locking system must be brass material with provisions for locking with a padlock. The enclosure must be fitted with all necessary electrical and mechanical fixtures outlined by the air compressor manufacturer to ensure a normal working system.

Pressure Regulator:

Pressure regulator must be combination type with filter, bowl, pressure regulator, and pressure gauge.

The filter bowl must be the quick disconnect type, plastic with metal guard, manual drain, and 5-micron filter.

Pressure regulator must be diaphragm controlled, balanced valve type, rated for 0 to 160 psig operation and must be equipped with pressure gage, bottom clean-out plugs and internal strainers. Regulator must be Wilkerson, Lincoln, Wabco, or equal.

Flexible Coupling: Flexible coupling must be brass flexible metal hose with threaded union ends and a minimum working pressure of 200 psig.

Pressure Gage: Pressure gage must be rotary type ANSI Standard: B40.1, Grade A, with 3½-inch dial, liquid filled with cover, plain case, reset screw and bottom inlet. Pressure gage movement must be phosphor bronze bushed. Gage must read from 0 psi to 175 psi. Each gage must be equipped with a gage cock. Pressure gage must be Marsh, Ashcroft, US Gage, or equal.

99-11146C CONSTRUCTION

99-11146C(1) Installation

The hose reels must be installed rigidly and securely to the reel mounting bracket. The mounting bracket must be attached to the overhead structure as shown.

Pipelines must be cleaned and flushed immediately prior to connecting the control valves.

Air compressor must be installed with drain piping, vibration isolation pads, and expansion anchors.

Unions must be installed before and after the pressure regulator/ball valve assembly.

99-11146C(2) Field Quality Control

Testing:

All tests, including general performance tests to demonstrate the proper operation of the air compressor, must be performed by you in the presence of the Engineer.

The air compressor system must be tested for the operational range, the cut-off pressure and the operation of air drops and system components.

The required delivery rate values may be adjusted, as determined by the Engineer, when testing for delivery rates with different materials or at temperatures other than 70°F.

99-11146D PAYMENT

Not Used

99-12 FURNISHINGS

99-12520 ROLLER SHADES

99-12520A GENERAL

99-12520A(1) Summary

Scope: This work consists of installing roller shades.

Roller shades must be manually operated, roll-up fabric interior window shades with single rollers including mounting and operating hardware. Roller Shades must be standard, factory manufactured assemblies suitable for use on interior wall windows.

99-12520A(2) Definitions

Not Used

99-12520A(3) Submittals

Product Data: Submit manufacturer's descriptive data, color chips, style, components profile, features, finishes, operating instruction, and installation instructions.

Shop Drawings: Submit plans, elevations, sections, product details, installation details, and operation clearances for roller shades, including shade materials, roller orientation, and seam and batten location.

Window Treatment Schedule: Submit schedule using same room designations as indicated, field verify window dimensions, quantities, type of shade controls, fabric, colors, including window opening sizes and key to typical mounting details.

Samples: Submit full range of manufacturer colors including shade and headbox for selection.

Closeout Submittals: Operating instructions and maintenance manuals.

99-12520A(4) Quality Assurance

Manufacturer Qualifications: Obtain roller shades through one source from a single manufacturer with a minimum twenty years experience manufacturing products comparable to those specified in this section.

NFPA Flame Test: Passes NFPA 701. Materials tested must be identical to products proposed of use.

99-12520A(5) Delivery, Storage, and Handling

Do not deliver window shades until building is enclosed and construction within spaces where shades will be installed is substantially complete. Deliver roller shades in original unopened, undamaged factory packages, marked with manufacturer product names, and location of installation using same designations indicated.

Store products in manufacturer's unopened packaging until ready for installation.

99-12520A(6) Project Conditions

Field Measurement: Where roller shades are indicated to fit to other construction, verify dimensions of other construction by field measurement before fabrication and indicate measurement on shop drawings. Coordinate fabrication schedule with construction progress to avoid delaying the work.

99-12520B MATERIAL

99-12520B(1) Manually Operated Control

Manually operate, vertical roll-up, fabric window shades with components necessary for a complete installation.

Operation: Bead chain and clutch operating mechanism allowing shade to stop when chain is released. Designed never to need adjustment or lubrication. Provide limit stops to prevent shade from being raised or lowered too far.

1. Clutch Mechanism: Fabricated from high carbon steel and molded fiberglass reinforced polyester or injected molded nylon.
2. Bead Chain Loop: Stainless steel bead chain hanging at side of window.
3. Idler Assembly: Provide roller idler assembly of molded nylon with adjustable length idler pin to facilitate easy installation, and removal of shade for service.

Mounting: Mounting brackets, endcaps, and headboxes.

Roller Tube: Fabricate from extruded aluminum, galvanized steel, or enameled steel. Diameter, wall thickness, and material selection by manufacturer to accommodate shade type and size. Fabric connected to the roller tube with low surface energy double sided adhesive specifically developed to attached coated textiles to metal.

Wall Mounted Brackets: Plated stamped steel, provide size compatible with roller size.

Shade Slat: Slat encased in heat seamed hem.

Headbox Wall Style: Aluminum fabrication with removable closure, endcaps, back and top cover piece.

1. Finish: Powder coat as selected by the Engineer from manufacturer's standard finish.

99-12520B(2) Fabric

Color and Pattern: Submit manufacturer standard full range of color and pattern to the Engineer for selection.

99-12520C CONSTRUCTION

99-12520C(1) Examination

Do not begin installation until substrates have been properly prepared.

99-12520C(2) Preparation

Coordinate requirements for blocking and structural supports to ensure adequate means for installation of window shades.

99-12520C(3) Installation

Roller shades must be installed level, plumb, square, and aligned with adjacent units under the manufacturer's written instructions.

Install closure panels to conceal roller and operating mechanism. Do not exposed fasteners.

99-12520C(4) Testing and Demonstration

Test and adjust window shades to verify that chain and clutch operating mechanism, fabric retainer, and other operating components are balanced, operate smoothly, easily, safely, and free from binding or malfunction throughout entire operational range.

99-12520C(5) Clearing and Protection

Clean roller shade surfaces after installation under the manufacturer's written instructions.

Protect installed produced until completion of project.

Touch-up, repair, or replace damaged products before work completion.

99-12520D PAYMENT

Not Used

99-13 SPECIAL CONSTRUCTION

Not Used

99-14 CONVEYING SYSTEMS

Not Used

99-15 MECHANICAL**99-15050 MECHANICAL WORK****99-15050A GENERAL****99-15050A(1) Summary**

Scope: This work consists of performing mechanical work.

Mechanical work must include furnishing all labor, materials, equipment and services required for providing heating, ventilating, air conditioning, plumbing, natural gas, and compressed air-distribution systems.

Earthwork, foundations, sheet metal, painting, electrical, and such other work incidental and necessary to the proper installation and operation of the mechanical work must comply with the requirements described for similar type work elsewhere.

System layouts are generally diagrammatic and location of equipment is approximate. Exact routing of pipes, ducts, etc., and location of equipment is to be governed by structural conditions and obstructions. Equipment requiring maintenance and inspection is to be readily accessible.

Roof penetrations must be flashed and sealed watertight under section 99-07620.

Comply with requirements under section 10-2.03C and coordinate with commissioning agent to carry out commissioning of mechanical systems.

99-15050A(2) Definitions

ATT: Acceptance Test Technicians

ATTCP: Acceptance Test Technician Certification Providers

CEC: California Energy Commission

CEA: Certified Energy Analyst

CEPE: Certified Energy Plans Examiner

CLCATT: Certified Lighting Control Acceptance Test Technician

CSLB: Contractor State License Board

CABEC: California Association of Building Energy Consultants

99-15050A(3) Submittals

Product Data:

A list of materials and equipment to be installed, manufacturer's descriptive data, and such other data as may be requested by the Engineer must be submitted.

Manufacturer's descriptive data must include complete description, performance data, and installation instructions for the materials and equipment described. Control and wiring diagrams, rough-in dimensions for plumbing fixtures, and component layout must be included where applicable.

The following documentations must be submitted in compliance with the 2022 Building Energy Efficiency Standards:

Submit a completed and signed by you Certificate(s) of Installation as listed below after complete install of each building components, specified systems and equipment for approval.

Submit a completed and signed by you Certificate(s) of Acceptance as listed below prior to any commencement of building components, specified systems and equipment testing.

Submit a completed and signed by you Certificate(s) of Verification as listed below after complete testing of each building components, specified systems and equipment for approval.

Current versions of Certificate(s) of Installation, Certificate(s) of Acceptance and Certificate(s) of Verification must be obtained from the CEC website at www.energy.ca.gov.

Final approved copies of the Certificate(s) of Installation, Certificate(s) of Acceptance and Certificate(s) of Verification must be posted at the site.

Manufacturer's descriptive data must be submitted for the following:

Combination heating/cooling rooftop unit
Combination heat/light/fan
Exhaust Fan
Fire hydrant
Fire sprinkler system
Fire Extinguisher
Heat Pump System
Insulation
Thermostat
Wired Remote Controller HVAC Equipment and Controls
Roof exhaust fan
Welding exhaust fan
Air compressor
Trap seal primer valve
Hose faucet
Wall hydrant
Water closet
Lavatory
Service sink
Faucets
Emergency shower and eyewash
Emergency eyewash
Kitchen sink
Electric Water Cooler
Pipe, Pipe fittings, Valves, Hangers, and Supports
Plumbing Fixtures, Drains, and Cleanouts
Flush valve
Shower Unit
Digital gas meter
Water heater
Air compressor weather proof enclosures
Air Dampers
Variable Air Volume Box's
Smoke Detectors
Thermostats

99-15050A(4) Closeout Submittals

Operation and Maintenance Manuals:

Prior to the completion of the contract, submit 3 identified copies of the operation and maintenance instructions with parts lists for the equipment used. The instructions and parts lists must be indexed and bound in a manual form and must be complete and adequate for the equipment installed. Inadequate or incomplete material must be returned. You must resubmit adequate and complete manuals at no expense to the Department.

Operation and maintenance manuals must be submitted for the following equipment:

Combination heating/cooling rooftop unit
Combination heat/light/fan
Exhaust Fan
Fire hydrant
Fire sprinkler system
Fire Extinguisher
Heat Pump System
Thermostat/Remote controller
HVAC Equipment and Controls
Roof exhaust fan
Welding exhaust fan
Wired Remote Controller
Air compressor
Electric Water Cooler
Digital gas meter
Water heater

99-15050A(5) Quality Assurance

Codes and Standards: Mechanical work, including equipment, materials and installation, must comply with the CBC: CMC; CPC; CEC; the California Building Energy Efficiency Standards; and California Code of Regulations, Title 8, Chapter 4, Division of Industrial Safety (DIS).

Regulatory Requirements: To comply with requirements of Nonresidential Building Energy Efficiency Standards as described in California Title 24, 2022, the State must receive the following properly filled out and signed forms by You (ATT, CEA, CEPE and Field Technician when indicated) before the building can receive final occupancy:

Certificate of Installation Forms:

1. MECHANICAL (Form NRCI-MCH-01-E)
2. NONRESIDENTIALCENTRAL HOT WATER SYSTEM DISTRIBUTION (Form NRCI-PLB-05-E)

Certificate of Acceptance Forms:

1. OUTDOOR AIR ACCEPTANCE (Form NRCA-MCH-02-A)
2. DUCT LEAKAGE (Form NRCA-MCH-04-H) (Form NRCA-MCH-06-A)
3. AIR ECONOMIZER CONTROLS ACCEPTANCE (Form NRCA-MCH-05-A)
4. DEMAND CONTROL VENTILATION SYSTEMS ACCEPTANCE (Form NRCA-MCH-06-A)
5. SUPPLY FAN VFD ACCEPTANCE (Form NRCA-MCH-07-A)
6. AUTOMATIC FAULT DETECTION AND DIAGNOSTICS FOR AIR HANDLING UNITS AND ZONE TERMINAL UNITS ACCEPTANCE (Form NRCA-MCH-13-F) This form must be filled out by a qualified Field Technician.
7. SUPPLY AIR TEMPERATURE RESET CONTROLS ACCEPTANCE (Form NRCA-MCH-16-F) This form must be filled out by a qualified Field Technician.

Certificate of Verification Forms:

1. DUCT LEAKAGE DIAGNOSTIC TEST-Completely New Duct System (Form NRCV-MCH-04-Ha) This form must be filled out by a HERS qualified rater.

2. DUCT LEAKAGE DIAGNOSTIC TEST-Low Leakage Air Handling Unit (Form NRCV-MCH-04-Hc) This form must be filled out by a HERS qualified rater.
3. DUCT LEAKAGE DIAGNOSTIC TEST-Sealing All Accessible Leaks using Smoke Test (Form NRCV-MCH-04-He) This form must be filled out by a HERS qualified rater.

All "Require Acceptance Tests" must be performed by a Certified Mechanical Equipment Control Acceptance Test Technician (CMEATT) with no additional cost to the State.

99-15050A(6) Warranty

Warranties and Guarantees: Manufacturer's warranties and guarantees for materials or equipment used in the work must be delivered to the Engineer at the job site prior to acceptance of the contract.

99-15050A(7) System Identification

Piping, Ducts, Valves and Equipment:

Identification of piping, ducts, valves, and equipment must be as shown or as follows:

Above Ground Piping and Ducts: Markers must be provided on lines which are either exposed or concealed in accessible spaces. For piping systems, except drain and vent lines, indicate the fluid conveyed or its abbreviation; either by preprinted markers or stenciled markings, and include arrows to show the direction of flow. Colors must comply with ANSI Standard: A13.1. Locate markers at ends of lines, near major branches and other interruptions including equipment in the line, where lines pass through penetrations in floors, walls or ceilings or otherwise pass into inaccessible spaces, and at 50-foot maximum intervals along exposed portions of the lines. Marking of short branches and repetitive branches for equipment connections is not required.

Valves: Valve tags must be provided on all valves of each piping system, excluding check valves, valves within equipment, faucets, stops and shut-off valves at fixtures and other repetitive terminal units. Provide brass or plastic laminate tags. Prepare and submit a tagged valve schedule, listing each valve by tag number, location and piping service. Valve schedule must be mounted in a glazed frame at a location authorized by the Engineer.

Equipment: All equipment must be identified with a plastic laminated, engraved nameplate, which bears the unit mark number as indicated on the drawings (for example, AC-4). Provide ½-inch high lettering, white on black background. Nameplates must be permanently secured to the unit.

99-15050B MATERIALS

Not Used

99-15050C CONSTRUCTION

Not Used

99-15050D PAYMENT

Not Used

99-15060 PIPE, FITTINGS, AND VALVES

99-15060A GENERAL

99-15060A(1) Summary

Scope: This work consists of installing pipes, fittings, and valves. Pipe, fittings, and valves must include such plumbing and piping accessories and appurtenances, not mentioned, that are required for the proper installation and operation of the plumbing and piping systems.

All piping insulation and wrapping material must comply with the requirements under section 99-15250.

The pipe sizes shown are nominal inside diameter. No change in the pipe size shown will be permitted without authorization from the Engineer.

The pipe and fitting classes and material descriptions must be as described. No change in class or description will be permitted without authorization from the Engineer.

Comply with requirements under section 10-2.03C to carry out commissioning of mechanical systems.

99-15060A(2) Definitions

Not Used

99-15060A(3) Submittals

Test Reports: Certified test reports signed by you and the supervisor who performed testing work.

LEED Submittals:

99-15060A(4) Quality Assurance

Codes and Standards: Pipe, fittings, and valves must be installed under the CPC, the manufacturer's instructions, and the requirements described herein.

LEED:

IEQ Credit 4.1, Low-Emitting Material—Adhesives and Sealants: For interior application (inside the weatherproofing system and applied on-site), provide adhesives, sealants, and sealant primers that comply with LEED limits for VOC content. Comply with local requirements if more stringent.

99-15060B MATERIALS

99-15060B(1) Pipe and Fittings (Class and Description)

A1: Schedule 40 galvanized steel pipe complying with ASTM A53, with 150 psi galvanized malleable iron banded screwed fittings and galvanized steel couplings. The weight of the zinc coating must be not less than 90 percent of that specified in ASTM A53.

A2: Schedule 40 galvanized steel pipe complying with ASTM A53, with black cast iron recessed drainage fittings. For rainwater leaders, neoprene-gasket compression couplings, Smith Blair, Dresser, or equal, must be used. The weight of the zinc coating must be not less than 90 percent of that specified in ASTM A53.

B1: Schedule 40 black steel pipe complying with ASTM A53, with screwed fittings suitable for working pressure involved, but not less than 175 psi. Fittings must be listed for fire protection.

B2:

Schedule 40 black steel pipe complying with ASTM A53, with 150 psi black malleable iron banded screwed fittings and black steel couplings.

Steel pipe coating, where required, must be factory applied plastic. Pipe coating must be X-Tru-Coat (20-mil thickness); 3M Company, Scotchkote 6533 fusion bonded epoxy powder coating (12-mil thickness); or equal.

C1: Hub and plain end cast iron soil pipe with neoprene gaskets complying with Cast Iron Soil Pipe Institute's Standard 301. Pipe, fittings, and gaskets must be of one manufacturer.

C2: Hubless cast iron soil pipe with neoprene gaskets, corrugated stainless steel shields and stainless steel clamps complying with Cast Iron Soil Pipe Institute's Standard 301. Joint materials must be furnished by pipe manufacturer.

D1: Ductile iron push on joint pipe complying with AWWA C151. Fittings must be push on ductile iron complying with AWWA C153. Joints must be rubber gasketed and designed for a working pressure of 350 psi. Pipe and fittings must be supplied with bituminous outer coating and cement lining. Pipe must be listed for fire protection.

H1: Type DWV hard copper tubing complying with ASTM B306, with DWV drainage fittings, stop type couplings and threaded adapters.

H2: Type K hard copper tubing complying with ASTM B88, with wrought copper or cast bronze solder joint pressure fittings, stop type couplings and threaded adapters. Solder must be lead-free.

H3: Type L hard copper tubing complying with ASTM B88, with wrought copper or cast bronze solder joint pressure fittings, stop type couplings and threaded adapters. Solder must be lead-free.

P3: Polyvinyl chloride (PVC) standard weight pipe and fittings, Schedule 40, complying with ASTM D1785. Pipe must meet or exceed requirements of NSF Standard No. 14. Pipe must have bell ends complying with ASTM D2672. For pipe sizes 3 inches and smaller, plain end pipe with solvent welded fittings complying with ASTM D2241, may be used.

P4: Polyvinyl chloride (PVC) plastic pipe and fittings must comply with AWWA C900, Class 150, Standard Dimension Ratio (SDR) 18. Pipe must have bell end with a solid cross section elastomeric ring complying with ASTM D1869. Pipe must be listed for fire protection.

P5: Polyethylene plastic gas pipe and fittings complying with ASTM D1248 and D2513 with Standard Dimension Ratio (SDR) 11, rated for 60 psi working pressure at 73°F, socket type fittings, joined by heat fusion.

P6: Polyvinyl chloride (PVC) natural gas pipe, Class 315, complying with ASTM D2513. Fittings must be Schedule 40 complying with ASTM D2513, and must be primed and glued. Primer must comply with ASTM F656. Solvent cement must comply with ASTM D2564. Approved adapters must be used for transition to other pipe materials.

Unions (for Steel Pipe): Unions (for steel pipe) must be 250 psi, threaded malleable iron, ground joint, brass to iron seat, galvanized or black to match piping.

Unions (for Copper or Brass Pipe): Unions (for copper or brass pipe) must be 150 psi cast bronze, ground joint, bronze to bronze seat with silver brazing threadless ends or 125 psi cast brass, ground joint, brass to brass seat with threaded ends.

Unions (for Brass Waste and Flush Pipes): Unions (for brass waste and flush pipes) must be slip or flange joint unions with soft rubber or leather gaskets. Unions must be placed on the fixture side of the traps.

Dielectric Waterway: Dielectric waterway must be a premanufactured unit that incorporates an insulated interior lining at least 3 inches in length between the 2 pipes being connected while maintaining metal to metal contact on the exterior surface. Dielectric water way must be listed by IAPMO (International Association of Plumbing and Mechanical Officials).

Insulating Union: Insulating union or flange as applicable must be suitable for the service on which used. Connections must be constructed such that the 2 pipes being connected are completely insulated from each other with no metal to metal contact. Insulating couplings must not be used. Insulating union must be F. H. Maloney; Central Plastics; EPCO; or equal.

Insulating Connection (Water Heater/Tanks): Insulating connection (to water heater/tanks) must be 6-inch minimum, flexible copper tubing with dielectric union at each end and designed to withstand a pressure of 150 psi and a temperature of 200°F.

99-15060B(2) Valves

Gate Valve (2½-inch and smaller):

Gate valve (2½-inch and smaller) must be bronze body and trim, removable bonnet and non rising stem, threaded ends, Class 125 and same size as pipe in which installed. Gate valve must be Crane, 438; Nibco, T-113; Jenkins, 310J; or equal.

Gate valve in nonferrous water piping systems may be solder joint type with bronze body and trim. Valve must be Crane, 1330; Nibco, S-111; Jenkins, 452J; or equal.

Gate Valve (3-inch and larger, above ground): Gate valve (3-inch and larger, above ground) must be iron body with bronze trim, removable bonnet and non-rising stem, flanged ends, Class 125 and same size as pipe in which installed. Gate valve must be Crane, 461; Nibco, F-619; Jenkins, 452J; or equal.

Gate Valve (3-inch and larger, below ground): Gate valve (3-inch and larger, below ground) must be AWWA double disc, hub or rubber ring type, removable bonnet and non-rising stem, equipped with

operating nuts, 200 psi working pressure, and Tee handle wrench for each valve. Valve must be Mueller, A-2380; American Valve, Model 28; or equal.

Ball Valve: Ball valve must be two piece, minimum 400 psi WOG, bronze body and chrome plated or brass ball with full size port, threaded ends. Valve must be Nibco, T-580; Watts, B-6000; Kitz, 58; or equal.

Gas Valve: Gas valve must be natural gas service type, bronze body, quarter turn, flathead and rated for 125 psi. Gas valve must be Crane, American or equal.

Check Valve (1½-inch and smaller): Check valve (1½-inch and smaller) must be silent spring loaded type, threaded bronze body, nylon or teflon disc, beryllium or stainless steel helical spring and shaft, Class 125 and same size as pipe in which installed. Check valve must be Nibco/Scott, T-480; CPV, 36; Kitz, 26; or equal.

Check Valve (2-inch and larger): Check valve (2-inch and larger) must be silent wafer type, full faced for installation between 125 psi flanges, iron body with bronze trim, nylon or teflon disc, stainless steel helical spring and shaft, Class 125 and same size as pipe in which installed. Check valve must be APCO, Series 300; CPV, 10D; Metraflex, Series 900; or equal.

Pressure Reducing Valve (PRV): Pressure reducing valve (PRV) must be direct acting, spring loaded diaphragm type control valve with balanced single seat, bronze body, bronze trim and screwed connection. PRV must be completely self-contained and must require no external sending pipes or outside control medium. The outlet pressure of the PRV must be adjustable within a range of 25 psi to 60 psi.

99-15060B(3) Faucets and Hydrants

Hose Faucet: Hose faucet must be compression type, angle pattern, wall flange at exterior locations, box and stop at interior locations, tee handle, ¾-inch female thread with hose end, chrome finish for locations inside building, rough brass finish for others. Hose faucet must be supplied with an integral or nonremovable threaded outlet vacuum breaker which meets the requirements of the American Society of Sanitary Engineering (ASSE) Standard: 1011. Hose faucet must be Nibco; Chicago; or equal.

Wall Hydrant:

Wall hydrant must be ¾-inch, exposed, nickel bronze head with bronze casing, and integral vacuum breaker. Operating key must be provided. Wall hydrant must be J. R. Smith, Model 5609 QTSAP; Josam, Model 71070; Wade, Model 8630-89; or equal.

Fire Hydrant: Fire hydrant must comply with the requirements of AWWA C503. Fire hydrant must have 6-inch inlet and have one 4-inch outlet steamer hose and two 2½-inch outlets. Fire hydrant must be approved by the authorities having jurisdiction and must be Jones, Model J-3765; Rich, Model 960; American Cast, Darling Division, Mark-73; or equal.

99-15060B(4) Cleanouts

Cleanout Through Wall: Cleanout through wall must be cast iron cleanout tee type with polished stainless access plates. Plug must be countersunk brass or bronze with tapered threads. Cleanout must be Wade, No. W-8460; Smith, No. 4532; Zurn, No. 1445; or equal.

Cleanout Through Floor:

Cleanout through floor must have nonslip scoriated nickel bronze access plate and adjustable frame with square pattern top for ceramic tile and round pattern top for other finishes. Where floors are constructed with a membrane, access frame must be provided with membrane clamping flange. Plug must be countersunk brass or bronze with tapered threads. Cleanout must be Wade, 6000 Series; Smith, 4021 Series; Zurn, No. 1400; or equal.

Cleanout through floors in exterior locations must be heavy duty, floating pipe type with cast iron cover. Cleanouts must be Wade, No. 6000 TY; Smith, No. 4231; Zurn, No. 1474; or equal.

Cleanout to Grade: Cleanout to grade must be cast iron ferrule type. Plug must be countersunk brass or bronze with tapered threads. Cleanout to grade must be Wade, No. W-8450; Smith, 4420; Zurn, No. 1440; or equal.

99-15060B(5) Miscellaneous Items

Water Hammer Arrestor: Water hammer arrestor must be Type "K" hard-drawn copper body with piston. Arrestor compression chambers must be pneumatically charged. Water hammer arrestors must be tested and certified under the Plumbing and Drainage Institute Standard: PDI-WH201 or ASSE 1010 and sized as shown.

Automatic Trap Primer Valve: Valve must:

1. Be made of cast bronze
2. Include an integral vacuum breaker
3. Have a non-liming internal operating assembly with gasketed bronze cover
4. Have an access panel installed in an accessible location

Provide Zurn Z1022; Precision Plumbing Products Inc. P2-500 for 2 drains or P1-500 for 4 drains; Wade W2400; or equal.

Access Door: Access door must be 16-gage prime coated steel, face mounting square frame, minimum 12" x 12" door with concealed hinge and screwdriver latch.

Compression Stop (Exposed): Compression stop (exposed) must be metal full free waterway, angle type, ground joint union, non-rising stem, molded rubber seat and wheel handle.

Compression Stop (Concealed): Compression stop (concealed) must be long neck, built-in compression stops for required wall thickness, loose key and exposed parts polished chromium plated. Supplies must be Chicago, 1771; Zurn, BC40; Precision Plumbing Products, 500; or equal.

Pressure Gages (for PRV) : Pressure gages (for PRV) must have 0 to 100 psi scale with 3½-inch minimum diameter dial. Gages must be installed within 6 inches of the inlet and outlet sides of the pressure reducing valve. Pressure gages must be provided with a brass gage cock.

Digital Gas Meter: Digital Gas Meter, must be inline (3" and 1" pipe size), remote thermal mass flow meter type, suitable for use with natural gas, stainless steel construction suitable for marine environment with an accuracy of ±0.5%, flow range 0 to 60,000 SFPM, with either an analog 4-20 mA output or scalable pulse output, visual display, digital communications capable of logging daily usage data for a minimum of one month, provide output to a remote Energy Monitoring Controller, stainless steel construction, aluminum enclosure, suitable for exterior locations in a marine environment, 120 volts AC to 24 volts DC transformer. Unit must come with any additional devices and or smart interface program and cables to communicate with the remote Energy Monitoring Controller.

Wye Strainer: Wye strainer must be wye pattern, cast iron body and Type 304 stainless steel or monel strainer screen. The strainer screen must have an open area equal to at least 3 times the cross sectional area of the pipe in which it is installed and must be woven wire fabric with 20 mesh or perforated sheet with 0.032-inch maximum diameter holes.

Pipe Hanger (for piping supported from overhead): Pipe hanger (for piping supported from overhead) must be Anvil International, Model RH260; Super Struct, C711; or equal.

Pipe Wrapping Tape and Primer:

Pipe wrapping tape must be pressure sensitive polyvinyl chloride or pressure sensitive polyethylene tape having nominal thickness of 20 mils. Wrapping tape must be Polyken, 922; Manville, Trantex VID-20; Scotchrap, 51; or equal.

Pipe wrapping primer must be compatible with the pipe wrapping tape used.

Floor, Wall, and Ceiling Plates: Floor, wall, and ceiling plates must be chromium plated steel or plastic plates having screw or spring clamping devices and concealed hinges. Plates must be sized to completely cover the hole.

Valve Box: Valve box must be precast high density concrete with polyethylene face and cast iron traffic rated cover marked "WATER," "GAS" or "CO-SS" as applicable. Extension must be provided as required. Valve box must be Christy, B24; Brooks Products Company, Dual-11; BES, C24W; or equal.

Roof Drain: Roof drain must be cast iron body, with integral flashing clamp and gravel stop with seepage openings, 15-inch nominal polyethylene low profile dome, 3-inch caulk or no-hub outlet and underdeck clamp. Roof drain must be Jay R. Smith, 1010; Zurn, Z-100; Wade, W-3500; or equal.

Floor Drain: Floor drain must be dura-coated cast iron body and adjustable flashing collar, adjustable nickel bronze 6-inch strainer head with seepage openings and caulk or no-hub outlet. Floor drain must be round or square as shown. Floor drain must be J R. Smith, 2005/2010; Wade, W-1100; Zurn, Z-415; or equal.

Sealants: Provide sealant for pipe installation that is:

1. One component
2. Low modulus
3. Non-acid curing
4. Compliant with ASTM C920
5. Tack-free in one hour
6. Not subject to sag or flow
7. Capable of 100 percent extension and 50 percent contraction without failure
8. Compliant with VOC requirements of LEED and the local air district

If other types of sealants are used for other applications, comply with requirements under section 99-07920.

99-15060C CONSTRUCTION

99-15060C(1) Installation of Pipes and Fittings

Pipe and Fittings: Pipe and fittings must be installed under the following designated uses:

Designated Use	Pipe and Fitting Class
Domestic water (CW and HW) in buildings	H3
Domestic water underground within 5 feet of the building	H2
Fire protection water, underground	B1,D1 or P4
Fire protection water riser	B1, D1 or H3
Fire protection sprinkler piping in building	A1, or B1
Sanitary drain piping above ground in building	H1, C1, or C2
Sanitary drain and vent piping underground within 5 feet of the building	C1 or C2
Sanitary vent piping above ground in building	A2, H1, C1, or C2
Natural gas, above ground	A1 or B2
Natural gas, underground	B2 (plastic coated), P5 or P6
Compressed air	A1
Rainwater leaders	A2
Equipment drains and relief valve discharge	H3 or A1
Condensate Drain Line	P3

Installing Piping:

Water piping must be installed generally level, free of traps and bends, and arranged to comply with the building requirements.

Piping installed underground must be tested as described elsewhere in these special provisions before backfilling.

Public use areas, offices, rest rooms, locker rooms, crew rooms, training rooms, storage rooms in office areas, hallway type rooms, and similar type use areas must have concealed piping.

Warehouse rooms, equipment bays, and loft areas must have exposed piping.

Piping must not be run in floor fill, except as shown.

Piping must be installed parallel to walls. All obstructions must be cleared, headroom preserved and openings and passageways kept clear whether shown or not. Piping must not interfere with other work.

Where pipes pass through exterior walls, a clear space around pipe must be provided. Space must be caulked water tight with silicone sealant.

Underground copper pipe must have brazed joints. Underground plastic pipe must be buried with No. 14 solid bare copper wire. Wire ends at pipe ends must be brought up 8 inches and looped around pipe.

Exposed supply and drain piping in rest rooms must be chrome finished.

Compressed air piping must be pitched to low point. Ball valved drips must be provided at all low points. Branches must be taken off top of main.

Gas piping must not be installed under building concrete slabs or structure. An insulating connection and valve must be installed above ground at each building supply.

Gas piping must be pitched to equipment or to low point and provided with an 8-inch minimum dirt leg.

Plastic pipe used for natural gas must be below grade outside of building only. Transition to Class B2 plastic coated must be before meter, regulator, or building wall with approved metal to plastic transition fitting. PVC natural gas pipe must be installed under the International Association of Plumbing and Mechanical Officials (IAPMO) Standard: IS10.

Fire Piping:

Fire water piping must be installed level and plumb. Underground piping must be buried at a depth no less than 30 inches below grade.

Underground tracer tape must be permanent, detectable, bright colored in conformance with APWA Standards, continuous printed plastic tape with integral metallic strip or wire, intended for direct burial service, having a minimum width of 2 inches. Printed lettering must read "CAUTION BURIED WATER LINE BELOW."

Forty-five degree bends must be used where offsets are required in venting. Vent pipe headers must be sloped to eliminate any water or condensation.

Vent piping must extend a minimum of 8 inches above the roof.

Horizontal sanitary sewer pipe inside buildings must be installed on a uniform grade of not less than 1/4 inch per foot unless otherwise shown.

Drainage pipe must be run as straight as possible and must have easy bends with long turns.

Wye fittings and 1/8 or 1/16 bends must be used where possible. Long sweep bends and combination Wye and 1/8 bends may be used only for the connection of branch pipes to fixtures and on vertical runs of pipe.

Water pipe near sewers:

Water pipe must not be installed below sewer pipe in the same trench or at any crossing, or below sewer pipe in parallel trenches less than 10 feet apart.

When a water pipe crosses above a sewer pipe, a vertical separation of at least 12 inches between the top of the sewer and the bottom of the water pipe must be maintained.

When water and sewer pipe is installed in the same trench, the water pipe must be on a solid shelf at least 12 inches above the top of the sewer pipe and 12 inches to one side.

Pipe Sleeves:

You must provide sleeves, inserts and openings necessary for the installation of pipe, fittings and valves. Damage to surrounding surfaces must be patched to match existing.

PVC pipe sleeves must be provided where each pipe passes through concrete floors, footings, walls or ceilings. Inside diameter of sleeves must be at least $\frac{3}{4}$ inch larger than outside diameter of pipe. Sleeves must be installed to provide at least $\frac{3}{8}$ -inch space all around pipe the full depth of concrete. Space between pipes and pipe sleeves must be caulked watertight.

Pipe Penetrations in Fire Rated Assemblies: Where pipes pass through fire rated wall, floor or ceiling assemblies, the penetration must be protected under section 99-07270.

Cutting Pipe: Pipe must be cut straight and true and the ends must be reamed to the full inside diameter of the pipe after cutting.

Damaged Pipe: Pipe that is cracked, bent or otherwise damaged must be removed from the work.

Pipe Joints and Connections:

Joints in threaded steel pipe must be made with teflon tape or a pipe joint compound that is nonhardening and noncorrosive, placed on the pipe and not in the fittings.

The use of thread cement or caulking on threaded joints will not be permitted. Threaded joints must be made tight. Long screw or other packed joints will not be permitted. Any leaky joints must be remade with new material.

Exposed polished or enameled connections to fixtures or equipment must be made with special care, showing no tool marks or threads.

Cleaning and Closing Pipe: The interior of all pipe must be cleaned before installation. All openings must be capped or plugged as soon as the pipe is installed to prevent the entrance of any materials. The caps or plugs must remain in place until their removal is necessary for completion of the installation.

