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STATE OF CALIFORNIA

DEPARTMENT OF TRANSPORTATION

NOTICE TO CONTRACTORS

AND

SPECIAL PROVISIONS

FOR CONSTRUCTION ON STATE HIGHWAY IN

SAN DIEGO COUNTY AT TECATE

FROM THE MEXICO BORDER TO 0.2 KM NORTH OF THING ROAD

DISTRICT 11, ROUTE 188

For Use in Connection with Standard Specifications Dated JULY 1999, Standard Plans Dated JULY 2004 and Labor Surcharge and Equipment Rental Rates.

CONTRACT NO. 11-256504

11-SD-188-0.0/0.4

Federal Aid Project

HPD-P188(001)

Bids Open: September 28, 2006
Dated: August 14, 2006

OSD

****

IMPORTANT SPECIAL NOTICES

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This project includes, but is not limited to, the following special requirements:

Security clearance shall be obtained by prospective bidders to examine the site of the work. Attention is directed to Section 2-1.03, "Examination of Plans, Specifications, Contract, and Site of Work," of the Standard Specifications.

Attention is directed to "Security Clearance," of Section 5 of the special provisions regarding the requirement for obtaining security clearance. Bidders are cautioned to make independent investigations and obtain the commitments or allocations deemed necessary to verify the length of time and requirements necessary for obtaining security clearance.

- Attention is directed to the revised internet reference for Federal minimum wage rates in the Notice to Contractors.

- Attention is directed to the following sections of the special provisions regarding the Department's DBE program:

  Section 2-1.02 Disadvantaged Business Enterprise (DBE)
  Section 2-1.03 DBE Availability Advisory
  Section 3. Award And Execution Of Contract
  Section 5-1.08 Subcontractor And DBE Records
  Section 5-1.083 DBE Certification Status
  Section 5-1.086 Performance Of Subcontractors
  Section 5-1.09 Subcontracting

- Attention is directed to Section 3, "Award and Execution of Contract," of these special provisions regarding submittal of the documents identified in Section 3-1.025, "Insurance Policies," of the Standard Specifications.

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The Standard Plan sheets applicable to this contract include, but are not limited to those indicated below. The Revised Standard Plans (RSP) and New Standard Plans (NSP) which apply to this contract are included as individual sheets of the project plans.

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H3	Planting and Irrigation Details
H5	Planting and Irrigation Details
H6	Planting and Irrigation Details
H7	Planting and Irrigation Details
H9	Planting and Irrigation Details
T1A	Temporary Crash Cushion, Sand Filled (Unidirectional)
T1B	Temporary Crash Cushion, Sand Filled (Bidirectional)
T2	Temporary Crash Cushion, Sand Filled (Shoulder Installations)
T3	Temporary Railing (Type K)
RSP T7	Construction Project Funding Identification Signs
RSP T13	Traffic Control System for Lane Closure On Two lane Conventional Highways
RSP T17	Traffic Control System for Moving Lane Closure On Two Lane Highways
T56	Temporary Water Pollution Control Details (Temporary Fiber Roll)
T58	Temporary Water Pollution Control Details (Temporary Construction Entrance)
T59	Temporary Water Pollution Control Details (Temporary Concrete Washout Facility)
B11-47	Cable Railing
RS1	Roadside Signs, Typical Installation Details No. 1
RS2	Roadside Signs - Wood Post, Typical Installation Details No. 2
RS3	Roadside Signs - Laminated Wood Box Post Typical Installation Details No. 3
RS4	Roadside Signs, Typical Installation Details No. 4
S93	Framing Details for Framed Single Sheet Aluminum Signs, Rectangular Shape
S94	Roadside Single Sheet Aluminum Sign, Rectangular Shape
S95	Roadside Single Sheet Aluminum Sign, Diamond Shape
ES-1A	Electrical Systems (Symbols And Abbreviations)
ES-1B	Electrical Systems (Symbols And Abbreviations)

ES-1C	Electrical Systems (Symbols And Abbreviations)
RSP ES-7M	Electrical Systems (Signal and Lighting Standards – Details No. 1)
ES-7N	Electrical Systems (Signal and Lighting Standards – Details No. 2)
ES-8	Electrical Systems (Pull Box Details)
ES-11	Electrical Systems (Foundation Installations)
ES-13A	Electrical Systems (Splicing Details)
ES-13B	Electrical Systems (Wiring Details and Fuse Ratings)

DEPARTMENT OF TRANSPORTATION

NOTICE TO CONTRACTORS

CONTRACT NO. 11-256504

11-SD-188-0.0/0.4

Sealed proposals for the work shown on the plans entitled:

STATE OF CALIFORNIA; DEPARTMENT OF TRANSPORTATION; PROJECT PLANS FOR CONSTRUCTION ON STATE HIGHWAY IN SAN DIEGO COUNTY AT TECATE FROM THE MEXICO BORDER TO 0.2 KM NORTH OF THING ROAD

will be received at the Department of Transportation, 3347 Michelson Drive, Suite 100, Irvine, CA 92612-1692, until 2 o'clock p.m. on September 28, 2006, at which time they will be publicly opened and read in Room C - 1116 at the same address.

Proposal forms for this work are included in a separate book entitled:

STATE OF CALIFORNIA; DEPARTMENT OF TRANSPORTATION; PROPOSAL AND CONTRACT FOR CONSTRUCTION ON STATE HIGHWAY IN SAN DIEGO COUNTY AT TECATE FROM THE MEXICO BORDER TO 0.2 KM NORTH OF THING ROAD

General work description: Construct Commercial Vehicle Enforcement Facility (CVEF).

Bidders are advised that, as required by federal law, the State has established a statewide overall DBE goal. The Department is required to report to FHWA on DBE participation for all Federal-aid contracts each year so that attainment efforts may be evaluated. To provide assistance in meeting the statewide goal, the Department may include a DBE Availability Advisory in this contract. Bidders need not achieve the percentage stated in any DBE Availability Advisory as a condition of award.

No prebid meeting is scheduled for this project.

THIS PROJECT IS SUBJECT TO THE "BUY AMERICA" PROVISIONS OF THE SURFACE TRANSPORTATION ASSISTANCE ACT OF 1982 AS AMENDED BY THE INTERMODAL SURFACE TRANSPORTATION EFFICIENCY ACT OF 1991.

Bids are required for the entire work described herein.

At the time this contract is awarded, the Contractor shall possess either a Class A license or a combination of Class C licenses which constitutes a majority of the work.

This contract is subject to state contract nondiscrimination and compliance requirements pursuant to Government Code, Section 12990.

Inquiries or questions based on alleged patent ambiguity of the plans, specifications or estimate must be communicated as a bidder inquiry prior to bid opening. Any such inquiries or questions, submitted after bid opening, will not be treated as a bid protest.

Bidder inquiries may be made as follows:

The Department will consider bidder inquiries only when a completed "Bidder Inquiry" form is submitted. A copy of the "Bidder Inquiry" form is available at the Internet address shown below. The bidder inquiry shall include the bidder's name and telephone number. Submit "Bidder Inquiry" forms to :

District 11 Construction Duty Senior

Location address: 2829 Juan Street, San Diego, CA 92110
Mailing address: P.O. Box 85406, San Diego, CA 92186–5406

Fax Number: (619) 688–6988
E-mail: Duty_Senior_Const_District11@dot.ca.gov
Tel. Number: (619) 688–6635

To expedite processing, submittal of "Bidder Inquiry" forms via Fax or E-mail is preferred.

To the extent feasible and at the discretion of the Department, completed "Bidder Inquiry" forms submitted for consideration will be investigated, and responses will be posted on the Internet at:

http://www.dot.ca.gov/dist11/construc/

The responses to bidders' inquiries, unless incorporated into formal addenda to the contract, are not a part of the contract, and are provided for the bidder's convenience only. In some instances, the question and answer may represent a summary of the matters discussed rather than a word-for-word recitation. The availability or use of information provided in the responses to bidders' inquiries is not to be construed in any way as a waiver of the provisions of Section 2-1.03 of the Standard Specifications or any other provision of the contract, the plans, Standard Specifications or Special Provisions, nor to excuse the Contractor from full compliance with those contract requirements. Bidders are cautioned that subsequent responses or contract addenda may affect or vary a response previously given.

Project plans, special provisions, and proposal forms for bidding this project can only be obtained at the Department of Transportation, Plans and Bid Documents, Room 0200, MS #26, Transportation Building, 1120 N Street, Sacramento, California 95814, FAX No. (916) 654-7028, Telephone No. (916) 654-4490. Use FAX orders to expedite orders for project plans, special provisions and proposal forms. FAX orders must include credit card charge number, card expiration date and authorizing signature. Project plans, special provisions, and proposal forms may be seen at the above Department of Transportation office and at the offices of the District Directors of Transportation at Irvine, Oakland, and the district in which the work is situated. Standard Specifications and Standard Plans are available through the State of California, Department of Transportation, Publications Unit, 1900 Royal Oaks Drive, Sacramento, CA 95815, Telephone No. (916) 445-3520.

The successful bidder shall furnish a payment bond and a performance bond.

The Department of Transportation affirms that in any contract entered into pursuant to this advertisement, disadvantaged business enterprises will be afforded full opportunity to submit bids in response to this invitation.

The U.S. Department of Transportation (USDOT) provides a toll-free "hotline" service to report bid rigging activities. Bid rigging activities can be reported Mondays through Fridays, between 8:00 a.m. and 5:00 p.m., eastern time, Telephone No. 1-800-424-9071. Anyone with knowledge of possible bid rigging, bidder collusion, or other fraudulent activities should use the "hotline" to report these activities. The "hotline" is part of USDOT's continuing effort to identify and investigate highway construction contract fraud and abuse and is operated under the direction of the USDOT Inspector General. All information will be treated confidentially and caller anonymity will be respected.

Pursuant to Section 1773 of the Labor Code, the general prevailing wage rates in the county, or counties, in which the work is to be done have been determined by the Director of the California Department of Industrial Relations. These wages are set forth in the General Prevailing Wage Rates for this project, available at the Labor Compliance Office at the offices of the District Director of Transportation for the district in which the work is situated, and available from the California Department of Industrial Relations' internet web site at: http://www.dir.ca.gov. The Federal minimum wage rates for this project as predetermined by the United States Secretary of Labor are available on the internet at http://www.dot.ca.gov/hq/esc/oe/federal-wages/. Addenda to modify the Federal minimum wage rates, if necessary, will be issued to holders of "Proposal and Contract" books. Future effective general prevailing wage rates which have been predetermined and are on file with the California Department of Industrial Relations are referenced but not printed in the general prevailing wage rates.

If there is a difference between the minimum wage rates predetermined by the United States Secretary of Labor and the general prevailing wage rates determined by the Director of the California Department of Industrial Relations for similar classifications of labor, the Contractor and subcontractors shall pay not less than the higher wage rate. The Department will not accept lower State wage rates not specifically included in the Federal minimum wage determinations. This includes "helper" (or other classifications based on hours of experience) or any other classification not appearing in the Federal wage determinations. Where Federal wage determinations do not contain the State wage rate determination otherwise available for use by the Contractor and subcontractors, the Contractor and subcontractors shall pay not less than the Federal minimum wage rate which most closely approximates the duties of the employees in question.

DEPARTMENT OF TRANSPORTATION

Deputy Director Transportation Engineering

Dated August 14, 2006

SK

COPY OF ENGINEER'S ESTIMATE

(NOT TO BE USED FOR BIDDING PURPOSES)

11-256504

Item No.	Item Code	Item Description	Unit of Measure	Estimated Quantity
1	070012	PROGRESS SCHEDULE (CRITICAL PATH METHOD)	LS	LUMP SUM
2	070018	TIME-RELATED OVERHEAD	WDAY	500
3 (S)	071325	TEMPORARY FENCE (TYPE ESA)	M	200
4	039861	TEMPORARY INLET	EA	1
5	039862	HAZARDOUS MATERIALS MITIGATION PLANS AND REPORTS	LS	LUMP SUM
6	074019	PREPARE STORM WATER POLLUTION PREVENTION PLAN	LS	LUMP SUM
7	074020	WATER POLLUTION CONTROL	LS	LUMP SUM
8	074023	TEMPORARY EROSION CONTROL	M2	9090
9	074028	TEMPORARY FIBER ROLL	M	3620
10	074032	TEMPORARY CONCRETE WASHOUT FACILITY	EA	7
11	074033	TEMPORARY CONSTRUCTION ENTRANCE	EA	2
12	074037	MOVE-IN/MOVE-OUT (TEMPORARY EROSION CONTROL)	EA	3
13	074038	TEMPORARY DRAINAGE INLET PROTECTION	EA	24
14	074041	STREET SWEEPING	LS	LUMP SUM
15	074042	TEMPORARY CONCRETE WASHOUT (PORTABLE)	LS	LUMP SUM
16 (S)	120090	CONSTRUCTION AREA SIGNS	LS	LUMP SUM
17 (S)	120100	TRAFFIC CONTROL SYSTEM	LS	LUMP SUM
18 (S)	120151	TEMPORARY TRAFFIC STRIPE (TAPE)	M	2270
19 (S)	120152	TEMPORARY PAVEMENT MARKING (TAPE)	M2	67
20 (S)	039863	TRAFFIC PLASTIC DRUM	EA	28

Item No.	Item Code	Item Description	Unit of Measure	Estimated Quantity
21 (S)	128650	PORTABLE CHANGEABLE MESSAGE SIGN	EA	3
22	129000	TEMPORARY RAILING (TYPE K)	M	930
23 (S)	129100	TEMPORARY CRASH CUSHION MODULE	EA	110
24 (S)	150701	REMOVE YELLOW PAINTED TRAFFIC STRIPE	M2	61
25 (S)	150717	REMOVE TRAFFIC STRIPE AND PAVEMENT MARKING	M2	12
26	150742	REMOVE ROADSIDE SIGN	EA	17
27	150805	REMOVE CULVERT	M	35
28	150821	REMOVE HEADWALL	EA	3
29	039864	REMOVE UNDERGROUND STORAGE TANK	EA	1
30	152320	RESET ROADSIDE SIGN	EA	9
31	152390	RELOCATE ROADSIDE SIGN	EA	2
32	153210	REMOVE CONCRETE	M3	33
33	160101	CLEARING AND GRUBBING	LS	LUMP SUM
34	170101	DEVELOP WATER SUPPLY	LS	LUMP SUM
35	190101	ROADWAY EXCAVATION	M3	79 800
36	190110	LEAD COMPLIANCE PLAN	LS	LUMP SUM
37	194001	DITCH EXCAVATION	M3	110
38 (S)	200001	HIGHWAY PLANTING	LS	LUMP SUM
39	039865	DECORATIVE BOULDER	EA	4
40	039866	DECORATIVE BOULDER WITH ENGRAVED SIGN	LS	LUMP SUM

Item No.	Item Code	Item Description	Unit of Measure	Estimated Quantity
41	200114	ROCK BLANKET	M2	1840
42 (S)	203014	FIBER (EROSION CONTROL)	KG	7560
43	203021	FIBER ROLLS	M	3620
44 (S)	203024	COMPOST (EROSION CONTROL)	M3	14
45 (S)	203026	MOVE-IN/MOVE-OUT (EROSION CONTROL)	EA	3
46 (S)	203045	PURE LIVE SEED (EROSION CONTROL)	KG	69
47 (S)	203056	COMMERCIAL FERTILIZER (EROSION CONTROL)	KG	83
48 (S)	203061	STABILIZING EMULSION (EROSION CONTROL)	KG	580
49 (S)	204099	PLANT ESTABLISHMENT WORK	LS	LUMP SUM
50 (S)	208000	IRRIGATION SYSTEM	LS	LUMP SUM
51	039867	150 MM IRRIGATION SLEEVE	M	38
52	208732	250 MM CORRUGATED HIGH DENSITY POLYETHYLENE PIPE CONDUIT	M	51
53	039868	150 MM CORRUGATED HIGH DENSITY POLYETHYLENE PIPE CONDUIT	M	140
54	250401	CLASS 4 AGGREGATE SUBBASE	M3	40
55	260201	CLASS 2 AGGREGATE BASE	M3	4300
56	390102	ASPHALT CONCRETE (TYPE A)	TONN	580
57	390108	ASPHALT CONCRETE BASE (TYPE A)	TONN	8310
58	394002	PLACE ASPHALT CONCRETE (MISCELLANEOUS AREA)	M2	230
59	401000	CONCRETE PAVEMENT	M3	5960
60	404092	SEAL PAVEMENT JOINT	M	11 700

Item No.	Item Code	Item Description	Unit of Measure	Estimated Quantity
61 (F)	510502	MINOR CONCRETE (MINOR STRUCTURE)	M3	73
62	560238	FURNISH SINGLE SHEET ALUMINUM SIGN (1.6 MM-UNFRAMED)	M2	29
63	560239	FURNISH SINGLE SHEET ALUMINUM SIGN (2.0 MM-UNFRAMED)	M2	4.2
64	560241	FURNISH SINGLE SHEET ALUMINUM SIGN (1.6 MM-FRAMED)	M2	17
65	560242	FURNISH SINGLE SHEET ALUMINUM SIGN (2.0 MM-FRAMED)	M2	9
66	566011	ROADSIDE SIGN - ONE POST	EA	38
67	566012	ROADSIDE SIGN - TWO POST	EA	12
68	568017	INSTALL ROADSIDE SIGN PANEL ON EXISTING POST	EA	11
69	650069	450 MM REINFORCED CONCRETE PIPE	M	30
70	650075	600 MM REINFORCED CONCRETE PIPE	M	1170
71	650079	900 MM REINFORCED CONCRETE PIPE	M	18
72	664009	300 MM CORRUGATED STEEL PIPE (1.63 MM THICK)	M	44
73	039869	100 MM PVC (C900) WATER PIPE	M	300
74	039870	50 MM PVC WATER PIPE	M	50
75	703233	GRATED LINE DRAIN	M	7
76	705224	600 MM CONCRETE FLARED END SECTION	EA	3
77	208491	50 MM GATE VALVE	EA	2
78	208494	100 MM GATE VALVE	EA	4
79	707471	900 MM PRECAST CONCRETE PIPE RISER	M	2
80	719589	MINOR CONCRETE (BACKFILL)	M3	18

Item No.	Item Code	Item Description	Unit of Measure	Estimated Quantity
81	721008	ROCK SLOPE PROTECTION (LIGHT, METHOD B)	M3	180
82	721420	CONCRETE (DITCH LINING)	M3	22
83	729010	ROCK SLOPE PROTECTION FABRIC	M2	260
84	731502	MINOR CONCRETE (MISCELLANEOUS CONSTRUCTION)	M3	280
85	731504	MINOR CONCRETE (CURB AND GUTTER)	M3	290
86 (S-F)	750001	MISCELLANEOUS IRON AND STEEL	KG	3290
87	760011	WELL DEVELOPMENT	LS	LUMP SUM
88	760012	TESTING WELL	HR	8
89	760021	DRILL PILOT HOLE	M	100
90	760022	REAMING WATER WELL	M	100
91	760025	CONDUCTOR CASING	M	15.3
92	760030	BLANK WELL CASING	M	96
93	760035	WELL SCREEN	M	4
94 (S)	800391	CHAIN LINK FENCE (TYPE CL-1.8)	M	1050
95 (S)	802672	4.9 M CHAIN LINK GATE (TYPE CL-1.8)	EA	1
96 (S)	039871	4.5 M CHAIN LINK GATE (TYPE CL-1.8)	EA	2
97 (S)	802674	5.5 M CHAIN LINK GATE (TYPE CL-1.8)	EA	2
98	820107	DELINEATOR (CLASS 1)	EA	15
99	839521	CABLE RAILING	M	120
100	839701	CONCRETE BARRIER (TYPE 60)	M	20

Item No.	Item Code	Item Description	Unit of Measure	Estimated Quantity
101 (S)	840515	THERMOPLASTIC PAVEMENT MARKING	M2	220
102 (S)	840561	100 MM THERMOPLASTIC TRAFFIC STRIPE	M	680
103 (S)	840563	200 MM THERMOPLASTIC TRAFFIC STRIPE	M	640
104 (S)	039872	300 MM THERMOPLASTIC TRAFFIC STRIPE	M	160
105 (S)	039873	600 MM THERMOPLASTIC TRAFFIC STRIPE	M	49
106 (S)	840656	PAINT TRAFFIC STRIPE (2-COAT)	M	4700
107 (S)	850111	PAVEMENT MARKER (RETROREFLECTIVE)	EA	330
108 (S)	861503	MODIFY LIGHTING	LS	LUMP SUM
109	039874	STATE SEAL	LS	LUMP SUM
110	993002	FIRE HYDRANT	EA	2
111 (S)	994650	BUILDING WORK	EA	1
112	999990	MOBILIZATION	LS	LUMP SUM

STATE OF CALIFORNIA

DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISIONS

Annexed to Contract No. 11-256504

SECTION 1. SPECIFICATIONS AND PLANS

The work embraced herein shall conform to the provisions in the Standard Specifications dated July 1999, and the Standard Plans dated July 2004, of the Department of Transportation insofar as the same may apply, and these special provisions.

In case of conflict between the Standard Specifications and these special provisions, the special provisions shall take precedence over and shall be used in lieu of the conflicting portions.

AMENDMENTS TO JULY 1999 STANDARD SPECIFICATIONS

UPDATED JULY 21, 2006

Amendments to the Standard Specifications set forth in these special provisions shall be considered as part of the Standard Specifications for the purposes set forth in Section 5-1.04, "Coordination and Interpretation of Plans, Standard Specifications and Special Provisions," of the Standard Specifications. Whenever either the term "Standard Specifications is amended" or the term "Standard Specifications are amended" is used in the special provisions, the text or table following the term shall be considered an amendment to the Standard Specifications. In case of conflict between such amendments and the Standard Specifications, the amendments shall take precedence over and be used in lieu of the conflicting portions.

SECTION 1: DEFINITIONS AND TERMS

Issue Date: June 30, 2006

Section 1-1.25, "Laboratory," of the Standard Specifications is amended to read:

1-1.25 LABORATORY

• The Division of Engineering Services - Materials Engineering and Testing Services and Division of Engineering Services - Geotechnical Services of the Department of Transportation, or established laboratories of the various Districts of the Department, or other laboratories authorized by the Department to test materials and work involved in the contract. When a reference is made in the specifications to the "Transportation Laboratory," the reference shall mean Division of Engineering Services - Materials Engineering and Testing Services and Division of Engineering Services - Geotechnical Services, located at 5900 Folsom Boulevard, Sacramento, CA 95819, Telephone (916) 227-7000.

Section 1-1.275, "Office of Structure Design," of the Standard Specifications is amended to read:

1-1.275 OFFICES OF STRUCTURE DESIGN

• The Offices of Structure Design of the Department of Transportation. When the specifications require working drawings to be submitted to the Offices of Structure Design, the drawings shall be submitted to: Offices of Structure Design, Documents Unit, Mail Station 9-4/4I, 1801 30th Street, Sacramento, CA 95816, Telephone (916) 227-8252.

Section 1-1.265, "Manual of Traffic Controls," of the Standard Specifications is amended to read:

1-1.265 MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES

• The Manual on Uniform Traffic Control Devices for Streets and Highways, 2003 Edition (MUTCD) is administered by the Federal Highway Administration.

Section 1, "Definitions and Terms," of the Standard Specifications is amended by adding the following section:

1-1.266 MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES CALIFORNIA SUPPLEMENT

• The MUTCD 2003 California Supplement (MUTCD California Supplement) is issued by the Department of Transportation to provide amendments to the MUTCD. The MUTCD and MUTCD California Supplement supersede the Department's Manual of Traffic Controls.

Section 1-1.39, "State," of the Standard Specifications is amended to read:

1-1.39 STATE

• The State of California, including its agencies, departments, or divisions, whose conduct or action is related to the work.

SECTION 2: PROPOSAL REQUIREMENTS AND CONDITIONS

Issue Date: June 19, 2003

Section 2-1.03, "Examination of Plans, Specifications, Contract, and Site of Work," of the Standard Specifications is amended to read:

2-1.03 Examination of Plans, Specifications, Contract, and Site of Work

• The bidder shall examine carefully the site of the work contemplated, the plans and specifications, and the proposal and contract forms therefor. The submission of a bid shall be conclusive evidence that the bidder has investigated and is satisfied as to the general and local conditions to be encountered, as to the character, quality and scope of work to be performed, the quantities of materials to be furnished and as to the requirements of the proposal, plans, specifications and the contract.

• The submission of a bid shall also be conclusive evidence that the bidder is satisfied as to the character, quality and quantity of surface and subsurface materials or obstacles to be encountered insofar as this information was reasonably ascertainable from an inspection of the site and the records of exploratory work done by the Department as shown in the bid documents, as well as from the plans and specifications made a part of the contract.

• Where the Department has made investigations of site conditions including subsurface conditions in areas where work is to be performed under the contract, or in other areas, some of which may constitute possible local material sources, bidders or contractors may, upon written request, inspect the records of the Department as to those investigations subject to and upon the conditions hereinafter set forth.

• Where there has been prior construction by the Department or other public agencies within the project limits, records of the prior construction that are currently in the possession of the Department and which have been used by, or are known to, the designers and administrators of the project will be made available for inspection by bidders or contractors, upon written request, subject to the conditions hereinafter set forth. The records may include, but are not limited to, as-built drawings, design calculations, foundation and site studies, project reports and other data assembled in connection with the investigation, design, construction and maintenance of the prior projects.

• Inspection of the records of investigations and project records may be made at the office of the district in which the work is situated, or in the case of records of investigations related to structure work, at the Transportation Laboratory in Sacramento, California.

• When a log of test borings or other record of geotechnical data obtained by the Department's investigation of surface and subsurface conditions is included with the contract plans, it is furnished for the bidders' or Contractor's information and its use shall be subject to the conditions and limitations set forth in this Section 2-1.03.

• In some instances, information considered by the Department to be of possible interest to bidders or contractors has been compiled as "Materials Information." The use of the "Materials Information" shall be subject to the conditions and limitations set forth in this Section 2-1.03 and Section 6-2, "Local Materials."

• When cross sections are not included with the plans, but are available, bidders or contractors may inspect the cross sections and obtain copies for their use, at their expense.

• When cross sections are included with the contract plans, it is expressly understood and agreed that the cross sections do not constitute part of the contract, do not necessarily represent actual site conditions or show location, character,

dimensions and details of work to be performed, and are included in the plans only for the convenience of bidders and their use is subject to the conditions and limitations set forth in this Section 2-1.03.

- When contour maps were used in the design of the project, the bidders may inspect those maps, and if available, they may obtain copies for their use.
- The availability or use of information described in this Section 2-1.03 is not to be construed in any way as a waiver of the provisions of the first paragraph in this Section 2-1.03 and bidders and contractors are cautioned to make independent investigations and examinations as they deem necessary to be satisfied as to conditions to be encountered in the performance of the work and, with respect to possible local material sources, the quality and quantity of material available from the property and the type and extent of processing that may be required in order to produce material conforming to the requirements of the specifications.
- The Department assumes no responsibility for conclusions or interpretations made by a bidder or contractor based on the information or data made available by the Department. The Department does not assume responsibility for representation made by its officers or agents before the execution of the contract concerning surface or subsurface conditions, unless that representation is expressly stated in the contract.
- No conclusions or interpretations made by a bidder or contractor from the information and data made available by the Department will relieve a bidder or contractor from properly fulfilling the terms of the contract.

SECTION 3: AWARD AND EXECUTION OF CONTRACT

Issue Date: July 21, 2006

Section 3, "Award and Execution of Contract," of the Standard Specifications is amended by adding the following section after Section 3-1.02, "Contract Bonds":

3-1.025 INSURANCE POLICIES

- The successful bidder shall submit:

A. Copy of its commercial general liability policy and its excess policy, including the declarations page, all amendments, riders, endorsements, and other modifications in effect at the time of contract execution. Standard ISO form No. CG 0001 or similar exclusions are allowed if not inconsistent with Section 7-1.12, "Indemnification and Insurance." Allowance of any additional exclusions is at the discretion of the Department.
B. Certificate of Insurance showing all other required coverages. Certificates of Insurance, as evidence of required insurance for the auto liability and any other required policy shall set forth deductible amounts applicable to each policy and all exclusions that are added by endorsement to each policy. The evidence of insurance shall provide that no cancellation, lapse, or reduction of coverage will occur without 10 days prior written notice to the Department.

- If the successful bidder uses any form of self-insurance, it shall submit:

A. A notice of election to self-insure.
B. The coverages for which self-insurance applies.
C. The amount of self-insurance.
D. Declaration under the penalty of perjury by a certified public accountant certifying the accountant has applied Generally Accepted Accounting Principles (GAAP) guidelines and the successful bidder has sufficient funds or other resources to cover the self-insurance amounts.
E. Copy of its commercial general liability policy and its excess policy, including the declarations page, all amendments, riders, endorsements and other modifications in effect at the time of contract execution, for those amounts not covered by self-insurance.

Section 3-1.03, "Execution of Contract," of the Standard Specifications is amended to read:

3-1.03 EXECUTION OF CONTRACT

- The contract shall be signed by the successful bidder and returned, together with the contract bonds and the documents identified in Section 3-1.025, "Insurance Policies," within 10 days, not including Saturdays, Sundays and legal holidays, of receiving the contract for execution.

Section 3-1.04, "Failure to Execute Contract," of the Standard Specifications is amended to read:

3-1.04 FAILURE TO EXECUTE CONTRACT

• Failure of the lowest responsible bidder, the second lowest responsible bidder, or the third lowest responsible bidder to execute the contract as required in Section 3-1.03, " Execution of Contract," within 10 days, not including Saturdays, Sundays, and legal holidays, of receiving the contract for execution shall be just cause for the forfeiture of the proposal guaranty. The successful bidder may file with the Department a written notice, signed by the bidder or the bidder's authorized representative, specifying that the bidder will refuse to execute the contract if it is presented. The filing of this notice shall have the same force and effect as the failure of the bidder to execute the contract and furnish acceptable bonds within the time specified.

SECTION 5: CONTROL OF WORK

Issue Date: December 31, 2001

Section 5-1.02A, "Trench Excavation Safety Plans," of the Standard Specifications is amended to read:

5-1.02A Excavation Safety Plans

• The Construction Safety Orders of the Division of Occupational Safety and Health shall apply to all excavations. For all excavations 1.5 m or more in depth, the Contractor shall submit to the Engineer a detailed plan showing the design and details of the protective systems to be provided for worker protection from the hazard of caving ground during excavation. The detailed plan shall include any tabulated data and any design calculations used in the preparation of the plan. Excavation shall not begin until the detailed plan has been reviewed and approved by the Engineer.

• Detailed plans of protective systems for which the Construction Safety Orders require design by a registered professional engineer shall be prepared and signed by an engineer who is registered as a Civil Engineer in the State of California, and shall include the soil classification, soil properties, soil design calculations that demonstrate adequate stability of the protective system, and any other design calculations used in the preparation of the plan.

• No plan shall allow the use of a protective system less effective than that required by the Construction Safety Orders.

• If the detailed plan includes designs of protective systems developed only from the allowable configurations and slopes, or Appendices, contained in the Construction Safety Orders, the plan shall be submitted at least 5 days before the Contractor intends to begin excavation. If the detailed plan includes designs of protective systems developed from tabulated data, or designs for which design by a registered professional engineer is required, the plan shall be submitted at least 3 weeks before the Contractor intends to begin excavation.

• Attention is directed to Section 7-1.01E, "Trench Safety."

SECTION 7: LEGAL RELATIONS AND RESPONSIBILITY

Issue Date: July 21, 2006

The eighth paragraph of Section 7-1.09, "Public Safety" of the Standard Specifications is amended to read:

• Signs, lights, flags, and other warning and safety devices and their use shall conform to the requirements set forth in Part 6 of the MUTCD and of the MUTCD California Supplement. Signs or other protective devices furnished and erected by the Contractor, at the Contractor's expense, as above provided, shall not obscure the visibility of, nor conflict in intent, meaning and function of either existing signs, lights and traffic control devices or any construction area signs and traffic control devices for which furnishing of, or payment for, is provided elsewhere in the specifications. Signs furnished and erected by the Contractor, at the Contractor's expense, shall be approved by the Engineer as to size, wording and location.

The fourteenth paragraph of Section 7-1.09, "Public Safety," of the Standard Specifications is amended to read:

• The Contractor shall notify the Engineer not less than 18 days and no more than 90 days prior to the anticipated start of an operation that will change the vertical or horizontal clearance available to public traffic (including shoulders).

The sixteenth paragraph of Section 7-1.09, "Public Safety," of the Standard Specifications is amended to read:

• When vertical clearance is temporarily reduced to 4.72 m or less, low clearance warning signs shall be placed in accordance with Part 2 of the MUTCD and the MUTCD California Supplement, and as directed by the Engineer. Signs shall conform to the dimensions, color, and legend requirements of the MUTCD, the MUTCD California Supplement, and these

specifications except that the signs shall have black letters and numbers on an orange retroreflective background. W12-2P signs shall be illuminated so that the signs are clearly visible.

Section 7-1.01A(6), "Workers' Compensation," of the Standard Specifications is amended to read:

7-1.101A(6) (Blank)

Section 7-1.12, "Indemnification and Insurance," of the Standard Specifications is amended to read:

7-1.12 INDEMNIFICATION AND INSURANCE

• The Contractor's obligations regarding indemnification of the State of California and the requirements for insurance shall conform to the provisions in Section 3-1.025, "Insurance Policies," and Sections 7-1.12A, "Indemnification," and 7-1.12B, "Insurance," of this Section 7-1.12.

7-1.12A Indemnification

• The Contractor shall defend, indemnify, and save harmless the State, including its officers, employees, and agents (excluding agents who are design professionals) from any and all claims, demands, causes of action, damages, costs, expenses, actual attorneys' fees, losses or liabilities, in law or in equity (Section 7-1.12A Claims) arising out of or in connection with the Contractor's performance of this contract for:

A. Bodily injury including, but not limited to, bodily injury, sickness or disease, emotional injury or death to persons, including, but not limited to, the public, any employees or agents of the Contractor, the State, or any other contractor; and
B. Damage to property of anyone including loss of use thereof; caused or alleged to be caused in whole or in part by any negligent or otherwise legally actionable act or omission of the Contractor or anyone directly or indirectly employed by the Contractor or anyone for whose acts the Contractor may be liable.

• Except as otherwise provided by law, these requirements apply regardless of the existence or degree of fault of the State. The Contractor is not obligated to indemnify the State for Claims arising from conduct delineated in Civil Code Section 2782 and to Claims arising from any defective or substandard condition of the highway that existed at or before the start of work, unless this condition has been changed by the work or the scope of the work requires the Contractor to maintain existing highway facilities and the Claim arises from the Contractor's failure to maintain. The Contractor's defense and indemnity obligation shall extend to Claims arising after the work is completed and accepted if the Claims are directly related to alleged acts or omissions by the Contractor that occurred during the course of the work. No inspection by the State is a waiver of full compliance with these requirements.

• The Contractor's obligation to defend and indemnify shall not be excused because of the Contractor's inability to evaluate liability or because the Contractor evaluates liability and determine that the Contractor is not liable. The Contractor shall respond within 30 days to the tender of any Claim for defense and indemnity by the State, unless this time has been extended by the State. If the Contractor fails to accept or reject a tender of defense and indemnity within 30 days, in addition to any other remedy authorized by law, the Department may withhold such funds the State reasonably considers necessary for its defense and indemnity until disposition has been made of the Claim or until the Contractor accepts or rejects the tender of defense, whichever occurs first.

• With respect to third-party claims against the Contractor, the Contractor waives all rights of any type to express or implied indemnity against the State, its officers, employees, or agents (excluding agents who are design professionals).

• Nothing in the Contract is intended to establish a standard of care owed to any member of the public or to extend to the public the status of a third-party beneficiary for any of these indemnification specifications.

7-1.12B Insurance

7-1.12B(1) General

• Nothing in the contract is intended to establish a standard of care owed to any member of the public or to extend to the public the status of a third-party beneficiary for any of these insurance specifications.

7-1.12B(2) Casualty Insurance

• The Contractor shall procure and maintain insurance on all of its operations with companies acceptable to the State as follows:

A. The Contractor shall keep all insurance in full force and effect from the beginning of the work through contract acceptance.
B. All insurance shall be with an insurance company with a rating from A.M. Best Financial Strength Rating of A- or better and a Financial Size Category of VII or better.
C. The Contractor shall maintain completed operations coverage with a carrier acceptable to the State through the expiration of the patent deficiency in construction statute of repose set forth in Code of Civil Procedure Section 337.1.

7-1.12B(3) Workers' Compensation and Employer's Liability Insurance

• In accordance with Labor Code Section 1860, the Contractor shall secure the payment of worker's compensation in accordance with Labor Code Section 3700.

• In accordance with Labor Code Section 1861, the Contractor shall submit to the Department the following certification before performing the work:

> I am aware of the provisions of Section 3700 of the Labor Code which require every employer to be insured against liability for workers' compensation or to undertake self-insurance in accordance with the provisions of that code, and I will comply with such provisions before commencing the performance of the work of this contract.

• Contract execution constitutes certification submittal.
• The Contractor shall provide Employer's Liability Insurance in amounts not less than:

A. $1 000 000 for each accident for bodily injury by accident.
B. $1 000 000 policy limit for bodily injury by disease.
C. $1 000 000 for each employee for bodily injury by disease.

• If there is an exposure of injury to the Contractor's employees under the U.S. Longshoremen's and Harbor Workers' Compensation Act, the Jones Act, or under laws, regulations, or statutes applicable to maritime employees, coverage shall be included for such injuries or claims.

7-1.12B(4) Liability Insurance

7-1.12B(4)(a) General

• The Contractor shall carry General Liability and Umbrella or Excess Liability Insurance covering all operations by or on behalf of the Contractor providing insurance for bodily injury liability and property damage liability for the following limits and including coverage for:

A. Premises, operations, and mobile equipment.
B. Products and completed operations.
C. Broad form property damage (including completed operations).
D. Explosion, collapse, and underground hazards.
E. Personal injury.
F. Contractual liability.

• The Contractor shall ensure that all of its subcontractors carry sufficient insurance coverage that the Contractor deems adequate based on the size, duration, and hazards of the subcontracted work.

7-1.12B(4)(b) Liability Limits/Additional Insureds

• The limits of liability shall be at least the amounts shown in the following table:

Total Bid	For Each Occurrence[1]	Aggregate for Products/Completed Operation	General Aggregate[2]	Umbrella or Excess Liability[3]
≤$25 000 000	$1 000 000	$2 000 000	$2 000 000	$5 000 000
>$25 000 000	$1 000 000	$2 000 000	$2 000 000	$15 000 000

1. Combined single limit for bodily injury and property damage.
2. This limit shall apply separately to the Contractor's work under this contract.
3. The umbrella or excess policy shall contain a clause stating that it takes effect (drops down) in the event the primary limits are impaired or exhausted.

• The State, including its officers, directors, agents (excluding agents who are design professionals), and employees, shall be named as additional insureds under the General Liability and Umbrella Liability Policies with respect to liability arising out of or connected with work or operations performed by or on behalf of the Contractor under this contract. Coverage for such additional insureds does not extend to liability:

A. Arising from any defective or substandard condition of the roadway which existed at or before the time the Contractor started work, unless such condition has been changed by the work or the scope of the work requires the Contractor to maintain existing roadway facilities and the claim arises from the Contractor's failure to maintain;
B. For claims occurring after the work is completed and accepted unless these claims are directly related to alleged acts or omissions of the Contractor that occurred during the course of the work; or
C. To the extent prohibited by Insurance Code Section 11580.04.

• Additional insured coverage shall be provided by a policy provision or by an endorsement providing coverage at least as broad as Additional Insured (Form B) endorsement form CG 2010, as published by the Insurance Services Office (ISO), or other form designated by the Department.

7-1.12B(4)(c) Contractor's Insurance Policy is Primary

• The policy shall stipulate that the insurance afforded the additional insureds applies as primary insurance. Any other insurance or self-insurance maintained by the State is excess only and shall not be called upon to contribute with this insurance.

7-1.12B(5) Automobile Liability Insurance

• The Contractor shall carry automobile liability insurance, including coverage for all owned, hired, and nonowned automobiles. The primary limits of liability shall be not less than $1 000 000 combined single limit each accident for bodily injury and property damage. The umbrella or excess liability coverage required under Section 7-1.12B(4)(b) also applies to automobile liability.

7-1.12B(6) Policy Forms, Endorsements, and Certificates

• The Contractor shall provide its General Liability Insurance under Commercial General Liability policy form No. CG0001 as published by the Insurance Services Office (ISO) or under a policy form at least as broad as policy form No. CG0001.

7-1.12B(7) Deductibles

• The State may expressly allow deductible clauses, which it does not consider excessive, overly broad, or harmful to the interests of the State. Regardless of the allowance of exclusions or deductions by the State, the Contractor is responsible for any deductible amount and shall warrant that the coverage provided to the State is in accordance with Section 7-1.12B, "Insurance."

7-1.12B(8) Enforcement

• The Department may assure the Contractor's compliance with its insurance obligations. Ten days before an insurance policy lapses or is canceled during the contract period, the Contractor shall submit to the Department evidence of renewal or replacement of the policy.

• If the Contractor fails to maintain any required insurance coverage, the Department may maintain this coverage and withhold or charge the expense to the Contractor or terminate the Contractor's control of the work in accordance with Section 8-1.08, "Termination of Control."

• The Contractor is not relieved of its duties and responsibilities to indemnify, defend, and hold harmless the State, its officers, agents, and employees by the Department's acceptance of insurance policies and certificates.

• Minimum insurance coverage amounts do not relieve the Contractor for liability in excess of such coverage, nor do they preclude the State from taking other actions available to it, including the withholding of funds under this contract.

7-1.12B(9) Self-Insurance

• Self-insurance programs and self-insured retentions in insurance policies are subject to separate annual review and approval by the State.

• If the Contractor uses a self-insurance program or self-insured retention, the Contractor shall provide the State with the same protection from liability and defense of suits as would be afforded by first-dollar insurance. Execution of the contract is the Contractor's acknowledgement that the Contractor will be bound by all laws as if the Contractor were an insurer as defined under Insurance Code Section 23 and that the self-insurance program or self-insured retention shall operate as insurance as defined under Insurance Code Section 22.

SECTION 9: MEASUREMENT AND PAYMENT

Issue Date: June 30, 2006

The third paragraph of Section 9-1.03, "Work Performed by Contractor," of the Standard Specifications is amended to read:

• The above markups shall constitute full compensation for all delay costs, overhead costs and profit which shall be deemed to include all items of expense not specifically designated as cost or equipment rental in Sections 9-1.03A(1), "Labor," 9-1.03A(2), "Materials," and 9-1.03A(3), "Equipment Rental." The total payment made as provided above shall be deemed to be the actual cost of the work and shall constitute full compensation therefor.

Section 9-1.04, "Notice of Potential Claim," of the Standard Specifications is amended to read:

9-1.04 NOTICE OF POTENTIAL CLAIM

• It is the intention of this section that disputes between the parties arising under and by virtue of the contract be brought to the attention of the Engineer at the earliest possible time in order that the matters may be resolved, if possible, or other appropriate action promptly taken.

• Disputes will not be considered unless the Contractor has first complied with specified notice or protest requirements, including Section 4-1.03, "Changes," Section 5-1.116, "Differing Site Conditions," Section 8-1.06, "Time of Completion," Section 8-1.07, "Liquidated Damages," and Section 8-1.10, "Utility and Non-Highway Facilities."

• For disputes arising under and by virtue of the contract, including an act or failure to act by the Engineer, the Contractor shall provide a signed written initial notice of potential claim to the Engineer within 5 days from the date the dispute first arose. The initial notice of potential claim shall provide the nature and circumstances involved in the dispute which shall remain consistent through the dispute. The initial notice of potential claim shall be submitted on Form CEM-6201A furnished by the Department and shall be certified with reference to the California False Claims Act, Government Code Sections 12650-12655. The Contractor shall assign an exclusive identification number for each dispute, determined by chronological sequencing, based on the date of the dispute.

• The exclusive identification number for each dispute shall be used on the following corresponding documents:

A. Initial notice of potential claim.
B. Supplemental notice of potential claim.
C. Full and final documentation of potential claim.
D. Corresponding claim included in the Contractor's written statement of claims.

• The Contractor shall provide the Engineer the opportunity to examine the site of work within 5 days from the date of the initial notice of potential claim. The Contractor shall proceed with the performance of contract work unless otherwise specified or directed by the Engineer.

• Throughout the disputed work, the Contractor shall maintain records that provide a clear distinction between the incurred direct costs of disputed work and that of undisputed work. The Contractor shall allow the Engineer access to the Contractor's project records deemed necessary by the Engineer to evaluate the potential claim within 20 days of the date of the Engineer's written request.

• Within 15 days of submitting the initial notice of potential claim, the Contractor shall provide a signed supplemental notice of potential claim to the Engineer that provides the following information:

A. The complete nature and circumstances of the dispute which caused the potential claim.

B. The contract provisions that provide the basis of claim.
C. The estimated cost of the potential claim, including an itemized breakdown of individual costs and how the estimate was determined.
D. A time impact analysis of the project schedule that illustrates the effect on the scheduled completion date due to schedule changes or disruptions where a request for adjustment of contract time is made.

• The information provided in items A and B above shall provide the Contractor's complete reasoning for additional compensation or adjustments.

• The supplemental notice of potential claim shall be submitted on Form CEM-6201B furnished by the Department and shall be certified with reference to the California False Claims Act, Government Code Sections 12650-12655. The Engineer will evaluate the information presented in the supplemental notice of potential claim and provide a written response to the Contractor within 20 days of its receipt. If the estimated cost or effect on the scheduled completion date changes, the Contractor shall update information in items C and D above as soon as the change is recognized and submit this information to the Engineer.

• Within 30 days of the completion of work related to the potential claim, the Contractor shall provide the full and final documentation of potential claim to the Engineer that provides the following information:

A. A detailed factual narration of events fully describing the nature and circumstances that caused the dispute, including, but not limited to, necessary dates, locations, and items of work affected by the dispute.
B. The specific provisions of the contract that support the potential claim and a statement of the reasons these provisions support and provide a basis for entitlement of the potential claim.
C. When additional monetary compensation is requested, the exact amount requested calculated in conformance with Section 9-1.03, "Force Account Payment," or Section 8-1.09, "Right of Way Delays," including an itemized breakdown of individual costs. These costs shall be segregated into the following cost categories:

    1. Labor – A listing of individuals, classifications, regular hours and overtime hours worked, dates worked, and other pertinent information related to the requested reimbursement of labor costs.
    2. Materials – Invoices, purchase orders, location of materials either stored or incorporated into the work, dates materials were transported to the project or incorporated into the work, and other pertinent information related to the requested reimbursement of material costs.
    3. Equipment – Listing of detailed description (make, model, and serial number), hours of use, dates of use and equipment rates. Equipment rates shall be at the applicable State rental rate as listed in the Department of Transportation publication entitled "Labor Surcharge and Equipment Rental Rates," in effect when the affected work related to the dispute was performed.
    4. Other categories as specified by the Contractor or the Engineer.

D. When an adjustment of contract time is requested the following information shall be provided:

    1. The specific dates for which contract time is being requested.
    2. The specific reasons for entitlement to a contract time adjustment.
    3. The specific provisions of the contract that provide the basis for the requested contract time adjustment.
    4. A detailed time impact analysis of the project schedule. The time impact analysis shall show the effect of changes or disruptions on the scheduled completion date to demonstrate entitlement to a contract time adjustment.

E. The identification and copies of the Contractor's documents and the substance of oral communications that support the potential claim.

• The full and final documentation of the potential claim shall be submitted on Form CEM-6201C furnished by the Department and shall be certified with reference to the California False Claims Act, Government Code Sections 12650-12655.

• Pertinent information, references, arguments, and data to support the potential claim shall be included in the full and final documentation of potential claim. Information submitted subsequent to the full and final documentation submittal will not be considered. Information required in the full and final documentation of potential claim, as listed in items A to E above, that is not applicable to the dispute may be exempted as determined by the Engineer. No full and final documentation of potential claim will be considered that does not have the same nature and circumstances, and basis of claim as those specified on the initial and supplemental notices of potential claim.

• The Engineer will evaluate the information presented in the full and final documentation of potential claim and provide a written response to the Contractor within 30 days of its receipt unless otherwise specified. The Engineer's receipt

of the full and final documentation of potential claim shall be evidenced by postal receipt or the Engineer's written receipt if delivered by hand. If the full and final documentation of potential claim is submitted by the Contractor after acceptance of the work by the Director, the Engineer need not provide a written response.

- Provisions in this section shall not apply to those claims for overhead costs and administrative disputes that occur after issuance of the proposed final estimate. Administrative disputes are disputes of administrative deductions or retentions, contract item quantities, contract item adjustments, interest payments, protests of contract change orders as provided in Section 4-1.03A, "Procedure and Protest," and protests of the weekly statement of working days as provided in Section 8-1.06, "Time of Completion." Administrative disputes that occur prior to issuance of the proposed final estimate shall follow applicable requirements of this section. Information listed in the supplemental notice and full and final documentation of potential claim that is not applicable to the administrative dispute may be exempted as determined by the Engineer.
- Unless otherwise specified in the special provisions, the Contractor may pursue the administrative claim process pursuant to Section 9-1.07B, "Final Payment and Claims," for any potential claim found by the Engineer to be without merit.
- Failure of the Contractor to conform to specified dispute procedures shall constitute a failure to pursue diligently and exhaust the administrative procedures in the contract, and is deemed as the Contractor's waiver of the potential claim and a waiver of the right to a corresponding claim for the disputed work in the administrative claim process in conformance with Section 9-1.07B, "Final Payment of Claims," and shall operate as a bar to arbitration pursuant to Section 10240.2 of the California Public Contract Code.

Section 9-1.07B, "Final Payment and Claims," of the Standard Specifications is amended to read:

9-1.07B Final Payment and Claims

- After acceptance by the Director, the Engineer will make a proposed final estimate in writing of the total amount payable to the Contractor, including an itemization of the total amount, segregated by contract item quantities, extra work and other bases for payment, and shall also show each deduction made or to be made for prior payments and amounts to be kept or retained under the provisions of the contract. Prior estimates and payments shall be subject to correction in the proposed final estimate. The Contractor shall submit written approval of the proposed final estimate or a written statement of claims arising under or by virtue of the contract so that the Engineer receives the written approval or statement of claims no later than close of business of the thirtieth day after receiving the proposed final estimate. If the thirtieth day falls on a Saturday, Sunday or legal holiday, then receipt of the written approval or statement of claims by the Engineer shall not be later than close of business of the next business day. The Contractor's receipt of the proposed final estimate shall be evidenced by postal receipt. The Engineer's receipt of the Contractor's written approval or statement of claims shall be evidenced by postal receipt or the Engineer's written receipt if delivered by hand.
- On the Contractor's approval, or if the Contractor files no claim within the specified period of 30 days, the Engineer will issue a final estimate in writing in conformance with the proposed final estimate submitted to the Contractor, and within 30 days thereafter the State will pay the entire sum so found to be due. That final estimate and payment thereon shall be conclusive and binding against both parties to the contract on all questions relating to the amount of work done and the compensation payable therefor, except as otherwise provided in Sections 9-1.03C, "Records," and 9-1.09, "Clerical Errors."
- If the Contractor within the specified period of 30 days files claims, the Engineer will issue a semifinal estimate in conformance with the proposed final estimate submitted to the Contractor and within 30 days thereafter the State will pay the sum found to be due. The semifinal estimate and corresponding payment shall be conclusive and binding against both parties to the contract on each question relating to the amount of work done and the compensation payable therefor, except insofar as affected by the claims filed within the time and in the manner required hereunder and except as otherwise provided in Sections 9-1.03C, "Records," and 9-1.09, "Clerical Errors."
- Except for claims for overhead costs and administrative disputes that occur after issuance of the proposed final estimate, the Contractor shall only provide the following two items of information for each claim:

A. The exclusive identification number that corresponds to the supporting full and final documentation of potential claim.
B. The final amount of requested additional compensation.