Securing Pipe: Pipe in the buildings must be held in place by iron hangers, supports, pipe rests, anchors, sway braces, guides or other special hangers. Material for hangers and supports must be compatible with the piping or neoprene isolators must be used. Allowances must be made for expansion and contraction. Steel pipe must have hangers or supports every 10 feet. Copper pipe one inch or less in diameter smaller must have hangers or supports every 6 feet and sizes larger than one inch must have hangers or supports every 10 feet. Plastic pipe must have hangers or supports every 3 feet. Cast iron soil pipe with neoprene gaskets must be supported at each joint. Vertical pipes must be supported with clamps or straps. Horizontal and vertical piping must be securely supported and braced to prevent swaying, sagging or flexing of joints.

Hangers and Supports:

Hangers and supports must be selected to withstand all conditions of loading to which the piping and associated equipment may be subjected and within the manufacturer's load ratings. Hangers and supports must be spaced and distributed so as to avoid load concentrations and to minimize the loading effect on the building structure.

Hangers and supports must be sized to fit the outside diameter of pipe or pipe insulation. Hangers must be removable from around pipe and must have provisions for vertical adjustment after erection. Turnbuckles may be used.

Materials for holding pipe in place must be compatible with piping material.

Hanger rods must be provided with locknuts at all threaded connections. Hanger rods must be sized as follows:

Pipe Size	Minimum Hanger Rod Diameter
1/2" to 2"	3/8"
2 1/2" to 3 1/2"	1/2"
4" to 5"	5/8"
6"	3/4"

Wrapping and Coating Steel Pipe:

Steel pipe buried in the ground must be wrapped or must be plastic coated as specified herein:

1. Wrapped steel pipe must be thoroughly cleaned and primed as recommended by the tape manufacturer.
2. Tapes must be tightly applied with 1/2 uniform lap, free from wrinkles and voids with authorized wrapping machines and experienced operators to provide not less than 40-mil thickness.
3. Plastic coating on steel pipe must be factory applied. Coating imperfections and damage must be repaired to the satisfaction of the Engineer.
4. Field joints, fittings and valves for wrapped and plastic coated steel pipe must be covered to provide continuous protection by puttying and double wrapping with 20-mil thick tape. Wrapping at joints must extend a minimum of 6 inches over the adjacent pipe covering. Width of tape for wrapping fittings must not exceed 2 inches. Adequate tension must be applied so tape will conform closely to contours of fittings. Putty tape insulation compounds authorized by the Engineer must be used to fill voids and provide a smooth even surface for the application of the tape wrap.

Wrapped or coated pipe, fittings, and field joints must be authorized by the Engineer after assembly. Piping must be placed on temporary blocks to allow for inspection. Deficiencies must be repaired to the satisfaction of the Engineer before backfilling or closing in.

Thrust Blocks:

Thrust blocks must be formed by pouring concrete between pipe and trench wall. Thrust blocks must be sized and so placed as to take all thrusts created by maximum internal water pressure.

Plastic pipe underground must be provided with thrust blocks and clamps at changes in direction of piping, connections or branches from mains 2 inches and larger, and all capped connections.

Union: Unions must be installed where shown and at each threaded or soldered connection to equipment and tanks. Unions must be located so piping can be easily disconnected for removal of equipment or tanks. Unions must be omitted at compression stops.

Dielectric Waterway: Dielectric waterway must be provided between metal pipes of different material, and between brass or bronze valves and steel piping.

Insulating Union and Insulating Connection:

Insulating union and insulating connection must be provided where shown and at the following locations:

1. In metallic water, gas and air service connections into each. Insulating connections must be installed on the exterior of the building, above ground and after shut-off valve.
2. In water, gas and air service connections in ground at point where new metallic pipes connect to existing metallic pipes. Install valve box above insulating connection.
3. At points of connections of copper or steel water pipes to steel domestic water heaters and tanks.

Bonding at Insulating Connections: Interior water piping and other interior piping that may be electrically energized and are connected with insulating connections must be bonded under the CEC. Bonding must all be coordinated with electrical work.

Compression Stop: Each fixture, including hose faucets, must be equipped with a compression stop installed on water supply pipes to permit repairs without shutting off water mains. Ball valves may be installed where shown or otherwise authorized by the Engineer.

99-15060C(2) Installation of Valves

Pressure Reducing Valve: A capped tee connection and strainer must be installed ahead of the pressure reducing valve.

Exterior Valves: Exterior valves located underground must be installed in a valve box marked "Water." Extensions must be provided as required.

99-15060C(3) Installation of Faucets and Hydrants

Hose Faucet and Hydrants: Faucets and hydrants must be installed with outlets 18 inches above finished grade.

99-15060C(4) Installation of Cleanouts

Cleanouts:

A concrete pad 18 inches long and 4 inches thick must be placed across the full width of trench under cleanout Wye or 1/8 bend. Cast iron soil pipe (C1 or C2) and fittings must be used from Wye to surface. Required clearance around cleanouts must be maintained.

Cleanout risers outside of a building installed in a surface other than concrete must terminate in a cleanout to grade. Cleanout to grade must terminate in a valve box with cover marked "CO-SS". Top of box must be set flush with finished grade. Cleanout plug must be 4 inches below grade and must be located in the box to provide sufficient room for rodding.

Cleanout risers installed in tile and concrete floors, including building aprons and sidewalks, must terminate in a cleanout through floor.

99-15060C(5) Installation of Miscellaneous Items

Water Hammer Arrestor: Water hammer arrestor must be installed so that they are vertical and accessible for replacement. Water hammer arrestor must be installed with access door when in walls or there is no access to ceiling crawl spaces. Access door location must be where shown or as authorized by the Engineer.

Gas Appliance Connection: Gas valve and flexible connector must be provided for gas piping at each appliance. Appropriately rated gas cocks may be used in 1/2-inch gas pipe. Cock or valve must be within 3 feet of the appliance.

Gas Regulator: Gas regulator must be installed complete with dirt leg, capped test tee, union, insulating union, gas valve and fittings.

Digital Gas Meter: Install digital gas meter as per manufacturer's recommendations.

Flushing Completed Systems: All completed systems must be flushed and blown out.

Potable Water Piping: Clean and flush domestic water systems with potable supply water. Continue to flush until potable water is maintained throughout entire system.

Drainage and Vent System: Clean and flush with potable supply water until free of all foreign matter.

Chlorination:

You must flush and chlorinate all domestic water piping and fixtures.

Calcium hypochlorite granules or tablets, if used, must not be applied in the dry form, but must first be dissolved into a solution before application.

You must take adequate precautions in handling chlorine so as not to endanger workmen or damage materials. All pipes and fittings must be completely filled with water containing a minimum of 50 ppm available chlorine. Each outlet in the system must be opened and water run to waste until a strong chlorine test is obtained. The line must then be closed and the chlorine solution allowed to remain in

the system for a minimum of 24 hours so that the line must contain no less than 25 ppm chlorine throughout. After the retention period, the system must be drained, flushed and refilled with fresh water.

99-15060C(6) Field Quality Control

Testing:

You must test piping at completion of roughing in, before backfilling, and at other times as directed by the Engineer.

The system must be tested as a single unit, or in sections as authorized by the Engineer. You must furnish necessary materials, test pumps, instruments and labor and notify the Engineer at least 3 working days in advance of testing. After testing, You must repair all leaks and retest to determine that leaks have been stopped. Surplus water must be disposed of after testing as directed by the Engineer.

You must take precautions to prevent joints from drawing while pipes and appurtenances are being tested. You must repair damage to pipes and appurtenances or to other structures resulting from or caused by tests.

General Tests:

All piping must be tested after assembly and prior to backfill, pipe wrapping, connecting fixtures, wrapping joints and covering the pipe. Systems must show no loss in pressure or visible leaks.

You must test systems under the following schedule for a period of not less than 4 hours:

Test Schedule		
Piping System	Test Pressure	Test Media
Sanitary sewer and vent	10-foot head	Water
Water	125 psig	Water
Gas (except P6)	100 psig	Air
Gas (P6)	50 psig	Air
Air	125 psig	Air

During testing of water systems, valves must be closed and pipeline filled with water. Provisions must be made for release of air.

Sanitary sewers must be cleared of obstructions before testing for leakage. The pipe must be proved clear of obstructions by pulling an appropriate size inflatable plug through the pipe. The plug must be moved slowly through the pipe with a tag line. You must remove or repair any obstructions or irregularities.

Test Procedures:

Rough Plumbing (Soil, Waste, and Vent): Verify piping materials and test upon completion of rough piping installation to ensure watertight system.

Water Test: Apply water test to drainage system in its entirety or in sections after rough piping is installed. If applied to the complete system, tightly close each opening in piping, except highest opening, and fill with water to the point of overflow. If the system is tested in sections, tightly plug each opening except the highest opening of the section under test, and fill with water.

1. Do not test a section with less than 10 feet head of water.

2. In testing successive sections, test at least the upper 10 feet of the following section so that each joint or pipe in the building, except the uppermost 10 feet of the system, is subjected to a test with more than a 10 foot head of water.
3. Keep water in system or in the portion under test for at least 15 minutes prior to inspection; the system must be tight at each point.

Sanitary Systems: After plumbing fixtures and floor drains are set and traps filled with water, verify drainage system materials and test. Ensure that system is gas tight by a smoke test or peppermint test.

Water Systems: When roughing in is completed and before fixtures are set, test hot water return and cold water piping systems at hydrostatic pressure of 150 psi for at least 4 hours to permit inspection of each joint. Where a portion of water piping system is concealed before completion, test portion separately the same as specified for system.

Exceptions: Exclude equipment and accessories such as plumbing fixtures or water heaters which may be damaged if subjected to full test pressure.

99-15060D PAYMENT

Not Used

99-15250 MECHANICAL INSULATION

99-15250A GENERAL

99-15250A(1) Summary

Scope: This work consists of installing mechanical insulation.

Piping insulation must be installed on all domestic hot water piping, above grade, in non-conditioned spaces.

P-trap, hot water supply pipes and angle valves for lavatories and sinks, except in janitor closets or similar enclosed spaces, must be insulated. There must be no sharp or abrasive surfaces under lavatories or sinks.

Duct insulation must be installed on all rigid ductwork installed in concealed non-conditioned spaces.

Duct liner must be installed in all rectangular ductwork installed in exposed non-conditioned spaces and in exterior locations. Plenum liner must be installed in all plenums in non-conditioned spaces or in walls facing a non-conditioned space.

99-15250A(2) Definitions

Not Used

99-15250A(3) Submittals

Test Reports: Certified test reports signed by you and the supervisor who performed testing work.

LEED Submittals:

IEQ Credit 4.1, Low-Emitting Materials—Adhesives and Sealants: Submit product data for adhesives, sealants, and sealant primers to be used on-site and inside building weatherproofing system, indicating VOC content.

99-15250A(4) Quality Assurance

Codes and Standards:

Mechanical insulation must comply with California State Energy Commission regulations and, where applicable, must meet ASTM standards.

All materials must bear the label of UL or other approved testing laboratory indicating that the materials proposed for use comply with the required fire hazard ratings.

Pipe safety insulation must comply with section 1115B.2.1.2.2 of the CPC.

LEED:S

IEQ Credit 4.1, Low-Emitting Material—Adhesives and Sealants: For interior application (inside the weatherproofing system and applied on-site), provide adhesives, sealants, and sealant primers that comply with LEED limits for VOC content. Comply with local requirements if more stringent.

99-15250B MATERIALS

All pipe insulation and wrapping material, including adhesives and jackets, located within buildings must be certified to have a composite flame spread rating of not more than 25 and smoke development rating of not more than 450 when tested under ASTM E84.

Duct insulation and wrapping material, including adhesives and jackets, located within buildings must be certified to have a composite flame spread of not more than 25 and smoke development rating of not more than 50 when tested under ASTM E84.

Domestic Water Piping Insulation: Piping insulation must be mineral wool pipe insulation with factory applied jacket suitable for service temperatures up to 350°F. Covering jacket must have pressure sealing lap adhesive joints. Pipe insulation must have a minimum thermal resistance of R-3. Insulation and jackets must be Owens-Corning, Molded mineral wool pipe Pipe Insulation must meet ASTM C 547 .

Piping Insulation Cement: Insulation cement must be Fenco, All Purpose Cement; Manville, JM375; or equal.

PVC Jacket: PVC jacket must be rated for a service temperature of 175°F. PVC jacket must include covers specifically designed to cover pipe fittings.

Alternative Pipe Insulation: Alternative pipe insulation must be closed cell, elastomeric material in a flexible tubular form. Insulation must have a service temperature range between -40°F and 200°F, a minimum vapor transmission rating of 0.20 perm-inch, and a minimum thermal resistance of R-3.

Pipe Safety Insulation: Pipe safety insulation for P-traps, hot water supply pipes and angle valves must be molded closed cell vinyl or closed cell foam with exterior vinyl surface. Pipe safety insulation must be configured to protect against contact. Pipe safety insulation must be Truebro Inc., Handi Lav-guard; Plumberex Specialty Products, Handy Shield; or equal.

External Duct Insulation: External duct insulation must be 1½ inch thick, one-pound density glass-fiber blanket type. Material and coatings must be fire resistive and must be approved by the State Fire Marshal. External duct insulation must be Fiberglas, Type PF-336; Ultralite, No. 100; Pittsburgh Plate Glass, Superfine; Johns-Manville, Microlite; Silvercote, Silvercel; or equal.

Plenum and Duct Liner: Plenum and duct liner must be one-inch minimum thickness. Material and coatings must be fire resistive and must be approved by the State Fire Marshal. Liner must be Gustin-Bacon, Ultra-Liner duct insulation; Owens-Corning Fiberglas, Type CE; Gustin-Bacon, coated insulation Board No. 90-A; Owens-Corning Fiberglas 1½-pound density coated flexible duct liner; Johns-Manville, MicroBar, or 1½-pound density coated Microlite; Pittsburgh Plate Glass, Superfine 1½-pound density coated interior duct insulation; or equal.

Adhesive: Adhesive must be non-flammable type, water-based, high solids, fast-tacking, pressure-sensitive adhesive recommended by manufacturer for use with insulation, with VOC content not to exceed 50 g/L.

Studs: Studs must be cement-in-place type, pneumatic driven type or percussive welding type, and must have one-inch minimum diameter washers.

Insulation Inserts: Insulation inserts at pipe hangers supports for pipes 2 inches or larger must be calcium silicate, cellular glass, or other acceptable material of the same thickness as the adjacent insulation and not less than 13-pound density.

99-15250C CONSTRUCTION

Insulation materials must be neatly installed with smooth and even surfaces, jackets drawn tight and smoothly cemented down.

Insulation material must not be installed until all pipes or surfaces to be covered are tested for leaks, cleaned and dried, and foreign materials, such as rust, have been removed.

Piping Insulation:

Piping insulation must comply with the following, except that unions, unless integral with valves, and flexible connections must not be insulated:

1. Where insulation butts against flanges or is discontinued, insulation must be tapered to pipe to allow for covering jacket to completely seal off end of insulation.
Insulation must be extended on the valve bodies up to the valve bonnet.
Extend insulation continuous through pipe hangers and pipe sleeves. At hangers where pipe is supported, provide an insulated protection shield.
Insulating cement must be applied to fittings, valves, and strainers and troweled smooth to thickness of adjacent covering. Strainer cleanout plugs must remain accessible. Covers fabricated from molded pipe covering may be used in lieu of cement, provided covers are neat and well secured.
2. Jacket flap must be sealed down with factory applied self-sealing lap. Seams must be lapped not less than 1½ inches. Jacket must be secured with aluminum bands installed at 12-inch centers.
3. Exposed outdoor insulation must have an additional 0.016-inch minimum thickness aluminum jacket applied over the completed insulation. The jacket must have a factory applied moisture barrier and must be Childers; Smith; or equal.
End joints must be lapped with aluminum holding traps located directly over the lap. Additional aluminum holding straps must be placed at 8-inch centers. Jacket at ells and tees must be mitered, or premanufactured fitting jackets must be provided, with additional aluminum holding bands, as required. All joints must be sealed watertight using silicon type, heat resistant sealant.
4. In-ground insulation must have an additional PVC jacket applied over the completed insulation and vapor barrier. PVC jacket must be made watertight with adhesive or sealant as recommended by the PVC jacket manufacturer.

Alternate pipe insulation, where used, must be installed on hot water piping before connections are made or the insulation may be slit lengthwise, applied to pipe and sealed with adhesive.

Pipe Safety Insulation: Pipe safety insulation must be installed under the manufacturer's instructions.

Duct Insulation:

Ragged edges must be repaired or taped. Coverings must be neatly finished at joints and edges. Each joint must have a 2-inch minimum lap.

Where transitions are made between externally covered ducts and lined ducts, the lined duct must be overlapped 8 inches with external covering.

Insulation must be flush with but not cover control devices, damper controls or access doors.

Before insulation is wrapped around concealed ducts, an adhesive must be spot applied at a maximum of 4-inch centers on each side of the ducts to prevent sagging of the insulation. Insulation must be wrapped entirely around the ducts and must be wired securely in place with No. 16 copper clad wire, metal bands at least ½ inch wide or plastic ties. Supports must be spaced a maximum of 12 inches on center. Metal bands must be installed with the use of a banding machine. Seams in the insulation must be taped.

The finished insulation covering must be even and level and must not contain humps.

Plenum and Duct Liner:

Plenums and exposed ducts must be lined with plenum and duct liner. Plenums and ducts must be sized to provide the clear inside dimensions shown after the liner is installed.

The insulation must be applied with coated side exposed to air stream to prevent surface erosion.

The lining must be fastened in place with adhesive and with studs with washers spaced a maximum of 18 inches on center each way.

Applying Adhesive: The adhesive must be liberally applied over entire interior surfaces of ducts or plenums.

Stud Installation:

Studs must be installed as follows:

1. Cement-In-Place Type Studs: Cement-in-place type studs must be cemented in place with adhesives manufactured for this purpose and must be as recommended by the stud manufacturer. Cement-in-place type studs must be used where concrete walls form part of plenum.
2. Percussive Welding Type Studs: Percussive welding type studs must be carefully welded in place with current settings that will not appreciably burn galvanizing on opposite side of the sheet metal.
3. Pneumatic Driven Type Studs: At locations where pneumatic driven type studs are used, hardened steel backup plates or dollies must be used under the sheet metal.

99-15250D PAYMENT

Not Used

99-15330 AUTOMATIC FIRE SPRINKLER SYSTEM

99-15330A GENERAL

99-15330A(1) Summary

Scope: This work consists of designing, furnishing and installing an automatic wet pipe type fire sprinkler system, complete and ready for use.

The automatic fire sprinkling system must include **water flow indicator, check valve, electric alarm bell** valves, sprinkler heads and related appurtenances, valves, piping and fittings.

Design:

The design of the sprinkler system must comply with the code requirements for light hazard and ordinary hazard occupancies, group 2, and must provide coverage of the entire building area shown.

The Contractor must provide, and modify as required, a hydraulic design and calculations to provide a sprinkler system to have adequate protection to the buildings in accordance with NFPA 13-2022. The sprinkler system must be designed based on hydraulic conditions, including available flow and pressure, as determined by the flow test conducted by the Contractor or obtained from the utility company's flow analysis. This requirement is in accordance with the regulations set forth by the State Fire Marshal and the Authority Having Jurisdiction.

You must obtain and verify the water pressure and flow rate from the local authority having jurisdiction.

99-15330A(2) Definitions

Not Used

99-15330A(3) Submittals

State Fire Marshal Plan Review: The contractor must submit the fire sprinkler system design with all necessary documentations, including but not limited to utility fire flow analysis report, to the State Fire Marshal for approval as soon as possible after award of contract. Any delay of the project due to approval of fire sprinkler system will be contractor's responsibility. Prior to the submittal of the shop drawings, the Contractor must have said drawings stamped "APPROVED" by the State Fire Marshal.

Shop Drawings: Complete shop drawings including written verification of the water pressure and flow rate, must be submitted for approval.

99-15330A(4) Quality Assurance

Codes and Standards: All work must comply with the California State Fire Marshal, the National Fire Protection Association (NFPA) Standard No. 13-2022, "Installation of Sprinkler Systems," and the requirements of other regulatory authorities having jurisdiction.

99-15330B MATERIALS

Water Flow Indicator: Water flow indicator must be UL or FM Approvals listed for fire protection; vane type switch designed for wet pipe systems. Water flow indicator must be designed for minimum flow rate of 10 GPM, and must have an adjustable delay setting of from 0 to 90 seconds. Water flow indicator must be Viking, Model VSR-D; Grinnell, Model F620; Reliable, Model A; or equal.

Check Valve: Check valve must be UL or FM Approvals listed, swing type, self-draining, iron body with brass trim and rubber clapper with removable cover plate. Check valve must be Viking, Grinnell, Groeniger, or equal.

Alarm Bell: Alarm bell must be UL or FM Approvals listed electric bell type, 115 **V(ac)** with a minimum sound rating of 95 decibels at 10 feet. Alarm bell must have a die cast aluminum housing with built-in rubber gasket for dust proof seal for bell striking mechanism. Alarm bell must be Viking, Grinnell, Reliable, or equal.

Pipe and Fittings:

Pipe and fittings must comply with the requirements specified under section 99-15060.

Pipe and fittings for drain lines must be as recommended by the valve manufacturer.

Pipe Hangers: Pipe hangers must be of types listed as acceptable for specific applications in NFPA No. 13.

Valves:

Valves must be UL or FM Approvals listed, outside screw and yoke (OS&Y) rising stem type.

Valves (OS&Y) 2½ inches and larger in size must be Crane, 467; Walworth, 8713F; Nibco Scott, F-607-0; or equal.

Valves (OS&Y) 2 inches and smaller in size must be Crane, 459; Walworth, 873; Nibco Scott, T-104-D; or equal.

Detector Check Valve must be UL listed and FM approved. Valve must be completed with water meter and trim package as manufactured by Mueller Co., A-2132-6; Grinnell Corp., Figure 1371P; or equal. (OS&Y) 2 inches and smaller in size must be Crane, 459; Walworth, 873; Nibco Scott, T-104-D; or equal.

Indicator Post:

Indicator post must be the adjustable vertical type as manufactured by Mueller Co., model A-20806; American Flow Control, model IP-71; or equal.

Optional; Valves 4 inches and larger may be butterfly type, UL or FM Approvals listed, working pressure 175 psi, gear operated, indicator flag, ductile iron body, bronze trim, with provisions for locking. Valve must be provided with mounting block for supervisory switch.

Supervisory Switch: Supervisory switch must be UL or FM Approvals listed, for the type of valve supplied, single contact set with tamper resistant cover. Supervisory switch must be suitable for exterior installations.

Sprinkler Head: Sprinkler head must be upright type above ceiling and pendant type below ceiling. Sprinkler head must be brass body, chemical or solder fusing type, with proper temperature rating element. Sprinkler head must be Viking, Grinnell, Reliable, or equal.

Spare Sprinkler Cabinet: Spare sprinkler cabinet must be metal cabinet as recommended by the sprinkler head manufacturer and complying with the NFPA requirements. The cabinet must be painted red.

Fire Department Connection: Fire department connection must be UL or FM Approvals listed, horizontal single or double Siamese as required, with 2½-inch inlets, drain cock, caps, chain, and brass nameplate. Inlets must have national standard fire hose coupling screw threads. The fire department connection must be Potter-Roemer, Grinnell, or equal; and must be approved by the authority having jurisdiction.

Accessories: Drains, test connection, flush connections, pressure gauges, and other accessories must be supplied as required.

Sign: Sign must be sheet steel, not less than 0.030 inch (22-gage) thick, with red letters on a white background and a baked enamel coating.

99-15330C CONSTRUCTION

99-15330C(1) Installation

Sprinkler piping and equipment must be installed under the authorized shop drawings and must be located to avoid interference with the lighting system, HVAC systems, ducting works, and access openings, or other piping. Piping must be adequately sized based on available pressure.

Reductions in pipe size must be made with one piece reduction fittings. Bushings must not be used.

Piping:

Fire sprinkler piping must be installed level.

Drain piping and test connections must discharge into the nearest floor drain or to the outside of the building. Discharge piping must not drain across walkways.

Spare Sprinkler Cabinet: The spare sprinkler cabinet must be installed where temperatures will not exceed 100 degrees F at any time. Such location must be authorized by the Engineer. Six spare sprinklers and 2 sprinkler head wrenches must be furnished and placed in the cabinet.

Securing Main Shutoff Valve: A galvanized chain, with a nominal material diameter of at least 7/32 inch, must be provided to lock the main shutoff in the open position. The lock will be Department-furnished.

Signs: Signs and messages must be as required by NFPA No. 13 and the regulatory authorities having jurisdiction. Lettering must be standard type of the following heights:

Item	Minimum Lettering Height
Nameplate date	¼"
Drain signs	¾"
Tamper sign	¾"

99-15330C(2) Field Quality Control

Acceptance Tests:

The Contractor must arrange for testing of the automatic fire sprinkler system in the presence of the Engineer and the State Fire Marshal and the authority having jurisdiction. Notify the Engineer and State Fire Marshal at least 5 working days before the test.

The system must be pressure tested for 4 hours at 200 psig. A successful test must have no visible leaks or loss of pressure.

The Contractor must perform such other tests as may be required by the State Fire Marshal at no extra cost to the state.

99-15330D PAYMENT

Not Used

99-15441 PLUMBING FIXTURES

99-15441A GENERAL

99-15441A(1) Summary

This work consists of installing plumbing fixtures and other equipment in buildings.

99-15441A(2) Definitions

gpf: Gallons per flush.

MaP: Maximum Performance Testing Program, <http://www.map-testing.com>.

99-15441A(3) Submittals

Product Data: Submit for all products. Include the following:

1. Manufacturer's technical information and catalog cuts for each item. Indicate model numbers, water consumption, required options, size, and finish.
2. Fasteners, carriers, supports, and other pertinent information.
3. Explanation of abbreviations, symbols, and codes contained in schedules.
4. NSF 61 certification where required.
5. Maintenance and operating instructions, including spare parts list.
6. Certified test results and certificates of compliance as required to verify LEED compliance.

LEED Submittals:

WE Prerequisite 1, Water Use Reduction-20 Percent Reduction: Submit documentation for plumbing fixture water consumption under *LEED Reference Guide for Green Building Design and Construction*, WE Prerequisite 1.

WE Credit 2, Innovative Wastewater Technologies: Submit documentation for plumbing fixture water consumption under *LEED Reference Guide for Green Building Design and Construction*, WE Credit 2.

WE Credit 3, Water Use Reduction: Submit documentation for plumbing fixture water consumption under *LEED Reference Guide for Green Building Design and Construction*, WE Credit 3.

IEQ Credit 4.1, Low-Emitting Materials - Adhesives and Sealants: Submit product data for adhesives, sealants, and sealant primers to be used on-site and inside building weatherproofing system, indicating VOC content.

99-15441A(4) Quality Assurance

99-15441A(4)(a) General

The Engineer will inspect all fixtures for proper installation and test for proper operation after all plumbing activities are complete.

99-15441A(4)(b) LEED

IEQ Credit 4.1, Low-Emitting Material - Adhesives and Sealants: For interior application inside the weatherproofing system and applied on-site, furnish adhesives, sealants, and sealant primers that comply with LEED limits for VOC content. Comply with local requirements if more stringent.

99-15441A(4)(c) Commissioning

Comply with requirements under section 10-2.03C. Coordinate with the commissioning agent to carry out commissioning of plumbing fixtures.

99-15441B MATERIALS

99-15441B(1) General

Plumbing fixtures must be white, commercial grade, and of vandal-resistant design. Plumbing fixtures must comply with ASME A 112.19.2 unless otherwise specified.

Plumbing fixtures in contact with potable water must be certified under NSF 61.

Furnish plumbing fixtures with suitable fasteners to complete work. Exposed metal on fixtures, including wall flanges, bolts, nuts, and washers must be polished chrome plated. Exposed metal surfaces on fixture supports must be enameled to match fixtures.

99-15441B(2) Water Closets

Water Closets: Water closets must be high efficiency type with no more than 1.28 gpf. Water closets must be vitreous china, siphon jet, 16 to 17-1/2 inches high, elongated bowl, close-coupled tank, and floor mounted. Water closets must be listed and labeled under the EPA "WaterSense" program.

Water Closet Seats: Water closet seats must be a solid plastic, open front, elongated seat with check hinges.

99-15441B(3) Urinals

Urinals:

Urinals must include the flushometer, wall hangers, and appurtenances. Urinals must be high efficiency type with no more than 0.125 gpf. Urinals must be wall hung, vitreous china, washout type, 3/4 inch top spud, integral shields, spreader, and trap. Urinals must be listed and labeled under the EPA "WaterSense" program.

Flushometers must be exposed, brass plated, diaphragm or piston type, with vacuum breaker suitable for use with 3/4 inch top spud urinals. Flushometers must include a infrared sensor with indicator light and manual override mounted in a box with stainless steel cover plate and vandal resistant screws. Include the manufacturers mounting plate for the box. Sensor range and time must be adjustable. Power supply must be a box mounted transformer, 120-volt AC input, low voltage AC and current output as required, and supplied by the flushometer manufacturer. Include power and control cables. Flushometers must be listed and labeled under the EPA "WaterSense" program.

99-15441B(4) Lavatories and Sinks

Lavatories:

Lavatories must be vitreous china with ledge, grid drain with overflow, and drilled for 4-inch centers. Nominal dimensions must be 20 by 18 inches. Lavatory faucets must be single extra long lever mixing faucet complying with 24 CA Code of Regs Pt 2 § 1115B.4.3.

Lavatory supports must be concealed type, counter mounted carrier-with leveling screws and locking devices. Carriers must be adjustable for type of wall. Include required hardware.

Kitchen Sinks:-Kitchen sinks must be 20 gauge, polished stainless steel, type 304, seamlessly drawn, double bowl, self-rimming with undercoating. Sink must be supplied with stainless steel sink strainers. Drains must be located toward rear of bowls, not centered. Nominal sink dimensions must be 33 in x 22 in x 6 in.

Service Sinks:

Service sinks must be enameled cast iron, trap standard mounted, with plain undrilled back, stainless steel or chrome plated sheet brass rim guard on three sides and complying with ASME A112.19.1. Nominal dimensions must be 28 by 28 inches. Wall hanger must be supplied by sink manufacturer.

Mop Sinks:

Mop Sinks: Mop sinks must be enameled cast iron, 3-inch trap, vinyl coated rim guard, vacuum breaker faucet with hose, and wall hook. Nominal dimensions must be 28 by 28 inches.

Trap must be 3-inch floor mount with integral cleanout and stainless steel strainer.

Faucets for service and mop sinks must be:

1. Solid brass construction and polished chrome plate finish
2. Wall mounted with center brace
3. Equipped with dual handles on 8-inch centers, integral stops, and vacuum breaker
4. Equipped with bucket hook and threaded hose spout that extends at least 8 inches from the wall
5. Compliant with ASME A112.18.1

99-15441B(5) Water Heaters

Water Heaters:

Tankless water heater must be a condensing, wall-mounted unit with integral or remote LCD display panel, On/Off and temperature setting controls, diagnostic and repair indications. The unit must be equipped with safety features including, but not limited to, electronic spark ignition, oxygen depletion sensor, overheating limiter, flame failure safety device and pressure relief valve. The unit must include a concentric, through-the-roof vent termination kit, freeze protection, flush valve kit, condensate collector and neutralizer kit, and wall mounted bracket. Water heater must be designed to at least 150 psi pressure and capable of 98 to 120 Fahrenheit working water supply temperatures. The unit must have a minimum energy factor of 0.95. Tankless water heater must be minimum capacity as shown on plans. Tankless water heater must be Rinnai; Noritz; or equal. Water heaters must comply with the California *Building Energy Efficiency Standards for Residential and Nonresidential Buildings*, 24 CA Code of Regs Pt 6, and the California Energy Commission *Appliance Efficiency Regulations*.

Water heaters must comply with ANSI Z21.10.3 and the ASME Boiler and Pressure Vessel Code.

99-15441B(6) Miscellaneous Equipment

Electric Water Coolers:

Electric water coolers must be wall mounted, split level, dual height, wheelchair accessible, with heavy duty galvanized steel frame, one-piece stainless steel top, stainless steel cabinet, and an integral electric bottle filler. Electric water coolers must have an accessible bottle-filling station behind the lower, accessible fountain, and self-closing, front and side mounted push bar actuators, shielded bubbler, and automatic stream regulator. Electric water coolers must include loose key stop, adjustable thermostat and cast brass p-trap. Compressors must be hermetically sealed, positive start with fan cooled condenser. Electric water coolers must have a 3-wire grounded cord and plug.

Electric water coolers must produce a minimum of 7.6 gallons of 50 degree F water per hour based on an inlet water temperature of 80 degrees F and an ambient room temperature of 90 degrees F.

Portable Emergency Eyewash Station

Eyewash station must be portable, self-contained, green in color, and manufactured to ANSI Z 358.1 standards. The eyewash station must have a independent 16-gallon capacity tank, be operated by gravity fed, and rated for 15 minutes of uninterrupted flushing at 0.4 gpm. The eye wash station must be equipped with an elastomeric pull strap for activation, and an independent solution refill bottle.

The eyewash station must be provided with all mounting hardware, inspection tag, and instruction booklet. Portable emergency eyewash station must comply with 8 CA Code of Regs § 5162 and must be designated accessible and barrier-free by the manufacturer. Sealant: Sealant be:

1. One component, low modulus silicone
2. Non-acid curing
3. Designed for plumbing fixture applications
4. Compliant with ASTM C920
5. Not subject to sag or flow and tack-free in 1 hour
6. Capable of 100 percent extension and 50 percent contraction without failure

99-15441C CONSTRUCTION

99-15441C(1) General

Seal fixtures to the wall and floor with sealant bead.

Install wall mounted fixtures on concealed carriers designed to support weight of fixture from the floor. Carriers must be made for the specific fixture to be supported and for the installation conditions.

Furnish fixtures with accessible compression stops.

Wrap hot water supply, trap and tailpiece on lavatories under section 99-15250.

99-15441C(2) Installation

Install flush valves for fixtures shown as disabled accessible so that the valve handle is on the widest side of the toilet space.

Install water closets under the manufacturer's instructions. Water closets shown as disabled accessible must be installed with disabled accessible flush valve. Install water closet seats.

Install urinals under the manufacturer's instructions. For waterless urinals, use only sealants, putty, and other installation accessories as recommended by the manufacturer to avoid damaging system.

Install transformers for lavatory faucets and flushometers as shown. Install a plastic junction box extension to cover the transformer.

Install mop sink faucets on the wall above the sink-back with the spout outlet 36 inches above the floor.

Install water heaters with seismic restraints, inlet ball valve, insulating connections, and 3/4-inch pressure and temperature relief valve. Install relief valve drain pipe as shown.

Install portable emergency eyewash station inches above the floor with manufacturer provided bracket.

99-15441D PAYMENT

Not Used

99-15443 WHEELCHAIR ACCESSIBLE SHOWER UNIT

99-15443A GENERAL

99-15443A(1) Summary

Scope: This work consists of installing a wheelchair accessible shower unit and fittings.

99-15443A(2) Definitions

Not Used

99-15443A(3) Submittals

Product Data: Manufacturer's descriptive data, installation instructions, and color palette must be submitted. The color must be selected from the manufacturer's standard product line by the Engineer after approval of the contract.

LEED Submittals:

IEQ Credit 4.1, Low-Emitting Materials—Adhesives and Sealants: Submit product data for adhesives, sealants, and sealant primers to be used on-site and inside building weatherproofing system, indicating VOC content.

99-15443A(4) Quality Assurance

Codes and Standards: Shower units must comply with the California State Accessibility Standards in the CBC and ANSI Z124.1.2.