- If the final amount of requested additional compensation is different than the amount of requested compensation included in the full and final documentation of potential claim, the Contractor shall provide in the written statement of claims the reasons for the changed amount, the specific provisions of the contract which support the changed amount, and a statement of the reasons the provisions support and provide a basis for the changed amount. If the Contractor's claim fails to provide an exclusive identification number or if there is a disparity in the provided exclusive identification number, the Engineer will notify the Contractor of the omission or disparity. The Contractor shall have 15 days after receiving notification from the Engineer to correct the omission or disparity. If after the 15 days has elapsed, there is still an omission

or disparity of the exclusive identification number assigned to the claim, the Engineer will assign the number. No claim will be considered that has any of the following deficiencies:

A. The claim does not have the same nature, circumstances, and basis as the corresponding full and final documentation of potential claim.
B. The claim does not have a corresponding full and final documentation of potential claim.
C. The claim was not included in the written statement of claims.
D. The Contractor did not comply with applicable notice or protest requirements of Sections 4-1.03, "Changes," 5-1.116, "Differing Site Condition," 8-1.06, "Time of Completion," 8-1.07, "Liquidated Damages," 8-1.10, "Utility and Non-Highway Facilities," and 9-1.04, "Notice of Potential Claim."

- Administrative disputes that occur after issuance of the proposed final estimate shall be included in the Contractor's written statement of claims in sufficient detail to enable the Engineer to ascertain the basis and amounts of those claims.
- The Contractor shall keep full and complete records of the costs and additional time incurred for work for which a claim for additional compensation is made. The Engineer or designated claim investigators or auditors shall have access to those records and any other records as may be required by the Engineer to determine the facts or contentions involved in the claims. Failure to permit access to those records shall be sufficient cause for denying the claims.
- The written statement of claims submitted by the Contractor shall be accompanied by a notarized certificate containing the following language:

Under the penalty of law for perjury or falsification and with specific reference to the California False Claims Act, Government Code Section 12650 et. seq., the undersigned,

_____ .
(name)

_____ *of*
(title)

_____ .
(company)

hereby certifies that the claim for the additional compensation and time, if any, made herein for the work on this contract is a true statement of the actual costs incurred and time sought, and is fully documented and supported under the contract between parties.

Dated _____

/s/ _____

Subscribed and sworn before me this _____ day

of _____ .

_____
(Notary Public)
My Commission
Expires _____

- Failure to submit the notarized certificate will be sufficient cause for denying the claim.
- Any claim for overhead, in addition to being certified as stated above, shall be supported and accompanied by an audit report of an independent Certified Public Accountant. Omission of a supporting audit report of an independent Certified Public Accountant shall result in denial of the claim and shall operate as a bar to arbitration, as to the claim, in conformance with the requirements in Section 10240.2 of the California Public Contract Code. Any claim for overhead shall be subject to audit by the State at its discretion. The costs of performing an audit examination and submitting the report shall be borne by the Contractor. The Department will deduct an offset amount for field and home office overhead paid on all added work from any claim for overhead as appropriate, as determined by the Department. The value of the added work equals the value of the work completed minus the total bid. The home office overhead offset equals 5 percent of the added work. The field office overhead offset equals 5-1/2 percent of the added work. The Certified Public Accountant's audit examination shall be performed in conformance with the requirements of the American Institute of Certified Public Accountants Attestation Standards. The audit examination and report shall depict the Contractor's project and company-wide financial records and shall specify the actual overall average daily rates for both field and home office overhead for the entire

duration of the project, and whether the costs have been properly allocated. The rates of field and home office overhead shall exclude unallowable costs as determined in Title 48 of the Federal Acquisition Regulations, Chapter 1, Part 31. The audit examination and report shall determine if the rates of field and home office overhead are:

A. Allowable in conformance with the requirements in Title 48 of the Federal Acquisition Regulations, Chapter 1, Part 31.
B. Adequately supported by reliable documentation.
C. Related solely to the project under examination.

• Costs or expenses incurred by the State in reviewing or auditing claims that are not supported by the Contractor's cost accounting or other records shall be deemed to be damages incurred by the State within the meaning of the California False Claims Act.

• If the Engineer determines that a claim requires additional analysis, the Engineer will schedule a board of review meeting. The Contractor shall meet with the review board or person and make a presentation in support of the claim. Attendance by the Contractor at the board of review meeting shall be mandatory.

• The District Director of the District that administered the contract will make the final determination of any claims which remain in dispute after completion of claim review by the Engineer or board of review meeting.

The final determination of claims will be sent to the Contractor by hand delivery or deposit in the U.S. mail. The Engineer will then make and issue the Engineer's final estimate in writing and within 30 days thereafter the State will pay the entire sum, if any, found due thereon. That final estimate shall be conclusive and binding against both parties to the contract on all questions relating to the amount of work done and the compensation payable therefor, except as otherwise provided in Sections 9-1.03C, "Records," and 9-1.09, "Clerical Errors."

• Failure of the Contractor to conform to the specified dispute procedures shall constitute a failure to pursue diligently and exhaust the administrative procedures in the contract and shall operate as a bar to arbitration in conformance with the requirements in Section 10240.2 of the California Public Contract Code.

SECTION 12: CONSTRUCTION AREA TRAFFIC CONTROL DEVICES

Issue Date: June 30, 2006

The second paragraph of Section 12-1.01, "Description," of the Standard Specifications is amended to read:

• Attention is directed to Part 6 of the MUTCD and of the MUTCD California Supplement. Nothing in this Section 12 is to be construed as to reduce the minimum standards in these manuals.

Section 12-2.01, "Flaggers," of the Standard Specifications is amended to read:

• Flaggers while on duty and assigned to traffic control or to give warning to the public that the highway is under construction and of any dangerous conditions to be encountered as a result thereof, shall perform their duties and shall be provided with the necessary equipment in conformance with Part 6 of the MUTCD and of the MUTCD California Supplement. The equipment shall be furnished and kept clean and in good repair by the Contractor at the Contractor's expense.

The first paragraph of Section 12-3.01, "General," of the Standard Specifications is amended to read:

• In addition to the requirements in Part 6 of the MUTCD and of the MUTCD California Supplement, all devices used by the Contractor in the performance of the work shall conform to the provisions in this Section 12-3.

The fifth paragraph of Section 12-3.01, "General," of the Standard Specifications is amended to read:

• Retroreflective sheeting shall conform to the requirements in ASTM Designation: D 4956 and to the special provisions.

The first paragraph of Section 12-3.06, "Construction Area Signs," of the Standard Specifications is amended to read:

• The term "Construction Area Signs" shall include all temporary signs required for the direction of public traffic through or around the work during construction. Construction area signs are shown in or referred to in Part 6 of the MUTCD and of the MUTCD California Supplement.

The fourth paragraph of Section 12-3.06, "Construction Area Signs," of the Standard Specifications is amended to read:

• All construction area signs shall conform to the dimensions, color and legend requirements of the plans, Part 6 of the MUTCD, Part 6 of the MUTCD California Supplement, and these specifications. All sign panels shall be the product of a commercial sign manufacturer, and shall be as specified in these specifications.

The eighth paragraph of Section 12-3.06, "Construction Area Signs," of the Standard Specifications is amended to read:

• Used signs with the specified sheeting material will be considered satisfactory if they conform to the requirements for visibility and legibility and the colors conform to the requirements in Part 6 of the MUTCD and of the MUTCD California Supplement. A significant difference between day and nighttime retroreflective color will be grounds for rejecting signs.

Section 12-3.06A, "Stationary Mounted Signs," of the Standard Specifications is amended by deleting the third, fourth, fifth, and sixth paragraphs.

SECTION 15: EXISTING HIGHWAY FACILITIES

Issue Date: November 2, 2004

The sixth paragraph of Section 15-2.07, "Payment," of the Standard Specifications is amended to read:

• Full compensation for removing, salvaging, reconstructing, relocating or resetting end caps, return caps, terminal sections, and buried post anchors, for metal beam guard railings and thrie beam barriers, and for connecting reconstructed, relocated or reset railings and barriers to new and existing facilities, including connections to concrete, shall be considered as included in the contract price paid per meter for the type of railing or barrier work involved and no additional compensation will be allowed therefor.

SECTION 19: EARTHWORK

Issue Date: December 31, 2001

The third paragraph of Section 19-1.02, "Preservation of Property," of the Standard Specifications is amended to read:

• In addition to the provisions in Sections 5-1.02, "Plans and Working Drawings," and 5-1.02A, "Excavation Safety Plans," detailed plans of the protective systems for excavations on or affecting railroad property will be reviewed for adequacy of protection provided for railroad facilities, property, and traffic. These plans shall be submitted at least 9 weeks before the Contractor intends to begin excavation requiring the protective systems. Approval by the Engineer of the detailed plans for the protective systems will be contingent upon the plans being satisfactory to the railroad company involved.

SECTION 20: EROSION CONTROL AND HIGHWAY PLANTING

Issue Date: November 18, 2005

Section 20-2.25, "Backflow Preventers," of the Standard Specifications is amended to read:

20-2.25 BACKFLOW PREVENTERS

• Backflow preventers shall be one of the reduced pressure principle devices as specified in these specifications and the special provisions.

• Backflow preventers shall be factory assembled and shall include 2 check valves, one pressure differential relief valve, 2 shut-off valves and 4 test cocks. Backflow preventer and valves shall be the same size as the pipeline in which they are installed, unless otherwise shown on the plans.

• Backflow preventer shut-off valves shall be manufactured from iron or bronze and shall be either resilient wedged gate valves, resilient seated and fully ported ball valves, or resilient seated butterfly valves. Threaded type shut-off valves shall be provided with a union on one side of each valve. Unions shall be brass or malleable iron.

Section 20-5.03J, "Check and Test Backflow Preventers," of the Standard Specifications is amended to read:

20-5.03J Check and Test Backflow Preventers

- Backflow preventers shall be checked and tested for proper operation by a certified Backflow Preventer Tester. The tester shall hold a valid certification as a Backflow Preventer Tester from the local governing authority in which the device to be tested is located. The local governing authority shall be the county, city or water purveyor having the governing authority over testing of backflow preventers involved. If the local governing authority does not have a certification program for Backflow Preventer Testers, the tester shall have a certificate from one of the following:

A. The American Water Works Association.
B. A county which has a certification program for Backflow Preventer Testers.

- Tests for proper operation shall conform to the requirements of the governing authority.
- The Engineer shall be notified at least 5 days prior to testing backflow preventers.
- One copy of the test results for each backflow preventer tested shall be furnished to the Engineer.
- Backflow preventers, installed by the Contractor, failing required tests shall be repaired at the Contractor's expense.

SECTION 29: TREATED PERMEABLE BASES

Issue Date: November 18, 2005

The fourth paragraph of Section 29-1.02A, "Asphalt Treated Permeable Base," of the Standard Specifications is amended to read:

- The type and grade of asphalt binder to be mixed with aggregate will be specified in the special provisions.

SECTION 39: ASPHALT CONCRETE

Issue Date: November 18, 2005

The fifth paragraph of Section 39-2.01, "Asphalts," of the Standard Specifications is amended to read:

- Paving asphalt to be used as a binder for pavement reinforcing fabric shall be a steam-refined paving asphalt conforming to the provisions in Section 92, "Asphalts," and shall be Grade PG 70-10.

SECTION 40: PORTLAND CEMENT CONCRETE PAVEMENT

Issue Date: June 30, 2006

The fourth paragraph of Section 40-1.08, "Joints," of the Standard Specifications is amended to read:

- Straight tie bars shall be deformed reinforcing steel bars conforming to the requirements in ASTM Designation: A 615/A 615M, Grade 280 or 420; ASTM Designation: A 996/A 996M, Grade 350 or 420; or ASTM Designation: A 706/A 706M.

SECTION 42: GROOVE AND GRIND PAVEMENT

Issue Date: December 31, 2001

The last sentence of the first subparagraph of the third paragraph in Section 42-2.02, "Construction," of the Standard Specifications is amended to read:

- After grinding has been completed, the pavement shall conform to the straightedge and profile requirements specified in Section 40-1.10, "Final Finishing."

SECTION 49: PILING

Issue Date: June 30, 2006

The first paragraph in Section 49-1.03, "Determination of Length," of the Standard Specifications is amended to read:

• Foundation piles of any material shall be of such length as is required to obtain the specified penetration, and to extend into the cap or footing block as shown on the plans, or specified in the special provisions.

The fourth paragraph in Section 49-1.03, "Determination of Length," of the Standard Specifications is amended to read:

• Modification to the specified installation methods and specified pile tip elevation will not be considered at locations where tension or lateral load demands control design pile tip elevations or when the plans state that specified pile tip elevation shall not be revised.

The sixth and seventh paragraphs in Section 49-1.03, "Determination of Length," of the Standard Specifications are amended to read:

• Indicator compression pile load testing shall conform to the requirements in ASTM Designation: D 1143-81. The pile shall sustain the first compression test load applied which is equal to the nominal resistance in compression, as shown on the plans, with no more than 13 mm total vertical movement at the top of the pile measured relative to the top of the pile prior to the start of compression load testing.

• Indicator tension pile load testing shall conform to the requirements in ASTM Designation: D 3689-90. The loading apparatus described as "Load Applied to Pile by Hydraulic Jack(s) Acting at One End of Test Beam(s) Anchored to the Pile" shall not be used. The pile shall sustain the first tension test load applied which is equal to the nominal resistance in tension, as shown on the plans, with no more than 13 mm total vertical movement at the top of the pile measured relative to the top of the pile prior to the start of tension load testing.

The ninth paragraph in Section 49-1.03, "Determination of Length," of the Standard Specifications is amended to read:

• For driven piling, the Contractor shall furnish piling of sufficient length to obtain the specified tip elevation shown on the plans or specified in the special provisions. For cast-in-drilled-hole concrete piling, the Contractor shall construct piling of such length to develop the nominal resistance in compression and to obtain the specified tip elevation shown on the plans or specified in the special provisions.

The tenth paragraph in Section 49-1.03, "Determination of Length," of the Standard Specifications is deleted.

The fourth paragraph in Section 49-1.04, "Load Test Piles," of the Standard Specifications is amended to read:

• Load test piles and anchor piles which are not to be incorporated in the completed structure shall be removed in conformance with the provisions in Section 15-4.02, "Removal Methods," and the remaining holes shall be backfilled with earth or other suitable material approved by the Engineer.

The fifth paragraph in Section 49-1.04, "Load Test Piles," of the Standard Specifications is amended to read:

• Load test anchorages in piles used as anchor piles shall conform to the following requirements:

A. High strength threaded steel rods shall conform to the provisions for bars in Section 50-1.05, "Prestressing Steel," except Type II bars shall be used.
B. High strength steel plates shall conform to the requirements in ASTM Designation: A 709/A 709M, Grade 345.
C. Anchor nuts shall conform to the provisions in the second paragraph in Section 50-1.06, "Anchorages and Distribution."

The first paragraph in Section 49-1.05, "Driving Equipment," of the Standard Specifications is amended to read:

• Driven piles shall be installed with impact hammers that are approved in writing by the Engineer. Impact hammers shall be steam, hydraulic, air or diesel hammers. Impact hammers shall develop sufficient energy to drive the piles at a penetration rate of not less than 3 mm per blow at the specified nominal resistance.

The seventh paragraph in Section 49-1.05, "Driving Equipment," of the Standard Specifications is amended to read:

• When necessary to obtain the specified penetration and when authorized by the Engineer, the Contractor may supply and operate one or more water jets and pumps, or furnish the necessary drilling apparatus and drill holes not greater than the least dimension of the pile to the proper depth and drive the piles therein. Jets shall not be used at locations where the stability of embankments or other improvements would be endangered. In addition, for steel piles, steel shells, or steel casings, when necessary to obtain the specified penetration or to prevent damage to the pile during installation, the Contractor shall provide special driving tips or heavier pile sections or take other measures as approved by the Engineer.

• The use of followers or underwater hammers for driving piles will be permitted if authorized in writing by the Engineer. When a follower or underwater hammer is used, its efficiency shall be verified by furnishing the first pile in each bent or footing sufficiently long and driving the pile without the use of a follower or underwater hammer.

The second paragraph in Section 49-1.07, "Driving," of the Standard Specifications is amended to read:

• Timber piles shall be fresh-headed and square and when permitted by the Engineer, the heads of the piles may be protected by means of heavy steel or wrought iron rings. During driving operations timber piling shall be restrained from lateral movement at intervals not to exceed 6 m over the length between the driving head and the ground surface. During driving operations, the timber pile shall be kept moving by continuous operation of the hammer. When the blow count exceeds either 2 times the blow count required in 300 mm, or 3 times the blow count required in 75 mm for the nominal resistance as shown on the plans, computed in conformance with the provisions in Section 49-1.08, "Pile Driving Acceptance Criteria," additional aids shall be used to obtain the specified penetration. These aids may include the use of water jets or drilling, where permitted, or the use of a larger hammer employing a heavy ram striking with a low velocity.

Section 49-1.08, "Bearing Value and Penetration," of the Standard Specifications is amended to read:

49-1.08 PILE DRIVING ACCEPTANCE CRITERIA

• Except for piles to be load tested, driven piles shall be driven to a value of not less than the nominal resistance shown on the plans unless otherwise specified in the special provisions or permitted in writing by the Engineer. In addition, when a pile tip elevation is specified, driven piles shall penetrate at least to the specified tip elevation, unless otherwise permitted in writing by the Engineer. Piles to be load tested shall be driven to the specified tip elevation.

• When the pile nominal resistance is omitted from the plans or the special provisions, timber piles shall be driven to a nominal resistance of 800 kN, and steel and concrete piles shall be driven to a nominal resistance of 1250 kN.

• The nominal resistance for driven piles shall be determined from the following formula in which "R_u" is the nominal resistance in kilonewtons, "E_r" is the manufacturer's rating for joules of energy developed by the hammer at the observed field drop height, and "N" is the number of hammer blows in the last 300 millimeters. (maximum value to be used for N is 100):

$$R_u = (7 * (E_r)^{1/2} * \log_{10} (0.83 * N)) - 550$$

The first paragraph in Section 49-2.03, "Requirements," of the Standard Specifications is amended to read:

• When preservative treatment of timber piles is required by the plans or specified in the special provisions, the treatment shall conform to the provisions in Section 58, "Preservative Treatment of Lumber, Timber and Piling," and the applicable AWPA Use Category.

The first paragraph in Section 49-2.04, "Treatment of Pile Heads," of the Standard Specifications is amended to read:

A. An application of wood preservative conforming to the provisions in Section 58-1.04, "Wood Preservative for Manual Treatment," shall first be applied to the head of the pile and a protective cap shall then be built up by applying alternate layers of loosely woven fabric and hot asphalt or tar similar to membrane waterproofing, using 3 layers of asphalt or tar and 2 layers of fabric. The fabric shall measure at least 150 mm more in each direction than the diameter of the pile and shall be turned down over the pile and the edges secured by binding with 2 turns of No.

10 galvanized wire. The fabric shall be wired in advance of the application of the final layer of asphalt or tar, which shall extend down over the wiring.

B. The sawed surface shall be covered with 3 applications of a hot mixture of 60 percent creosote and 40 percent roofing pitch, or thoroughly brushcoated with 3 applications of hot creosote and covered with hot roofing pitch. A covering of 3.50-mm nominal thickness galvanized steel sheet shall be placed over the coating and bent down over the sides of each pile to shed water.

Section 49-3.01, "Description," of the Standard Specifications is amended by deleting the fifth paragraph.

The sixth and seventh paragraphs in Section 49-3.01, "Description," of the Standard Specifications are amended to read:

• Except for precast prestressed concrete piles in a corrosive environment, lifting anchors used in precast prestressed concrete piles shall be removed, and the holes filled in conformance with the provisions in Section 51-1.18A, "Ordinary Surface Finish."

• Lifting anchors used in precast prestressed concrete piles in a corrosive environment shall be removed to a depth of at least 25 mm below the surface of the concrete, and the resulting hole shall be filled with epoxy adhesive before the piles are delivered to the job site. The epoxy adhesive shall conform to the provisions in Sections 95-1, "General," and 95-2.01, "Binder (Adhesive), Epoxy Resin Base (State Specification 8040-03)."

The first and second paragraphs in Section 49-4.01, "Description," of the Standard Specifications are amended to read:

• Cast-in-place concrete piles shall consist of one of the following:

A. Steel shells driven permanently to the required nominal resistance and penetration and filled with concrete.
B. Steel casings installed permanently to the required penetration and filled with concrete.
C. Drilled holes filled with concrete.
D. Rock sockets filled with concrete.

• The drilling of holes shall conform to the provisions in these specifications. Concrete filling for cast-in-place concrete piles is designated by compressive strength and shall have a minimum 28-day compressive strength of 25 MPa. At the option of the Contractor, the combined aggregate grading for the concrete shall be either the 25-mm maximum grading, the 12.5-mm maximum grading, or the 9.5-mm maximum grading. Concrete shall conform to the provisions in Section 90, "Portland Cement Concrete," and Section 51, "Concrete Structures." Reinforcement shall conform to the provisions in Section 52, "Reinforcement."

The fourth paragraph in Section 49-4.03, "Drilled Holes," of the Standard Specifications is amended to read:

• After placing reinforcement and prior to placing concrete in the drilled hole, if caving occurs or deteriorated foundation material accumulates on the bottom of the hole, the bottom of the drilled hole shall be cleaned. The Contractor shall verify that the bottom of the drilled hole is clean.

The first and second paragraphs in Section 49-4.04, "Steel Shells," of the Standard Specifications are amended to read:

• Steel shells shall be sufficiently watertight to exclude water during the placing of concrete. The shells may be cylindrical or tapered, step-tapered, or a combination of either, with cylindrical sections.

The first paragraph in Section 49-4.05, "Inspection," of the Standard Specifications is amended to read:

• After being driven and prior to placing reinforcement and concrete therein, the steel shells shall be examined for collapse or reduced diameter at any point. Any shell which is improperly driven or broken or shows partial collapse to such an extent as to materially decrease its nominal resistance will be rejected. Rejected shells shall be removed and replaced, or a new shell shall be driven adjacent to the rejected shell. Rejected shells which cannot be removed shall be filled with concrete by the Contractor at the Contractor's expense. When a new shell is driven to replace a rejected shell, the Contractor, at the Contractor's expense, shall enlarge the footing as determined necessary by the Engineer.

The third paragraph in Section 49-5.01, "Description," of the Standard Specifications is amended to read:

• Steel pipe piles shall conform to the following requirements:

1. Steel pipe piles less than 360 mm in diameter shall conform to the requirements in ASTM Designation: A 252, Grade 2 or 3.
2. Steel pipe piles 360 mm and greater in diameter shall conform to the requirements in ASTM Designation: A 252, Grade 3.
3. Steel pipe piles shall be of the nominal diameter and nominal wall thickness shown on the plans or specified in the special provisions.
4. The carbon equivalency (CE) of steel for steel pipe piles, as defined in AWS D 1.1, Section XI5.1, shall not exceed 0.45.
5. The sulfur content of steel for steel pipe piles shall not exceed 0.05-percent.
6. Seams in steel pipe piles shall be complete penetration welds.

The first paragraph in Section 49-6.01, "Measurement," of the Standard Specifications is amended to read:

• The length of timber, steel, and precast prestressed concrete piles, and of cast-in-place concrete piles consisting of driven shells filled with concrete, shall be the greater of the following:

A. The total length in place in the completed work, measured along the longest side, from the tip of the pile to the plane of pile cut-off.
B. The length measured along the longest side, from the tip elevation shown on the plans or the tip elevation ordered by the Engineer, to the plane of pile cut-off.

The third paragraph in Section 49-6.02, "Payment," of the Standard Specifications is amended to read:

• The contract price paid per meter for cast-in-drilled-hole concrete piling shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all work involved in drilling holes, disposing of material resulting from drilling holes, temporarily casing holes and removing water when necessary, furnishing and placing concrete and reinforcement, and constructing reinforced concrete extensions, complete in place, to the required penetration, as shown on the plans, as specified in these specifications and in the special provisions, and as directed by the Engineer.

The seventh paragraph in Section 49-6.02, "Payment," of the Standard Specifications is amended to read

• The contract unit price paid for drive pile shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in driving timber, concrete and steel piles, driving steel shells for cast-in-place concrete piles, placing filling materials for cast-in-place concrete piles and cutting off piles, all complete in place to the required nominal resistance and penetration as shown on the plans and as specified in these specifications and the special provisions, and as directed by the Engineer.

The ninth paragraph in Section 49-6.02, "Payment," of the Standard Specifications is amended to read:

• Full compensation for all jetting, drilling, providing special driving tips or heavier sections for steel piles or shells, or other work necessary to obtain the specified penetration and nominal resistance of the piles, for predrilling holes through embankment and filling the space remaining around the pile with sand or pea gravel, for disposing of material resulting from jetting, drilling or predrilling holes, and for all excavation and backfill involved in constructing concrete extensions as shown on the plans, and as specified in these specifications and the special provisions, and as directed by the Engineer shall be considered as included in the contract unit price paid for drive pile or in the contract price paid per meter for cast-in-drilled-hole concrete piling, and no additional compensation will be allowed therefor.

Section 49-6.02, "Payment," of the Standard Specifications is amended by adding the following paragraphs:

• Full compensation for furnishing and placing additional testing reinforcement, for load test anchorages, and for cutting off test piles, shall be considered as included in the contract price paid for piling of the type or class shown in the Engineer's Estimate, and no additional compensation will be allowed.

• No additional compensation or extension of time will be made for additional foundation investigation, installation and testing of indicator piling, cutting off piling and restoring the foundation investigation and indicator pile sites, and review of request by the Engineer.

SECTION 50: PRESTRESSING CONCRETE

Issue Date: June 30, 2006

Section 50-1.02, "Drawings," of the Standard Specifications is amended by adding the following paragraph after the second paragraph:

- Each working drawing submittal shall consist of plans for a single bridge or portion thereof. For multi-frame bridges, each frame shall require a separate working drawing submittal.

The eighth paragraph of Section 50-1.02, "Drawings," of the Standard Specifications is deleted.

Section 50-1.05, "Prestressing Steel," of the Standard Specifications is amended to read:

- Prestressing steel shall be high-tensile wire conforming to the requirements in ASTM Designation: A 421, including Supplement I; high-tensile seven-wire strand conforming to the requirements in ASTM Designation: A 416; or uncoated high-strength steel bars conforming to the requirements in ASTM Designation: A 722, including all supplementary requirements. The maximum mass requirement of ASTM Designation: A 722 will not apply.
- In addition to the requirements of ASTM Designation: A 722, for deformed bars, the reduction of area shall be determined from a bar from which the deformations have been removed. The bar shall be machined no more than necessary to remove the deformations over a length of 300 mm, and reduction will be based on the area of the machined portion.
- In addition to the requirements specified herein, epoxy-coated seven-wire prestressing steel strand shall be grit impregnated and filled in conformance with the requirements in ASTM Designation: A 882/A 882M, including Supplement I, and the following:

A. The coating material shall be on the Department's list of approved coating materials for epoxy-coated strand, available from the Transportation Laboratory.
B. The film thickness of the coating after curing shall be 381 µm to 1143 µm.
C. Prior to coating the strand, the Contractor shall furnish to the Transportation Laboratory a representative 230-g sample from each batch of epoxy coating material to be used. Each sample shall be packaged in an airtight container identified with the manufacturer's name and batch number.
D. Prior to use of the epoxy-coated strand in the work, written certifications referenced in ASTM Designation: A 882/A 882M, including a representative load-elongation curve for each size and grade of strand to be used and a copy of the quality control tests performed by the manufacturer, shall be furnished to the Engineer.
E. In addition to the requirements in Section 50-1.10, "Samples for Testing," four 1.5-m long samples of coated strand and one 1.5-m long sample of uncoated strand of each size and reel shall be furnished to the Engineer for testing. These samples, as selected by the Engineer, shall be representative of the material to be used in the work.
F. Epoxy-coated strand shall be cut using an abrasive saw.
G. All visible damage to coatings caused by shipping and handling, or during installation, including cut ends, shall be repaired in conformance with the requirements in ASTM Designation: A 882/A 882M. The patching material shall be furnished by the manufacturer of the epoxy powder and shall be applied in conformance with the manufacturer's written recommendations. The patching material shall be compatible with the original epoxy coating material and shall be inert in concrete.

- All bars in any individual member shall be of the same grade, unless otherwise permitted by the Engineer.
- When bars are to be extended by the use of couplers, the assembled units shall have a tensile strength of not less than the manufacturer's minimum guaranteed ultimate tensile strength of the bars. Failure of any one sample to meet this requirement will be cause for rejection of the heat of bars and lot of couplers. The location of couplers in the member shall be subject to approval by the Engineer.
- Wires shall be straightened if necessary to produce equal stress in all wires or wire groups or parallel lay cables that are to be stressed simultaneously or when necessary to ensure proper positioning in the ducts.
- Where wires are to be button-headed, the buttons shall be cold formed symmetrically about the axes of the wires. The buttons shall develop the minimum guaranteed ultimate tensile strength of the wire. No cold forming process shall be used that causes indentations in the wire. Buttonheads shall not contain wide open splits, more than 2 splits per head, or splits not parallel with the axis of the wire.
- Prestressing steel shall be protected against physical damage and rust or other results of corrosion at all times from manufacture to grouting or encasing in concrete. Prestressing steel that has sustained physical damage at any time shall be

rejected. The development of visible rust or other results of corrosion shall be cause for rejection, when ordered by the Engineer.

- Epoxy-coated prestressing steel strand shall be covered with an opaque polyethylene sheeting or other suitable protective material to protect the strand from exposure to sunlight, salt spray, and weather. For stacked coils, the protective covering shall be draped around the perimeter of the stack. The covering shall be adequately secured; however, it should allow for air circulation around the strand to prevent condensation under the covering. Epoxy-coated strand shall not be stored within 300 m of ocean or tidal water for more than 2 months.
- Prestressing steel shall be packaged in containers or shipping forms for the protection of the steel against physical damage and corrosion during shipping and storage. Except for epoxy-coated strand, a corrosion inhibitor which prevents rust or other results of corrosion, shall be placed in the package or form, or shall be incorporated in a corrosion inhibitor carrier type packaging material, or when permitted by the Engineer, may be applied directly to the steel. The corrosion inhibitor shall have no deleterious effect on the steel or concrete or bond strength of steel to concrete. Packaging or forms damaged from any cause shall be immediately replaced or restored to original condition.
- The shipping package or form shall be clearly marked with a statement that the package contains high-strength prestressing steel, and the type of corrosion inhibitor used, including the date packaged.
- Prestressing steel for post-tensioning which is installed in members prior to placing and curing of the concrete, and which is not epoxy-coated, shall be continuously protected against rust or other results of corrosion, until grouted, by means of a corrosion inhibitor placed in the ducts or applied to the steel in the duct. The corrosion inhibitor shall conform to the provisions specified herein.
- When steam curing is used, prestressing steel for post-tensioning shall not be installed until the steam curing is completed.
- Water used for flushing ducts shall contain either quick lime (calcium oxide) or slaked lime (calcium hydroxide) in the amount of 0.01-kg/L. Compressed air used to blow out ducts shall be oil free.
- When prestressing steel for post-tensioning is installed in the ducts after completion of concrete curing, and if stressing and grouting are completed within 10 days after the installation of the prestressing steel, rust which may form during those 10 days will not be cause for rejection of the steel. Prestressing steel installed, tensioned, and grouted in this manner, all within 10 days, will not require the use of a corrosion inhibitor in the duct following installation of the prestressing steel. Prestressing steel installed as above but not grouted within 10 days shall be subject to all the requirements in this section pertaining to corrosion protection and rejection because of rust. The requirements in this section pertaining to tensioning and grouting within 10 days shall not apply to epoxy-coated prestressing steel strand.
- Any time prestressing steel for pretensioning is placed in the stressing bed and is exposed to the elements for more than 36 hours prior to encasement in concrete, adequate measures shall be taken by the Contractor, as approved by the Engineer, to protect the steel from contamination or corrosion.
- After final fabrication of the seven-wire prestressing steel strand, no electric welding of any form shall be performed on the prestressing steel. Whenever electric welding is performed on or near members containing prestressing steel, the welding ground shall be attached directly to the steel being welded.
- Pretensioned prestressing steel shall be cut off flush with the end of the member. For epoxy-coated prestressing steel, only abrasive saws shall be used to cut the steel. The exposed ends of the prestressing steel and a 25-mm strip of adjoining concrete shall be cleaned and painted. Cleaning shall be by wire brushing or abrasive blast cleaning to remove all dirt and residue on the metal or concrete surfaces. Immediately after cleaning, the surfaces shall be covered with one application of unthinned zinc-rich primer (organic vehicle type) conforming to the provisions in Section 91, "Paint," except that 2 applications shall be applied to surfaces which will not be covered by concrete or mortar. Aerosol cans shall not be used. The paint shall be thoroughly mixed at the time of application and shall be worked into any voids in the prestressing tendons.

The sixth paragraph of Section 50-1.08, "Prestressing," of the Standard Specifications is amended to read:

- The following formula and friction coefficients shall be used in calculating friction losses in tendons:

$$To = Txe\ (\mu\alpha + KL)$$

Where:

To = steel stress at jacking end
Tx = steel stress at any point x
e = base of Naperian logarithms
μ = friction curvature coefficient
α = total angular change of prestressing steel profile in radians from jacking end to point x

K = friction wobble coefficient (=0.00066/m)
L = length of prestressing steel from jacking end to point x

Type of Steel Tendon	Length of Tendon L(m)	Type of Duct	μ
Wire or Strand	0 to less than 183	Rigid or semi-rigid galvanized sheet metal	0.15
	183 to less than 275		0.20
	275 to less than 366		0.25
	Greater than or equal to 366		0.25*
Wire or Strand	All	Plastic	0.23
	All	Rigid Steel Pipes	0.25*
High Strength Bar	All	Rigid or semi-rigid galvanized sheet metal	0.30

* With the use of lubrication

The thirteenth and fourteenth paragraphs in Section 50-1.08, "Prestressing," of the Standard Specifications are amended to read:

- Prestressing steel in pretensioned members shall not be cut or released until the concrete in the member has attained a compressive strength of not less than the value shown on the plans or 28 MPa, whichever is greater. In addition to these concrete strength requirements, when epoxy-coated prestressing steel strand is used, the steel shall not be cut or released until the temperature of the concrete surrounding the strand is less than 65°C, and falling.
- When ordered by the Engineer, prestressing steel strands in pretensioned members, if tensioned individually, shall be checked by the Contractor for loss of prestress not more than 48 hours prior to placing concrete for the members. The method and equipment for checking the loss of prestress shall be subject to approval by the Engineer. Strands which show a loss of prestress in excess of 3 percent shall be retensioned to the original computed jacking stress.

The fifth paragraph in Section 50-1.10, "Samples for Testing," of the Standard Specifications is amended to read:

- The following samples of materials and tendons, selected by the Engineer from the prestressing steel at the plant or jobsite, shall be furnished by the Contractor to the Engineer well in advance of anticipated use:

A. For wire or bars, one 2-m long sample and for strand, one 1.5-m long sample, of each size shall be furnished for each heat or reel.
B. For epoxy-coated strand, one 1.5-m long sample of uncoated strand of each size shall be furnished for each reel.
C. If the prestressing tendon is a bar, one 2-m long sample shall be furnished and in addition, if couplers are to be used with the bar, two 1.25-m long samples of bar, equipped with one coupler and fabricated to fit the coupler, shall be furnished.

The second paragraph in Section 50-1.11, "Payment," of the Standard Specifications is amended to read:

- The contract lump sum prices paid for prestressing cast-in-place concrete of the types listed in the Engineer's Estimate shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all work involved in furnishing, placing, and tensioning the prestressing steel in cast-in-place concrete structures, complete in place, as shown on the plans, as specified in these specifications and the special provisions, and as directed by the Engineer.

SECTION 51: CONCRETE STRUCTURES

Issue Date: January 28, 2005

The eleventh paragraph in Section 51-1.05, "Forms," of the Standard Specifications is amended to read:

• Form panels for exposed surfaces shall be furnished and placed in uniform widths of not less than 0.9-m and in uniform lengths of not less than 1.8 m, except at the end of continuously formed surfaces where the final panel length required is less than 1.8 m. Where the width of the member formed is less than 0.9-m, the width of the panels shall be not less than the width of the member. Panels shall be arranged in symmetrical patterns conforming to the general lines of the structure. Except when otherwise provided herein or shown on the plans, panels for vertical surfaces shall be placed with the long dimension horizontal and with horizontal joints level and continuous. Form panels for curved surfaces of columns shall be continuous for a minimum of one quarter of the circumference, or 1.8 m. For walls with sloping footings which do not abut other walls, panels may be placed with the long dimension parallel to the footing. Form panels on each side of the panel joint shall be precisely aligned, by means of supports or fasteners common to both panels, to result in a continuous unbroken concrete plane surface. When prefabricated soffit panels are used, form filler panels joining prefabricated panels shall have a uniform minimum width of 0.3-m and shall produce a smooth uniform surface with consistent longitudinal joint lines between the prefabricated panels.

The first and second paragraph in Section 51-1.06A, "Falsework Design and Drawings," of the Standard Specifications are amended to read:

• The Contractor shall submit to the Engineer working drawings and design calculations for falsework proposed for use at bridges. For bridges where the height of any portion of the falsework, as measured from the ground line to the soffit of the superstructure, exceeds 4.25 m; or where any individual falsework clear span length exceeds 4.85 m; or where provision for vehicular, pedestrian, or railroad traffic through the falsework is made; the drawings shall be signed by an engineer who is registered as a Civil Engineer in the State of California. Six sets of the working drawings and 2 copies of the design calculations shall be furnished. Additional working drawings and design calculations shall be submitted to the Engineer when specified in "Railroad Relations and Insurance" of the special provisions.

• The falsework drawings shall include details of the falsework erection and removal operations showing the methods and sequences of erection and removal and the equipment to be used. The details of the falsework erection and removal operations shall demonstrate the stability of all or any portions of the falsework during all stages of the erection and removal operations.

The seventh paragraph in Section 51-1.06A, "Falsework Design and Drawings," of the Standard Specifications is amended to read:

• In the event that several falsework plans are submitted simultaneously, or an additional plan is submitted for review before the review of a previously submitted plan has been completed, the Contractor shall designate the sequence in which the plans are to be reviewed. In such event, the time to be provided for the review of any plan in the sequence shall be not less than the review time specified above for that plan, plus 2 weeks for each plan of higher priority which is still under review. A falsework plan submittal shall consist of plans for a single bridge or portion thereof. For multi-frame bridges, each frame shall require a separate falsework plan submittal.

Section 51-1.06A, "Falsework Design and Drawings," of the Standard Specifications is amended by adding the following paragraphs:

• If structural composite lumber is proposed for use, the falsework drawings shall clearly identify the structural composite lumber members by grade (E value), species, and type. The Contractor shall provide technical data from the manufacturer showing the tabulated working stress values of the composite lumber. The Contractor shall furnish a certificate of compliance as specified in Section 6-1.07, "Certificates of Compliance," for each delivery of structural composite lumber to the project site.

• For falsework piles with a calculated loading capacity greater than 900 kN, the falsework piles shall be designed by an engineer who is registered as either a Civil Engineer or a Geotechnical Engineer in the State of California, and the calculations shall be submitted to the Engineer.

The first paragraph in Section 51-1.06A(1), "Design Loads," of the Standard Specifications is amended to read:

• The design load for falsework shall consist of the sum of dead and live vertical loads, and an assumed horizontal load. The minimum total design load for any falsework, including members that support walkways, shall be not less than 4800 N/m^2 for the combined live and dead load regardless of slab thickness.

The eighth paragraph in Section 51-1.06A(1), "Design Loads," of the Standard Specifications is amended to read:

- In addition to the minimum requirements specified in this Section 51-1.06A, falsework for box girder structures with internal falsework bracing systems using flexible members capable of withstanding tensile forces only, shall be designed to include the vertical effects caused by the elongation of the flexible member and the design horizontal load combined with the dead and live loads imposed by concrete placement for the girder stems and connected bottom slabs. Falsework comprised of individual steel towers with bracing systems using flexible members capable of withstanding tensile forces only to resist overturning, shall be exempt from these additional requirements.

The third paragraph in Section 51-1.06B, "Falsework Construction," of the Standard Specifications is amended to read:

- When falsework is supported on piles, the piles shall be driven and the actual nominal resistance assessed in conformance with the provisions in Section 49, "Piling."

Section 51-1.06B, "Falsework Construction," of the Standard Specifications is amended by adding the following paragraphs:

- For falsework piles with a calculated nominal resistance greater than 1800 kN, the Contractor shall conduct dynamic monitoring of pile driving and generate field acceptance criteria based on a wave equation analysis. These analyses shall be signed by an engineer who is registered as a Civil Engineer in the State of California and submitted to the Engineer prior to completion of falsework erection.

- Prior to the placement of falsework members above the stringers, the final bracing system for the falsework shall be installed.

Section 51-1.06C, "Removing Falsework," of the Standard Specifications is amended by adding the following paragraph:

- The falsework removal operation shall be conducted in such a manner that any portion of the falsework not yet removed remains in a stable condition at all times.

The sixth paragraph in Section 51-1.09, "Placing Concrete," of the Standard Specifications is amended to read:

- Vibrators used to consolidate concrete containing epoxy-coated bar reinforcement or epoxy-coated prestressing steel shall have a resilient covering to prevent damage to the epoxy-coating on the reinforcement or prestressing steel.

The third sentence of the fourth paragraph in Section 51-1.12D, "Sheet Packing, Preformed Pads and Board Fillers," of the Standard Specifications is amended to read:

Surfaces of expanded polystyrene against which concrete is placed shall be faced with hardboard.

Section 51-1.12F, "Sealed Joints," of the Standard Specifications is amended by adding the following paragraph:

- The opening of the joints at the time of placing shall be that shown on the plans adjusted for temperature. Care shall be taken to avoid impairment of the clearance in any manner.

The first paragraph in Section 51-1.12F, "Sealed Joints," of the Standard Specifications is amended to read:

- Where shown on the plans, joints in structures shall be sealed with joint seals, joint seal assemblies, or seismic joints in conformance with the details shown on the plans, the provisions in these specifications, and the special provisions.

The fourth paragraph in Section 51-1.12F, "Sealed Joints," of the Standard Specifications is amended to read:

- Joint seal assemblies and seismic joints shall consist of metal or metal and elastomeric assemblies which are anchored or cast into a recess in the concrete over the joint. Strip seal joint seal assemblies consist of only one joint cell. Modular unit joint seal assemblies consist of more than one joint cell.

The fifth paragraph in Section 51-1.12F, "Sealed Joints," of the Standard Specifications is amended to read:

- The Movement Rating (MR) shall be measured normal to the longitudinal axis of the joint. The type of seal to be used for the MR shown on the plans shall be as follows:

Movement Rating (MR)	Seal Type
MR ≤ 15 mm	Type A or Type B
15 mm < MR ≤ 30 mm	Type A (silicone only) or Type B
30 mm < MR ≤ 50 mm	Type B
50 mm < MR ≤ 100 mm	Joint Seal Assembly (Strip Seal)
MR > 100 mm	Joint Seal Assembly (Modular Unit) or Seismic Joint

The second paragraph in Section 51-1.12F(3)(b), "Type B Seal," of the Standard Specifications is amended to read:

- The preformed elastomeric joint seal shall conform to the requirements in ASTM Designation: D 2628 and the following:

A. The seal shall consist of a multi-channel, nonporous, homogeneous material furnished in a finished extruded form.
B. The minimum depth of the seal, measured at the contact surface, shall be at least 95 percent of the minimum uncompressed width of the seal as designated by the manufacturer.
C. When tested in conformance with the requirements in California Test 673 for Type B seals, joint seals shall provide a Movement Rating (MR) of not less than that shown on the plans.
D. The top and bottom edges of the joint seal shall maintain continuous contact with the sides of the groove over the entire range of joint movement.
E. The seal shall be furnished full length for each joint with no more than one shop splice in any 18-m length of seal.
F. The Contractor shall demonstrate the adequacy of the procedures to be used in the work before installing seals in the joints.
G. Shop splices and field splices shall have no visible offset of exterior surfaces, and shall show no evidence of bond failure.
H. At all open ends of the seal that would admit water or debris, each cell shall be filled to a depth of 80 mm with commercial quality open cell polyurethane foam, or closed by other means subject to approval by the Engineer.

Section 51-1.12F(3)(c), "Joint Seal Assemblies," of the Standard Specifications is amended to read:

(c) Joint Seal Assemblies and Seismic Joints

- Joint seal assemblies and seismic joints shall be furnished and installed in joints in bridge decks as shown on the plans and as specified in the special provisions.

The eighth paragraph in Section 51-1.12H(1), "Plain and Fabric Reinforced Elastomeric Bearing Pads," of the Standard Specifications is amended to read:

- The elastomer, as determined from test specimens, shall conform to the following:

Test	ASTM Designation	Requirement
Tensile strength, MPa	D 412	15.5 Min.
Elongation at break, percent	D 412	350 Min.
Compression set, 22 h at 70°C, percent	D 395 (Method B)	25 Max.
Tear strength, kN/m	D 624 (Die C)	31.5 Min.
Hardness (Type A)	D 2240 with 2 kg. mass	55 ±5
Ozone resistance 20% strain, 100 h at 40°C ±2°C	D 1149 (except 100 ±20 parts per 100 000 000)	No cracks
Instantaneous thermal stiffening at -40°C	D 1043	Shall not exceed 4 times the stiffness measured at 23°C
Low temperature brittleness at -40°C	D 746 (Procedure B)	Pass

The table in the ninth paragraph of Section 51-1.12H(1), "Plain and Fabric Reinforced Elastomeric Bearing Pads," of the Standard Specifications is amended to read:

Tensile strength, percent	-15
Elongation at break, percent	-40; but not less than 300% total elongation of the material
Hardness, points	+10

The first paragraph in Section 51-1.12H(2), "Steel Reinforced Elastomeric Bearings," of the Standard Specifications is amended to read:

• Steel reinforced elastomeric bearings shall conform to the requirements for steel-laminated elastomeric bearings in ASTM Designation: D 4014 and the following:

A. The bearings shall consist of alternating steel laminates and internal elastomer laminates with top and bottom elastomer covers. Steel laminates shall have a nominal thickness of 1.9 mm (14 gage). Internal elastomer laminates shall have a thickness of 12 mm, and top and bottom elastomer covers shall each have a thickness of 6 mm. The combined thickness of internal elastomer laminates and top and bottom elastomer covers shall be equal to the bearing pad thickness shown on the plans. The elastomer cover to the steel laminates at the sides of the bearing shall be 3 mm. If guide pins or other devices are used to control the side cover over the steel laminates, any exposed portions of the steel laminates shall be sealed by vulcanized patching. The length, width, or diameter of the bearings shall be as shown on the plans.
B. The total thickness of the bearings shall be equal to the thickness of elastomer laminates and covers plus the thickness of the steel laminates.
C. Elastomer for steel reinforced elastomeric bearings shall conform to the provisions for elastomer in Section 51-1.12H(1), "Plain and Fabric Reinforced Elastomeric Bearing Pads."
D. A Certificate of Compliance conforming to the provisions in Section 6-1.07, "Certificates of Compliance," shall be furnished to the Engineer certifying that the bearings to be furnished conform to all of the above provisions. The Certificate of Compliance shall be supported by a certified copy of the results of tests performed by the manufacturer on the bearings.
E. One sample bearing shall be furnished to the Engineer from each lot of bearings to be furnished for the contract. Samples shall be available at least 3 weeks in advance of intended use. The sample bearing shall be one of the following:

Bearing Pad Thickness as Shown on the Plans	Sample Bearing
≤ 50 mm	Smallest complete bearing shown on the plans
> 50 mm	* 57 ± 3 mm thick sample not less than 200 mm x 305 mm in plan and cut by the manufacturer from the center of one of the thickest complete bearings

* The sample bearing plus remnant parts of the complete bearing shall be furnished to the Engineer.

F. A test specimen taken from the sample furnished to the Engineer will be tested in conformance with the requirements in California Test 663. Specimens tested shall show no indication of loss of bond between the elastomer and steel laminates.

The fourth paragraph in Section 51-1.14, "Waterstops," of the Standard Specifications is amended to read:

• Neoprene shall be manufactured from a vulcanized elastomeric compound containing neoprene as the sole elastomer and shall conform to the following:

Test	ASTM Designation	Requirement
Tensile strength, MPa	D 412	13.8 Min.
Elongation at break, percent	D 412	300 Min.
Compression set, 22 h at 70°C, percent	D 395 (Method B)	30 Max.
Tear strength, kN/m	D 624 (Die C)	26.3 Min.
Hardness (Type A)	D 2240	55±5
Ozone resistance 20% strain, 100 h at 38°C ±1°C	D 1149 (except 100± 20 parts per 100 000 000)	No cracks
Low temperature brittleness at -40°C	D 746 (Procedure B)	Pass
Flame resistance	C 542	Must not propagate flame
Oil Swell, ASTM Oil #3, 70 h at 100°C, volume change, percent	D 471	80 Max.
Water absorption, immersed 7 days at 70°C, change in mass, percent	D 471	15 Max.

The first sentence of the fourth paragraph in Section 51-1.17, "Finish Bridge Decks," of the Standard Specifications is amended to read:

• The smoothness of completed roadway surfaces of structures, approach slabs and the adjacent 15 m of approach pavement, and the top surfaces of concrete decks which are to be covered with another material, will be tested by the Engineer with a bridge profilograph in conformance with the requirements in California Test 547 and the requirements herein.

Section 51-1.17, "Finishing Bridge Decks," of the Standard Specifications is amended by deleting the seventh, thirteenth and fourteenth paragraphs.

The fourteenth paragraph in Section 51-1.23, "Payment," of the Standard Specifications is amended by deleting "and injecting epoxy in cracks".

SECTION 52: REINFORCEMENT

Issue Date: June 30, 2006

The first paragraph in Section 52-1.02A, "Bar Reinforcement," of the Standard Specifications is amended to read:

• Reinforcing bars shall be low-alloy steel deformed bars conforming to the requirements in ASTM Designation: A 706/A 706M, except that deformed or plain billet-steel bars conforming to the requirements in ASTM Designation: A 615/A 615M, Grade 280 or 420, may be used as reinforcement in the following 5 categories:

A. Slope and channel paving,
B. Minor structures,
C. Sign and signal foundations (pile and spread footing types),
D. Roadside rest facilities, and
E. Concrete barrier Type 50 and Type 60 series and temporary railing.

The third paragraph in Section 52-1.04, "Inspection," of the Standard Specifications is amended to read:

• A Certificate of Compliance conforming to the provisions in Section 6-1.07, "Certificates of Compliance," shall also be furnished for each shipment of epoxy-coated bar reinforcement or wire reinforcement certifying that the coated reinforcement conforms to the requirements in ASTM Designation: A 775/A 775M or A 884/A 884M respectively, and the provisions in Section 52-1.02B, "Epoxy-coated Reinforcement." The Certificate of Compliance shall include all of the certifications specified in ASTM Designation: A 775/A 775M or A 884/A 884M respectively.

The third paragraph of Section 52-1.06, "Bending," of the Standard Specifications is amended to read:

• Hooks and bends shall conform to the provisions of the Building Code Requirements for Structural Concrete of the American Concrete Institute.

Section 52-1.07 "Placing," of the Standard Specifications is amended by deleting item C of the third paragraph.

The eleventh paragraph in Section 52-1.07, "Placing," of the Standard Specifications is amended to read:

• Attention is directed to the provisions in Section 7-1.09, "Public Safety." Whenever a portion of an assemblage of bar reinforcing steel that is not encased in concrete exceeds 6 m in height, the Contractor shall submit to the Engineer for approval, in accordance with the provisions in Section 5-1.02, "Plans and Working Drawings," working drawings and design calculations for the temporary support system to be used. The working drawings and design calculations shall be signed by an engineer who is registered as a Civil Engineer in the State of California. The temporary support system shall be designed to resist all expected loads and shall be adequate to prevent collapse or overturning of the assemblage. If the installation of forms or other work requires revisions to or temporary release of any portion of the temporary support system, the working drawings shall show the support system to be used during each phase of construction. The minimum horizontal wind load to be applied to the bar reinforcing steel assemblage, or to a combined assemblage of reinforcing steel and forms, shall be the sum of the products of the wind impact area and the applicable wind pressure value for each height zone. The wind impact area is the total projected area of the cage normal to the direction of the applied wind. Wind pressure values shall be determined from the following table:

Height Zone (Meters above ground)	Wind Pressure Value (Pa)
0-9.0	960
9.1-15.0	1200
15.1-30.0	1440
Over 30	1675

Section 52-1.08 "Splicing," of the Standard Specifications is amended to read:

52-1.08 SPLICING

• Splices of reinforcing bars shall consist of lap splices, service splices, or ultimate butt splices.

• Splicing of reinforcing bars will not be permitted at a location designated on the plans as a "No-Splice Zone." At the option of the Contractor, reinforcing bars may be continuous at locations where splices are shown on the plans. The location of splices, except where shown on the plans, shall be determined by the Contractor using available commercial lengths where practicable.