LEED:

IEQ Credit 4.1, Low-Emitting Material—Adhesives and Sealants: For interior application (inside the weatherproofing system and applied on-site), provide adhesives, sealants, and sealant primers that comply with LEED limits for VOC content. Comply with local requirements if more stringent.

99-15443B MATERIALS

Shower Stall:

Shower stall must be single unit, **single piece** construction with clear interior dimensions of 42 inches wide, 48 inches deep, with an entrance width of 36 inches, and no obstruction at the threshold. Shower stall must be fabricated from gel-coated fiberglass or acrylic with a Class I Flame Spread. Shower unit must be reinforced to accommodate the grab bars and seat.

Shower unit must have a threshold or recessed drop, a maximum of ½ inch in height, sloped at an angle not exceeding 45 degrees from the horizontal. The floor must be slip-resistant, sloping a maximum of ½ inch per foot to a drain located near the rear wall.

Shower unit must be provided with the following fittings and accessories: stainless steel corner grab bar and folding teakwood or woodgrain phenolic wheelchair transfer seat, each capable of resisting 250 pounds of lateral, vertical and tensile load, stainless steel soap dish, chromium plated or stainless steel curtain rod, chromium plated steel hand-held shower head with ball joint, chromium plated 60-inch long flexible shower spray hose, chromium plated fixed shower head, chromium plated metal outlet drain with removable strainer, chromium plated single lever control thermostatic mixing valve with control cartridge with no metal to metal wearing surface, a lever operated shower head selector, and vinyl shower curtain with corrosion resistant hooks.

Shower stall units must be Crane; Floestone; or equal.

99-15443C CONSTRUCTION

Shower must be installed with the manufacturer's instructions. All joints must be sealed and caulked watertight.

99-15443D PAYMENT

Not Used

99-15500 HEATING, VENTILATING AND AIR CONDITIONING EQUIPMENT AND SYSTEMS

99-15500A GENERAL

99-15500A(1) Summary

Scope: This work consists of installing and testing heating, ventilating and air conditioning (HVAC) equipment and systems.

The performance rating and electric service of the HVAC equipment must be as shown.

Comply with requirements under section 10-2.03E.

Temperature Controls: Temperature controls including thermostats, relays, timer switches, and other sensor type control devices required for this work must be furnished and installed by the controls subcontractor of the supplier of the heating, ventilating and air conditioning equipment. All temperature control wiring must be installed under section 99-16. All temperature and control equipment must come from the same manufacturer as the HVAC units.

Codes and Standards:

Comply with codes and other requirements specified under section 99-15050.

Equipment and systems must comply with California Energy Commission regulations including the California Building Energy Efficiency Standards and the Appliance Efficiency Regulations and, where applicable, must comply with standards of the Air-Conditioning, Heating, and Refrigeration Institute (AHRI), Sheet Metal and Air Conditioning Contractors National Association, Inc. (SMACNA), and Air Movement and Control Association International (AMCA). Gas-fired equipment must be CSA certified as complying with applicable ANSI standards.

Cooling and refrigeration equipment and components must be certified by AHRI for the performance rating shown, under the AHRI or ARI rating systems. Performance of space heating equipment and component must be certified by AHRI under the GAMA, I=B=R, ARI, or AHRI rating systems as applicable.

Safety: Equipment must be certified compliant with UL 1995 or with ASHRAE 15, NFPA 90A, and NFPA 90B.

Motors: Motors must be premium type, of highest efficiency available.

99-15500A(2) Definitions

Not Used

99-15500A(3) Submittals

Product Data: Submit product literature and installation instructions for all products including controller, thermostat, sensors, ductwork and accessories. Include energy efficiency ratio (EER) and seasonal energy efficiency ratio (SEER) for cooling equipment, coefficient of performance (COP) for heating equipment, annual fuel utilization efficiency (AFUE) for gas-fired heating equipment, and type and quantity of refrigerant for each cooling unit.

Heat Pump System: Submit calculations of size of refrigerant tube based on plans and heat pump manufacturer's recommendations.

Shop Drawings: For heaters, air conditioners, economizers, fans, dampers, controller, sensors, and duct layout on full size sheets, drawn at same scale as the plans or larger scale as needed for clarity, but not less than 1/4 inch scale.

LEED Submittals:

EA Prerequisite 3, Fundamental Refrigerant Management:

Submit product data for HVAC and refrigeration systems and certification of absence of CFC refrigerants.

EA Credit 4, Enhanced Refrigerant Management:

Submit product data for new HVAC and refrigeration systems indicating specific refrigerant type and charge (quantity) per ton of gross cooling capacity) for each equipment item, for review and authorization by Engineer.

Submit completed LEED template for EA Credit 4, listing all HVAC and refrigeration equipment covered by the credit and showing compliance with credit requirements.

Submit product data for clean-agent fire-extinguishing systems indicating type of clean agent used.

IEQ Credit 1, Outdoor Air Delivery Monitoring: Submit product data for CO2 monitors and direct outdoor airflow measurement devices.

IEQ Credit 4.1, Low-Emitting Materials—Adhesives and Sealants: Submit product data for adhesives, sealants, and sealant primers to be used on-site and inside building weatherproofing system, indicating VOC content.

99-15500A(4) Quality Assurance

Single Source Responsibility: HVAC equipment in each of the following categories must be the products of a single manufacturer:

1. Heating and cooling units
2. Fans and ventilators
3. HVAC controls
4. Ductwork
5. Diffusers, registers, and grilles
6. Dampers
7. Air filters
8. Heat pump (indoor and outdoor units)
9. Remote controller
10. Branch box
11. Thermostat

Controls subcontractor must be certified by the controls manufacturer as an authorized representative and installer.

LEED:

EA Prerequisite 3, Fundamental Refrigerant Management:

Provide refrigerants that do not contain chlorofluorocarbons (CFCs) for HVAC and refrigeration systems.

EA Credit 4, Enhanced Refrigerant Management:

For HVAC and refrigeration systems containing 0.5 pounds or more of refrigerant, select units using refrigerants with low combined potential for contributing to global warming and ozone depletion, as calculated under the LEED Reference Guide.

Provide fire suppression systems that do not contain CFCs, hydrochlorofluorocarbons (HCFCs), or halons.

IEQ Credit 4.1, Low-Emitting Material—Adhesives and Sealants: For interior application (inside the weatherproofing system and applied on-site), provide adhesives, sealants, and sealant primers that comply with LEED limits for VOC content. Comply with local requirements if more stringent.

99-15500B MATERIALS

99-15500B(1) Heating and Cooling Units

Combination Heating/Cooling Rooftop Unit (A/C-1 and A/C-2):

Combination Heating/Cooling Rooftop Unit] must be high efficiency , commercial quality, single package, dual-compressor, variable speed indoor fan motor, multiple-zone VAV control, filter and filter access. Unit must have anti-short cycle timer, colored and numbered wiring, easy access low voltage terminal board, filters, foil-faced and edge captured insulation, high pressure control, removable stainless steel drain pans, liquid line refrigerant drier, low pressure control, operating charge of R-410A refrigerant; phase loss, phase imbalance and phase reversal protection / indication; stainless steel heat exchanger; through the base; gas, electrical, and disconnect switch, hinged access doors, return air sensor, filter status, powered convenience outlet, economizer, supply, return and plenum air smoke detector, CO2 sensor, changeover bypass system, motorized outside air damper, powered exhaust, roof curb, two stage heating, and direct drive, hermetic scroll type compressors. Unit must be shut down as soon as smoke detector detects smoke in supply or return air. Roof curb mounted unit with weatherproof acoustically lined cabinet. The cabinet must have convenient access panels and a baked-on enamel finish. The roof curb must be insulated and must be supplied by the unit manufacturer.

Unit must be provided with positive pressure combustion and mechanical flue gas venting and furnace safety controls.

Indoor air blower must be variable speed, adjustable V-belt drive type. The fan and fan motor must provide the specified air flow.

Motors must have integral thermal overload protection.

Unit must be provided with an economizer and modulating exhaust fan.

Economizer: Economizer must be modulating type assembly and must be provided by the manufacturer of package rooftop unit. The economizer must be complete with damper motor and linkage for full range modulation of the outdoor and return air dampers, modulating exhaust fan, screened rain hoods, factory wiring for convenient connections, automatic compressor lockout, minimum position damper control, and air filters sized to have a maximum velocity of 400 feet per minute, all installed in an enclosure similar in color to the basic unit with paint applied by the manufacturer of the economizer. Modulating exhaust fan must be capable of relieving 100 percent of the rated air conditioning unit. The economizer must be constructed to meet SMACNA requirements and shop drawings must be submitted prior to fabrication. Economizer controls must be fully integrated with cooling system controls.

Economizer must include an air measuring device for outside air.

Heat Pump System : Heat pump must consist of an outdoor condenser unit with indoor fan/coil units, multizone system. The condenser unit must consist of a compressor, condenser fan, condensing coil, refrigerant branch box, suction side refrigerant accumulator. The outdoor unit must control by microprocessors located in the indoor units.

The compressor must be high performance, hermetic, inverter driven, variable speed, dual rotary type. The compressor motor must be DC type equipped with a factory supplied and installed inverter drive package, internal thermal overload protection. Inverter-driven compressor with electronic control systems must detect any change in room or zone temperature and automatically adjust speed of the outdoor unit compressor for precise capacity and temperature control, and control refrigerant flow to regulate coil temperature.

Condenser fan must be direct drive, high performance propeller type fan. Condenser fan motor must be variable speed, DC motor, permanently lubricated bearings, fan speed must be switch automatically according to the number of operating indoor units and the compressor operating frequency, fan motor must be mounted on vibration isolators.

Condenser coil, must be nonferrous construction with lanced or corrugated plate fins on copper tubing, the coil must be protected with an integral guard. Refrigerant flow from the outdoor unit to the indoor units must be independently controlled by means of individual electronic linear expansion valves for each indoor unit. All refrigerant lines between outdoor and indoor units must be annealed, refrigeration grade copper tubing, ARC Type, meeting ASTM B280 requirements and the unit must be charged with R-410A.

Indoor fan/coil units must be wall and ceiling mounted as shown in plans, built-in drain mechanism (condensate removal pump) for condensate removal, ventilation air intake knockout, air filter, supply and return grilles, wired remote controller connectable. The units must be powered from outdoor unit.

Branch Box / Branch Selector Box: Branch box / Branch Selector Box must ensure optimal refrigerant flow to the connected indoor units. The unit must have linear expansion valves which open/close through stepping motor after receiving the pulse signals from the branch box controller board. Valve position must be changed in proportion to the number of pulse signals. The branch box must be multiport type and must be installed in a protective cover.

99-15500B(2) Fans and Ventilators

Exhaust Fan (Ceiling Mounted): Exhaust fan must be ceiling mounted, centrifugal type, AMCA certified and must be equipped with grille, backdraft damper and minimum 0.033-inch thick (20 gauge) galvanized steel housing with acoustical insulation. Exhaust fan motor must have permanently lubricated sealed bearings, integral thermal overload protection and disconnect plug, mounted on vibration isolators. Ceiling exhaust fan must be Loren Cook Company, Greenheck Fan Corp., ACME, or equal.

Combination Heat /Light/Fan: Combination heat /light/fan must be ceiling mounted, recessed type unit with metal housing, grille, and backdraft damper. Ducting size must be as required by the manufacturer.

Roof Exhaust Fan: Roof exhaust fan must be AMCA certified and must be equipped with metal housing, centrifugal fan wheel, backdraft damper and bird screen. Fan motor and fan assembly must be isolated from base with rubber vibration isolators. Fan motor must have integral thermal overload protection. Roof fan must be completely weatherproof and must have a disconnect means under the hood. Roof curb must be insulated and must be supplied by the fan manufacturer. Roof fan must be Penn Barry; Jenn-Air; Loren Cook; or equal.

99-15500B(3) HVAC Controls (A/C-1 and A/c-2)

HVAC Controls System: HVAC control system must be a changeover-bypass VAV type system and from the same manufacturer as the HVAC unit. The HVAC units will deliver a variable volume of supply air to the system. Each zone will have a zone temperature sensor and in some areas CO2 sensor as shown on the plans. The zone temperature sensors (ZTS) and CO2 sensors will communicate information to the unit control module (UCM) on each zone damper. The UCM will then modulate the zone damper (ZD) open or closed supplying conditioned air to the zone. The individual UCMs will communicate zone temperature information to a central control panel (CCP). The CCP also gathers information from the system, including duct static pressure and supply air-temperature, and acts as the central source of communications and decision making between the individual zones and the HVAC unit. The CCP

determines zone heating or cooling needs using voting / polling logic, then requests heating or cooling from the HVAC unit. The CCP directs its HVAC unit to provide ventilation air to zones where the CO2 sensors call for increased air volume, or free cooling when the outside air sensor indicates an air temperature below the temperature set point. As the volume of air required by the zones change the evaporator fan speed change accordingly to maintain the pressure in the supply ducts. See the control diagrams and sequence of operations on the plans.

The control system must contain the following and from the same manufacturer as the HVAC unit.

Central Control Panel: Central control panel must act as the central source of communications and decision making for each HVAC unit. The CCP shall have 24VAC power, and communication wiring to the zone dampers and bypass control as shown on the control diagram. Binary inputs shall consist of priority shutdown and occupied/unoccupied modes. The CCP shall control heating, cooling, and the fans with a communication link tied to an interface board mounted in the HVAC unit. It must also display status information from the electronic controller in the HVAC unit. The CCP shall be capable of communicating with as many zones as required on the plans, make heating and cooling decisions based on set points and temperature information received from individual zones, automatically calibrate all zone dampers, provide diagnostic information for all system components via the operator display, provide status and diagnostic information for the HVAC unit.

Operator Display: Operator display must be a backlit, liquid crystal display with touch screen programming capability. The display must allow the operator to access system and zone status, and perform setup of zone UCMs and CCP system parameters, provide a level of control for the daily operator and a second level for commissioning and service. The system must have a seven-day time clock for stand-alone time of day scheduling capability.

Unit Control Module: Unit control module must be the individual zone controller for the zone damper and must be mounted on each damper. The UCM must continually monitor the zone temperature and where indicated on the plans CO2 levels. The UCM must vary the zone damper position as required to meet zone setpoints and must communicate current space requirements and system operation modes to the CCP.

Zone Damper: Zone damper must be a fully modulating, pressure-dependent VAV device. Each damper must have a UCM control board and actuator in one enclosure, and must be designed to operate to a static pressure of 1.75 in. wg. The zone damper shall be rectangular, with a heavy gage G60 galvanized steel frame, single-ply, heavy gage G60 galvanized steel blades, nylon bearings and metal drive link, with factory installed 24 VAC direct coupled actuator.

Zone Temperature Sensor: Zone temperature sensor must have an LCD display, two button control of space setpoint, and must display setpoint adjustment and space temperature in degrees F. ZTS must be capable of disabling setpoint control and room temperature display.

CO2 Sensor: CO2 sensor must be a wall mounted sensor of Carbon Dioxide levels in parts-per-million (ppm), and must be located as indicated on the plans. The sensor must have a measurement range of 2000 ppm with an output of 0-10 DC.

Time Switch: Time switch must be one-hour, spring-wound, "OFF" type time switch without a "HOLD" feature. Time switch must be Intermatic; Tork, A500 Series; or equal.

Heat Pump Control System:

Heat Pump Control System must be wired remote controllers and cable must be manufactured by the same manufacturer of heat pump. Wired remote controllers must be dual set point, backlit LCD, ON and OFF switches, Operation modes (Cool/Dry/Fan/Auto/Setback/Heat), room temperature display, temperature setting, fan speed setting, air flow direction setting, louver setting, 7-day programmable, clock date (year/month/day) and time (hour/minute), error information display, and wall mounted.

99-15500B(4) Auxiliary HVAC Components

Unless specified herein, all components must be sized and have the characteristics as shown.

Rigid Ductwork: Rigid ductwork must be galvanized steel sheet metal complying with ANSI/SMACNA 006, "HVAC Duct Construction Standards—Metal and Flexible." Galvanized steel must be cleaned by

washing with mineral spirit solvent sufficient to remove any oil, grease or other materials foreign to the galvanized coating.

Spiral Duct: Spiral duct must be prefabricated type.

Duct Supports: Duct supports must be hot-dip galvanized steel.

Flexible Ductwork: Flexible ductwork must be UL 181, Class 1 air duct rated and must meet the requirements of NFPA 90A. Duct must have steel helix wire, 1.5 inch minimum flexible acoustic insulation, with a minimum thermal resistance of R-8, and flame resistant vapor barrier. Inner and outer surfaces must be non-metallic. Outer surface must be copolymer or mylar, factory applied.

Flexible Connection: Flexible connection must be prefabricated type and must be commercial quality flexible glass fabric coated on both sides with neoprene or hypalon.

Ceiling Diffuser (for Gypsum Board Ceilings): Ceiling diffuser for gypsum board ceilings must be rectangular or square type. Diffuser must be steel with oven baked-on enamel bone white dull finish or extruded aluminum, equipped with a removable core and a standard flanged frame with sponge rubber or felt gasket. Diffuser must have individually adjustable curved blades, counter-sunk screw holes, must be surface mounted, with face velocity less than 600 feet per minute; Titus, 250; Hart and Cooley; or equal.

Return Register (for Gypsum Board Ceilings): Return register for gypsum board ceilings must be rectangular or square, and must be steel with oven baked-on enamel bone white dull finish or extruded aluminum, fixed bar type, die formed louvers set at 45 degrees, ½-inch spacing maximum, surface mounted; Titus; AirMate; or equal.

Ceiling Diffuser (for Suspended Ceilings): Ceiling diffuser for suspended ceilings must be 24 inches square. Diffuser must be steel with oven baked-on enamel bone white dull finish or extruded aluminum, perforated face hinged for easy access, and must be fitted with fully adjustable air pattern controllers, a removable core, and a standard flanged frame; Titus; AirMate; or equal.

Return Register (for Suspended Ceilings): The size of return register for suspended ceilings are mentioned in the plans and must be steel or extruded aluminum, perforated face hinged for easy access; Air Mate; Titus; or equal.

Diffuser Plenum: Diffuser plenum must be galvanized steel construction with internal 1/2" rigid acoustic insulation.

Wall Supply Register: Wall supply register must be double-deflecting adjustable type, with vertical face bars and horizontal rear louvers, steel with oven baked-on enamel bone white finish or extruded aluminum, flanged frame with sponge or felt gasket; Hart and Cooley; Air Mate or equal.

Volume Damper: Volume damper must be opposed blade type, operable from face with screwdriver or Allen-head wrench, must be same manufacturer as diffuser or may be furnished as part of the diffuser.

Bypass Damper: Bypass damper must be able communicate and be modulated by a central control panel. Damper must be 22 gage galvanized sheet metal casing. Blade assembly must be double skin 24 gage galvanized sheet steel with a flexible gasket sandwiched between the two layers for low leakage. Must be provided by central control panel manufacturer.

Bypass Controller: Bypass controller must be a single enclosure with temperature sensor, static pressure sensor, and communicating controller mounted to supply ductwork. Must be provided by central control panel manufacturer.

Balance Damper: Balance damper must be butterfly type, 16-gage (minimum) galvanized steel blade, end bearings with steel shaft and locking and indicator operator.

Air Filter (for HVAC Units): Air filters must be disposable filters with a minimum efficiency reporting value (MERV) of not less than 13 when tested under ASHRAE 52.2. Filters must be located to process both return and outside air that is delivered as supply air.

Refrigerant and Condensate Drain Piping: Refrigerant and condensate drain piping must be rigid, Type L copper tubing with brazed solder fittings. The suction line must be insulated, with vapor barrier and must

be weatherproofed for exterior installation. Condensate Drain Piping shall be routed to avoid PV panels on the roof and other installations. Factory sealed tubing must not be used.

99-15500C CONSTRUCTION

99-15500C(1) Installation

Ventilators:

Exhaust ducts connected to exhaust fans must be routed as shown and avoid PV panels on the roof and must terminate in a weatherproof cap and bird screen. Duct sizes must be as shown or as recommended by the manufacturer, whichever is larger.

Roof fans must be curb mounted.

Condensate Drains: Air conditioning units and heat pumps must be provided with condensate drain trap and piping. Outdoor piping must extend to the nearest roof drain, gutter or as shown. Install supply and return refrigerant piping close to roof level to avoid other installations. The condensate drain pipe from indoor fan/coil units must be routed to the outside of building as shown in plans. Air gap must be installed where required by code. Interior condensate drain piping must be insulated with foam insulation.

Mounting Heights: Thermostats, zone temperature sensors, central control panels, remote temperature controllers, and time switches must be installed consistent with accessibility requirements.

Install thermostats on interior walls. If installation on an exterior wall is unavoidable, each thermostat installed on an exterior wall must be insulated from the outside wall, and must be provided with an aluminum radiation shield above the thermostat.

The time switch must be installed beside the thermostat or where shown.

Vents and Flues: Vents and flues must be securely fastened to the building construction, must be provided with a collar at all ceiling penetrations and must terminate with a weather cap. Access Door: Access doors must be provided in rigid ducts and plenums for access to volume dampers, smoke dampers and control devices located within such ductwork.

Ducts and Vents:

Ductwork within the building must be installed to clear lighting fixtures, doors, windows and other obstructions. Ductwork must preserve head room and must keep openings and passageways clear whether shown on plans or not.

Ductwork must be installed and braced according to the latest edition of the SMACNA "HVAC Duct Construction Standards—Metal and Flexible."

Slopes in sides at transitions must be approximately one to five. The ductwork system must not contain abrupt changes or offsets of any kind unless otherwise shown.

Where ducts pass through walls or ceilings, galvanized sheet metal or steel angle collars must be installed around the ducts.

Duct sections must be connected by beaded sleeve-type couplings using joint sealer as recommended by the duct manufacturer. Duct sections must be mechanically fastened with pop rivets or sheet metal screws and sealed with mastic or insulated, reinforced silver tape.

Flexible connections must be provided at both inlet and outlet of fan coil and ventilating units.

Sheet metal plenums must be adequately braced and supported from the floor or structure with structural steel angles to prevent sagging, flexing and vibration.

All standing seams and transverse joints of supply, return and exhaust ducts and seams around plenums, fan and coil housings must be sealed with sealant and taped.

Duct Penetrations in Fire Rated Assemblies: Where ductwork passes through fire rated wall, floor or ceiling assemblies, the penetration must be protected under section 99-07270.

Ductwork Identification:

Ductwork must be identified as follows:

Duct Description	Identification Symbol
Supply duct	S
Return duct	R
Bypass duct	B
Exhaust duct	EXH
Outside air duct	OA

Identification symbol letters must be stenciled at locations visible from the access routes to be used by maintenance workers. Such letters must be painted with black colored paint and must be a minimum of 2 inches high.

99-15500C(2) Field Quality Control

Pre-test Requirements:

Before starting or operating systems, equipment must be cleaned and checked for proper installation, lubrication and servicing package roof top units must have manufacturer's start up service.

In each system, at least one air path, from fan to final outlet, must have all balance dampers open. The final air quantities must be achieved by adjusting the volume dampers or the fan RPM.

Final adjustments and balancing of the systems must be performed in such a manner that the systems will operate as specified and as shown.

The Contractor must replace or revise any equipment, systems or work found deficient during tests.

All automatic operating devices which are pertinent to the adjustment of the aforementioned air systems must be set and adjusted to deliver the required quantities of air and at temperatures specified by the Engineer. All control work must be done in collaboration with the control manufacturer's representative.

Project Completion Tests:

The Engineer must be notified at least 5 working days in advance of starting project completion tests.

The project completion tests must consist of the following:

1. Air Systems: All air systems must be tested and balanced to the conditions set forth on the plans and in these special provisions. This work must be performed by an Associated Air Balance Council (AABC) or National Environmental Balancing Bureau (NEBB) certified contractor. The air systems include, but are not necessarily limited to, the following:
 - a. Supply air systems
 - b. Return air systems
 - c. Exhaust air systems
2. Operational Data: The tests must include operation of the heating, cooling, and ventilating systems for not less than two 8-hour days, each system must operate at not less than 90 percent of their full specified capacities.

The required data must be accurately measured. The data must be measured during one operational cycle in the presence of the Engineer and must be submitted for authorization.

The following data must be measured and tabulated:

- a. Ambient temperatures and conditions, °F
- b. Supply and return air quantities, CFM, each room
- c. Thermostat set point, °F
- d. Air temperatures at room center, °F
- e. Fan motor amperages and voltages
- f. System static pressures, inches of water column

99-15500D PAYMENT

Not Used

99-16 ELECTRICAL

99-16010 ELECTRICAL WORK

99-16010A GENERAL

99-16010A(1) Summary

Scope: This work consists of performing electrical work including furnishing all labor, materials, equipment and services required to construct, connect and install the complete electrical system.

99-16010A(2) System Description

System layouts are generally diagrammatic and location of equipment is approximate. Exact routing of conduits and other facilities and location of equipment is to be governed by structural conditions and other obstructions, and must be coordinated with the work of other trades. Equipment requiring maintenance and inspection must be located where it is readily accessible for the performance of such maintenance and inspection.

99-16010A(3) Definitions

Not Used

99-16010A(4) Submittals

Submittals of each electrical system must be submitted as one single package consisting of product data, working drawings (size must be 34" by 22"), installation instructions, seismic anchoring calculations, anchoring details for equipment and other listed requirements as specified. Submittals must be stamped "Approved" by the Engineer prior to the commencing of any installation work. All installation work done prior to receiving "Approved" submittals from the Engineer must be corrected as directed by the Engineer. Conduit layout and stub out location submittal must be approved prior to concrete slab and pad installations.

Submit seismic anchoring calculations and anchoring details for all electrical equipment which must be mounted and braced to withstand, without damage, seismic acceleration forces in the horizontal and vertical directions. The forces in the vertical direction must be at least 66% of those in the horizontal direction. The entire seismic anchoring installation must meet all applicable seismic requirements of the latest version of the California Building Code (CBC). The equipment anchoring methods and details must be submitted for review and approval by the Engineer. The equipment anchorage details must be coordinated with the equipment mounting provisions, prepared and stamped by a licensed civil engineer in the State of California. The attachment methods must not damage any structural member. The installation must meet requirements of the Essential Building Seismic Safety Act, per 24 CA Code of Regs.

99-16010A(5) Quality Assurance

Regulatory Requirements: All electrical work performed and materials installed must comply with section 86-1.01D(1) and 24 CA Code of Regs, Part 6, "California Energy Code."

99-16010B MATERIALS

Not Used

99-16010C CONSTRUCTION

99-16010C(1) General

Not Used

99-16010C(2) Testing

After the installation work for the electrical systems has been completed, each electrical system must be tested in the presence of the Engineer to demonstrate that the electrical systems function properly. Make necessary repairs, replacements, adjustments and retests at your expense.

Final inspection for the completed electrical system must take place after all the various systems have been tested. A punch list will be generated by the Engineer after inspecting each electrical system. Make necessary repairs, replacements, and adjustments for all the items listed in the punch list at your expense.

The Engineer must be notified 15 days in advance of testing and Department personnel training on the job site. When a manufacturer's representative is required on the job site, the Engineer must be notified 15 days in advance.

99-16010D PAYMENT

Not Used

99-16050 BASIC MATERIALS AND METHODS**99-16050A GENERAL****99-16050A(1) Summary**

Scope: This work consists of furnishing and installing the basic materials for the electrical work, including conduits, conductors, fittings, and wiring devices. The basic materials must include those accessories and appurtenances, not mentioned, that are required for the installation and operation of the electrical system.

Related Work:

Roof penetrations must be flashed and sealed watertight to comply with section 99-07620.

Where conduits pass through fire rated walls, floor or ceiling assemblies, the penetrations must be protected to comply with section 99-07270.

99-16050A(2) Definitions

Not Used

99-16050A(3) Submittals

Product Data:

Submit a list of all materials and equipment to be installed and the manufacturer's descriptive data.

Manufacturer's descriptive data must include catalog cuts with exact part number and data (voltage, phase, and rated amperes or watts or horsepower), complete description, performance data and installation instructions for the materials and equipment.

99-16050A(4) Quality Assurance

Not Used

99-16050B MATERIALS**99-16050B(1) Conduits and Fittings**

Rigid Steel Conduit and Fittings:

Rigid steel conduit must be Type 1 complying with section 86-1.02B(1).

Type 1 conduit must have steel or malleable iron fittings.

Split or three-piece couplings must be electroplated, malleable cast iron couplings.

Insulated grounding bushings must be threaded malleable cast iron body with plastic insulated throat and steel, lay-in ground lug with compression screw.

PVC Coated Rigid Steel Conduit and Fittings: PVC coated rigid steel conduit and fittings must be Type 2 complying with section 86-1.02B(1).

Electrical Metallic Tubing (EMT) and Fittings:

EMT must be formed of cold rolled strip steel, zinc coated, and interior lined to comply with UL Standard 797 and ANSI C 80.3.

Couplings must be electroplated, rain and concrete tight, gland compression type, steel body couplings with malleable iron nuts.

Connectors must be electroplated, rain and concrete tight, gland compression type, steel body connectors with male hub, malleable iron nut and insulated thermoplastic throat.

Flexible Metallic Conduit and Fittings:

Flexible metallic conduit must be fabricated in continuous lengths from galvanized steel strip, spirally wound and formed to provide an interlocking design.

Fittings must be electroplated screw-in type with malleable cast iron body and threaded male hub with insulated throat.

Rigid Non-Metallic Conduit and Fittings:

Rigid non-metallic conduit and fittings must be Type 3 complying with section 86-1.02B(1).

Couplings must be PVC, socket type or thread on one end and socket type on the other end as required for the particular application.

Terminal adapters for adapting PVC conduit to boxes, threaded fittings, or metallic conduit system must be PVC adapters with threads on one end and socket type on the other end.

Liquidtight Flexible Metallic Conduit and Fittings:

Liquidtight flexible metallic conduit must be Type 4 complying with section 86-1.02B(1).

Fittings must be electroplated, malleable cast iron body, with cap nut, grounding ferrule, and connector body with insulated throat.

Explosion Proof Conduit Seal: Explosion proof conduit seal must be suitable for Class 1, Division 1, EYSX type with 40% fill capacity, integral bushings in conduit hubs to protect conductor/cable insulation damage, UL 1203 Standard listed, and size as shown.

99-16050B(2) Conductors

Conductors:

Conductors must be stranded copper wire of the size shown. Conductors must comply with ASTM B3 and ASTM B8. Conductor size must be based on AWG, except that conductor diameter must be not less than 98 percent of the specified AWG diameter.

Conductor insulation types must be as follows:

1. Conductors in control panel enclosures must be Type MTW.
2. Conductors in wet, underground, or outdoor locations must be Type XHHW-2.
3. All conductors other than Type MTW and XHHW-2 must be Type THHN.

Wire Connections and Devices: Wire connections and devices must be pressure or compression type, except that connectors for No. 10 AWG and smaller conductors in dry locations may be preinsulated spring-pressure type.

99-16050B(3) Electrical Boxes

Outlet, Device and Junction Boxes:

Boxes must be galvanized steel boxes with knock-outs and must be the size and configuration best suited to the application shown. Minimum size of outlet, device, or junction boxes must be 4 inches

square by 1-1/2 inches deep. Flush-mounted single device and surface mounted light fixture boxes must have four inch square single raised device covers.

Flush-mounted boxes must have stainless steel covers, 0.04 inches thick. Surface-mounted boxes must have galvanized steel covers with metal screws. Cover screws must be metal with finish to match cover finish.

Sectional device plates will not be permitted.

Cast boxes and weatherproof boxes must be cast iron boxes with threaded hubs complying with NEMA FB-1, and must be of the size and configuration best suited to the application shown. Minimum size of outlet, device, or junction boxes must be 4 inches square by 1-7/8 inches deep.

Cast boxes and weatherproof boxes must have cast iron covers with gaskets.

Weatherproof device boxes must have gasketed covers with gasketed hinged flaps to cover switches and receptacles.

Combination Heat, Light and Vent Unit: Combination heat, light and vent unit must be in a dual gang box as shown.

Communication Outlet Box:

Communication outlet box must be 4-inch square box with faceplate. Boxes on stud walls must have raised device covers.

Faceplate must accommodate modular type communication outlet jacks and include tear-resistant icons showing computer icon for data jacks and telephone icon for telephone jacks.

Communication Outlet Jack: Communication outlet jack must be either data or voice jacks. Each communication outlet jack must include data and voice jack as shown. Jacks must be as follows:

1. Data jack must be modular RJ-45, for Cat 6, 4 pair UTP cable and must snap into Cat 6 faceplates and/or termination boxes. Data jack must be UL approved.
2. Voice jack must be modular RJ-11, for Cat 6, 4 pair UTP cable and must snap into Cat 6 faceplates and/or termination boxes.

Pull Boxes:

Pull boxes must comply with section 86-1.02C.

Traffic pull boxes must comply with section 86-1.02C.

Tamper-resistant pull boxes must comply with section 86-1.02C.

Electrical pull box covers and traffic rated pull box covers must be marked "ELECTRICAL."

Telephone pull box covers must be marked "COMMUNICATION." Lighting pull box covers must be marked "LIGHTING." Control pull box covers must be marked "CONTOL."

99-16050B(4) Receptacles and Switches

Ground Fault Circuit Interrupter Receptacle, (GFCI): GFCI receptacle must be NEMA Type 5-20R, feed-through type, ivory color, 3-wire, 20-ampere, 125-volt, specification grade, duplex receptacle suitable for wiring with stranded conductors. Receptacle must detect and trip at current leakage of 5 mA and must have front mounted test and reset buttons.

Duplex Receptacle: Duplex receptacle must be NEMA Type 5-20R, 3-wire, 20-ampere, 125-volt, ivory color, specification grade duplex receptacle suitable for wiring with stranded conductors.

Fourplex Receptacle: Fourplex receptacle must be NEMA Type 5-20R, 3-wire, 20-ampere, 125-volt, ivory color, specification grade fourplex receptacle suitable for wiring with stranded conductors.

Single Receptacles: Single receptacles must be NEMA Type 5-20R, 3-wire, 20-ampere, 125-volt AC, safety grounding, ivory color, specification grade single receptacle suitable for wiring with stranded conductors.

Reel Light Receptacle: Reel light receptacle must be NEMA Type L5-20R, 3-wire, 20-ampere, 125-volt, twist-lock, single, specification grade receptacle suitable for wiring with stranded conductors.

Single Pole Switch: Single pole switch must be 20-ampere, 120/277-volt, quiet type, specification grade, ivory color switch with silver alloy contacts. Switch must be suitable for wiring with stranded conductors.

Three-way Switch: Three-way switch must be 20-ampere, 120/277-volt, quiet type, specification grade, ivory color switch with silver alloy contacts. Switch must be suitable for wiring with stranded conductors.

Selector Switch, SS: Selector switch must be rotary action, double-pole, 2-position, 10-ampere, 120-volt switch. Switch contacts must have an inductive pilot duty rating of 60 amperes (make), 6 amperes (break) and 10 amperes (continuous) at 120 volts and 35 percent power factor. Selector switch must have legend plate marked MANUAL-AUTO.

Timer Switch: Timer switch must be a spring wound mechanical timer with a rotary dial. Contacts must be rated 20 amperes at 120 volts. Time adjustments must range from zero to two hours. Outdoor timer switch must be equipped with weatherproof cover.