• Unless otherwise shown on the plans, splices in adjacent reinforcing bars at any particular section shall be staggered. The minimum distance between staggered lap splices or mechanical lap splices shall be the same as the length required for a lap splice in the largest bar. The minimum distance between staggered butt splices shall be 600 mm, measured between the midpoints of the splices along a line which is centered between the axes of the adjacent bars.

52-1.08A Lap Splicing Requirements

• Splices made by lapping shall consist of placing reinforcing bars in contact and wiring them together, maintaining the alignment of the bars and the minimum clearances. Should the Contractor elect to use a butt welded or mechanical splice at a location not designated on the plans as requiring a service or ultimate butt splice, this splice shall conform to the testing requirements for service splice.

• Reinforcing bars shall not be spliced by lapping at locations where the concrete section is not sufficient to provide a minimum clear distance of 50 mm between the splice and the nearest adjacent bar. The clearance to the surface of the concrete specified in Section 52-1.07, "Placing," shall not be reduced.

• Reinforcing bars Nos. 43 and 57 shall not be spliced by lapping.

• Where ASTM Designations: A 615/A 615M, Grade 420 or A 706/A 706M reinforcing bars are required, the length of lap splices shall be as follows: Reinforcing bars No. 25 or smaller shall be lapped at least 45 diameters of the smaller bar joined; and reinforcing bars Nos. 29, 32, and 36 shall be lapped at least 60 diameters of the smaller bar joined, except when otherwise shown on the plans.

• Where ASTM Designation: A 615/A 615M, Grade 280 reinforcing bars are permitted, the length of lap splices shall be as follows: Reinforcing bars No. 25 or smaller shall be lapped at least 30 diameters of the smaller bar joined; and

reinforcing bars Nos. 29, 32, and 36 shall be lapped at least 45 diameters of the smaller bar joined, except when otherwise shown on the plans.

- Splices in bundled bars shall conform to the following:

A In bundles of 2 bars, the length of the lap splice shall be the same as the length of a single bar lap splice.
B. In bundles of 3 bars, the length of the lap splice shall be 1.2 times the length of a single bar lap splice.

- Welded wire fabric shall be lapped such that the overlap between the outermost cross wires is not less than the larger of:

A. 150 mm,
B. The spacing of the cross wires plus 50 mm, or
C. The numerical value of the longitudinal wire size (MW-Size Number) times 370 divided by the spacing of the longitudinal wires in millimeters.

52-1.08B Service Splicing and Ultimate Butt Splicing Requirements

- Service splices and ultimate butt splices shall be either butt welded or mechanical splices, shall be used at the locations shown on the plans, and shall conform to the requirements of these specifications and the special provisions.

52-1.08B(1) Mechanical Splices

- Mechanical splices to be used in the work shall be on the Department's current prequalified list before use. The prequalified list can be obtained from the Department's internet site listed in the special provisions or by contacting the Transportation Laboratory directly.
- When tested in conformance with the requirements in California Test 670, the total slip shall not exceed the values listed in the following table:

Reinforcing Bar Number	Total Slip (μm)
13	250
16	250
19	250
22	350
25	350
29	350
32	450
36	450
43	600
57	750

- Slip requirements shall not apply to mechanical lap splices, splices that are welded, or splices that are used on hoops.
- Splicing procedures shall be in conformance with the manufacturer's recommendations, except as modified in this section. Splices shall be made using the manufacturer's standard equipment, jigs, clamps, and other required accessories.
- Splice devices shall have a clear coverage of not less than 40 mm measured from the surface of the concrete to the outside of the splice device. Stirrups, ties, and other reinforcement shall be adjusted or relocated, and additional reinforcement shall be placed, if necessary, to provide the specified clear coverage to reinforcement.
- The Contractor shall furnish the following information for each shipment of splice material in conformance with the provisions in Section 6-1.07, "Certificates of Compliance:"

A. The type or series identification of the splice material including tracking information for traceability.
B. The bar grade and size number to be spliced.
C. A copy of the manufacturer's product literature giving complete data on the splice material and installation procedures.
D. A statement that the splicing systems and materials used in conformance with the manufacturer's installation procedures will develop the required tensile strengths, based on the nominal bar area, and will conform to the total slip requirements and the other requirements in these specifications.
E. A statement that the splice material conforms to the type of mechanical splice in the Department's current prequalified list.

52-1.08B(2) Butt Welded Splices

- Except for resistance butt welds, butt welded splices of reinforcing bars shall be complete joint penetration butt welds conforming to the requirements in AWS D 1.4, and these specifications.
- Welders and welding procedures shall be qualified in conformance with the requirements in AWS D 1.4.
- Only the joint details and dimensions as shown in Figure 3.2, "Direct Butt Joints," of AWS D 1.4, shall be used for making complete joint penetration butt welds of bar reinforcement. Split pipe backing shall not be used.
- Butt welds shall be made with multiple weld passes using a stringer bead without an appreciable weaving motion. The maximum stringer bead width shall be 2.5 times the diameter of the electrode and slagging shall be performed between each weld pass. Weld reinforcement shall not exceed 4 mm in convexity.
- Electrodes used for welding shall meet the minimum Charpy V-notch impact requirement of 27°J at –20°C.
- For welding of bars conforming to the requirements of ASTM Designation: A 615/A 615M, Grade 280 or Grade 420, the requirements of Table 5.2, "Minimum Preheat and Interpass Temperatures," of AWS D 1.4 are superseded by the following:

The minimum preheat and interpass temperatures shall be 200°C for Grade 280 bars and 300°C for Grade 420 bars. Immediately after completing the welding, at least 150 mm of the bar on each side of the splice shall be covered by an insulated wrapping to control the rate of cooling. The insulated wrapping shall remain in place until the bar has cooled below 90°C.

- When welding different grades of reinforcing bars, the electrode shall conform to Grade 280 bar requirements and the preheat shall conform to the Grade 420 bar requirements.
- In the event that any of the specified preheat, interpass, and post weld cooling temperatures are not met, all weld and heat affected zone metal shall be removed and the splice rewelded.
- Welding shall be protected from air currents, drafts, and precipitation to prevent loss of heat or loss of arc shielding. The method of protecting the welding area from loss of heat or loss of arc shielding shall be subject to approval by the Engineer.
- Reinforcing bars shall not be direct butt spliced by thermite welding.
- Procedures to be used in making welded splices in reinforcing bars, and welders employed to make splices in reinforcing bars, shall be qualified by tests performed by the Contractor on sample splices of the type to be used, before making splices to be used in the work.

52-1.08B(3) Resistance Butt Welds

- Shop produced resistance butt welds shall be produced by a fabricator who is approved by the Transportation Laboratory. The list of approved fabricators can be obtained from the Department's internet site or by contacting the Transportation Laboratory directly.
- Before manufacturing hoops using resistance butt welding, the Contractor shall submit to the Engineer the manufacturer's Quality Control (QC) manual for the fabrication of hoops. As a minimum, the QC manual shall include the following:

A. The pre-production procedures for the qualification of material and equipment.
B. The methods and frequencies for performing QC procedures during production.
C. The calibration procedures and calibration frequency for all equipment.
D. The welding procedure specification (WPS) for resistance welding.
E. The method for identifying and tracking lots.

52-1.08C Service Splice and Ultimate Butt Splice Testing Requirements

- The Contractor shall designate in writing a splicing Quality Control Manager (QCM). The QCM shall be responsible directly to the Contractor for 1) the quality of all service and ultimate butt splicing including the inspection of materials and workmanship performed by the Contractor and all subcontractors; and 2) submitting, receiving, and approving all correspondence, required submittals, and reports regarding service and ultimate splicing to and from the Engineer.
- The QCM shall not be employed or compensated by any subcontractor, or by other persons or entities hired by subcontractors, who will provide other services or materials for the project. The QCM may be an employee of the Contractor.
- Testing on prequalification and production sample splices shall be performed at the Contractor's expense, at an independent qualified testing laboratory. The laboratory shall not be employed or compensated by any subcontractor, or by other persons or entities hired by subcontractors who will provide other services or materials for the project, and shall have the following:

A. Proper facilities, including a tensile testing machine capable of breaking the largest size of reinforcing bar to be tested with minimum lengths as shown in this section.
B. A device for measuring the total slip of the reinforcing bars across the splice to the nearest 25 µm, that, when placed parallel to the longitudinal axis of the bar is able to simultaneously measure movement across the splice at 2 locations 180 degrees apart.
C. Operators who have received formal training for performing the testing requirements of ASTM Designation: A 370 and California Test 670.
D. A record of annual calibration of testing equipment performed by an independent third party that has 1) standards that are traceable to the National Institute of Standards and Technology, and 2) a formal reporting procedure, including published test forms.

• The Contractor shall provide samples for quality assurance testing in conformance with the provisions in these specifications and the special provisions.

• Prequalification and production sample splices shall be 1) a minimum length of 1.5 meters for reinforcing bars No. 25 or smaller, and 2 meters for reinforcing bars No. 29 or larger, with the splice located at mid-point; and 2) suitably identified before shipment with weatherproof markings that do not interfere with the Engineer's tamper-proof markings or seals. Splices that show signs of tampering will be rejected.

• Shorter length sample splice bars may be furnished if approved in writing by the Engineer.

• The Contractor shall ensure that sample splices are properly secured and transported to the testing laboratory in such a manner that no alterations to the physical conditions occur during transportation. Sample splices shall be tested in the same condition as received. No modifications to the sample splices shall be made before testing.

• Each set or sample splice, as defined herein, shall be identified as representing either a prequalification or production test sample splice.

• For the purpose of production testing, a lot of either service splices or ultimate butt splices is defined as 1) 150, or fraction thereof, of the same type of mechanical splices used for each bar size and each bar deformation pattern that is used in the work, or 2) 150, or fraction thereof, of complete joint penetration butt welded splices or resistance butt welded splices for each bar size used in the work. If different diameters of hoop reinforcement are shown on the plans, separate lots shall be used for each different hoop diameter.

• Whenever a lot of splices is rejected, the rejected lot and subsequent lots of splices shall not be used in the work until 1) the QCM performs a complete review of the Contractor's quality control process for these splices, 2) a written report is submitted to the Engineer describing the cause of failure for the splices in this lot and provisions for preventing similar failures in future lots, and 3) the Engineer has provided the Contractor with written notification that the report is acceptable. The Engineer shall have 3 working days after receipt of the report to provide notification to the Contractor. In the event the Engineer fails to provide notification within the time allowed, and if, in the opinion of the Engineer, completion of the work is delayed or interfered with by reason of the Engineer's delay in providing notification, the Contractor will be compensated for any resulting loss, and an extension of time will be granted in the same manner as provided for in Section 8-1.09, "Right of Way Delays."

52-1.08C(1) Splice Prequalification Report

• Before using any service splices or ultimate butt splices in the work, the Contractor shall submit a Splice Prequalification Report. The report shall include splice material information, names of the operators who will be performing the splicing, and descriptions of the positions, locations, equipment, and procedures that will be used in the work.

• The Splice Prequalification Report shall also include certifications from the fabricator for prequalifications of operators and procedures based on sample tests performed no more than 2 years before submitting the report. Each operator shall be certified by performing 2 sample splices for each bar size of each splice type that the operator will be performing in the work. For deformation-dependent types of splice devices, each operator shall be certified by performing 2 additional samples for each bar size and deformation pattern that will be used in the work.

• Prequalification sample splices shall be tested by an independent qualified testing laboratory and shall conform to the appropriate production test criteria and slip requirements specified herein. When epoxy-coated reinforcement is required, resistance butt welded sample splices shall have the weld flash removed by the same procedure as will be used in the work, before coating and testing. The Splice Prequalification Report shall include the certified test results for all prequalification sample splices.

• The QCM shall review and approve the Splice Prequalification Report before submitting it to the Engineer for approval. The Contractor shall allow 2 weeks for the review and approval of a complete report before performing any service splicing or ultimate butt splicing in the work. In the event the Engineer fails to complete the review within the time allowed, and in the opinion of the Engineer, completion of the work is delayed or interfered with by reason of the Engineer's delay in completing the review, the Contractor will be compensated for any resulting loss, and an extension of time will be granted, in the same manner as provided for in Section 8-1.09, "Right of Way Delays."

52-1.08C(2) Service Splice Test Criteria

- Service production and quality assurance sample splices shall be tensile tested in conformance with the requirements in ASTM Designation: A 370 and California Test 670 and shall develop a minimum tensile strength of not less than 550 MPa.

52-1.08C(2)(a) Production Test Requirements for Service Splices

- Production tests shall be performed by the Contractor's independent laboratory for all service splices used in the work. A production test shall consist of testing 4 sample splices prepared for each lot of completed splices. The samples shall be prepared by the Contractor using the same splice material, position, operators, location, and equipment, and following the same procedure as used in the work.
- At least one week before testing, the Contractor shall notify the Engineer in writing of the date when and the location where the testing of the samples will be performed.
- The 4 samples from each production test shall be securely bundled together and identified with a completed sample identification card before shipment to the independent laboratory. The card will be furnished by the Engineer. Bundles of samples containing fewer than 4 samples of splices shall not be tested.
- Before performing any tensile tests on production test sample splices, one of the 4 samples shall be tested for, and shall conform to, the requirements for total slip. Should this sample not meet the total slip requirements, one retest, in which the 3 remaining samples are tested for total slip, will be allowed. Should any of the 3 remaining samples not conform to the total slip requirements, all splices in the lot represented by this production test will be rejected.
- If 3 or more sample splices from a production test conform to the provisions in this Section 52-1.08C(2),"Service Splice Test Criteria," all splices in the lot represented by this production test will be considered acceptable, provided each of the 4 samples develop a minimum tensile strength of not less than 420 MPa.
- Should only 2 sample splices from a production test conform to the provisions in this Section 52-1.08C(2), "Service Splice Test Criteria," one additional production test shall be performed on the same lot of splices. This additional production test shall consist of testing 4 samples splices that have been randomly selected by the Engineer and removed by the Contractor from the actual completed lot of splices. Should any of the 4 splices from this additional test fail to conform to these provisions, all splices in the lot represented by these production tests will be rejected.
- If only one sample splice from a production test conforms to the provisions in this Section 52-1.08C(2), "Service Splice Test Criteria," all splices in the lot represented by this production test will be rejected.
- If a production test for a lot fails, the Contractor shall repair or replace all reinforcing bars from which sample splices were removed before the Engineer selects additional splices from this lot for further testing.

52-1.08C(2)(b) Quality Assurance Test Requirements for Service Splices

- For the first production test performed, and for at least one, randomly selected by the Engineer, of every 5 subsequent production tests, or portion thereof, the Contractor shall concurrently prepare 4 additional service quality assurance sample splices. These service quality assurance sample splices shall be prepared in the same manner as specified herein for service production sample splices.
- These 4 additional quality assurance sample splices shall be shipped to the Transportation Laboratory for quality assurance testing. The 4 sample splices shall be securely bundled together and identified by location and contract number with weatherproof markings before shipment. Bundles containing fewer than 4 samples of splices will not be tested. Sample splices not accompanied by the supporting documentation required in Section 52-1.08B(1), for mechanical splices, or in Section 52-1.08B(3), for resistance butt welds, will not be tested.
- Quality assurance testing will be performed in conformance with the requirements for service production sample splices in Section 52-1.08C(2)(a), "Production Test Requirements for Service Splices."

52-1.08C(3) Ultimate Butt Splice Test Criteria

- Ultimate production and quality assurance sample splices shall be tensile tested in conformance with the requirements described in ASTM Designation: A 370 and California Test 670.
- A minimum of one control bar shall be removed from the same bar as, and adjacent to, all ultimate prequalification, production, and quality assurance sample splices. Control bars shall be 1) a minimum length of one meter for reinforcing bars No. 25 or smaller and 1.5 meters for reinforcing bars No. 29 or larger, and 2) suitably identified before shipment with weatherproof markings that do not interfere with the Engineer's tamper-proof markings or seals. The portion of adjacent bar remaining in the work shall also be identified with weatherproof markings that correspond to its adjacent control bar.
- Each sample splice and its associated control bar shall be identified and marked as a set. Each set shall be identified as representing a prequalification, production, or quality assurance sample splice.
- The portion of hoop reinforcing bar, removed to obtain a sample splice and control bar, shall be replaced using a prequalified ultimate mechanical butt splice, or the hoop shall be replaced in kind.

• Reinforcing bars, other than hoops, from which sample splices are removed, shall be repaired using ultimate mechanical butt splices conforming to the provisions in Section 52-1.08C(1), "Splice Prequalification Report," or the bars shall be replaced in kind. These bars shall be repaired or replaced such that no splices are located in any "No Splice Zone" shown on the plans.

• Ultimate production and quality assurance sample splices shall rupture in the reinforcing bar either: 1) outside of the affected zone or 2) within the affected zone, provided that the sample splice has achieved at least 95 percent of the ultimate tensile strength of the control bar associated with the sample splice. In addition, necking of the bar, as defined in California Test 670, shall be evident at rupture regardless of whether the bar breaks inside or outside the affected zone.

• The affected zone is the portion of the reinforcing bar where any properties of the bar, including the physical, metallurgical, or material characteristics, have been altered by fabrication or installation of the splice.

• The ultimate tensile strength shall be determined for all control bars by tensile testing the bars to rupture, regardless of where each sample splice ruptures. If 2 control bars are tested for one sample splice, the bar with the lower ultimate tensile strength shall be considered the control bar.

52-1.08C(3)(a) Production Test Requirements for Ultimate Butt Splices

• Production tests shall be performed for all ultimate butt splices used in the work. A production test shall consist of testing 4 sets of sample splices and control bars removed from each lot of completed splices, except when quality assurance tests are performed.

• After the splices in a lot have been completed, and the bars have been epoxy-coated when required, the QCM shall notify the Engineer in writing that the splices in this lot conform to the specifications and are ready for testing. Except for hoops, sample splices will be selected by the Engineer at the job site. Sample splices for hoops will be selected by the Engineer either at the job site or a fabrication facility.

• After notification has been received, the Engineer will randomly select the 4 sample splices to be removed from the lot and place tamper-proof markings or seals on them. The Contractor shall select the adjacent control bar for each sample splice bar, and the Engineer will place tamper-proof markings or seals on them. These ultimate production sample splices and control bars shall be removed by the Contractor, and tested by an independent qualified testing laboratory.

• At least one week before testing, the Contractor shall notify the Engineer in writing of the date when and the location where the testing of the samples will be performed.

• A sample splice or control bar from any set will be rejected if a tamper-proof marking or seal is disturbed before testing.

• The 4 sets from each production test shall be securely bundled together and identified with a completed sample identification card before shipment to the independent laboratory. The card will be furnished by the Engineer. Bundles of samples containing fewer than 4 sets of splices shall not be tested.

• Before performing any tensile tests on production test sample splices, one of the 4 sample splices shall be tested for, and shall conform to, the requirements for total slip. Should this sample splice not meet these requirements, one retest, in which the 3 remaining sample splices are tested for total slip, will be allowed. Should any of the 3 remaining sample splices not conform to these requirements, all splices in the lot represented by this production test will be rejected.

• If 3 or more sample splices from a production test conform to the provisions in Section 52-1.08C(3), "Ultimate Butt Splice Test Criteria," all splices in the lot represented by this production test will be considered acceptable.

• Should only 2 sample splices from a production test conform to the provisions in Section 52-1.08C(3), "Ultimate Butt Splice Test Criteria," one additional production test shall be performed on the same lot of splices. Should any of the 4 sample splices from this additional test fail to conform to these provisions, all splices in the lot represented by these production tests will be rejected.

• If only one sample splice from a production test conforms to the provisions in Section 52-1.08C(3), "Ultimate Butt Splice Test Criteria," all splices in the lot represented by this production test will be rejected.

• If a production test for a lot fails, the Contractor shall repair or replace all reinforcing bars from which sample splices were removed, complete in place, before the Engineer selects additional splices from this lot for further testing.

• Production tests will not be required on repaired splices from a lot, regardless of the type of prequalified ultimate mechanical butt splice used to make the repair. However, should an additional production test be required, the Engineer may select any repaired splice for the additional production test.

52-1.08C(3)(b) Quality Assurance Test Requirements for Ultimate Butt Splices

• For the first production test performed, and for at least one, randomly selected by the Engineer, of every 5 subsequent production tests, or portion thereof, the Contractor shall concurrently prepare 4 additional ultimate quality assurance sample splices along with associated control bars.

• Each time 4 additional ultimate quality assurance sample splices are prepared, 2 of these quality assurance sample splice and associated control bar sets and 2 of the production sample splice and associated control bar sets, together, shall conform to the requirements for ultimate production sample splices in Section 52-1.08C(3)(a),"Production Test Requirements for Ultimate Butt Splices."

- The 2 remaining quality assurance sample splice and associated control bar sets, along with the 2 remaining production sample splice and associated control bar sets shall be shipped to the Transportation Laboratory for quality assurance testing. The 4 sets shall be securely bundled together and identified by location and contract number with weatherproof markings before shipment. Bundles containing fewer than 4 sets will not be tested.
- Quality assurance testing will be performed in conformance with the requirements for ultimate production sample splices in Section 52-1.08C(3)(a), "Production Test Requirements for Ultimate Butt Splices."

52-1.08C(3)(c) Nondestructive Splice Tests

- When the specifications allow for welded sample splices to be taken from other than the completed lot of splices, the Contractor shall meet the following additional requirements.
- Except for resistance butt welded splices, radiographic examinations shall be performed on 25 percent of all complete joint penetration butt welded splices from a production lot. The size of a production lot will be a maximum of 150 splices. The Engineer will select the splices which will compose the production lot and also the splices within each production lot to be radiographically examined.
- All required radiographic examinations of complete joint penetration butt welded splices shall be performed by the Contractor in conformance with the requirements in AWS D 1.4 and these specifications.
- Before radiographic examination, welds shall conform to the requirements in Section 4.4, "Quality of Welds," of AWS D 1.4.
- Should more than 12 percent of the splices which have been radiographically examined in any production lot be defective, an additional 25 percent of the splices, selected by the Engineer from the same production lot, shall be radiographically examined. Should more than 12 percent of the cumulative total of splices tested from the same production lot be defective, all remaining splices in the lot shall be radiographically examined.
- Additional radiographic examinations performed due to the identification of defective splices shall be at the Contractor's expense.
- All defects shall be repaired in conformance with the requirements in AWS D 1.4.
- The Contractor shall notify the Engineer in writing 48 hours before performing any radiographic examinations.
- The radiographic procedure used shall conform to the requirements in AWS D1.1, AWS D1.4, and the following:

Two exposures shall be made for each complete joint penetration butt welded splice. For each of the 2 exposures, the radiation source shall be centered on each bar to be radiographed. The first exposure shall be made with the radiation source placed at zero degrees from the top of the weld and perpendicular to the weld root and identified with a station mark of "0." The second exposure shall be at 90 degrees to the "0" station mark and shall be identified with a station mark of "90." When obstructions prevent a 90 degree placement of the radiation source for the second exposure, and when approved in writing by the Engineer, the source may be rotated, around the centerline of the reinforcing bar, a maximum of 25 degrees.

For field produced complete joint penetration butt welds, no more than one weld shall be radiographed during one exposure. For shop produced complete joint penetration butt welds, if more than one weld is to be radiographed during one exposure, the angle between the root line of each weld and the direction to the radiation source shall be not less than 65 degrees.

Radiographs shall be made by either X-ray or gamma ray. Radiographs made by X-ray or gamma rays shall have densities of not less than 2.3 nor more than 3.5 in the area of interest. A tolerance of 0.05 in density is allowed for densitometer variations. Gamma rays shall be from the iridium 192 isotope and the emitting specimen shall not exceed 4.45 mm in the greatest diagonal dimension.

The radiographic film shall be placed perpendicular to the radiation source at all times; parallel to the root line of the weld unless source placement determines that the film must be turned; and as close to the root of the weld as possible.

The minimum source to film distance shall be maintained so as to ensure that all radiographs maintain a maximum geometric unsharpness of 0.020 at all times, regardless of the size of the reinforcing bars.

Penetrameters shall be placed on the source side of the bar and perpendicular to the radiation source at all times. One penetrameter shall be placed in the center of each bar to be radiographed, perpendicular to the weld root, and adjacent to the weld. Penetrameter images shall not appear in the weld area.

When radiography of more than one weld is being performed per exposure, each exposure shall have a minimum of one penetrameter per bar, or 3 penetrameters per exposure. When 3 penetrameters per exposure are used, one penetrameter shall be placed on each of the 2 outermost bars of the exposure, and the remaining penetrameter shall be placed on a centrally located bar.

An allowable weld buildup of 4 mm may be added to the total material thickness when determining the proper penetrameter selection. No image quality indicator equivalency will be accepted. Wire penetrameters or penetrameter blocks shall not be used.

Penetrameters shall be sufficiently shimmed using a radiographically identical material. Penetrameter image densities shall be a minimum of 2.0 and a maximum of 3.6.

Radiographic film shall be Class 1, regardless of the size of reinforcing bars.

Radiographs shall be free of film artifacts and processing defects, including, but not limited to, streaks, scratches, pressure marks or marks made for the purpose of identifying film or welding indications.

Each splice shall be clearly identified on each radiograph and the radiograph identification and marking system shall be established between the Contractor and the Engineer before radiographic inspection begins. Film shall be identified by lead numbers only; etching, flashing or writing in identifications of any type will not be permitted. Each piece of film identification information shall be legible and shall include, as a minimum, the following information: Contractor's name, date, name of nondestructive testing firm, initials of radiographer, contract number, part number and weld number. The letter "R" and repair number shall be placed directly after the weld number to designate a radiograph of a repaired weld.

Radiographic film shall be developed within a time range of one minute less to one minute more than the film manufacturer's recommended maximum development time. Sight development will not be allowed.

Processing chemistry shall be done with a consistent mixture and quality, and processing rinses and tanks shall be clean to ensure proper results. Records of all developing processes and any chemical changes to the developing processes shall be kept and furnished to the Engineer upon request. The Engineer may request, at any time, that a sheet of unexposed film be processed in the presence of the Engineer to verify processing chemical and rinse quality.

The results of all radiographic interpretations shall be recorded on a signed certification and a copy kept with the film packet.

Technique sheets prepared in conformance with the requirements in ASME Boiler and Pressure Vessels Code, Section V, Article 2 Section T-291 shall also contain the developer temperature, developing time, fixing duration and all rinse times.

52-1.08D Reporting Test Results

- A Production Test Report for all testing performed on each lot shall be prepared by the independent testing laboratory performing the testing and submitted to the QCM for review and approval. The report shall be signed by an engineer who represents the laboratory and is registered as a Civil Engineer in the State of California. The report shall include, as a minimum, the following information for each test: contract number, bridge number, lot number and location, bar size, type of splice, length of mechanical splice, length of test specimen, physical condition of test sample splice and any associated control bar, any notable defects, total measured slip, ultimate tensile strength of each splice, and for ultimate butt splices, limits of affected zone, location of visible necking area, ultimate tensile strength and 95 percent of this ultimate tensile strength for each control bar, and a comparison between 95 percent of the ultimate tensile strength of each control bar and the ultimate tensile strength of its associated splice.
- The QCM must review, approve, and forward each Production Test Report to the Engineer for review before the splices represented by the report are encased in concrete. The Engineer will have 3 working days to review each Production Test Report and respond in writing after a complete report has been received. Should the Contractor elect to encase any splices before receiving notification from the Engineer, it is expressly understood that the Contractor will not be relieved of the responsibility for incorporating material in the work that conforms to the requirements of the plans and specifications. Material not conforming to these requirements will be subject to rejection. Should the Contractor elect to wait to encase splices pending notification by the Engineer, and in the event the Engineer fails to complete the review and provide notification within the time allowed, and if, in the opinion of the Engineer, the work is delayed or interfered with by reason of the Engineer's delay in completing the review, the Contractor will be compensated for any resulting loss, and an extension of time will be granted, in the same manner as provided for in Section 8-1.09, "Right of Way Delays."
- Quality assurance test results for each bundle of 4 sets or 4 samples of splices will be reported in writing to the Contractor within 3 working days after receipt of the bundle by the Transportation Laboratory. In the event that more than one bundle is received on the same day, 2 additional working days shall be allowed for providing test results for each additional bundle received. A test report will be made for each bundle received. Should the Contractor elect to encase splices before receiving notification from the Engineer, it is expressly understood that the Contractor will not be relieved of the responsibility for incorporating material in the work that conforms to the requirements of the plans and specifications. Material not conforming to these requirements will be subject to rejection. Should the Contractor elect to wait to encase splices pending notification by the Engineer, and in the event the Engineer fails to complete the review within the time allowed, and in the opinion of the Engineer, completion of the work is delayed or interfered with by reason of the Engineer's delay in completing the review, the Contractor will be compensated for any resulting loss, and an extension of time will be granted, in the same manner as provided for in Section 8-1.09, "Right of Way Delays."

Section 52-1.11, "Payment," of the Standard Specifications is amended by adding the following paragraph after the seventh paragraph:

• If a portion or all of the reinforcing steel is epoxy-coated more than 480 air line kilometers from both Sacramento and Los Angeles, additional shop inspection expenses will be sustained by the State. Whereas it is and will be impracticable and extremely difficult to ascertain and determine the actual increase in these expenses, it is agreed that payment to the Contractor for furnishing the epoxy-coated reinforcement will be reduced $5000 for each epoxy-coating facility located more than 480 air line kilometers from both Sacramento and Los Angeles and an additional $3000 ($8000 total) for each epoxy-coating facility located more than 4800 air line kilometers from both Sacramento and Los Angeles.

SECTION 55: STEEL STRUCTURES

Issue Date: July 21, 2006

The third and fourth paragraphs of Section 55-1.01, "Description," of the Standard Specifications are amended to read:

• Details of connections for highway bridges selected for use by the Contractor shall conform to the AASHTO LRFD Bridge Design Specifications with Caltrans Amendments.

• Details of design selected by the Contractor, fabrication and workmanship, for steel railway bridges shall conform to the requirements of the Specifications for Steel Railway Bridges, for Fixed Spans Not Exceeding 400 Feet in Length of the AREMA, as set forth in the special provisions.

The third paragraph of Section 55-1.05, "Falsework," of the Standard Specifications is amended to read:

• Construction methods and equipment employed by the Contractor shall conform to the provisions in Section 7-1.02, "Load Limitations." Loads imposed on existing, new or partially completed structures shall not exceed the load carrying capacity of the structure, or portion of structure, as determined by the AASHTO LRFD Bridge Design Specifications with Caltrans Amendments.

The fourth and fifth paragraphs of Section 55-2.01, "Description," of the Standard Specifications are amended to read:

• All structural steel plate used for the fabrication of tension members, tension flanges, eyebars and hanger plates and for splice plates of tension members, tension flanges and eyebars shall meet the longitudinal Charpy V-notch impact value requirements specified herein. Sampling procedures shall conform to the requirements in ASTM Designation: A 673. The H (Heat) frequency of testing shall be used for structural steels conforming to the requirements in ASTM Designations: A 709/A 709M, Grades 36 [250], 50 [345], 50W [345W], and HPS 50W [345W]. The P (Piece) frequency of testing shall be used for structural steel conforming to the requirements in ASTM Designation: A 709/A 709M, Grades HPS 70W [485W], 100 [690], and 100W [690W]. Charpy V-notch impact values shall be determined in conformance with the requirements in ASTM Designation: E 23.

• Charpy V-notch (CVN) impact values shall conform to the following minimum values for non fracture critical members:

Material Conforming to ASTM Designation: A 709/A 709M	CVN Impact Value (Joules at Temp.)
Grade 36 [250]	20 at 4°C
Grade 50 [345]* (50 mm and under in thickness)	20 at 4°C
Grade 50W [345W]* (50 mm and under in thickness)	20 at 4°C
Grade 50 [345]* (Over 50 mm to 100 mm in thickness)	27 at 4°C
Grade 50W [345W]* (Over 50 mm to 100 mm in thickness)	27 at 4°C
Grade HPS 50W [345W]* (100 mm and under in thickness)	27 at -12°C
Grade HPS 70W [485]* (100 mm and under in thickness)	34 at -23°C
Grade 100 [490] (65 mm and under in thickness)	34 at -18°C
Grade 100W [490W] (Over 65 mm to 100 mm in thickness)	48 at -18°C

* If the yield point of the material exceeds 450 MPa, the temperature for the CVN impact value for acceptability shall be reduced 8°C for each increment of 70 MPa above 450 MPa.

Structural Steel Materials

Material	Specification
Structural steel:	
Carbon steel	ASTM: A 709/A 709M, Grade 36 [250] or {A 36/A 36M}a
High strength low alloy columbium vanadium steel	ASTM: A 709/A 709M, Grade 50 [345]or {A 572/A 572M, Grade 50 [345]}a
High strength low alloy structural steel	ASTM: A 709/A 709M, Grade 50W [345W], Grade HPS 50W [HSP 345W], or {A 588/A 588M}a
High strength low alloy structural steel plate	ASTM: A 709/A 709M, Grade HPS 70W [HPS 485W]
High-yield strength, quenched and tempered alloy steel plate suitable for welding	ASTM: A 709/A 709M, Grade 100 [690] and Grade 100W [690W], or {A 514/A 514M}a
Steel fastener components for general applications:	
Bolts and studs	ASTM: A 307
Headed anchor bolts	ASTM: A 307, Grade B, including S1 supplementary requirements
Nonheaded anchor bolts	ASTM: A 307, Grade C, including S1 supplementary requirements and S1.6 of AASHTO: M 314 supplementary requirements or AASHTO: M 314, Grade 36 or 55, including S1 supplementary requirements
High-strength bolts and studs	ASTM: A 449, Type 1
High-strength threaded rods	ASTM: A 449, Type 1
High-strength nonheaded anchor bolts	ASTM: A 449, Type 1
Nuts	ASTM: A 563, including Appendix X1b
Washers	ASTM: F 844

Components of high-strength steel fastener assemblies for use in structural steel joints:	
Bolts	ASTM: A 325, Type 1
Tension control bolts	ASTM: F 1852, Type 1
Nuts	ASTM: A 563, including Appendix X1b
Hardened washers	ASTM : F 436, Type 1, Circular, including S1 supplementary requirements
Direct tension indicators	ASTM: F 959, Type 325, zinc-coated
Carbon steel for forgings, pins and rollers	ASTM: A 668/A 668M, Class D
Alloy steel for forgings	ASTM: A 668/A 668M, Class G
Pin nuts	ASTM: A 36/A 36M
Carbon-steel castings	ASTM: A 27/A 27M, Grade 65-35, Class 1
Malleable iron castings	ASTM: A 47, Grade 32510 or A 47M, Grade 22010
Gray iron castings	ASTM: A 48, Class 30B
Carbon steel structural tubing	ASTM: A 500, Grade B or A 501
Steel pipe (Hydrostatic testing will not apply)	ASTM: A 53, Type E or S, Grade B; A 106, Grade B; or A 139, Grade B
Stud connectors	ASTM: A 108 and AASHTO/AWS D1.5

a Grades that may be substituted for the equivalent ASTM Designation: A 709 steel, at the Contractor's option, subject to the modifications and additions specified and to the requirements of A 709.

b Zinc-coated nuts that will be tightened beyond snug or wrench tight shall be furnished with a dry lubricant conforming to Supplementary Requirement S2 in ASTM Designation: A 563.

The first sentence of the first paragraph of Section 55-2.02, " Structural Steel," of the Standard Specifications is amended to read:

• Unless otherwise specified or shown on the plans, all structural steel plates, shapes, and bars shall conform to ASTM Designation: A 709/A 709M, Grade 50 [345].

Section 55-3.14, "Bolted Connections," of the Standard Specifications is amended by adding the following after the ninth paragraph:

• If a torque multiplier is used in conjunction with a calibrated wrench as a method for tightening fastener assemblies to the required tension, both the multiplier and the wrench shall be calibrated together as a system. The same length input and output sockets and extensions that will be used in the work shall also be included in the calibration of the system. The manufacturer's torque multiplication ratio shall be adjusted during calibration of the system, such that when this adjusted ratio is multiplied by the actual input calibrated wrench reading, the product is a calculated output torque that is within 2 percent of the true output torque. When this system is used in the work to perform any installation tension testing, rotational capacity testing, fastener tightening, or tension verification, it shall be used, intact as calibrated.

The second paragraph of Section 55-3.17, "Welding," of the Standard Specifications is amended to read:

• The minimum size of all fillet welds, except those to reinforce groove welds, shall be as shown in the following table:

Base Metal Thickness of the Thicker Part Joined (Millimeters)	*Minimum Size of Fillet Weld (Millimeters)
To 19 inclusive	6
Over 19	8

* Except that the weld size need not exceed the thickness of the thinner part joined.

The third paragraph of Section 55-3.19, "Bearings and Anchorages," is amended to read:

• Immediately before setting bearing assemblies or masonry plates directly on ground concrete surfaces, the Contractor shall thoroughly clean the surfaces of the concrete and the metal to be in contact and shall apply a coating of polysulfide or polyurethane caulking conforming to the requirements in ASTM Designation: C 920, Type S, Grade NS, Class 25, Use M, to contact areas to provide full bedding.

The sixth paragraph of Section 55-4.02, "Payment," of the Standard Specifications is amended to read:

• If a portion or all of the structural steel is fabricated more than 480 air line kilometers from both Sacramento and Los Angeles, additional shop inspection expenses will be sustained by the State. Whereas it is and will be impracticable and extremely difficult to ascertain and determine the actual increase in these expenses, it is agreed that payment to the Contractor for furnishing the structural steel from each fabrication site located more than 480 air line kilometers from both Sacramento and Los Angeles will be reduced $5000 or by an amount computed at $0.044 per kilogram of structural steel fabricated, whichever is greater, or in the case of each fabrication site located more than 4800 air line kilometers from both Sacramento and Los Angeles, payment will be reduced $8000 or by $0.079 per kilogram of structural steel fabricated, whichever is greater.

SECTION 56: SIGNS

Issue Date: November 2, 2004

Section 56-1.01, "Description," of the Standard Specifications is amended by deleting the third paragraph.

Section 56-1.02A, "Bars, Plates and Shapes," of the Standard Specifications is amended to read:

56-1.02A Bars, Plates, Shapes, and Structural Tubing

• Bars, plates, and shapes shall be structural steel conforming to the requirements in ASTM Designation: A 36/A 36M, except, at the option of the Contractor, the light fixture mounting channel shall be continuous-slot steel channel conforming to the requirements in ASTM Designation: A 1011/A 1011M, Designation SS, Grade 33[230], or aluminum Alloy 6063-T6 extruded aluminum conforming to the requirements in ASTM Designation: B 221 or B 221M.

• Structural tubing shall be structural steel conforming to the requirements in ASTM Designation: A 500, Grade B.

• Removable sign panel frames shall be constructed of structural steel conforming to the requirements in ASTM Designation: A 36/A 36M.

Section 56-1.02B, "Sheets," of the Standard Specifications is amended to read:

56-1.02B Sheets

• Sheets shall be carbon-steel sheets conforming to the requirements in ASTM Designation: A 1011/A 1011M, Designation SS, Grade 33[230].

• Ribbed sheet metal for box beam-closed truss sign structures shall be fabricated from galvanized sheet steel conforming to the requirements in ASTM Designation: A 653/A 653M, Designation SS, Grade 33[230]. Sheet metal panels shall be G 165 coating designation in conformance with the requirements in ASTM Designation: A 653/A 653M.

Section 56-1.02F, "Steel Walkway Gratings," of the Standard Specifications is amended to read:

56-1.02F Steel Walkway Gratings

• Steel walkway gratings shall be furnished and installed in conformance with the details shown on the plans and the following provisions:

A. Gratings shall be the standard product of an established grating manufacturer.
B. Material for gratings shall be structural steel conforming to the requirements in ASTM Designation: A 1011/A 1011M, Designation CS, Type B.
C. For welded type gratings, each joint shall be full resistance welded under pressure, to provide a sound, completely beaded joint.
D. For mechanically locked gratings, the method of fabrication and interlocking of the members shall be approved by the Engineer, and the fabricated grating shall be equal in strength to the welded type.

E. Gratings shall be accurately fabricated and free from warps, twists, or other defects affecting their appearance or serviceability. Ends of all rectangular panels shall be square. The tops of the bearing bars and cross members shall be in the same plane. Gratings distorted by the galvanizing process shall be straightened.

The sixth through the thirteenth paragraphs in Section 56-1.03, "Fabrication," of the Standard Specifications are amended to read:

- High-strength bolted connections, where shown on the plans, shall conform to the provisions in Section 55-3.14, "Bolted Connections," except that only fastener assemblies consisting of a high-strength bolt, nut, hardened washer, and direct tension indicator shall be used.
- High-strength fastener assemblies, and any other bolts, nuts, and washers attached to sign structures shall be zinc-coated by the mechanical deposition process.
- Nuts for high-strength bolts designated as snug-tight shall not be lubricated.
- An alternating snugging and tensioning pattern for anchor bolts and high-strength bolted splices shall be used. Once tensioned, high-strength fastener components and direct tension indicators shall not be reused.
- For bolt diameters less than 10 mm, the diameter of the bolt hole shall be not more than 0.80-mm larger than the nominal bolt diameter. For bolt diameters greater than or equal to 10 mm, the diameter of the bolt hole shall be not more than 1.6 mm larger than the nominal bolt diameter.
- Sign structures shall be fabricated into the largest practical sections prior to galvanizing.
- Ribbed sheet metal panels for box beam closed truss sign structures shall be fastened to the truss members by cap screws or bolts as shown on the plans, or by 4.76 mm stainless steel blind rivets conforming to Industrial Fasteners Institute, Standard IFI-114, Grade 51. The outside diameter of the large flange rivet head shall be not less than 15.88 mm in diameter. Web splices in ribbed sheet metal panels may be made with similar type blind rivets of a size suitable for the thickness of material being connected.
- Spalling or chipping of concrete structures shall be repaired by the Contractor at the Contractor's expense.
- Overhead sign supports shall have an aluminum identification plate permanently attached near the base, adjacent to the traffic side on one of the vertical posts, using either stainless steel rivets or stainless steel screws. As a minimum, the information on the plate shall include the name of the manufacturer, the date of manufacture and the contract number.

The fifth paragraph of Section 56-2.02B, "Wood Posts," of the Standard Specifications is amended to read:

- Douglas fir and Hem-Fir posts shall be treated in conformance with the provisions in Section 58, "Preservative Treatment of Lumber, Timber and Piling," and in conformance with AWPA Use Category System: UC4A, Commodity Specification A. Posts shall be incised and the minimum retention of preservative shall be as specified in AWPA Standards.

SECTION 57: TIMBER STRUCTURES

Issue Date: October 12, 2004

The second paragraph of Section 57-1.02A, "Structural Timber and Lumber," of the Standard Specifications is amended to read:

- When preservative treatment of timber and lumber is required, the treatment shall conform to the provisions in Section 58, "Preservative Treatment of Lumber, Timber and Piling," and AWPA's Use Category 4B. The type of treatment to be used will be shown on the plans or specified in the special provisions.

SECTION 58: PRESERVATIVE TREATMENT OF LUMBER, TIMBER AND PILING

Issue Date: November 18, 2005

The first paragraph of Section 58-1.02, "Treatment and Retention," of the Standard Specifications is amended to read:

- Timber, lumber, and piling shall be pressure treated after millwork is completed. Preservatives, treatment, and results of treatment shall conform to the requirements in AWPA Standards U1 and T1. Treatment of lumber and timber shall conform to the specified AWPA Use Category cited in the special provisions, on the plans, or elsewhere in these specifications.

The second paragraph of Section 58-1.02, "Treatment and Retention," of the Standard Specifications is deleted.

SECTION 59: PAINTING

Issue Date: June 30, 2006

The first paragraph of Section 59-1.02, "Weather Conditions," of the Standard Specifications is amended to read:

• Paint shall be applied only on thoroughly dry surfaces and during periods of favorable weather. Blast cleaning or application of solvent-borne paint will not be permitted when the atmospheric or surface temperature is at or below 2°C or above 38°C, or when the relative humidity exceeds 85 percent at the site of the work. Application of water-borne paint will not be permitted when the atmospheric or surface temperature is at or below 10°C, or above 38°C, or when the relative humidity exceeds 75 percent at the site of the work. Application of paint will not be permitted when the steel surface temperature is less than 3°C above the dew point, or when freshly painted surfaces may become damaged by rain, fog or condensation, or when it can be anticipated that the atmospheric temperature or relative humidity will not remain within the specified application conditions during the drying period, except as provided in the following paragraph for enclosures. If uncured paint is damaged by the elements, it shall be replaced or repaired by the Contractor at the Contractor's expense.

The second paragraph of Section 59-1.05, "Protection Against Damage," of the Standard Specifications is amended to read:

• Paint or paint stains on surfaces not designated to be painted shall be removed by the Contractor at the Contractor's expense and to the satisfaction of the Engineer.

Section 59-2.01, "General," of the Standard Specifications is amended by adding the following paragraphs after the first paragraph:

• Unless otherwise specified, no painting Contractors or subcontractors will be permitted to commence work without having the following current "SSPC: The Society for Protective Coatings" (formerly the Steel Structures Painting Council) certifications in good standing:

A. For cleaning and painting structural steel in the field, certification in conformance with the requirements in Qualification Procedure No. 1, "Standard Procedure For Evaluating Painting Contractors (Field Application to Complex Industrial Structures)" (SSPC-QP 1).
B. For removing paint from structural steel, certification in conformance with the requirements in Qualification Procedure No. 2, "Standard Procedure For Evaluating Painting Contractors (Field Removal of Hazardous Coatings from Complex Structures)" (SSPC-QP 2).
C. For cleaning and painting structural steel in a permanent painting facility, certification in conformance with the requirements in Qualification Procedure No. 3, "Standard Procedure For Evaluating Qualifications of Shop Painting Applicators" (SSPC-QP 3). The AISC's Sophisticated Paint Endorsement (SPE) quality program will be considered equivalent to SSPC-QP 3.

The third paragraph of Section 59-2.03, "Blast Cleaning," of the Standard Specifications is amended to read:

• Exposed steel or other metal surfaces to be blast cleaned shall be cleaned in conformance with the requirements in Surface Preparation Specification No. 6, "Commercial Blast Cleaning," of the "SSPC: The Society for Protective Coatings." Blast cleaning shall leave all surfaces with a dense, uniform, angular anchor pattern of not less than 35 µm as measured in conformance with the requirements in ASTM Designation: D 4417.

The first paragraph of Section 59-2.06, "Hand Cleaning," of the Standard Specifications is amended to read:

• Dirt, loose rust and mill scale, or paint which is not firmly bonded to the surfaces shall be removed in conformance with the requirements in Surface Preparation Specification No. 2, "Hand Tool Cleaning," of the "SSPC: The Society for Protective Coatings." Edges of old remaining paint shall be feathered.

The third and fourth paragraphs of Section 59-2.12, "Painting," of the Standard Specifications are amended to read:

- Contact surfaces of stiffeners, railings, built up members or open seam exceeding 6 mils in width that would retain moisture, shall be caulked with polysulfide or polyurethane sealing compound conforming to the requirements in ASTM Designation: C 920, Type S, Grade NS, Class 25, Use O, or other approved material.
- The dry film thickness of the paint will be measured in place with a calibrated Type 2 magnetic film thickness gage in conformance with the requirements in SSPC-PA 2, "Measurement of Dry Coating Thickness with Magnetic Gages," of the "SSPC: The Society for Protective Coatings," except that there shall be no limit to the number or location of spot measurements to verify compliance with specified thickness requirements.

SECTION 72: SLOPE PROTECTION

Issue Date: November 18, 2005

The sixth paragraph of Section 72-4.04, "Construction," of the Standard Specifications is amended to read:

- Pervious backfill material, if required by the plans, shall be placed as shown. A securely tied sack containing 0.03-m^3 of pervious backfill material shall be placed at each weep hole and drain hole. The sack material shall conform to the provisions in Section 88-1.03, "Filter Fabric."

SECTION 75: MISCELLANEOUS METAL

Issue Date: June 30, 2006

The table in the tenth paragraph of Section 75-1.02, "Miscellaneous Iron and Steel," of the Standard Specifications is amended to read:

Material	Specification
Steel bars, plates and shapes	ASTM Designation: A 36/A 36M or A 575, A 576 (AISI or M Grades 1016 through 1030)
Steel fastener components for general applications:	
Bolts and studs	ASTM Designation: A 307
Headed anchor bolts	ASTM Designation: A 307, Grade B, including S1 supplementary requirements
Nonheaded anchor bolts	ASTM Designation: A 307, Grade C, including S1 supplementary requirements and S1.6 of AASHTO Designation: M 314 supplementary requirements or AASHTO Designation: M 314, Grade 36 or 55, including S1 supplementary requirements
High-strength bolts and studs, threaded rods, and nonheaded anchor bolts	ASTM Designation: A 449, Type 1
Nuts	ASTM Designation: A 563, including Appendix X1*
Washers	ASTM Designation: F 844
Components of high-strength steel fastener assemblies for use in structural steel joints:	
Bolts	ASTM Designation: A 325, Type 1
Tension control bolts	ASTM Designation: F 1852, Type 1
Nuts	ASTM Designation: A 563, including Appendix X1*
Hardened washers	ASTM Designation: F 436, Type 1, Circular, including S1 supplementary requirements
Direct tension indicators	ASTM Designation: F 959, Type 325, zinc-coated
Stainless steel fasteners (Alloys 304 & 316) for general applications:	
Bolts, screws, studs, threaded rods, and nonheaded anchor bolts	ASTM Designation: F 593 or F 738M
Nuts	ASTM Designation: F 594 or F 836M
Washers	ASTM Designation: A 240/A 240M and ANSI B 18.22M
Carbon-steel castings	ASTM Designation: A 27/A 27M, Grade 65-35 [450-240], Class 1
Malleable iron castings	ASTM Designation: A 47, Grade 32510 or A 47M, Grade 22010
Gray iron castings	ASTM Designation: A 48, Class 30B
Ductile iron castings	ASTM Designation: A 536, Grade 65-45-12
Cast iron pipe	Commercial quality
Steel pipe	Commercial quality, welded or extruded
Other parts for general applications	Commercial quality

* Zinc-coated nuts that will be tightened beyond snug or wrench tight shall be furnished with a dyed dry lubricant conforming to Supplementary Requirement S2 in ASTM Designation: A 563.

The second paragraph in Section 75-1.03, "Miscellaneous Bridge Metal," of the Standard Specifications is amended to read:

• Miscellaneous bridge metal shall consist of the following, except as further provided in Section 51-1.19, "Utility Facilities," and in the special provisions:

A. Bearing assemblies, equalizing bolts and expansion joint armor in concrete structures.
B. Expansion joint armor in steel structures.
C. Manhole frames and covers, frames and grates, ladder rungs, guard posts and access door assemblies.
D. Deck drains, area drains, retaining wall drains, and drainage piping, except drainage items identified as "Bridge Deck Drainage System" in the special provisions.

The seventh paragraph of Section 75-1.03, "Miscellaneous Bridge Metal," of the Standard Specifications is amended to read:

• Sheet steel for access doors shall be galvanized sheet conforming to the requirements in ASTM Designation: A 653/A 653M, Coating Designation Z600 {G210}.

The table in the eighteenth paragraph of Section 75-1.03, "Miscellaneous Bridge Metal," of the Standard Specifications is amended to read:

Stud Diameter (millimeters)	Sustained Tension Test Load (kilonewtons)
29.01-33.00	137.9
23.01-29.00	79.6
21.01-23.00	64.1
* 18.01-21.00	22.2
15.01-18.00	18.2
12.01-15.00	14.2
9.01-12.00	9.34
6.00-9.00	4.23

* Maximum stud diameter permitted for mechanical expansion anchors.

The table in the nineteenth paragraph of Section 75-1.03, "Miscellaneous Bridge Metal," of the Standard Specifications is amended to read:

Stud Diameter (millimeters)	Ultimate Tensile Load (kilonewtons)
30.01-33.00	112.1
27.01-30.00	88.1
23.01-27.00	71.2
20.01-23.00	51.6
16.01-20.00	32.0
14.01-16.00	29.4
12.00-14.00	18.7

The table in the twenty-second paragraph of Section 75-1.03, "Miscellaneous Bridge Metal," of the Standard Specifications is amended to read:

Installation Torque Values, (newton meters)

Stud Diameter (millimeters)	Shell Type Mechanical Expansion Anchors	Integral Stud Type Mechanical Expansion Anchors	Resin Capsule Anchors and Cast-in-Place Inserts
29.01-33.00	—	—	540
23.01-29.00	—	—	315
21.01-23.00	—	—	235
18.01-21.00	110	235	200
15.01-18.00	45	120	100
12.01-15.00	30	65	40
9.01-12.00	15	35	24
6.00-9.00	5	10	—

The twenty-fourth paragraph of Section 75-1.03, "Miscellaneous Bridge Metal," of the Standard Specifications is amended to read:

- Sealing compound, for caulking and adhesive sealing, shall be a polysulfide or polyurethane material conforming to the requirements in ASTM Designation: C 920, Type S, Grade NS, Class 25, Use O.