Digital Timer Switch: Digital timer switch must be an electronic interval timer switch with a manually operated toggle switch or pushbutton. Switch must be rated 1200-watt at 120/277 volts. Time adjustments must range from 5 minutes to 12 hours, initially set at 2 hours. Switch must have an audible warning that beeps every 5 seconds at one minute prior to time out.

99-16050B(5) Occupancy Sensor Switches

Not Used

99-16050B(6) Miscellaneous Materials

Warning Tape: Warning tape must be 4 inches wide and contain the printed warning "CAUTION ELECTRICAL CONDUIT" in bold 3/4-inch black letters at 30-inch intervals on bright orange or yellow background. The printed warning must be non-erasable when submerged under water and resistant to insects, acids, alkali, and other corrosive elements in the soil. The tape must have a tensile strength of not less than 155 pounds per 4-inch wide strip and must have a minimum elongation of 700 percent before breaking.

Pull Tape : Pull tape must be a flat woven lubricated soft polyester tape with minimum tensile strength of 1,800 lb and have printed sequential measurement markings every 3 feet. At least 2 feet of pull tape must be doubled back into the conduit at each end.

Watertight Conduit Plug: Watertight conduit plug must be a hollow or solid stem expansion plug complete with inner and outer white polypropylene compression plates and red thermoplastic rubber seal. Seal material must be non-stick type rubber resistant to oils, salt, and alkaline substances.

Anchorage Devices: Anchorage devices must be corrosion resistant, toggle bolts, wood screws, bolts, machine screws, studs, expansion shields, or expansion anchors as required by the supporting device.

Electrical Supporting Devices:

Electrical supporting devices must be one hole conduit clamps with clamp backs, hot-dipped galvanized, malleable iron.

Construction channel must be 1-5/8 inches x 1-5/8 inches, 12-gage galvanized steel channel with 17/32-inch diameter bolt holes, 1-1/2 inches on center in the base of the channel.

Ground Rod: Ground rod must be a 3/4-inch (minimum) galvanized or copper clad steel rod, 10 feet long, and must conform to the requirements in NEMA GR-1.

99-16050C CONSTRUCTION

Conduit:

Conduits must be installed to comply with section 87-1.03B and the following:

1. All conduits must be rigid steel except as follows:

- a. EMT may be used in walls and furred spaces and for exposed work indoors above the switch height.
 - b. Flexible metallic conduit must be used to connect suspended lighting fixtures, motors, HVAC equipment, and other equipment subject to vibration in dry locations.
 - c. Liquidtight flexible metallic conduit must be used to connect motors, HVAC equipment, and other equipment subject to vibration in wet or exterior locations.
 - d. PVC coated rigid steel conduit must be used for all base elbows and vertical risers through concrete slabs inside and outside the building.
 - e. Rigid non-metallic conduit must be used in underground, exterior locations.
 - f. Rigid non-metallic conduit must be used in underground and underslab locations inside the building only at locations where the PVC symbol are shown on the plans. All base elbows and vertical risers must be PVC coated steel conduit.
2. Rigid non-metallic conduit bends of 30 degrees or greater must be factory-made long radius sweeps. Bends less than 30 degrees must be made using an authorized heat box.
 3. Locations of conduit runs must be planned in advance of the installation and coordinated with the ductwork, plumbing, ceiling and wall construction in the same areas and must not unnecessarily cross other conduits or pipe, nor prevent removal of ceiling tiles or panels, nor block access to mechanical or electrical equipment.
 4. Where practical, conduits must be installed in groups of parallel, vertical or horizontal runs and at elevations that avoid unnecessary offsets.
 5. Exposed conduit must be installed parallel and at right angles to the building lines.
 6. Conduits must not be placed closer than 12 inches from a parallel hot water or steam pipe or 3 inches from such lines crossing perpendicular to the runs.
 7. All raceway systems must be secured to the building structures using specified fasteners, clamps and hangers.
 8. All metal conduits, fittings, and elbows in contact with soil or concrete must be wrapped with a double layer of 20-mil thick pipe wrapping tape.
 9. Single conduit runs must be supported by one hole conduit clamps. Single conduit runs on walls in damp or wet locations must be installed with clamp backs to space conduit off the surface.
 10. Multiple conduit runs must be supported with construction channel secured to the building structure. Conduits must be fastened to construction channel with channel compatible pipe clamps.
 11. Raceways of different types must be joined using authorized couplings or transition fittings.
 12. Expansion couplings must be installed where conduit crosses a building separation or expansion joint.
 13. All floor and wall penetrations must be sealed watertight.
 14. All raceway systems run on the I-beams and vertical columns must be secured using fasteners, clamps and hangers without drilling holes on the structure.

Conduit Terminations:

Rigid steel conduits must be securely fastened to cabinets, boxes and gutters using 2 locknuts and insulating metallic bushing. EMT must be securely fastened to cabinets, boxes and gutters using connectors. Conduit terminations at exposed weatherproof and cast boxes must be made watertight using hubs.

Grounding bushings with bonding jumpers must be installed on all conduits terminating at concentric knockouts and on all conduits containing service conductors, grounding electrode conductor, and conductors feeding separate buildings or systems.

Rigid non-metallic conduit must be terminated inside the underground pull boxes with an authorized conduit bushing or fitting. All conduits must enter vertically through the bottom of pull boxes.

All future conduits terminated in underground pull boxes or left exposed indoors and outdoors must be provided with watertight conduit plugs.

Warning Tape: Warning tape must be placed over each conduit in a trench. Each warning tape must be centered over the conduit and must be placed over the 6 inch layer of sand covering the conduit.

Conductor and Cable Installation:

Conductors must not be installed in conduits until all work of any nature that may cause injury is completed. Care must be taken in pulling conductors so that insulation is not damaged. An authorized non-petroleum base and insulating type pulling compound must be used as needed.

Sensor Cables: Sensor cable splices inside underground pull boxes and junction boxes must be made if required using approved methods and devices as recommended by the manufacturer of the field instrumentation devices. Number of splices in each sensor cable homerun to the control panels must be as per the manufacturer recommendations. Sensor cable lengths must be ordered as required for terminating them at junction boxes and at control panels without the use of splices.

All cables must be installed and tested to comply with manufacturer's instructions.

Splices and joints must be insulated with insulation equivalent to that of the conductor.

Six inches of slack must be provided at each outlet and device connection. If the outlet or device is not at the end of a run of conductor, connection must be made with correctly colored pigtails tapped to the runs with splices.

All pressure type connectors and lugs must be retightened after the initial set.

Splices in underground pull boxes and similar locations must comply with section 87-1.03H(2).

Junction boxes in furred or accessible ceiling spaces must be identified on the cover plate with permanent marking pen denoting the circuits contained in the box.

Conductor Identification:

The neutral and equipment grounding conductors must be identified as follows:

1. Neutral (grounded) conductor No. 6 and smaller must be identified as follows:
 - 1.1 White insulation for 120/208 V system.
 - 1.2 Orange insulation with 3 continuous white stripes along its entire length for 120/240 V system.
 - 1.2 Gray insulation for 277/480 V system.
2. Neutral (grounded) conductor No. 4 and larger for 120/208 V system must be identified by distinctive white markers such as paint or white tape at all accessible locations over the entire exposed conductor length at each termination.
3. Neutral (grounded) conductor No. 4 and larger for 120/240 V system must be identified by distinctive orange markers with continuous white stripes such as paint or orange tape with continuous white stripe at all accessible locations over the entire exposed conductor length at each termination.
4. Neutral (grounded) conductor No. 4 and larger for 277/480 V system must be identified by distinctive gray markers such as paint or gray tape at all accessible locations over the entire exposed conductor length at each termination.
5. Equipment grounding conductor may be bare or insulated. Insulated equipment grounding conductors must be green over its entire length. Isolated equipment grounding conductors for MIS receptacles must be green with one or more yellow stripes over its entire length. Conductors No. 4 and larger may be permanently identified by distinctive green markers such as paint or green tape at all accessible locations over the entire exposed conductor.

Ungrounded feeder and branch circuit conductors must be color coded by continuously colored insulation, except conductors No. 6 AWG or larger may be color coded by colored tape at each connection and where accessible. Ungrounded conductor color coding must be as follows:

SYSTEM	COLOR CODE
120/240 volt-Single phase	Black, blue
120/240 volt-Three phase	Black, orange, blue
120/208 volt-Three phase	Black, red, blue
277/480 volt-Three phase	Brown, purple, yellow

Once grounded and ungrounded insulated conductors are identified with a specific color code, that color code must be used for the entire length of the circuit. Conductors with gray insulation must not be used as ungrounded circuit conductors and/or for wiring control panels and stations.

Where more than one branch circuit enters or leaves a conduit, main switchboard, panelboard, control panel, control station, gutter, or junction box, each conductor must be identified by its panelboard and circuit number. All control conductors including control conductors of manufacturer supplied and field wired control devices must be identified at each termination with the conductor numbers shown and shop drawings, where deemed necessary. Identification must be made with one of the following:

1. Adhesive backed paper or cloth wrap-around markers with clear, heat shrinkable tubing sealed over either type of marker.
2. Pre-printed, white, heat-shrinkable tubing.

The identifying numbers of the terminating conductors, as shown on the shop drawings, must be identified on the terminal block marking strip.

Outlet, Device and Junction Box Installation:

Where exposed rigid steel conduits are connected to an exposed outlet, device, or junction box at or below switch height, the box must be a cast box.

All boxes must be finished flush with building walls, ceiling and floors except where exposed work is called for.

Raised device covers must be installed on all boxes concealed in concrete, masonry or stud walls.

No unused openings must be left in any box. Knockout seals must be installed to close openings.

Adjustments to locations of outlet, device and junction boxes may be made as required by structural conditions and to suit coordination requirements of other trades.

Boxes in stud walls and partitions must not be mounted back to back. Through-wall boxes will not be allowed.

Boxes installed in metal stud walls must be equipped with brackets designed for attaching directly to the studs or must be mounted on heavy gauge galvanized steel, snap-in box supports.

Fixture outlet boxes installed in suspended ceilings of gypsum board or lath and plaster construction must be mounted on 16-gage metal channel bars attached to main ceiling runners.

Fixture outlet boxes for pendant-mounted fixtures installed in suspended ceilings supporting acoustical tiles or panels must be supported directly from the structures above.

Multiple switches must be installed in standard boxes.

Outlet boxes installed on I-beams and vertical columns must be secured using fasteners, clamps and hangers without drilling holes on the structure.

Pull Box Installation:

Pull box installation must comply with section 87-1.03C and the following:

Top of pull boxes must be flush with surrounding grade or top of curb. In unpaved areas where pull box is not immediately adjacent to and protected by a concrete foundation, pole or other protective construction, the top of pull box must be set at plus one inch above surrounding grade. Pull boxes shown in the vicinity of curbs must be placed adjacent to the back of curb. Pull boxes shown adjacent to lighting standards must be placed on the side of foundation facing away from traffic.

Ground Rod Installation: The ground rod must be driven vertically until the top is 6 inches above the surrounding surface. When vertical penetration of the ground rod cannot be obtained, an equivalent horizontal grounding system, authorized by the Engineer, must be installed.

Anchorage:

Hangers, brackets, conduit straps, supports, and electrical equipment must be rigidly and securely fastened to surfaces by means of toggle bolts on hollow masonry; expansion shields and machine screws, or expansion anchors and studs or standard preset inserts on concrete or solid masonry; machine screws or bolts on metal surfaces; and wood or lag screws on wood construction.

Anchorage devices must be installed to comply with the anchorage manufacturer's instructions.

Mounting heights: Electrical system components must be mounted at the following mounting heights, unless otherwise shown. The mounting height dimensions must be measured above the finished floor to the bottom of the device or component.

Thermostats	3'-8"
Wall switches	3'-8"
Convenience outlets	1'-6"
Electric water cooler outlet	As recommended by the water cooler manufacturer.
Data and voice outlets	1'-6"

99-16050D PAYMENT

Not Used

99-260553 - IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Color and legend requirements for raceways, conductors, warning labels and signs.
2. Labels.
3. Bands and tubes.
4. Tapes and stencils.
5. Tags.
6. Signs.
7. Cable ties.
8. Paint for identification.
9. Fasteners for labels and signs.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for electrical identification products.

B. Delegated-Design Submittal: For arc-flash hazard study.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Comply with the CEC.
- B. Comply with 29 CFR 1910.144 and 29 CFR 1910.145.
- C. Comply with the CEC and Section 99-260573.19 "Arc-Flash Hazard Analysis" requirements for arc-flash warning labels.
- D. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, must comply with UL 969.

2.2 COLOR AND LEGEND REQUIREMENTS

- A. Conductors at 600 V or Less:
 - 1. Black letters on and white field.
 - 2. Legend: Indicate circuit number or wire number as shown on the drawings.
- B. Color-Coding for Phase- and Voltage-Level Identification, Conductors at 600 V or Less: Use colors listed below for conductors.
 - 1. Color must be factory applied for sizes equal to and smaller than No. 6 AWG.
 - 2. Colors may be field applied for sizes equal to and larger than No. 4 AWG.
 - 3. Colors for 208/120-V Circuits:
 - a. Phase A: Black.
 - b. Phase B: Red.
 - c. Phase C: Blue.
 - d. Grounded Circuit Conductor (Neutral): White
 - e. Equipment Grounding Conductor: Green
 - 4. Colors for 240/120-V Circuits:
 - a. Phase A: Black.
 - b. Phase B: Orange.
 - c. Phase C: Blue.
 - d. Grounded Circuit Conductor (Neutral): Gray
 - e. Equipment Grounding Conductor: Green
 - 5. Colors for 480/277-V Circuits:
 - a. Phase A: Brown.
 - b. Phase B: Purple. Use Orange if no 120/240-V system is present at the same facility.
 - c. Phase C: Yellow.
 - d. Grounded Circuit Conductor (Neutral): White with blue stripe
 - e. Equipment Grounding Conductor: Green
 - 6. Once grounded and ungrounded insulated conductors are identified with a specific color code, that color code must be used for the entire length of the circuit.
 - 7. Colors for Isolated Grounds: Green with two or more yellow stripes.
- C. Warning Label Colors:
 - 1. Identify system voltage with black letters on an orange background.
- D. Warning labels must include, but are not limited to, the following legends:

1. Multiple Power Source Warning: "DANGER - ELECTRICAL SHOCK HAZARD - EQUIPMENT HAS MULTIPLE POWER SOURCES."
2. Workspace Clearance Warning: "WARNING - Cal-OSHA REGULATION - AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR 36 INCHES."
3. See plans for additional Warning Labels.

E. Device Identification Labels:

1. Black letters on a white field.
2. Receptacle outlets must be provided with device labels. Devices labels must include the voltage, panelboard number and circuit number as shown: 120V, Circuit A25.
3. GFCI protected receptacles must include the inscription that reads 'GFCI PROTECTED' on the label.
4. Occupancy controlled receptacles must include the inscription that reads 'OCCUPANCY SENSOR CONTROLLED' on the label.

2.3 LABELS

- A. Self-Adhesive Wraparound Labels for Conductors and Cables: Preprinted, 3-mil- thick, polyester flexible label with acrylic pressure-sensitive adhesive.
 1. Self-Lamination: Clear; UV-, weather- and chemical-resistant; self-laminating, protective shield over the legend. Labels sized such that the clear shield overlaps the entire printed legend.
 2. Marker for Labels: Machine-printed, permanent, waterproof, black ink recommended by printer manufacturer.
- B. Self-Adhesive Labels: Polyester, thermal, transfer-printed, 3-mil- thick, multicolor, weather- and UV-resistant, pressure-sensitive adhesive labels, configured for intended use and location.
 1. Minimum Nominal Size:
 - a. 3-1/2 by 5 inches for equipment.

2.4 TUBES

- A. Heat-Shrink Preprinted Tubes for Conductors and Cables: Flame-retardant polyolefin tubes with machine-printed identification labels, sized to suit diameter and shrunk to fit firmly around conductors and cables. Full shrink recovery occurs at a maximum of 200 deg F. Comply with UL 224.

2.5 TAPES

- A. Self-Adhesive Vinyl Tape: Colored, heavy duty, waterproof, fade resistant; not less than 3 mils thick by 1 to 2 inches wide; compounded for outdoor use.
- B. Floor Marking Tape: 2-inch- wide, 5-mil pressure-sensitive vinyl tape, with yellow and black stripes and clear vinyl overlay.
- C. Underground Raceway Warning Tape:
 1. Tape:
 - a. Recommended by manufacturer for the method of installation and suitable to identify and locate underground electrical and communications raceways.
 - b. Printing on tape must be permanent and must not be damaged by burial operations.
 - c. Tape material and ink must be chemically inert and not subject to degradation when exposed to acids, alkalis, and other destructive substances commonly found in soils.
 2. Color and Printing:

- a. Comply with ANSI Z535.1, ANSI Z535.2, ANSI Z535.3, ANSI Z535.4, and ANSI Z535.5.
 - b. Inscriptions for Red-Colored Tapes: "ELECTRIC LINE"
 - c. Inscriptions for Orange-Colored Tapes: "TELEPHONE CABLE, CATV CABLE, COMMUNICATIONS CABLE, OPTICAL FIBER CABLE"
3. Tracer Tape For All Raceways:
- a. Multilayer laminate, consisting of high-density polyethylene scrim coated with pigmented polyolefin; bright colored, continuous-printed on one side with the inscription of the utility, compounded for direct-burial service.
 - b. Width: 3 inches.
 - c. Thickness: 12 mils.
 - d. Weight: 36.1 lb/1000 sq. ft..
 - e. Tensile according to ASTM D882: 400 lbf and 11,500 psi.
4. Detectable Tracer Tape For Communication Raceway:
- a. Detectable three-layer laminate, consisting of a printed pigmented polyolefin film, a solid aluminum-foil core, and a clear protective film that allows inspection of the continuity of the conductive core; bright colored, continuous-printed on one side with the inscription of the utility, compounded for direct-burial service.
 - b. Width: 3 inches.
 - c. Overall Thickness: 5 mils.
 - d. Foil Core Thickness: 0.35 mil.
 - e. Weight: 28 lb/1000 sq. ft.
 - f. Tensile according to ASTM D882: 70 lbf and 4600 psi.

2.6 TAGS

- A. Metal Tags: Brass or aluminum, 2 by 2 by 0.05 inch, with stamped legend, punched for use with self-locking cable tie fastener.
- B. Nonmetallic Preprinted Tags: Polyethylene tags, 0.023 inch thick, color-coded for phase and voltage level, with factory printed permanent designations; punched for use with self-locking cable tie fastener.
- C. Write-on Tags:
 - 1. Polyester Tags: 0.015 inch thick, with corrosion-resistant grommet and cable tie for attachment.
 - 2. Marker for Tags: Machine-printed, permanent, waterproof, black ink marker recommended by printer manufacturer.

2.7 NAMEPLATES

- A. Laminated Acrylic or Melamine Plastic Nameplates:
 - 1. Engraved legend.
 - 2. Thickness:
 - a. For nameplates up to 20 sq. in., minimum 1/16 inch thick.
 - b. For nameplates larger than 20 sq. in., 1/8 inch thick.
 - c. Engraved legend with white letters on black face.
 - d. Fastened with self-tapping, cadmium-plated screws or nickel-plated bolts.

2.8 Warning Nameplates

- A. Laminated Acrylic or Melamine Plastic Nameplates:
 - 1. Engraved legend.

2. Thickness:

- a. For warning nameplates up to 20 sq. in., minimum 1/16 inch thick.
- b. For warning nameplates larger than 20 sq. in., 1/8 inch thick.
- c. Engraved legend with white letters on red face.
- d. Fastened with self-tapping, cadmium-plated screws or nickel-plated bolts.

2.9 CABLE TIES

- A. General-Purpose Cable Ties: Fungus inert, self-extinguishing, one piece, self-locking, and Type 6/6 nylon.
 1. Minimum Width: 3/16 inch.
 2. Tensile Strength at 73 Deg F according to ASTM D638: 12,000 psi.
 3. Temperature Range: Minus 40 to plus 185 deg F.
 4. Color: Black, except where used for color-coding.
- B. UV-Stabilized Cable Ties: Fungus inert, designed for continuous exposure to exterior sunlight, self-extinguishing, one piece, self-locking, and Type 6/6 nylon.
 1. Minimum Width: 3/16 inch.
 2. Tensile Strength at 73 Deg F according to ASTM D638: 12,000 psi.
 3. Temperature Range: Minus 40 to plus 185 deg F.
 4. Color: Black.
- C. Plenum-Rated Cable Ties: Self-extinguishing, UV stabilized, one piece, and self-locking.
 1. Minimum Width: 3/16 inch.
 2. Tensile Strength at 73 Deg F according to ASTM D638: 7000 psi.
 3. UL 94 Flame Rating: 94V-0.
 4. Temperature Range: Minus 50 to plus 284 deg F.
 5. Color: Black.

2.10 MISCELLANEOUS IDENTIFICATION PRODUCTS

- A. Paint: Comply with requirements in painting Sections for paint materials and application requirements. Retain paint system applicable for surface material and location (exterior or interior).
- B. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Self-Adhesive Identification Products: Before applying electrical identification products, clean substrates of substances that could impair bond, using materials and methods recommended by manufacturer of identification product.

3.2 INSTALLATION

- A. Verify and coordinate identification names, abbreviations, colors, and other features with requirements in other Sections requiring identification applications, Drawings, Shop Drawings, manufacturer's wiring diagrams, and operation and maintenance manual. Use consistent designations throughout Project.
- B. Install identifying devices before installing acoustical ceilings and similar concealment.
- C. Verify identity of each item before installing identification products.
- D. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and operation and maintenance manual.

- E. Apply identification devices to surfaces that require finish after completing finish work.
- F. Install signs with approved legend to facilitate proper identification, operation, and maintenance of electrical systems and connected items.
- G. System Identification for Conductors and Cables under 600 V: Identification must completely encircle conductors and cables. Place identification of two-color markings in contact, side by side.
 - 1. Secure tight to surface of conductor, cable, or raceway.
- H. Auxiliary Electrical Systems Conductor Identification: Identify field-installed alarm, control, and signal connections.
- I. Emergency Operating Instruction Signs: Install instruction signs with white legend on a red background with minimum 3/8-inch- high letters for emergency instructions as shown.
- J. Elevated Components: Increase sizes of labels, signs, and letters to those appropriate for viewing from the floor.
- K. Accessible Fittings for Raceways: Identify the covers of each junction box of the following systems with the wiring system legend and system voltage. System legends must be as follows:
 - 1. "EMERGENCY POWER."
 - 2. "POWER."
 - 3. "UPS."
- L. Self-Adhesive Wraparound Labels: Secure tight to surface at a location with high visibility and accessibility.
- M. Self-Adhesive Labels:
 - 1. On each item, install unique designation label that is consistent with wiring diagrams, schedules, and operation and maintenance manual.
 - 2. Unless otherwise indicated, provide a single line of text with 1/2-inch- high letters on 1-1/2-inch- high label; where two lines of text are required, use labels 2 inches high.
- N. Heat-Shrink, Preprinted Tubes: Secure tight to surface at a location with high visibility and accessibility.
- O. Self-Adhesive Vinyl Tape: Secure tight to surface at a location with high visibility and accessibility.
 - 1. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for entire exposed conductor length where splices or taps are made and for a minimum distance of 12 inches at each termination. Apply last two turns of tape with no tension to prevent possible unwinding.
- P. Floor Marking Tape: Apply stripes to finished surfaces following manufacturer's written instructions.
- Q. Underground Raceway Warning Tape:
 - 1. During backfilling of trenches, install continuous underground raceway warning tape directly above raceway at 12 inches below finished grade. Use multiple tapes where width of multiple lines installed in a common trench or concrete envelope exceeds 12 inches overall.
 - 2. Install underground raceway warning tape for direct-buried cables and for conductors and cables inside raceways.
- R. Nonmetallic Preprinted Tags:

1. Place in a location with high visibility and accessibility.
2. Secure using plenum-rated cable ties.

S. Write-on Tags:

1. Place in a location with high visibility and accessibility.
2. Secure using plenum-rated cable ties.

T. Laminated Acrylic or Melamine Plastic Nameplates:

1. Attach nameplates that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.
2. Unless otherwise indicated, provide a single line of text with 1/2-inch- high letters on 1-1/2-inch- high sign; where two lines of text are required, use labels 2 inches high.

U. Cable Ties: General purpose, for attaching tags, except as listed below:

1. Outdoors: UV-stabilized nylon.
2. In Spaces Handling Environmental Air: Plenum rated.

3.3 IDENTIFICATION SCHEDULE

- A. Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment. Install access doors or panels to provide view of identifying devices.
- B. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, pull points, and locations of high visibility. Identify by system and circuit designation.
- C. Accessible Fittings for Raceways within Buildings: Identify the covers of each junction box of the following systems with a permanent marker.
 1. "EMERGENCY POWER."
 2. "POWER."
 3. "UPS."
- D. Power-Circuit Conductor Phase Identification, 600 V or Less: For conductors in vaults, pull and junction boxes, manholes, enclosed switches, switchboards, panelboards, cabinets, and handholes, use self-adhesive vinyl tape to identify the phase.
 1. Locate phase identification at all accessible locations and at each termination.
- E. Power-Circuit Conductor Termination Identification, 600 V or Less: For conductors in vaults, pull and junction boxes, manholes, enclosed switches, switchboards, panelboards, cabinets, and handholes, use Self-Adhesive Wraparound Labels or Heat-Shrink Preprinted Tubes with the panelboard name and circuit number.
 1. Locate termination identification at all terminations, splices and where accessible.
- F. Cable Termination Identification: For cables in vaults, pull and junction boxes, manholes, communication racks, switches and equipment's use Self-Adhesive Wraparound Labels or Heat-Shrink Preprinted Tubes with the cable designation, origin, and destination.
 1. Locate cable termination identification at all terminations, splices and where accessible.
- G. Control-Circuit Conductor Termination Identification: For identification at terminations, of control-circuit conductors including control conductors of fabricated control cabinets and equipment's, provide heat-shrink preprinted tubes or self-adhesive wraparound labels with the conductor designation, as shown on the shop drawings.

- H. Conductors to Be Extended in the Future: Attach write-on tags to conductors and list source.
- I. Auxiliary Electrical Systems Conductor Identification: Identify fire alarm, intrusion alarm, access controls systems conductors and cables as specified for the power conductors and control circuit conductors.
 - 1. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, and pull points. Identify by system and circuit designation.
 - 2. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and operation and maintenance manual.
- J. Locations of Underground Raceways: Provide underground raceway warning tape for power, lighting, communication, and control wiring and optical-fiber cable.
- K. Workspace Indication: Apply floor marking tape to finished surfaces. Show working clearances in the direction of access to live parts. Workspace must comply with the CEC and 29 CFR 1926.403 unless otherwise indicated. Do not install at flush-mounted panelboards and similar equipment in finished spaces.
- L. Instructional Signs: Self-adhesive labels, including the color code for grounded and ungrounded conductors.
- M. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Self-adhesive labels.
 - 1. Apply to exterior of door, cover, or other access.
 - 2. For equipment with multiple power or control sources, apply to door or cover of equipment, including, but not limited to, the following:
 - a. Power-transfer switches.
 - b. Controls with external control power connections.
- N. Arc Flash Warning Labeling: Self-adhesive labels.
- O. Operating Instruction Signs: Laminated acrylic or melamine plastic nameplates.
- P. Emergency Operating Instruction Signs: Laminated acrylic or melamine plastic nameplates with white legend on a red background with minimum 3/8-inch- high letters for emergency instructions at equipment as shown.
- Q. Equipment Identification Labels:
 - 1. Indoor Equipment: Laminated acrylic or melamine plastic nameplates.
 - 2. Outdoor Equipment: Laminated acrylic or melamine nameplate or Stenciled legend 4 inches high.
 - 3. Equipment to Be Labeled:
 - a. Panelboards: Typewritten directory of circuits in the location provided by panelboard manufacturer. Panelboard identification must be in the form of an engraved, laminated acrylic or melamine plastic nameplate.
 - b. Enclosures and electrical cabinets.
 - c. Access doors and panels for concealed electrical items.
 - d. Switchgear.
 - e. Switchboards.
 - f. Transformers: Label that includes tag designation indicated on Drawings for the transformer, feeder, and panelboards or equipment supplied by the secondary.
 - g. Substations.
 - h. Emergency system boxes and enclosures.
 - i. Motor-control centers.

- j. Enclosed switches.
- k. Enclosed circuit breakers.
- l. Enclosed controllers.
- m. Variable-speed controllers.
- n. Push-button stations.
- o. Power-transfer equipment.
- p. Contactors.
- q. Remote-controlled switches, dimmer modules, and control devices.
- r. Battery-inverter units.
- s. Battery racks.
- t. Power-generating units.
- u. Monitoring and control equipment.
- v. UPS equipment.
- w. All electrical equipment such as but not limited to control relays, fuses, circuit breakers, pushbuttons, switches, etc., mounted inside and on the exterior doors of the control cabinets, junction boxes, switchgear and switchboards.

PART 4 - PAYMENT

Not Used

END OF 99-260553

99- 260573.13 - SHORT-CIRCUIT STUDIES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes a computer-based, fault-current study to determine the minimum interrupting capacity of circuit protective devices.
- B. The scope of the studies must include all new distribution and controls equipment supplied by the equipment Manufacturer under this contract as well as all existing distribution equipment at the Department's facility. Separate studies must be provided for each location. You must obtain all required data for this study.

1.2 DEFINITIONS

- A. Existing to Remain: Existing items of construction that are not to be removed and that are not otherwise indicated to be removed and salvaged, or removed and reinstalled. Existing to remain items must remain functional throughout the construction period.
- B. Field Adjusting Agency: An independent electrical testing agency with full-time employees and the capability to adjust devices and conduct testing indicated and that is a member company of NETA.
- C. One-Line Diagram: A diagram that shows, by means of single lines and graphic symbols, the course of an electric circuit or system of circuits and the component devices or parts used therein.
- D. Power System Analysis Software Developer: An entity that commercially develops, maintains, and distributes computer software used for power system studies.
- E. Power Systems Analysis Specialist: Professional engineer in charge of performing the study and documenting recommendations, licensed in CA.
- F. Protective Device: A device that senses when an abnormal current flow exists and then removes the affected portion of the circuit from the system.
- G. SCCR: Short-circuit current rating.
- H. Service: The conductors and equipment for delivering electric energy from the serving utility to the wiring system of the premises served.

- I. Single-Line Diagram: See "One-Line Diagram."

1.3 ACTION SUBMITTALS

A. Product Data:

1. For computer software program to be used for studies.
2. Submit the following after the approval of system protective devices submittals. Submittals may be in digital form.
 - a. Short-circuit study input data, including completed computer program input data sheets.
 - b. Short-circuit study and equipment evaluation report; signed, dated, and sealed by a qualified professional engineer.
 - 1) Submit study report for action prior to receiving final approval of distribution equipment submittals. If formal completion of studies will cause a delay in equipment manufacturing, obtain approval from Engineer for preliminary submittal of sufficient study data to ensure that selection of devices and associated characteristics is satisfactory.
 - 2) Revised one-line diagram, reflecting field investigation results and results of short-circuit study.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data:

1. For Power Systems Analysis Software Developer.
2. For Power System Analysis Specialist.
3. For Field Adjusting Agency.

B. Product Certificates: For short-circuit study software, certifying compliance with IEEE 399.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data:

1. For overcurrent protective devices to include in emergency, operation, and maintenance manuals.
2. The following are from the Short-Circuit Study Report:
 - a. Final one-line diagram.
 - b. Final Short-Circuit Study Report.
 - c. Short-circuit study data files.
 - d. Power system data.
 - e. Recommended breaker sizes with their instantaneous and inverse time over the current trip settings.

1.6 QUALITY ASSURANCE

- A. Study must be performed using commercially developed and distributed software designed specifically for power system analysis.
- B. Software algorithms must comply with the requirements of standards and guides specified in this Section.
- C. Manual calculations are unacceptable.
 1. Power System Analysis Software Qualifications: A computer program must be designed to perform short-circuit studies or have a function, component, or add-on module designed to perform short-circuit studies.

2. Computer program must be developed under the charge of a licensed professional engineer who holds IEEE Computer Society's Certified Software Development Professional certification.
- D. Power Systems Analysis Specialist Qualifications: Professional engineer licensed in the state of CA. All elements of the study shall be performed under the direct supervision and control of this professional engineer. The power systems analysis specialist must be full time employee of the equipment manufacturer or an approved engineering firm.
 - E. Short-Circuit Study Certification: Short-Circuit Study Report must be signed and sealed by Power Systems Analysis Specialist.
 - F. Field Adjusting Agency Qualifications:
 1. Employer of a NETA ETT-Certified Technician Level III or NICET Electrical Power Testing Level III certification responsible for all field adjusting of the Work.
 2. A member company of NETA.
 3. Acceptable to the Department.

PART 2 - PRODUCTS

2.1 POWER SYSTEM ANALYSIS SOFTWARE DEVELOPERS

- A. Comply with IEEE 399 and IEEE 551.
 1. Analytical features of power systems analysis software program must have the capability to calculate "mandatory," "very desirable," and "desirable" features as listed in IEEE 399.
- B. Computer software program must be capable of plotting and diagramming time-current-characteristic curves as part of its output.

2.2 SHORT-CIRCUIT STUDY REPORT CONTENTS

- A. Executive summary of study findings.
- B. Study descriptions, purpose, basis, and scope. Include case descriptions, the definition of terms, and a guide for the interpretation of results.
- C. One-line diagram of modeled power system, showing the following:
 1. Protective device designations and ampere ratings.
 2. Conductor types, sizes, and lengths.
 3. Transformer kilovolt ampere (kVA) and voltage ratings.
 4. Motor and generator designations and kVA ratings.
 5. Switchgear, switchboard, motor-control center, and panelboard designations and ratings.
 6. Derating factors and environmental conditions.
 7. Any revisions to electrical equipment required by the study.
- D. Comments and recommendations for system improvements or revisions in a written document, separate from one-line diagram.
- E. Protective Device Evaluation:
 1. Evaluate equipment and protective devices and compare to available short-circuit currents. Verify that equipment withstands ratings exceeding available short-circuit current at equipment installation locations.
 - a. For new equipment, notify the equipment manufacturers to provide equipment with withstand rating exceeding the available calculated short-circuit currents.
 - b. For existing equipment, notify the Department if the existing circuit protective devices are improperly rated for the available calculated short-circuit currents.

2. Tabulations of circuit breaker, fuse, and other protective device ratings versus calculated short-circuit duties.
3. For 600-V overcurrent protective devices, ensure that interrupting ratings are equal to or higher than the calculated 1/2-cycle symmetrical fault current.
4. For devices and equipment rated for asymmetrical fault current, apply multiplication factors listed in standards to 1/2-cycle symmetrical fault current.
5. Verify adequacy of phase conductors at maximum three-phase bolted fault currents; verify the adequacy of equipment grounding conductors and grounding electrode conductors at maximum ground-fault currents. Ensure that short-circuit withstand ratings are equal to or higher than the calculated 1/2-cycle symmetrical fault current.

F. Short-Circuit Study Input Data:

1. One-line diagram of the system being studied.
2. Power sources available.
3. Manufacturer, model, and interrupting rating of protective devices.
4. Conductors.
5. Transformer data.