The third paragraph in Section 75-1.035, "Bridge Joint Restrainer Units," of the Standard Specifications is amended to read:

- Cables shall be 19 mm preformed, 6 x 19, wire strand core or independent wire rope core (IWRC), galvanized, and in conformance with the requirements in Federal Specification RR-W-410D, right regular lay, manufactured of improved plow steel with a minimum breaking strength of 200 kN. Two certified copies of mill test reports of each manufactured length of cable used shall be furnished to the Engineer.

The second paragraph in Section 75-1.05, "Galvanizing," of the Standard Specifications is amended to read:

- At the option of the Contractor, material thinner than 3.2 mm shall be galvanized either before fabrication in conformance with the requirements of ASTM Designation: A 653/A 653M, Coating Designation Z600, or after fabrication in conformance with the requirements of ASTM Designation: A 123, except that the weight of zinc coating shall average not less than 365 g per square meter of actual surface area with no individual specimen having a coating weight of less than 305 g per square meter.

SECTION 80: FENCES

Issue Date: October 12, 2004

The second paragraph of Section 80-3.01B(2), "Treated Wood Posts and Braces," of the Standard Specifications is amended to read:

- Posts and braces to be treated shall be pressure treated in conformance with the provisions in Section 58, "Preservative Treatment of Lumber, Timber and Piling," and AWPA Use Category System: UC4A, Commodity Specification A or B.

SECTION 81: MONUMENTS

Issue Date: June 30, 2006

The fifth paragraph of Section 81-1.02, "Materials," of the Standard Specifications is amended to read:

- At the option of the Contractor, the frame and cover for Type B and Type D survey monuments shall be fabricated from either cast steel or gray cast iron. The covers shall fit into the frames without rocking.

The seventh paragraph of Section 81-1.02, "Materials," of the Standard Specifications is amended to read:

• Granular material for Type B and Type D survey monuments shall be gravel, crushed gravel, crushed rock or any combination thereof. Granular material shall not exceed 37.5 mm in greatest dimension.

SECTION 82: MARKERS AND DELINEATORS

Issue Date: June 30, 2006

The first paragraph of Section 82-1.02B, "Metal Posts," of the Standard Specifications is amended to read:

• Steel for metal posts shall conform to the requirements in ASTM Designation: A 36/A 36M. The posts shall be galvanized in conformance with the requirements in Section 75-1.05, "Galvanizing."

The third paragraph of Section 82-1.02D, "Target Plates," of the Standard Specifications is amended to read:

• The zinc-coated steel sheet shall conform to the requirements in ASTM Designation: A 653/A 653M, Classification: Commercial Steel (CS Types A, B and C). The steel sheets shall be galvanized in conformance with the requirements in Section 75-1.05, "Galvanizing." The zinc-coated surface shall be prepared for painting in a manner designed to produce optimum paint adherence. The surface preparation shall be accomplished without damaging or removing the zinc coating. Any evidence of damage or removal of the zinc coating shall be cause for rejection of the entire lot.

The eleventh paragraph of Section 82-1.02D, "Target Plates," of the Standard Specifications is amended to read:

• When tested in conformance with the requirements in California Test 671, the painted metal target plates shall, in general, have satisfactory resistance to weathering, humidity, salt spray and chemicals; the enamel coating shall have satisfactory adherence and impact resistance, a pencil lead hardness of HB minimum, 60° specular gloss of 80 percent minimum, an excitation purity of 3 percent maximum as received and after 1000 hours in an artificial weathering device in conformance with the requirements in ASTM Designation: G 155, Table X3.1, Cycle 1, and a daylight luminous directional reflectance ("Y" value) of 70 minimum.

The second paragraph of Section 82-1.02F, "Reflectors," of the Standard Specifications is amended to read:

• Reflectors for flexible target plates on Type K object markers and target plates on Class 2 delineators, and reflectors for Class 1 delineators shall be made from impact resistant retroreflective sheeting as specified in the special provisions. The color of the retroreflective sheeting shall conform to the color designated on the plans and the Chromaticity Coordinates specified in ASTM Designation: D 4956, or the PR color number specified by the Federal Highway Administration's Color Tolerance Chart.

The fourth paragraph of Section 82-1.02F, "Reflectors," of the Standard Specifications is amended to read:

The instrumental method of determining color shall conform to the requirements specified in ASTM Designation: D 4956. In the event of any dispute concerning the test results of instrumental testing, the visual test shall prevail.

SECTION 83: RAILINGS AND BARRIERS

Issue Date: January 28, 2005

The first paragraph of Section 83-1.02B, "Metal Beam Guard Railing," of the Standard Specifications is amended to read:

• The rail elements, backup plates, terminal sections, end and return caps, bolts, nuts and other fittings shall conform to the requirements in AASHTO Designation: M 180, except as modified in this Section 83-1.02B and as specified in Section 83-1.02. The rail elements, backup plates, terminal sections, end and return caps shall conform to Class A, Type 1 W-Beam guard railing as shown in AASHTO Designation: M 180. The edges and center of the rail element shall contact each post block. Rail element joints shall be lapped not less than 316 mm and bolted. The rail metal, in addition to conforming to the requirements in AASHTO Designation: M 180, shall withstand a cold bend, without cracking, of 180 degrees around a mandrel of a diameter equal to 2.5 times the thickness of the plate.

The ninth paragraph in Section 83-1.02B, "Metal Beam Guard Railing," of the Standard Specifications is amended to read:

• The grades and species of wood posts and blocks shall be No. 1 timbers (also known as No. 1 structural) Douglas fir or No. 1 timbers Southern yellow pine. Wood posts and blocks shall be graded in conformance with the provisions in Section 57-2, "Structural Timber," of the Standard Specifications, except allowances for shrinkage after mill cutting shall in no case exceed 5 percent of the American Lumber Standards minimum sizes, at the time of installation.

The eleventh paragraph in Section 83-1.02B, "Metal Beam Guard Railing," of the Standard Specifications is amended to read:

• After fabrication, wood posts and blocks shall be pressure treated in conformance with Section 58, "Preservative Treatment of Lumber, Timber and Piling," and AWPA Use Category System: UC4A, Commodity Specification A.

The twelfth paragraph in Section 83-1.02B, "Metal Beam Guard Railing," of the Standard Specifications is amended to read:

• If copper naphthenate, ammoniacal copper arsenate, chromated copper arsenate, ammoniacal copper zinc arsenate, ammoniacal copper quat or copper azole is used to treat the wood posts and blocks, the bolt holes shall be treated as follows:

A. Before the bolts are inserted, bolt holes shall be filled with a grease, recommended by the manufacturer for corrosion protection, which will not melt or run at a temperature of 65°C.

The twenty-fourth paragraph of Section 83-1.02B, "Metal Beam Guard Railing," of the Standard Specifications is amended to read:

• End anchor assemblies and rail tensioning assemblies for metal beam guard railing shall be constructed as shown on the plans and shall conform to the following provisions:

An end anchor assembly (Type SFT) for metal beam guard railing shall consist of an anchor cable, an anchor plate, a wood post, a steel foundation tube, a steel soil plate and hardware.

An end anchor assembly (Type CA) for metal beam guard railing shall consist of an anchor cable, an anchor plate, a single anchor rod or double anchor rods, hardware and one concrete anchor.

A rail tensioning assembly for metal beam guard railing shall consist of an anchor cable, an anchor plate, and hardware.

The anchor plate, metal plates, steel foundation tubes and steel soil plate shall be fabricated of steel conforming to the requirements in ASTM Designation: A 36/A 36M.

The anchor rods shall be fabricated of steel conforming to the requirements in ASTM Designation: A 36/A 36M, A 441 or A 572, or ASTM Designation: A 576, Grades 1018, 1019, 1021 or 1026. The eyes shall be hot forged or formed with full penetration welds. After fabrication, anchor rods with eyes that have been formed with any part of the eye below 870°C during the forming operation or with eyes that have been closed by welding shall be thermally stress relieved prior to galvanizing. The completed anchor rod, after galvanizing, shall develop a strength of 220 kN.

In lieu of built-up fabrication of anchor plates as shown on the plans, anchor plates may be press-formed from steel plate, with or without welded seams.

All bolts and nuts shall conform to the requirements in ASTM Designation: A 307, unless otherwise specified in the special provisions or shown on the plans.

Anchor cable shall be 19-mm preformed, 6 x 19, wire strand core or independent wire rope core (IWRC), galvanized in conformance with the requirements in Federal Specification RR-W-410D, right regular lay, manufactured of improved plow steel with a minimum breaking strength of 200 kN. Two certified copies of mill test reports of each manufactured length of cable used shall be furnished to the Engineer. The overall length of each cable anchor assembly shall be as shown on the plans, but shall be a minimum of 2 m.

Where shown on the plans, cable clips and a cable thimble shall be used to attach cable to the anchor rod. Thimbles shall be commercial quality, galvanized steel. Cable clips shall be commercial quality drop forged galvanized steel.

The swaged fitting shall be machined from hot-rolled bars of steel conforming to AISI Designation: C 1035, and shall be annealed suitable for cold swaging. The swaged fitting shall be galvanized before swaging. A lock pin hole to accommodate a 6-mm, plated, spring steel pin shall be drilled through the head of the swage fitting to retain the stud in proper position. The manufacturer's identifying mark shall be stamped on the body of the swage fitting.

The 25-mm nominal diameter stud shall conform to the requirements in ASTM Designation: A 449 after galvanizing. Prior to galvanizing, a 10-mm slot for the locking pin shall be milled in the stud end.

The swaged fittings, stud and nut assembly shall develop the specified breaking strength of the cable.

The cable assemblies shall be shipped as a complete unit including stud and nut.

Clevises shall be drop forged galvanized steel and shall develop the specified breaking strength of the cable.

One sample of cable properly fitted with swaged fitting and right hand thread stud at both ends as specified above, including a clevis when shown on the plans, one meter in total length, shall be furnished the Engineer for testing.

The portion of the anchor rod to be buried in earth shall be coated with a minimum 0.5-mm thickness of coal tar enamel conforming to AWWA Standard: C203 or a coal tar epoxy conforming to the requirements in Steel Structures Painting Council Paint Specification No. 16, Coal-Tar Epoxy-Polymide Black Paint or Corps of Engineers Specification, Formula C-200a, Coal-Tar Epoxy Paint.

Metal components of the anchor assembly shall be fabricated in conformance with good shop practice and shall be hot-dip galvanized in conformance with the provisions in Section 75-1.05, "Galvanizing."

Anchor cables shall be tightened after the concrete anchor has cured for at least 5 days.

Concrete used to construct anchors for end anchor assemblies shall be Class 3 or minor concrete conforming to the provisions in Section 90, "Portland Cement Concrete."

Concrete shall be placed against undisturbed material of the excavated holes for end anchors. The top 300 mm of holes shall be formed, if required by the Engineer.

Reinforcing steel in concrete anchors for end anchor assemblies shall conform to the provisions in Section 52, "Reinforcement."

The second paragraph in Section 83-1.02D, "Steel Bridge Railing," of the Standard Specifications is amended to read:

- Structural shapes, tubing, plates, bars, bolts, nuts, and washers shall be structural steel conforming to the provisions in Section 55-2, "Materials." Other fittings shall be commercial quality.

The second and third paragraphs in Section 83-1.02E, "Cable Railing," of the Standard Specifications are replaced with the following paragraph:

- Pipe for posts and braces shall be standard steel pipe or pipe that conforms to the provisions in Section 80-4.01A, "Posts and Braces."

The fourteenth paragraph in Section 83-1.02I, "Chain Link Railing," of the Standard Specifications is amended to read:

- Chain link fabric shall be either 11-gage Type I zinc coated fabric conforming to the requirements in AASHTO Designation: M 181 or 11-gage Type IV polyvinyl chloride (PVC) coated fabric conforming to the requirements in Federal Specification RR-F-191/1D.

The second paragraph of Section 83-1.03, "Measurement," of the Standard Specifications is amended to read:

- Except for metal beam guard railing within the pay limits of a terminal system end treatment or transition railing (Type WB), metal beam guard railing will be measured by the meter along the face of the rail element from end post to end post of the completed railing at each installation. The point of measurement at each end post will be the center of the bolt attaching the rail element to the end post.

The seventh paragraph of Section 83-1.03, "Measurement," of the Standard Specifications is amended to read:

- The quantities of end anchor assemblies (Type SFT or Type CA) and rail tensioning assemblies will be measured as units determined from actual count. An end anchor assembly (Type CA) with 2 cables attached to one concrete anchor will be counted as one terminal anchor assembly (Type CA) for measurement and payment.

The eighth paragraph of Section 83-1.03, "Measurement," of the Standard Specifications is amended to read:

- The quantities of return and end caps and the various types of terminal sections for metal beam guard railing will be determined as units from actual count.

The third paragraph of Section 83-1.04, "Payment," of the Standard Specifications is amended to read:

• The contract unit prices paid for end anchor assembly (Type SFT), end anchor assembly (Type CA), and rail tensioning assembly shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all work involved in constructing the end anchor assemblies, complete in place, including drilling anchor plate bolt holes in rail elements, driving steel foundation tubes, excavating for concrete anchor holes and disposing of surplus material, as shown on the plans, as specified in these specifications and the special provisions, and as directed by the Engineer.

The fourth paragraph of Section 83-1.04, "Payment," of the Standard Specifications is amended to read:

• The contract unit prices paid for return caps, end caps, and the various types of terminal sections for metal beam guard railing shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in installing terminal sections, return and end caps, complete in place, as shown on the plans, as specified in these specifications and the special provisions, and as directed by the Engineer.

The second paragraph of Section 83-2.02B, "Thrie Beam Barrier," of the Standard Specifications is amended to read:

• Rail elements, backup plates, terminal connectors, terminal sections, and return caps shall conform to Class A, Type 1 thrie beam guard railing as shown in AASHTO Designation: M 180.

The fourteenth paragraph of Section 83-2.02B, "Thrie Beam Barrier," of the Standard Specifications is amended to read:

• All metal work shall be fabricated in the shop, and no punching, cutting or welding will be permitted in the field. Rail elements shall be lapped so that the exposed ends will not face approaching traffic. Terminal sections and return caps shall be installed in conformance with the manufacturer's recommendation.

The first paragraph in Section 83-2.02D(2), "Materials," of the Standard Specifications is amended to read:

• Type 50 and 60 series concrete barriers shall be constructed of minor concrete conforming to the provisions in Section 90-10, "Minor Concrete," except as follows:

a. The maximum size of aggregate used for extruded or slip-formed concrete barriers shall be at the option of the Contractor, but in no case shall the maximum size be larger than 37.5-mm or smaller than 9.5-mm.
b. If the 9.5-mm maximum size aggregate grading is used to construct extruded or slip-formed concrete barriers, the cementitious material content of the minor concrete shall be not less than 400 kg/m^3.

The third paragraph in Section 83-2.02D(2), "Materials," of the Standard Specifications is amended to read:

• The concrete paving between the tops of the 2 walls of concrete barrier (Types 50E, 60E, 60GE, and 60SE) and the optional concrete slab at the base between the 2 walls of concrete barrier (Types 50E, 60E, 60GE, and 60SE) shall be constructed of minor concrete conforming to the provisions of Section 90-10, except that the minor concrete shall contain not less than 300 kg of cementitious material per cubic meter.

The first paragraph of Section 83-2.03, "Measurement," of the Standard Specifications is amended to read:

• Except for single thrie beam barrier within the pay limits of transition railing (Type STB), single thrie beam barrier will be measured by the meter from end post to end post along the face of the rail element of the installed barrier. Single thrie beam barriers constructed on each side of piers under structures or other obstructions will be measured for payment along each line of the installed barrier.

The second paragraph of Section 83-2.03, "Measurement," of the Standard Specifications is amended to read:

• Except for double thrie beam barrier within the pay limits of transition railing (Type DTB), double thrie beam barrier will be measured by the meter from end post to end post along the center line of the installed barrier.

The fifth paragraph of Section 83-2.03, "Measurement," of the Standard Specifications is amended to read:

• The quantity of return caps, terminal connectors and the various types of terminal sections for single and double thrie beam barriers will be determined as units from actual count.

The sixth paragraph of Section 83-2.03, "Measurement," of the Standard Specifications is amended to read:

- The quantity of end anchor assemblies will be paid for as units determined from actual count.

The first paragraph of Section 83-2.04, "Payment," of the Standard Specifications is amended to read:

- The various types of thrie beam barrier, measured as specified in Section 83-2.03, "Measurement," will be paid for at the contract price per meter for single or double thrie beam barrier, whichever applies, and the contract unit price or prices for end anchor assemblies, return caps, terminal connectors and the various types of terminal sections.

The second paragraph of Section 83-2.04, "Payment," of the Standard Specifications is amended to read:

- The above prices and payments shall include full compensation for furnishing all labor, materials, tools, equipment and incidentals, and for doing all the work involved in constructing the barrier, complete in place, including drilling holes for wood posts, driving posts, backfilling the space around posts, excavating and backfilling end anchor assembly holes, connecting thrie beam barrier to concrete surfaces and disposing of surplus excavated material, and for furnishing, placing, removing and disposing of the temporary railing for closing the gap between existing barrier and the barrier being constructed as shown on the plans, and as specified in these specifications and the special provisions, and as directed by the Engineer.

The fourth paragraph in Section 83-2.04, "Payments," of the Standard Specifications is amended to read:

- Steel plate barrier attached to concrete barrier at overhead sign foundations, electroliers, drainage structures, and other locations shown on the plans will be measured and paid for as the type of concrete barrier attached thereto.

SECTION 84: TRAFFIC STRIPES AND PAVEMENT MARKINGS

Issue Date: July 21, 2006

The first paragraph of Section 84-2.02, "Materials," of the Standard Specifications is amended to read:

- The thermoplastic material shall conform to State Specification PTH-02SPRAY, PTH-02HYDRO or PTH-02ALKYD. Glass beads to be applied to the surface of the molten thermoplastic material shall conform to the requirements of State Specification 8010-004 (Type II).

The first paragraph of Section 84-3.02, "Materials," of the Standard Specifications is amended to read:

- Paint for traffic stripes and pavement markings shall conform to the following State Specifications:

Paint Type	Color	State Specification No.
Waterborne Traffic Line	White, Yellow and Black	PTWB-01
Acetone-Based	White, Yellow and Black	PT-150VOC(A)
Waterborne Traffic Line for disabled persons' parking, and other curb markings	Blue, Red and Green	Federal Specification No. TT-P-1952D

The fourth paragraph of Section 84-3.02, "Materials," of the Standard Specifications is amended to read:

- The kind of paint to be used (waterborne or acetone-based) shall be determined by the Contractor based on the time of year the paint is applied and local air pollution control regulations.

The first paragraph of Section 84-3.05, "Application," of the Standard Specifications is amended to read:

Traffic stripes and pavement markings shall be applied only on dry surfaces and only during periods of favorable weather. Painting shall not be performed when the atmospheric temperature is below 5°C when using acetone-based paint or

below 10°C when using water borne paint; when freshly painted surfaces may become damaged by rain, fog, or condensation; nor when it can be anticipated that the atmospheric temperature will drop below the aforementioned 5°C or 10°C temperatures during the drying period.

The third paragraph of Section 84-3.05, "Application," of the Standard Specifications is deleted.

The tenth paragraph of Section 84-3.05, "Application," of the Standard Specifications is amended to read:

- Paint to be applied in 2 coats shall be applied approximately as follows:

Paint Type	Square Meter Coverage Per Liter	
	First Coat	Second Coat
Waterborne Paint	6	6
Acetone-Based Paint	10	5

SECTION 85: PAVEMENT MARKERS

Issue Date: June 30, 2006

The second through fifth paragraphs in Section 85-1.03, "Sampling, Tolerances and Packaging," of the Standard Specifications are amended to read:

Sampling

- Twenty markers selected at random will constitute a representative sample for each lot of markers.
- The lot size shall not exceed 25 000 markers.

Tolerances

- Three test specimens will be randomly selected from the sample for each test and tested in conformance with these specifications. Should any one of the 3 specimens fail to conform with the requirements in these specifications, 6 additional specimens will be tested. The failure of any one of these 6 specimens shall be cause for rejection of the entire lot or shipment represented by the sample.
- The entire sample of retroreflective pavement markers will be tested for reflectance. The failure of 10 percent or more of the original sampling shall be cause for rejection.

Section 85-1.04, "Non-Reflective Pavement Markers," of the Standard Specifications is amended to read:

85-1.04 Non-Reflective Pavement Markers

- Non-reflective pavement markers (Types A and AY) shall be, at the option of the Contractor, either ceramic or plastic conforming to these specifications.
- The top surface of the marker shall be convex with a gradual change in curvature. The top, bottom and sides shall be free of objectionable marks or discoloration that will affect adhesion or appearance.
- The bottom of markers shall have areas of integrally formed protrusions or indentations, which will increase the effective bonding surface area of adhesive. The bottom surface of the marker shall not deviate more than 1.5 mm from a flat surface. The areas of protrusion shall have faces parallel to the bottom of the marker and shall project approximately one mm from the bottom.

The second through fourth paragraphs of Section 85-1.04A, "Non-Reflective Pavement Markers (Ceramic)," of the Standard Specifications are deleted.

The table in the fifth paragraph in Section 85-1.04A, "Non-Reflective Pavement Markers (Ceramic)," of the Standard Specifications is amended to read:

Testing

- Tests shall be performed in conformance with the requirements in California Test 669.

Test	Test Description	Requirement
a	Bond strength	4.8 MPa, min.
b	Glaze thickness	180 µm, min.
c	Hardness	6 Moh, min.
d	Luminance factor, Type A, white markers only, glazed surface	75, min.
e	Yellowness index, Type A, white markers only, glazed surface	7, max.
f	Color-yellow, Type AY, yellow markers only. The chromaticity coordinates shall be within a color box defined in CTM 669	Pass
g	Compressive strength	6700 N, min.
h	Water absorption	2.0 %, max.
i	Artificial weathering, 500 hours exposure, yellowness index	20, max.

Section 85-1.04B, "Non-Reflective Pavement Markers (Plastic)," of the Standard Specifications is amended to read:

85-1.04B Non-Reflective Pavement Markers (Plastic)

- Plastic non-reflective pavement markers Types A and AY shall be, at the option of the Contractor, either polypropylene or acrylonitrile-butadiene-styrene (ABS) plastic type.
- Plastic markers shall conform to the testing requirements specified in Section 85-1.04A, "Non-Reflective Pavement Markers (Ceramic)," except that Tests a, b, c, and h shall not apply. The plastic markers shall not be coated with substances that interfere with the ability of the adhesive bonding to the marker.

The sixth and seventh paragraphs in Section 85-1.05, "Retroreflective Pavement Markers," of the Standard Specifications are amended to read:

Testing

- Tests shall be performed in conformance with the requirements in California Test 669.

Test Description	Requirement		
Bond strength[a]	3.4 MPa, min.		
Compressive strength[b]	8900 N, min.		
Abrasion resistance, marker must meet the respective specific intensity minimum requirements after abrasion.	Pass		
Water Soak Resistance	No delamination of the body or lens system of the marker nor loss of reflectance		
	Specific Intensity		
Reflectance	Clear	Yellow	Red
0° Incidence Angle, min.	3.0	1.5	0.75
20° Incidence Angle, min.	1.2	0.60	0.30
After one year field evaluation	0.30	0.15	0.08

a. Failure of the marker body or filler material prior to reaching 3.4 MPa shall constitute a failing bond strength test.

b. Deformation of the marker of more than 3 mm at a load of less than 8900 N or delamination of the shell and the filler material of more than 3 mm regardless of the load required to break the marker shall be cause for rejection of the markers as specified in Section 85-1.03, "Sampling, Tolerances and Packaging."

- Pavement markers to be placed in pavement recesses shall conform to the above requirements for retroreflective pavement markers except that the minimum compressive strength requirement shall be 5338 N.

The eighth paragraph of Section 85-1.05, "Retroreflective Pavement Markers" of the Standard Specifications is deleted.

The eighth paragraph in Section 85-1.06, "Replacement," of the Standard Specifications is amended to read:

- Epoxy adhesive shall not be used to apply non-reflective plastic pavement markers.

The seventh sentence of the fourteenth paragraph of Section 85-1.06, "Placement," of the Standard Specifications is amended to read:

- Soft rags moistened with mineral spirits conforming to Army Mil-PRF-680A(1) or kerosene may be used, if necessary, to remove adhesive from exposed faces of pavement markers.

SECTION 86: SIGNALS, LIGHTING AND ELECTRICAL SYSTEMS

Issue Date: June 30, 2006

The second paragraph of Section 86-1.01, "Description," of the Standard Specifications is amended to read:

- The locations of signals, beacons, standards, lighting fixtures, signs, controls, services and appurtenances shown on the plans are approximate and the exact locations will be approved by the Engineer in the field.

The tenth paragraph of Section 86-1.06, "Maintaining Existing and Temporary Electrical Systems," of the Standard Specifications is amended to read:

- These provisions will not relieve the Contractor in any manner of the Contractor's responsibilities as provided in Section 7-1.12, "Indemnification and Insurance," and Section 7-1.16, "Contractor's Responsibility for the Work and Materials."

The first paragraph of Section 86-2.03, "Foundations," of the Standard Specifications is amended to read:

- Except for concrete for cast-in-drilled-hole concrete pile foundations, portland cement concrete shall conform to Section 90-10, "Minor Concrete."

The fifth paragraph of Section 86-2.03, "Foundations," of the Standard Specifications is amended to read:

- Reinforced cast-in-drilled-hole concrete pile foundations for traffic signal and lighting standards shall conform to the provisions in Section 49, "Piling," with the following exceptions: 1) Material resulting from drilling holes shall be disposed of in conformance with the provisions in Section 86-2.01, "Excavating and Backfilling," and 2) Concrete filling for cast-in-drilled-hole concrete piles will not be considered as designated by compressive strength.

The seventh paragraph of Section 86-2.03, "Foundations," of the Standard Specifications is amended to read:

- Forms shall be true to line and grade. Tops of foundations for posts and standards, except special foundations, shall be finished to curb or sidewalk grade or as directed by the Engineer. Forms shall be rigid and securely braced in place. Conduit ends and anchor bolts shall be placed in proper position and to proper height, and anchor bolts shall be held in place by means of rigid top and bottom templates. The bottom template shall be made of steel. The bottom template shall provide proper spacing and alignment of the anchor bolts near their bottom embedded end. The bottom template shall be installed before placing footing concrete. Anchor bolts shall not be installed more than 1:40 from vertical.

Section 86-2.03, "Foundations," of the Standard Specifications is amended by deleting the eighth paragraph.

The twelfth paragraph of Section 86-2.03, "Foundations," of the Standard Specifications is amended to read:

- Plumbing of the standards shall be accomplished by adjusting the leveling nuts before placing the mortar or before the foundation is finished to final grade. Shims or other similar devices shall not be used for plumbing or raking of posts, standards, or pedestals. After final adjustments of both top nuts and leveling nuts on anchorage assemblies have been made, firm contact shall exist between all bearing surfaces of the anchor bolt nuts, washers, and the base plates.

The first paragraph of Section 86-2.04, "Standards, Steel Pedestals and Posts," of the Standard Specifications is amended to read:

• Bolts, nuts and washers, and anchor bolts for use in signal and lighting support structures shall conform to the provisions in Section 55-2, "Materials." Except when bearing-type connections or slipbases are specified, high-strength bolted connections shall conform to the provisions in Section 55-3.14, "Bolted Connections." Welding, nondestructive testing (NDT) of welds, and acceptance and repair criteria for NDT of steel members shall conform to the requirements of AWS D1.1 and the special provisions.

The second paragraph of Section 86-2.04, "Standards, Steel Pedestals and Posts," of the Standard Specifications is amended to read:

• On each lighting standard except Type 1, one rectangular corrosion resistant metal identification tag shall be permanently attached above the hand hole, near the base of the standard, using stainless steel rivets. On each signal pole support, two corrosion resistant metal identification tags shall be attached, one above the hand hole near the base of the vertical standard and one on the underside of the signal mast arm near the arm plate. As a minimum, the information on each identification tag shall include the name of the manufacturer, the date of manufacture, the identification number as shown on the plans, the contract number, and a unique identification code assigned by the fabricator. This number shall be traceable to a particular contract and the welds on that component, and shall be readable after the support structure is coated and installed. The lettering shall be a minimum of 7 mm high. The information may be either depressed or raised, and shall be legible.

The fourth paragraph of Section 86-2.04, "Standards, Steel Pedestals and Posts," of the Standard Specifications is amended to read:

• Ferrous metal parts of standards, with shaft length of 4.6 m and longer, shall conform to the details shown on the plans, the provisions in Section 55-2, "Materials," except as otherwise noted, and the following requirements:

Except as otherwise specified, standards shall be fabricated from sheet steel of weldable grade having a minimum yield strength, after fabrication, of 276 MPa.

Certified test reports which verify conformance to the minimum yield strength requirements shall be submitted to the Engineer. The test reports may be the mill test reports for the as-received steel or, when the as-received steel has a lower yield strength than required, the Contractor shall provide supportive test data which provides assurance that the Contractor's method of cold forming will consistently increase the tensile properties of the steel to meet the specified minimum yield strength. The supportive test data shall include tensile properties of the steel after cold forming for specific heats and thicknesses.

When a single-ply 8-mm thick pole is specified, a 2-ply pole with equivalent section modulus may be substituted.

Standards may be fabricated of full-length sheets or shorter sections. Each section shall be fabricated from not more than 2 pieces of sheet steel. Where 2 pieces are used, the longitudinal welded seams shall be directly opposite one another. When the sections are butt-welded together, the longitudinal welded seams on adjacent sections shall be placed to form continuous straight seams from base to top of standard.

Butt-welded circumferential joints of tubular sections requiring CJP groove welds shall be made using a metal sleeve backing ring inside each joint. The sleeve shall be 3-mm nominal thickness, or thicker, and manufactured from steel having the same chemical composition as the steel in the tubular sections to be joined. When the sections to be joined have different specified minimum yield strengths, the steel in the sleeve shall have the same chemical composition as the tubular section having the higher minimum yield strength. The width of the metal sleeve shall be consistent with the type of NDT chosen and shall be a minimum width of 25 mm. The sleeve shall be centered at the joint and be in contact with the tubular section at the point of the weld at time of fit-up.

Welds shall be continuous.

The weld metal at the transverse joint shall extend to the sleeve, making the sleeve an integral part of the joint.

During fabrication, longitudinal seams on vertical tubular members of cantilevered support structures shall be centered on and along the side of the pole that the pole plate is located. Longitudinal seams on horizontal tubular members, including signal and luminaire arms, shall be within +/-45 degrees of the bottom of the arm.

The longitudinal seam welds in steel tubular sections may be made by the electric resistance welding process.

Longitudinal seam welds shall have 60 percent minimum penetration, except that within 150 mm of circumferential welds, longitudinal seam welds shall be CJP groove welds. In addition, longitudinal seam welds on lighting support structures having telescopic pole segment splices shall be CJP groove welds on the female end for a length on each end equal to the designated slip fit splice length plus 150 mm.

Exposed circumferential welds, except fillet and fatigue-resistant welds, shall be ground flush (-0, +2mm) with the base metal prior to galvanizing or painting.

Circumferential welds and base plate-to-pole welds may be repaired only one time without written permission from the Engineer.

Exposed edges of the plates that make up the base assembly shall be finished smooth and exposed corners of the plates shall be broken unless otherwise shown on the plans. Shafts shall be provided with slip-fitter shaft caps.

Flatness of surfaces of 1) base plates that are to come in contact with concrete, grout, or washers and leveling nuts; 2) plates in high-strength bolted connections; 3) plates in joints where cap screws are used to secure luminaire and signal arms; and 4) plates used for breakaway slip base assemblies shall conform to the requirements in ASTM A6.

Standards shall be straight, with a permissive variation not to exceed 25 mm measured at the midpoint of a 9-m or 11-m standard and not to exceed 20 mm measured at the midpoint of a 5-m through 6-m standard. Variation shall not exceed 25 mm at a point 4.5 m above the base plate for Type 35 and Type 36 standards.

Zinc-coated nuts used on fastener assemblies having a specified preload (obtained by specifying a prescribed tension, torque value, or degree of turn) shall be provided with a colored lubricant that is clean and dry to the touch. The color of the lubricant shall be in contrast to the zinc coating on the nut so that the presence of the lubricant is visually obvious. In addition, either the lubricant shall be insoluble in water, or fastener components shall be shipped to the job site in a sealed container.

No holes shall be made in structural members unless the holes are shown on the plans or are approved in writing by the Engineer.

Standards with an outside diameter of 300 mm or less shall be round. Standards with an outside diameter greater than 300 mm shall be round or multisided. Multisided standards shall have a minimum of 12 sides which shall be convex and shall have a minimum bend radius of 100 mm.

Mast arms for standards shall be fabricated from material as specified for standards, and shall conform to the dimensions shown on the plans.

The cast steel option for slip bases shall be fabricated from material conforming to the requirements in ASTM Designation: A 27/A 27M, Grade 70-40. Other comparable material may be used if written permission is given by the Engineer. The casting tolerances shall be in conformance with the Steel Founder's Society of America recommendations (green sand molding).

One casting from each lot of 50 castings or less shall be subject to radiographic inspection, in conformance with the requirements in ASTM Designation: E 94. The castings shall comply with the acceptance criteria severity level 3 or better for the types and categories of discontinuities in conformance with the requirements in ASTM Designations: E 186 and E 446. If the one casting fails to pass the inspection, 2 additional castings shall be radiographed. Both of these castings shall pass the inspection, or the entire lot of 50 will be rejected.

Material certifications, consisting of physical and chemical properties, and radiographic films of the castings shall be filed at the manufacturer's office. These certifications and films shall be available for inspection upon request.

High-strength bolts, nuts, and flat washers used to connect slip base plates shall conform to the requirements in ASTM Designation: A 325 or A 325M and shall be galvanized in conformance with the provisions in Section 75-1.05, "Galvanizing."

Plate washers shall be fabricated by saw cutting and drilling steel plate conforming to the requirements in AISI Designation: 1018, and be galvanized in conformance with the provisions in Section 75-1.05, "Galvanizing." Prior to galvanizing, burrs and sharp edges shall be removed and holes shall be chamfered sufficiently on each side to allow the bolt head to make full contact with the washer without tension on the bolt.

High-strength cap screws shown on the plans for attaching arms to standards shall conform to the requirements in ASTM Designation: A 325, A 325M, or A 449, and shall comply with the mechanical requirements in ASTM Designation: A 325 or A 325M after galvanizing. The cap screws shall be galvanized in conformance with the provisions in Section 75-1.05, "Galvanizing." The threads of the cap screws shall be coated with a colored lubricant that is clean and dry to the touch. The color of the lubricant shall be in contrast to the color of the zinc coating on the cap screw so that presence of the lubricant is visually obvious. In addition, either the lubricant shall be insoluble in water, or fastener components shall be shipped to the job site in a sealed container.

Unless otherwise specified, bolted connections attaching signal or luminaire arms to poles shall be considered slip critical. Galvanized faying surfaces on plates on luminaire and signal arms and matching plate surfaces on poles shall be roughened by hand using a wire brush prior to assembly and shall conform to the requirements for Class C surface conditions for slip-critical connections in "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts," a specification approved by the Research Council on Structural Connections (RCSC) of the Engineering Foundation. For faying surfaces required to be painted, the paint shall be an approved type, brand, and thickness that has been tested and approved according to the RCSC Specification as a Class B coating.

Samples of fastener components will be randomly taken from each production lot by the Engineer and submitted, along with test reports required by appropriate ASTM fastener specifications, for QA testing and evaluation. Sample sizes for each fastener component shall be as determined by the Engineer.

The seventh paragraph of Section 86-2.04, "Standards, Steel Pedestals and Posts," of the Standard Specifications is amended to read:

- To avoid interference of arm plate-to-tube welds with cap screw heads, and to ensure cap screw heads can be turned using conventional installation tools, fabricators shall make necessary adjustments to details prior to fabrication and properly locate the position of arm tubes on arm plates during fabrication.

The traffic signal controller cabinet requirement in the table in Section 86-2.08A, "Conductor Identification," of the Standard Specifications is amended to read:

Traffic Signal Controller Cabinet	Ungrounded between Service	Blk	None	CON-1	6
	Grounded Circuit Conductor	White	None	CON-2	6

The second paragraph of Section 86-2.08B, "Multiple Circuit Conductors," of the Standard Specifications is amended to read by the following 2 paragraphs:

- At any point, the minimum insulation thickness of any Type USE, RHH, or RHW insulation shall be 1.0 mm for conductor sizes No. 14 to No. 10, inclusive; and 1.3 mm for No. 8 to No. 2, inclusive.
- At any point, the minimum insulation thickness of any Type THW or TW wires shall be 0.7 mm for conductor sizes No. 14 to No. 10, inclusive; 1.0 mm for No. 8; and 1.4 mm for No. 6 to No. 2, inclusive.

The sixth and seventh paragraphs of 86-2.12, "Wood Poles," of the Standard Specifications are amended to read:

- After fabrication, wood poles shall be pressure treated in conformance with the provisions in Section 58, "Preservative Treatment of Lumber, Timber and Piling," and AWPA Use Category System: UC4B, Commodity Specification D.
- Wood poles, when specified in the special provisions to be painted, shall be treated with waterborne wood preservatives.

The first paragraph of Section 86-2.15, "Galvanizing," of the Standard Specifications is amended to read:

- Galvanizing shall be in conformance with the provisions in Section 75-1.05, "Galvanizing," except that cabinets may be constructed of material galvanized prior to fabrication in conformance with the requirements in ASTM Designation: A 653/653M, Coating Designation G 90, in which case all cut or damaged edges shall be painted with at least 2 applications of approved unthinned zinc-rich primer (organic vehicle type) conforming to the provisions in Section 91, "Paint." Aerosol cans shall not be used. Other types of protective coating must be approved by the Engineer prior to installation.

Subparagraph B of the thirteenth paragraph of Section 86-2.16, "Multiple Circuit Conductors," of the Standard Specifications is amended to read:

B. Salt Spray Resistance - The undercutting of the film of the coating system shall not exceed 3 mm average, from lines scored diagonally and deep enough to expose the base metal, after 336 hours exposure in a salt spray cabinet in conformance with the requirements in ASTM Designation: B 117.

The third paragraph under "Mounting Assemblies" of Section 86-2.16, "Internally Illuminated Street Name Signs," of the Standard Specifications is amended to read:

- At least 16 feet of clearance shall be provided between the bottom of the fixture and the roadway.

The first paragraph of Section 86-4.01, "Vehicle Signal Faces," of the Standard Specifications is amended to read:

- Each vehicle signal face shall be of the adjustable type conforming to the requirements in Institute of Transportation Engineers (ITE) Publication: ST-017B, "Vehicle Traffic Control Signal Heads."

Subparagraphs 1 and 3 of the first paragraph of Section 86-4.01A, "Optical Units," of the Standard Specifications are amended to read:

- Lenses, reflectors, reflector assemblies, lamp receptacles, lamps, wiring and light distribution shall conform to the requirements in ITE Publication: ST-017B.

- All reflectors shall conform to the requirements in ITE Publication: ST-017B except that reflectors shall be made of silvered glass or of specular aluminum with an anodic coating. Reflector ring holder shall be made of cast aluminum.

The first paragraph of Section 86-4.01B, "Signal Sections," of the Standard Specifications is amended to read:

- Each signal section housing shall be either die-cast or permanent mold-cast aluminum conforming to ITE Publication: ST-017B or, when specified in the special provisions, shall be structural plastic.

The first paragraph of Section 86-4.01C, "Electrical Components," of the Standard Specifications is amended to read:

- Lamp receptacles and wiring shall conform to ITE Publication: ST-017B. The metal portion of the medium base lamp socket shall be brass, copper or phosphor bronze.

The first paragraph of Section 86-4.01D, "Visors," of the Standard Specifications is amended to read:

- Each signal section shall be provided with a removable visor conforming to the requirements in ITE Publication: ST-017B. Visors are classified, on the basis of lens enclosure, as full circle, tunnel (bottom open), or cap (bottom and lower sides open). Unless otherwise specified, visors shall be the tunnel type.

The first paragraph of Section 86-4.02A, "Physical and Mechanical Requirements," of the Standard Specifications is amended to read:

- Light emitting diode signal modules shall be designed as retrofit replacements for optical units of standard traffic signal sections and shall not require special tools for installation. Light emitting diode signal modules shall fit into existing traffic signal section housings built in conformance with the requirements in the Institute of Transportation Engineers (ITE) publication ST-017B, "Vehicle Traffic Control Signal Heads (VTCSH)" without modification to the housing.

The seventh paragraph of Section 86-4.02A, "Physical and Mechanical Requirements," of the Standard Specifications is amended to read:

- Light emitting diode signal modules shall be protected against dust and moisture intrusion in conformance with the requirements in NEMA Standard 250 for Type 4 enclosures to protect the internal components.

The first paragraph of Section 86-4.02B, "Photometric Requirements," of the Standard Specifications is amended to read:

- The minimum initial luminous intensity values for light emitting diode signal modules shall conform to the requirements in Section 11.04 of the Institute of Transportation Engineers (ITE) publication ST-017B, "Vehicle Traffic Control Signal Heads (VTCSH)" at 25°C.

The third paragraph of Section 86-4.02C, "Electrical," of the Standard Specifications is amended to read:

- The light emitting diode signal module on-board circuitry shall include voltage surge protection to withstand high-repetition noise transients as specified in Section 2.1.6 of NEMA Standard TS2.

Subparagraph 7 of the fourth paragraph of Section 86-4.02D(1), "Design Qualification Testing," of the Standard Specifications is amended to read:

- Moisture resistance testing shall be performed on light emitting diode signal modules in conformance with the requirements in NEMA Standard 250 for Type 4 enclosures. Evidence of internal moisture after testing shall be cause for rejection.

The second paragraph of Section 86-4.05, "Programmed Visibility Vehicle Signal Faces," of the Standard Specifications is amended to read:

- Each programmed visibility signal section shall provide a nominal 300-mm diameter circular or arrow indication. Color and arrow configuration shall conform to the requirements in ITE Publication: ST-017B.

The first paragraph of Section 86-4.06, "Pedestrian Signal Faces" of the Standard Specifications is amended to read:

- Message symbols for pedestrian signal faces shall be white WALKING PERSON and Portland orange UPRAISED HAND conforming to the requirements in the Institute of Transportation Engineers Standards: "Pedestrian Traffic Control Signal Indications," "Manual on Uniform Traffic Control Devices," and "MUTCD California Supplement." The height of each symbol shall be not less than 250 mm and the width of each symbol shall be not less than 165 mm.

Subparagraph 3 of the first paragraph of Section 86-4.06A, "Types," of the Standard Specifications is amended to read:

- Each reflector assembly shall consist of a double reflector or 2 single reflectors. Each reflector shall be made of either aluminum or plastic. Reflectors shall conform to the requirements in Institute of Transportation Engineers Publication: ST-017B, "Vehicle Traffic Control Signal Heads." Plastic reflectors shall consist of molded or vacuum-formed plastic with a vacuum-deposited aluminum reflecting surface. The plastic material shall not distort when the reflector is used with the lamp of the wattage normally furnished with the signal. In addition, the UL nonmechanical loading temperature of the material shall exceed, by at least 10°C, the maximum temperature in the signal section with the lamp "ON" and measured in an ambient air temperature of 25°C in conformance with the requirements in UL Publication UL 746B. Each completed reflector shall, when operated with the appropriate lamp and lens, provide the message brightness specified.

The tenth paragraph of Section 86-4.07, "Light Emitting Diode Pedestrian Signal Face 'Upraised Hand' Module" of the Standard Specifications is amended to read:

- The luminance of the "UPRAISED HAND" symbol shall be 3750 cd/m^2 minimum. The color of "UPRAISED HAND" shall be Portland orange conforming to the requirements of the Institute of Transportation Engineers Standards: "Pedestrian Traffic Control Signal Indications," "Manual on Uniform Traffic Control Devices," and "MUTCD California Supplement." The height of each symbol shall be not less than 250 mm and the width of each symbol shall be not less than 165 mm.

The second paragraph of Section 86-4.07C, "Electrical," of the Standard Specifications is amended to read:

- On-board circuitry of the light emitting diode pedestrian signal modules shall include voltage surge protection to withstand high-repetition noise transients as stated in Section 2.1.6 of NEMA Standard TS2.

The second paragraph of Section 86-4.07D(1), "Design Qualification Testing," of the Standard Specifications is amended to read:

- A quantity of 2 units for each design shall be submitted for Design Qualification Testing. Test units shall be submitted to the Transportation Laboratory, after manufacturer's testing is complete.

Subparagraphs 5 and 7 of the fourth paragraph of Section 86-4.07D(1), "Design Qualification Testing," of the Standard Specifications are amended to read:

- Mechanical vibration testing shall be in conformance with the requirements in Military Specification MIL-STD-883, Test Method 2007, using three 4-minute cycles along each x, y and z axis, at a force of 2.5 Gs, with a frequency sweep from 2 Hz to 120 Hz. The loosening of the lens or of internal components, or other physical damage shall be cause for rejection.

- Moisture resistance testing shall be performed on modules mounted in a standard pedestrian signal housing in conformance to the requirements in NEMA Standard 250 for Type 4 enclosures. Evidence of internal moisture after testing shall be cause for rejection.

The cone penetration, flow, and resilience requirements in the table in the second paragraph under "Hot-Melt Rubberized Asphalt Sealant" of Section 86-5.01A(5), "Installation Details," of the Standard Specifications is amended to read:

Cone Penetration, 25°C, 150 g, 5 s	D 5329, Sec. 6	3.5 mm, max.
Flow, 60°C	D 5329, Sec. 8	5 mm, max.
Resilience, 25°C	D 5329, Sec. 12	25%, min.

The third paragraph under "Mounting Assemblies" of Section 86-6.065, "Internally Illuminated Street Name Signs," of the Standard Specifications is amended to read:

- At least 4.9-m of clearance shall be provided between the bottom of the fixture and the roadway.

Section 86-8.01, "Payment," of the Standard Specifications is amended by adding the following paragraph after the first paragraph:

- If a portion or all of the poles for signal, lighting and electrical systems pursuant to Standard Specification Section 86, "Signals, Lighting and Electrical Systems," is fabricated more than 480 air line kilometers from both-Sacramento and Los Angeles, additional shop inspection expenses will be sustained by the State. Whereas it is and will be impracticable and extremely difficult to ascertain and determine the actual increase in such expenses, it is agreed that payment to the Contractor for furnishing such items from each fabrication site located more than 480 air line kilometers from both Sacramento and Los Angeles will be reduced $5000; in addition, in the case where a fabrication site is located more than 4800 air line kilometers from both Sacramento and Los Angeles, payment will be reduced an additional $3000 per each fabrication site ($8000 total per site).

SECTION 88: ENGINEERING FABRIC

Issue Date: January 15, 2002

Section 88-1.02, "Pavement Reinforcing Fabric," of the Standard Specifications is amended to read:

- Pavement reinforcing fabric shall be 100 percent polypropylene staple fiber fabric material, needle-punched, thermally bonded on one side, and conform to the following:

Specification	Requirement
Weight, grams per square meter ASTM Designation: D 5261	140
Grab tensile strength (25-mm grip), kilonewtons, min. in each direction ASTM Designation: D 4632	0.45
Elongation at break, percent min. ASTM Designation: D 4632	50
Asphalt retention by fabric, grams per square meter. (Residual Minimum) ASTM Designation: D 6140	900

Note: Weight, grab, elongation and asphalt retention are based on Minimum Average Roll Value (MARV)

SECTION 90: PORTLAND CEMENT CONCRETE

Issue Date: November 2, 2004

Section 90, "Portland Cement Concrete," of the Standard Specifications is amended to read:

SECTION 90: PORTLAND CEMENT CONCRETE
90-1 GENERAL

90-1.01 DESCRIPTION

- Portland cement concrete shall be composed of cementitious material, fine aggregate, coarse aggregate, admixtures if used, and water, proportioned and mixed as specified in these specifications.

• The Contractor shall determine the mix proportions for concrete in conformance with these specifications. Unless otherwise specified, cementitious material shall be a combination of cement and mineral admixture. Cementitious material shall be either:

1. "Type IP (MS) Modified" cement; or
2. A combination of "Type II Modified" portland cement and mineral admixture; or
3. A combination of Type V portland cement and mineral admixture.

• Type III portland cement shall be used only as allowed in the special provisions or with the approval of the Engineer.
• Class 1 concrete shall contain not less than 400 kg of cementitious material per cubic meter.
• Class 2 concrete shall contain not less than 350 kg of cementitious material per cubic meter.
• Class 3 concrete shall contain not less than 300 kg of cementitious material per cubic meter.
• Class 4 concrete shall contain not less than 250 kg of cementitious material per cubic meter.
• Minor concrete shall contain not less than 325 kg of cementitious material per cubic meter unless otherwise specified in these specifications or the special provisions.
• Unless otherwise designated on the plans or specified in these specifications or the special provisions, the amount of cementitious material used per cubic meter of concrete in structures or portions of structures shall conform to the following:

Use	Cementitious Material Content (kg/m3)
Concrete designated by compressive strength:	
Deck slabs and slab spans of bridges	400 min., 475 max.
Roof sections of exposed top box culverts	400 min., 475 max.
Other portions of structures	350 min., 475 max.
Concrete not designated by compressive strength:	
Deck slabs and slab spans of bridges	400 min.
Roof sections of exposed top box culverts	400 min.
Prestressed members	400 min.
Seal courses	400 min.
Other portions of structures	350 min.
Concrete for precast members	350 min., 550 max.

• Whenever the 28-day compressive strength shown on the plans is greater than 25 MPa, the concrete shall be designated by compressive strength. If the plans show a 28-day compressive strength that is 28 MPa or greater, an additional 14 days will be allowed to obtain the specified strength. The 28-day compressive strengths shown on the plans that are 25 MPa or less are shown for design information only and are not a requirement for acceptance of the concrete.
• Concrete designated by compressive strength shall be proportioned such that the concrete will attain the strength shown on the plans or specified in the special provisions.
• Before using concrete for which the mix proportions have been determined by the Contractor, or in advance of revising those mix proportions, the Contractor shall submit in writing to the Engineer a copy of the mix design.
• Compliance with cementitious material content requirements will be verified in conformance with procedures described in California Test 518 for cement content. For testing purposes, mineral admixture shall be considered to be cement. Batch proportions shall be adjusted as necessary to produce concrete having the specified cementitious material content.
• If any concrete has a cementitious material, portland cement, or mineral admixture content that is less than the minimum required, the concrete shall be removed. However, if the Engineer determines that the concrete is structurally adequate, the concrete may remain in place and the Contractor shall pay to the State $0.55 for each kilogram of cementitious material, portland cement, or mineral admixture that is less than the minimum required. The Department may deduct the amount from any moneys due, or that may become due, the Contractor under the contract. The deductions will not be made unless the difference between the contents required and those actually provided exceeds the batching tolerances permitted by Section 90-5, "Proportioning." No deductions will be made based on the results of California Test 518.
• The requirements of the preceding paragraph shall not apply to minor concrete or commercial quality concrete.

90-2 MATERIALS

90-2.01 CEMENT

- Unless otherwise specified, cement shall be either "Type IP (MS) Modified" cement, "Type II Modified" portland cement or Type V portland cement.
- "Type IP (MS) Modified" cement shall conform to the requirements for Type IP (MS) cement in ASTM Designation: C 595, and shall be comprised of an intimate and uniform blend of Type II cement and not more than 35 percent by mass of mineral admixture. The type and minimum amount of mineral admixture used in the manufacture of "Type IP (MS) Modified" cement shall be in conformance with the provisions in Section 90-4.08, "Required Use of Mineral Admixtures."
- "Type II Modified" portland cement shall conform to the requirements for Type II portland cement in ASTM Designation: C 150-02a.
- In addition, "Type IP (MS) Modified" cement and "Type II Modified" portland cement shall conform to the following requirements:

A. The cement shall not contain more than 0.60-percent by mass of alkalies, calculated as the percentage of Na_2O plus 0.658 times the percentage of K_2O, when determined by either direct intensity flame photometry or by the atomic absorption method. The instrument and procedure used shall be qualified as to precision and accuracy in conformance with the requirements in ASTM Designation: C 114;
B. The autoclave expansion shall not exceed 0.50-percent; and
C. Mortar, containing the cement to be used and Ottawa sand, when tested in conformance with California Test 527, shall not expand in water more than 0.010 percent and shall not contract in air more than 0.048 percent, except that when cement is to be used for precast prestressed concrete piling, precast prestressed concrete members, or steam cured concrete products, the mortar shall not contract in air more than 0.053 percent.

- Type III and Type V portland cements shall conform to the requirements in ASTM Designation: C 150-02a and the additional requirements listed above for "Type II Modified" portland cement, except that when tested in conformance with California Test 527, mortar containing Type III portland cement shall not contract in air more than 0.075 percent.
- Cement used in the manufacture of cast-in-place concrete for exposed surfaces of like elements of a structure shall be from the same cement mill.
- Cement shall be protected from exposure to moisture until used. Sacked cement shall be piled to permit access for tally, inspection, and identification of each shipment.
- Adequate facilities shall be provided to assure that cement meeting the provisions specified in this Section 90-2.01 shall be kept separate from other cement in order to prevent any but the specified cement from entering the work. Safe and suitable facilities for sampling cement shall be provided at the weigh hopper or in the feed line immediately in advance of the hopper, in conformance with California Test 125.
- If cement is used prior to sampling and testing as provided in Section 6-1.07, "Certificates of Compliance," and the cement is delivered directly to the site of the work, the Certificate of Compliance shall be signed by the cement manufacturer or supplier of the cement. If the cement is used in ready-mixed concrete or in precast concrete products purchased as such by the Contractor, the Certificate of Compliance shall be signed by the manufacturer of the concrete or product.
- Cement furnished without a Certificate of Compliance shall not be used in the work until the Engineer has had sufficient time to make appropriate tests and has approved the cement for use.

90-2.02 AGGREGATES

- Aggregates shall be free from deleterious coatings, clay balls, roots, bark, sticks, rags, and other extraneous material.
- Natural aggregates shall be thoroughly and uniformly washed before use.
- The Contractor, at the Contractor's expense, shall provide safe and suitable facilities, including necessary splitting devices for obtaining samples of aggregates, in conformance with California Test 125.
- Aggregates shall be of such character that it will be possible to produce workable concrete within the limits of water content provided in Section 90-6.06, "Amount of Water and Penetration."
- Aggregates shall have not more than 10 percent loss when tested for soundness in conformance with the requirements in California Test 214. The soundness requirement for fine aggregate will be waived, provided that the durability index, D_f, of the fine aggregate is 60, or greater, when tested for durability in conformance with California Test 229.
- If the results of any one or more of the Cleanness Value, Sand Equivalent, or aggregate grading tests do not meet the requirements specified for "Operating Range" but all meet the "Contract Compliance" requirements, the placement of

concrete shall be suspended at the completion of the current pour until tests or other information indicate that the next material to be used in the work will comply with the requirements specified for "Operating Range."

- If the results of either or both the Cleanness Value and coarse aggregate grading tests do not meet the requirements specified for "Contract Compliance," the concrete that is represented by the tests shall be removed. However, if the Engineer determines that the concrete is structurally adequate, the concrete may remain in place, and the Contractor shall pay to the State $4.60 per cubic meter for paving concrete and $7.20 per cubic meter for all other concrete for the concrete represented by these tests and left in place. The Department may deduct the amount from any moneys due, or that may become due, the Contractor under the contract.
- If the results of either or both the Sand Equivalent and fine aggregate grading tests do not meet the requirements specified for "Contract Compliance," the concrete which is represented by the tests shall be removed. However, if the Engineer determines that the concrete is structurally adequate, the concrete may remain in place, and the Contractor shall pay to the State $4.60 per cubic meter for paving concrete and $7.20 per cubic meter for all other concrete for the concrete represented by these tests and left in place. The Department may deduct the amount from any moneys due, or that may become due, the Contractor under the contract.
- The 2 preceding paragraphs apply individually to the "Contract Compliance" requirements for coarse aggregate and fine aggregate. When both coarse aggregate and fine aggregate do not conform to the "Contract Compliance" requirements, both paragraphs shall apply. The payments specified in those paragraphs shall be in addition to any payments made in conformance with the provisions in Section 90-1.01, "Description."
- No single Cleanness Value, Sand Equivalent or aggregate grading test shall represent more than 250 m^3 of concrete or one day's pour, whichever is smaller.
- When the source of an aggregate is changed, the Contractor shall adjust the mix proportions and submit in writing to the Engineer a copy of the mix design before using the aggregates.

90-2.02A Coarse Aggregate

- Coarse aggregate shall consist of gravel, crushed gravel, crushed rock, crushed air-cooled iron blast furnace slag or combinations thereof. Crushed air-cooled blast furnace slag shall not be used in reinforced or prestressed concrete.
- Coarse aggregate shall conform to the following quality requirements:

Tests	California Test	Requirements
Loss in Los Angeles Rattler (after 500 revolutions)	211	45% max.
Cleanness Value		
Operating Range	227	75 min.
Contract Compliance	227	71 min.

- In lieu of the above Cleanness Value requirements, a Cleanness Value "Operating Range" limit of 71, minimum, and a Cleanness Value "Contract Compliance" limit of 68, minimum, will be used to determine the acceptability of the coarse aggregate if the Contractor furnishes a Certificate of Compliance, as provided in Section 6-1.07, "Certificates of Compliance," certifying that:

1. coarse aggregate sampled at the completion of processing at the aggregate production plant had a Cleanness Value of not less than 82 when tested by California Test 227; and
2. prequalification tests performed in conformance with the requirements in California Test 549 indicated that the aggregate would develop a relative strength of not less than 95 percent and would have a relative shrinkage not greater than 105 percent, based on concrete.

90-2.02B Fine Aggregate

- Fine aggregate shall consist of natural sand, manufactured sand produced from larger aggregate or a combination thereof. Manufactured sand shall be well graded.

- Fine aggregate shall conform to the following quality requirements:

Test	California Test	Requirements
Organic Impurities	213	Satisfactory[a]
Mortar Strengths Relative to Ottawa Sand	515	95%, min.
Sand Equivalent:		
Operating Range	217	75, min.
Contract Compliance	217	71, min.

a Fine aggregate developing a color darker than the reference standard color solution may be accepted if it is determined by the Engineer, from mortar strength tests, that a darker color is acceptable.

• In lieu of the above Sand Equivalent requirements, a Sand Equivalent "Operating Range" limit of 71 minimum and a Sand Equivalent "Contract Compliance" limit of 68 minimum will be used to determine the acceptability of the fine aggregate if the Contractor furnishes a Certificate of Compliance, as provided in Section 6-1.07, "Certificates of Compliance," certifying that:

1. fine aggregate sampled at the completion of processing at the aggregate production plant had a Sand Equivalent value of not less than 82 when tested by California Test 217; and
2. prequalification tests performed in conformance with California Test 549 indicated that the aggregate would develop a relative strength of not less than 95 percent and would have a relative shrinkage not greater than 105 percent, based on concrete.

90-2.03 WATER

• In conventionally reinforced concrete work, the water for curing, for washing aggregates, and for mixing shall be free from oil and shall not contain more than 1000 parts per million of chlorides as Cl, when tested in conformance with California Test 422, nor more than 1300 parts per million of sulfates as SO_4, when tested in conformance with California Test 417. In prestressed concrete work, the water for curing, for washing aggregates, and for mixing shall be free from oil and shall not contain more than 650 parts per million of chlorides as Cl, when tested in conformance with California Test 422, nor more than 1300 parts per million of sulfates as SO_4, when tested in conformance with California Test 417. In no case shall the water contain an amount of impurities that will cause either: 1) a change in the setting time of cement of more than 25 percent when tested in conformance with the requirements in ASTM Designation: C 191 or ASTM Designation: C 266 or 2) a reduction in the compressive strength of mortar at 14 days of more than 5 percent, when tested in conformance with the requirements in ASTM Designation: C 109, when compared to the results obtained with distilled water or deionized water, tested in conformance with the requirements in ASTM Designation: C 109.

• In non-reinforced concrete work, the water for curing, for washing aggregates and for mixing shall be free from oil and shall not contain more than 2000 parts per million of chlorides as Cl, when tested in conformance with California Test 422, or more than 1500 parts per million of sulfates as SO_4, when tested in conformance with California Test 417.

• In addition to the above provisions, water for curing concrete shall not contain impurities in a sufficient amount to cause discoloration of the concrete or produce etching of the surface.

• Water reclaimed from mixer wash-out operations may be used in mixing concrete. The water shall not contain coloring agents or more than 300 parts per million of alkalis ($Na_2O + 0.658\ K_2O$) as determined on the filtrate. The specific gravity of the water shall not exceed 1.03 and shall not vary more than ±0.010 during a day's operations.

90-2.04 ADMIXTURE MATERIALS

• Admixture materials shall conform to the requirements in the following ASTM Designations:

A. Chemical Admixtures—ASTM Designation: C 494.
B. Air-entraining Admixtures—ASTM Designation: C 260.
C. Calcium Chloride—ASTM Designation: D 98.
D. Mineral Admixtures—Coal fly ash; raw or calcined natural pozzolan as specified in ASTM Designation: C 618; silica fume conforming to the requirements in ASTM Designation: C 1240, with reduction of mortar expansion of 80 percent, minimum, using the cement from the proposed mix design.

• Unless otherwise specified in the special provisions, mineral admixtures shall be used in conformance with the provisions in Section 90-4.08, "Required Use of Mineral Admixtures."

90-3 AGGREGATE GRADINGS

90-3.01 GENERAL

• Before beginning concrete work, the Contractor shall submit in writing to the Engineer the gradation of the primary aggregate nominal sizes that the Contractor proposes to furnish. If a primary coarse aggregate or the fine aggregate is separated into 2 or more sizes, the proposed gradation shall consist of the gradation for each individual size, and the proposed proportions of each individual size, combined mathematically to indicate one proposed gradation. The proposed gradation shall meet the grading requirements shown in the table in this section, and shall show the percentage passing each of the sieve sizes used in determining the end result.

• The Engineer may waive, in writing, the gradation requirements in this Section 90-3.01 and in Sections 90-3.02, "Coarse Aggregate Grading," 90-3.03, "Fine Aggregate Grading," and 90-3.04, "Combined Aggregate Gradings," if, in the Engineer's opinion, furnishing the gradation is not necessary for the type or amount of concrete work to be constructed.

• Gradations proposed by the Contractor shall be within the following percentage passing limits:

Primary Aggregate Nominal Size	Sieve Size	Limits of Proposed Gradation
37.5-mm x 19-mm	25-mm	19 - 41
25-mm x 4.75-mm	19-mm	52 - 85
25-mm x 4.75-mm	9.5-mm	15 - 38
12.5-mm x 4.75-mm	9.5-mm	40 - 78
9.5-mm x 2.36-mm	9.5-mm	50 - 85
Fine Aggregate	1.18-mm	55 - 75
Fine Aggregate	600-µm	34 - 46
Fine Aggregate	300-µm	16 - 29

• Should the Contractor change the source of supply, the Contractor shall submit in writing to the Engineer the new gradations before their intended use.

90-3.02 COARSE AGGREGATE GRADING

• The grading requirements for coarse aggregates are shown in the following table for each size of coarse aggregate:

	Percentage Passing Primary Aggregate Nominal Sizes							
	37.5-mm x 19-mm		25-mm x 4.75-mm		12.5-mm x 4.75-mm		9.5-mm x 2.36-mm	
Sieve Sizes	Operating Range	Contract Compliance	Operating Range	Contract Compliance	Operating Range	Contract Compliance	Operating Range	Contract Compliance
50-mm	100	100	—	—	—	—	—	—
37.5-mm	88-100	85-100	100	100	—	—	—	—
25-mm	x ± 18	X ± 25	88-100	86-100	—	—	—	—
19-mm	0-17	0-20	X ± 15	X ± 22	100	100	—	—
12.5-mm	—	—	—	—	82-100	80-100	100	100
9.5-mm	0-7	0-9	X ± 15	X ± 22	X ± 15	X ± 22	X ± 15	X ± 20
4.75-mm	—	—	0-16	0-18	0-15	0-18	0-25	0-28
2.36-mm	—	—	0-6	0-7	0-6	0-7	0-6	0-7

• In the above table, the symbol X is the gradation that the Contractor proposes to furnish for the specific sieve size as provided in Section 90-3.01, "General."

• Coarse aggregate for the 37.5-mm, maximum, combined aggregate grading as provided in Section 90-3.04, "Combined Aggregate Gradings," shall be furnished in 2 or more primary aggregate nominal sizes. Each primary aggregate nominal size may be separated into 2 sizes and stored separately, provided that the combined material conforms to the grading requirements for that particular primary aggregate nominal size.

• When the 25-mm, maximum, combined aggregate grading as provided in Section 90-3.04, "Combined Aggregate Gradings," is to be used, the coarse aggregate may be separated into 2 sizes and stored separately, provided that the combined material shall conform to the grading requirements for the 25-mm x 4.75-mm primary aggregate nominal size.

90-3.03 FINE AGGREGATE GRADING

- Fine aggregate shall be graded within the following limits:

Sieve Sizes	Percentage Passing	
	Operating Range	Contract Compliance
9.5-mm	100	100
4.75-mm	95-100	93-100
2.36-mm	65-95	61-99
1.18-mm	X ± 10	X ± 13
600-µm	X ± 9	X ± 12
300-µm	X ± 6	X ± 9
150-µm	2-12	1-15
75-µm	0-8	0-10

- In the above table, the symbol X is the gradation that the Contractor proposes to furnish for the specific sieve size as provided in Section 90-3.01, "General."
- In addition to the above required grading analysis, the distribution of the fine aggregate sizes shall be such that the difference between the total percentage passing the 1.18-mm sieve and the total percentage passing the 600-µm sieve shall be between 10 and 40, and the difference between the percentage passing the 600-µm and 300-µm sieves shall be between 10 and 40.
- Fine aggregate may be separated into 2 or more sizes and stored separately, provided that the combined material conforms to the grading requirements specified in this Section 90-3.03.

90-3.04 COMBINED AGGREGATE GRADINGS

- Combined aggregate grading limits shall be used only for the design of concrete mixes. Concrete mixes shall be designed so that aggregates are combined in proportions that shall produce a mixture within the grading limits for combined aggregates as specified herein.
- The combined aggregate grading, except when otherwise specified in these specifications or the special provisions, shall be either the 37.5-mm, maximum grading, or the 25-mm, maximum grading, at the option of the Contractor.

Grading Limits of Combined Aggregates

Sieve Sizes	Percentage Passing			
	37.5-mm Max.	25-mm Max.	12.5-mm Max.	9.5-mm Max.
50-mm	100	—	—	—
37.5-mm	90-100	100	—	—
25-mm	50-86	90-100	—	—
19-mm	45-75	55-100	100	—
12.5-mm	—	—	90-100	100
9.5-mm	38-55	45-75	55-86	50 - 100
4.75-mm	30-45	35-60	45-63	45 - 63
2.36-mm	23-38	27-45	35-49	35 - 49
1.18-mm	17-33	20-35	25-37	25 - 37
600-µm	10-22	12-25	15-25	15 - 25
300-µm	4-10	5-15	5-15	5 - 15
150-µm	1-6	1-8	1-8	1 - 8
75-µm	0-3	0-4	0-4	0 - 4

- Changes from one grading to another shall not be made during the progress of the work unless permitted by the Engineer.

90-4 ADMIXTURES

90-4.01 GENERAL

- Admixtures used in portland cement concrete shall conform to and be used in conformance with the provisions in this Section 90-4 and the special provisions. Admixtures shall be used when specified or ordered by the Engineer and may be used at the Contractor's option as provided herein.

- Chemical admixtures and air-entraining admixtures containing chlorides as Cl in excess of one percent by mass of admixture, as determined by California Test 415, shall not be used in prestressed or reinforced concrete.
- Calcium chloride shall not be used in concrete except when otherwise specified.
- Mineral admixture used in concrete for exposed surfaces of like elements of a structure shall be from the same source and of the same percentage.
- Admixtures shall be uniform in properties throughout their use in the work. Should it be found that an admixture as furnished is not uniform in properties, its use shall be discontinued.
- If more than one admixture is used, the admixtures shall be compatible with each other so that the desirable effects of all admixtures used will be realized.

90-4.02 MATERIALS

- Admixture materials shall conform to the provisions in Section 90–2.04, "Admixture Materials."

90-4.03 ADMIXTURE APPROVAL

- No admixture brand shall be used in the work unless it is on the Department's current list of approved brands for the type of admixture involved.
- Admixture brands will be considered for addition to the approved list if the manufacturer of the admixture submits to the Transportation Laboratory a sample of the admixture accompanied by certified test results demonstrating that the admixture complies with the requirements in the appropriate ASTM Designation and these specifications. The sample shall be sufficient to permit performance of all required tests. Approval of admixture brands will be dependent upon a determination as to compliance with the requirements, based on the certified test results submitted, together with tests the Department may elect to perform.
- When the Contractor proposes to use an admixture of a brand and type on the current list of approved admixture brands, the Contractor shall furnish a Certificate of Compliance from the manufacturer, as provided in Section 6-1.07, "Certificates of Compliance," certifying that the admixture furnished is the same as that previously approved. If a previously approved admixture is not accompanied by a Certificate of Compliance, the admixture shall not be used in the work until the Engineer has had sufficient time to make the appropriate tests and has approved the admixture for use. The Engineer may take samples for testing at any time, whether or not the admixture has been accompanied by a Certificate of Compliance.
- If a mineral admixture is delivered directly to the site of the work, the Certificate of Compliance shall be signed by the manufacturer or supplier of the mineral admixture. If the mineral admixture is used in ready-mix concrete or in precast concrete products purchased as such by the Contractor, the Certificate of Compliance shall be signed by the manufacturer of the concrete or product.

90-4.04 REQUIRED USE OF CHEMICAL ADMIXTURES AND CALCIUM CHLORIDE

- When the use of a chemical admixture or calcium chloride is specified, the admixture shall be used at the dosage specified, except that if no dosage is specified, the admixture shall be used at the dosage normally recommended by the manufacturer of the admixture.
- Calcium chloride shall be dispensed in liquid, flake, or pellet form. Calcium chloride dispensed in liquid form shall conform to the provisions for dispensing liquid admixtures in Section 90-4.10, "Proportioning and Dispensing Liquid Admixtures."

90-4.05 OPTIONAL USE OF CHEMICAL ADMIXTURES

- The Contractor will be permitted to use Type A or F, water-reducing; Type B, retarding; or Type D or G, water-reducing and retarding admixtures as described in ASTM Designation: C 494 to conserve cementitious material or to facilitate any concrete construction application subject to the following conditions:

A. When a water-reducing admixture or a water-reducing and retarding admixture is used, the cementitious material content specified or ordered may be reduced by a maximum of 5 percent by mass, except that the resultant cementitious material content shall be not less than 300 kilograms per cubic meter; and
B. When a reduction in cementitious material content is made, the dosage of admixture used shall be the dosage used in determining approval of the admixture.

- Unless otherwise specified, a Type C accelerating chemical admixture conforming to the requirements in ASTM Designation: C 494, may be used in portland cement concrete. Inclusion in the mix design submitted for approval will not be required provided that the admixture is added to counteract changing conditions that contribute to delayed setting of the portland cement concrete, and the use or change in dosage of the admixture is approved in writing by the Engineer.

90-4.06 REQUIRED USE OF AIR-ENTRAINING ADMIXTURES

• When air-entrainment is specified or ordered by the Engineer, the air-entraining admixture shall be used in amounts to produce a concrete having the specified air content as determined by California Test 504.

90-4.07 OPTIONAL USE OF AIR-ENTRAINING ADMIXTURES

• When air-entrainment has not been specified or ordered by the Engineer, the Contractor will be permitted to use an air-entraining admixture to facilitate the use of any construction procedure or equipment provided that the average air content, as determined by California Test 504, of 3 successive tests does not exceed 4 percent, and no single test value exceeds 5.5 percent. If the Contractor elects to use an air-entraining admixture in concrete for pavement, the Contractor shall so indicate at the time the Contractor designates the source of aggregate as provided in Section 40-1.015, "Cement Content."

90-4.08 REQUIRED USE OF MINERAL ADMIXTURES

• Unless otherwise specified, mineral admixture shall be combined with cement to make cementitious material.

• The calcium oxide content shall not exceed 10 percent when determined in conformance with the requirements in ASTM Designation: C 114. The available alkali content (as sodium oxide equivalent) shall not exceed 1.5 percent when determined in conformance with the requirements in ASTM Designation: C 311, or the total alkali content (as sodium oxide equivalent) shall not exceed 5.0 percent when determined in conformance with the requirements in ASTM Designation: D 4326.

• The amounts of cement and mineral admixture used in cementitious material shall be sufficient to satisfy the minimum cementitious material content requirements specified in Section 90-1.01, "Description," or Section 90-4.05, "Optional Use of Chemical Admixtures," and shall conform to the following:

A. The minimum amount of cement shall not be less than 75 percent by mass of the specified minimum cementitious material content;
B. The minimum amount of mineral admixture to be combined with cement shall be determined using one of the following criteria:

    1. When the calcium oxide content of a mineral admixture is equal to or less than 2 percent by mass, the amount of mineral admixture shall not be less than 15 percent by mass of the total amount of cementitious material to be used in the mix;
    2. When the calcium oxide content of a mineral admixture is greater than 2 percent, the amount of mineral admixture shall not be less than 25 percent by mass of the total amount of cementitious material to be used in the mix;
    3. When a mineral admixture that conforms to the provisions for silica fume in Section 90-2.04, "Admixture Materials," is used, the amount of mineral admixture shall not be less than 10 percent by mass of the total amount of cementitious material to be used in the mix

C. The total amount of mineral admixture shall not exceed 35 percent by mass of the total amount of cementitious material to be used in the mix. Where Section 90-1.01, "Description," specifies a maximum cementitious content in kilograms per cubic meter, the total mass of cement and mineral admixture per cubic meter shall not exceed the specified maximum cementitious material content.

90-4.09 BLANK

90-4.10 PROPORTIONING AND DISPENSING LIQUID ADMIXTURES

• Chemical admixtures and air-entraining admixtures shall be dispensed in liquid form. Dispensers for liquid admixtures shall have sufficient capacity to measure at one time the prescribed quantity required for each batch of concrete. Each dispenser shall include a graduated measuring unit into which liquid admixtures are measured to within ±5 percent of the prescribed quantity for each batch. Dispensers shall be located and maintained so that the graduations can be accurately read from the point at which proportioning operations are controlled to permit a visual check of batching accuracy prior to discharge. Each measuring unit shall be clearly marked for the type and quantity of admixture.

• Each liquid admixture dispensing system shall be equipped with a sampling device consisting of a valve located in a safe and readily accessible position such that a sample of the admixture may be withdrawn slowly by the Engineer.

• If more than one liquid admixture is used in the concrete mix, each liquid admixture shall have a separate measuring unit and shall be dispensed by injecting equipment located in such a manner that the admixtures are not mixed at high concentrations and do not interfere with the effectiveness of each other. When air-entraining admixtures are used in conjunction with other liquid admixtures, the air-entraining admixture shall be the first to be incorporated into the mix.

• When automatic proportioning devices are required for concrete pavement, dispensers for liquid admixtures shall operate automatically with the batching control equipment. The dispensers shall be equipped with an automatic warning system in good operating condition that will provide a visible or audible signal at the point at which proportioning operations are controlled when the quantity of admixture measured for each batch of concrete varies from the preselected dosage by more than 5 percent, or when the entire contents of the measuring unit are not emptied from the dispenser into each batch of concrete.

• Unless liquid admixtures are added to premeasured water for the batch, their discharge into the batch shall be arranged to flow into the stream of water so that the admixtures are well dispersed throughout the batch, except that air-entraining admixtures may be dispensed directly into moist sand in the batching bins provided that adequate control of the air content of the concrete can be maintained.

• Liquid admixtures requiring dosages greater than 2.5 L/m^3 shall be considered to be water when determining the total amount of free water as specified in Section 90-6.06, "Amount of Water and Penetration."

• Special admixtures, such as "high range" water reducers that may contribute to a high rate of slump loss, shall be measured and dispensed as recommended by the admixture manufacturer and as approved by the Engineer.

90-4.11 STORAGE, PROPORTIONING, AND DISPENSING OF MINERAL ADMIXTURES

• Mineral admixtures shall be protected from exposure to moisture until used. Sacked material shall be piled to permit access for tally, inspection and identification for each shipment.

• Adequate facilities shall be provided to assure that mineral admixtures meeting the specified requirements are kept separate from other mineral admixtures in order to prevent any but the specified mineral admixtures from entering the work. Safe and suitable facilities for sampling mineral admixtures shall be provided at the weigh hopper or in the feed line immediately in advance of the hopper.

• Mineral admixtures shall be incorporated into concrete using equipment conforming to the requirements for cement weigh hoppers, and charging and discharging mechanisms in ASTM Designation: C 94, in Section 90-5.03, "Proportioning," and in this Section 90-4.11.

• When concrete is completely mixed in stationary paving mixers, the mineral admixture shall be weighed in a separate weigh hopper conforming to the provisions for cement weigh hoppers and charging and discharging mechanisms in Section 90-5.03A, "Proportioning for Pavement," and the mineral admixture and cement shall be introduced simultaneously into the mixer proportionately with the aggregate. If the mineral admixture is not weighed in a separate weigh hopper, the Contractor shall provide certification that the stationary mixer is capable of mixing the cement, admixture, aggregates and water uniformly prior to discharge. Certification shall contain the following:

A. Test results for 2 compressive strength test cylinders of concrete taken within the first one-third and 2 compressive strength test cylinders of concrete taken within the last one-third of the concrete discharged from a single batch from the stationary paving mixer. Strength tests and cylinder preparation will be in conformance with the provisions of Section 90-9, "Compressive Strength;"
B. Calculations demonstrating that the difference in the averages of 2 compressive strengths taken in the first one-third is no greater than 7.5 percent different than the averages of 2 compressive strengths taken in the last one-third of the concrete discharged from a single batch from the stationary paving mixer. Strength tests and cylinder preparation will be in conformance with the provisions of Section 90-9, "Compressive Strength;" and
C. The mixer rotation speed and time of mixing prior to discharge that are required to produce a mix that meets the requirements above.

90-5 PROPORTIONING

90-5.01 STORAGE OF AGGREGATES

• Aggregates shall be stored or stockpiled in such a manner that separation of coarse and fine particles of each size shall be avoided and also that the various sizes shall not become intermixed before proportioning.

• Aggregates shall be stored or stockpiled and handled in a manner that shall prevent contamination by foreign materials. In addition, storage of aggregates at batching or mixing facilities that are erected subsequent to the award of the contract and that furnish concrete to the project shall conform to the following:

A. Intermingling of the different sizes of aggregates shall be positively prevented. The Contractor shall take the necessary measures to prevent intermingling. The preventive measures may include, but are not necessarily limited to, physical separation of stockpiles or construction of bulkheads of adequate length and height; and
B. Contamination of aggregates by contact with the ground shall be positively prevented. The Contractor shall take the necessary measures to prevent contamination. The preventive measures shall include, but are not necessarily limited

to, placing aggregates on wooden platforms or on hardened surfaces consisting of portland cement concrete, asphalt concrete, or cement treated material.

• In placing aggregates in storage or in moving the aggregates from storage to the weigh hopper of the batching plant, any method that may cause segregation, degradation, or the combining of materials of different gradings that will result in any size of aggregate at the weigh hopper failing to meet the grading requirements, shall be discontinued. Any method of handling aggregates that results in excessive breakage of particles shall be discontinued. The use of suitable devices to reduce impact of falling aggregates may be required by the Engineer.

90-5.02 PROPORTIONING DEVICES

• Weighing, measuring, or metering devices used for proportioning materials shall conform to the requirements in Section 9-1.01, "Measurement of Quantities," and this Section 90-5.02. In addition, automatic weighing systems shall comply with the requirements for automatic proportioning devices in Section 90-5.03A, "Proportioning for Pavement." Automatic devices shall be automatic to the extent that the only manual operation required for proportioning the aggregates, cement, and mineral admixture for one batch of concrete is a single operation of a switch or starter.

• Proportioning devices shall be tested at the expense of the Contractor as frequently as the Engineer may deem necessary to ensure their accuracy.

• Weighing equipment shall be insulated against vibration or movement of other operating equipment in the plant. When the plant is in operation, the mass of each batch of material shall not vary from the mass designated by the Engineer by more than the tolerances specified herein.

• Equipment for cumulative weighing of aggregate shall have a zero tolerance of ±0.5 percent of the designated total batch mass of the aggregate. For systems with individual weigh hoppers for the various sizes of aggregate, the zero tolerance shall be ±0.5 percent of the individual batch mass designated for each size of aggregate. Equipment for cumulative weighing of cement and mineral admixtures shall have a zero tolerance of ±0.5 percent of the designated total batch mass of the cement and mineral admixture. Equipment for weighing cement or mineral admixture separately shall have a zero tolerance of ±0.5 percent of their designated individual batch masses. Equipment for measuring water shall have a zero tolerance of ±0.5 percent of its designated mass or volume.

• The mass indicated for any batch of material shall not vary from the preselected scale setting by more than the following:

A. Aggregate weighed cumulatively shall be within 1.0 percent of the designated total batch mass of the aggregate. Aggregates weighed individually shall be within 1.5 percent of their respective designated batch masses; and
B. Cement shall be within 1.0 percent of its designated batch mass. When weighed individually, mineral admixture shall be within 1.0 percent of its designated batch mass. When mineral admixture and cement are permitted to be weighed cumulatively, cement shall be weighed first to within 1.0 percent of its designated batch mass, and the total for cement and mineral admixture shall be within 1.0 percent of the sum of their designated batch masses; and
C. Water shall be within 1.5 percent of its designated mass or volume.

• Each scale graduation shall be approximately 0.001 of the total capacity of the scale. The capacity of scales for weighing cement, mineral admixture, or cement plus mineral admixture and aggregates shall not exceed that of commercially available scales having single graduations indicating a mass not exceeding the maximum permissible mass variation above, except that no scale shall be required having a capacity of less than 500 kg, with 0.5-kg graduations.

90-5.03 PROPORTIONING

• Proportioning shall consist of dividing the aggregates into the specified sizes, each stored in a separate bin, and combining them with cement, mineral admixture, and water as provided in these specifications. Aggregates shall be proportioned by mass.

• At the time of batching, aggregates shall have been dried or drained sufficiently to result in a stable moisture content such that no visible separation of water from aggregate will take place during transportation from the proportioning plant to the point of mixing. In no event shall the free moisture content of the fine aggregate at the time of batching exceed 8 percent of its saturated, surface-dry mass.

• Should separate supplies of aggregate material of the same size group, but of different moisture content or specific gravity or surface characteristics affecting workability, be available at the proportioning plant, withdrawals shall be made from one supply exclusively and the materials therein completely exhausted before starting upon another.

• Bulk "Type IP (MS) Modified" cement shall be weighed in an individual hopper and shall be kept separate from the aggregates until the ingredients are released for discharge into the mixer.

• Bulk cement and mineral admixture may be weighed in separate, individual weigh hoppers or may be weighed in the same weigh hopper and shall be kept separate from the aggregates until the ingredients are released for discharge into the mixer. If the cement and mineral admixture are weighed cumulatively, the cement shall be weighed first.

• When cement and mineral admixtures are weighed in separate weigh hoppers**,** the weigh systems for the proportioning of the aggregate, the cement, and the mineral admixture shall be individual and distinct from all other weigh systems. Each weigh system shall be equipped with a hopper, a lever system, and an indicator to constitute an individual and independent material weighing device. The cement and the mineral admixture shall be discharged into the mixer simultaneously with the aggregate.

• The scales and weigh hoppers for bulk weighing cement, mineral admixture, or cement plus mineral admixture shall be separate and distinct from the aggregate weighing equipment.

• For batches with a volume of one cubic meter or more, the batching equipment shall conform to one of the following combinations:

A. Separate boxes and separate scale and indicator for weighing each size of aggregate.
B. Single box and scale indicator for all aggregates.
C. Single box or separate boxes and automatic weighing mechanism for all aggregates.

• In order to check the accuracy of batch masses, the gross mass and tare mass of batch trucks, truck mixers, truck agitators, and non-agitating hauling equipment shall be determined when ordered by the Engineer. The equipment shall be weighed at the Contractor's expense on scales designated by the Engineer.

90-5.03A Proportioning for Pavement

• Aggregates and bulk cement, mineral admixture, and cement plus mineral admixture for use in pavement shall be proportioned by mass by means of automatic proportioning devices of approved type conforming to these specifications.

• The Contractor shall install and maintain in operating condition an electronically actuated moisture meter that will indicate, on a readily visible scale, changes in the moisture content of the fine aggregate as it is batched within a sensitivity of 0.5 percent by mass of the fine aggregate.

• The batching of cement, mineral admixture, or cement plus mineral admixture and aggregate shall be interlocked so that a new batch cannot be started until all weigh hoppers are empty, the proportioning devices are within zero tolerance, and the discharge gates are closed. The interlock shall permit no part of the batch to be discharged until all aggregate hoppers and the cement and mineral admixture hoppers or the cement plus mineral admixture hopper are charged with masses that are within the tolerances specified in Section 90-5.02, "Proportioning Devices."

• When interlocks are required for cement and mineral admixture charging mechanisms and cement and mineral admixtures are weighed cumulatively, their charging mechanisms shall be interlocked to prevent the introduction of mineral admixture until the mass of cement in the cement weigh hopper is within the tolerances specified in Section 90-5.02, "Proportioning Devices."

• The discharge gate on the cement and mineral admixture hoppers or the cement plus mineral admixture hopper shall be designed to permit regulating the flow of cement, mineral admixture, or cement plus mineral admixture into the aggregate as directed by the Engineer.

• When separate weigh boxes are used for each size of aggregate, the discharge gates shall permit regulating the flow of each size of aggregate as directed by the Engineer.

• Material discharged from the several bins shall be controlled by gates or by mechanical conveyors. The means of withdrawal from the several bins, and of discharge from the weigh box, shall be interlocked so that not more than one bin can discharge at a time, and so that the weigh box cannot be tripped until the required quantity from each of the several bins has been deposited therein. Should a separate weigh box be used for each size of aggregate, all may be operated and discharged simultaneously.

• When the discharge from the several bins is controlled by gates, each gate shall be actuated automatically so that the required mass is discharged into the weigh box, after which the gate shall automatically close and lock.

• The automatic weighing system shall be designed so that all proportions required may be set on the weighing controller at the same time.

90-6 MIXING AND TRANSPORTING

90-6.01 GENERAL

• Concrete shall be mixed in mechanically operated mixers, except that when permitted by the Engineer, batches not exceeding 0.25 m^3 may be mixed by hand methods in conformance with the provisions in Section 90-6.05, "Hand-Mixing."

• Equipment having components made of aluminum or magnesium alloys that would have contact with plastic concrete during mixing, transporting, or pumping of portland cement concrete shall not be used.

• Concrete shall be homogeneous and thoroughly mixed, and there shall be no lumps or evidence of undispersed cement, mineral admixture, or cement plus mineral admixture.

• Uniformity of concrete mixtures will be determined by differences in penetration as determined by California Test 533, or slump as determined by ASTM Designation: C 143, and by variations in the proportion of coarse aggregate as determined by California Test 529.

• When the mix design specifies a penetration value, the difference in penetration, determined by comparing penetration tests on 2 samples of mixed concrete from the same batch or truck mixer load, shall not exceed 10 mm. When the mix design specifies a slump value, the difference in slump, determined by comparing slump tests on 2 samples of mixed concrete from the same batch or truck mixer load, shall not exceed the values given in the table below. Variation in the proportion of coarse aggregate will be determined by comparing the results of tests of 2 samples of mixed concrete from the same batch or truck mixer load and the difference between the 2 results shall not exceed 100 kg per cubic meter of concrete.

Average Slump	Maximum Permissible Difference
Less than 100-mm	25-mm
100-mm to 150-mm	38-mm
Greater than 150-mm to 225-mm	50-mm

• The Contractor, at the Contractor's expense, shall furnish samples of the freshly mixed concrete and provide satisfactory facilities for obtaining the samples.

90-6.02 MACHINE MIXING

• Concrete mixers may be of the revolving drum or the revolving blade type, and the mixing drum or blades shall be operated uniformly at the mixing speed recommended by the manufacturer. Mixers and agitators that have an accumulation of hard concrete or mortar shall not be used.

• The temperature of mixed concrete, immediately before placing, shall be not less than 10°C or more than 32°C. Aggregates and water shall be heated or cooled as necessary to produce concrete within these temperature limits. Neither aggregates nor mixing water shall be heated to exceed 65°C. If ice is used to cool the concrete, discharge of the mixer will not be permitted until all ice is melted.

• The batch shall be so charged into the mixer that some water will enter in advance of cementitious materials and aggregates. All water shall be in the drum by the end of the first one-fourth of the specified mixing time.

• Cementitious materials shall be batched and charged into the mixer by means that will not result either in loss of cementitious materials due to the effect of wind, in accumulation of cementitious materials on surfaces of conveyors or hoppers, or in other conditions that reduce or vary the required quantity of cementitious material in the concrete mixture.

• Paving and stationary mixers shall be operated with an automatic timing device. The timing device and discharge mechanism shall be interlocked so that during normal operation no part of the batch will be discharged until the specified mixing time has elapsed.

• The total elapsed time between the intermingling of damp aggregates and all cementitious materials and the start of mixing shall not exceed 30 minutes.

• The size of batch shall not exceed the manufacturer's guaranteed capacity.

• When producing concrete for pavement or base, suitable batch counters shall be installed and maintained in good operating condition at jobsite batching plants and stationary mixers. The batch counters shall indicate the exact number of batches proportioned and mixed.

• Concrete shall be mixed and delivered to the jobsite by means of one of the following combinations of operations:

A. Mixed completely in a stationary mixer and the mixed concrete transported to the point of delivery in truck agitators or in non-agitating hauling equipment (central-mixed concrete).
B. Mixed partially in a stationary mixer, and the mixing completed in a truck mixer (shrink-mixed concrete).
C. Mixed completely in a truck mixer (transit-mixed concrete).
D. Mixed completely in a paving mixer.

• Agitators may be truck mixers operating at agitating speed or truck agitators. Each mixer and agitator shall have attached thereto in a prominent place a metal plate or plates on which is plainly marked the various uses for which the equipment is designed, the manufacturer's guaranteed capacity of the drum or container in terms of the volume of mixed concrete and the speed of rotation of the mixing drum or blades.

• Truck mixers shall be equipped with electrically or mechanically actuated revolution counters by which the number of revolutions of the drum or blades may readily be verified.

• When shrink-mixed concrete is furnished, concrete that has been partially mixed at a central plant shall be transferred to a truck mixer and all requirements for transit-mixed concrete shall apply. No credit in the number of revolutions at mixing speed shall be allowed for partial mixing in a central plant.

90-6.03 TRANSPORTING MIXED CONCRETE

• Mixed concrete may be transported to the delivery point in truck agitators or truck mixers operating at the speed designated by the manufacturer of the equipment as agitating speed, or in non-agitating hauling equipment, provided the consistency and workability of the mixed concrete upon discharge at the delivery point is suitable for adequate placement and consolidation in place, and provided the mixed concrete after hauling to the delivery point conforms to the provisions in Section 90-6.01, "General."

• Truck agitators shall be loaded not to exceed the manufacturer's guaranteed capacity and shall maintain the mixed concrete in a thoroughly mixed and uniform mass during hauling.

• Bodies of non-agitating hauling equipment shall be constructed so that leakage of the concrete mix, or any part thereof, will not occur at any time.

• Concrete hauled in open-top vehicles shall be protected during hauling against rain or against exposure to the sun for more than 20 minutes when the ambient temperature exceeds 24°C.

• No additional mixing water shall be incorporated into the concrete during hauling or after arrival at the delivery point, unless authorized by the Engineer. If the Engineer authorizes additional water to be incorporated into the concrete, the drum shall be revolved not less than 30 revolutions at mixing speed after the water is added and before discharge is commenced.

• The rate of discharge of mixed concrete from truck mixer-agitators shall be controlled by the speed of rotation of the drum in the discharge direction with the discharge gate fully open.

• When a truck mixer or agitator is used for transporting concrete to the delivery point, discharge shall be completed within 1.5 hours or before 250 revolutions of the drum or blades, whichever occurs first, after the introduction of the cement to the aggregates. Under conditions contributing to quick stiffening of the concrete, or when the temperature of the concrete is 30°C or above, the time allowed may be less than 1.5 hours.

• When non-agitating hauling equipment is used for transporting concrete to the delivery point, discharge shall be completed within one hour after the addition of the cement to the aggregates. Under conditions contributing to quick stiffening of the concrete, or when the temperature of the concrete is 30°C or above, the time between the introduction of cement to the aggregates and discharge shall not exceed 45 minutes.

• Each load of concrete delivered at the jobsite shall be accompanied by a weighmaster certificate showing the mix identification number, non-repeating load number, date and time at which the materials were batched, the total amount of water added to the load, and for transit-mixed concrete, the reading of the revolution counter at the time the truck mixer is charged with cement. This weighmaster certificate shall also show the actual scale masses (kilograms) for the ingredients batched. Theoretical or target batch masses shall not be used as a substitute for actual scale masses.

• Weighmaster certificates shall be provided in printed form, or if approved by the Engineer, the data may be submitted in electronic media. Electronic media shall be presented in a tab-delimited format on a 90 mm diskette with a capacity of at least 1.4 megabytes. Captured data, for the ingredients represented by each batch shall be "line feed, carriage return" (LFCR) and "one line, separate record" with allowances for sufficient fields to satisfy the amount of data required by these specifications.

• The Contractor may furnish a weighmaster certificate accompanied by a separate certificate that lists the actual batch masses or measurements for a load of concrete provided that both certificates are imprinted with the same non-repeating load number that is unique to the contract and delivered to the jobsite with the load.

• Weighmaster certificates furnished by the Contractor shall conform to the provisions in Section 9-1.01, "Measurement of Quantities."

90-6.04 TIME OR AMOUNT OF MIXING

• Mixing of concrete in paving or stationary mixers shall continue for the required mixing time after all ingredients, except water and admixture, if added with the water, are in the mixing compartment of the mixer before any part of the batch is released. Transfer time in multiple drum mixers shall not be counted as part of the required mixing time.

• The required mixing time, in paving or stationary mixers, of concrete used for concrete structures, except minor structures, shall be not less than 90 seconds or more than 5 minutes, except that when directed by the Engineer in writing, the requirements of the following paragraph shall apply.

• The required mixing time, in paving or stationary mixers, except as provided in the preceding paragraph, shall be not less than 50 seconds or more than 5 minutes.

• The minimum required revolutions at the mixing speed for transit-mixed concrete shall not be less than that recommended by the mixer manufacturer, but in no case shall the number of revolutions be less than that required to consistently produce concrete conforming to the provisions for uniformity in Section 90-6.01, "General."

90-6.05 HAND-MIXING

• Hand-mixed concrete shall be made in batches of not more than 0.25 m^3 and shall be mixed on a watertight, level platform. The proper amount of coarse aggregate shall be measured in measuring boxes and spread on the platform and the fine aggregate shall be spread on this layer, the 2 layers being not more than 0.3 meters in total depth. On this mixture shall be spread the dry cement and mineral admixture and the whole mass turned no fewer than 2 times dry; then sufficient clean water shall be added, evenly distributed, and the whole mass again turned no fewer than 3 times, not including placing in the carriers or forms.

90-6.06 AMOUNT OF WATER AND PENETRATION

• The amount of water used in concrete mixes shall be regulated so that the penetration of the concrete as determined by California Test 533 or the slump of the concrete as determined by ASTM Designation: C 143 is within the "Nominal" values shown in the following table. When the penetration or slump of the concrete is found to exceed the nominal values listed, the mixture of subsequent batches shall be adjusted to reduce the penetration or slump to a value within the nominal range shown. Batches of concrete with a penetration or slump exceeding the maximum values listed shall not be used in the work. When Type F or Type G chemical admixtures are added to the mix, the penetration requirements shall not apply and the slump shall not exceed 225 mm after the chemical admixtures are added.

Type of Work	Nominal		Maximum	
	Penetration (mm)	Slump (mm)	Penetration (mm)	Slump (mm)
Concrete Pavement	0-25	—	40	—
Non-reinforced concrete facilities	0-35	—	50	—
Reinforced concrete structures				
Sections over 300-mm thick	0-35	—	65	—
Sections 300-mm thick or less	0-50	—	75	—
Concrete placed under water	—	150-200	—	225
Cast-in-place concrete piles	65-90	130-180	100	200

• The amount of free water used in concrete shall not exceed 183 kg/m^3, plus 20 kg for each required 100 kg of cementitious material in excess of 325 kg/m^3.

• The term free water is defined as the total water in the mixture minus the water absorbed by the aggregates in reaching a saturated surface-dry condition.

• Where there are adverse or difficult conditions that affect the placing of concrete, the above specified penetration and free water content limitations may be exceeded providing the Contractor is granted permission by the Engineer in writing to increase the cementitious material content per cubic meter of concrete. The increase in water and cementitious material shall be at a ratio not to exceed 30 kg of water per added 100 kg of cementitious material per cubic meter. The cost of additional cementitious material and water added under these conditions shall be at the Contractor's expense and no additional compensation will be allowed therefor.

• The equipment for supplying water to the mixer shall be constructed and arranged so that the amount of water added can be measured accurately. Any method of discharging water into the mixer for a batch shall be accurate within 1.5 percent of the quantity of water required to be added to the mix for any position of the mixer. Tanks used to measure water shall be designed so that water cannot enter while water is being discharged into the mixer and discharge into the mixer shall be made rapidly in one operation without dribbling. All equipment shall be arranged so as to permit checking the amount of water delivered by discharging into measured containers.

90-7 CURING CONCRETE

90-7.01 METHODS OF CURING

• Newly placed concrete shall be cured by the methods specified in this Section 90-7.01 and the special provisions.

90-7.01A Water Method

• The concrete shall be kept continuously wet by the application of water for a minimum curing period of 7 days after the concrete has been placed.

• When a curing medium consisting of cotton mats, rugs, carpets, or earth or sand blankets is to be used to retain the moisture, the entire surface of the concrete shall be kept damp by applying water with a nozzle that so atomizes the flow that a mist and not a spray is formed, until the surface of the concrete is covered with the curing medium. The moisture from the

nozzle shall not be applied under pressure directly upon the concrete and shall not be allowed to accumulate on the concrete in a quantity sufficient to cause a flow or wash the surface. At the expiration of the curing period, the concrete surfaces shall be cleared of all curing mediums.

- At the option of the Contractor, a curing medium consisting of white opaque polyethylene sheeting extruded onto burlap may be used to cure concrete structures. The polyethylene sheeting shall have a minimum thickness of 100 µm, and shall be extruded onto 283.5 gram burlap.
- At the option of the Contractor, a curing medium consisting of polyethylene sheeting may be used to cure concrete columns. The polyethylene sheeting shall have a minimum thickness of 250 µm achieved in a single layer of material.
- If the Contractor chooses to use polyethylene sheeting or polyethylene sheeting on burlap as a curing medium as specified above, these mediums and any joints therein shall be secured as necessary to provide moisture retention and shall be within 75 mm of the concrete at all points along the surface being cured. When these mediums are used, the temperature of the concrete shall be monitored during curing. If the temperature of the concrete cannot be maintained below 60°C, this method of curing shall be discontinued, and one of the other curing methods allowed for the concrete shall be used.
- When concrete bridge decks and flat slabs are to be cured without the use of a curing medium, the entire surface of the bridge deck or slab shall be kept damp by the application of water with an atomizing nozzle as specified in the preceding paragraph, until the concrete has set, after which the entire surface of the concrete shall be sprinkled continuously with water for a period of not less than 7 days.

90-7.01B Curing Compound Method

- Surfaces of the concrete that are exposed to the air shall be sprayed uniformly with a curing compound.
- Curing compounds to be used shall be as follows:

1. Pigmented curing compound conforming to the requirements in ASTM Designation: C 309, Type 2, Class B, except the resin type shall be poly-alpha-methylstyrene.
2. Pigmented curing compound conforming to the requirements in ASTM Designation: C 309, Type 2, Class B.
3. Pigmented curing compound conforming to the requirements in ASTM Designation: C 309, Type 2, Class A.
4. Non-pigmented curing compound conforming to the requirements in ASTM Designation: C 309, Type 1, Class B.
5. Non-pigmented curing compound conforming to the requirements in ASTM Designation: C 309, Type 1, Class A.
6. Non-pigmented curing compound with fugitive dye conforming to the requirements in ASTM Designation: C 309, Type 1-D, Class A.

- The infrared scan for the dried vehicle from curing compound (1) shall match the infrared scan on file at the Transportation Laboratory.
- The loss of water for each type of curing compound, when tested in conformance with the requirements in California Test 534, shall not be more than 0.15-kg/m^2 in 24 hours.
- The curing compound to be used will be specified elsewhere in these specifications or in the special provisions.
- When the use of curing compound is required or permitted elsewhere in these specifications or in the special provisions and no specific kind is specified, any of the curing compounds listed above may be used.
- Curing compound shall be applied at a nominal rate of 3.7 m^2/L, unless otherwise specified.
- At any point, the application rate shall be within ±1.2 m^2/L of the nominal rate specified, and the average application rate shall be within ±0.5 m^2/L of the nominal rate specified when tested in conformance with the requirements in California Test 535. Runs, sags, thin areas, skips, or holidays in the applied curing compound shall be evidence that the application is not satisfactory.
- Curing compounds shall be applied using power operated spray equipment. The power operated spraying equipment shall be equipped with an operational pressure gage and a means of controlling the pressure. Hand spraying of small and irregular areas that are not reasonably accessible to mechanical spraying equipment, in the opinion of the Engineer, may be permitted.
- The curing compound shall be applied to the concrete following the surface finishing operation, immediately before the moisture sheen disappears from the surface, but before any drying shrinkage or craze cracks begin to appear. In the event of any drying or cracking of the surface, application of water with an atomizing nozzle as specified in Section 90-7.01A, "Water Method," shall be started immediately and shall be continued until application of the compound is resumed or started; however, the compound shall not be applied over any resulting freestanding water. Should the film of compound be damaged from any cause before the expiration of 7 days after the concrete is placed in the case of structures and 72 hours in the case of pavement, the damaged portion shall be repaired immediately with additional compound.
- At the time of use, compounds containing pigments shall be in a thoroughly mixed condition with the pigment uniformly dispersed throughout the vehicle. A paddle shall be used to loosen all settled pigment from the bottom of the container, and a power driven agitator shall be used to disperse the pigment uniformly throughout the vehicle.
- Agitation shall not introduce air or other foreign substance into the curing compound.

- The manufacturer shall include in the curing compound the necessary additives for control of sagging, pigment settling, leveling, de-emulsification, or other requisite qualities of a satisfactory working material. Pigmented curing compounds shall be manufactured so that the pigment does not settle badly, does not cake or thicken in the container, and does not become granular or curdled. Settlement of pigment shall be a thoroughly wetted, soft, mushy mass permitting the complete and easy vertical penetration of a paddle. Settled pigment shall be easily redispersed, with minimum resistance to the sideways manual motion of the paddle across the bottom of the container, to form a smooth uniform product of the proper consistency.
- Curing compounds shall remain sprayable at temperatures above 4°C and shall not be diluted or altered after manufacture.
- The curing compound shall be packaged in clean 1040-L totes, 210-L barrels

or 19-L pails shall be supplied from a suitable storage tank located at the jobsite. The containers shall comply with "Title 49, Code of Federal Regulations, Hazardous Materials Regulations." The 1040-L totes and the 210-L barrels shall have removable lids and airtight fasteners. The 19-L pails shall be round and have standard full open head and bail. Lids with bungholes shall not be permitted. Settling or separation of solids in containers, except tanks, must be completely redispersed with low speed mixing prior to use, in conformance with these specifications and the manufacturer's recommendations. Mixing shall be accomplished either manually by use of a paddle or by use of a mixing blade driven by a drill motor, at low speed. Mixing blades shall be the type used for mixing paint. On site storage tanks shall be kept clean and free of contaminants. Each tank shall have a permanent system designed to completely redisperse settled material without introducing air or other foreign substances.