G. Short-Circuit Study Output Reports:

1. Low-Voltage Fault Report: Three-phase and unbalanced fault calculations, showing the following for each overcurrent device location:
 - a. Voltage.
 - b. Calculated fault-current magnitude and angle.
 - c. Fault-point X/R ratio.
 - d. Equivalent impedance.
2. Momentary Duty Report: Three-phase and unbalanced fault calculations, showing the following for each overcurrent device location:
 - a. Voltage.
 - b. Calculated symmetrical fault-current magnitude and angle.
 - c. Fault-point X/R ratio.
 - d. Calculated asymmetrical fault currents:
 - 1) Based on the fault-point X/R ratio.
 - 2) Based on the calculated symmetrical value multiplied by 1.6.
 - 3) Based on the calculated symmetrical value multiplied by 2.7.
3. Interrupting Duty Report: Three-phase and unbalanced fault calculations, showing the following for each overcurrent device location:
 - a. Voltage.
 - b. Calculated symmetrical fault-current magnitude and angle.
 - c. Fault-point X/R ratio.
 - d. No AC Decrement (NACD) ratio.
 - e. Equivalent impedance.
 - f. Multiplying factors for 2-, 3-, 5-, and 8-cycle circuit breakers rated on a symmetrical basis.
 - g. Multiplying factors for 2-, 3-, 5-, and 8-cycle circuit breakers rated on a total basis.

PART 3 - EXECUTION

3.1 POWER SYSTEM DATA

- A. Obtain all data necessary for the conduct of the study.

1. Verify completeness of data supplied on one-line diagram. Generate a new one-line diagram, if no existing one-line diagram is included as part of the project plans. Call any discrepancies to Engineer's attention.
2. For equipment included as Work of this Project, use characteristics submitted under provisions of action submittals and information submittals for this Project.
3. For equipment that is existing, obtain required electrical distribution system data by field investigation and surveys, conducted by qualified technicians and engineers. Qualifications of technicians and engineers must be as defined by NFPA 70E.

B. Equipment to be surveyed during data collection:

1. Medium-voltage step-down service transformers from utility and primary protection.
2. All service equipment.
3. All separately derived system 3-phase transformers with secondary's equal or above 440V.
4. All separately derived system 3-phase transformers with secondary's below 440V.
5. All 480V, & 240 or 208V bus ducts.
6. All motors equal to or greater than 1 HP.
7. Standby generators.
8. Solar photovoltaic systems.
9. Transfer switches
10. 480V & 240V or 208V distribution panels.
11. 480V & 240V or 208V motor control centers.
12. 480V & 240V or 208V disconnects if fed by OCPD's of 30A or larger.
13. 480V & 240V or 208V control panels fed by OCPD's of 30A or larger.
14. Lighting panels.
15. HVAC equipment.
16. All separately derived system 1-phase transformers with secondary's below 440V.

C. Gather and tabulate the required input data to support the short-circuit study. Record data on a Record Document copy of one-line diagram. Comply with recommendations in IEEE 551 as to the amount of detail that is required to be acquired in the field. Field data gathering must be under direct supervision and control of the engineer in charge of performing the study, and must be by the engineer or its representative who holds NETA ETT-Certified Technician Level III or NICET Electrical Power Testing Level III certification. Data include, but are not limited to, the following:

1. Product Data for Project's overcurrent protective devices involved in overcurrent protective device coordination studies. Use equipment designation tags that are consistent with electrical distribution system diagrams, overcurrent protective device submittals, input and output data, and recommended device settings.
2. Obtain electrical power utility impedance at the service.
3. Power sources and ties.
4. For transformers, include kVA, primary and secondary voltages, connection type, impedance, X/R ratio, taps measured in percent, and phase shift.
5. For reactors, provide manufacturer and model designation, voltage rating, and impedance.
6. For circuit breakers and fuses, provide manufacturer and model designation. List type of breaker, type of trip, SCCR, current rating, and breaker settings.
7. Generator short-circuit current contribution data, including short-circuit reactance, rated kVA, rated voltage, and X/R ratio.
8. Busway manufacturer and model designation, current rating, impedance, lengths, and conductor material.
9. Motor horsepower and NEMA MG 1 code letter designation for motors 1HP or larger.
10. Conductor sizes, lengths, number, conductor material and conduit material (magnetic or nonmagnetic).
11. Derating factors.
12. Obtain conduit lengths if not shown on plans.

3.2 SHORT-CIRCUIT STUDY

A. Perform study following the general study procedures contained in IEEE 399.

- B. Calculate short-circuit currents according to IEEE 551.
- C. Base study on device characteristics supplied by the device manufacturer.
- D. Extent of the electrical power system to be studied includes all existing systems as well as all new equipment.
- E. Begin short-circuit current analysis at the service, extending down to system overcurrent protective devices as follows:
 - 1. To normal system low-voltage load buses where fault current is 10 kA or less.
- F. Study electrical distribution system from normal and alternate power sources throughout electrical distribution system for Project. Study all cases of system-switching configurations and alternate operations that could result in maximum fault conditions.
- G. Include the AC fault-current decay from induction motors, synchronous motors, and asynchronous generators and apply to low- and medium-voltage, three-phase AC systems. Also account for the fault-current DC decrement to address asymmetrical requirements of interrupting equipment.
- H. Calculate short-circuit momentary and interrupting duties for a three-phase bolted fault and a single line-to-ground fault at each piece of equipment indicated on the one-line diagram.
 - 1. For grounded systems, provide a bolted line-to-ground fault-current study for areas as defined for the three-phase bolted fault short-circuit study.
- I. Include in the report identification of any protective device applied outside its capacity.

PART 4 - PAYMENT

Not Used

END OF 99-260573.13

99-260573.19 - ARC-FLASH HAZARD ANALYSIS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes a computer-based, arc-flash study to determine the arc-flash hazard distance and the incident energy to which personnel could be exposed during work on or near electrical equipment. To generate arc flash hazard labels based on the result of the study.
- B. The scope of the studies must include all new distribution and controls equipment supplied by the equipment Manufacturer under this contract as well as all existing distribution equipment at the Department's facility. You must obtain all required data for this study.
- C. During system studies, every effort such as equipment selection and proper selection of AC magnetic trip adjustment of all circuit breakers must be considered and put into practice so that the Category of Hazard at any location under consideration is lower than 4 cal/cm². Category of hazard greater than these values will be rejected.
- D. New Equipment: The scope must also include recommendations for equipment modifications or replacement of tripping devices inside the electrical service and distribution equipment and other electrical equipment's which are part of the study to the equipment manufacturers if needed, in order to reduce the Category of Hazard at all locations under consideration lower than 4 cal/cm². Such modifications to the equipment must be made prior to making shop submittals for the electrical equipment.

- E. Existing Equipment: The scope must also include recommendations for equipment modifications to existing equipment if needed in order to reduce the Category of Hazard at all locations under consideration lower than 4 cal/cm². Such modifications to the equipment must be documented and presented to the Engineer. Upgrades needed for the existing equipment are not the part of this contract.

1.2 DEFINITIONS

- A. Existing to Remain: Existing items of construction that are not to be removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.
- B. Field Adjusting Agency: An independent electrical testing agency with full-time employees and the capability to adjust devices and conduct testing indicated and that is a member company of NETA.
- C. One-Line Diagram: A diagram that shows, by means of single lines and graphic symbols, the course of an electric circuit or system of circuits and the component devices or parts used therein.
- D. Power System Analysis Software Developer: An entity that commercially develops, maintains, and distributes computer software used for power system studies.
- E. Power Systems Analysis Specialist: Professional engineer in charge of performing the study and documenting recommendations, licensed in the state of CA
- F. Protective Device: A device that senses when an abnormal current flow exists and then removes the affected portion from the system.
- G. SCCR: Short-circuit current rating.
- H. Service: The conductors and equipment for delivering electric energy from the serving utility to the wiring system of the premises served.
- I. Single-Line Diagram: See "One-Line Diagram."

1.3 ACTION SUBMITTALS

- A. Product Data: For computer software program to be used for studies.
- B. Study Submittals: Submit the following submittals after the approval of system protective devices submittals. Submittals may be in digital form:
 - 1. Arc-flash study input data, including completed computer program input data sheets.
 - 2. Arc-flash study report; signed, dated, and sealed by Power Systems Analysis Specialist.
 - 3. Submit study report for action prior to receiving final approval of distribution equipment submittals. If formal completion of studies will cause delay in equipment manufacturing, obtain approval from Engineer for preliminary submittal of sufficient study data to ensure that selection of devices and associated characteristics is satisfactory.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data:
 - 1. For Power Systems Analysis Software Developer.
 - 2. For Power System Analysis Specialist.
 - 3. For Field Adjusting Agency.
- B. Product Certificates: For arc-flash hazard analysis software, certifying compliance with IEEE 1584 and NFPA 70E.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data:

1. Provide maintenance procedures in equipment manuals according to requirements in NFPA 70E.
2. Operation and Maintenance Procedures: Provide maintenance procedures for use by the Department's personnel that comply with requirements in NFPA 70E.

1.6 QUALITY ASSURANCE

- A. Study must be performed using commercially developed and distributed software designed specifically for power system analysis.
- B. Software algorithms must comply with requirements of standards and guides specified in this Section.
- C. Manual calculations are unacceptable.
- D. Power System Analysis Software Qualifications: An entity that owns and markets computer software used for studies, having performed successful studies of similar magnitude on electrical distribution systems using similar devices.
 1. Computer program must be designed to perform arc-flash analysis or have a function, component, or add-on module designed to perform arc-flash analysis.
 2. Computer program must be developed under the charge of a licensed professional engineer who holds IEEE Computer Society's Certified Software Development Professional certification.
- E. Power Systems Analysis Specialist Qualifications: Professional engineer in charge of performing the arc-flash study, analyzing the arc flash, and documenting recommendations, licensed in the state of CA. All elements of the study must be performed under the direct supervision and control of this professional engineer. The power systems analysis specialist must be full time employee of the equipment manufacturer or an approved engineering firm.
- F. Arc-Flash Study Certification: Arc-Flash Study Report must be signed and sealed by Power Systems Analysis Specialist.
- G. Field Adjusting Agency Qualifications:
 1. Employer of a NETA ETT-Certified Technician Level III or NICET Electrical Power Testing Level III certification responsible for all field adjusting of the Work.
 2. A member company of NETA.
 3. Acceptable to 24 CA Code of Regs.

PART 2 - PRODUCTS

2.1 COMPUTER SOFTWARE DEVELOPERS

- A. Comply with IEEE 1584 and NFPA 70E.
- B. Analytical features of device coordination study computer software program must have the capability to calculate "mandatory," "very desirable," and "desirable" features as listed in IEEE 399.

2.2 ARC-FLASH STUDY REPORT CONTENT

- A. Executive summary of study findings.
- B. Study descriptions, purpose, basis, and scope. Include case descriptions, definition of terms, and guide for interpretation of results.
- C. One-line diagram, showing the following:
 1. Protective device designations and ampere ratings.

2. Conductor types, sizes, and lengths.
 3. Transformer kilovolt ampere (kVA) and voltage ratings, including derating factors and environmental conditions.
 4. Motor and generator designations and kVA ratings.
 5. Switchgear, switchboard, motor-control center, panelboard designations, and ratings.
- D. Study Input Data: As described in "Power System Data" Article.
- E. Short-Circuit Study Output Data: As specified in "Short-Circuit Study Output Reports" Paragraph in "Short-Circuit Study Report Contents" Article in Section 99-260573.13 "Short-Circuit Studies."
- F. Arc-Flash Study Output Reports:
1. Interrupting Duty Report: Three-phase and unbalanced fault calculations, showing the following for each equipment location included in the report:
 - a. Voltage.
 - b. Calculated symmetrical fault-current magnitude and angle.
 - c. Fault-point X/R ratio.
 - d. No AC Decrement (NACD) ratio.
 - e. Equivalent impedance.
 - f. Multiplying factors for 2-, 3-, 5-, and 8-cycle circuit breakers rated on a symmetrical basis.
 - g. Multiplying factors for 2-, 3-, 5-, and 8-cycle circuit breakers rated on a total basis.
- G. Incident Energy and Flash Protection Boundary Calculations:
1. Arcing fault magnitude.
 2. Protective device clearing time.
 3. Duration of arc.
 4. Arc-flash boundary.
 5. Restricted approach boundary.
 6. Limited approach boundary.
 7. Working distance.
 8. Incident energy.
 9. Hazard risk category.
 10. Recommendations for arc-flash energy reduction.
- H. Fault study input data, case descriptions, and fault-current calculations including a definition of terms and guide for interpretation of computer printout.

2.3 ARC-FLASH WARNING LABELS

- A. Comply with requirements in Section 99-260553 "Identification for Electrical Systems" for self-adhesive equipment labels. Produce a 5-by-7-inch self-adhesive equipment label for each work location included in the analysis.
- B. Label must have an orange header with the wording, "WARNING, ARC-FLASH HAZARD," and must include the following information taken directly from the arc-flash hazard analysis:
1. Location designation.
 2. Nominal voltage.
 3. Protection boundaries.
 - a. Arc-flash boundary.
 - b. Restricted approach boundary.
 - c. Limited approach boundary.
 4. Arc flash PPE category.
 5. Required minimum arc rating of PPE in Cal/cm squared.
 6. Available incident energy.

7. Working distance.
8. Engineering report number, revision number, and issue date.

C. Labels must be machine printed, with no field-applied markings.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine Project overcurrent protective device submittals. Proceed with arc-flash study only after relevant equipment submittals have been assembled. Overcurrent protective devices that have not been submitted and approved prior to arc-flash study may not be used in study.

3.2 ARC-FLASH HAZARD ANALYSIS

- A. Comply with NFPA 70E and its Annex D for hazard analysis study.
- B. Preparatory Studies: Perform the Short-Circuit study prior to starting the Arc-Flash Hazard Analysis.
 1. Short-Circuit Study Output: As specified in "Short-Circuit Study Output Reports" Paragraph in "Short-Circuit Study Report Contents" Article in Section 260573.13 "Short-Circuit Studies."
- C. Calculate maximum and minimum contributions of fault-current size.
 1. Maximum calculation must assume a maximum contribution from the utility and must assume motors to be operating under full-load conditions.
- D. Calculate the arc-flash protection boundary and incident energy at locations in electrical distribution system where personnel could perform work on energized parts.
- E. Include medium- and low-voltage equipment locations, except equipment rated 240 V ac or less fed from transformers less than 125 kVA.
- F. Calculate the limited, restricted, and prohibited approach boundaries for each location.
- G. Incident energy calculations must consider the accumulation of energy over time when performing arc-flash calculations on buses with multiple sources. Iterative calculations must take into account the changing current contributions, as the sources are interrupted or decremented with time. Fault contribution from motors and generators must be decremented as follows:
 1. Fault contribution from induction motors must not be considered beyond three to five cycles.
 2. Fault contribution from synchronous motors and generators must be decayed to match the actual decrement of each as closely as possible (for example, contributions from permanent magnet generators will typically decay from 10 per unit to three per unit after 10 cycles).
- H. Arc-flash energy must generally be reported for the maximum of line or load side of a circuit breaker. However, arc-flash computation must be performed and reported for both line and load side of a circuit breaker as follows:
 1. When the circuit breaker is in a separate enclosure.
 2. When the line terminals of the circuit breaker are separate from the work location.
- I. Base arc-flash calculations on actual overcurrent protective device clearing time. Cap maximum clearing time at two seconds based on IEEE 1584, Section B.1.2.

3.3 POWER SYSTEM DATA

- A. Obtain all data necessary for the conduct of the arc-flash hazard analysis.
 1. Verify completeness of data supplied on one-line diagram on Drawings and under "Preparatory Studies" Paragraph in "Arc-Flash Hazard Analysis" Article. Call discrepancies to

Engineer's attention. Generate a new one-line diagram, if no existing one-line diagram is included as part of the project plans.

2. For new equipment, use characteristics from approved submittals under provisions of action submittals and information submittals for this Project.
3. For existing equipment, whether or not relocated, obtain required electrical distribution system data by field investigation and surveys conducted by qualified technicians and engineers.

B. Equipment to be surveyed during data collection:

1. Medium-voltage step-down service transformers from utility and primary protection.
2. All service equipment.
3. All separately derived system 3-phase transformers with secondary's equal or above 440V.
4. All separately derived system 3-phase transformers with secondary's below 440V.
5. All 480V, & 240 or 208V busducts.
6. All motors equal or greater than 1 HP.
7. Standby generators.
8. Solar photovoltaic systems.
9. Transfer switches
10. 480V & 240V or 208V distribution panels.
11. 480V & 240V or 208V motor control centers.
12. 480V & 240V or 208V disconnects if fed by OCPD's of 30A or larger.
13. 480V & 240V or 208V control panels fed by OCPD's of 30A or larger.
14. Lighting panels.
15. HVAC equipment's.
16. All separately derived system 1-phase transformers with secondary's below 440V for updating the one line diagram(do not include 1-phase system in the arch flash study).

C. Electrical Survey Data: Gather and tabulate the following input data to support study. Comply with recommendations in IEEE 1584 and NFPA 70E as to the amount of detail that is required to be acquired in the field. Field data gathering must be under the direct supervision and control of the engineer in charge of performing the study, and must be by the engineer or its representative who holds NETA ETT-Certified Technician Level III or NICET Electrical Power Testing Level III certification. Data include, but are not limited to, the following:

1. Product Data for overcurrent protective devices specified in other Sections and involved in overcurrent protective device coordination studies. Use equipment designation tags that are consistent with electrical distribution system diagrams, overcurrent protective device submittals, input and output data, and recommended device settings.
2. Obtain electrical power utility impedance or available short circuit current at the service.
3. Power sources and ties.
4. Short-circuit current at each system bus (three phase and line to ground).
5. Full-load current of all loads.
6. Voltage level at each bus.
7. For transformers, include kVA, primary and secondary voltages, connection type, impedance, X/R ratio, taps measured in percent, and phase shift.
8. For reactors, provide manufacturer and model designation, voltage rating and impedance.
9. For circuit breakers and fuses, provide manufacturer and model designation. List type of breaker, type of trip and available range of settings, SCCR, current rating, and breaker settings.
10. Generator short-circuit current contribution data, including short-circuit reactance, rated kVA, rated voltage, and X/R ratio.
11. For relays, provide manufacturer and model designation, current transformer ratios, potential transformer ratios, and relay settings.
12. Busway manufacturer and model designation, current rating, impedance, lengths, size, and conductor material.
13. Motor horsepower and NEMA MG 1 code letter designation for motors 1HP and larger.
14. Low-voltage conductor sizes, lengths, number, conductor material and conduit material (magnetic or nonmagnetic).

15. Medium-voltage conductor sizes, lengths, conductor material, conductor construction and metallic shield performance parameters, and conduit material (magnetic or nonmagnetic).
16. Obtain conduit lengths if not shown.

3.4 LABELING

- A. Apply one arc-flash label on the front cover of each section of the equipment and on side or rear covers with accessible live parts and hinged doors or removable plates for each equipment included in the study. Base arc-flash label data on highest values calculated at each location.
- B. Each piece of equipment listed below must have an arc-flash label applied to it:
 1. Motor-control center.
 2. Low-voltage switchboard.
 3. Switchgear.
 4. Low voltage transformers.
 5. Panelboard and safety switches.
 6. Control panel.
- C. Note on record Drawings the location of equipment where the personnel could be exposed to arc-flash hazard during their work.
 1. Indicate arc-flash energy.
 2. Indicate protection level required.
- D. Apply one generic arc flash warning label for all single phase equipment's.

3.5 FIELD ADJUSTMENTS

- A. Adjust relay and protective device settings according to the recommended settings table provided by the study. Field adjustments to be completed by the trained representative of the firm performing the study.

3.6 APPLICATION OF WARNING LABELS

- A. Install arc-flash warning labels under the direct supervision and control of Power System Analysis Specialist.

3.7 DEMONSTRATION

- A. Engage Power Systems Analysis Specialist to train 10 Department's maintenance personnel for minimum of 4 hours in potential arc-flash hazards associated with working on energized equipment and the significance of arc-flash warning labels.

PART 4 - PAYMENT

Not Used

END OF 99-260573.19

99-16420 BUILDING SWITCHBOARD

99-16420A GENERAL

99-16420A(1) Summary

Scope: This work consists of furnishing and installing building switchboard.

Related Work:

Attention is directed to the requirements specified under Section 99-260573.13 and, 99-260573.19 "Short Circuit Studies and Arc Flash Hazard Analysis" of these special provisions.

Attention is directed to the requirements specified under Section 99-16432, "Electrical Equipment" of these special provisions.

Concrete and reinforcement for building switchboard must comply with section 99-3.

99-16420A(2) Definitions

Not Used

99-16420A(3) Submittals

Product Data:

Submit a list of all materials and equipment to be installed and the manufacturer's descriptive data.

Manufacturer's descriptive data must include complete description, performance data and installation instructions for the materials, front view, and plan view of the assembly, assembly ratings and equipment. Control and wiring diagrams, rough-in dimensions, and component layout must be included where applicable. All control and power conductors on the shop drawings must be identified with wire numbers. Any other data as requested by the Engineer must also be submitted for approval. Assembly ratings must include withstand and closing rating, voltage, continuous current and short circuit rating.

Shop Drawings: Shop drawings must show the shape, size, and method of attachment for each component used in the work. Control and wiring diagrams must include rough-in dimensions, component layout and conductor number identification.

99-16420A(4) Quality Assurance

Prior to shipping, the Manufacturer must test the assembled service and distribution equipment for proper operation.

99-16420B MATERIALS

Building Switchboard:

Building switchboard must be factory wired, ampere rating as shown, 208/120-V(ac), 3-phase, 4-wire, 65,000 A short circuit current rating cabinet with, silver-plated copper bus bars and NEMA Type 12 enclosure with sections as shown.

Building switchboard must be constructed with:

1. 12-gage exterior sheet steel and 14-gage interior sheet steel
2. Baked enamel or baked thermosetting polyester exterior finish
3. Stainless steel hardware, including screws, latches, hasps, hinge pins, and similar items
4. Full capacity neutral bus bar
5. Copper ground bus

Building switchboard must be suitable for use as a service equipment and must be labeled in accordance with the UL requirements. Building switchboard must be a free standing, dead front type, service and distribution switchboard, utilizing group mounted circuit protective devices and other equipment as shown on the plans.

Building switchboard must be designed, manufactured and tested in accordance with NEMA PB-2 and UL Standard 891. Building switchboard must be rated to withstand mechanical forces exerted during short-circuit conditions when connected directly to a power source having available fault current as calculated from the "Short Circuit Studies and Arc flash hazard Analysis" in Section 99-260573-13 and 99-260573-19. Building switchboard must be provided with adequate lifting means and must be capable of being moved into installation position and bolted directly to floor sills to be set level in concrete per manufacturer's recommendations.

Building switchboard must consist of the required number of vertical sections as shown bolted together to form a rigid assembly. The sides and rear must be covered with removable bolt-on covers. All edges of front covers or hinged front panels must be formed. Adequate ventilation must be provided within the enclosure. All sections of the building switchboard must be rear aligned as shown. All protective devices must be group mounted. Devices must be front removable and load

connections front accessible enabling switchboard to be mounted against a wall. Equipment supplied must be equal to or less than the dimensions as shown.

All bus bars must be silver-plated copper except for ground bus. Full capacity neutral bus must be provided where a neutral bus is indicated on the plans. A copper ground bus (minimum 1/4 by 2 inch) must be furnished and firmly secured to each vertical section structure and must extend the entire length of the switchboard. All hardware used on conductors must be high-tensile strength and zinc plated. All bus joints must be provided with conical spring-type washers. Feeders in between units must be copper.

Building Switchboard Disconnect switch must be 3-pole, 208-V (ac), ampere frame and ampere trip ratings as shown, molded case circuit breaker with following features:

1. UL 891 listed
2. Microprocessor based adjustable electronic trip unit
3. Interrupting capacity of 65,000 A symmetrical at 480V
4. External operable handle that is lockable with a padlock in the "OFF" position
5. Equipped with ground fault protector

All distribution circuit breakers must be a molded case circuit breaker complete with adjustable thermal magnetic trip unit. The ampere trip ratings and number of poles must be as shown. Interrupting capacity of all distribution circuit breakers must be 65,000 A symmetrical at 480 V. Distribution circuit breakers must be operated by a toggle-type handle and must have a quick-make, quick-break over-center switching mechanism that is mechanically trip-free. Automatic tripping of the breaker must be clearly indicated by the handle position. Contacts must be nonwelding silver alloy and arc extinction must be accomplished by means of arc chutes. All distribution circuit breakers must have external operable handle that is lockable with a padlock in the "OFF" position.

Distribution circuit breakers supplying the EVSE must be provided with lockable mechanism to padlock the circuit breaker in the "OFF" position during maintenance.

Power Monitoring:

Power monitor must:

1. Be microprocessor based line of multifunction, three phase current and voltage meter
2. Be supplied completely wired with Instrument accuracy Class 1 or better type CTs at all three phases, and fuses at voltage and auxiliary power inputs
3. Have CTs primary rating selected so that each motor full load current lies between 40% to 80% of its full scale
4. Be capable of operating on a power supply range of 90 to 240 Volts AC
5. Be capable of operating on a direct voltage input range of up to 416 Volts Line to Neutral, and a range of up to 721 Volts Line to Line
6. Be programmable for current to any CT ratio. The use of DIP switches for selecting fixed ratios will not be acceptable
7. Have an accuracy of +/- 0.25% or better for volts and amps, and 0.5% for power and energy functions. The meter must meet the accuracy requirements of IEC 687 (class 0.5%) and ANSI C12.20 (Class 0.5%)
8. Provide true RMS measurements of phase and line voltage and current
9. Have operating temperature range from -20 to +70 degrees C

Current transducers for power meter must:

1. Be self-powered
2. Have instrument accuracy Class 1 or better
3. Provide one transducer for each phase
4. Be compatible with the electronic energy meter

Landing lugs must be:

1. Sized for incoming conductors
2. Made of copper and suitable for copper or aluminum conductors

3. Rated for 600 Volts

Provide additional landing lugs or vertical pull section for building switchboard. Surge Protection Device, SPD, must be Type 2, Category C type device conforming to latest IEEE standards and designed for connecting at the point of entry and suitable for three phase, with voltages as shown. The SPD must be able to withstand 250 kA surge current. The surge protective device must be provided with a disconnect that has been directly integrated into the suppressor and assembly bus using bolted bus bar connections. The surge protective device unit must be designed, manufactured and tested in accordance with UL 1449 and UL 1283. The surge protective device must be complete with status indicator lights on each phase, audible alarm, enable/disable transient counter and push to test pushbutton.

For description of panelboards A, D, G and K installed inside the building switchboard, see Section 99-16432.

Transformer: Transformer must dry type, energy efficient, NEMA Type TP-1 compliant transformer to be installed at the location as shown. Transformer must have two 2 1/2 percent full capacity taps above and four 2 1/2 percent full capacity taps below normal primary voltage and copper windings. Transformer rating and location must be as shown.

99-16420C CONSTRUCTION

99-16420C(1) General

Foundation for building switchboard must comply with plans.

Locate the foundation such that the minimum clearance around the front and back of the enclosure complies with NEC article 110.26, "Spaces About Electrical Equipment, (600 V, nominal or less)". Locate the foundation such that it is installed at a higher elevation than the surrounding site to prevent water logging of the pedestal.

Installation of the building switchboard must be in accordance with the manufacturer's requirements to comply with seismic anchoring requirements and anchorage details. Provide seismic anchoring and equipment anchorage details coordinated with the equipment mounting provisions suitable for seismic zone 4 compliance, prepared and stamped by a licensed civil engineer in the State of California.

Shutdown of existing electrical service for modification must not exceed an eight hour limit. Notify the Engineer 15 days prior to the shutdown.

99-16420C(2) Fabrication

Building switchboard must be completely assembled, wired, adjusted and tested at the factory. All major components must be installed, bussed and cabled at the factory. After assembly, the complete switchboard must be tested for operation under simulated service conditions to assure the accuracy of the wiring and the functioning of all equipment. The main circuits must be given a dielectric test of 2200 volts for one minute between live parts and ground and between opposite polarities. The wiring and control circuits must be given a dielectric test of 1500 volts for one minute between live parts and ground. The manufacturer must provide 3 certified copies of the factory test reports.

Building switchboard must integrate and assemble panelboards into the unit as shown. Panelboards must contain a trim with lockable door. The panelboards must be recessed in the building switchboard enclosure a minimum of 4 inches from the front of the switchboard to allow easy access to line and/or load conductors. Trim doors must assure proper fit. Three quarter inch (3/4-inch) breakers shall not be used in any part of the panelboard. Panelboards must have a wire management system inside wireway to accommodate branch circuit wiring passing through vertically in that section. Panelboards must have bolted cover trims.

Small wiring, necessary fuse blocks and terminal blocks within the building switchboard must be furnished as required. Mechanical-type terminals must be provided for all line and load terminations suitable for copper or aluminum cable rated for 167 degrees F of the size as indicated. Lugs must be provided in the incoming line section for connection of the main grounding conductor. Additional lugs for connection of other grounding conductors must be provided. All control wire must be type MTW, bundled and secured with nylon ties. Insulated locking spade terminals must be provided for all control connections, except where saddle type terminals are provided integral to a device.

Prior to shipment of building switchboard to job site, they must be inspected in factory by the Engineer and a written notice must be provided for shipment.

You must perform field adjustments of the protective devices in the presence of the Engineer as required to place the equipment in final operating condition. The settings must be in accordance with the approved short circuit study, protective device evaluation study and protective device evaluation study. Necessary field settings of devices and adjustments and minor modifications to equipment to accomplish conformance with approved short circuit and protective device coordination study must be carried out by you at no additional cost to State.

99-16420D PAYMENT

Not Used

99-16432 ELECTRICAL EQUIPMENT

99-16432A GENERAL

99-16432A(1) Summary

Scope: This work consists of furnishing and installing panelboards, control panels, starters, disconnect switches, transformers, and other related equipment.

Related Work:

Anchorage devices must comply with section 99-16050.

System studies must comply with the requirements under sections 99-260573.13 and 99-260573.19.

99-16432A(2) Definitions

Not Used

99-16432A(3) Submittals

After the System Studies including the Short Circuit and Overcurrent Protective Device Coordination Study and the Electrical Arc Flash Hazard Calculation and Analysis has been approved, you must submit a complete electrical equipment submittal to the Engineer for approval as one packaged submittal.

Submittal must include seismic anchoring and equipment anchorage details in coordination with the equipment mounting provisions, prepared and stamped by a licensed civil engineer in the State of California.

Submittal must be approved by the Engineer prior to commencing work with the electrical equipment installation.

Product Data:

Submit a list of materials and equipment to be installed and the manufacturer's descriptive data.

Manufacturer's descriptive data must include complete description, performance data and installation instructions for the materials and equipment. Control and wiring diagrams, rough-in dimensions, and component layout must be included where applicable. All control and power conductors on the shop drawings must be identified with wire numbers. Any other data as requested by the Engineer must also be submitted for approval.

99-16432A(4) Quality Assurance

Not Used

99-16432B MATERIALS

99-16432B(1) Panelboards

All panelboards must be designed, manufactured and tested in accordance with UL 67 (Panelboards), UL 50 (Cabinets and boxes) and NEMA PB1 (Panelboards). All panelboards must be fully rated with copper main bus. All panelboards must have in-door trim. Both hinged trim and trim door must utilize a 3-point latching. Main circuit breakers for all panelboards must be equipped with handle lock-off to lock the circuit breaker in OFF position for maintenance purpose. Unless otherwise shown, the interrupting capacity of

the branch circuit breakers of all panelboards must be not less than 22 kAIC. Series combination ratings must not be allowed.

Main circuit breakers that are 100 amperes or less must be thermal-magnetic type molded case circuit breakers. Main circuit breakers for panelboards rated greater than 100 amperes must be thermal magnetic type with adjustable AC magnetic trip units.

Panelboard A: Panelboard A must be indoor type, factory assembled, three-phase, 4-wire, 208-volt, AC panelboard at least 20 inches wide with 200-ampere main lugs, insulated groundable neutral, hinged door and molded case branch circuit breakers as shown. Panel must be Square D Company; Westinghouse; Siemens, General Electric, or equal. Panelboard A must be installed inside the building switchboard.

Panelboard B: Panelboard B must be indoor type, surface-mounted, factory assembled, three-phase, 4-wire, 208-volt, AC panelboard at least 20 inches wide with 250-ampere main circuit breaker, insulated groundable neutral, hinged door and molded case branch circuit breakers as shown. Panel must be Square D Company; Westinghouse; Siemens, General Electric, or equal.

Panelboard C: Panelboard C must be indoor type, surface-mounted, factory assembled, three-phase, 4-wire, 208-volt, AC panelboard at least 20 inches wide with 125-ampere main circuit breaker, insulated groundable neutral, hinged door and molded case branch circuit breakers as shown. Panel must be Square D Company; Westinghouse; Siemens, General Electric, or equal.

Panelboard D: Panelboard D must be indoor type, factory assembled, three-phase, 4-wire, 208-volt, AC panelboard at least 20 inches wide with 125-ampere main lugs, insulated groundable neutral, hinged door and molded case branch circuit breakers as shown. Panel must be Square D Company; Westinghouse; Siemens, General Electric, or equal. Panelboard D must be installed inside the building switchboard.

Panelboard E: Panelboard E must be indoor type, surface-mounted, factory assembled, three-phase, 4-wire, 208-volt, AC panelboard at least 20 inches wide with 250-ampere main circuit breaker, insulated groundable neutral, hinged door and molded case branch circuit breakers as shown. Panel must be Square D Company; Westinghouse; Siemens, General Electric, or equal.

Panelboard F: Panelboard F must be indoor type, surface-mounted, factory assembled, three-phase, 4-wire, 208-volt, AC panelboard at least 20 inches wide with 125-ampere main circuit breaker, insulated groundable neutral, hinged door and molded case branch circuit breakers as shown. Panel must be Square D Company; Westinghouse; Siemens, General Electric, or equal.

Panelboard G: Panelboard G must be indoor type, factory assembled, three-phase, 4-wire, 208-volt, AC panelboard at least 20 inches wide with 400-ampere main lugs, insulated groundable neutral, hinged door and molded case branch circuit breakers as shown. Panel must be Square D Company; Westinghouse; Siemens, General Electric, or equal. Panelboard G must be installed inside the building switchboard.

Panelboard H: Panelboard H must be indoor type, surface-mounted, factory assembled, three-phase, 4-wire, 208-volt, AC panelboard at least 20 inches wide with 60-ampere main circuit breaker, insulated groundable neutral, hinged door and molded case branch circuit breakers as shown. Panel must be Square D Company; Westinghouse; Siemens, General Electric, or equal.

Panelboard K: Panelboard K must be indoor type, factory assembled, three-phase, 4-wire, 208-volt, AC panelboard at least 20 inches wide with 250-ampere main lugs, insulated groundable neutral, hinged door and molded case branch circuit breakers as shown. Panel must be Square D Company; Westinghouse; Siemens, General Electric, or equal. Panelboard K must be installed inside the building switchboard.

99-16432B(2) Starters

Air Compressor Starter: Air compressor starter must be combination 3-pole, 208-volt, NEMA Size 2, NEMA rated, line voltage starter and motor circuit protector in a NEMA-1 enclosure. Air compressor starter must have two, 2-ampere, dual element, 250-volt fuses with 2-pole barrier type fuse base; 208-volt coil, double-break silver contacts and 3 manual reset, non-adjustable thermal overloads, set to trip between 115 and 125 percent of full load motor current, as quoted on the nameplate by the motor manufacturer. Reset button must be externally operable.

99-16432B(3) Switches

Air Conditioner Disconnect Switch: Air conditioner disconnect switch must be 3-pole, 208-volt, AC, ampere as recommended by unit manufacturer, non-fused, heavy duty safety switch in a NEMA-3R enclosure with provision for padlocking in the "OFF" position.

Air Compressor Disconnect Switch: Air compressor disconnect switch must be 3-pole, 208-volt, AC, ampere as recommended by unit manufacturer, non-fused, heavy duty safety switch in a NEMA-3R enclosure with provision for padlocking in the "OFF" position.

Heat Pump Outdoor Unit Disconnect Switch: Heat pump outdoor unit disconnect switch must be 3-pole, 208-volt, AC, ampere as recommended by unit manufacturer, non-fused, heavy duty safety switch in a NEMA-3R enclosure with provision for padlocking in the "OFF" position.

Welding Exhaust Fan Disconnect Switch: Welding exhaust fan disconnect switch must be 3-pole, 208-volt, AC, 30-ampere, non-fused, heavy duty safety switch in a NEMA-1 enclosure with provision for padlocking in the "OFF" position.

Overhead Coiling Door Operator Disconnect Switch: Overhead coiling door operator disconnect switch must be 3-pole, 208-volt, AC, 30-ampere, non-fusible, general duty safety switch in a NEMA-1 enclosure with provision for padlocking in the "OFF" position.

Supply Fan Disconnect Switch: Supply fan disconnect switch must be 2-pole, 208-volt, AC, 30-ampere, non-fusible, general duty safety switch in a NEMA-1 enclosure with provision for padlocking in the "OFF" position.

99-16432B(4) Transformer

Transformer: Transformer must be dry type, energy efficient, NEMA Type TP-1 compliant transformer to be installed at the location as shown. Transformer must have two 2 1/2 percent full capacity taps above and four 2 1/2 percent full capacity taps below normal primary voltage and copper windings. Transformer rating and location must be as shown.

99-16432B(5) Miscellaneous Materials

Nameplates: Nameplates must be laminated phenolic plastic with white core and black front and back. Nameplate inscription must be in capitals letters etched through the outer layer of the nameplate material.

Warning Plates: Warning plates must be laminated phenolic plastic with white core and red front and back. Warning plates inscription must be in capital letters etched through the outer layer of the nameplate material.

Device Labels: Device labels must be industrial type, preprinted labels with adhesive backed white core and black front and back. Device labels must resist fading, scratching, moisture, heat, chemicals, ultraviolet (UV) exposure and cleaning fluids. Device labels must be K-Sun Labels, Dymo Letra Tag, or equal.

Plywood Backing Board: Plywood backing board for mounting electrical or telephone equipment must be 3/4-inch, APA plywood panels, C-D PLUGGED and touch-sanded, Exposure 1.

99-16432C CONSTRUCTION

Installation of panelboards must be in accordance with the manufacturer's requirements and comply with seismic anchoring requirements and anchorage details.

Plywood Backing Board:

Plywood backing board must be securely fastened to walls or other vertical framing.

Surface to be coated must be cleaned of all dirt, excess materials, and filler by hand cleaning.

Exposed surfaces of plywood backing board must be coated to comply with "Wood, Painted" in section 99-09900. The color must match surrounding surfaces, or must be authorized by the Engineer.

Coatings must be applied to comply with the manufacturer's instructions. Each coat must be applied to a uniform finish, free of skips, brush marks, laps or other imperfections.

Existing Panelboards: Provide new circuit breakers, where required to match existing type unless otherwise shown. Provide mounting hardware, bus straps, and related materials for proper circuit breaker installation. Provide new panelboard identification nameplate with designation as shown for each panelboard. Remove existing nameplates where applicable. Provide new typewritten circuit directory reflecting changes.

Panelboard Installation:

Set cabinets plumb and symmetrical with building lines. Train interior wiring to comply with "Conductor Installation" in section 99-16050. Touch-up paint any marks, blemishes, or other finish damage suffered during installation. Replace cabinets, doors or trim exhibiting dents, bends, warps or poor fit that may impede ready access, security or integrity.

Mounting height must be 5½ feet to the highest circuit breaker handle, measured above the finished floor.

Provide one ¾-inch empty conduit from flush panelboard enclosure to a point above furred ceiling for each 16 circuits or fraction thereof in each panelboard.

Where "Spare" or "Space" is shown, branch connectors, mounting brackets, and other hardware must be furnished and installed for future breaker.

A typewritten directory under transparent protective cover must be provided and set in metal frame inside each cabinet door. Directory panel designation for each circuit breaker must include complete information concerning equipment controlled, including room number or area as shown.

Transformer Installation: Connect primary to minimum value taps during construction period and prior to initial building start-up. Make voltage readings and adjust tap connections to nominal voltage during final construction review and prior to building occupancy. Install conduit connections that will prevent transmission of the transformer vibrations to the conduit system. Transformers must be bolted to floor when floor mounted and bolted to wall with support brackets when wall mounted. Pad mounted transformers (unit substation) must be installed as shown.

Equipment Identification:

Equipment must be identified with nameplates fastened with self-tapping, cadmium-plated screws or nickel-plated bolts.

Nameplate inscriptions must read as follows:

1. Inscriptions for panelboards, must include designation, voltage, amperes and phase of supply and must read in the following example: PANEL A, 208/120 V, 200 A, 3-PHASE, 4-WIRE, FED FROM BUILDING SWITCHBOARD.
2. Receptacle outlets fed from dedicated circuits must be identified with nameplates adjacent to the outlet. Inscription must be the particular device the circuit is feeding and as shown. For example, the receptacle outlet for the drinking fountain must have a nameplate adjacent to it that reads "DRINKING FOUNTAIN". Controlled receptacles must include the inscription that reads "CONTROLLED RECEPTACLE": Receptacle outlets device labels must read as the following: 120V, 20 A, B4, GFCI PROTECTED.

Warning Plates:

Warning plates must be attached to designated equipment with self-tapping cadmium-plated screws or nickel-plated bolts.

Warning plate inscriptions must be as shown.

99-16432D PAYMENT

Not Used

99-263100 - PHOTOVOLTAIC SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. PV system description.
2. PV modules.
3. PV module framing.
4. PV racking system.
5. Utility Interactive Inverter.
6. System overcurrent protection.
7. Mounting structures.
8. Rapid shutdown devices.
9. Energy storage system

1.2 DEFINITIONS

- A. CEC: California Energy Commission.
- B. ETFE: Ethylene tetrafluoroethylene.
- C. FEP: Fluorinated ethylene propylene.
- D. IP Code: Required ingress protection to comply with IEC 60529.
- E. MPPT: Maximum power point tracking.
- F. PTC: PVUSA Test Condition. Commonly regarded as a "real-world" measure of PV output. See below for definition of "PVUSA."
- G. PV: Photovoltaic.
- H. PVUSA: Photovoltaics for Utility Systems Applications.
- I. STC: Standard Test Conditions defined in IEC 61215.
- J. CSI: California Solar Initiative.
- K. Utility-Interactive Inverter: An inverter that can function only when electrically connected to the utility grid and uses the voltage and frequency on the utility line as a control parameter to ensure that the photovoltaic array's DC output is converted to AC power fully synchronized with the utility power.

1.3 ACTION SUBMITTALS

A. Product Data: For Each Type Of Product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, PV DC conductor properties, and finishes for PV panels.
2. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.
3. Photovoltaic system must meet or exceed the local electric utility interconnection requirements for self-generating equipment.

B. Shop Drawings: For PV system.

Complete design and installation details, including all engineering calculations, which must be sealed and signed by an Engineer of the respective field (electrical and civil engineering) who are registered in the State, and must include:

1. Plans, elevations, sections, and mounting details.
2. Details of equipment assemblies. Indicate dimensions, weights, required clearances, method of field assembly, components, and location and size of each field connection.
3. Detail fabrication and assembly.
4. Wiring diagrams for power, signal, and control wiring.
5. Structural calculations for panel and racking system installation including ballast location and weights, to withstand wind forces applied to the panels as located on the roof. Calculations from a registered structural engineer must be signed and submitted for approval.
6. PV modules and conduit layout plan showing the following:

- a. The layout of the PV modules on the roof.
 - b. The layout of conduits and conductors for PV circuit strings on the roof.
 - c. Details for the method of weatherproofing roof penetrations.
 - d. Layout of devices on the roof and electrical room for rapid shutdown devices of the PV system such as power optimizers and/or combiner boxes.
 - e. The area of roof disturbed by the installation of the PV modules must not exceed area in square feet as shown.
 - f. Wiring diagrams including conductor identification (origin and destination) of all power and control conductors (both on the roof and inside the building).
 - g. Installation details of PV mounting including mounting rack supports and ballast locations and weights for self-ballasted installations.
- C. PV Installer Qualifications: The PV installer must have the following qualifications:
- 1. Be a registered installer listed on the CSI database found at the following website <http://www.gosolarcalifornia.ca.gov/database/search-new.php>.
 - 2. Must have experience in designing and installing at least twenty commercial PV systems of 100 kW and above.
- D. You must contact and arrange with the local electrical utility company representative to inspect and approve that the installed PV system complies with the Utility requirements.
- E. State Fire Marshal Approval: Prior to the submittal of the shop drawings to the Engineer, you must have said drawings stamped "APPROVED" by the State Fire Marshal. Allow 12 weeks for State Fire Marshal review and approval. You must resubmit shop drawings to the State Fire Marshal as needed until approved. No additional payment will be made for resubmittals. Submittals must be approved by the State Fire Marshal and Engineer prior to commencing work with the PV system installation.

1.4 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.
- B. Sample Warranty: For manufacturer's special materials and workmanship warranty and minimum power output warranty.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: Closeout documents must contain the following sections:
 - 1. Operating instructions for the complete PV System.
 - 2. Maintenance instructions of the complete PV System.
 - 3. Operational manuals for each device listed on the bill of materials.
 - 4. Specified product warranty information.
 - 5. As-built drawings.
 - 6. Certificate of compliance must be submitted stating that the work has been performed in compliance with the CSI Handbook and these special provisions.

1.6 WARRANTY

- A. Manufacturer's Special Warranty: Manufacturer agrees to repair or replace components of PV system that fail in materials or workmanship within specified warranty period.
 - 1. Manufacturer's materials and workmanship warranties include, but are not limited to, the following:
 - a. Faulty operation of PV modules.
 - 2. Warranty Period: Five years from date of work completion.

- B. Manufacturer's Special Minimum Power Output Warranty: Manufacturer agrees to repair or replace components of PV system that fail to exhibit the minimum power output within specified warranty period. Special warranty, applying to modules only, applies to materials only, on a prorated basis, for period specified.
 - 1. Manufacturer's minimum power output warranties include, but are not limited to, the following warranty periods, from date of work completion:
 - a. Specified minimum power output to 85 percent or more, for a period of 10 years.

PART 2 - PRODUCTS

2.1 MANUFACTURED UNITS

Not Used

2.2 PERFORMANCE REQUIREMENTS

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Seismic Qualification Certificates: For accessories, and components, from manufacturer.
 - 1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
 - 2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
 - 3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

2.3 PV SYSTEMS DESCRIPTION

- A. Interactive PV System: Collectors connected in parallel to the electrical utility; and capable of providing power for Project and supplying power to a distributed network.
 - 1. A string array of PV modules combined to generate a total nominal rated output of 90 KW .
 - 2. System Components:
 - a. PV modules.
 - b. PV modules frame.
 - c. Utility-interactive inverter.
 - d. Overcurrent protection, disconnect, conductors, and rapid shutdown devices.
 - e. PV Rack Mounting structure.
 - f. Utility grade metering system.
 - g. Energy storage system (ESS)
- B. PV inverter/ESS cabinet: PV inverter/ESS cabinet technical specifications must be as shown.

2.4 PV MODULES

- A. Cell Materials: Polycrystalline.
 - 1. c-Si.
- B. Module Construction:
 - 1. Nominal Size: 40 inches wide by 80 inches long.
 - 2. Weight: 50 lb.
- C. Minimum Module Watts (STC): 500 W
- D. Front Panel: Fully tempered glass.

- E. Front Panel: 0.125-inch- thick glass.
- F. Front Panel: Low iron glass.
- G. Front Panel: Antireflective coating glass.
- H. Bypass Diode Protection: Internal.
- I. Junction Box:
 - 1. Size: 1.56 by 3.96 by 0.52 inch.
 - 2. Fully potted, vandal resistant.
 - 3. IP Code: [IP65] [IP66] [IP67] <Insert IP code designation>.
 - 4. Flammability Test: UL 1703.
- J. Output Cabling: Quick, multiconnect, polarized connectors.

2.5 PV MODULE FRAMING

- A. PV laminates mounted in anodized extruded-aluminum frames.
 - 1. Entire assembly UL listed for electrical and fire safety, Class C, according to UL 1703 and UL 2703, and complying with IEC 61215.
 - 2. Frame strength exceeding requirements of certifying agencies in subparagraph above.
 - 3. Finish: Anodized aluminum.
 - a. Alloy and temper recommended by framing manufacturer for strength, corrosion resistance, and application of required finish.
 - b. Color: As indicated by manufacturer's designations.
 - 4. Finish: Baked-enamel finish.
 - a. Color: As indicated by manufacturer's designations.

2.6 PV RACKING SYSTEM

- A. Framing:
 - 1. Material: [Extruded aluminum.] [Galvanized steel] [Coated steel].
 - 2. Maximum System Weight: Less than 4 lb/sq. ft.
 - 3. Raceway Cover Plates: Aluminum.
 - 4. Vandal resistant hardware and provide matching tool.
- B. Roof Mounting:
 - 1. Ballasted System:
 - a. No roof penetrations.
 - b. Wind-tunnel calculations for the entire racking system and PV modules for withstanding wind forces.
 - c. Service Life: 25years.
 - 2. Anchored System:
 - a. Anchor thru roof material to structural framing as indicated.
 - b. Anchor to canopy structural framing as indicated.
 - c. Wind-tunnel calculations for the entire racking system and PV modules for withstanding wind forces.
 - d. Service Life: 25 years.

2.7 UTILITY INTERACTIVE INVERTER

- A. Inverter Type: grid tied.
- B. Control Type: Maximum power point tracker control.
- C. Inverter Electrical Characteristics:
 - 1. Minimum Recommended PV Input Power: 90 kilowatts.
 - 2. CEC Rated Power: 90 kilowatts
 - 3. Nominal Output Voltage: 480/277, 3-phase, 4 wire.
 - 4. Communications Interface: RS 485,Ethernet.
 - 5. Utility Interface: Utility-interactive inverter.
- D. Operating Conditions:
 - 1. Operating Ambient Temperatures: Minus 4 to plus 122 deg F.
 - 2. Storage Temperature: Minus 40 to plus 122 deg F.
 - 3. Relative Humidity: Zero to 95 percent, noncondensing.
- E. Charge controllers must have the following:
 - 1. Overcurrent protection.
 - 2. Automatic transfer relay.
 - 3. Digital display.
 - 4. Output isolation type Transformer.
 - 5. Disconnect switch.
 - 6. Surge overload protection.
- F. Enclosure:
 - 1. NEMA 250, Type 3R.
 - 2. Enclosure Material: Galvanized steel
 - 3. Cooling Methods:
 - a. Fan convection cooling.
 - b. Passive cooling.
 - 4. Protective Functions:
 - a. AC over/undervoltage.
 - b. AC over/underfrequency.
 - c. Ground overcurrent.
 - d. Overtemperature.
 - e. AC and dc overcurrent.
 - f. DC overvoltage.
 - 5. Standard LCD, four lines, 20 characters, with user display and on/off toggle switch.
- G. Disconnects: Built-in to the inverter. Rated for system voltage and conductor.
- I. Regulatory Approvals:
 - 1. IEEE 1547.1.
 - 2. IEEE 1547.3.
 - 3. UL 1741.

2.8 SYSTEM OVERCURRENT PROTECTION

A. Disconnect switches:

1. PV Power DC Disconnect Switch: PV Power DC Disconnect Switch must be a 3 pole, 600-volt, DC, non-fusible, heavy duty safety switch in a NEMA-3R enclosure with provision for padlocking in the "OFF" position. Ampacity must be calculated as per latest CEC requirements.
2. PV Service AC disconnect Switch: PV Service AC disconnect Switch must conform to the requirements shown.

B. PV Array circuit combiner box: PV array circuit combiner box must be factory assembled, 600 VDC rated combiner box with fuses for all PV input circuits, two isolated DC bus bars, ground bus bar, all enclosed inside NEMA 4X lockable hinged cover enclosure. The combiner box must be UL 1741 listed. PV array circuit combiner box must have the following components:

1. DIN Rail mounted touch safe fuse holders with fuse rated for 600 VDC.
2. Positive DC bus bar, Negative DC bus bar and ground bus bar.
3. DIN rail mounted Grid-Tie surge arrestor:
4. The surge arrestor must be Type 1 heavy duty surge protector and rated to withstand 40 kA (8/20 micro second) induced transient surge type and compatible to use with grounded PV arrays.
5. Plastic shield guards to enclose DC buses from all sides.
6. Integrated load break Main Disconnect with external rotary handle and suitable for the size of the strings combined inside the box.
7. Suitable for horizontal and vertical mounting.
8. Integrated DC solar current monitor per string

2.9 MOUNTING STRUCTURES

- A. Roof Mount: Extruded aluminum, four rails, tilt legs, and roof standoffs. Screws and bolts and miscellaneous hardware must be corrosion resistant aluminum and have tamper resistant heads. A tool must be provided for each type of tamper resistance bolt, screw or nut for maintenance after installation.

2.10 RAPIDSHUT DOWNDEVICES

- A. PV System must have a rapid power shutdown function (to de-energize PV Panels) to comply with the CEC requirements, from either utilizing the rapid shutdown combiner box with a rapidshut down switch or utilizing the power optimizer devices with a rapid shutdown switch. The rapid shutdown switch must be installed on the roof and inside the electrical room. You may choose which method to use and then submit complete system details for approval.
- B. Power Optimizer Device: Power optimizer device must be a NEMA 3R enclosure with easy rack mount installation and sized for individual PV panel power (voltage and current) output with the following control features:
1. PV Panel shutdown upon signal from inverter.
 2. DC to DC converter.
 3. Monitor module performance and communicate data to monitoring portal
- C. Rapid Shut Down Combiner Box: Rapid shut down combiner box must be factory assembled, 600 VDC rated combiner box with fuses for all PV input circuits, two isolated DC bus bars, ground bus bar, all enclosed inside NEMA 4X fiberglass lockable hinged cover enclosure. The combiner box must be UL 1741 listed. Rapid shut down combiner box must have the following components:
1. DIN Rail mounted touch safe fuse holders with fuse rated for 600 VDC.
 2. Positive DC bus bar, Negative DC bus bar and ground bus bar.
 3. DIN rail mounted Grid-Tie surge arrestor:
 4. The surge arrestor must be Type 1 heavy duty surge protector and rated to withstand 40 kA (8/20 microsecond) induced transient surge type and compatible to use with grounded PV arrays.

5. Plastic shield guards to enclose DC buses from all sides.
 6. Integrated load break Main Disconnect with external rotary handle and suitable for the size of the strings combined inside the box.
 7. Disconnect switch must be lockable in OFF position.
 8. With dry contacts or a relay trip breaker device.
 9. Suitable for horizontal and vertical mounting.
 10. Integrated DC solar current monitor per string.
 11. Integrated true string level arc-fault protection.
 12. Input Control Voltage: 24VDC.
 13. Audible, LED and Dry Contact Status Indications.
 14. Remote reset of the disconnect switch from the ground.
- D. Rapid Shut Down Switch: Rapid shut down switch must be a NEMA 3R enclosure with switch that is paired to work with the rapid shut down combiner box. When the switch is in the normal operation mode the combiner box must allow the PV array to provide DC power to the inverter like a typical PV system. When the switch is shut off the combiner box must open, shutting down the power coming from the PV Panels going to the inverter. The switch must have LED indicators for normal operation, and system shutdown.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrate areas and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Do not begin installation until mounting surfaces have been properly prepared including roof sacrificial membrane installation.
- C. If preparation of mounting surfaces is the responsibility of another installer, notify Engineer of unsatisfactory preparation before proceeding.
- D. Examine modules and array frame before installation. Reject modules and arrays that are wet, moisture damaged, or mold damaged.
- E. Examine roofs, supports, and supporting structures for suitable conditions where PV system will be installed.
- F. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Comply with NECA 1.
- B. Coordinate layout and installation of PV panels with support assembly and other construction. The PV system must be installed to comply with the manufacturer's instructions. You must verify that items provided under other portions of these special provisions are properly sized and located. You must notify the Engineer at least 2 days prior to installing the PV modules.
 1. PV modules mounting rack must be designed to withstand loading as shown and in conformance with the California Building Code.
 2. Module racking systems must be designed to accept framed PV modules.
 3. Metal framed PV modules must be grounded as shown and in conformance with the California Electrical Code, Article 690.
- C. Support PV panel assemblies independent of supports for other elements such as roof and support assemblies, enclosures, vents, pipes, and conduits. Support assembly to prevent twisting from eccentric loading.
- D. Install PV inverters energy storage, and rapid shutdown in locations indicated on Drawings. Coordinate installation of utility-interactive meter with utility.

- E. Install weather seal fittings and flanges where PV panel assemblies penetrate exterior elements such as walls or roofs. Seal around openings to make weathertight.
- F. Seismic Restraints: Comply with requirements for seismic-restraint devices for Electric Systems.
- G. Wiring Method: Install cables in raceways. Coordinate PV panel cabling to equipment enclosures to ensure proper connections.
- H. Wiring within Enclosures: Bundle, lace, and train conductors to terminal points with no excess and without exceeding manufacturer's limitations on bending radii. Install lacing bars and distribution spools. Provide and install junction boxes as required. All roof mounted junction boxes must be NEMA-3R rated and sized for the number of conductors inside it. Submit details for supporting roof mounted junction boxes. There must be minimum of two roof support per junction box.
- I. State Fire Marshal Approval: The complete PV system design must be reviewed and approved, and accepted by the State Fire Marshal. The system must also be inspected and accepted by State Fire Marshal after installation of the system has been completed.
- J. Grid-Tie PV System Report: Attention is directed to "Supplemental Project Information" of these special provisions regarding Grid-Tie PV System Report form. You must record Information must be recorded by you on the Grid-Tie PV System Report form provided during construction, in the presence of the Engineer. Final completed form must be submitted to the Engineer.
- K. PV System rapid shut down control equipment and wiring must be included in the PV system installation. The system must shut down power from either the PV Panel power optimizers or Combiner box. All devices required for the rapid shut down must be installed per manufacturer's recommendations. Rapid shutdown devices must be installed within 10 feet of PV Arrays.
- L. Provide all PV equipment warning labels as required by the CEC and as shown.

3.3 CONNECTIONS

- A. Coordinate PV panel cabling to equipment enclosures to ensure proper connections.
- B. Coordinate installation of utility-interactive meter with utility.
- C. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A-486B.
- D. Make splices, terminations, and taps that are compatible with conductor material[and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors].

3.4 TESTING

- A. Functional Testing: After installation is completed, functional testing must be performed in the presence of the Engineer to demonstrate that the entire PV system is functioning properly. Functional testing of the PV system must not be performed until:
 - 1. All of the Engineer's punch list items have been corrected
 - 2. The local electrical utility company representative has approved the completed PV system
 - 3. Obtaining State Fire Marshal approval
- B. The functional test for the PV system must consist of verifying all aspects of the PV system and then operating the entire PV system for 3 consecutive days without issues. PV system data must be monitored during the test and you must fix any issue.

- C. PV system installer must be responsible for the compatibility and adjustment of all operating functions of the PV system, in accordance with manufacturer's instructions and these special provisions.
- D. You must make necessary repairs, replacements, adjustments and retests at your expense.
- E. Cleaning PV Modules: PV system installer must clean PV modules surfaces in compliance with manufacturer's recommendations; remove excess mastic, mastic smears, foreign materials, and other unsightly marks
- F. PV system installer must clean metal surfaces exercising care to avoid damage.
- G. PV system installer must clean energy generating surfaces of the PV modules to ensure no obstructions block sunlight.
- H. Notify the Engineer not less than 10 days in advance of performing the operational tests.

3.5 TRAINING

- 1. Training: Provide two hours of on-site training on the use, operation, and maintenance of the PV systems for not more than 8 designated State employees. Notify the Engineer not less than 10 days in advance of proposed training class.

PART 4 - PAYMENT

Not Used

END OF 99-263100

99-16500 LIGHTING

99-16500A GENERAL

99-16500A(1) Summary

Scope: This work consists of furnishing, installing and connecting all lighting equipment and network lighting control system.

Related Work: Nameplates and device labels must be as specified under "Electrical Equipment" in Section 99-16432.

99-16500A(2) System Description

Network Lighting Control System Description:

The network lighting control system must be an addressable sensor based control system consisting of lighting control devices that are capable of turning light emitting diode, LED, lighting loads "on" and "off" as well as dimming LED lighting loads within a lighting control zone. The system includes lighting control devices such as occupancy sensors, occupancy sensors with integrated dimming, interface dimming devices, dimming photocells, dimming switches, lighting control hubs, power packs with switching relays, lighting network set-up computer and lighting network panel with lighting control hub and lighting network gateway.

Lighting control zone must consist of lighting control devices daisy-chained with lighting cables to perform switching and dimming of LED fixtures within the control zone through a power packs and interface dimming devices. Low voltage power for the lighting control devices must be provided by the power packs and by lighting control hubs.

Lighting control devices must be networked to the lighting control hubs. Lighting control hubs must be used to communicate with the power packs and to distribute low voltage power through the lighting control system. Lighting network gateway must provide the required backbone network connectivity for the entire network lighting control system and must provide connectivity with the local area

network thru the lighting network set-up computer. Lighting control zones must be capable of stand-alone default operation in case the network connectivity to the local area network is lost.

System must be provided with a lighting network set-up computer installed with a web-based lighting network software management program that is capable of remote system control, status monitoring, and creating of lighting profiles. Individual lighting zones must be programmed with lighting profiles through the web-based software. Software must be capable of logging of system performance data and provide graphical reports for power consumed by the entire network lighting control system which can be exported in to excel format. It must be capable of reporting and storing lighting system events and performance data.

99-16500A(3) Submittals

Submit manufacturer's descriptive information, photometric curves, catalog cuts, and installation instructions. Any other data as requested by the Engineer must also be submitted for approval. Wiring diagram for all the control panels, network riser diagrams for all the network lighting control system, component layout for the lighting network panels and control panels must be submitted for approval. Shop drawings showing complete lighting network interconnection diagram must be submitted for approval. Shop drawings that include building floor plan with wiring layout of fixtures altogether with lighting control devices per room or area, lighting control devices layout, programming schedules of lighting control system, and other lighting details must be submitted for approval. Shop drawings must be of 22 by 34 inch size.

Closeout Document Submittals:

Submit closeout documents for the following equipment after system has been installed and is fully operational and before completion of the project:

1. Network Lighting Control
2. Building Exterior Lighting Control Panel

Include in each closeout document:

1. Parts list
2. Operating instructions
3. Maintenance instructions
4. Wiring schematics
5. Riser diagrams

Submit three copies of each closeout document in the following manner:

1. An electronic copy as a PDF file on an Engineer-authorized data-storage device
2. Two individual 3-ring binders containing paper copies

Incomplete or inadequate documentation will be returned to you for correction and resubmittal. Resubmit adequate and complete manuals at no expense to the State.

99-16500A(4) Quality Assurance

Regulatory Requirements, Verification and documentation:

To comply with requirements of 24 CA Code of Regs, Part 6, "California Energy Code", the State must receive the following properly filled out forms signed by responsible person before the building can receive final occupancy:

Certificate(s) of Installation:

1. Electrical Power Distribution (Form NRCI-ELC-01-E)
2. Indoor Lighting (Form NRCI-LTI-01-E)
3. Outdoor Lighting (Form NRCI-LTO-01-E)
4. Photovoltaic System (Form NRCI-SPV-01-E)

Corrective action must be taken if the installation/construction is not in compliance with the building plans and specifications and Certificate(s) of Compliance as shown or if a Certificate(s) of Installation

has not been properly completed and posted. Corrective action must be performed prior to proceeding with the acceptance tests and prior to proceeding with completion and submittal or posting of the Certificate(s) of Acceptance.

Certificate(s) of Acceptance:

1. Indoor Lighting, Lighting Controls (Form NRCA-LTI-02-A)
2. Indoor Lighting, Automatic Daylight (Form NRCA-LTI-03-A)
3. Outdoor Lighting, Outdoor Motion Sensor and Lighting Shut-Off Controls (Form NRCA-LTO-02-A)

Acceptance testing performed for completing the Certificate(s) of Acceptance is not intended to take the place of commissioning and testing requirements as specified for each building components, specified systems and equipment. It is an adjunct process focusing only on demonstrating compliance with 24 CA Code of Regs, Part 6, "California Energy Code."

Certificate of Acceptance forms must be submitted for each component to the State that certifies plans, specifications, installation certificates, operating and maintenance information meet the requirements of "Section 10-103(a)," of 24 CA Code of Regs, Part 6. The State must receive the properly filled out and signed forms by a Responsible Engineer before the building can receive final occupancy.

Certificate(s) of Acceptance forms must be performed and signed by a certified technician, who is certified by an Energy Commission approved Acceptance Test Technician Certification Provider (ATTCP), at no additional cost to the State. The certified technician is required to confirm that the Certificate(s) of Installation has been properly completed and signed as a prerequisite to issuance of Certificate(s) of Acceptance.

Certificate(s) of Compliance:

1. Electrical Power Distribution (Form NRCC-ELC-E)
2. Indoor Lighting (Form NRCC-LTI-E)
3. Outdoor Lighting (Form NRCC-LTO-E)
4. Photovoltaic System (Form NRCC-SRA-E)

All performance deficiencies must be corrected by you and the certified technician must repeat the acceptance requirement verification procedures until all building components and specified systems and equipment conform to the required performance criteria, and the construction and installation is confirmed to be in compliance with the 24 CA Code of Regs, Part 6, "California Energy Code."

Submit completed Certificate(s) of Installation, Certificate(s) of Acceptance and Certificate(s) of Compliance for approval.

Current versions of Certificate(s) of Installation, Certificate(s) of Acceptance and Certificate(s) of Compliance must be obtained from the CEC website at www.energy.ca.gov.

Final approved copies of the Certificate(s) of Installation and Certificate(s) of Acceptance must be posted at the site.

Certificate(s) of Acceptance forms must be performed and signed by a certified technician, who is certified by an Energy Commission approved Acceptance Test Technician Certification Provider (ATTCP), at no additional cost to the State. The certified technician is required to confirm that the Certificate(s) of Installation has been properly completed and signed as a prerequisite to issuance of Certificate(s) of Acceptance.

System Startup: Before system startup all the network lighting control system components must coordinate together to form an integrated network lighting control system. At system startup all lighting control devices must be grouped together into a functional lighting control zones as shown. All functional lighting zones along with the lighting control device must be programmed into the lighting network software by the network lighting control system manufacturer. The representative from the lighting network control system manufacturer must be present and responsible for commissioning and programming the entire system at startup.

Installer Qualifications: The subcontractor or installer selected must be certified or trained by the manufacturer of the products, adhere to the engineering, installation and procedures of the manufacturer of the products and utilize authorized manufacturer components. The subcontractor or installer must complete the required Certificate(s) of Installation forms and Certificate(s) of Acceptance forms as listed above.

99-16500B MATERIALS

99-16500B(1) General

Lighting Fixture Lamps: All lighting fixture lamps must be Light Emitting Diode (LED) type and size as shown and as specified herein.

Lighting Fixtures: Lighting fixtures must be Light Emitting Diode Luminaire (LED) as shown and as specified below. The light emitting diode luminaire consists of an assembly that uses light emitting diodes (LEDs) as the light source. A complete luminaire consists of a housing, an LED array, and an electronic module driver (power supply). The luminaire must be UL listed under UL 1598 for luminaires with a minimum operational life of 63,000 hours and have an operating temperature range from -40 °F to +130 °F. The individual LEDs inside the LED array must be connected such that a catastrophic loss or a failure of one LED will not result in the loss of the entire luminaire. The voltage rating and power consumption must be as shown. The luminaire on-board circuitry must include a Surge Protective Device to protect the luminaire from damage and failure from transient voltages and currents.

Lighting Fixtures: Lighting fixtures must be as shown. Outdoor luminaires must be listed and labeled "Fixture Suitable For Wet Locations."

Lighting Control Cable: Lighting cable control cable must be Ethernet cable, Cat 5e, 4-pair, 24-AWG, 600 volt industrial grade. Cable must be in conformance with the requirements in TIA 568, "Commercial Building Telecommunication Cabling Standards." Cable must be suitable for terminating with an 8P8C modular connector at each termination. Provide 8P8C modular connectors as required.

Lighting Control Devices: All lighting control devices must be compatible with each other to be connected in a lighting control network and can be configured remotely. All lighting control devices must be from the same manufacturer.

Dimming Switch Type 1, S_D: Dimming switch, Type 1 must be a low voltage, corrosion resistant wall mounted ON/OFF plus RAISE/LOWER switch that can control the 0 to 10 V(dc) dimmable LED drivers. Switch must have two 8P8C modular communication ports. Switch must be programmable and be able to communicate with other lighting control devices through CAT 5e cabling. Power for the switch must be provided by the power pack. Switch must have soft click pushbutton control and single channel of control. Switch must have single on/off, single dimming raise/lower pushbuttons and LED feedbacks. Switch must be white in color and must be installed in a wall mounted device box with single raised device cover.

Dimming Switch Type 2, S_{2D}: Dimming switch, Type 2 must be a low voltage, corrosion resistant wall mounted ON/OFF plus RAISE/LOWER switch that can control the 0 to 10 V(dc) dimmable LED drivers. Switch must have two 8P8C modular communication ports. Switch must be programmable and be able to communicate with other lighting control devices through CAT 5e cabling. Power for the switch must be provided by the power pack. Switch must have soft click pushbutton control and 2 channels of control. Switch must have dual on/off, dual dimming raise/lower pushbuttons and LED feedbacks. Switch must be white in color and must be installed in a wall mounted device box with single raised device cover.

Occupancy Sensor, OC: Occupancy sensor must be ceiling or surface mounted type as shown, must be a low voltage, passive infrared occupancy detection sensor with 2 internal time delay, and two 8P8C modular communication ports. Sensor must be CA Code of Regs compliant and must be able to communicate with the other lighting control devices through CAT 5e cabling. Sensor must be white in color. Power for the sensor must be provided by the power. Sensor must have a lens with 360 degree view and be capable of providing 500 square feet of coverage when mounted at 9 feet above finished floor. Sensor must have LED indicator that remains active at all times in order to verify detection within the area to be controlled. The time delay off setting must be adjustable from 30 seconds to 30 minutes, initially set at 10 minutes. Provide required hardware equipment for installation of the sensor in open ceiling areas as shown.

Daylighting Occupancy Sensor, OCD: Daylighting occupancy sensor must be similar to occupancy sensor and also must have integrated automatic dimming control, and photo sensor for daylight harvesting. Sensor must have both on/off, and continuous dimming (0 to 10 volts DC) control.