- Steel containers and lids shall be lined with a coating that will prevent destructive action by the compound or chemical agents in the air space above the compound. The coating shall not come off the container or lid as skins. Containers shall be filled in a manner that will prevent skinning. Plastic containers shall not react with the compound.
- Each container shall be labeled with the manufacturer's name, kind of curing compound, batch number, volume, date of manufacture, and volatile organic compound (VOC) content. The label shall also warn that the curing compound containing pigment shall be well stirred before use. Precautions concerning the handling and the application of curing compound shall be shown on the label of the curing compound containers in conformance with the Construction Safety Orders and General Industry Safety Orders of the State of California.
- Containers of curing compound shall be labeled to indicate that the contents fully comply with the rules and regulations concerning air pollution control in the State of California.
- When the curing compound is shipped in tanks or tank trucks, a shipping invoice shall accompany each load. The invoice shall contain the same information as that required herein for container labels.
- Curing compound will be sampled by the Engineer at the source of supply or at the jobsite or at both locations.
- Curing compound shall be formulated so as to maintain the specified properties for a minimum of one year. The Engineer may require additional testing before use to determine compliance with these specifications if the compound has not been used within one year or whenever the Engineer has reason to believe the compound is no longer satisfactory.
- Tests will be conducted in conformance with the latest ASTM test methods and methods in use by the Transportation Laboratory.

90-7.01C Waterproof Membrane Method

- The exposed finished surfaces of concrete shall be sprayed with water, using a nozzle that so atomizes the flow that a mist and not a spray is formed, until the concrete has set, after which the curing membrane shall be placed. The curing membrane shall remain in place for a period of not less than 72 hours.
- Sheeting material for curing concrete shall conform to the requirements in AASHTO Designation: M 171 for white reflective materials.
- The sheeting material shall be fabricated into sheets of such width as to provide a complete cover for the entire concrete surface. Joints in the sheets shall be securely cemented together in such a manner as to provide a waterproof joint. The joint seams shall have a minimum lap of 100 mm.
- The sheets shall be securely weighted down by placing a bank of earth on the edges of the sheets or by other means satisfactory to the Engineer.
- Should any portion of the sheets be broken or damaged before the expiration of 72 hours after being placed, the broken or damaged portions shall be immediately repaired with new sheets properly cemented into place.
- Sections of membrane that have lost their waterproof qualities or have been damaged to such an extent as to render them unfit for curing the concrete shall not be used.

90-7.01D Forms-In-Place Method

- Formed surfaces of concrete may be cured by retaining the forms in place. The forms shall remain in place for a minimum period of 7 days after the concrete has been placed, except that for members over 0.5-m in least dimension the forms shall remain in place for a minimum period of 5 days.

• Joints in the forms and the joints between the end of forms and concrete shall be kept moisture tight during the curing period. Cracks in the forms and cracks between the forms and the concrete shall be resealed by methods subject to the approval of the Engineer.

90-7.02 CURING PAVEMENT

• The entire exposed area of the pavement, including edges, shall be cured by the waterproof membrane method, or curing compound method using curing compound (1) or (2) as the Contractor may elect. Should the side forms be removed before the expiration of 72 hours following the start of curing, the exposed pavement edges shall also be cured. If the pavement is cured by means of the curing compound method, the sawcut and all portions of the curing compound that have been disturbed by sawing operations shall be restored by spraying with additional curing compound.

• Curing shall commence as soon as the finishing process provided in Section 40-1.10, "Final Finishing," has been completed. The method selected shall conform to the provisions in Section 90-7.01, "Methods of Curing."

• When the curing compound method is used, the compound shall be applied to the entire pavement surface by mechanical sprayers. Spraying equipment shall be of the fully atomizing type equipped with a tank agitator that provides for continual agitation of the curing compound during the time of application. The spray shall be adequately protected against wind, and the nozzles shall be so oriented or moved mechanically transversely as to result in the minimum specified rate of coverage being applied uniformly on exposed faces. Hand spraying of small and irregular areas, and areas inaccessible to mechanical spraying equipment, in the opinion of the Engineer, will be permitted. When the ambient air temperature is above 15°C, the Contractor shall fog the surface of the concrete with a fine spray of water as specified in Section 90-7.01A, "Water Method." The surface of the pavement shall be kept moist between the hours of 10:00 a.m. and 4:30 p.m. on the day the concrete is placed. However, the fogging done after the curing compound has been applied shall not begin until the compound has set sufficiently to prevent displacement. Fogging shall be discontinued if ordered in writing by the Engineer.

90-7.03 CURING STRUCTURES

• Newly placed concrete for cast-in-place structures, other than highway bridge decks, shall be cured by the water method, the forms-in-place method, or, as permitted herein, by the curing compound method, in conformance with the provisions in Section 90-7.01, "Methods of Curing."

• The curing compound method using a pigmented curing compound may be used on concrete surfaces of construction joints, surfaces that are to be buried underground, and surfaces where only Ordinary Surface Finish is to be applied and on which a uniform color is not required and that will not be visible from a public traveled way. If the Contractor elects to use the curing compound method on the bottom slab of box girder spans, the curing compound shall be curing compound (1).

• The top surface of highway bridge decks shall be cured by both the curing compound method and the water method. The curing compound shall be curing compound (1).

• Concrete surfaces of minor structures, as defined in Section 51-1.02, "Minor Structures," shall be cured by the water method, the forms-in-place method or the curing compound method.

• When deemed necessary by the Engineer during periods of hot weather, water shall be applied to concrete surfaces being cured by the curing compound method or by the forms-in-place method, until the Engineer determines that a cooling effect is no longer required. Application of water for this purpose will be paid for as extra work as provided in Section 4-1.03D, "Extra Work."

90-7.04 CURING PRECAST CONCRETE MEMBERS

• Precast concrete members shall be cured in conformance with any of the methods specified in Section 90-7.01, "Methods of Curing." Curing shall be provided for the minimum time specified for each method or until the concrete reaches its design strength, whichever is less. Steam curing may also be used for precast members and shall conform to the following provisions:

A. After placement of the concrete, members shall be held for a minimum 4-hour presteaming period. If the ambient air temperature is below 10°C, steam shall be applied during the presteaming period to hold the air surrounding the member at a temperature between 10°C and 32°C.
B. To prevent moisture loss on exposed surfaces during the presteaming period, members shall be covered as soon as possible after casting or the exposed surfaces shall be kept wet by fog spray or wet blankets.
C. Enclosures for steam curing shall allow free circulation of steam about the member and shall be constructed to contain the live steam with a minimum moisture loss. The use of tarpaulins or similar flexible covers will be permitted, provided they are kept in good repair and secured in such a manner as to prevent the loss of steam and moisture.
D. Steam at the jets shall be at low pressure and in a saturated condition. Steam jets shall not impinge directly on the concrete, test cylinders, or forms. During application of the steam, the temperature rise within the enclosure shall

not exceed 22°C per hour. The curing temperature throughout the enclosure shall not exceed 65°C and shall be maintained at a constant level for a sufficient time necessary to develop the required transfer strength. Control cylinders shall be covered to prevent moisture loss and shall be placed in a location where temperature is representative of the average temperature of the enclosure.

E. Temperature recording devices that will provide an accurate, continuous, permanent record of the curing temperature shall be provided. A minimum of one temperature recording device per 60 m of continuous bed length will be required for checking temperature.

F. Members in pretension beds shall be detensioned immediately after the termination of steam curing while the concrete and forms are still warm, or the temperature under the enclosure shall be maintained above 15°C until the stress is transferred to the concrete.

G. Curing of precast concrete will be considered completed after termination of the steam curing cycle.

90-7.05 CURING PRECAST PRESTRESSED CONCRETE PILES

• Newly placed concrete for precast prestressed concrete piles shall be cured in conformance with the provisions in Section 90-7.04, "Curing Precast Concrete Members," except that piles in a corrosive environment shall be cured as follows:

A. Piles shall be either steam cured or water cured. If water curing is used, the piles shall be kept continuously wet by the application of water in conformance with the provisions in Section 90-7.01A, "Water Method."

B. If steam curing is used, the steam curing provisions in Section 90-7.04, "Curing Precast Concrete Members," shall apply except that the piles shall be kept continuously wet for their entire length for a period of not less than 3 days, including the holding and steam curing periods.

90-7.06 CURING SLOPE PROTECTION

• Concrete slope protection shall be cured in conformance with any of the methods specified in Section 90-7.01, "Methods of Curing."

• Concreted-rock slope protection shall be cured in conformance with any of the methods specified in Section 90-7.01, "Methods of Curing," or with a blanket of earth kept wet for 72 hours, or by sprinkling with a fine spray of water every 2 hours during the daytime for a period of 3 days.

90-7.07 CURING MISCELLANEOUS CONCRETE WORK

• Exposed surfaces of curbs shall be cured by pigmented curing compounds as specified in Section 90-7.01B, "Curing Compound Method."

• Concrete sidewalks, gutter depressions, island paving, curb ramps, driveways, and other miscellaneous concrete areas shall be cured in conformance with any of the methods specified in Section 90-7.01, "Methods of Curing."

• Shotcrete shall be cured for at least 72 hours by spraying with water, or by a moist earth blanket, or by any of the methods provided in Section 90-7.01, "Methods of Curing."

• Mortar and grout shall be cured by keeping the surface damp for 3 days.

• After placing, the exposed surfaces of sign structure foundations, including pedestal portions, if constructed, shall be cured for at least 72 hours by spraying with water, or by a moist earth blanket, or by any of the methods provided in Section 90-7.01, "Methods of Curing."

90-8 PROTECTING CONCRETE

90-8.01 GENERAL

• In addition to the provisions in Section 7-1.16, "Contractor's Responsibility for the Work and Materials," the Contractor shall protect concrete as provided in this Section 90-8.

• Concrete shall not be placed on frozen or ice-coated ground or subgrade nor on ice-coated forms, reinforcing steel, structural steel, conduits, precast members, or construction joints.

• Under rainy conditions, placing of concrete shall be stopped before the quantity of surface water is sufficient to damage surface mortar or cause a flow or wash of the concrete surface, unless the Contractor provides adequate protection against damage.

• Concrete that has been frozen or damaged by other causes, as determined by the Engineer, shall be removed and replaced by the Contractor at the Contractor's expense.

90-8.02 PROTECTING CONCRETE STRUCTURES

• Structure concrete and shotcrete used as structure concrete shall be maintained at a temperature of not less than 7°C for 72 hours after placing and at not less than 4°C for an additional 4 days. When required by the Engineer, the Contractor shall submit a written outline of the proposed methods for protecting the concrete.

90-8.03 PROTECTING CONCRETE PAVEMENT

• Pavement concrete shall be maintained at a temperature of not less than 4°C for 72 hours. When required by the Engineer, the Contractor shall submit a written outline of the proposed methods for protecting the concrete.

• Except as provided in Section 7-1.08, "Public Convenience," the Contractor shall protect concrete pavement against construction and other activities that abrade, scar, discolor, reduce texture depth, lower coefficient of friction, or otherwise damage the surface. Stockpiling, drifting, or excessive spillage of soil, gravel, petroleum products, and concrete or asphalt mixes on the surface of concrete pavement is prohibited unless otherwise specified in these specifications, the special provisions or permitted by the Engineer.

• When ordered by the Engineer or shown on the plans or specified in the special provisions, pavement crossings shall be constructed for the convenience of public traffic. The material and work necessary for the construction of the crossings, and their subsequent removal and disposal, will be paid for at the contract unit prices for the items of work involved and if there are no contract items for the work involved, payment for pavement crossings will be made by extra work as provided in Section 4-1.03D, "Extra Work.". Where public traffic will be required to cross over the new pavement, Type III portland cement may be used in concrete, if permitted in writing by the Engineer. The pavement may be opened to traffic as soon as the concrete has developed a modulus of rupture of 3.8 MPa. The modulus of rupture will be determined by California Test 523.

• No traffic or Contractor's equipment, except as hereinafter provided, will be permitted on the pavement before a period of 10 days has elapsed after the concrete has been placed, nor before the concrete has developed a modulus of rupture of at least 3.8 MPa. Concrete that fails to attain a modulus of rupture of 3.8 MPa within 10 days shall not be opened to traffic until directed by the Engineer.

• Equipment for sawing weakened plane joints will be permitted on the pavement as specified in Section 40-1.08B, "Weakened Plane Joints."

• When requested in writing by the Contractor, the tracks on one side of paving equipment will be permitted on the pavement after a modulus of rupture of 2.4 MPa has been attained, provided that:

A. Unit pressure exerted on the pavement by the paver shall not exceed 135 kPa;
B. Tracks with cleats, grousers, or similar protuberances shall be modified or shall travel on planks or equivalent protective material, so that the pavement is not damaged; and
C. No part of the track shall be closer than 0.3-m from the edge of pavement.

• In case of visible cracking of, or other damage to the pavement, operation of the paving equipment on the pavement shall be immediately discontinued.

• Damage to the pavement resulting from early use of pavement by the Contractor's equipment as provided above shall be repaired by the Contractor at the Contractor's expense.

• The State will furnish the molds and machines for testing the concrete for modulus of rupture, and the Contractor, at the Contractor's expense, shall furnish the material and whatever labor the Engineer may require.

90-9 COMPRESSIVE STRENGTH

90-9.01 GENERAL

• Concrete compressive strength requirements consist of a minimum strength that shall be attained before various loads or stresses are applied to the concrete and, for concrete designated by strength, a minimum strength at the age of 28 days or at the age otherwise allowed in Section 90-1.01, "Description." The various strengths required are specified in these specifications or the special provisions or are shown on the plans.

• The compressive strength of concrete will be determined from test cylinders that have been fabricated from concrete sampled in conformance with the requirements of California Test 539. Test cylinders will be molded and initially field cured in conformance with California Test 540. Test cylinders will be cured and tested after receipt at the testing laboratory in conformance with the requirements of California Test 521. A strength test shall consist of the average strength of 2 cylinders fabricated from material taken from a single load of concrete, except that, if any cylinder should show evidence of improper sampling, molding, or testing, that cylinder shall be discarded and the strength test shall consist of the strength of the remaining cylinder.

• When concrete compressive strength is specified as a prerequisite to applying loads or stresses to a concrete structure or member, test cylinders for other than steam cured concrete will be cured in conformance with Method 1 of

California Test 540. The compressive strength of concrete determined for these purposes will be evaluated on the basis of individual tests.

- When concrete is designated by 28-day compressive strength rather than by cementitious material content, the concrete strength to be used as a basis for acceptance of other than steam cured concrete will be determined from cylinders cured in conformance with Method 1 of California Test 540. If the result of a single compressive strength test at the maximum age specified or allowed is below the specified strength but is 95 percent or more of the specified strength, the Contractor shall, at the Contractor's expense, make corrective changes, subject to approval of the Engineer, in the mix proportions or in the concrete fabrication procedures, before placing additional concrete, and shall pay to the State $14 for each in-place cubic meter of concrete represented by the deficient test. If the result of a single compressive strength test at the maximum age specified or allowed is below 95 percent of the specified strength, but is 85 percent or more of the specified strength, the Contractor shall make the corrective changes specified above, and shall pay to the State $20 for each in place cubic meter of concrete represented by the deficient test. In addition, such corrective changes shall be made when the compressive strength of concrete tested at 7 days indicates, in the judgment of the Engineer, that the concrete will not attain the required compressive strength at the maximum age specified or allowed. Concrete represented by a single test that indicates a compressive strength of less than 85 percent of the specified 28-day compressive strength will be rejected in conformance with the provisions in Section 6-1.04, "Defective Materials."
- If the test result indicates that the compressive strength at the maximum curing age specified or allowed is below the specified strength, but is 85 percent or more of the specified strength, payments to the State as required above shall be made, unless the Contractor, at the Contractor's expense, obtains and submits evidence acceptable to the Engineer that the strength of the concrete placed in the work meets or exceeds the specified 28-day compressive strength. If the test result indicates a compressive strength at the maximum curing age specified or allowed below 85 percent, the concrete represented by that test will be rejected, unless the Contractor, at the Contractor's expense, obtains and submits evidence acceptable to the Engineer that the strength and quality of the concrete placed in the work are acceptable. If the evidence consists of tests made on cores taken from the work, the cores shall be obtained and tested in conformance with the requirements in ASTM Designation: C 42.
- No single compressive strength test shall represent more than 250 m^3.
- When a precast concrete member is steam cured, the compressive strength of the concrete will be determined from test cylinders that have been handled and stored in conformance with Method 3 of California Test 540. The compressive strength of steam cured concrete will be evaluated on the basis of individual tests representing specific portions of production. When the concrete is designated by 28-day compressive strength rather than by cementitious material content, the concrete shall be considered to be acceptable whenever its compressive strength reaches the specified 28-day compressive strength provided that strength is reached in not more than the maximum number of days specified or allowed after the member is cast.
- When concrete is specified by compressive strength, prequalification of materials, mix proportions, mixing equipment, and procedures proposed for use will be required prior to placement of the concrete. Prequalification shall be accomplished by the submission of acceptable certified test data or trial batch reports by the Contractor. Prequalification data shall be based on the use of materials, mix proportions, mixing equipment, procedures, and size of batch proposed for use in the work.
- Certified test data, in order to be acceptable, shall indicate that not less than 90 percent of at least 20 consecutive tests exceed the specified strength at the maximum number of cure days specified or allowed, and none of those tests are less than 95 percent of specified strength. Strength tests included in the data shall be the most recent tests made on concrete of the proposed mix design and all shall have been made within one year of the proposed use of the concrete.
- Trial batch test reports, in order to be acceptable, shall indicate that the average compressive strength of 5 consecutive concrete cylinders, taken from a single batch, at not more than 28 days (or the maximum age allowed) after molding shall be at least 4 MPa greater than the specified 28-day compressive strength, and no individual cylinder shall have a strength less than the specified strength at the maximum age specified or allowed. Data contained in the report shall be from trial batches that were produced within one year of the proposed use of specified strength concrete in the project. Whenever air-entrainment is required, the air content of trial batches shall be equal to or greater than the air content specified for the concrete without reduction due to tolerances.
- Tests shall be performed in conformance with either the appropriate California Test methods or the comparable ASTM test methods. Equipment employed in testing shall be in good condition and shall be properly calibrated. If the tests are performed during the life of the contract, the Engineer shall be notified sufficiently in advance of performing the tests in order to witness the test procedures.
- The certified test data and trial batch test reports shall include the following information:

A. Date of mixing.
B. Mixing equipment and procedures used.
C. The size of batch in cubic meters and the mass, type, and source of all ingredients used.
D. Penetration of the concrete.

E. The air content of the concrete if an air-entraining admixture is used.
F. The age at time of testing and strength of all concrete cylinders tested.

- Certified test data and trial batch test reports shall be signed by an official of the firm that performed the tests.
- When approved by the Engineer, concrete from trial batches may be used in the work at locations where concrete of a lower quality is required and the concrete will be paid for as the type or class of concrete required at that location.
- After materials, mix proportions, mixing equipment, and procedures for concrete have been prequalified for use, additional prequalification by testing of trial batches will be required prior to making changes that, in the judgment of the Engineer, could result in a strength of concrete below that specified.
- The Contractor's attention is directed to the time required to test trial batches and the Contractor shall be responsible for production of trial batches at a sufficiently early date so that the progress of the work is not delayed.
- When precast concrete members are manufactured at the plant of an established manufacturer of precast concrete members, the mix proportions of the concrete shall be determined by the Contractor, and a trial batch and prequalification of the materials, mix proportions, mixing equipment, and procedures will not be required.

90-10 MINOR CONCRETE

90-10.01 GENERAL

- Concrete for minor structures, slope paving, curbs, sidewalks and other concrete work, when designated as minor concrete on the plans, in the specifications, or in the contract item, shall conform to the provisions specified herein.
- The Engineer, at the Engineer's discretion, will inspect and test the facilities, materials and methods for producing the concrete to ensure that minor concrete of the quality suitable for use in the work is obtained.

90-10.02 MATERIALS

- Minor concrete shall conform to the following requirements:

90-10.02A Cementitious Material

- Cementitious material shall conform to the provisions in Section 90-1.01, "Description."

90-10.02B Aggregate

- Aggregate shall be clean and free from deleterious coatings, clay balls, roots, and other extraneous materials.
- The Contractor shall submit to the Engineer for approval, a grading of the combined aggregate proposed for use in the minor concrete. After acceptance of the grading, aggregate furnished for minor concrete shall conform to that grading, unless a change is authorized in writing by the Engineer.
- The Engineer may require the Contractor to furnish periodic test reports of the aggregate grading furnished. The maximum size of aggregate used shall be at the option of the Contractor, but in no case shall the maximum size be larger than 37.5 mm or smaller than 19 mm.
- The Engineer may waive, in writing, the gradation requirements in this Section 90-10.02B, if, in the Engineer's opinion, the furnishing of the gradation is not necessary for the type or amount of concrete work to be constructed.

90-10.02C Water

- Water used for washing, mixing, and curing shall be free from oil, salts, and other impurities that would discolor or etch the surface or have an adverse affect on the quality of the concrete.

90-10.02D Admixtures

- The use of admixtures shall conform to the provisions in Section 90-4, "Admixtures."

90-10.03 PRODUCTION

- Cementitious material, water, aggregate, and admixtures shall be stored, proportioned, mixed, transported, and discharged in conformance with recognized standards of good practice that will result in concrete that is thoroughly and uniformly mixed, that is suitable for the use intended, and that conforms to requirements specified herein. Recognized standards of good practice are outlined in various industry publications such as are issued by American Concrete Institute, AASHTO, or the Department.
- The cementitious material content of minor concrete shall conform to the provisions in Section 90-1.01, "Description."

- The amount of water used shall result in a consistency of concrete conforming to the provisions in Section 90-6.06, "Amount of Water and Penetration." Additional mixing water shall not be incorporated into the concrete during hauling or after arrival at the delivery point, unless authorized by the Engineer.
- Discharge of ready-mixed concrete from the transporting vehicle shall be made while the concrete is still plastic and before stiffening occurs. An elapsed time of 1.5 hours (one hour in non-agitating hauling equipment), or more than 250 revolutions of the drum or blades, after the introduction of the cementitious material to the aggregates, or a temperature of concrete of more than 32°C will be considered conditions contributing to the quick stiffening of concrete. The Contractor shall take whatever action is necessary to eliminate quick stiffening, except that the addition of water will not be permitted.
- The required mixing time in stationary mixers shall be not less than 50 seconds or more than 5 minutes.
- The minimum required revolutions at mixing speed for transit-mixed concrete shall be not less than that recommended by the mixer manufacturer, and shall be increased, if necessary, to produce thoroughly and uniformly mixed concrete.
- Each load of ready-mixed concrete shall be accompanied by a weighmaster certificate that shall be delivered to the Engineer at the discharge location of the concrete, unless otherwise directed by the Engineer. The weighmaster certificate shall be clearly marked with the date and time of day when the load left the batching plant and, if hauled in truck mixers or agitators, the time the mixing cycle started.
- A Certificate of Compliance conforming to the provisions in Section 6–1.07, "Certificates of Compliance," shall be furnished to the Engineer, prior to placing minor concrete from a source not previously used on the contract, stating that minor concrete to be furnished meets contract requirements, including minimum cementitious material content specified.

90-10.04 CURING MINOR CONCRETE

- Curing minor concrete shall conform to the provisions in Section 90-7, "Curing Concrete."

90-10.05 PROTECTING MINOR CONCRETE

- Protecting minor concrete shall conform to the provisions in Section 90-8, "Protecting Concrete," except the concrete shall be maintained at a temperature of not less than 4°C for 72 hours after placing.

90-10.06 MEASUREMENT AND PAYMENT

- Minor concrete will be measured and paid for in conformance with the provisions specified in the various sections of these specifications covering concrete construction when minor concrete is specified in the specifications, shown on the plans, or indicated by contract item in the Engineer's Estimate.

90-11 MEASUREMENT AND PAYMENT

90-11.01 MEASUREMENT

- Portland cement concrete will be measured in conformance with the provisions specified in the various sections of these specifications covering construction requiring concrete.
- When it is provided that concrete will be measured at the mixer, the volume in cubic meters shall be computed as the total mass of the batch in kilograms divided by the density of the concrete in kilograms per cubic meter. The total mass of the batch shall be calculated as the sum of all materials, including water, entering the batch. The density of the concrete will be determined in conformance with the requirements in California Test 518.

90-11.02 PAYMENT

- Portland cement concrete will be paid for in conformance with the provisions specified in the various sections of these specifications covering construction requiring concrete.
- Full compensation for furnishing and incorporating admixtures required by these specifications or the special provisions will be considered as included in the contract prices paid for the concrete involved and no additional compensation will be allowed therefor.
- Should the Engineer order the Contractor to incorporate any admixtures in the concrete when their use is not required by these specifications or the special provisions, furnishing the admixtures and adding them to the concrete will be paid for as extra work as provided in Section 4-1.03D, "Extra Work."
- Should the Contractor use admixtures in conformance with the provisions in Section 90-4.05, "Optional Use of Chemical Admixtures," or Section 90-4.07, "Optional Use of Air-entraining Admixtures," or should the Contractor request and obtain permission to use other admixtures for the Contractor’s benefit, the Contractor shall furnish those admixtures and incorporate them into the concrete at the Contractor’s expense and no additional compensation will be allowed therefor.

SECTION 91: PAINT

Issue Date: November 18, 2005

Section 91-3, "Paints for Timber," of the Standard Specifications is amended to read:

91-3 PAINTS FOR TIMBER

91-3.01 WOOD PRIMER, LATEX-BASE

Classification:

- This specification covers a ready-mixed priming paint for use on unpainted wood or exterior woodwork. It shall conform with the requirements in the Detailed Performance Standards of the Master Painters Institute (MPI) for exterior wood primers, and be listed on the Exterior Latex Wood Primer MPI List Number 6.

91-3.02 PAINT; LATEX-BASE FOR EXTERIOR WOOD, WHITE AND TINTS

Classification:

- This specification covers a ready-mixed paint for use on wood surfaces subject to outside exposures. This paint shall conform to the requirements in the Detailed Performance Standards of the Master Painters Institute (MPI) for Paint, Latex, Exterior, and shall be listed on the following MPI Approved Products List:

A. Exterior Latex, Flat MPI Gloss Level 1, MPI List Number 10.
B. Exterior Latex, Semi-Gloss, MPI Gloss Level 5, MPI List Number 11.
C. Exterior Latex, Gloss, MPI Gloss Level 6, MPI List Number 119.

- Unpainted wood shall first be primed with wood primer conforming to the provisions in Section 91-3.01, "Wood Primer, Latex-Base."

Section 91-4, "Miscellaneous Paints," of the Standard Specifications is amended to read:

91-4 MISCELLANEOUS PAINTS

91-4.01 THROUGH 91-4.04 (BLANK)

91-4.05 PAINT; ACRYLIC EMULSION, EXTERIOR WHITE AND LIGHT AND MEDIUM TINTS

Classification:

- This specification covers an acrylic emulsion paint designed for use on exterior masonry. This paint shall conform to the requirements in the Detailed Performance Standards of the Master Painters Institute (MPI) for Paint, Latex, Exterior, and shall be listed on the following MPI Approved Products Lists:

A. Exterior Latex, Flat MPI Gloss Level 1, MPI List Number 10.
B. Exterior Latex, Semi-Gloss, MPI Gloss Level 5, MPI List Number 11.
C. Exterior Latex, Gloss, MPI Gloss Level 6, MPI List Number 119.

- This paint may be tinted by using "universal" or "all purpose" concentrates.

SECTION 92: ASPHALTS

Issue Date: November 18, 2005

Section 92, "Asphalts," of the Standard Specifications is amended to read:

92-1.01 DESCRIPTION

- Asphalt shall consist of refined petroleum or a mixture of refined liquid asphalt and refined solid asphalt, prepared from crude petroleum. Asphalt shall be:

A. Free from residues caused by the artificial distillation of coal, coal tar, or paraffin.
B. Free from water.
C. Homogeneous.

92-1.02 MATERIALS

92-1.02(A) General

- The Contractor shall furnish asphalt under the Department's "Certification Program for Suppliers of Asphalt." The Department maintains the program requirements, procedures, and a list of approved suppliers at:

http://www.dot.ca.gov/hq/esc/Translab/fpmcoc.htm

- The Contractor shall ensure the safe transportation, storage, use, and disposal of asphalt.
- The Contractor shall prevent the formation of carbonized particles caused by overheating asphalt during manufacturing or construction.

92-1.02(B) Grades

- Performance graded (PG) asphalt binder shall conform to the following:

Performance Graded Asphalt Binder

Property	AASHTO Test Method	Specification Grade				
		PG 58-22 [a]	PG 64-10	PG 64-16	PG 64-28	PG 70-10
Original Binder						
Flash Point, Minimum °C	T48	230	230	230	230	230
Solubility, Minimum % [b]	T44	99	99	99	99	99
Viscosity at 135°C, [c] Maximum, Pa·s	T316	3.0	3.0	3.0	3.0	3.0
Dynamic Shear, Test Temp. at 10 rad/s, °C Minimum G*/sin(delta), kPa	T315	58 1.00	64 1.00	64 1.00	64 1.00	70 1.00
RTFO Test, [e] Mass Loss, Maximum, %	T240	1.00	1.00	1.00	1.00	1.00
RTFO Test Aged Binder						
Dynamic Shear, Test Temp. at 10 rad/s, °C Minimum G*/sin(delta), kPa	T315	58 2.20	64 2.20	64 2.20	64 2.20	70 2.20
Ductility at 25°C Minimum, cm	T51	75	75	75	75	75
PAV [f] Aging, Temperature, °C	R28	100	100	100	100	110
RTFO Test and PAV Aged Binder						
Dynamic Shear, Test Temp. at 10 rad/s, °C Maximum G*/sin(delta), kPa	T315	22 [d] 5000	31 [d] 5000	28 [d] 5000	22 [d] 5000	34 [d] 5000
Creep Stiffness, Test Temperature, °C Maximum S-value, Mpa Minimum M-value	T313	-12 300 0.300	0 300 0.300	-6 300 0.300	-18 300 0.300	0 300 0.300

Notes:

a. For use as asphalt rubber base stock for high mountain and high desert area.
b. The Engineer will waive this specification if the supplier is a Quality Supplier as defined by the Department's "Certification Program for Suppliers of Asphalt."
c. The Engineer will waive this specification if the supplier certifies the asphalt binder can be adequately pumped and mixed at temperatures meeting applicable safety standards.
d. Test the sample at 3°C higher if it fails at the specified test temperature. G*sin(delta) shall remain 5000 kPa maximum.
e. "RTFO Test" means the asphaltic residue obtained using the Rolling Thin Film Oven Test, AASHTO Test Method T240 or ASTM Designation: D 2872.
f. "PAV" means Pressurized Aging Vessel.

- Performance based asphalt (PBA) binder shall conform to the following:

Performance Based Asphalt Binder

Property	AASHTO Test Method	Specification Grade PBA 6a	PBA 6a(mod)	PBA 6b	PBA 7
Absolute Viscosity (60°C), Pa·s(x10^{-1})[a]	T202				
Original Binder, Minimum		2000	2000	2000	1100
RTFO Aged Residue [b], Minimum		5000	5000	5000	3000
Kinematic Viscosity (135°C), $m^2/s(x10^{-6})$	T201				
Original Binder, Maximum		2000	2000	2000	2000
RTFO Aged Residue, Minimum		275	275	275	275
Absolute Viscosity Ratio (60°C), Maximum RTFO Test Visc./Orig. Visc.	—	4.0	4.0	4.0	4.0
Flash Point, Cleveland Open Cup, °C, [d]	T48				
Original Binder, Minimum		232	232	232	232
Mass Loss After RTFO Test, %	T240	0.60	0.60	0.60	0.60
Solubility in Trichloroethylene, % [c]	T44				
Original Binder, Minimum		Report	Report	Report	Report
Ductility (25°C, 5 cm/min), cm	T51				
RTFO Test Aged Residue [b], Minimum		60	60	60	75
On RTFO Test Aged Residue, °C:	[f]				
1 to 10 rad/sec: SSD ≥ 0 and Phase Angle (at 1 rad/sec) < 72°		—	35	—	—
On Residue from	R28				
PAV [g] at temp., °C		100	100	100	110
Or Residue from Tilt Oven[f] (@113°C), hours		36	36	36	72
[e] SSD ≥ -115(SSV)-50.6, °C	[f]	—	—	—	25
Stiffness,	T313				
Test Temperature, °C		-24	-24	-30	-6
Maximum S-value, MPa		300	300	300	300
Minimum M-value		0.300	0.300	0.300	0.300

Notes:

a. Absolute viscosity (60°C) will be determined at one sec^{-1} using ASTM Designation: D 4957 with Asphalt Institute vacuum capillary viscometers.
b. "RTFO Aged Residue" means the asphaltic residue obtained using the Rolling Thin Film Oven Test (RTFO Test), AASHTO Test Method T240 or ASTM Designation: D 2872.
c. There is no requirement; however results of the test shall be part of the certified copy of test results furnished with the Certificate of Compliance.
d. "Residue from Tilt Oven " means the asphalt obtained using California Test 374, Method B, "Method for Determining Asphalt Durability Using the California Tilt-Oven Durability Test."
e. "SSD" means Shear Susceptibility of Delta; "SSV" means Shear Susceptibility of Viscosity.
f. California Test 381.
g. "PAV" means Pressurized Aging Vessel.

92-1.02(C) Sampling

• The Contractor shall provide a sampling device in the asphalt feed line connecting the plant storage tanks to the asphalt weighing system or spray bar. The sampling device shall be accessible between 600 mm and 750 mm above the platform. The Contractor shall provide a receptacle for flushing the sampling device.

• The sampling device shall include a valve:

A. With a diameter between 10 mm and 20 mm.
B. Manufactured in a manner that a one-liter sample may be taken slowly at any time during plant operations.
C. Maintained in good condition.

- The Contractor shall replace failed valves.
- In the presence of the Engineer, the Contractor will take 2 one-liter samples per operating day. The Contractor shall provide round, friction top, one-liter containers for storing samples.

92-1.03 APPLYING ASPHALT

- Unless otherwise specified, the Contractor shall heat and apply asphalt in conformance with the provisions in Section 93, "Liquid Asphalts."
- The Contractor shall apply paving asphalt at a temperature between 120°C and 190°C. The Engineer will determine the exact temperature of paving asphalt.

92-1.04 MEASUREMENT

- If asphalt is paid as a contract work item on a mass basis, the Department will measure asphalt by the tonne under the provisions for determining the mass for payment of liquid asphalt in Section 93, "Liquid Asphalt."
- The Engineer will determine the mass of asphalt from volumetric measurements if the Contractor:

A. Uses partial loads of asphalt.
B. Uses asphalt at locations other than a mixing plant and no suitable scales are available within 35 km.
C. Delivers asphalt meeting either of the following:

   1. In calibrated trucks and each tank is accompanied by its measuring stick and calibration card.
   2. In trucks equipped with a calibrated thermometer that determines the asphalt temperature at the time of delivery and equipped with a vehicle tank meter meeting Section 9-1.01, "Measurement of Quantities," for weighing, measuring, and metering devices.

- If the Contractor furnishes asphalt concrete from a mixing plant producing material for only one project, the Department will determine the amount of asphalt from volumetric measurements by measuring the amount in the tank at the start and the end of the project provided the tank is calibrated and equipped with its measuring stick and calibration card. The Engineer will determine pay quantities in conformance with the following:

A. Before converting the volume to mass, the Engineer will reduce the volume measured to that which the asphalt would occupy at 15°C.
B. The Engineer will use 981 L/tonne and 1020 g/L for the average weight and volume for both PG and PBA grades of asphalt at 15°C.
C. The Engineer will use the Conversion Table in Section 93, "Liquid Asphalts."

SECTION 93: LIQUID ASPHALTS

Issue Date: November 18, 2005

The ninth paragraph of Section 93-1.04, "Measurement," of the Standard Specifications is amended to read:

- The following Legend and Conversion Table is to be used for converting volumes of liquid asphalt products, Grades 70 to 3000, inclusive, and paving asphalt Grades PG 58-22, PG 64-10, PG 64-16, PG 64-28, and PG 70-10, and Grades PBA 6a, PBA 6a (mod), PBA 6b, and PBA 7.

SECTION 95: EPOXY

Issue Date: June 30, 2006

Section 95, "Epoxy," of the Standard Specifications is amended to read:

95-1 GENERAL

95-1.01 DESCRIPTION

- These specifications are intended to specify epoxy that will meet service requirements for highway construction.
- Epoxy shall be furnished as 2 components, which shall be mixed together at the site of the work.

95-1.02 SAMPLING AND TESTING

• Epoxy shall not be used prior to sampling and testing unless its use is permitted prior to sampling and testing in conformance with the provisions in Section 6-1.07, "Certificates of Compliance."

• Tests will be conducted in conformance with the latest test methods of the American Society for Testing and Materials, and California Test Methods in use by the Transportation Laboratory.

• Epoxy components shall be formulated to maintain the specified properties for a minimum of one year. The Engineer may require additional testing of any epoxy component that has not been used within one year of manufacture.

95-1.03 PACKAGING, LABELING AND STORING

• Each component shall be packaged in containers of size proportional to the amount of that component in the mix so that one container of each component is used in mixing one batch of epoxy. The containers shall be of such design that all of the contents may be readily removed and shall be well sealed to prevent leakage. The containers and labeling shall meet U.S. Department of Transportation Hazardous Material Shipping Regulations, and the containers shall be of a material, or lined with a material, of such character as to resist any action by the components. Each container shall be clearly labeled with the ASTM Designation: C881 Class and Type; designation (Component A or B); manufacturer's name; date of manufacture; batch number (a batch shall consist of a single charge of all components in a mixing chamber); all directions for use (as specified elsewhere) and such warning or precautions concerning the contents as may be required by State or Federal Laws and Regulations. The manufacturer of the finished epoxy components shall furnish a Certificate of Compliance in conformance with the provisions in Section 6-1.07, "Certificates of Compliance," and a copy of the label for each material. The certificate shall include a list, by Title and Section, of the State and Federal packaging and labeling laws and regulations that the manufacturer has complied with.

• Attention is directed to the characteristic of some epoxy components to crystallize or thicken excessively prior to use when stored at temperatures below 2ºC. Any material which shows evidence of crystallization or a permanent increase in viscosity or settling of pigments which cannot be readily redispersed with a paddle shall not be used.

95-1.04 DIRECTIONS FOR USE

• At the time of mixing, components A and B shall be at a temperature between 15°C and 30°C, unless otherwise specified. Any heating of the adhesive components shall be done by application of indirect heat. Immediately prior to mixing, each component shall be thoroughly mixed with a paddle. Separate paddles shall be used to stir each component. Immediately prior to use, the 2 components shall be thoroughly mixed together in the specified ratios. No solvent shall be added to any epoxy.

• After mixing, epoxies shall be placed in the work and any overlaying or inserted material which is to be bonded to the work by the epoxy shall also be placed before thickening of the epoxy has begun. Surfaces upon which epoxy is to be placed shall be free of rust, paint, grease, asphalt, and loose and deleterious material. When epoxy is used as a binder to make epoxy concrete or mortar, the 2 components of epoxy shall be thoroughly mixed together before the aggregate is added and, unless otherwise specified, the mix proportions shall consist of one part of binder to approximately 4 parts of aggregate, by volume. Aggregate for use in epoxy concrete and mortar shall be clean and shall have a moisture content of not more than 0.50-percent when tested by California Test 226. Surfaces against which epoxy concrete and mortar are to be placed shall be primed with a coat of the epoxy used just prior to placing the concrete or mortar.

95-2 TYPES OF EPOXIES

95-2.01 BINDER (ADHESIVE), EPOXY RESING BASE

Classification:

• This specification covers a low viscosity epoxy formulated primarily for use in making high-strength epoxy concrete and epoxy mortar and in pressure grouting of cracks in concrete. For load bearing applications, use ASTM Designation: C 881, Type IV, Grade 1, Class B or C. Class B or C shall be used depending on the substrate and ambient temperatures. Use Grade B for atmospheric and surface temperatures as low as 4°C. Use Class C when temperatures are 15°C or higher. For non-load bearing applications use ASTM Designation: C881, Type I, Grade 1, Class B or C. Apply no thicker than recommended by the manufacturer. Thick sections of this epoxy are not suitable for use in freeze thaw environments. In a freeze-thaw environment, increase the aggregate loading to improve the properties of the epoxy concrete.

Directions for Use:

• Mix in conformance with the manufacturer's written recommendations. No more material shall be mixed than can be used within the pot-life from the time mixing operations are started.

95-2.02 (BLANK)

95-2.03 EPOXY RESIN ADHESIVE FOR BONDING NEW CONCRET TO OLD CONCRETE

Classification:

• This specification covers a low viscosity paste epoxy formulated primarily for use in bonding new portland cement concrete to hardened portland cement concrete. The epoxy shall meet the specification requirements of ASTM Designation: C 881, Type V, Grade 2. This epoxy is available in 2 Classes: Class C for general use at temperature greater than 15°C and Class B for use when cure temperatures are below 15°C and above 4°C, or when a faster cure is required.

Directions for Use:

• The mixing ratio and use shall be in conformance with the manufacturer's written recommendations. When measuring as individual Components A and B, stir and tap the measuring containers to remove possible air voids. The ingredients in Components A and B shall be thoroughly dispersed such that each component forms a uniform paste. Do not mix more material than can be spread within the pot life from the time mixing operations are started. The spreading rate shall be sufficient to thoroughly coat the surface. Spread the mixed adhesive by brush or roller over blast-cleaned concrete at a rate recommended by the manufacturer. The new concrete shall be placed against the adhesive coating on the old concrete before the adhesive has set. If the adhesive has set and is not tacky prior to placing the new concrete, a new coating of adhesive shall be applied.

95-2.04 RAPID SET EPOXY ADHESIVE FOR PAVEMENT MARKERS

Classification:

• This specification covers a high viscosity paste, rapid set epoxy formulated primarily for use in bonding pavement markers to portland cement concrete and asphalt concrete. The adhesive shall meet ASTM Designation: C 881, Type IV, Grade 3, Class B and C except that the gel time may be shorter than 30 minutes. The adhesive shall conform to these requirements and the following.

Characteristics of Combined Components:

• All tests shall be performed in conformance with the requirements in California Test 434.

Property	Requirement
Gel time, minutes, maximum, at 25°C	30
Bond Strength to Concrete, Time, minutes (maximum) to reach not less than 1.4 MPa	
at 25ºC ±1ºC	35
at 10ºC ±1ºC	45
Slant Shear Strength	
2 days at 25ºC ±1ºC, MPa	7
14 days at 25ºC ±1ºC, plus water soak, MPa	10.5
Tensile Adhesion and Cohesion	
Ceramic marker bottom, MPa	4.8 min.
Ceramic marker bottom, including post cure, MPa	4.8 min.
Retroreflective pavement marker bottom, MPa	3.4 min.
Color of mixed epoxy	gray
Glass transition temperature, Tg, samples conditioned at 25°C for 24 hours, ASTM Designation: D 4065	30ºC min.

Directions for Use:

• Components A and B shall be mixed in conformance with the manufacturer's written recommendations. When an automatic proportioning and mixing machine is used, the temperature of the components shall be maintained by indirect heating or cooling, so that the adhesive will meter, mix and extrude properly. The maximum temperature shall be such that after proper mixing no excess adhesive shall flow from under the marker other than that specified in Section 85-1.06, "Placement."

95-2.05 STANDARD SET EPOXY ADHESIVE FOR PAVEMENT MARKERS

Classification:

• This specification covers a high viscosity paste standard set epoxy formulated primarily for use in bonding pavement markers to portland cement concrete and asphalt concrete. The epoxy shall meet ASTM Designation: C 881, Type IV, Viscosity Grade 3, Classes B or C, except that the gel time may be shorter than 30 minutes.

Characteristics of Combined Components:

• All tests shall be performed in conformance with the requirements in California Test 434.

Property	Requirement
Gel time, minutes, maximum, at 25ºC	30
Bond Strength to Concrete, Time (maximum) to reach not less than 1.4 MPa	
at 25ºC ±1ºC	3.5 hours
at 13ºC ±1ºC	24 hours
Slant Shear Strength	
2 days at 25ºC ±1ºC, MPa	7 min.
14 days at 25ºC ±1ºC, plus water soak, MPa	10.5 min.
Tensile Adhesion and Cohesion	
Ceramic marker bottom, MPa	4.8 min.
Ceramic marker bottom, including post cure, MPa	4.8 min.
Reflective pavement marker bottom, MPa	3.4 min.
Color of Mixed Components	gray
Glass transition temperature, Tg, samples conditioned at 25ºC for 24 hours, ASTM Designation: D 4065	30ºC min.

Directions for Use:

• Components A and B shall be mixed in conformance with the manufacturer's written recommendations. When an automatic proportioning and mixing machine is used, the temperature of the components shall be maintained by indirect heating or cooling, so that the adhesive will meter, mix and extrude properly. The maximum temperature shall be such that after proper mixing no excess adhesive shall flow from under the marker other than that specified in Section 85-1.06, "Placement."

95-2.06 (BLANK)

95-2.07 (BLANK)

95-2.08 (BLANK)

95-2.09 EPOXY SEALANT FOR INDUCTIVE LOOPS

Classification:

• This specification covers a high viscosity liquid epoxy formulated primarily for use in sealing inductive wire loops and leads imbedded in asphalt concrete and portland cement concrete for traffic signal controls and vehicle counters. This epoxy is to be used for repair work on existing spalls, cracks and other deformations in and around saw cuts housing inductor loops and leads. The rapid cure allows minimum traffic delay. This sealant is suitable for use in freeze-thaw areas. The epoxy shall meet ASTM Designation: C 881, Type I, Grade 2 and the following requirements.

Characteristics of Combined Components:

• All tests shall be performed in conformance with the requirements in California Test 434.

Property	Requirement
Gel time, minutes, maximum	30
On 3-mm cast sheet, cured 18 hours at 25ºC, + 5 hours at 70ºC	
Tensile Strength, MPa	2.7 min.
Elongation, percent	90 min.
Shore D Hardness	45 min.

Directions for Use:

- Saw cuts shall be cleaned with compressed air to remove all excess moisture and debris. For repairing damaged saw cuts, all loose spalled material shall be cleaned away from the saw cut, chipping back to sound asphalt concrete or portland cement concrete and all loose material cleaned from loop wires.
- The mixing ratio shall be in conformance with the manufacturer's recommendations. No more material shall be mixed than can be used within the gel time from the time mixing operations are started.
- When automatic mixing equipment is used for mixing the sealant, the provisions in the twelfth paragraph in Section 85-1.06, "Placement," shall apply.

95-2.10 (BLANK)

95-2.11 EPOXY RESIN ADHESIVE FOR INJECTION GROUTING OF PORTLAND CEMENT CONCRETE PAVEMENTS

Directions for Use:

- Both components and the mixed material shall contain no solvents. The mixing ratio of the components in terms of volume and mass shall be clearly stated. The material shall be suitable for use in the mixing equipment used by the applicator. Epoxy adhesive samples shall be furnished to the Engineer for testing at least 12 days before the expected time of use.

Characteristics of Adhesive:

Test[a]	California Test	Requirement
Brookfield Viscosity, No. 3 Spindle at 20 rpm, Pa·s at 25ºC	434, Part 4	0.9 max.
Gel time, minutes	434, Part 1	2 to 15
Slant Shear Strength on Dry Concrete, MPa, after 4 days of cure in air at 25ºC ±1ºC	434, Part 5[b]	41.4 min.
Slant Shear Strength on Wet Concrete, MPa, after 4 days of cure in air at 25ºC ±1ºC	434, Part 5[b]	21.1 min.
Tensile Strength, Mpa	434, Part 7, except test after 4 days of cure at 25ºC ±1ºC	31.0 min.
Elongation, %	434, Part 7, except test after 4 days of cure at 25ºC ±1ºC	10 max.

a The mixing ratio used will be that recommended by the manufacturer.

b For slant shear strength on concrete, delete Sections B-1 and B-5 of California Test 434, Part 5. For dry concrete, use Step "2" below only. For wet concrete, use both Steps "1" & "2":

1 Soak blocks in water for 24 hours at 25ºC ±1ºC. Remove and wipe off excess water.

2 Mix epoxy as described in California Test 434, Part 1, and apply a coat approximately 250 µm-inch thick to each diagonal surface. Place four 3-mm square pieces of shim stock 305 µm thick on one block to control final film thickness. Before pressing the coated surfaces together, leave the blocks so that the coated surfaces are horizontal until the epoxy reacts slightly to prevent excessive flow.

END OF AMENDMENTS

SECTION 2. PROPOSAL REQUIREMENTS AND CONDITIONS

2-1.01 GENERAL

The bidder's attention is directed to the provisions in Section 2, "Proposal Requirements and Conditions," of the Standard Specifications and these special provisions for the requirements and conditions which the bidder must observe in the preparation of the Proposal form and the submission of the bid.

The Bidder's Bond form mentioned in the last paragraph in Section 2-1.07, "Proposal Guaranty," of the Standard Specifications will be found following the signature page of the Proposal.

Submit request for substitution of an "or equal" item, and the data substantiating the request to the Department of Transportation, District 11, Construction Duty Senior MS 73, P.O. Box 85406, San Diego, CA. 92186-5400, so that the request is received by the Department by close of business on the fourth day, not including Saturdays, Sundays and legal holidays, following bid opening.

In conformance with Public Contract Code Section 7106, a Noncollusion Affidavit is included in the Proposal. Signing the Proposal shall also constitute signature of the Noncollusion Affidavit.

The Contractor, sub recipient or subcontractor shall not discriminate on the basis of race, color, national origin, or sex in the performance of this contract. The Contractor shall carry out applicable requirements of title 49, part 26, Code of Federal Regulations (49 CFR 26) in the award and administration of USDOT-assisted contracts. Failure by the Contractor to carry out these requirements is a material breach of this contract, which may result in the termination of this contract or such other remedy as the recipient deems appropriate. Each subcontract signed by the bidder must include this assurance.

Failure of the bidder to fulfill the requirements of the Special Provisions for submittals required to be furnished after bid opening, including but not limited to escrowed bid documents, where applicable, may subject the bidder to a determination of the bidder's responsibility in the event it is the apparent low bidder on a future public works contracts.

2-1.015 FEDERAL LOBBYING RESTRICTIONS

Section 1352, Title 31, United States Code prohibits Federal funds from being expended by the recipient or any lower tier subrecipient of a Federal-aid contract to pay for any person for influencing or attempting to influence a Federal agency or Congress in connection with the awarding of any Federal-aid contract, the making of any Federal grant or loan, or the entering into of any cooperative agreement.

If any funds other than Federal funds have been paid for the same purposes in connection with this Federal-aid contract, the recipient shall submit an executed certification and, if required, submit a completed disclosure form as part of the bid documents.

A certification for Federal-aid contracts regarding payment of funds to lobby Congress or a Federal agency is included in the Proposal. Standard Form - LLL, "Disclosure of Lobbying Activities," with instructions for completion of the Standard Form is also included in the Proposal. Signing the Proposal shall constitute signature of the Certification.

The above-referenced certification and disclosure of lobbying activities shall be included in each subcontract and any lower-tier contracts exceeding $100,000. All disclosure forms, but not certifications, shall be forwarded from tier to tier until received by the Engineer.

The Contractor, subcontractors and any lower-tier contractors shall file a disclosure form at the end of each calendar quarter in which there occurs any event that requires disclosure or that materially affects the accuracy of the information contained in any disclosure form previously filed by the Contractor, subcontractors and any lower-tier contractors. An event that materially affects the accuracy of the information reported includes:

A. A cumulative increase of $25,000 or more in the amount paid or expected to be paid for influencing or attempting to influence a covered Federal action; or
B. A change in the person(s) or individual(s) influencing or attempting to influence a covered Federal action; or,
C. A change in the officer(s), employee(s), or Member(s) contacted to influence or attempt to influence a covered Federal action.

2-1.02 DISADVANTAGED BUSINESS ENTERPRISE (DBE)

This project is subject to title 49, part 26, Code of Federal Regulations (49 CFR 26) entitled "Participation by Disadvantaged Business Enterprises in Department of Transportation Financial Assistance Programs." In order to ensure the Department achieves its federally mandated statewide overall DBE goal, the Department encourages the participation of Disadvantaged Business Enterprises (DBEs), as defined in 49 CFR 26 in the performance of contracts financed in whole or in part with Federal Funds. The Contractor shall not discriminate on the basis of race, color, national origin, or sex in the award and performance of subcontracts.