Power Pack, PP: Power pack must be a combination 15 volts DC power supply and 16 ampere line voltage switching relay to switch LED drivers. Power pack must be a self-contained transformer with 15 volts DC and minimum 40 mA output per RJ-45 port. Input voltage to power pack unit must be suitable for 120/277 volts. Unit must have two 8P8C modular communication ports. Unit must interface with other lighting control devices to provide switching outputs to LED driver as required. Power pack must be CA Code of Regs compliant, UL listed, programmable and must be able to provide power to the other lighting control devices connected to it through CAT 5e cabling. Power Pack must also be suitable for switching 120V receptacles as shown. Sensor must be white in color and must have a green LED indicator. Power pack and all the lighting control devices must be from the same manufacturer. Power pack unit must be mounted inside a junction box.

Digital Timer Switch: Digital timer switch must be an electronic interval timer switch with a manually operated pushbutton. Switch must be rated 1200-watt at 120/277 volts. Time adjustments must range from 5 minutes to 12 hours, initially set at 2 hours. Switch must have an audible warning that beeps every 5 seconds at one minute prior to time out. Switch must have a flicker time out warning as visual alarm. Switch must be ivory in color.

Lighting Control Hub, LCH: Lighting control hub must have eight 8P8C modular communication ports and operates on 24-volt DC. Each port must have a green LED indicator and capable of delivering 40mA output per port over lighting cable to low voltage lighting control devices. The hub must be able to communicate with the lighting control devices and with the lighting network gateway to control the lighting profiles. Lighting control hub must be UL listed and programmable. A 120/277 volt AC to 15/24 volt DC, minimum 150mA output, UL listed DC power supply must be provided for each lighting control hub to deliver power to the lighting control hub. Unit must be mounted inside a junction box.

Lighting Network Gateway: Lighting network gateway must have internal astronomical time clock, touch screen control user interface and four 8P8C modular communication ports and operates on 24-volt DC. One of the ports is an Ethernet port and assigned an IP address. The other 3 ports are available for connection to any downstream lighting control hubs and touch screen control user interface. Each port must have a green LED indicator. The lighting network gateway must be programmable and able to communicate with the lighting control devices, lighting control hub and lighting network set-up computer. The lighting network gateway must be capable of networking up to 400 lighting control devices and stores all the time-bases lighting profiles programmed using the lighting network software. A 120/277 volt AC to 15/24 volt DC, minimum 250mA output, UL listed DC power supply must be provided for each lighting network gateway to deliver power to the lighting network gateway.

Lighting Network Set-Up Computer:

1. Lighting network set-up computer must be a portable laptop computer with accessories. Set-up computer must have all the software needed to run the network lighting control system installed and tested. In addition to the original DVD or CD copy of the software and manuals, inclusive of all licenses and carrying bag for computer, all must be handed over to the Engineer. The portable laptop computer must meet or exceed the following minimum requirements:
 - 1.1 Processor: 3.00 GHz, quad core 64-bit;
 - 1.2 Memory; 12 GB 1333 MHz ECC DDR3;
 - 1.3 Hard Drive: 3.5 inch, SATA II, 500 Gb, Solid State;
 - 1.4 Operating System; Microsoft Windows Server 2008, NET 3.0 and 25 user CAL;
 - 1.5 Graphics Card: 1 Gb, HD Graphics;
 - 1.6 Ethernet Connection: Integrated 10/100/1000 Gigabit Ethernet LAN (RJ-45 connector);
 - 1.7 Modem: 56K V.92 internal;
 - 1.8 DVD Drive: 16X DVD \pm RW Drive;
 - 1.9 802.11b/g/n WLAN;
 - 1.10 Built-in Backlit Keyboard and Touchpad;
 - 1.11 Four USB 3.0 port;
 - 1.12 Multi-Format Digital Media Card Reader;
 - 1.13 Display: 15.6-inch diagonal LED-backlit (1366x768);

- 1.14 Microsoft Office Home & Business 2013 licensed full version installed;
- 1.15 Adobe Acrobat XI Standard licensed full version installed;
- 1.16 Power Sources: 6 cell, 83 WHr battery and AC power cord;
- 1.17 One year warranty on parts and labor.

Lighting Network Software:

1. Lighting network software must be an application that is routinely advertised and supplied for network lighting control system. The software must be capable of auto-detecting all the downstream lighting control devices, lighting control hub and lighting network gateway. All the lighting control devices must be able to communicate their status to the software and be capable of being programmed through commands from the software home screen. A printable network inventory of the entire system must be available from the software.
2. Lighting network software must be capable of defining lighting control profiles which can be applied to the lighting control devices. All relays, dimming and switching outputs must be capable of being controlled through the software. All lighting control profiles must be stored on the lighting network gateway and on the lighting network set-up computer. Lighting control profiles must be capable of being scheduled based on occupancy, scheduled timed intervals and/or based on pre set working schedule hours. Software must provide graphic tool for viewing all the programmed lighting control profiles. A printable report for all the lighting network profiles must be available for printing.
3. The lighting network software must include inbuilt encryption to protect the stored data and must be accessed using user name and password only with at least three level of permissions. All lighting control devices firmware and software updates must be available for free download through internet. The software has in-built daylight savings time adjustments and sunrise/sunset schedules based on location information using an internal astronomical clock.
4. The lighting network software must monitor following status information for all the lighting control devices, whichever is applicable:
 - a. Current occupancy status,
 - b. Occupancy time-delay status,
 - c. Current photocell footcandle reading,
 - d. Current dimming levels,
 - e. Current relay switching status,
 - f. Manual override status,
 - g. Device temperature.
5. The lighting network software must provide graphical screens in order to facilitate system energy performance. An energy score card must be displayed that shows calculated energy savings in dollars and kwhr. Energy saving data must be calculated for the system as a whole or individual zones. Reporting must be provided in an Excel file format for all this data.

Control Panels:

Lighting Network Panel, LNP: Lighting network panel must include lighting control hubs, power supply, building exterior lighting control panel and lighting network gateway mounted inside a compartment inside the building switchboard. Touch screen control user interface must be mounted on the lighting network panel door accessible to operator even when the panel door closed.

Building Exterior Lighting Control Panel, BELCP: Building exterior lighting control panel must consist of 4 latching relays, printed circuit board, integrated power supply digital input/output interface kit and heavy duty terminal blocks in a surface mounted NEMA Type 12 enclosure. Relays must be rated to switch up to 30 A load (ballast) at 277 V(ac). Panel must provide 0-10 V(dc) dimming output paired with each relay. Integrated power supply must be able to provide power for the network lighting control system backbone and for the lighting control devices. Digital input/output interface kit consists of an outdoor type, class 2, low voltage ambient light photoelectric sensor (PES), suitable for communicating with a normally low input interface device to detect the state of photoelectric sensor and communicate it to the building exterior lighting control panel. Panel must be able to communicate

with the lighting network panel and be capable of being controlled by astronomical time clock as part of lighting network gateway inside lighting network panel. Panel must include four 8P8C modular communication ports. Each building exterior lighting control panel must be capable of controlling up to two exterior lighting control zones.

Terminal Block, TB: Terminal block must be 30-ampere, 600-volt, molded plastic with two or more mounting holes and two or more terminals in each cast block. The molded plastic must have a high resistance to heat, moisture, mechanical shock, and electrical potential and must have a smooth even finish. Each block must have a molded marking strip attached with screws. Terminal blocks must have tubular, high pressure clamp connectors.

Ground Bar, GB: Ground bar must be 100-ampere copper ground bar with circuit taps.

Neutral Bar, NB: Neutral bar must be 100-ampere copper neutral bar with circuit taps.

Three-way Switch: Three-way switch must be 20-ampere, 120/277-volt, quiet type, specification grade, ivory color switch with silver alloy contacts. Switch must be suitable for wiring with stranded conductors.

Concrete: Concrete must comply with section 99-03300. The concrete must be commercial quality portland cement concrete containing not less than 564 pounds of cement per cubic yard.

99-16500B(2) Fabrication

Component Mounting:

No equipment or device must be mounted on the side or at the bottom of the control panels. A minimum of 6 inches of empty space must be provided at the bottom of the panel for bundling and terminating field conductors.

All components mounted inside the control panel must be identified with nameplates fastened with self-tapping, cadmium-plated screws or nickel-plated bolts. Nameplates must use abbreviations as shown. For example, PS for power supply.

The following electrical components must be mounted on the interior back panel of the building exterior lighting control panel enclosure:

1. Terminal block, TB
2. Latching relays, Lighting contactors, CO and CR
3. Printed circuit board
4. Power supply, Current monitor, CM
5. Digital Input/Output interface

The photoelectric sensor, (PES), must be mounted on the building exterior wall and on the exterior lighting control panel as shown.

The following electrical components must be mounted on the interior back panel of the lighting network panel enclosure inside the building switchboard:

Lighting Control Hubs and power supply,
Lighting Network Gateway and power supply.

Component Wiring:

The control panels must be factory prewired in conformance with NEMA Class IIC wiring. All wires entering the enclosure must terminate on terminal blocks. Power distribution type terminal blocks must be installed as required for distributing power to various power devices. Dimming wiring must be 7 strand No. 14 MTW. Low voltage cables must be physically separated from the un-grounded hot conductors using full height barriers inside the control panels.

The control panels must be wired using colored insulation conductors for general wiring as specified elsewhere in these specifications.

Wires and lighting cables must be neatly trained and bundled, and wiring troughs must be provided in the enclosure as necessary. Wiring must be arranged so that any piece of apparatus may be removed without disconnecting any wires except the leads to that piece of apparatus.

A wiring diagram and relays switching and dimming sequence encased between 2 heat fused laminated plastic sheets must be provided with brass mounting eyelets attached to the inside of the control stations.

Communication ports and dimming outputs inside the control panels must be identified using device labels by the associated room number. For example, communication ports in LCP125 for room 125 must be identified with 125.

99-16500C CONSTRUCTION

99-16500C(1) Installation

Lighting Fixtures:

Lighting fixtures must be mounted securely to comply with the manufacturer's instructions. Mounting methods must be suitable for the particular type of ceiling or support at each location.

Lighting fixtures must be mounted securely to comply with the manufacturer's instructions. Mounting methods must be suitable for the particular type of ceiling or support at each location.

You must provide all supports, hangers, spacers, channels, fasteners and other hardware necessary to support the fixtures. Pendant mounted fixtures must be securely supported with at least two wires to the building framing in addition to the standard mounting methods for seismic safety.

Fixtures must be set at the mounting heights shown, except heights shown must be adjusted to meet conditions.

Lighting Control Devices: Wall mounted lighting control devices must be mounted at height of 3'-4" from the finished floor at locations shown. Ceiling mounted lighting control devices must be mounted securely in accordance with the manufacturer's recommendations. Mounting methods must be suitable for the particular type of ceiling or support at each location. You must provide all supports, hangers, spacers, channels, fasteners and all other necessary hardware to support the devices. Final location of the devices must be per manufacturer's recommendations to provide best coverage for the application. Ceiling mounted devices in rooms with open ceiling must be pendant mounted at fixture heights in those rooms.

Lighting Cable:

All lighting cables must be installed and tested in conformance with manufacturer's recommendations and the following:

1. All lighting cables must be extended continuous and unspliced between the lighting control devices, lighting control hubs and lighting network gateway. Both ends of the cable must be terminated using the 8P8C modular connectors for making terminations at the lighting control devices, lighting control hubs and lighting network gateway.
2. Exposed armored lighting cables must be installed parallel and at right angles to the building lines. Cable runs must be securely supported every 3 feet with open metal drive rings. Cable runs on walls in damp or wet locations must be securely supported every 3 feet with open metal drive rings with backboards to space cable off the wet surfaces. Horizontal cables runs on the walls must not be made lower than the mounting heights of light fixture in rooms with exposed ceilings, as shown.
3. Lighting cables must not be placed closer than 12 inches from a parallel hot water or steam pipe or 3 inches from such lines crossing perpendicular to the runs.
4. All lighting cables must be secured to the building structures using specified fasteners, clamps and hangers.
5. Lighting dimming cables installed in spaces above suspended ceilings tiles must be securely fastened using appropriate fasteners and must not be permitted to be run on top of suspended ceiling tiles.
6. Lighting dimming cable runs above ceiling spaces must be bundled together using fire rated tie wraps as required. Plastic tie wraps must not be used.

7. Lighting cable terminations at control panels enclosures and lighting control devices boxes must be made using the approved cable grip connector fittings.
8. Provide plastic sleeves through full height walls to route lighting cables. All penetrations through full height walls must be airtight.
9. Provide approved smoke and fire stop fitting through fire walls to route lighting control cables.
10. All vertical lighting cable runs to various wall mounted lighting devices must be installed using conduits up to height of 12 feet in spaces with open ceilings and up to attic space in spaces with closed ceiling systems. Provide conduit bushings at conduit terminations.

Lighting Cable Identification: All lighting control cable runs between lighting control devices within a single lighting zone must be identified with the associated room number at each terminations. All lighting cables homeruns between lighting control devices and lighting control hubs and between lighting control hubs and lighting network gateway must be identified at both ends of the cable. Each cable identifier must be placed at an easily accessible location somewhere between 6 to 12 inches from each end of the cable. At minimum the cable identifier must include the following information:

1. Lighting control device room number where the cable originated from
2. LNP where the cable is terminated at
3. Lighting control hub number
4. Lighting control hub port number

For example, cable identification for Gear Room 125 from the LCP125 to LNP-1A and terminated on hub HAA port 6 inside LNP-1A must be identified as 125-1A-HAA-6.

Lighting cable identification must be made with one of the following:

1. Adhesive backed paper or cloth wrap-around markers with clear, heat shrinkable tubing sealed over either type of marker.
2. Pre-printed, white, heat-shrinkable tubing.

Lighting Control Devices: Wall mounted lighting control devices must be mounted at height of 3'-4" from the finished floor at locations shown. Ceiling mounted lighting control devices must be mounted securely in accordance with the manufacturer's recommendations. Mounting methods must be suitable for the particular type of ceiling or support at each location. You must provide all supports, hangers, spacers, channels, fasteners and all other necessary hardware to support the devices. Final location of the devices must be per manufacturer's recommendations to provide best coverage for the application. Ceiling mounted devices in rooms with open ceiling must be pendant mounted at fixture heights in those rooms.

Control Panels:

Building exterior lighting control panel must be surface mounted at the location as shown.

Lighting network panels must be mounted inside the building switchboard as shown behind operable compartment doors.

Lighting network panels must be identified with nameplates.

Lighting control hubs, lighting network gateway and power supply must be securely fastened to the back mounting panel inside the lighting network panels. Lighting cables must be neatly trained and bundled. Wiring troughs must be provided in the enclosure.

Network Lighting Control System:

You must provide the services of a network lighting control system manufacturer's representative for a complete system startup, commissioning and network lighting software programming. The manufacturer representative must be factory-trained and must have a thorough knowledge of the software, hardware, and system programming. The manufacturer representative must coordinate with the engineer to perform the following tasks:

1. Program the lighting profiles, user logins and access passwords into the network lighting software
2. Program the switching relays and dimming outputs of the power packs and interfacing devices

3. Program the network lighting control system device tree
4. Troubleshoot any communication issues between the lighting control devices and lighting network devices
5. Program the lighting control devices set point and parameters
6. Establishing communication link between the lighting network gateway and Ethernet LAN or WAN
7. Generate reports for lighting system events and performances data
8. Develop graphical screens for energy usage and monitoring

99-16500C(2) Field Quality Control

Network Lighting Control System Testing: The operational test for the network lighting control system must be performed by the network lighting control system manufacturer's representative in the presence of the Engineer. Duration of the operational test must be for at least 1 week period under real conditions at the site. The operational tests must demonstrate that all functions of the system operate in the manner described in the manufacturer's literature and that the system is stable under normal vibration and shocks to components. You must notify the Engineer in writing not less than 10 days in advance of performing the operational tests. The Network Lighting Control System manufacturer's representative must certify in writing that the equipment has been installed, adjusted and tested in accordance with the manufacturer recommendation.

Network Lighting Control System Support:

You must provide support services for network lighting control system of the facility for 1 year after the final acceptance of the contract. The services must include a toll free telephone line connecting to a technical help desk for the network lighting control system manufacturer. Technical help desk must provide over the phone support for troubleshooting any aspect of the network lighting control system free of cost to the State.

The support service for the network lighting control system must include a 1 year service contract to maintain the software and all hardware system devices. The contract must include a minimum of two site visits by the network lighting control system manufacturer's representative to perform system maintenance. The system maintenance must include at minimum installation of software patches and upgrades to the system operating system, database maintenance and archiving of data, lighting profiles modifications, lighting control devices firmware upgrades and generating reports from the archived data.

Support services for the network lighting system after the first year will be handled by the State.

99-16500C(3) Demonstration

Network Lighting Control System Training

You must provide four hours of on-site training on the use, operation, and, maintenance of each system for not more than 8 designated State employees. You must notify the Engineer in writing not less than 10 days in advance of proposed training class. The training for the complete network lighting control system must be performed by the network lighting control system manufacturer's representative. The training for the power monitoring system must be performed by the power monitoring system manufacturer's representatives for their respective systems

Within 6 months of the operational tests, you must provide an additional four hours on-site follow-up training for the use, operation and maintenance of the system for not more than 8 designated State employees. Exact date of the follow-up training must be as directed by the Engineer.

99-16500C(4) Warranty

The manufacturer must provide for all the light emitting diode luminaires a written warranty for the performance of the luminaires and against defects in materials and workmanship for the luminaires for 60 months after acceptance of the luminaires. Replacement luminaires must be provided promptly after receipt of failed luminaires at manufacturer expense. The State pays for shipping the failed luminaires to the manufacturer.

All network lighting control system components must have a 5 year manufacturer warranty.

99-16500D PAYMENT

Not Used

99-16722 FIRE ALARM AND DETECTION SYSTEM

99-16722A GENERAL

99-16722A(1) Summary

Scope: This work consists of furnishing and installing a complete and operational fire alarm and detection system.

The system must include all materials necessary for the complete and operational fire alarm and detection system.

99-16722A(2) Definitions

Not Used

99-16722A(3) System Description

Design Requirements:

The fire alarm and detection system must be a low voltage, direct current, zoned, closed circuit, electrically supervised, signaling line circuits, and Class A addressable fire alarm and detection system. The system must consist of fire alarm control panel, manual pull stations, smoke detectors, duct smoke detectors, heat detectors, end-of-line resistors, audio-visual devices, annunciator, multivoltage relay modules, addressable relay modules, fan relays control panel and all other necessary appurtenances.

Each addressable initiating device will annunciate its own unique identification number or "address" to the fire alarm control panel. When an individual device is activated in a specific zone, the fire alarm control panel must communicate with the fan relay control panels and with addressable relay module to shut off all the heating, ventilating, air conditioning, exhaust and supply systems within that zone. The voltage rating and ampere rating of the relays must be as required for the particular application.

Each and all items of the fire alarm and detection system must be listed as a product of a single fire alarm system manufacturer under the appropriate category by UL or FM and must bear the "UL" or "FM" label. Control equipment must be listed under UL category UOJZ as a single control unit. Partial listing will not be acceptable.

The alarm system components must be listed by Underwriters Laboratory or FM Approvals, and the California State Fire Marshal.

99-16722A(4) Submittals

Product Data:

Submit manufacturer's descriptive information and installation instructions.

Installation instructions must include brand name and catalog reference of equipment supplied, wiring diagrams, battery calculations, voltage drop calculations, riser diagrams and floor plans showing all devices and conduit and conductor sizes.

State Fire Marshal Plan Review: Before submitting shop drawings as specified below, you must comply with the SFM plan review requirements in section 99-010000.

Shop Drawings: Submit complete shop drawings. Provide control wiring diagrams for fire-alarm interface to Fire Pump Controller, Fire Pump remote annunciator panel, and all Fire Pump system devices monitored.

Working Drawings: Complete working drawings must be submitted for approval. Working drawings must include building floor plan with component layout and wiring layout, including conduit size and wire sizes. Working drawings must be 34 by 22 inch size. Working drawings must show the shape, size, and method of attachment for each component used in the work. Submit control and wiring diagrams that must include

rough-in dimensions, component layout and wire number identification. Fire matrix table for sequence of operation must be submitted.

Closeout Submittals. Prior to the completion of the contract, one CD with PDF files and 2 identified copies of the operation and maintenance instructions with parts lists must be delivered to the Engineer at the jobsite. The instructions and parts lists must be in a bound manual form and must be complete and adequate for the equipment installed. Approved working drawings from the Fire Marshal must with as-built changes must be included in the submittal. Inadequate or incomplete material will be returned. You must resubmit adequate and complete manuals at no expense to the State.

Test Reports: Submit results of electrical continuity, insulation, and ground continuity tests performed on installed wiring.

State Fire Marshal Approval: Prior to the submittal of the working drawings, you must have said drawings stamped "APPROVED" by the State Fire Marshal. Allow 12 weeks for State Fire Marshal review and approval. You must resubmit working drawings to the State Fire Marshal as needed until approved. No additional payment will be made for resubmittals. Submittals must be approved by the State Fire Marshal and Engineer prior to commencing work with the fire alarm system installation.

99-16722A(5) Quality Assurance

Not Used

99-16722B MATERIALS

Fire Alarm System:

The system must be wired, connected, and left in first-class operating condition. The system must be electrically supervised, 4-wire Class A system, and must use closed loop initiating device circuits with individual zone supervision, individual indicating appliance circuit supervision, incoming and standby power supervision.

The system must be an addressable fire alarm system complete with built-in or portable reprogramming capabilities so that all reprogramming or reconfiguration of the fire alarm system can be accomplished without removal of any solid-state devices. Hardware, software, and passwords used in programming the system and the I/O Map must be submitted to the Engineer.

The system alarm operation subsequent to the alarm activation of any manual station, automatic detection device, or sprinkler flow switch must be as follows:

1. The appropriate initiating device circuit's red LED must flash on the control panel and the annunciator until the alarm has been silenced at the control panel or the annunciator. Once silenced, this same LED must latch on. A subsequent alarm received after silencing must flash the subsequent zone alarm LED on the control panel.
2. A pulsing alarm tone must occur within the control panel until silenced.
3. All alarm-indicating appliances must sound in a Continuous Ringing Alarm until silenced by the Alarm Silence Switch at the control panel or the annunciator.
4. All visual alarm lamps must operate in a continuous pattern until extinguished by the Alarm Reset Switch.
5. Activate a supervised signal to notify specified notifying parties.

The alarm indicating appliances may be silenced by authorized personnel upon entering the locked control panel and operating the Alarm Silence Switch or by use of the key operated switch at the annunciator. A subsequent zone alarm must reactivate the signals.

The system must include the following electrical power requirements:

1. The control panel must receive 120 V ac power via a dedicated standby circuit.
2. The system must be provided with sufficient battery capacity to operate the entire system upon loss of normal 120 V ac power in a normal supervisory mode in accordance with NFPA 72. The system must automatically transfer to the standby batteries upon power failure. All battery charging and recharging operations must be automatic. Batteries, once discharged, must recharge at a rate to provide a minimum of 80 percent capacity in 12 hours.

3. The supervised standby battery power must operate the entire system for 4 hours under normal conditions. At the end of 4 hours, the standby battery must power the system under fire alarm conditions for 5 minutes.
4. All circuits requiring system-operating power must be 24-Volt DC and must be individually fused at the control panel.
5. Faults on ancillary circuits must not interfere with the operation of the alarm and detection system.

Activation of Standpipe or Sprinkler Tamper Switch and Trouble Silence Switch:

1. The activation of any standpipe or sprinkler tamper switch must activate a distinctive system supervisory audible signal and illuminate a "Sprinkler Supervisory Tamper" LED at the system control panel and the annunciator. There must be no confusion between valve tamper activation and opens and grounds on fire alarm initiation circuit wiring.
2. Activating the Trouble Silence Switch must silence the supervisory audible signal while maintaining the Sprinkler Supervisory Tamper LED indicating the tamper contact is still activated.
3. Restoring the valve to the normal position must cause the audible signal and LED to pulse.
4. Activating the Trouble Silence Switch must silence the supervisory audible signal and restore the system to normal.

Fire Alarm Control Panel:

Fire alarm control panel must be surface-mounted, locking cabinet, completely self-contained control panel suitable for 120-volt, AC, input power with separate terminals for all external wires and end-of-line resistors installed within the control panel. Panel must be capable of communicating with addressable relay modules and the fan relay control panel. When a device is activated, the panel must display the actual device and reference zone where the device is located and the associated zone number.

The fire alarm system must conform to the California Electrical Code (CEC) Article 760, California Fire Code (CFC) Article 1007 and NFPA 72 National Fire Alarm Code as amended by California Building Code.

Each addressable device must have a unique address. The manufacturer must program each address to a system input zone and correlate to output operations as indicated. Non-functioning, non-addressed and non-programmed devices must report trouble. Provide for site modification to the addressable programming. Provide for removal and replacement of devices without the necessity of readdressing any other devices.

Provide installation flexibility by ensuring that the physical sequence (placement) of the devices on the loop need not determine the device address. Installation tables must be furnished by you to identify all device addresses.

The control panel must comply with the following:

1. Compatible with Simplex 4100, Notifier 640 or equivalent
2. Minimum 12 reference zones and expandable to 16 zones
3. Digital dialer communicator
4. Audible trouble signal, silencing switch and trouble pilot light
5. Solid state, modular construction
6. Fan shut down relays
7. 24-hour standby batteries, battery charger with automatic transfer on loss of utility company power and retransfer upon restoration of utility power
8. Indicating lights for normal power failure, battery power failure, audible alarm, and silencing switch
9. Low battery reporting
10. Fire pump operation control, if applicable

Manual Pull Station: Manual pull station must be single-action, addressable, non-coded, closed circuit, pull down type pull station mounted on a standard electrical outlet box. The manual pull station actuating contact must function continuously until reset. The pull station must have provisions for fire drill and

testing. Manual pull station must be capable of being reset with the same key as for the fire alarm control panel. By using the key, authorized personnel can activate the manual pull station.

Smoke Detector: Smoke detector must be ionization type addressable detector with dual chamber with sensitivity control and plug-in detector head. One chamber must be for detection and the other for changes in ambient parameters. The smoke detector must have integral LED light to indicate operation of the smoke detector.

Duct Smoke Detector:

Duct-mounted smoke detector must be similar to the space smoke detector except it must have the following additional features:

1. Sampling tube
2. Uniform sensitivity between 500 feet to 3,000 feet per minute air velocity
3. Remote mounted key activated test switch

Duct smoke detector for the air conditioning units must be similar and must be the type approved by the air conditioning unit manufacturer.

Heat Detector: Heat detector for automatic detection of fire must be of compact and rugged construction employing rate-of-rise and fixed temperature methods of detecting fires. The heat detectors must be addressable and must have twist-and-lock type plug-in detector head, and low profile.

Audio-visual Device:

Audio-visual device must be addressable, vibrating type horn with flashing light and adjustable volume control and must conform to the following requirements .

Audible alarm must provide:

1. A sound pressure level of at least 15 decibels (dB) above the average ambient sound level in the room or space, or 5 dB above the maximum sound level having a duration of 60 seconds, whichever is greater.
2. The minimum sound pressure level must be 60 dBA
3. The maximum must be 110dBA at the minimum hearing distance.

Visual alarm must have the following:

1. Visible alarm must be provided in entrance, hallways, restrooms, and other common use areas as indicated.
2. No place in corridors or any rooms requiring visual alarm must be more than 50 feet from the signal in the horizontal plane.
3. Visible alarm must be placed 80 inches above the highest floor level or 6 inches below the ceiling, whichever is lower.
4. The Lamp must be a xenon strobe type or equivalent.
5. The color must be clear or nominal white (i.e., unfiltered or color filtered white light).
6. The maximum pulse duration must be two-tenths of one second with a maximum duty cycle of 40 percent. The pulse duration is defined as the time interval between initial and final points of 10 percent of maximum signal.
7. The intensity must be a minimum of 75 candela.
8. The flash rate must be a minimum of 1 Hz and a maximum of 3 Hz.

Addressable Relay Module: Addressable relay module must be an addressable relay that will provide the system it is associated with a dry contact output for equipment shutdown. Dry contact must be rated for the control voltage and current being interrupted. Relay module must be compatible with the fire alarm control panel. Addressable relay module must be provided with a surface mounted back box.

Multivoltage Relay Module: Multivoltage relay module must be an encapsulated multi-voltage relay module compatible with the fire alarm control panel. Contacts for multivoltage relay module connected directly to fans or motors or air conditioning units must be double pole double throw (DPDT) with ampere and voltage ratings suitable for the unit that is being controlled. Contacts for multivoltage relay modules

connected directly to control circuits must be rated 10 A (minimum) and suitable for the control voltage for the unit that is being controlled. Multivoltage relay module must be provided with a surface mounted back box.

Fire Access Key Box: Key box must be UL listed, 1/4 " thick stainless steel case, with an exterior hinged door and interior compartment which can holds up to 2 keys and 100% welded with maximum width of 4". Key box must be complete with an alarm tamper switch. Mount the key box recessed into the exterior wall panels at least 6 feet from the finished floor. Key box must be the type approved by the local Fire Marshal.

Fire Alarm Bell: Fire alarm bell must be UL or FM listed electric bell type, 120 volt AC with minimum sound rating of 95 decibels at 10 feet. Fire alarm bell must have die cast aluminum housing with built-in rubber gasket for dust proof seal for bell striking mechanism. Fire alarm bell must be Viking, Grinnell, Reliable, or equal.

99-16722C CONSTRUCTION

99-16722C(1) Installation

Install the fire alarm system to comply with the manufacturer's instructions. Do not modify the recommended alarm system type or components type, or replace, without prior written authorization from the Engineer. Detectors must not be installed until the cleanup of all trades is completed and final. (NFPA 72 Section 17.7.1.11)

Fire alarm panel zoning: Fire alarm panel zoning must be as follows:

- Zone 1: Rooms 101, 102, 103
- Zone 2: Rooms 104, 105, 106, 107, 108
- Zone 3: Rooms 109, 112
- Zone 4: Rooms 110, 111, 113, 114
- Zone 5: Rooms 115, 116, 117, 118
- Zone 6: Rooms 119, 120, 121
- Zone 7: Rooms 122, 123, 124
- Zone 8: Rooms 125, 126, 127, 128, 129
- Zone 9: Rooms 130, 131, 132, 133, 134, 135
- Zone 10: Rooms 136, 137, 138, 139, 140
- Zone 11: Rooms 141, 142, 143, 144, 145, 146

Conduit and Conductors:

Fire alarm system wiring must be installed in conduits to comply with section 99-16050. Conduit size must be as recommended by the fire alarm system manufacturers except that conduits must be not less than 1/2-inch diameter, trade size. Within the office areas and rooms with finished ceiling and furred wall, conduits must be concealed in ceiling or walls. All other conduits must be exposed conduit.

Conductors and cables for the fire alarm system must be as recommended by the fire alarm system manufacturer.

No wiring other than that directly associated with fire alarm detection system must be permitted in these conduits. Wiring splices must be avoided to the extent possible and if needed, they must be made only in junction boxes and must be connected with crimp-type connectors. Wire nut-type connections are not acceptable.

All conduits entering or leaving the terminal cabinets and junction boxes must be numbered in a logical and consecutive manner. A number must be used only once.

All conductors must be tagged, labeled, and color-coded. Color-coding must be by wire insulation, not taping or banding. The numbering and color-coding must be continuous for each circuit wire.

Wire must be numbered at each connection, termination, and junction point. Each group of wires must be tagged with its destination at each panel, terminal box, or junction box. Identification must be made with one of the following:

1. Adhesive backed paper or cloth wrap-around markers with clear, heat shrinkable tubing sealed over either type of marker.
2. Pre-printed, white, heat-shrinkable tubing.

99-16722C(2) Field Quality Control

Testing: Perform operational tests for the fire alarm system in the presence of the Engineer. The operational tests must demonstrate that all functions of the system operate in the manner described in the manufacturer's literature and that the system is stable under normal vibration and shocks to components. Notify the Engineer not less than 10 days in advance of performing the operational tests.

The completed fire alarm system must be fully tested in accordance with NFPA 72 under the observation of the Engineer and subject to approval by the State Fire Marshal. The submitted and approved matrix for the sequence of operation must be followed during the operational test. Submit test procedures before performing tests. Testing program must include the following information, listings, and instructions:

1. Statement of procedure objective, scope of test, and list of equipment/system to be tested.
2. List of equipment required setting up and performing the tests.
3. List of prerequisite tests that need to be completed before the procedure can be performed.
4. Description of the required procedure setup, including diagrams illustrating test equipment connections and identifying test points, where applicable.
5. Step-by-step instructions for performing the procedure, identifying the points where data is to be recorded and the limits for acceptable data.
6. Provisions for recording pertinent test conditions and environment at time of test.
7. Instructions for recording data on data sheets and verifying that procedure steps have been completed.

Before requesting final approval of the installation, the installing company must furnish a written statement to the State Fire Marshal to the effect that the system has been installed in accordance with approved plans and completely tested in accordance with manufacturer's specifications and appropriate NFPA requirements. (NFPA 72 Section 10.18.1.3)

Upon completion of the installation of the fire alarm system, a satisfactory test of the system must be made in the presence of the State Fire Marshal.

Monitoring:

Provide monitoring services for the facility for one year after the Contract acceptance. The services must include a toll-free telephone line connecting to the 24-hour on call monitoring station. Monitoring station must contact designated site representative in the event of alarm and dispatch an immediate on-site response to the alarm location if the site representative cannot be reached or verification of the cause of the alarm cannot be determined.

Monitoring services after the first year will be handled by the Department.

99-16722C(3) Demonstration

Training: Provide four hour of on-site training on the use, operation, and maintenance of the system for not more than 8 designated Department employees. Notify the Engineer not less than 10 days in advance of proposed training class.

99-16722D PAYMENT

Not Used

99-16724 INTRUSION ALARM AND ACCESS CONTROL SYSTEM

99-16724A GENERAL

99-16724A(1) Summary

Scope: This work consists of furnishing and installing a complete and operational intrusion alarm system and access control system.

The system must include all necessary materials for a complete and operational intrusion alarm and access control system.

Related Work: Related items are as specified under in "Door Hardware" in Section 99-08710.

99-16724A(2) Definitions

Not Used

99-16724A(3) System Description

Design Requirements:

The intrusion alarm system must be a low voltage, direct current, zoned alarm system. Each zone must be "supervised, Class B circuit." The end of line resistor must be installed in the control panel.

The intrusion alarm system must consist of a surface mounted intrusion alarm panels, magnetic contact switches, combination motion detector-microwave/passive infrared detectors, glass break discriminators, digital card readers, electromechanical locks, electrified door hinges, electrical power transfers, lock guards, digital keypad stations and other devices as shown.

The intrusion alarm system must self-test and report status of individual zones.

The intrusion alarm system must provide an automatically rechargeable back-up power supply system, 24 hours minimum for building operation, in case of building power interruption.

Each and all items of the intrusion alarm system must be listed as a product of a single alarm system manufacturer under the appropriate category by UL or FM, and must bear the "UL" or "FM" label. Control equipment must be listed under ULFM and by AHJ as a single alarm unit for commercial use. Partial listing will not be acceptable.

The access control system must consist of an access control workstation with an attached card reader, access control door controllers, electrified lock sets, electrified power transfer hinges, and 26 bit Wiegand compatible card readers able to read Bosch access card stock D8236.

The intrusion alarm and access control systems must not be interconnected in any way. Each system must be wired, connected and left in first class operating condition. Each system must be electrically supervised, 4-wire, Class A system and must use closed loop initiating device circuits with individual zone supervision, individual indicating appliance circuit supervision, incoming and standby power supervision. Each system must be an addressable system complete with built-in or portable reprogramming capabilities so that all reprogramming and reconfiguration of the system can be accomplished without removal of any solid state devices. Hardware, software and password used in programming the system and the I/O map must be submitted to the Engineer.

99-16724A(4) Submittals

Product Data:

Submit manufacturer's descriptive information, working drawings and installation instructions.

Working drawings must include voltage drop and standby battery calculations, building floor plan with component layout, system riser diagram including wiring layout, interconnection between intrusion and access control system and conduits and conductor sizes. Working drawings must show the shape, size and method of attachment for each component used in the work. Control and wiring diagrams must include rough in dimensions, component layout and conductor number identification. Working drawing size must be 34 by 22 inches.

Installation instructions must include manufacturer and catalog reference, and model number of equipment to be furnished, conduit and conductor sizes, wiring diagram, and floor plan showing locations of multiple switch contact monitor and devices.

Test Reports: Submit results of electrical continuity, insulation, and ground continuity tests performed on installed wiring.

Closeout Submittals: Prior to the completion of the contract, one CD with PDF files and 2 identified copies of the operation and maintenance instructions with parts lists must be delivered to the Engineer at

the jobsite. The instructions and parts lists must be in a bound manual form and must be complete and adequate for the equipment installed. Approved working drawings with as-built changes must be included in the submittal. Inadequate or incomplete material will be returned. You must resubmit adequate and complete manuals at no expense to the State.

99-16724A(5) Quality Assurance

Installer Qualification: The installer of the intrusion and access alarm system must be licensed by the State Department of Consumer Affairs, Bureau of Collection and Investigative Services. License numbers and expiration dates must be included on all correspondence.

Manufacturer qualification: The system manufacturer must have not less than 5 years experience in products or systems similar to the size and complexity for this project and with a record of successful service performance.

99-16724B MATERIALS

Intrusion Alarm Control Panel:

The intrusion alarm control panel must be a surface-mounted, locking cabinet, completely self-contained control panel suitable for 120-volt, AC, input power with separate terminals for all external wires.

The control panel must meet the following requirements:

1. Compatible with existing Bosch D9412GV2 receiver or equivalent
2. Capable up to 246 individually identified points
3. Addressable expandable modules
4. Capable of controlling up to 8 doors
5. Network Ethernet interface module
6. Digital dialer communicator
7. 12-volt auxiliary power supply
8. Rechargeable battery (8 hour minimum)
9. Battery charger
10. Low battery reporting
11. Silent alarm signaling
12. System connected to RJ31X or RJ38X telephone jack or equivalent
13. Line test every twenty-four (24) hours
14. 120-volt, AC, input
15. Front accessible control and indication digital keypad.

Magnetic Contact Switch:

Magnetic door switch for pedestrian door must be a 2-section, self-lock mounting type switch, and must be compatible with the material of the door on which it is installed. The switch must be epoxied in the switch housing. Magnetic contact switches must be the type capable of being concealed on the top of the door frame.

Magnetic contact switches for the overhead vehicle doors must be 2-section, extra heavy-duty, floor mounting type switch with stainless steel armored cable.

Switch must be housed in a non-magnetic case.

Glass Break Discriminator: Glass break discriminator must be an acoustic glass break detector with advanced technology for sensing and reporting sound and shock wave activity. Detector must respond to energy of breaking windows using piezo-electric crystal microphone. Sensor coverage pattern must be directional, detecting breakage of uncovered glass in a 34-foot wide area at a distance of 11½ feet minimum. The sensor must be housed in a fire retardant ABS housing.

Digital Keypad: The remote digital keypad must be flush mounted on a sheet metal box. Each digital keypad must have two separate SPDT outputs contact with selectable timings (10, 30, 35 seconds); multiple programmable codes, and 3 LED indicating lights for loop status, system status and shunt status. Each digital keypad must operate on DC power and contacts must be rated one ampere at minimum 12-volt DC. Each digital keypad must be wired to the control panel to turn on or turn off the covered

designated zones from each location. Digital keypad must have 12-key with alarmed and ready lights and audible warning signal.

Combination Motion Detector-Microwave/Passive Infrared: Combination Motion detectors-Microwave/Passive Infrared must be low voltage, wall-mounted, wide angle microwave or passive infrared detectors with a detection pattern appropriate to cover areas shown. Model must be specified on proposed installation layout. The detector must have an LED indicating light.

Expansion Module: Expansion module must be an addressable expansion module mounted inside a NEMA Type 1 enclosure. Module must be compatible with the access control system and intrusion alarm system that is provided. Module must include end-of line resistors required for the proper operation of the system.

The systems must include the following electrical power requirements:

1. The control panels must receive 120-volt AC power via dedicated standby circuit.
2. The system must be provided with sufficient battery capacity to operate the entire system upon loss of normal 120-volt AC power in a normal supervisory mode in accordance with NFPA 72. The system must automatically transfer to the standby batteries upon power failure. All battery charging and recharging operations must be automatic. Batteries, once discharged, must recharge at a rate to provide a minimum of 80 percent capacity in 12 hours.
3. The supervised standby battery power must operate the entire system for 24 hours under normal conditions.
4. All circuits requiring system-operating power must be 24-Volt DC and must be individually fused at the control panel.
5. Faults on ancillary circuits must not interfere with the operation of the alarm and detection system.

Access Control Panel:

The access control system must utilize a 26 bit Wiegand compatible card readers able to read the existing Bosch access card stock D8236. The door controllers must be surface mounted, self contained lockable enclosures. Control panel must in a surface mounted, self-contained lockable panel and suitable for 120-volt, AC, input power with separate terminals for all external wires.

The access control panel must meet the following requirements:

1. Capable of managing up to 128 door operators and 5,000 card holders
2. Network Ethernet interface module
3. 12-volt auxiliary power supply
4. Rechargeable battery (24 hour minimum)
5. Battery charger

Door Controller Enclosure:

The door controller and power supplies must be mounted in a series of surface mounted enclosures without a keypad or faceplate. The controllers must be suitable for 120-volt, AC, input power with separate terminals for all external wires. Controllers must be provided with automatic standby battery powered power supply. Back up batteries must operate all doors and digital card readers managed by the door controller unit for up to 24 hours.

Access Credential Cards: Access credential cards must be of credit card type plastic material and must be compatible with the digital card readers and access system control panel. Entrance cards must be compatible with the card reader that is provided.

99-16724C CONSTRUCTION

99-16724C(1) Installation

The intrusion alarm system must be installed to comply with the manufacturer's instructions.

The magnetic switch section without wires must be recessed flush into the top edge of the door at the approximate center of the door, and the switch section with wires must be recessed flush in the top section of the door frame. The two sections of the switch must be mounted directly opposite each other to

provide maximum sensitivity. The wiring from each magnetic switch must be run to the control panel in the zone dedicated for the intrusion alarm circuit.

The magnetic switch section mounted on the bottom edge of the overhead door must be without wires. The switch section with wire must be mounted on the floor directly below the switch part without wires.

The glass break discriminator must be mounted on the ceiling at locations shown.

Combination detector must be mounted at not less than 7½ feet above finished floor at locations shown.

The end of line resistors must be installed in the control panel.

Intrusion alarm zoning: Intrusion alarm panel zoning must be as shown.

Conduit and Conductors:

All intrusion alarm system wiring must be installed in conduit system complying with the requirements under "Basic Materials and Methods." Conduit size must be as recommended by the intrusion alarm manufacturer, except that conduits must be not less than ½-inch diameter. Within the office areas and areas with finished ceiling and furred wall, conduits must be concealed in ceiling or walls. All other conduits must be exposed.

All conductors and cables for the intrusion alarm system wiring must be as recommended by the intrusion alarm system manufacturer.

No common wires must be connected to components across multiple zones.

No wiring other than that directly associated with intrusion, access, or auxiliary functions must be permitted in these conduits. Wiring splices must be avoided to the extent possible and if needed, they must be made only in junction boxes and must be connected with crimp-type connectors. Wire nut-type connections are not acceptable.

All conduits entering or leaving the terminal cabinets and junction boxes must be identified in a logical and consecutive manner. A number must be used only once.

All conductors must be identified, tagged, labeled, and color-coded. Color-coding must be by wire insulation, not taping or banding. The numbering and color-coding must be continuous for each circuit wire.

Wire must be identified at each connection, termination, and junction point. Each group of wires must be tagged with its destination at each panel, terminal box, or junction box.

Conductor identification must be made with one of the following:

1. Adhesive backed paper or cloth wrap-around markers with clear, heat shrinkable tubing sealed over either type of marker.
2. Pre-printed, white, heat-shrinkable tubing.

99-16724C(2) Field Quality Control

Testing:

Perform operational test for the intrusion alarm system and access control in the presence of the Engineer. The operational tests must demonstrate that all functions of the system operate in the manner described in the manufacturer's literature and demonstrate system stability under normal vibration and shocks to components. Manufacturer's representative must be present during testing. Notify the Engineer not less than 10 days in advance of performing the operational tests.

Testing program must include the following information, listings, and instructions:

1. Statement of procedure objective, scope of test, and list of equipment/system to be tested.
2. List of equipment required setting up and performing the tests.
3. List of prerequisite tests that need to be completed before the procedure can be performed.
4. Description of the required procedure setup, including diagrams illustrating test equipment connections and identifying test points, where applicable.

5. Step-by-step instructions for performing the procedure, identifying the points where data is to be recorded and the limits for acceptable data.
6. Provisions for recording pertinent test conditions and environment at time of test.
7. Instructions for recording data on data sheets and verifying that procedure steps have been completed.

Monitoring:

Provide monitoring services for the facility for one year after the acceptance of the contract. The services must include a toll-free telephone line connecting to the 24-hour on call monitoring station. Monitoring station must contact designated site representative in the event of alarm and dispatch an immediate on-site response to the alarm location if the site representative cannot be reached or verification of the cause of the alarm cannot be determined.

Monitoring services after the first year will be handled by the Department.

99-16724C(3) Demonstration

Training: Provide four hours of on-site training on the use, operation, and maintenance of the system for not more than 8 designated Department employees. Notify the Engineer not less than 10 days in advance of proposed training class.

Follow-up Training: Within 2 months of the operational test, you must provide an additional two hours on-site follow-up training for the use, operation and maintenance of the system for not more than 8 designated State employees. Exact date of the follow-up training must be as directed by the Engineer.

99-16724D PAYMENT

Not Used

99-16912 SEWAGE LIFT STATION CONTROL PANEL

99-16912A GENERAL

Scope: This work consists of furnishing and installing sewage lift station control panel equipment.

Related Work:

Concrete and reinforcement for foundation must comply with section 99-033000 .

Basic materials must comply with "Basic Materials and Methods" under section 99-16050.

Nameplates must comply with "Electrical Equipment" in section 99-16432.

99-16912A(2) Definitions

Not Used

99-16912A(3) Submittals

Product Data:

Submit a list of materials and equipment to be installed and the manufacturer's descriptive data.

Manufacturer's descriptive data must include complete description, performance data and installation instructions for the materials and equipment specified herein. Control and wiring diagrams, rough-in dimensions, and component layout must be included where applicable. All control and power conductors on the shop drawings must be identified with wire numbers. Any other data as requested by the Engineer must also be submitted for approval. Incomplete submittal will be returned for resubmission at your expense.

99-16912A(4) Quality Assurance

Not Used

99-16912B MATERIALS

99-16912B(1) General

Sewage Lift Station Control Panel:

Sewage lift station control panel must be single exterior hinged door NEMA Type 4X enclosure containing a fixed interior electrical mounting panel and hinged interior door. The enclosure must be made of 0.075-inch (14-gage) steel minimum with all seams continuously welded. A rolled up lip must be provided around three sides of the hinged exterior door and around all sides of the enclosure opening. The door must be provided with a neoprene gasket that is attached with an oil-resistant adhesive. The door must be maintained closed with door clamps. A hasp and staple for padlocking must be installed near the center of hinged exterior door edge. Control panel must be provided with floor stands as shown.

Circuit breakers, alarm reset, alarm test switch, selector switches and digital multimeter must be externally operable after the hinged exterior door is opened. The hinged interior door must not be capable of being opened unless the main breaker is in the "off" position.

All exposed surfaces of the enclosure must be lined with high density foam, aluminum clad, insulation to prevent heat gain from the exterior. The insulation must be attached to the enclosure with adhesive only. The R-value of the insulation must be greater than R30. The control cabinet must be equipped with an exterior mounted thermoelectric air conditioner unit as shown.

The enclosure must be factory pre-wired to comply with NEMA Class IIC wiring. All wires entering or leaving the enclosure must terminate on terminal blocks. Control wiring must be 7 strand No. 14 MTW except for hinge wiring, which must be 19 strand No. 14 MTW. Panel must be wired using red colored insulation conductors for general wiring and white colored insulation conductors for neutrals. Use of gray colored insulation conductors for wiring is prohibited. Wires must be neatly trained and bundled, and wiring troughs must be provided in the enclosure as necessary. Wiring must be arranged so that any piece of apparatus may be removed without disconnecting any wiring except the leads to that piece of apparatus. No equipment or device must be mounted on the side or at the bottom of the panel. A minimum of 6 inches of empty space must be provided at the bottom of the panel for bundling field conductors and terminating field conduits.

A schematic diagram encased between two heat-fused laminated plastic sheets must be provided with brass mounting eyelets and attached to the inside of the enclosure.

Main Breaker, MB: Main breaker, MB, must be 2-pole, 208-volt, AC, molded case circuit breaker with 100-ampere frame, 70-ampere trip, and interrupting capacity of not less than 22,000 amperes (symmetrical) at 208 volts. Power distribution blocks must be installed on load side of the circuit breaker.

Starter, ST1 and ST2: Starters, ST1 and ST2, must be NEMA Size 1, NEMA rated, 2-pole, 208-volt, contactors with 120-volt coil, and non-adjustable overload relays. Overload relays must be resettable by an externally operable pushbutton on the hinged interior door. Overload relays must have two thermal overload elements and must trip between 115 and 125 percent of full load motor current, as quoted on the nameplate by the motor manufacturer. Starters must have two normally-open auxiliary contact and two normally-closed auxiliary contact.

Current Sensors, CS1 and CS2: Current sensors CS1 and CS2 must:

1. Be self-powered.
2. Have instrument accuracy Class 1 or better.
3. Provide one transducer for each phase of the motor.
4. Have primary rating selected so that each motor full load current lies between 40% to 80% of its full scale.
5. Be compatible with DMM's

Digital Multimeters, DMM1 and DMM2: Digital multimeters, DMM1 and DMM2 must:

1. Be microprocessor based line of multifunction, three phase current and voltage meter.
2. Be supplied completely wired with Instrument accuracy Class 1 or better type CTs at all three phases, and fuses at voltage and auxiliary power inputs.

3. Have CTs primary rating selected so that each motor full load current lies between 40% to 80% of its full scale.
4. Be capable of operating on a power supply range of 90 to 265 Volts AC.
5. Be programmable for current to any CT ratio. The use of DIP switches for selecting fixed ratios will not be acceptable.
6. Have an accuracy of +/- 0.25% or better for volts and amps, and 0.5% for power and energy functions. The meter must meet the accuracy requirements of IEC 687 (class 0.5%) and ANSI C12.20 (Class 0.5%).
7. Provide true RMS measurements of phase and line voltage and current.
8. Have operating temperature range from -20 to +70 degrees C.
9. Communicate with the pump controller for power monitoring.

Surge Protective Device, SPD: Surge protective device must be Type 2, Category B device conforming to latest IEEE standards and designed for connecting at the point of entry and suitable for single-phase, 120/208 volt, 3-wire system. The surge protective device must be complete with status indicator lights on each phase, audible alarm, enable/disable transient counter, form C relay contact, and push to test pushbutton.

Pump Disconnects, PD1 and PD2: Pump disconnects, PD1 and PD2, must be 2-pole, 208-volt, AC, 100-ampere frame, 30-ampere trip, molded case circuit breakers. The interrupting capacity of the breakers must be not less than 22,000 amperes (symmetrical) at 208 volts.

Control Disconnect, CD, Spare Disconnect, SD and Receptacle Disconnect, RD: Control disconnect, CD, spare disconnect, SD and receptacle disconnect, RD, must be single pole, 120-volt, AC, 100-ampere frame, 20-ampere trip, molded case circuit breakers. The interrupting capacity of the breakers must be 10,000 amperes (symmetrical) at 120 volts.

Control Relays, CR1 through CR8: Control relays, CR1 through CR8, must be 120-volt, AC, general purpose relays with 3-pole, double-throw, 10-ampere, 120-volt, AC, contacts with pilot light. Relays must be enclosed in clear plastic with 11-pin tube type plug base. Sockets for relays must be barrier type, 11-contact relay socket with 10-ampere contacts and screw terminals.

Time Meters, TM1 and TM2: Time meters, TM1 and TM2, must be 120-volt, 60 Hz running time meters with 0 to 99,999.9 hours range without a reset.

Seal Failure Relays, SFR1 and SFR2: Seal failure relays, SFR1 and SFR2, must be 120-volt, 60 Hz, transformer and relay combinations. Seal failure relays must be as shown or as recommended by the pump manufacturer. The seal failure relays, complete with pump leak detector light, sensor probe continuity test pushbutton and test indicator light, must be a factory assembled unit mounted inside the control panel as shown in a NEMA Type 1 enclosure. Relays must include one normally open and one normally closed contact having a rating of 10 amperes at 120 volts AC.

Terminal Block, TB: Terminal block, TB, must be 20-ampere, 600-volt, molded plastic with two or more mounting holes and two or more terminals in each cast block. The molded plastic must have a high resistance to heat, moisture, mechanical shock, and electric potential and must have a smooth even finish. Each block must have a molded marking strip attached with screws. The identifying numbers of the terminating wires as shown on the shop drawings must be engraved in the marking strip. Terminal blocks must have tubular, high-pressure clamp connectors.

Ground and Neutral Bars: Ground and neutral bars must be 100-ampere copper neutral bars with circuit tabs.

Alarm Reset, AR: Alarm reset, AR, must be 1 1/8-inch heavy duty oil-tight pushbutton with one normally-closed contact. The contact must have an inductive pilot duty rating of 60 amperes (make), 6 amperes (break) and 10 amperes (continuous) at 120 volts and 35 percent power factor.

Alarm Test Switch, AT: Alarm test switch, AT, must be the same as AR, except that the contact must be one normally open contact.

Selector Switches, SS1 and SS2: Selector switches, SS1 and SS2, must be rotary action single-pole, 3-position, 10-ampere, 120 -volt switches. Switch contacts must have an inductive pilot duty rating of 60

amperes (make), 6 amperes (break), and 10 amperes (continuous) at 120 volts and 35 percent power factor. Selector switches SS1 and SS2 must have legend plate marked "HAND-OFF-AUTO."

Selector Switches, SS3 and SS4: Selector switches, SS3 and SS4, must be toggle switch, single-pole, 2-position, 10-ampere, 120 -volt switches. Switch contacts must have an inductive pilot duty rating of 60 amperes (make), 6 amperes (break), and 10 amperes (continuous) at 120 volts and 35 percent power factor. Selector switches, SS3 and SS4, must have a legend plate marked "ON-OFF."

Pilot Lights, PL1 through PL7: Pilot lights, PL1 through PL7, must be 30 mm panel mounted pilot lights with lens and screw cap and a high intensity LED, 120-volt lamp. Color of pilot lights must be as shown.

Fiber Optic Float Switches, FS1 through FS4: Fiber optic float switches, FS1 through FS4 must be completely fiber optic type, NSF approved, NRTL listed and impact and corrosion resistant float switches with sealed fiber optic cable and external weight. Float switches cable must have a minimum of 75 feet in length and be of SJOW type, 2 strands fiber optic cable of the size and type suitable for the transmission distance and for making connection between the float switch and the transceiver.

Fiber Optic Float Switch Transceivers, FT1 and FT2: Fiber optic float switch transceivers, FT1 and FT2 must be completely solid state and din-rail mounted type transceiver suitable for use with specified fiber optic float switches. Transceivers must be of minimum two channel, fiber optic, input type device with separate output relay for each input channel. Output relay contacts must be rated 3 amperes at 120-volt, AC. FT1 must have 2 normally closed contacts and FT2 must have 2 normally open contacts.

Power Supply, PS: Power supply, PS, must be UL listed, Class 2, din-rail mounting type power supply suitable for 120-volt, AC, input and must have 12-volt, DC output. PS1 must be suitably sized to supply all the needs of the fiber optic float system with an additional 50 percent safety factor, over temperature protection, and LED pilot light. PS must be provided with fuses at primary and secondary. Rating of fuses must be as recommended by the fiber optic float system manufacturer.

Alternator, ALT: Alternator, ALT, must be 120-volt, 60 Hz, synchronous motor driven, mechanical memory, 60-minute recycling timer with single-pole, double-throw, snap action, 15-ampere, 120-volt contacts. Contact positions must alternate at 30-minute intervals.

Time Delay Relay, TDR: Time delay relay, TDR, must be solid-state adjustable, plug-in time delay relay with 120-volt, AC, coil, and 2 single-pole, double-throw contacts rated 10 amperes at 120 volts, AC. TDR must have a time delay on energizing, adjustable from one to 60 minutes, initially set at 30 minutes. Socket for relay must be barrier type, 8-pin tube type relay socket, with 10-ampere contacts and screw terminals.

Alarm Light, AL: Alarm light, AL, must be cast-metal, LED lighting fixture for use with threaded rigid conduit. Light fixture must have a red polycarbonate globe. Lamp must be 18-watt, 120-volt screw base standard LED lamp.

Ground Fault Circuit Interrupter Receptacle, (GFCI): Ground fault circuit interrupter receptacles, GFCI, must be NEMA Type 5-20R, feed-through type, ivory color, 3-wire, 20-ampere, 125-volt AC, grounding type, specification grade, duplex receptacle with ground fault interruption. Receptacle must detect and trip at current of 5 milliampere and must have front mounted test and reset button.

99-16912B(2) Fabrication

Component Mounting:

The following electrical components must be mounted on the fixed interior electrical mounting panel of the Sewage Lift Station Control Panel: Sewage Lift station main breaker, MB; Starters, ST1 and ST2; Current Sensors, CS1 and CS2; Current Transformers of each Digital Multimeters; Power Supply, PS; Fiber Optic Transceivers, FT1 and FT2; Control disconnect, CD; Receptacle disconnect, RD; Spare disconnects, SD; Pump disconnects, PD1 and PD2; Control relays, CR1 through CR8; Seal failure relays, SFR1 and SFR2; Alternator ALT; Ground and neutral bars; and Terminal blocks. Spacers must be installed with all breakers (MB, PD1, PD2, CD RD, SD and SPD) so that they are externally operable with the hinged interior door closed. The hinged interior door must only be open when MB is in the "OFF" position.

The following electrical components must be mounted on the hinged interior deadfront panel of the Sewage Lift Station Control Panel: Time meters, TM1 and TM2; Digital multimeters, DMM1 and DMM2; Alarm reset, AR; Alarm test switch, AT; Selector switches, SS1, SS2, SS3 and SS4; Pilot lights, PL1 through PL7; Overload reset pushbuttons, OL1 and OL2; and GFCI receptacle.

The following equipment must be mounted on the side of the Sewage Lift Station Control Panel: Alarm light, AL as shown.

99-16912C CONSTRUCTION

99-16912C(1) Installation

The Sewage Lift Station control panel must be installed on a concrete pad and oriented as shown.

All bolts and fasteners in the sump must be stainless steel.

All concrete around conduit penetrations must be finished smooth and sloped in a way to avoid standing water around the conduit.

99-16912C(2) Operation

Automatic Operation:

The automatic operation of the sewage lift pumps must be controlled by the fiber optic float switches FS1, FS2, FS3 and FS4 as shown. When the liquid level rises to elevation that closes FS2, relay CR4 must be energized, which must start one of the pumps through alternator time switch, ALT. The pump must operate until the liquid level lowers to elevation that opens FS1, and relay CR3 is energized.

The high liquid level alarm circuit must be actuated when the liquid level rises to elevation that closes FS3, and relay CR5 must be energized. When relay CR5 is energized, it must start both pumps, bypassing alternator time switch ALT, and must also energize time delay relay, TDR. Time delay relay TDR must energize alarm light, AL, after a period of 30 minutes if the liquid level does not go down. The alarm light, AL, must stay energized until the alarm-reset pushbutton is pushed.

The low-level alarm circuit must be activated by float switch FS4 when the liquid level drops to elevation that closes FS4, and relays CR1 and CR2 must be energized. Relay CR2 must stop the pump motors and relay CR1 must also energize alarm light, AL and pilot light PL2. The alarm light, AL, must stay energized until the alarm-reset pushbutton is pushed.

Each submersible pump motor must have thermal and moisture protection. The thermal protection must contain contacts that will open and stop the pump motor should the temperature in the motor rise above the design operating temperature.

Each moisture protection must consist of two electrode sensors, which will detect the presence of water in respective oil filled chamber. The electrodes must sense this water through seal failure relays, SFR1 and SFR2, located in the pump control panel. Relays SFR1 and SFR2 must energized alarm light, AL, seal failure indicator pilot lights, PL6 and PL7, when moisture is in the oil filled chambers.

Alternator time switch, ALT, must alternate the pumps after a running time of 30 minutes.

99-16912C(3) Functional Testing

After complete installation work in the field of all various systems, the control station must be tested in the presence of the Engineer to demonstrate that all functions operate properly. The contractor must provide all materials and equipment require for testing the system. The contractor must be responsible for the necessary repairs, replacements, adjustments and retests at his own expense.

99-169212C(4) Training

Engage a factory-authorized service representative to train the Department's maintenance personnel to adjust, operate, and maintain sewage lift station. Training will be for 4 hours at the site.

99-16912D PAYMENT

Not Used

99-16920 ELECTRICAL VEHICLE CHARGING SYSTEM

99-16920A GENERAL

99-16920A(1) Summary

Scope: This work consists of furnishing and installing electrical vehicle charging system.

Electrical vehicle charging system includes:

1. Foundations
2. Pull boxes
3. Conduit
4. Conductors
5. Standards
6. EVSE Service Pedestal
7. EVSE Disconnect
8. Electrical vehicle supply equipment

The components of an electrical vehicle charging systems are shown.

99-16920A(2) Related Requirements

EVSE Disconnect must comply with Section 99-16432.

99-16920A(3) Definitions

CBC: California Building Code

CEC: California Electrical Code

CHADdeMO: Charge de Move

EV: Electric vehicle.

EV Cable: The off-board cable containing the conductor(s) to connect the EV power controller to the EV that provides both power and communications during energy transfer.

EV Charger or EV Charging Equipment: See "EVSE".

EV Connector: A conductive device that, when electrically coupled to an EV inlet, establishes an electrical connection to the EV for the purpose of power transfer and information exchange. This device is part of the EV coupler.

EV Coupler: A mating EV inlet and connector set.

EV Inlet: The device in the vehicle into which the EV connector is inserted, and a conductive connection is made for the transfer of power and communication. This device is part of the EV coupler.

EVSE: Electric-Vehicle Supply Equipment. It includes the EV charging equipment and conductors, including the ungrounded, grounded, and equipment grounding conductors and EV cables, attachment plugs, and all other fittings, devices, power outlets, or apparatus installed specifically for transferring energy between the premises wiring and the EV.

NECA: National Electrical Contractor Association

SAE: Society Of Automotive Engineers

99-16920A(4) Action Submittals

99-16920A(4)(a) Product Data

For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for EV charging equipment.
2. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

99-16920A(4)(b) Shop Drawings

For EVSE.

1. Include plans, elevations, sections, and attachment details.
2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
3. Detail fabrication and assembly of mounting assemblies for EV charging equipment.
4. Include diagrams for power, signal, and control wiring.

99-16920A(5) Informational Submittals

99-16920A(5)(a) Seismic Qualification Data

Provide certificates, for EVSE, accessories, and components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

99-16920A(5)(b) Sample Warranty

EVSE manufacturer's warranty.

99-16920A(6) Closeout Submittals

Operation and Maintenance Data: For EVSE to include in operation and maintenance manuals.

99-16920A(7) Quality Assurance

Installer Qualifications: An authorized representative who is trained and approved by manufacturer.

99-16920A(8) Field Conditions

Comply with following field conditions:

1. Rate equipment for continuous operation under the following conditions unless otherwise indicated:
 - 1.1. Ambient Temperature: Not exceeding -22 to 122 degrees.
 - 1.2. Altitude: Not exceeding 6600 feet.
2. Interruption of Existing Electric Service: Do not interrupt electric service to facilities occupied by the Department unless permitted under the following conditions and then only after arranging to provide temporary electric service according to requirements indicated:
 - 2.1. Notify the Engineer no fewer than ten working days in advance of proposed interruption of electric service.
 - 2.2. Do not proceed with interruption of electric service without the Engineer's written permission.

99-16920A(9) Warranty

Manufacturer's Warranty: Manufacturer agrees to replace components of EVSE that fail(s) in materials or workmanship within specified warranty period.

1. Warranty Period: Five years from date of Substantial Completion.

99-16920B MATERIALS

99-16920B(1) General

Not Used

99-16920B(2) Electrical Vehicle Supply Equipment

99-16920B(2)(a) Performance Requirements

1. Seismic Performance: EVSE must withstand the effects of earthquake motions determined according to the CBC.
 - 1.1. The term "withstand" means "the unit will remain in place without separation of any parts when subjected to the seismic forces."

- 1.2. Component Importance Factor: 1.0.
2. Electrical Components, Devices, and Accessories: Listed and labeled as defined in the CEC, by a qualified testing agency, and marked for intended location and use.
3. Comply with UL 2231-1 and UL 2594.
4. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.
5. Surge Withstand: 6 kV at 3000 A.
6. EV Charging Levels:
 - 6.1. DC Level 3 at 50 kW as shown.
 - 6.2. Level 2 at 7.2 kW as shown.

99-16920B(2)(b) Description

1. Comply with SAE J1772 and CHAdeMo.
2. Comply with CBC Accessibility Guidelines.
3. Metering: Revenue grade meter.
4. Control Power: 20 A, 110/120-V(ac), 60 Hz, single phase per charger.
5. Input Power: 60 Hz, phase, ampere ratings and kW ratings as shown.
6. Integral GFCI.
7. Auto-GFCI fault retry.
8. EV Charging Equipment Mounting: Floor mount and as shown on the drawings.
9. Enclosures:
 - 9.1. Outdoor Locations: NEMA 250, Type 3R.
 - 9.2. Stainless steel.
 - 9.3. Thermoset, polyester powder paint.
 - 9.4. Lockable.
 - 9.5. Tamper resistant.
10. EV Cable and Connectors:
 - 10.1. SAE J1772 Combo and CHAdeMO connector.
 - 10.2. Double connectors with locking holster.
 - 10.3. 20-foot reachable cable lengths with automatic cable retraction system to prevent cables from lying on the ground.
 - 10.4. Field-replaceable connector and cable assembly.
11. Status Indicators: LEDs to indicate power, charging, charging complete, system status, faults, and service.
12. Display Screen:
 - 12.1. Daylight viewable, UV-protected display with human-machine interface capability.
 - 12.2. Displays power, charging, charging complete, remote control, system status, faults, and service.

99-16920B(2)(c) Finish Requirements

1. Protect mechanical finishes on exposed surfaces from damage by utilizing cushioning materials or foam or by applying a strippable, temporary protective covering before shipping.
2. Appearance of Finished Work: Noticeable variations in same piece are unacceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved samples and are assembled or installed to minimize contrast.

99-16920C CONSTRUCTION

99-16920C(1) General

Examine areas and conditions, with installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the work.

Examine roughing-in for EVSE electrical conduit to verify actual locations of conduit connections before equipment installation.

Examine floors and pavement for suitable conditions where EVSE will be installed.

Proceed with installation only after unsatisfactory conditions have been corrected.

99-16920C(2) Electrical Vehicle Supply Equipment

99-16920C(2)(a) Installation

1. Comply with NECA 1 and NECA 413.
2. Concrete Base Mounting:
 - 2.1. Install EVSE on concrete base as shown. Use minor concrete.
 - 2.1.1. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 - 2.1.2. Install anchor bolts to elevations required for proper attachment to supported equipment.
 - 2.1.3. Secure EVSE to concrete base according to manufacturer's written instructions.
3. Comply with anchoring requirements for the seismic zone of the project site.
4. Wiring within Enclosures: Bundle, lace, and train conductors to terminal points with no excess and without exceeding manufacturer's limitations on bending radii. Install lacing bars and distribution spools.
5. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking from enclosures and components.
6. Secure covers to enclosure.

99-16920C(2)(b) Connections

1. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A-486B.
2. Verify that all electrical connections have been made according to the manufacturer's instructions. Remove all burrs, shavings, and detritus from inside the enclosure.
3. For liquid-cooled chargers, confirm that all cooling lines are properly connected.
4. After confirming all connections, install covers and tighten fasteners to according to manufacturer's instructions.

99-16920C(2)(c) Identifications

Identify system components, wiring, cabling, and terminals.

99-16920C(2)(d) Field Quality Control

1. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.
2. Perform tests and inspections with the assistance of a factory-authorized service representative.
3. Tests and Inspections:
 - 3.1. For each unit of EV charging equipment, perform the following tests and inspections:
 - 3.1.1. Unit self-test.
 - 3.1.2. Operation test with EV.
4. EVSE will be considered defective if it does not pass tests and inspections.
5. Prepare test and inspection reports.

99-16920C(2)(e) Startup Service

Engage a factory-authorized service representative to perform startup service.

Complete installation and startup check according to manufacturer's written instructions.

99-16920C(3) Service Agreements

99-16920C(3)(a) Manufacturer Maintenance Service Agreement

Beginning at Substantial Completion, service agreement must include the following services for five years with an option to extend the agreement after expiration of five years.

1. 24/7 direct toll free telephone number for the travelling public to activate stations and process payments over the phone.
2. Provide field services to perform monthly and semi-annual preventative maintenances activities.
3. Provide field services to perform on-going maintenance to achieve maximum availability of the station to the travelling public.
4. Provide a 24/7 direct toll free telephone number to the Department for requesting such field services.

5. On-going maintenance to include repairing or replacing connectors, cables, automatic retraction system, display, screens, etc.
6. Material and labor cost of the replacement parts covered under warranty are replaced without any additional cost to the Department.

99-16920C(4) Functional Testing

The functional test for the complete electrical vehicle supply equipment must take place in the presence of the engineer after all system components have been pre-tested and all punch list items have been corrected. Engage a factory-authorized service representative to perform the functional testing.

You must provide a compatible electric vehicle for a full day for each location. The electrical vehicle must be able to plug into and be charged from both a SAE J1772 charger cord and CHAdeMO charger cord. Provide an SAE J1772 to CHAdeMO adapters or CHAdeMO to SAEJ1772 adapter so the test vehicle can be charged using both charge cord connectors of the EVSE.

The functional test must consists of:

1. Operational Test to verify the rate of charge of the electrical vehicle to 80% of its capacity. The test will be repeated for each connector with the following initial battery capacities of the electrical vehicle:
 - 1.1. Under 10% of their full capacity
 - 1.2. Approximately 25% of their full capacity
 - 1.3. Approximately 50% of their full capacity
 - 1.4. The rate of charge test will be alternated for each cord connectors for total of 4 charging tests only.

99-16920C(5) Training

Provide four hours of on-site training on the use, operation, and maintenance of the system for not more than 8 designated Department employees. Notify the Engineer not less than 10 days in advance of proposed training class.

99-16920D PAYMENT

Not Used