Bidders shall be fully informed respecting the requirements of the Regulations. The Regulations in their entirety are incorporated herein by this reference Attention is directed to the following matters:

A. A DBE must be a small business concern as defined pursuant to Section 3 of U.S. Small Business Act and relevant regulations promulgated pursuant thereto.
B. A DBE may participate as a prime contractor, subcontractor, joint venture partner with a prime or subcontractor, vendor of material or supplies, or as a trucking company.
C. A DBE joint venture partner must be responsible for specific contract items of work, or clearly defined portions thereof. Responsibility means actually performing, managing and supervising the work with its own forces. The DBE joint venture partner must share in the capital contribution, control, management, risks and profits of the joint venture commensurate with its ownership interest.
D. A DBE must perform a commercially useful function, i.e., must be responsible for the execution of a distinct element of the work and must carry out its responsibility by actually performing, managing and supervising the work.
E. DBEs must be certified by the California Unified Certification Program (CUCP). Listings of DBEs certified by the CUCP are available from the following sources:

    1. The Department's web site at http://www.dot.ca.gov/hq/bep.
    2. The Department's DBE Directory. This Directory may be obtained from the Department of Transportation, Materiel Operations Branch, Publication Distribution Unit, 1900 Royal Oaks Drive, Sacramento, California 95815, Telephone: (916) 445-3520.

F. When reporting DBE participation, bidders may count the cost of materials or supplies purchased from DBEs as follows:

1. If the materials or supplies are obtained from a DBE manufacturer, count 100 percent of the cost of the materials or supplies. A DBE manufacturer is a firm that operates or maintains a factory or establishment that produces, on the premises, the materials, supplies, articles, or equipment required under the contract and of the general character described by the specifications.
2. If the materials or supplies are purchased from a DBE regular dealer, count 60 percent of the cost of the materials or supplies. A DBE regular dealer is a firm that owns, operates, or maintains a store, warehouse, or other establishment in which the materials, supplies, articles or equipment of the general character described by the specifications and required under the contract are bought, kept in stock, and regularly sold or leased to the public in the usual course of business. To be a DBE regular dealer, the firm must be an established, regular business that engages, as its principal business and under its own name, in the purchase and sale or lease of the products in question. A person may be a DBE regular dealer in such bulk items as petroleum products, steel, cement, gravel, stone, or asphalt without owning, operating, or maintaining a place of business as provided in this paragraph F.2. if the person both owns and operates distribution equipment for the products. Any supplementing of regular dealers' own distribution equipment shall be by a long-term lease agreement and not on an ad hoc or contract-by-contract basis. Packagers, brokers, manufacturers' representatives, or other persons who arrange or expedite transactions are not DBE regular dealers within the meaning of this paragraph F.2.
3. If the DBE is neither a manufacturer nor a regular dealer, count only the entire amount of fees or commissions charged for assistance in the procurement of the materials and supplies, or fees or transportation charges for the delivery of materials or supplies required on a job site, provided the fees are reasonable and not excessive as compared with fees charged for similar services.

G. When reporting DBE participation, bidders may count the participation of DBE trucking companies as follows:

1. The DBE must be responsible for the management and supervision of the entire trucking operation for which it is responsible on a particular contract.
2. The DBE must itself own and operate at least one fully licensed, insured, and operational truck used on the contract.
3. The DBE receives credit for the total value of the transportation services it provides on the contract using trucks its owns, insures, and operates using drivers it employs.
4. The DBE may lease trucks from another DBE firm, including an owner-operator who is certified as a DBE. The DBE who leases trucks from another DBE receives credit for the total value of the transportation services the lessee DBE provides on the contract.
5. The DBE may also lease trucks from a non-DBE firm, including an owner-operator. The DBE who leases trucks from a non-DBE is entitled to credit only for the fee or commission it receives as a result of the lease arrangement. The DBE does not receive credit for the total value of the transportation services provided by the lessee, since these services are not provided by a DBE.
6. For the purposes of this paragraph G, a lease must indicate that the DBE has exclusive use of and control over the truck. This does not preclude the leased truck from working for others during the term of the lease with the consent of the DBE, so long as the lease gives the DBE absolute priority for use of the leased truck. Leased trucks must display the name and identification number of the DBE.

H. Bidders are encouraged to use services offered by financial institutions owned and controlled by DBEs.

2-1.03 DBE AVAILABILITY ADVISORY

As required by federal law, the Department has established a statewide overall DBE goal. In order to ascertain whether that statewide overall DBE goal is being achieved, the Department is tracking DBE participation on all Federal-aid contracts.

To assist bidders in ascertaining DBE availability for specific items of work, the Department advises that it has determined that DBEs could reasonably be expected to compete for subcontracting opportunities on this project, and their likely availability for work on this project is 10 percent. The Department also advises that participation of DBEs in the specified percentage is not a condition of award.

SECTION 3. AWARD AND EXECUTION OF CONTRACT

The bidder's attention is directed to the provisions in Section 3, "Award and Execution of Contract," of the Standard Specifications and these special provisions for the requirements and conditions concerning award and execution of contract.

Requests for relief of bid and bid protests are to be delivered to the following address: Department of Transportation, MS 43, Attn: Office Engineer, 1727 30th Street, Sacramento, CA 95816 or by facsimile to the Office Engineer at (916) 227-6282.

The award of the contract, if it be awarded, will be to the lowest responsible bidder whose proposal complies with all the requirements prescribed.

The contract shall be executed by the successful bidder and shall be returned, together with the contract bonds and the documents identified in Section 3-1.025, "Insurance Policies," of the Standard Specifications, to the Department so that it is received within 10 days, not including Saturdays, Sundays and legal holidays, after the bidder has received the contract for execution. Failure to do so shall be just cause for forfeiture of the proposal guaranty. The executed contract documents shall be delivered to the following address: Department of Transportation MS 43, Attn: Office Engineer, 1727 30th Street, Sacramento, CA 95816.

A "CALTRANS BIDDER - DBE INFORMATION" form will be included in the contract documents to be executed by the successful bidder. The purpose of the form is to collect data required under 49 CFR 26. Even if no DBE participation will be reported, the successful bidder must execute and return the form.

The bidder's "CALTRANS BIDDER - DBE INFORMATION" form should include the names, addresses and phone numbers of DBE firms that will participate, with a complete description of work or supplies to be provided by each, and the dollar value of each DBE transaction. When 100 percent of a contract item of work is not to be performed or furnished by a DBE, a description of the exact portion of that work to be performed or furnished by that DBE should be included in the DBE information, including the planned location of that work. A bidder certified as a DBE should describe the work it has committed to performing with its own forces as well as any other work that it has committed to be performed by DBE subcontractors, suppliers and trucking companies.

The bidder is encouraged to provide written confirmation from each DBE that the DBE is participating in the contract. A copy of a DBE's quote will serve as written confirmation that the DBE is participating in the contract. If a DBE is participating as a joint venture partner, the bidder is encouraged to submit a copy of the joint venture agreement.

The "CALTRANS BIDDER - DBE INFORMATION" form should be completed and returned to the Department by the successful bidder with the executed contract, contract bonds and the documents identified in Section 3-1.025, "Insurance Policies," of the Standard Specifications.

A "Payee Data Record" form will be included in the contract documents to be executed by the successful bidder. The purpose of the form is to facilitate the collection of taxpayer identification data. The form shall be completed and returned to the Department by the successful bidder with the executed contract, contract bonds and the documents identified in Section 3-1.025, "Insurance Policies," of the Standard Specifications. For the purposes of the form, payee shall be deemed to mean the successful bidder. The form is not to be completed for subcontractors or suppliers. Failure to complete and return the "Payee Data Record" form to the Department as provided herein will result in the retention of 31 percent of payments due the Contractor and penalties of up to $20,000. This retention of payments for failure to complete the "Payee Data Record" form is in addition to any other retention of payments due the Contractor.

SECTION 4. BEGINNING OF WORK, TIME OF COMPLETION AND LIQUIDATED DAMAGES

Attention is directed to the provisions in Sections 8-1.03, "Beginning of Work," 8-1.06, "Time of Completion," 8-1.07, "Liquidated Damages," and 20-4.08, "Plant Establishment Work," of the Standard Specifications and to "Security Clearance" and "Order of Work" of these special provisions.

The Contractor shall furnish the Engineer with a written statement that the applications for security clearance required for employees on this project have been submitted. The statement shall be furnished within 15 calendar days after the contract has been approved by the Attorney General, or the attorney appointed and authorized to represent the Department of Transportation. The statement shall list the names of employees and the date that the applications for security clearance were submitted to the United States General Services Administration, and the anticipated date of security clearance approval.

The Contractor shall furnish the Engineer with a statement from the vendor that the order for the sign panels and electrical materials required for this contract has been received and accepted by the vendor; and the statement shall be furnished within 15 calendar days after the contract has been approved by the Attorney General, or the attorney appointed and authorized to represent the Department of Transportation. The statement shall give the dates that the sign panels and electrical materials will be shipped. If the Contractor has the necessary materials on hand, the Contractor will not be required to furnish the vendor's statement.

The Contractor shall begin work within 15 calendar days after the contract has been approved by the Attorney General or the attorney appointed and authorized to represent the Department of Transportation.

The work (except plant establishment work) shall be diligently prosecuted to completion before the expiration of **500 WORKING DAYS** beginning on the fifteenth calendar day after approval of the contract.

The Contractor shall pay to the State of California the sum of $4,700 per day, for each and every calendar day's delay in finishing the work (except plant establishment work) in excess of **500 WORKING DAYS**.

The Contractor shall diligently prosecute all work (including plant establishment) to completion before the expiration of **750 WORKING DAYS** beginning on the fifteenth calendar day after approval of the contract.

The Contractor shall pay to the State of California the sum of $600 per day, for each and every calendar day's delay in completing the work in excess of **750 WORKING DAYS**.

In no case will liquidated damages of more than $4,700 per day be assessed.

SECTION 5. GENERAL

SECTION 5-1. MISCELLANEOUS

5-1.01 PLANS AND WORKING DRAWINGS

When the specifications require working drawings to be submitted to the Division of Structure Design, the drawings shall be submitted to: Division of Structure Design, Documents Unit, Mail Station 9, 1801 30th Street, Sacramento, CA 95816, Telephone 916 227-8252.

5-1.013 LINES AND GRADES

Attention is directed to Section 5-1.07, "Lines and Grades," of the Standard Specifications.

Stakes or marks will be set by the Engineer in conformance with the requirements in Chapter 12, "Construction Surveys," of the Department's Surveys Manual.

5-1.017 CONTRACT BONDS

Attention is directed to Section 3-1.02, "Contract Bonds," of the Standard Specifications and these special provisions.

The payment bond shall be in a sum not less than one hundred percent of the total amount payable by the terms of the contract.

5-1.018 GUARANTEE

GENERAL

The Contractor shall guarantee the work is in accordance with contract requirements and remains free from substantial defects in materials and workmanship for a period of one year after contract acceptance. For certain portions of the work where the Director relieves the Contractor of responsibility in accordance with Section 7-1.15, "Relief from Maintenance and Responsibility," of the Standard Specifications, the guarantee period starts on the relief date and ends one year therefrom.

Substantial defects in materials and workmanship means defective work objectively manifested by damaged, displaced, or missing parts or components: and workmanship resulting in improper function of materials, components, equipment, or systems, as installed or manufactured by the Contractor, subcontractor, supplier, or manufacturer.

During the guarantee period, the Contractor shall repair or replace contract work and associated work which is not in accordance with contract requirements or has substantial defects in materials and workmanship. The Contractor shall perform the corrective work with no expense to the Department other than State-provided field inspection services.

The guarantee of work excludes damage or displacement that is outside the control of the Contractor and caused by normal wear and tear, improper operation, insufficient maintenance, abuse, unauthorized modification, or natural disaster as described in Section 7-1.165, "Damage by Storm, Flood, Tsunami or Earthquake," of the Standard Specifications.

The Contractor shall have the same insurance coverage during corrective work operations as prior to contract acceptance, in accordance with Section 7-1.12, "Indemnification and Insurance," of the Standard Specifications.

The contract bonds furnished in accordance with Section 3-1.02, "Contract Bonds," of the Standard Specifications must remain in full force and effect during the guarantee period and until all corrective work is complete.

In the case of conflict between this guarantee provision and any warranty provision included in the contract, the warranty provision shall govern for the specific construction product or feature covered.

CORRECTIVE WORK

During the guarantee period, the Department will monitor performance of the highway facilities completed by the Contractor and will perform a thorough review of the contract work at least 60 days before the expiration of the one-year guarantee.

If the Engineer discovers contract work not in compliance with contract requirements or that has substantial defects in materials and workmanship, at any time during the guarantee period, a list of items that require corrective work will be developed and forwarded to the Contractor. Within 15 days of receipt of a list, the Contractor shall submit to the Engineer a detailed plan for performing corrective work. The work plan shall include a start to finish schedule. It shall include a list of labor, equipment, materials, and any special services intended to be used. It shall clearly show related work including traffic control, temporary delineation, and permanent delineation.

The Contractor shall start the corrective and related work within 15 days of receiving notice from the Engineer that the Contractor’s work plan is approved. The corrective work shall be diligently prosecuted and completed within the time allotted in the approved work plan.

If the Engineer determines that corrective work, covered by the guarantee, is urgently needed to prevent injury or property damage, the Engineer will give the Contractor a request to start emergency repair work and a list of items that require repair work. The Contractor shall mobilize within 24 hours and diligently perform emergency repair work on the damaged highway facilities. The Contractor shall submit a work plan within 5 days of starting emergency repair work.

If the Contractor fails to commence and execute, with due diligence, corrective work and related work required under the guarantee in the time allotted, the Engineer may proceed to have the work performed by State forces or other forces at the Contractor's expense. Upon demand, the Contractor shall pay all costs incurred by the Department for work performed by State forces or other forces including labor, equipment, material, and special services.

PAYMENT

Full compensation for performing corrective work; and related work such as traffic control, temporary delineation, and permanent delineation, and to maintain insurance coverage and bonds, shall be considered as included in the contract prices paid for the various contract items of work and no separate payment will be made therefore.

5-1.019 COST REDUCTION INCENTIVE

Attention is directed to Section 5-1.14, "Cost Reduction Incentive," of the Standard Specifications.

Prior to preparing a written cost reduction proposal, the Contractor shall request a meeting with the Engineer to discuss the proposal in concept. Items of discussion will also include permit issues, impact on other projects, impact on the project schedule, peer reviews, overall merit of the proposal, and review times required by the Department and other agencies.

If a cost reduction proposal submitted by the Contractor, and subsequently approved by the Engineer, provides for a reduction in contract time, 50 percent of that contract time reduction shall be credited to the State by reducing the contract working days, not including plant establishment. Attention is directed to "Beginning of Work, Time of Completion and Liquidated Damages" of these special provisions regarding the working days.

If a cost reduction proposal submitted by the Contractor, and subsequently approved by the Engineer, provides for a reduction in traffic congestion or avoids traffic congestion during construction, 60 percent of the estimated net savings in construction costs attributable to the cost reduction proposal will be paid to the Contractor. In addition to the requirements in Section 5-1.14, "Cost Reduction Incentive," of the Standard Specifications, the Contractor shall provide detailed comparisons of the traffic handling between the existing contract and the proposed change, and estimates of the traffic volumes and congestion.

5-1.02 LABOR NONDISCRIMINATION

Attention is directed to the following Notice that is required by Chapter 5 of Division 4 of Title 2, California Code of Regulations.

NOTICE OF REQUIREMENT FOR NONDISCRIMINATION PROGRAM

(GOV. CODE, SECTION 12990)

Your attention is called to the "Nondiscrimination Clause", set forth in Section 7-1.01A(4), "Labor Nondiscrimination," of the Standard Specifications, which is applicable to all nonexempt State contracts and subcontracts, and to the "Standard California Nondiscrimination Construction Contract Specifications" set forth therein. The specifications are applicable to all nonexempt State construction contracts and subcontracts of $5000 or more.

5-1.022 EXCLUSION OF RETENTION

In conformance with 49 CFR, Part 26, Subpart B, Section 26.29 (b)(1), the retention of proceeds required by Public Contract Code Section 10261 shall not apply. In conformance with Public Contract Code 7200 (b), in subcontracts between the Contractor and a subcontractor and in subcontracts between a subcontractor and any subcontractor thereunder, retention proceeds shall not be withheld, and the exceptions provided in Public Contract Code 7200 (c) shall not apply. At the option of the Contractor, subcontractors may be required to furnish payment and performance bonds issued by an admitted surety insurer.

The third paragraph of Section 9-1.06, "Partial Payments," of the Standard Specifications, and Section 9-1.065, "Payment of Withheld Funds," of the Standard Specifications shall not apply.

5-1.023 UNSATISFACTORY PROGRESS

If the number of working days charged to the contract exceeds 75 percent of the working days in the current time of completion and the percent working days elapsed exceeds the percent work completed by more than 15 percentage points, the Department will withhold 10 percent of the amount due on the current monthly estimate.

The percent working days elapsed will be determined from the number of working days charged to the contract divided by the number of contract working days in the current time of completion, expressed as a percentage. The number of contract working days in the current time of completion shall consist of the original contract working days increased or decreased by time adjustment s approved by the Engineer.

The percent work completed will be determined by the Engineer from the sum of payments made to date plus the amount due on the current monthly estimate, divided by the current total estimated value of the work, expressed as a percentage.

When the percent of working days elapsed minus the percent of work completed is less than or equal to 15 percentage points, the funds withheld shall be returned to the Contractor with the next monthly progress payment.

Funds kept or withheld from payment, due to the failure of the Contractor to comply with the provisions of the contract, will not be subject to the requirements of Public Contract Code 7107 or to the payment of interest pursuant to Public Contract Code Section 10261.5.

5-1.03 INTEREST ON PAYMENTS

Interest shall be payable on progress payments, payments after acceptance, final payments, extra work payments, and claim payments as follows:

A. Unpaid progress payments, payment after acceptance, and final payments shall begin to accrue interest 30 days after the Engineer prepares the payment estimate.
B. Unpaid extra work bills shall begin to accrue interest 30 days after preparation of the first pay estimate following receipt of a properly submitted and undisputed extra work bill. To be properly submitted, the bill must be submitted within 7 days of the performance of the extra work and in conformance with the provisions in Section 9-1.03C, "Records," and Section 9-1.06, "Partial Payments," of the Standard Specifications. An undisputed extra work bill not submitted within 7 days of performance of the extra work will begin to accrue interest 30 days after the preparation of the second pay estimate following submittal of the bill.
C. The rate of interest payable for unpaid progress payments, payments after acceptance, final payments, and extra work payments shall be 10 percent per annum.
D. The rate of interest payable on a claim, protest or dispute ultimately allowed under this contract shall be 6 percent per annum. Interest shall begin to accrue 61 days after the Contractor submits to the Engineer information in sufficient detail to enable the Engineer to ascertain the basis and amount of said claim, protest or dispute.

The rate of interest payable on any award in arbitration shall be 6 percent per annum if allowed under the provisions of Civil Code Section 3289.

5-1.04 PUBLIC SAFETY

The Contractor shall provide for the safety of traffic and the public in conformance with the provisions in Section 7-1.09, "Public Safety," of the Standard Specifications and these special provisions.

The Contractor shall install temporary railing (Type K) between a lane open to public traffic and an excavation, obstacle or storage area when the following conditions exist:

A. Excavations—The near edge of the excavation is 3.6 m or less from the edge of the lane, except:

    1. Excavations covered with sheet steel or concrete covers of adequate thickness to prevent accidental entry by traffic or the public.
    2. Excavations less than 0.3-m deep.
    3. Trenches less than 0.3-m wide for irrigation pipe or electrical conduit, or excavations less than 0.3-m in diameter.
    4. Excavations parallel to the lane for the purpose of pavement widening or reconstruction.
    5. Excavations in side slopes, where the slope is steeper than 1:4 (vertical:horizontal).
    6. Excavations protected by existing barrier or railing.

B. Temporarily Unprotected Permanent Obstacles—The work includes the installation of a fixed obstacle together with a protective system, such as a sign structure together with protective railing, and the Contractor elects to install the obstacle prior to installing the protective system; or the Contractor, for the Contractor's convenience and with permission of the Engineer, removes a portion of an existing protective railing at an obstacle and does not replace such railing complete in place during the same day.
C. Storage Areas—Material or equipment is stored within 3.6 m of the lane and the storage is not otherwise prohibited by the provisions of the Standard Specifications and these special provisions.

The approach end of temporary railing (Type K), installed in conformance with the provisions in this section "Public Safety" and in Section 7-1.09, "Public Safety," of the Standard Specifications, shall be offset a minimum of 4.6 m from the edge of the traffic lane open to public traffic. The temporary railing shall be installed on a skew toward the edge of the traffic lane of not more than 0.3-m transversely to 3 m longitudinally with respect to the edge of the traffic lane. If the 4.6-m minimum offset cannot be achieved, the temporary railing shall be installed on the 10 to 1 skew to obtain the maximum available offset between the approach end of the railing and the edge of the traffic lane, and an array of temporary crash cushion modules shall be installed at the approach end of the temporary railing.

Except for installing, maintaining and removing traffic control devices, whenever work is performed or equipment is operated in the following work areas, the Contractor shall close the adjacent traffic lane unless otherwise provided in the Standard Specifications and these special provisions:

Approach Speed of Public Traffic (Posted Limit) (Kilometers Per Hour)	Work Areas
Over 72 (45 Miles Per Hour)	Within 1.8 m of a traffic lane but not on a traffic lane
56 to 72 (35 to 45 Miles Per Hour)	Within 0.9-m of a traffic lane but not on a traffic lane

The lane closure provisions of this section shall not apply if the work area is protected by permanent or temporary railing or barrier.

When traffic cones or delineators are used to delineate a temporary edge of a traffic lane, the line of cones or delineators shall be considered to be the edge of the traffic lane, however, the Contractor shall not reduce the width of an existing lane to less than 3 m without written approval from the Engineer.

When work is not in progress on a trench or other excavation that required closure of an adjacent lane, the traffic cones or portable delineators used for the lane closure shall be placed off of and adjacent to the edge of the traveled way. The spacing of the cones or delineators shall be not more than the spacing used for the lane closure.

Suspended loads or equipment shall not be moved nor positioned over public traffic or pedestrians.

Full compensation for conforming to the provisions in this section "Public Safety," including furnishing and installing temporary railing (Type K) and temporary crash cushion modules, shall be considered as included in the contract prices paid for the various items of work involved and no additional compensation will be allowed therefor.

5-1.05 TESTING

Testing of materials and work shall conform to the provisions in Section 6-3, "Testing," of the Standard Specifications and these special provisions.

Whenever the provisions of Section 6-3.01, "General," of the Standard Specifications refer to tests or testing, it shall mean tests to assure the quality and to determine the acceptability of the materials and work.

The Engineer will deduct the costs for testing of materials and work found to be unacceptable, as determined by the tests performed by the Department, and the costs for testing of material sources identified by the Contractor which are not used for the work, from moneys due or to become due to the Contractor. The amount deducted will be determined by the Engineer.

5-1.06 REMOVAL OF ASBESTOS AND HAZARDOUS SUBSTANCES

When the presence of asbestos or hazardous substances are not shown on the plans or indicated in the specifications and the Contractor encounters materials which the Contractor reasonably believes to be asbestos or a hazardous substance as defined in Section 25914.1 of the Health and Safety Code, and the asbestos or hazardous substance has not been rendered harmless, the Contractor may continue work in unaffected areas reasonably believed to be safe. The Contractor shall immediately cease work in the affected area and report the condition to the Engineer in writing.

In conformance with Section 25914.1 of the Health and Safety Code, removal of asbestos or hazardous substances including exploratory work to identify and determine the extent of the asbestos or hazardous substance will be performed by separate contract.

If delay of work in the area delays the current controlling operation, the delay will be considered a right of way delay and the Contractor will be compensated for the delay in conformance with the provisions in Section 8-1.09, "Right of Way Delays," of the Standard Specifications.

5-1.065 SOLID WASTE DISPOSAL AND RECYCLING REPORT

This work shall consist of reporting disposal and recycling of construction solid waste, as specified in these special provisions. For the purposes of this section, solid waste includes construction and demolition waste debris, but not hazardous waste.

Annually by the fifteenth day of January, the Contractor shall complete and certify Form CEM-2025, "Solid Waste Disposal and Recycling Report," which quantifies solid waste generated by the work performed and disposed of in landfills

or recycled during the previous calendar year. The amount and type of solid waste disposed of or recycled shall be reported in either metric tonnes or cubic meters. The Contractor shall also complete and certify Form CEM-2025 within 5 days following contract acceptance.

Form CEM-2025, "Solid Waste Disposal and Recycling Report" can be downloaded from the following website:

http://www.dot.ca.gov/hq/construc/manual2001

If the Contractor has not submitted Form CEM-2025, by the dates specified above, the Department will withhold the amount of $10,000 for each missing or incomplete report. The moneys withheld will be released for payment on the next monthly estimate for partial payment following the date that a complete and acceptable Form CEM-2025 is submitted to the Engineer. Upon completion of all contract work and submittal of the final Form CEM-2025, remaining withheld funds associated with this section, "Solid Waste Disposal and Recycling Report," will be released for payment. Withheld funds in conformance with this section shall be in addition to other moneys withheld provided for in the contract. No interest will be due the Contractor on withheld amounts.

Full compensation for preparing and submitting Form CEM-2025, "Solid Waste Disposal and Recycling Report," shall be considered as included in the contract price for the various items of work involved and no additional compensation will be allowed therefor.

5-1.07 (BLANK)

5-1.075 BUY AMERICA REQUIREMENTS

Attention is directed to the "Buy America" requirements of the Surface Transportation Assistance Act of 1982 (Section 165) and the Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA) Sections 1041(a) and 1048(a), and the regulations adopted pursuant thereto. In conformance with the law and regulations, all manufacturing processes for steel and iron materials furnished for incorporation into the work on this project shall occur in the United States; with the exception that pig iron and processed, pelletized and reduced iron ore manufactured outside of the United States may be used in the domestic manufacturing process for such steel and iron materials. The application of coatings, such as epoxy coating, galvanizing, painting, and other coatings that protect or enhance the value of steel or iron materials shall be considered a manufacturing process subject to the "Buy America" requirements.

A Certificate of Compliance conforming to the provisions in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications shall be furnished for steel and iron materials. The certificates, in addition to certifying that the materials comply with the specifications, shall specifically certify that all manufacturing processes for the materials occurred in the United States, except for the above exceptions.

The requirements imposed by the law and regulations do not prevent a minimal use of foreign steel and iron materials if the total combined cost of the materials used does not exceed one-tenth of one percent (0.1 percent) of the total contract cost or $2500, whichever is greater. The Contractor shall furnish the Engineer acceptable documentation of the quantity and value of the foreign steel and iron prior to incorporating the materials into the work.

5-1.08 SUBCONTRACTOR AND DBE RECORDS

The Contractor shall maintain records showing the name and business address of each first-tier subcontractor. The records shall also show the name and business address of every DBE subcontractor, DBE vendor of materials and DBE trucking company, regardless of tier. The records shall show the date of payment and the total dollar figure paid to all of these firms. DBE prime contractors shall also show the date of work performed by their own forces along with the corresponding dollar value of the work.

Upon completion of the contract, a summary of these records shall be prepared on Form CEM-2402 (F) and certified correct by the Contractor or the Contractor's authorized representative, and shall be furnished to the Engineer. The form shall be furnished to the Engineer within 90 days from the date of contract acceptance. $10,000 will be withheld from payment until the Form CEM-2402 (F) is submitted. The amount will be returned to the Contractor when a satisfactory Form CEM-2402 (F) is submitted.

Prior to the fifteenth of each month, the Contractor shall submit documentation to the Engineer showing the amount paid to DBE trucking companies. The Contractor shall also obtain and submit documentation to the Engineer showing the amount paid by DBE trucking companies to all firms, including owner-operators, for the leasing of trucks. If the DBE leases trucks from a non-DBE, the Contractor may count only the fee or commission the DBE receives as a result of the lease arrangement.

The Contractor shall also obtain and submit documentation to the Engineer showing the truck number, owner's name, California Highway Patrol CA number, and if applicable, the DBE certification number of the owner of the truck for all trucks used during that month. This documentation shall be submitted on Form CEM-2404 (F).

5-1.083 DBE CERTIFICATION STATUS

If a DBE subcontractor is decertified during the life of the project, the decertified subcontractor shall notify the Contractor in writing with the date of decertification. If a subcontractor becomes a certified DBE during the life of the project, the subcontractor shall notify the Contractor in writing with the date of certification. The Contractor shall furnish the written documentation to the Engineer.

Upon completion of the contract, Form CEM-2403 (F) indicating the DBE's existing certification status shall be signed and certified correct by the Contractor. The certified form shall be furnished to the Engineer within 90 days from the date of contract acceptance.

5-1.086 PERFORMANCE OF SUBCONTRACTORS

The subcontractors listed by the Contractor in conformance with Section 2-1.054, "Required Listing of Proposed Subcontractors," of the Standard Specifications, shall perform the work and supply the materials for which they are listed, unless the Contractor has received prior written authorization to perform the work with other forces or to obtain the materials from other sources.

The Contractor should notify the Engineer in writing of any changes to its anticipated DBE participation. This notice should be provided prior to the commencement of that portion of the work.

5-1.09 SUBCONTRACTING

Attention is directed to the provisions in Section 8-1.01, "Subcontracting," of the Standard Specifications, and these special provisions.

The provisions in the third paragraph of Section 8-1.01, "Subcontracting," of the Standard Specifications, that the Contractor shall perform with the Contractor's own organization contract work amounting to not less than 50 percent of the original contract price, is not changed by the Federal Aid requirement specified under "Required Contract Provisions Federal-Aid Construction Contracts" in Section 14 of these special provisions that the Contractor perform not less than 30 percent of the original contract work with the Contractor's own organization.

Each subcontract and lower tier subcontracts that may in turn be made shall include the "Required Contract Provisions Federal-Aid Construction Contracts" in Section 14 of these special provisions. Noncompliance shall be corrected. Payment for subcontracted work involved will be withheld from progress payments due, or to become due, until correction is made. Failure to comply may result in termination of the contract.

Pursuant to the provisions of Section 1777.1 of the Labor Code, the Labor Commissioner publishes and distributes a list of contractors ineligible to perform work as a subcontractor on a public works project. This list of debarred contractors is available from the Department of Industrial Relations web site at:

http://www.dir.ca.gov/DLSE/Debar.html.

5-1.10 PROMPT PROGRESS PAYMENT TO SUBCONTRACTORS

Attention is directed to the provisions in Sections 10262 and 10262.5 of the Public Contract Code concerning prompt payment to subcontractors.

5-1.103 RECORDS

The Contractor shall maintain cost accounting records for the contract pertaining to, and in such a manner as to provide a clear distinction between, the following six categories of costs of work during the life of the contract:

A. Direct costs of contract item work.
B. Direct costs of changes in character in conformance with Section 4-1.03C, "Changes in Character of Work," of the Standard Specifications.
C. Direct costs of extra work in conformance with Section 4-1.03D, "Extra Work," of the Standard Specifications.
D. Direct costs of work not required by the contract and performed for others.

E. Direct costs of work performed under a notice of potential claim in conformance with the provisions in Section 9-1.04, "Notice of Potential Claim," of the Standard Specifications.
F. Indirect costs of overhead.

Cost accounting records shall include the information specified for daily extra work reports in Section 9-1.03C, "Records," of the Standard Specifications. The requirements for furnishing the Engineer completed daily extra work reports shall only apply to work paid for on a force account basis.

The cost accounting records for the contract shall be maintained separately from other contracts, during the life of the contract, and for a period of not less than 3 years after the date of acceptance of the contract. If the Contractor intends to file claims against the Department, the Contractor shall keep the cost accounting records specified above until complete resolution of all claims has been reached.

5-1.104 INTERNET DAILY EXTRA WORK REPORT

When extra work is being paid for on a force account basis, the Contractor shall submit daily extra work reports in conformance with the provisions in Section 9-1.03C, "Records," of the Standard Specifications and these special provisions.

The Contractor shall send daily extra work reports to the Engineer using the Department's Internet extra work billing system. The reports shall conform to the requirements in the "iCAS User's Guide" (Guide). The Guide is available from the Department, and is also found on the Internet at:

http://www.dot.ca.gov/hq/construc/ewb/EWB_INSTRUCTION.pdf

The Department will provide system accounts to the Contractor's authorized representatives when at least one of the representatives has received training. The Department will provide system training to at least one of the Contractor's authorized representatives within 30 days of the Contractor's request for training. The Department will assign an account and user identification to the Contractor's authorized representatives, and each Contractor's authorized representative shall maintain a unique password. A daily extra work report that the Contractor's authorized representative sends to the Department using the Internet extra work billing system will be considered signed by the Contractor. A daily extra work report that the Engineer approves using the Internet extra work billing system will be considered signed by the Engineer.

Daily extra work reports that include billing for materials shall be substantiated by a valid copy of a vendor's invoice in conformance to the requirements in Section 9-1.03C, "Records," of the Standard Specifications. Each materials invoice shall clearly identify the relative daily extra work report and the associated cost of the materials. In addition to postal service and parcel service and if approved by the Engineer, invoices may be sent by facsimile or as an electronic-mail attachment.

The Contractor shall maintain the Contractor's interface with the Department's Internet extra work billing system. If the Contractor is using the file transfer process to submit extra work reports, it shall conform to the file transfer format and process defined in the Guide.

5-1.11 PARTNERING

The State will promote the formation of a "Partnering" relationship with the Contractor in order to effectively complete the contract to the benefit of both parties. The purpose of this relationship is to maintain a cooperative communication and to mutually resolve conflicts at the lowest responsible management level.

The Contractor may request the formation of a "Partnering" relationship by submitting a request in writing to the Engineer after approval of the contract. If the Contractor's request for "Partnering" is approved by the Engineer, scheduling of a "Partnering Workshop," selecting the "Partnering" facilitator and workshop site, and other administrative details shall be as agreed to by both parties. If agreed to by the parties, additional "Partnering Workshops" will be conducted as needed throughout the life of the contract.

The costs involved in providing the "Partnering Workshop" facilitator and workshop site will be borne equally by the State and the Contractor. The division of cost will be made by determining the cost in providing the "Partnering Workshop" facilitator and workshop site in conformance with the provisions in Section 9-1.03B, "Work Performed by Special Forces or Other Special Services," of the Standard Specifications, and paying to the Contractor one-half of that cost, except no markups will be allowed.

All other costs associated with "Partnering Workshops" will be borne separately by the party incurring the costs, such as wages and travel expenses, and no additional compensation will be allowed therefor.

The establishment of a "Partnering" relationship will not change or modify the terms and conditions of the contract and will not relieve either party of the legal requirements of the contract.

5-1.114 VALUE ANALYSIS

The Contractor may submit to the Engineer, in writing, a request for a "Value Analysis" workshop. The purpose for having a workshop is to identify value enhancing opportunities and to consider modifications to the plans and specifications that will reduce either the total cost, time of construction or traffic congestion, without impairing, in any manner, the essential functions or characteristics of the project including, but not limited to, service life, economy of operation, ease of maintenance, benefits to the travelling public, desired appearance, or design and safety standards.

To maximize the potential benefits of a workshop, the request should be submitted to the Engineer early in the project after approval of the contract. If the Contractor's request for a "Value Analysis" workshop is approved by the Engineer, scheduling of a workshop, selecting the facilitator and workshop site, and other administrative details shall be determined cooperatively by the Contractor and the Engineer.

The workshop shall be conducted in conformance with the methodology described in the Department's "Value Analysis Team Guide" available at the Department's web site at:

http://www.dot.ca.gov/hq/oppd/value/

The facilitator shall be a Certified Value Specialist (CVS) as recognized by the Society of American Value Engineers (SAVE) International, which may be contacted as follows:

SAVE International, 60 Revere Drive, Northbrook, IL 60062
Telephone 1-847-480-1730, FAX 1-847-480-9282

The Contractor may submit recommendations resulting from a "Value Analysis" workshop for approval by the Engineer as cost reduction incentive proposals in conformance with the provisions in Section 5-1.14, "Cost Reduction Incentive," of the Standard Specifications.

The costs involved in providing the "Value Analysis" facilitator and workshop site will be borne equally by the State and the Contractor. The division of cost will be made by determining the cost in providing the "Value Analysis" facilitator and workshop site in conformance with the provisions in Section 9-1.03B, "Work Performed by Special Forces or Other Special Services," of the Standard Specifications, and paying to the Contractor one-half of that cost, except no markups will be allowed.

All other costs associated with the "Value Analysis" workshop will be borne separately by the party incurring the costs, such as wages and travel expenses, and no additional compensation will be allowed therefor.

5-1.12 DISPUTE REVIEW BOARD

GENERAL

To assist in the resolution of disputes or potential claims arising out of the work of this project, a Dispute Review Board, hereinafter referred to as the "DRB," shall be established by the Engineer and Contractor cooperatively upon approval of the contract. The DRB is intended to assist the contract administrative claims resolution process as specified in the provisions in Section 9-1.04, "Notice of Potential Claim," and Section 9-1.07B, "Final Payment and Claims," of the Standard Specifications and these special provisions. The DRB shall not serve as a substitute for provisions in the specifications in regard to filing potential claims. The requirements and procedures established in this section shall be a prerequisite to filing a claim, filing for arbitration, or filing for litigation prior or subsequent to project completion.

The DRB shall be utilized when dispute or potential claim resolution at the project level is unsuccessful. The DRB shall function as specified herein until the day of acceptance of the contract, at which time the work of the DRB will cease except for completion of unfinished reports. No DRB dispute meetings shall take place later than 30 days prior to acceptance of contract. After acceptance of contract, disputes or potential claims which have followed the dispute resolution processes of the Standard Specifications and these special provisions, but have not been resolved, shall be stated or restated by the Contractor, in response to the Proposed Final Estimate within the time limits provided in Section 9-1.07B, "Final Payment and Claims," of the Standard Specifications. The State will review those claims in conformance with the provisions in Section 9-1.07B of the Standard Specifications. Following the adherence to and completion of the contractual administrative claims procedure, the Contractor may file for arbitration in conformance with the provisions in Section 9-1.10, "Arbitration," of the Standard Specifications and these special provisions.

Disputes, as used in this section, shall include differences of opinion, properly noticed as provided hereinafter, between the State and Contractor on matters related to the work and other subjects considered by the State or Contractor, or by both, to be of concern to the DRB on this project, except matters relating to Contractor, subcontractor or supplier potential claims not actionable against the Department as specified in these special provisions or quantification of disputes for overhead type expenses or costs. Disputes for overhead type expenses or costs shall conform to the requirements of Section 9-1.07B, "Final Payment and Claims," of the Standard Specifications. Whenever the term "dispute" or "disputes" is used herein, it shall be deemed to include potential claims as well as disputes.

The DRB shall serve as an advisory body to assist in the resolution of disputes between the State and the Contractor, hereinafter referred to as the "parties." The DRB shall consider disputes referred to it, and furnish written reports containing findings and recommendations pertaining to those disputes, to the parties to aid in resolution of the differences between them. DRB findings and recommendations are not binding on the parties.

SELECTION PROCESS, DISCLOSURE AND APPOINTMENTS

The DRB shall consist of one member selected by the State and approved by the Contractor, one member selected by the Contractor and approved by the State, and a third member selected by the first 2 members and approved by both the State and the Contractor. The third member shall act as the DRB Chairperson.

DRB members shall be especially knowledgeable in the type of construction and contract documents potentially anticipated by the contract. DRB members shall discharge their responsibilities impartially as an independent body, considering the facts and circumstances related to the matters under consideration, pertinent provisions of the contract and applicable laws and regulations.

The State and the Contractor shall nominate and approve DRB members in conformance with the terms and conditions of the Dispute Review Board Agreement and these special provisions, within 45 days of the approval of the contract. Each party shall provide written notification to the other of the name of their selected DRB nominee along with the prospective member's complete written disclosure statement.

Disclosure statements shall include a resume of the prospective member's experience and a declaration statement describing past, present, anticipated, and planned relationships, including indirect relationships through the prospective member's primary or full-time employer, to this project and with the parties involved in this construction contract, including but not limited to, relevant subcontractors or suppliers to the parties, parties' principals, or parties' counsel. DRB members shall also include a full disclosure of close professional or personal relationships with all key members of the contract. Objections to nominees must be based on a specific breech or violation of nominee responsibilities or on nominee qualifications under these provisions unless otherwise specified. The Contractor or the State may, on a one-time basis, object to the other's nominee without specifying a reason and this person will not be selected for the DRB. Another person shall then be nominated within 15 days.

The first duty of the State and Contractor selected members of the DRB shall be to select and recommend a prospective third DRB member to the parties for final selection and approval. The first 2 DRB members shall proceed with the selection of the third DRB member immediately upon receiving written notification from the State of their selection, and shall provide their recommendation simultaneously to the parties within 15 days of the notification.

The first 2 DRB members shall select a third DRB member subject to mutual approval of the parties or may mutually concur on a list of potentially acceptable third DRB members and submit the list to the parties for final selection and approval of the third member. The goal in the selection of the third member is to complement the professional experience of the first 2 members and to provide leadership for the DRB's activities.

The third prospective DRB member shall supply a full disclosure statement to the first 2 DRB members and to the parties prior to appointment.

An impasse shall be considered to have been reached if the parties are unable to approve a third member within 15 days of receipt of the recommendation of the first 2 DRB members, or if the first 2 DRB members are unable to agree upon a recommendation within their 15 day time limit. In the event of an impasse in selection of third DRB member the State and the Contractor shall each propose 3 candidates for the third DRB member position. The parties shall select the candidates proposed under this paragraph from the current list of arbitrators certified by the Public Works Contract Arbitration Committee created by Article 7.2 (commencing with Section 10245) of the State Contract Act. The first 2 DRB members shall then select one of the 6 proposed candidates in a blind draw.

No DRB member shall have prior direct involvement in this contract. No member shall have a financial interest in this contract or the parties thereto, within a period of 6 months prior to award of this contract or during the contract, except as follows:

A. Compensation for services on this DRB.
B. Ownership interest in a party or parties, documented by the prospective DRB member, that has been reviewed and determined in writing by the State to be sufficiently insignificant to render the prospective member acceptable to the State.
C. Service as a member of other Dispute Review Boards on other contracts.
D. Retirement payments or pensions received from a party that are not tied to, dependent on or affected by the net worth of the party.
E. The above provisions apply to parties having a financial interest in this contract, including but not limited to contractors, subcontractors, suppliers, consultants, and legal and business services.

The Contractor or the State may reject any of the three DRB members who fail to fully comply at all times with all required employment and financial disclosure conditions of DRB membership as described in the Dispute Review Board Agreement and as specified herein. A copy of the Dispute Review Board Agreement is included in this section.

The Contractor, the State, and the 3 members of the DRB shall complete and adhere to the Dispute Review Board Agreement in administration of this DRB within 15 days of the parties' concurrence in the selection of the third member. No DRB meeting shall take place until the Dispute Review Board Agreement has been signed by all parties. The State authorizes the Engineer to execute and administer the terms of the Agreement. The person(s) designated by the Contractor as authorized to execute contract change orders shall be authorized to execute and administer the terms of this agreement, or to delegate the authority in writing. The operation of the DRB shall be in conformance with the terms of the Dispute Review Board Agreement.

COMPENSATION

The State and the Contractor shall bear the costs and expenses of the DRB equally. Each DRB member shall be compensated at an agreed rate of $1,200 per day if time spent per meeting, including on-site time plus one hour of travel time, is greater than 4 hours. Each DRB member shall be compensated at an agreed rate of $700 per day if time spent per meeting, including on-site time plus one hour of travel time, is less than or equal to 4 hours. The agreed rates shall be considered full compensation for on-site time, travel expenses, transportation, lodging, time for travel and incidentals for each day, or portion thereof, that the DRB member is at an authorized DRB meeting. No additional compensation will be made for time spent by DRB members in review and research activities outside the official DRB meetings unless that time, (such as time spent evaluating and preparing recommendations on specific issues presented to the DRB), has been specifically agreed to in advance by the State and Contractor. Time away from the project, which has been specifically agreed to in advance by the parties, will be compensated at an agreed rate of $125 per hour. The agreed amount of $125 per hour shall include all incidentals including expenses for telephone, fax, and computer services. Members serving on more than one DRB involving the Department, regardless of the number of meetings per day, shall not be paid more than the all inclusive rate per day or rate per hour for an individual project. The State will provide, at no cost to the Contractor, administrative services such as conference facilities and secretarial services to the DRB. These special provisions and the Dispute Review Board Agreement state the provisions for compensation and expenses of the DRB. DRB members shall be compensated at the same daily and hourly rate. The Contractor shall make direct payments to each DRB member for their participation in authorized meetings and approved hourly rate charges from invoices submitted by each DRB member. The State will reimburse the Contractor for the State's share of the costs. There will be no markups applied to expenses connected with the DRB, either by the DRB members or by the Contractor when requesting payment of the State's share of DRB expenses. Regardless of the DRB recommendation, neither party shall be entitled to reimbursement of DRB costs from the other party.

REPLACEMENT OF DRB MEMBERS

Service of a DRB member may be terminated at any time with not less than 15 days notice as follows:

A. The State may terminate service of the State appointed member.
B. The Contractor may terminate service of the Contractor appointed member.
C. Upon the written recommendation of the State and Contractor appointed members for the removal of the third member.
D. Upon resignation of a member.
E. The State or Contractor may terminate the service of any member who fails to fully comply with all required employment and financial disclosure conditions of DRB membership

When a member of the DRB is replaced, the replacement member shall be appointed in the same manner as the replaced member was appointed. The appointment of a replacement DRB member will begin promptly upon determination of the need for replacement and shall be completed within 15 days. Changes in either of the DRB members chosen by the two parties will not require re-selection of the third member, unless both parties agree to such re-selection in writing. The Dispute Review Board Agreement shall be amended to reflect the change of a DRB member.

OPERATION

The following procedure shall be used for dispute resolution:

A. If the Contractor objects to any decision, act or order of the Engineer, the Contractor shall give written notice of potential claim in conformance with the provisions in Section 9-1.04, "Notice of Potential Claim," of the Standard Specifications and these special provisions, including the provision of applicable cost documentation; or file written protests or notices in conformance with the provisions in the Standard Specifications and these special provisions.

B. The Engineer will respond, in writing, to the Contractor's written supplemental notice of potential claim within 20 days of receipt of the notice.
C. Within 15 days after receipt of the Engineer's written response, the Contractor shall, if the Contractor still objects, file a written reply with the Engineer, stating clearly and in detail the basis of the objection.
D. Following an objection to the Engineer's written response, the Contractor shall refer the dispute to the DRB if the Contractor wishes to further pursue the objection to the Engineer's decision. The Contractor shall make the referral in writing to the DRB, simultaneously copied to the State, within 21 days after receipt of the written response from the Engineer. The written dispute referral shall describe the disputed matter in individual discrete segments so that it will be clear to both parties and the DRB what discrete elements of the dispute have been resolved, and which remain unresolved, and shall include an estimate of the cost of the affected work and impacts, if any, on project completion.
E. By failing to submit the written notice of referral to the DRB, within 21 days after receipt of the Engineer's written response to the supplemental notice of potential claim, the Contractor waives future claims and arbitration on the matter in contention.
F. The Contractor and the State shall each be afforded an opportunity to be present and to be heard by the DRB, and to offer evidence. Either party furnishing written evidence or documentation to the DRB must furnish copies of such information to the other party a minimum of 15 days prior to the date the DRB is scheduled to convene the meeting for the dispute. Either party shall produce such additional evidence as the DRB may deem necessary to reach an understanding and a determination of the dispute. The party furnishing additional evidence shall furnish copies of such additional evidence to the other party at the same time the evidence is provided to the DRB. The DRB shall not consider evidence not furnished in conformance with the terms specified herein.
G. Upon receipt by the DRB of a written referral of a dispute, the DRB shall convene to review and consider the dispute. The dispute meeting shall be held no earlier than 30 days and no later than 60 days after receipt of the written referral unless otherwise agreed to by all parties. The DRB shall determine the time and location of the DRB dispute meeting, with due consideration for the needs and preferences of the parties while recognizing the paramount importance of a timely hearing of the dispute.
H. There shall be no participation of either party's attorneys at DRB dispute meetings.
I. There shall be no participation of persons who are not directly involved in the contract or who do not have direct knowledge of the dispute, including but not limited to consultants, except for expert testimony allowed at the discretion of the DRB and with approval prior to the dispute meeting by both parties.
J. The DRB shall furnish a report, containing findings and recommendations as described in the Dispute Review Board Agreement, in writing to both the State and the Contractor. The DRB may request clarifying information of either party within 10 days after the DRB dispute meeting. Requested information shall be submitted to the DRB within 10 days of the DRB request. The DRB shall complete its report, including minority opinion, if any, and submit it to the parties within 30 days of the DRB dispute meeting, except that time extensions may be granted at the request of the DRB with the written concurrence of both parties. The report shall include the facts and circumstances related to the matters under consideration, pertinent provisions of the contract, applicable laws and regulations, and actual costs and time incurred as shown on the Contractor's cost accounting records. The DRB shall make recommendations on the merit of the dispute and, if appropriate, recommend guidelines for determining compensation.
K. Within 30 days after receiving the DRB's report, both the State and the Contractor shall respond to the DRB in writing signifying that the dispute is either resolved or remains unresolved. Failure to provide the written response within the time specified, or a written rejection of the DRB's recommendation or response to a request for reconsideration presented in the report by either party, shall conclusively indicate that the party(s) failing to respond accepts the DRB recommendation. Immediately after responses have been received from both parties, the DRB shall provide copies of both responses to the parties simultaneously. Either party may request clarification of elements of the DRB's report from the DRB prior to responding to the report. The DRB shall consider any clarification request only if submitted within 10 days of receipt of the DRB's report, and if submitted simultaneously in writing to both the DRB and the other party. Each party may submit only one request for clarification for any individual DRB report. The DRB shall respond, in writing, to requests for clarification within 10 days of receipt of such requests.
L. The DRB's recommendations, stated in the DRB's reports, are not binding on either party. Either party may seek a reconsideration of a recommendation of the DRB. The DRB shall only grant a reconsideration based upon submission of new evidence and if the request is submitted within the 30-day time limit specified for response to the DRB's written report. Each party may submit only one request for reconsideration regarding an individual DRB recommendation.
M. If the State and the Contractor are able to resolve their dispute with the aid of the DRB's report, the State and Contractor shall promptly accept and implement the recommendations of the DRB. If the parties cannot agree on

compensation within 60 days of the acceptance by both parties of the DRB's recommendation, either party may request the DRB to make a recommendation regarding compensation.

N. The State or the Contractor shall not call DRB members who served on the DRB for this contract as witnesses in arbitration proceedings which may arise from this contract, and all documents created by the DRB shall be inadmissible as evidence in subsequent arbitration proceedings, except the DRB's final written reports on each issue brought before it.

O. The State and Contractor shall jointly indemnify and hold harmless the DRB members from and against all claims, damages, losses, and expenses, including but not limited to attorney's fees, arising out of and resulting from the findings and recommendations of the DRB.

P. The DRB members shall have no claim against the State or the Contractor, or both, from claimed harm arising out of the parties' evaluations of the DRB's report.

DISPUTES INVOLVING SUBCONTRACTOR POTENTIAL CLAIMS

For purposes of this section, a "subcontractor potential claim" shall include any potential claim by a subcontractor (including also any pass through potential claims by a lower tier subcontractor or supplier) against the Contractor that is actionable by the Contractor against the Department which arises from the work, services, or materials provided or to be provided in connection with the contract. If the Contractor determines to pursue a dispute against the Department that includes a subcontractor potential claim, the dispute shall be processed and resolved in conformance with these special provisions and in conformance with the following:

A. The Contractor shall identify clearly in submissions pursuant to this section, that portion of the dispute that involves a subcontractor potential claim or potential claims.

B. The Contractor shall include, as part of its submission pursuant to Step D above, a certification (False Claims Act Certification) by the subcontractor's or supplier's officer, partner, or authorized representative with authority to bind the subcontractor and with direct knowledge of the facts underlying the subcontractor potential claim. The Contractor shall submit a certification that the subcontractor potential claim is acknowledged and forwarded by the Contractor. The form for these certifications is available from the Engineer.

C. At DRB dispute meetings involving one or more subcontractor potential claims, the Contractor shall require that each subcontractor involved in the dispute have present an authorized representative with actual knowledge of the facts underlying the subcontractor potential claim to assist in presenting the subcontractor potential claim and to answer questions raised by the DRB members or the Department's representatives.

D. Failure by the Contractor to declare a subcontractor potential claim on behalf of its subcontractor (including lower tier subcontractors' and suppliers' pass through potential claims) at the time of submission of the Contractor's potential claims, as provided hereunder, shall constitute a release of the State by the Contractor of such subcontractor potential claim.

E. The Contractor shall include in all subcontracts under this contract that subcontractors and suppliers of any tier (a) agree to submit subcontractor potential claims to the Contractor in a proper form and in sufficient time to allow processing by the Contractor in conformance with the Dispute Review Board resolution specifications; (b) agree to be bound by the terms of the Dispute Review Board provisions to the extent applicable to subcontractor potential claims; (c) agree that, to the extent a subcontractor potential claim is involved, completion of all steps required under these Dispute Review Board special provisions shall be a condition precedent to pursuit by the subcontractor of other remedies permitted by law, including without limitation of a lawsuit against the Contractor; and (d) agree that the existence of a dispute resolution process for disputes involving subcontractor potential claims shall not be deemed to create any claim, right, or cause of action by any subcontractor or supplier against the Department.

Notwithstanding the foregoing, this Dispute Review Board special provision shall not apply to, and the DRB shall not have the authority to consider, subcontractor potential claims between the subcontractor(s) or supplier(s) and the Contractor that are not actionable by the Contractor against the Department.

RETENTION

Failure of the Contractor to nominate and approve DRB members in conformance with the terms and conditions of the Dispute Review Board Agreement and these special provisions shall result in the retention of 25 percent of the estimated value of all work performed during each estimate period in which the Contractor fails to comply with the requirements of this section as determined by the Engineer. DRB retentions will be released for payment on the next monthly estimate for partial payment following the date that the Contractor has nominated and approved DRB members and no interest will be due the Contractor.

DISPUTE REVIEW BOARD AGREEMENT

A copy of the "Dispute Review Board Agreement" to be executed by the Contractor, State and the 3 DRB members after approval of the contract follows:

Form 6202 Rev (09/01/02)

DISPUTE REVIEW BOARD AGREEMENT

_____
(Contract Identification)

Contract No. _____

THIS DISPUTE REVIEW BOARD AGREEMENT, hereinafter called "AGREEMENT", made and entered into this _____ day of _____, _____, between the State of California, acting through the California Department of Transportation and the Director of Transportation, hereinafter called the "STATE," _____ _____ hereinafter called the "CONTRACTOR," and the Dispute Review Board, hereinafter called the "DRB" consisting of the following members:

_____ ,
(Contractor Appointee)

_____ ,
(State Appointee)

and _____
(Third Person)

WITNESSETH, that

WHEREAS, the STATE and the CONTRACTOR, hereinafter called the "parties," are now engaged in the construction on the State Highway project referenced above; and

WHEREAS, the special provisions for the above referenced contract provides for the establishment and operation of the DRB to assist in resolving disputes; and

WHEREAS, the DRB is composed of three members, one selected by the STATE, one selected by the CONTRACTOR, and the third member selected by the other two members and approved by the parties;

NOW THEREFORE, in consideration of the terms, conditions, covenants, and performance contained herein, or attached and incorporated and made a part hereof, the STATE, the CONTRACTOR, and the DRB members hereto agree as follows:

SECTION I DESCRIPTION OF WORK

To assist in the resolution of disputes between the parties, the contract provides for the establishment and the operation of the DRB. The intent of the DRB is to fairly and impartially consider disputes placed before it and provide written recommendations for resolution of these disputes to both parties. The members of this DRB shall perform the services necessary to participate in the DRB's actions as designated in Section II, Scope of Work.

SECTION II SCOPE OF WORK

The scope of work of the DRB includes, but is not limited to, the following:

A. OBJECTIVE

The principal objective of the DRB is to assist in the timely resolution of disputes between the parties arising from performance of this contract. It is not intended for either party to default on their normal responsibility to amicably and fairly settle their differences by indiscriminately assigning them to the DRB. It is intended that the mere existence of the DRB will encourage the parties to resolve disputes without resorting to this review procedure. But when a dispute that is serious enough to warrant the DRB's review does develop, the process for prompt and efficient action will be in place.

B. PROCEDURES

The DRB shall render written reports on disputes between the parties arising from the construction contract. Prior to consideration of a dispute, the DRB shall establish rules and regulations that will govern the conduct of its business and reporting procedures in conformance with the requirements of the contract and the terms of this AGREEMENT. DRB recommendations, resulting from its consideration of a dispute, shall be furnished in writing to both parties. The recommendations shall be based on facts and circumstances involved in the dispute, pertinent contract provisions, applicable laws and regulations. The recommendations shall find one responsible party in a dispute; shared or "jury" determinations shall not be rendered. The DRB shall make recommendations on the merit of the dispute, and if appropriate, recommend guidelines for determining compensation. If the parties cannot agree on compensation within 60 days of the acceptance by both parties of the DRB's recommendation, either party may request the DRB to make a recommendation regarding compensation.

The DRB shall refrain from officially giving advice or consulting services to anyone involved in the contract. The individual members shall act in a completely independent manner and while serving as members of the DRB shall have no consulting business connections with either party or its principals or attorneys or other affiliates (subcontractors, suppliers, etc.) who have a beneficial interest in the contract.

During scheduled meetings of the DRB as well as during dispute meetings, DRB members shall refrain from expressing opinions on the merits of statements on matters under dispute or potential dispute. Opinions of DRB members expressed in private sessions shall be kept strictly confidential. Individual DRB members shall not meet with, or discuss contract issues with individual parties, except as directed by the DRB Chairperson. Such discussions or meetings shall be disclosed to both parties. Other discussions regarding the project between the DRB members and the parties shall be in the presence of all three members and both parties. Individual DRB members shall not undertake independent investigations of any kind pertaining to disputes or potential disputes, except with the knowledge of both parties and as expressly directed by the DRB Chairperson.

C. CONSTRUCTION SITE VISITS, PROGRESS MEETINGS AND FIELD INSPECTIONS

The DRB members shall visit the project site and meet with representatives of the parties to keep abreast of construction activities and to develop familiarity with the work in progress. Scheduled progress meetings shall be held at or near the project site. The DRB shall meet at least once at the start of the project, and at least once every 4 months thereafter. The frequency, exact time, and duration of additional site visits and progress meetings shall be as recommended by the DRB and approved by the parties consistent with the construction activities or matters under consideration and dispute. Each meeting shall consist of a round table discussion and a field inspection of the work being performed on the contract, if necessary. Each meeting shall be attended by representatives of both parties. The agenda shall generally be as follows:

1. Meeting opened by the DRB Chairperson.
2. Remarks by the STATE's representative.
3. A description by the CONTRACTOR's representative of work accomplished since the last meeting; the current schedule status of the work; and a forecast for the coming period.
4. An outline by the CONTRACTOR's representative of potential problems and a description of proposed solutions.
5. An outline by the STATE's representative of the status of the work as the STATE views it.
6. A brief description by the CONTRACTOR's or STATE's representative of potential claims or disputes which have surfaced since the last meeting.
7. A summary by the STATE's representative, the CONTRACTOR's representative, or the DRB of the status of past disputes and potential claims.

The STATE's representative will prepare minutes of all progress meetings and circulate them for revision and approval by all concerned within 10 days of the meeting.

The field inspection shall cover all active segments of the work, the DRB being accompanied by both parties' representatives. The field inspection may be waived upon mutual agreement of the parties.

D. DRB CONSIDERATION AND HANDLING OF DISPUTES

Upon receipt by the DRB of a written referral of a dispute, the DRB shall convene to review and consider the dispute. The dispute meeting shall be held no earlier than 30 days and no later than 60 days after receipt of the written referral, unless otherwise agreed to by all parties. The DRB shall determine the time and location of DRB dispute meetings, with due consideration for the needs and preferences of the parties while recognizing the paramount importance of speedy resolution of issues. No dispute meetings shall take place later than 30 days prior to acceptance of contract.

Normally, dispute meetings shall be conducted at or near the project site. However, any location that would be more convenient and still provide required facilities and access to necessary documentation shall be satisfactory.

Both parties shall be given the opportunity to present their evidence at these dispute meetings. It is expressly understood that the DRB members are to act impartially and independently in the consideration of the contract provisions, applicable

laws and regulations, and the facts and conditions surrounding any dispute presented by either party, and that the recommendations concerning any such dispute are advisory and nonbinding on the parties.

The DRB may request that written documentation and arguments from both parties be sent to each DRB member, through the DRB Chairperson, for review before the dispute meeting begins. A party furnishing written documentation to the DRB shall furnish copies of such information to the other party at the same time that such information is supplied to the DRB.

DRB dispute meetings shall be informal. There shall be no testimony under oath or cross-examination. There shall be no reporting of the procedures by a shorthand reporter or by electronic means. Documents and verbal statements shall be received by the DRB in conformance with acceptance standards established by the DRB. These standards need not comply with prescribed legal laws of evidence.

The third DRB member shall act as Chairperson for dispute meetings and all other DRB activities. The parties shall have a representative at all dispute meetings. Failure to attend a duly noticed dispute meeting by either of the parties shall be conclusively considered by the DRB as indication that the non-attending party considers written submittals as their entire and complete argument. The claimant shall discuss the dispute, followed by the other party. Each party shall then be allowed one or more rebuttals until all aspects of the dispute are thoroughly covered. DRB members shall ask questions, seek clarification, and request further data from either of the parties as may be necessary to assist in making a fully informed recommendation. The DRB may request from either party documents or information that would assist the DRB in making its findings and recommendations including, but not limited to, documents used by the CONTRACTOR in preparing the bid for the project. A refusal by a party to provide information requested by the DRB may be considered by the DRB as an indication that the requested material would tend to disprove that party's position. In large or complex cases, additional dispute meetings may be necessary in order to consider all the evidence presented by both parties. All involved parties shall maintain the confidentiality of all documents and information, as provided in this AGREEMENT.

During dispute meetings, no DRB member shall express an opinion concerning the merit of any facet of the case. DRB deliberations shall be conducted in private, with interim individual views kept strictly confidential.

After dispute meetings are concluded, the DRB shall meet in private and reach a conclusion supported by 2 or more members. Private sessions of the DRB may be held at a location other than the job site or by electronic conferencing as deemed appropriate, in order to expedite the process.

The DRB's findings and recommendations, along with discussion of reasons therefor, shall then be submitted as a written report to both parties. Recommendations shall be based on the pertinent contract provisions, applicable laws and regulations, and facts and circumstances related to the dispute. The report shall be thorough in discussing the facts considered, the contract language, law or regulation viewed by the DRB as pertinent to the issues, and the DRB's interpretation and philosophy in arriving at its conclusions and recommendations. The DRB's report shall stand on its own, without attachments or appendices. The DRB Chairperson shall furnish a copy of the written recommendation report to the DRB Coordinator, Division of Construction, MS 44, P.O. Box 942874, Sacramento, CA 94274.

With prior written approval of both parties, the DRB may obtain technical services necessary to adequately review the disputes presented, including audit, geotechnical, schedule analysis and other services. The parties' technical staff may supply those services as appropriate. The cost of technical services, as agreed to by the parties, shall be borne equally by the 2 parties as specified in an approved contract change order. The CONTRACTOR will not be entitled to markups for the payments made for these services.

The DRB shall resist submittal of incremental portions of information by either party, in the interest of making a fully informed decision and recommendation.

The DRB shall make every effort to reach a unanimous decision. If this proves impossible, the dissenting member shall prepare a minority opinion, which shall be included in the DRB's report.

Although both parties should place weight upon the DRB's recommendations, they are not binding. Either party may appeal a recommendation to the DRB for reconsideration. However, reconsideration shall only be allowed when there is new evidence to present, and the DRB shall accept only one appeal from each party pertaining to an individual DRB recommendation. The DRB shall hear appeals in conformance with the terms described in the Section entitled "Dispute Review Board" in the special provisions.

E. DRB MEMBER REPLACEMENT

Should the need arise to appoint a replacement DRB member, the replacement DRB member shall be appointed in the same manner as the original DRB members were appointed. The selection of a replacement DRB member shall begin promptly upon notification of the necessity for a replacement and shall be completed within 15 days. This AGREEMENT shall be amended to indicate change in DRB membership.

SECTION III CONTRACTOR RESPONSIBILITIES

The CONTRACTOR shall furnish to each DRB member one copy of pertinent documents that are or may become necessary for the DRB to perform their function. Pertinent documents are written notices of potential claim, responses to those notices, drawings or sketches, calculations, procedures, schedules, estimates, or other documents which are used in the

performance of the work or in justifying or substantiating the CONTRACTOR's position. The CONTRACTOR shall also furnish a copy of such pertinent documents to the STATE, in conformance with the terms outlined in the special provisions.

SECTION IV STATE RESPONSIBILITIES

The STATE will furnish the following services and items:

A. CONTRACT RELATED DOCUMENTS

The STATE will furnish to each DRB member one copy of Notice to Contractors and Special Provisions, Proposal and Contract, Plans, Standard Specifications, and Standard Plans, change orders, written instructions issued by the STATE to the CONTRACTOR, or other documents pertinent to any dispute that has been referred to the DRB and necessary for the DRB to perform its function.

B. COORDINATION AND SERVICES

The STATE, through the Engineer, will, in cooperation with the CONTRACTOR, coordinate the operations of the DRB. The Engineer will arrange or provide conference facilities at or near the project site and provide secretarial and copying services to the DRB without charge to the CONTRACTOR.

SECTION V TIME FOR BEGINNING AND COMPLETION

Once established, the DRB shall be in operation until the day of acceptance of the contract. The DRB members shall not begin work under the terms of this AGREEMENT until authorized in writing by the STATE.

SECTION VI PAYMENT

A. ALL INCLUSIVE RATE PAYMENT

The STATE and the CONTRACTOR shall bear the costs and expenses of the DRB equally. Each DRB member shall be compensated at an agreed rate of $1,200 per day if time spent per meeting, including on-site time plus one hour of travel time, is greater than 4 hours. Each DRB member shall be compensated at an agreed rate of $700 per day if time spent per meeting, including on-site time plus one hour of travel time, is less than or equal to 4 hours. The agreed rates shall be considered full compensation for on-site time, travel expenses, transportation, lodging, time for travel and incidentals for each day, or portion thereof, that the DRB member is at an authorized DRB meeting. No additional compensation will be made for time spent by DRB members in review and research activities outside the official DRB meetings unless that time has been specifically agreed to in advance by the STATE and CONTRACTOR. Time away from the project that has been specifically agreed to in advance by the parties will be compensated at an agreed rate of $125 per hour. The agreed amount of $125 per hour shall include all incidentals including expenses for telephone, fax, and computer services. Members serving on more than one DRB involving the State, regardless of the number of meetings per day, shall not be paid more than the all inclusive rate per day or rate per hour for an individual project. The STATE will provide, at no cost to the CONTRACTOR, administrative services such as conference facilities and secretarial services to the DRB.

B. PAYMENTS

DRB members shall be compensated at the same rate. The CONTRACTOR shall make direct payments to each DRB member for their participation in authorized meetings and approved hourly rate charges from invoices submitted by each DRB member. The STATE will reimburse the CONTRACTOR for its share of the costs of the DRB.

The DRB members may submit invoices to the CONTRACTOR for partial payment for work performed and services rendered for their participation in authorized meetings not more often than once per month during the progress of the work. The invoices shall be in a format approved by the parties and accompanied by a general description of activities performed during that billing period. Payment for hourly fees, at the agreed rate, shall not be paid to a DRB member until the amount and extent of those fees are approved by the STATE and CONTRACTOR.

Invoices shall be accompanied by original supporting documents, which the CONTRACTOR shall include with the extra work billing when submitting for reimbursement of the STATE's share of cost from the STATE. The CONTRACTOR will be reimbursed for one-half of approved costs of the DRB. No markups will be added to the CONTRACTOR's payment.

C. INSPECTION OF COSTS RECORDS

The DRB members and the CONTRACTOR shall keep available for inspection by representatives of the STATE and the United States, for a period of 3 years after final payment, the cost records and accounts pertaining to this AGREEMENT. If any litigation, claim, or audit arising out of, in connection with, or related to this contract is initiated before the expiration of the 3-year period, the cost records and accounts shall be retained until such litigation, claim, or audit involving the records is completed.

SECTION VII ASSIGNMENT OF TASKS OF WORK

The DRB members shall not assign the work of this AGREEMENT.

SECTION VIII TERMINATION OF DRB MEMBERS

DRB members may resign from the DRB by providing not less than 15 days written notice of the resignation to the STATE and CONTRACTOR. DRB members may be terminated by their original appointing power or by either party, for failing to fully comply at all times with all required employment and financial disclosure conditions of DRB membership in conformance with the terms of the contract.

SECTION IX LEGAL RELATIONS

The parties hereto mutually understand and agree that the DRB member in the performance of duties on the DRB, is acting in the capacity of an independent agent and not as an employee of either party.

No party to this AGREEMENT shall bear a greater responsibility for damages or personal injury than is normally provided by Federal or State of California Law.

Notwithstanding the provisions of this contract that require the CONTRACTOR to indemnify and hold harmless the STATE, the parties shall jointly indemnify and hold harmless the DRB members from and against all claims, damages, losses, and expenses, including but not limited to attorney's fees, arising out of and resulting from the findings and recommendations of the DRB.

SECTION X CONFIDENTIALITY

The parties hereto mutually understand and agree that all documents and records provided by the parties in reference to issues brought before the DRB, which documents and records are marked "Confidential - for use by the DRB only," shall be kept in confidence and used only for the purpose of resolution of subject disputes, and for assisting in development of DRB findings and recommendations; that such documents and records will not be utilized or revealed to others, except to officials of the parties who are authorized to act on the subject disputes, for any purposes, during the life of the DRB. Upon termination of this AGREEMENT, said confidential documents and records, and all copies thereof, shall be returned to the parties who furnished them to the DRB. However, the parties understand that such documents shall be subsequently discoverable and admissible in court or arbitration proceedings unless a protective order has been obtained by the party seeking further confidentiality.

SECTION XI DISPUTES

Disputes between the parties hereto, including disputes between the DRB members and either party or both parties, arising out of the work or other terms of this AGREEMENT, which cannot be resolved by negotiation and mutual concurrence between the parties, or through the administrative process provided in the contract, shall be resolved by arbitration as provided in Section 9-1.10, "Arbitration," of the Standard Specifications.

SECTION XII VENUE, APPLICABLE LAW, AND PERSONAL JURISDICTION

In the event that any party, including an individual member of the DRB, deems it necessary to institute arbitration proceedings to enforce any right or obligation under this AGREEMENT, the parties hereto agree that such action shall be initiated in the Office of Administrative Hearings of the State of California. The parties hereto agree that all questions shall be resolved by arbitration by application of California law and that the parties to such arbitration shall have the right of appeal from such decisions to the Superior Court in conformance with the laws of the State of California. Venue for the arbitration shall be Sacramento or any other location as agreed to by the parties.

SECTION XIII FEDERAL REVIEW AND REQUIREMENTS

On Federal-Aid contracts, the Federal Highway Administration shall have the right to review the work of the DRB in progress, except for private meetings or deliberations of the DRB.

Other Federal requirements in this agreement shall only apply to Federal-Aid contracts.

SECTION XIV CERTIFICATION OF THE CONTRACTOR, THE DRB MEMBERS, AND THE STATE

IN WITNESS WHEREOF, the parties hereto have executed this AGREEMENT as of the day and year first above written.

DRB MEMBER	DRB MEMBER
By: _____	By: _____
Title: _____	Title :_____
DRB MEMBER	
By :_____	
Title :_____	
CONTRACTOR	CALIFORNIA STATE DEPARTMENT OF TRANSPORTATION
By: _____	By: _____
Title: _____	Title: _____

5-1.13 SECURITY CLEARANCE

The Contractor shall obtain security clearance from the United States General Services Administration for all persons engaged in the work at the job site, including sub-contractors and suppliers.

Attention is directed to "Order of Work" and "Beginning of Work, Time of Completion and Liquidated Damages" of these special provisions.

The request for security clearances shall be made to the United States General Services Administration, located at the Office of Property Management, 880 Front Street Suite 4236, San Diego, California, 92101, telephone number 619-557-7135. The Contractor shall cooperate with all agencies involved in the process of conducting the background checks and shall comply with security regulations.

Security clearance will be required during the prosecution of the work. The Contractor shall assume the risks in connection with obtaining security clearance and the terms upon which the use shall be made. There is no warranty or guaranty, either express or implied, to the length of time required to obtain security clearance from the United States General Services Administration. The bidder or Contractor is cautioned to make independent investigations and obtain the commitments or allocations as the bidder or Contractor deems necessary to verify the length of time and requirements necessary for obtaining security clearance.

During the progress of the work, if any person employed by the Contractor loses their security clearance, they shall be removed immediately from the job site and shall not return to the job site until their security clearance has been reinstated.

The Information Handout includes samples of forms that may be required by the U.S. General Services Administration for security clearance. The Contractor shall obtain the official forms required for security clearance directly from the United States General Services Administration.

The provisions in this special provision shall be included in all subcontracts.

Full compensation for obtaining security clearance will be considered as included in the prices paid for the various contract items of work and no additional compensation will be allowed therefor.

5-1.14 FORCE ACCOUNT PAYMENT

Payment for extra work at force account will be determined by either non-subcontracted or subcontracted force account payment unless otherwise specified.

Non-Subcontracted Force Account Payment:

When extra work to be paid for on a force account basis is performed by the Contractor, compensation will be determined in accordance with Section 9-1.03, "Force Account Payment," of the Standard Specifications and these special provisions.

The second, third and fourth paragraphs of Section 9-1.03A, "Work Performed by Contractor," in the Standard Specifications, shall not apply.

Attention is directed to "Time-Related Overhead" of these special provisions.

To the total of the direct costs for work performed on a force account basis, computed as provided in Sections 9-1.03A(1), "Labor," 9-1.03A(2), "Materials," and 9-1.03A(3), "Equipment Rental," of the Standard Specifications, there will be added the following markups:

Cost	Percent Markup
Labor	28
Materials	10
Equipment Rental	10

The above markups shall be applied to work performed on a force account basis, regardless of whether the work revises the current contract completion date.

The above markups, together with payments made for time-related overhead pursuant to "Time-Related Overhead" of these special provisions, shall constitute full compensation for all overhead costs for work performed on a force account basis. These overhead costs shall be deemed to include all items of expense not specifically designated as cost or equipment rental in conformance with the provisions in Sections 9-1.03A(1), "Labor," 9-1.03A(2), "Materials," and 9-1.03A(3), "Equipment Rental," of the Standard Specifications. The total payment made as provided above and in the first paragraph of Section 9-1.03A, "Work Performed by Contractor," of the Standard Specifications shall be deemed to be the actual cost of the work performed on a force account basis, and shall constitute full compensation therefor.

Full compensation for overhead costs for work performed on a force account basis, and for which no adjustment is made to the quantity for time-related overhead conforming to the provisions in "Time-Related Overhead" of these special provisions, shall be considered as included in the markups specified above, and no additional compensation will be allowed therefor.

Subcontracted Force Account Payment:

When extra work to be paid for on a force account basis is performed by a subcontractor approved in conformance with the provisions in Section 8-1.01, "Subcontracting," of the Standard Specifications, compensation will be determined in accordance with the provisions in Section 9-1.03, "Force Account Payment," of the Standard Specifications.

5-1.15 COMPENSATION ADJUSTMENTS FOR PRICE INDEX FLUCTUATIONS

The provisions of this section shall apply only to the following contract items:

ITEM CODE	ITEM
390102	ASPHALT CONCRETE (TYPE A)
390108	ASPHALT CONCRETE BASE (TYPE A)

The compensation payable for paving asphalt used in asphalt concrete and asphalt concrete base will be increased or decreased in conformance with the provisions of this section for paving asphalt price fluctuations exceeding 10 percent (Iu/Ib is greater than 1.10 or less than 0.90) which occur during performance of the work.

The adjustment in compensation will be determined in conformance with the following formulae when the item of asphalt concrete or asphalt concrete base, are included in a monthly estimate:

A. Total monthly adjustment = AQ

B. For an increase in paving asphalt price index exceeding 10 percent:

$$A = 0.90\ (1.1023)\ (Iu/Ib - 1.10)\ Ib$$

C. For a decrease in paving asphalt price index exceeding 10 percent:

$$A = 0.90\ (1.1023)\ (Iu/Ib - 0.90)\ Ib$$

D. Where:

A = Adjustment in dollars per tonne of paving asphalt used to produce asphalt concrete and asphalt concrete base rounded to the nearest $0.01.

Iu = The California Statewide Paving Asphalt Price Index which is in effect on the first business day of the month within the pay period in which the quantity subject to adjustment was included in the estimate.

Ib = The California Statewide Paving Asphalt Price Index for the month in which the bid opening for the project occurred.

Q = Quantity in tonnes of paving asphalt that was used in producing the quantity of asphalt concrete and asphalt concrete base shown under "This Estimate" on the monthly estimate using the amount of asphalt determined by the Engineer.

The adjustment in compensation will also be subject to the following:

A. The compensation adjustments provided herein will be shown separately on payment estimates. The Contractor shall be liable to the State for decreased compensation adjustments and the Department may deduct the amount thereof from moneys due or that may become due the Contractor.
B. Compensation adjustments made under this section will be taken into account in making adjustments in conformance with the provisions in Section 4-1.03B, "Increased or Decreased Quantities," of the Standard Specifications.
C. In the event of an overrun of contract time, adjustment in compensation for paving asphalt included in estimates during the overrun period will be determined using the California Statewide Paving Asphalt Price Index in effect on the first business day of the month within the pay period in which the overrun began.

The California Statewide Paving Asphalt Price Index is determined each month on the first business day of the month by the Department using the median of posted prices in effect as posted by Chevron, Mobil, and Unocal for the Buena Vista, Huntington Beach, Kern River, Long Beach, Midway Sunset, and Wilmington fields.

In the event that the companies discontinue posting their prices for a field, the Department will determine an index from the remaining posted prices. The Department reserves the right to include in the index determination the posted prices of additional fields.

The California Statewide Paving Asphalt Price Index is available on the Division of Engineering Services website at:

http://www.dot.ca.gov/hq/esc/oe/asphalt_index/astable.html

5-1.16 AREAS FOR CONTRACTOR'S USE

Attention is directed to the provisions in Section 7-1.19, "Rights in Land and Improvements," of the Standard Specifications and these special provisions.

The highway right of way shall be used only for purposes that are necessary to perform the required work. The Contractor shall not occupy the right of way, or allow others to occupy the right of way, for purposes which are not necessary to perform the required work.

No State-owned parcels adjacent to the right of way are available for the exclusive use of the Contractor within the contract limits. The Contractor shall secure, at the Contractor's own expense, areas required for plant sites, storage of equipment or materials, or for other purposes.

No area is available within the contract limits for the exclusive use of the Contractor. However, temporary storage of equipment and materials on State property may be arranged with the Engineer, subject to the prior demands of State maintenance forces and to other contract requirements. Use of the Contractor's work areas and other State-owned property shall be at the Contractor's own risk, and the State shall not be held liable for damage to or loss of materials or equipment located within such areas.

5-1.17 PAYMENTS

Attention is directed to Sections 9-1.06, "Partial Payments," and 9-1.07, "Payment After Acceptance," of the Standard Specifications and these special provisions.

For the purpose of making partial payments pursuant to Section 9-1.06, "Partial Payments," of the Standard Specifications, the amount set forth for the contract items of work hereinafter listed shall be deemed to be the maximum value of the contract item of work which will be recognized for progress payment purposes:

A.	Clearing and Grubbing	$100,000.00
B.	Develop Water Supply	$ 20,000.00
C.	Progress Schedule (Critical Path Method)	$ 12,500.00
D.	Lead Compliance Plan	$ 5,000.00
E.	Hazardous Materials Mitigation Plans and Reports	$ 70,000.00

After acceptance of the contract pursuant to the provisions in Section 7-1.17, "Acceptance of Contract," of the Standard Specifications, the amount, if any, payable for a contract item of work in excess of the maximum value for progress payment purposes hereinabove listed for the item, will be included for payment in the first estimate made after acceptance of the contract.

In determining the partial payments to be made to the Contractor, only the following listed materials will be considered for inclusion in the payment as materials furnished but not incorporated in the work:

A. Reinforced Concrete Pipe
B. Fences and Gates
C. Railing
D. Miscellaneous Drainage Facilities
E. Luminaire
F. Lighting Standards
G. Signal Heads and Mounting Brackets

For the contract item of Plant Establishment the Department has determined that the amount of $60,000.00 shall be considered to be the value of the contract item for the purpose of calculating contract retention pursuant to Public Contract Code section 10261.

If the amount bid is less than the value, the partial payments for all work performed prior to start of plant establishment will be reduced by the difference between the amount bid for plant establishment and the value specified. This reduction in payment shall not be considered funds withheld to ensure performance of the contract. Partial payments during the plant establishment period will be increased proportionately by the amount the value exceeds the amount bid for plant establishment.

5-1.18 PROJECT INFORMATION

The information in this section has been compiled specifically for this project and is made available for bidders and Contractors. Other information referenced in the Standard Specifications and these special provisions do not appear in this section. The information is subject to the conditions and limitations set forth in Section 2-1.03, "Examination of Plans, Specifications, Contract, and Site of Work," and Section 6-2, "Local Materials," of the Standard Specifications. Bidders and Contractors shall be responsible for knowing the procedures for obtaining information.

Information attached to the project plans is as follows:

A. Log of Test Borings.

Information included in the Information Handout provided to bidders and Contractors is as follows:

A. Informal Endangered Species Consultation (U.S Fish and Wild life Service)
B. Water Availability Letter
C. Foundation Recommendations
D. Sample of security clearance forms that may be required by the United States General Services Administration

Information available for inspection at the District Office is as follows:

A. Cross sections
B. Subsurface Investigation Report
C. Initial Site Assessment and Limited Subsurface Investigation

Cross sections are available in electronic copy.

The Subsurface Investigation Report and the Initial Site Assessment and Limited Subsurface Investigation are available in electronic copy.

The District Office in which the work is situated is located at 2829 Juan Street, San Diego, California 92110.

5-1.19 SOUND CONTROL REQUIREMENTS

Sound control shall conform to the provisions in Section 7-1.01I, "Sound Control Requirements," of the Standard Specifications and these special provisions.

The noise level from the Contractor's operations, between the hours of 7:00 p.m. and 7:00 a.m., shall not exceed 86 dBa at a distance of 15 m. This requirement shall not relieve the Contractor from responsibility for complying with local ordinances regulating noise level outside the limits of the State right of way.

The noise level requirement specified herein shall apply to the equipment on the job or related to the job, including but not limited to trucks, transit mixers or transient equipment that may or may not be owned by the Contractor. The use of loud sound signals shall be avoided in favor of light warnings except those required by safety laws for the protection of personnel.

Full compensation for conforming to the requirements of this section shall be considered as included in the prices paid for the various contract items of work involved and no additional compensation will be allowed therefor.

5-1.20 RELATIONS WITH U.S. FISH AND WILDLIFE SERVICE

A portion of this project is located within the jurisdiction of the U.S. Fish and Wildlife Service. An Informal Endangered Species Consultation (FWS-SDG-4441.3) regarding impacts to the listed species was issued by the U.S. Fish and Wildlife Service on November 17, 2005. The Contractor shall be fully informed of the requirements of this Informal Endangered Species Consultation as well as rules, regulations, and conditions that may govern the Contractor's operations in these areas and shall conduct the work accordingly.

A copy of the Informal Endangered Species Consultation is included in the Information Handout. Additional copies may be obtained from the District 11 Construction Duty Senior, Telephone No. (619) 688-6635 at the office of the District Director of Transportation at 4050 Taylor Street, San Diego, CA 92110.

Attention is directed to Sections 7-1.01, "Laws to be Observed," 7-1.01G, "Water Pollution," and 7-1.12, "Indemnification and Insurance," of the Standard Specifications.

The provisions of this section shall be made a part of every subcontract executed pursuant to this contract.

5-1.21 ENVIRONMENTALLY SENSITIVE AREA

An environmentally sensitive area (ESA) shall consist of an area within and near the limits of construction where access is prohibited or limited for the preservation of archeological site or existing vegetation, or protection of biological habitat as shown on the plans. The Engineer will determine the exact location of the boundaries of the ESA. No work shall be conducted within the ESA.

Attention is directed to Section 7-1.01 "Laws to be Observed," and Section 7-1.04 "Permits and Licenses," of the Standard Specifications regarding State and Federal regulations, permits, or agreements which pertain to an ESA.

Prior to beginning work, the boundaries of the ESA shall be clearly delineated by the placement of temporary fence (Type ESA).

Vehicle access, storage or transport of materials or equipment, or other project related activities are prohibited within the boundaries of ESA.

The Contractor shall mitigate damage or impacts to the ESA caused by the Contractor's operations, at the Contractor's expense. If the Engineer determines mitigation work will be performed by others, or if mitigation fees are assessed the Department, deductions from moneys due or to become due the Contractor will be made for the mitigation costs.

5-1.22 MIGRATORY BIRDS

Attention is directed to the Federal Migratory Bird Treaty Act (16 USC 703 et seq.) Title 50 Code of Federal Regulations Part 10, and the California Department of Fish and Game Code Sections 3503, 3513, and 3800, that protect migratory birds, their occupied nests, and their eggs from destruction or take.

A Biologist will be provided by the State for this project. The Biologist will verify the presence or absence of migratory birds.

Between January 15 and August 31, the Contractor shall notify the Engineer in writing 15 working days prior to beginning work disturbing the ground or vegetation. The notification shall include the timing and order of work to be performed. The Engineer will approve the beginning of work.

If, in the opinion of the Engineer, the Contractor's operations are delayed or interfered with by reason of the Engineer's delay in approving the disturbance to structures, ground or vegetation, the Contractor will be compensated for resulting losses, and an extension of time will be granted, in the same manner as provided for in Section 8-1.09, "Right of Way Delays," of the Standard Specifications.

Prior to the migratory bird nesting season of January 15 through August 31, clearing and grubbing work shall be completed in conformance with the provisions in "Clearing and Grubbing" of these special provisions.

If evidence of bird nesting is discovered during the nesting season, the Contractor shall not disturb the nesting birds or nests, and shall immediately stop work and notify the Engineer. During the nesting season migratory birds shall be handled as follows:

A. If nesting migratory birds are found within the project limits, the nesting area shall be designated as an environmentally sensitive area and no work shall occur within 20 meters until the nesting season is over.

The boundaries of the environmentally sensitive areas for migratory birds shall be delineated in conformance with "Environmentally Sensitive Area" and "Temporary Fence (Type ESA)" of these special provisions. Once the nesting season

is over, the areas will no longer be considered an environmentally sensitive area and temporary fence (Type ESA) shall be removed.

Temporary fence (Type ESA), when required to delineate the boundaries of the environmentally sensitive areas for migratory birds, will be measured and paid for in conformance with "Temporary Fence (Type ESA)" of these special provisions.

If nesting migratory birds are found within the project limits and, if in the opinion of the Engineer, the Contractor's operations are delayed or interfered with, the State will compensate the Contractor for such delays to the extent provided in Section 8-1.09, "Right of Way Delays," of the Standard Specifications.

Attention is directed to "Time Related Overhead" of these special provisions.

5-1.23 QUINO CHECKERSPOT BUTTERFLY

The Quino Checkerspot Butterfly is an endangered species that is listed with the United States Fish and Wildlife Service. Attention is directed to Section 7 of the Endangered Species Act of 1973 (ACT) as amended (16 U.S.C. 1531 et seq.), and Title 50 Code of Federal Regulations Part 17, final determination of the endangered status of the Quino Checkerspot Butterfly. Federal regulations protect the butterflies and their larvae from destruction or take.

A Biologist will be provided by the State for this project. The Biologist will verify the presence or absence of the Quino Checkerspot Butterfly.

Between January 15 and May 15, the Contractor shall notify the Engineer in writing 15 working days prior to beginning work disturbing the ground or vegetation. The notification shall include the timing and order of work to be performed.

Prior to the Quino Checkerspot Butterfly flight season of January 15 through May 15, clearing and grubbing work shall be completed in conformance with the provisions in "Clearing and Grubbing" of these special provisions.

If grading work is performed during the Quino Checkerspot Butterfly flight season the Biologist shall be present on site during all grading operations.

If Quino Checkerspot Butterflies are discovered during the flight season, the Contractor shall not disturb the butterflies, and shall immediately stop work and notify the Engineer.

If Quino Checkerspot Butterflies are found within the project limits and, if in the opinion of the Engineer, the Contractor's operations are delayed or interfered with, the State will compensate the Contractor for such delays to the extent provided in Section 8-1.09, "Right of Way Delays," of the Standard Specifications.

Attention is directed to "Time Related Overhead" of these special provisions.

5-1.24 PRESERVATION OF PROPERTY

Attention is directed to Section 7-1.11, "Preservation of Property," of the Standard Specifications and these special provisions.

Existing trees, shrubs and other plants, that are not to be removed as shown on the plans or specified in these special provisions, and are injured or damaged by reason of the Contractor's operations, shall be replaced by the Contractor. The minimum size of tree replacement shall be 600 mm box and the minimum size of shrub replacement shall be No. 15 container. Replacement planting shall conform to the requirements in Section 20-4.07, "Replacement," of the Standard Specifications. The Contractor shall water replacement plants in conformance with the provisions in Section 20-4.06, "Watering," of the Standard Specifications.

Damaged or injured plants shall be removed and disposed of outside the highway right of way in conformance with the provisions in Section 7-l.13 of the Standard Specifications.

Replacement planting of injured or damaged trees, shrubs, and other plants shall be completed prior to the start of the plant establishment period. Replacement planting shall conform to the provisions in Section 20-4.05, "Planting," of the Standard Specifications.

5-1.25 RELIEF FROM MAINTENANCE AND RESPONSIBILITY

The Contractor may be relieved of the duty of maintenance and protection for those items not directly connected with plant establishment work in conformance with the provisions in Section 7-1.15, "Relief From Maintenance and Responsibility," of the Standard Specifications. Water pollution control, maintain existing planted areas, maintain existing irrigation facilities, transplant trees, and transplant palm trees shall not be relieved of maintenance.

SECTION 6. (BLANK)

SECTION 7. (BLANK)

SECTION 8. MATERIALS

SECTION 8-1. MISCELLANEOUS

8-1.01 SUBSTITUTION OF NON-METRIC MATERIALS AND PRODUCTS

Only materials and products conforming to the requirements of the specifications shall be incorporated in the work. When metric materials and products are not available, and when approved by the Engineer, and at no cost to the State, materials and products in the United States Standard Measures which are of equal quality and of the required properties and characteristics for the purpose intended, may be substituted for the equivalent metric materials and products, subject to the following provisions:

A. Materials and products shown on the plans or in the special provisions as being equivalent may be substituted for the metric materials and products specified or detailed on the plans.
B. Before other non-metric materials and products will be considered for use, the Contractor shall furnish, at the Contractor's expense, evidence satisfactory to the Engineer that the materials and products proposed for use are equal to or better than the materials and products specified or detailed on the plans. The burden of proof as to the quality and suitability of substitutions shall be upon the Contractor and the Contractor shall furnish necessary information as required by the Engineer. The Engineer will be the sole judge as to the quality and suitability of the substituted materials and products and the Engineer's decision will be final.
C. When the Contractor elects to substitute non-metric materials and products, including materials and products shown on the plans or in the special provisions as being equivalent, the list of sources of material specified in Section 6-1.01, "Source of Supply and Quality of Materials," of the Standard Specification shall include a list of substitutions to be made and contract items involved. In addition, for a change in design or details, the Contractor shall submit plans and working drawings in conformance with the provisions in Section 5-1.02, "Plans and Working Drawings," of the Standard Specifications. The plans and working drawings shall be submitted at least 7 days before the Contractor intends to begin the work involved.

Unless otherwise specified, the following substitutions of materials and products will be allowed:

SUBSTITUTION TABLE FOR PLAIN WIRE REINFORCEMENT
ASTM Designation: A 82

METRIC SIZE SHOWN ON THE PLANS mm^2	SIZE TO BE SUBSTITUTED $inch^2$ x 100
MW9	W1.4
MW10	W1.6
MW13	W2.0
MW15	W2.3
MW19	W2.9
MW20	W3.1
MW22	W3.5
MW25	W3.9, except W3.5 in piles only
MW26	W4.0
MW30	W4.7
MW32	W5.0
MW35	W5.4
MW40	W6.2
MW45	W6.5
MW50	W7.8
MW55	W8.5, except W8.0 in piles only
MW60	W9.3
MW70	W10.9, except W11.0 in piles only
MW80	W12.4
MW90	W14.0
MW100	W15.5

SUBSTITUTION TABLE FOR BAR REINFORCEMENT

METRIC BAR DESIGNATION NUMBER[1] SHOWN ON THE PLANS	BAR DESIGNATION NUMBER[2] TO BE SUBSTITUTED
10	3
13	4
16	5
19	6
22	7
25	8
29	9
32	10
36	11
43	14
57	18

[1]Bar designation numbers approximate the number of millimeters of the nominal diameter of the bars.

[2]Bar numbers are based on the number of eighths of an inch included in the nominal diameter of the bars.

No adjustment will be required in spacing or total number of reinforcing bars due to a difference in minimum yield strength between metric and non-metric bars.

SUBSTITUTION TABLE FOR SIZES OF:

(1) STEEL FASTENERS FOR GENERAL APPLICATIONS (ASTM Designation: A 307 or AASHTO Designation: M 314, Grade 36 or 55), and

(2) HIGH STRENGTH STEEL FASTENERS (ASTM Designation: A 325 or A 449)

METRIC SIZE SHOWN ON THE PLANS mm	SIZE TO BE SUBSTITUTED inch
6 or 6.35	1/4
8 or 7.94	5/16
10 or 9.52	3/8
11 or 11.11	7/16
13, 12.70, or M12	1/2
14 or 14.29	9/16
16, 15.88, or M16	5/8
19, 19.05, or M20	3/4
22, 22.22, or M22	7/8
24, 25, 25.40, or M24	1
29, 28.58, or M27	1-1/8
32, 31.75, or M30	1-1/4
35 or 34.93	1-3/8
38, 38.10, or M36	1-1/2
44 or 44.45	1-3/4
51 or 50.80	2
57 or 57.15	2-1/4
64 or 63.50	2-1/2
70 or 69.85	2-3/4
76 or 76.20	3
83 or 82.55	3-1/4
89 or 88.90	3-1/2
95 or 95.25	3-3/4
102 or 101.60	4

SUBSTITUTION TABLE FOR NOMINAL THICKNESS OF SHEET METAL

UNCOATED HOT AND COLD ROLLED SHEETS		HOT-DIPPED ZINC COATED SHEETS (GALVANIZED)	
METRIC THICKNESS SHOWN ON THE PLANS mm	GAGE TO BE SUBSTITUTED inch	METRIC THICKNESS SHOWN ON THE PLANS mm	GAGE TO BE SUBSTITUTED inch
7.94	0.3125	4.270	0.1681
6.07	0.2391	3.891	0.1532
5.69	0.2242	3.510	0.1382
5.31	0.2092	3.132	0.1233
4.94	0.1943	2.753	0.1084
4.55	0.1793	2.372	0.0934
4.18	0.1644	1.994	0.0785
3.80	0.1495	1.803	0.0710
3.42	0.1345	1.613	0.0635
3.04	0.1196	1.461	0.0575
2.66	0.1046	1.311	0.0516
2.28	0.0897	1.158	0.0456
1.90	0.0747	1.006 or 1.016	0.0396
1.71	0.0673	0.930	0.0366
1.52	0.0598	0.853	0.0336
1.37	0.0538	0.777	0.0306
1.21	0.0478	0.701	0.0276
1.06	0.0418	0.627	0.0247
0.91	0.0359	0.551	0.0217
0.84	0.0329	0.513	0.0202
0.76	0.0299	0.475	0.0187
0.68	0.0269	--------	--------
0.61	0.0239	--------	--------
0.53	0.0209	--------	--------
0.45	0.0179	--------	--------
0.42	0.0164	--------	--------
0.38	0.0149	--------	--------

SUBSTITUTION TABLE FOR WIRE

METRIC THICKNESS SHOWN ON THE PLANS mm	WIRE THICKNESS TO BE SUBSTITUTED inch	GAGE NO.
6.20	0.244	3
5.72	0.225	4
5.26	0.207	5
4.88	0.192	6
4.50	0.177	7
4.11	0.162	8
3.76	0.148	9
3.43	0.135	10
3.05	0.120	11
2.69	0.106	12
2.34	0.092	13
2.03	0.080	14
1.83	0.072	15
1.57	0.062	16
1.37	0.054	17
1.22	0.048	18
1.04	0.041	19
0.89	0.035	20

SUBSTITUTION TABLE FOR PIPE PILES

METRIC SIZE SHOWN ON THE PLANS mm x mm	SIZE TO BE SUBSTITUTED inch x inch
PP 360 x 4.55	NPS 14 x 0.179
PP 360 x 6.35	NPS 14 x 0.250
PP 360 x 9.53	NPS 14 x 0.375
PP 360 x 11.12	NPS 14 x 0.438
PP 406 x 12.70	NPS 16 x 0.500
PP 460 x T	NPS 18 x T"
PP 508 x T	NPS 20 x T"
PP 559 x T	NPS 22 x T"
PP 610 x T	NPS 24 x T"
PP 660 x T	NPS 26 x T"
PP 711 x T	NPS 28 x T"
PP 762 x T	NPS 30 x T"
PP 813 x T	NPS 32 x T"
PP 864 x T	NPS 34 x T"
PP 914 x T	NPS 36 x T"
PP 965 x T	NPS 38 x T"
PP 1016 x T	NPS 40 x T"
PP 1067 x T	NPS 42 x T"
PP 1118 x T	NPS 44 x T"
PP 1219 x T	NPS 48 x T"
PP 1524 x T	NPS 60 x T"

The thickness in millimeters (T) represents an exact conversion of the thickness in inches (T").

SUBSTITUTION TABLE FOR CIDH CONCRETE PILING

METRIC SIZE SHOWN ON THE PLANS	ACTUAL AUGER SIZE TO BE SUBSTITUTED inches
350 mm	14
400 mm	16
450 mm	18
600 mm	24
750 mm	30
900 mm	36
1.0 m	42
1.2 m	48
1.5 m	60
1.8 m	72
2.1 m	84
2.4 m	96
2.7 m	108
3.0 m	120
3.3 m	132
3.6 m	144
4.0 m	156

SUBSTITUTION TABLE FOR STRUCTURAL TIMBER AND LUMBER

METRIC MINIMUM DRESSED DRY, SHOWN ON THE PLANS mm x mm	METRIC MINIMUM DRESSED GREEN, SHOWN ON THE PLANS mm x mm	NOMINAL SIZE TO BE SUBSTITUTED inch x inch
19x89	20x90	1x4
38x89	40x90	2x4
64x89	65x90	3x4
89x89	90x90	4x4
140x140	143x143	6x6
140x184	143x190	6x8
184x184	190x190	8x8
235x235	241x241	10x10
286x286	292x292	12x12

SUBSTITUTION TABLE FOR NAILS AND SPIKES

METRIC COMMON NAIL, SHOWN ON THE PLANS Length, mm Diameter, mm	METRIC BOX NAIL, SHOWN ON THE PLANS Length, mm Diameter, mm	METRIC SPIKE, SHOWN ON THE PLANS Length, mm Diameter, mm	SIZE TO BE SUBSTITUTED Penny-weight
50.80 2.87	50.80 2.51	_____	6d
63.50 3.33	63.50 2.87	_____	8d
76.20 3.76	76.20 3.25	76.20 4.88	10d
82.55 3.76	82.55 3.25	82.55 4.88	12d
88.90 4.11	88.90 3.43	88.90 5.26	16d
101.60 4.88	101.60 3.76	101.60 5.72	20d
114.30 5.26	114.30 3.76	114.30 6.20	30d
127.00 5.72	127.00 4.11	127.00 6.68	40d
_____	_____	139.70 7.19	50d
_____	_____	152.40 7.19	60d

SUBSTITUTION TABLE FOR IRRIGATION COMPONENTS

METRIC WATER METERS, TRUCK LOADING STANDPIPES, VALVES, BACKFLOW PREVENTERS, FLOW SENSORS, WYE STRAINERS, FILTER ASSEMBLY UNITS, PIPE SUPPLY LINES, AND PIPE IRRIGATION SUPPLY LINES SHOWN ON THE PLANS DIAMETER NOMINAL (DN) mm	NOMINAL SIZE TO BE SUBSTITUTED inch
15	1/2
20	3/4
25	1
32	1-1/4
40	1-1/2
50	2
65	2-1/2
75	3
100	4
150	6
200	8
250	10
300	12
350	14
400	16

Unless otherwise specified, substitutions of United States Standard Measures standard structural shapes corresponding to the metric designations shown on the plans and in conformance with the requirements in ASTM Designation: A 6/A 6M, Annex 2, will be allowed.

8-1.02 PREQUALIFIED AND TESTED SIGNING AND DELINEATION MATERIALS

The Department maintains the following list of Prequalified and Tested Signing and Delineation Materials. The Engineer shall not be precluded from sampling and testing products on the list of Prequalified and Tested Signing and Delineation Materials.

The manufacturer of products on the list of Prequalified and Tested Signing and Delineation Materials shall furnish the Engineer a Certificate of Compliance in conformance with the provisions in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications for each type of traffic product supplied.

For those categories of materials included on the list of Prequalified and Tested Signing and Delineation Materials, only those products shown within the listing may be used in the work. Other categories of products, not included on the list of Prequalified and Tested Signing and Delineation Materials, may be used in the work provided they conform to the requirements of the Standard Specifications.

Materials and products may be added to the list of Prequalified and Tested Signing and Delineation Materials if the manufacturer submits a New Product Information Form to the New Product Coordinator at the Transportation Laboratory. Upon a Departmental request for samples, sufficient samples shall be submitted to permit performance of required tests. Approval of materials or products will depend upon compliance with the specifications and tests the Department may elect to perform.

PAVEMENT MARKERS, PERMANENT TYPE

Retroreflective With Abrasion Resistant Surface (ARS)

A. Apex, Model 921AR (100 mm x 100 mm)
B. Avery Dennison, Models C88 (100 mm x 100 mm), 911 (100 mm x 100 mm) and 953 (70 mm x 114 mm)
C. Ray-O-Lite, Model "AA" ARS (100 mm x 100 mm)
D. 3M Series 290 (89 mm x 100 mm)
E. 3M Series 290 PSA, with pressure sensitive adhesive pad (89 mm x 100 mm)

Retroreflective With Abrasion Resistant Surface (ARS)

(for recessed applications only)

A. Avery Dennison, Model 948 (58 mm x 119 mm)
B. Avery Dennison, Model 944SB (51 mm x 100 mm)*
C. Ray-O-Lite, Model 2002 (58 mm x 117 mm)
D. Ray-O-Lite, Model 2004 ARS (51 mm x 100 mm)*

*For use only in 114 mm wide (older) recessed slots

Non-Reflective, 100 mm Round

A. Apex Universal (Ceramic)
B. Apex Universal, Models 929 (ABS) and 929PP (Polypropylene)
C. Glowlite, Inc. (Ceramic)
D. Hi-Way Safety, Inc., Models P20-2000W and 2001Y (ABS)
E. Interstate Sales, "Diamond Back" (Polypropylene)
F. Novabrite Models Cdot (White) Cdot-y (Yellow), Ceramic
G. Novabrite Models Pdot-w (White) Pdot-y (Yellow), Polypropylene
H. Three D Traffic Works TD10000 (ABS), TD10500 (Polypropylene)

PAVEMENT MARKERS, TEMPORARY TYPE

Temporary Markers For Long Term Day/Night Use (6 months or less)

A. Vega Molded Products "Temporary Road Marker" (75 mm x 100 mm)

Temporary Markers For Short Term Day/Night Use (14 days or less)

(For seal coat or chip seal applications, clear protective covers are required)

A. Apex Universal, Model 932
B. Bunzl Extrusion, Models T.O.M., T.R.P.M., and "HH" (High Heat)
C. Hi-Way Safety, Inc., Model 1280/1281
D. Glowlite, Inc., Model 932

STRIPING AND PAVEMENT MARKING MATERIAL

Permanent Traffic Striping and Pavement Marking Tape

A. Advanced Traffic Marking, Series 300 and 400
B. Brite-Line, Series 1000
C. Brite-Line, "DeltaLine XRP"
D. Swarco Industries, "Director 35" (For transverse application only)
E. Swarco Industries, "Director 60"
F. 3M, "Stamark" Series 380 and 5730
G. 3M, "Stamark" Series 420 (For transverse application only)

Temporary (Removable) Striping and Pavement Marking Tape (6 months or less)

A. Advanced Traffic Marking, Series 200
B. Brite-Line, Series 100
C. Garlock Rubber Technologies, Series 2000
D. P.B. Laminations, Aztec, Grade 102
E. Swarco Industries, "Director-2"
F. Trelleborg Industries, R140 Series
G. 3M, Series 620 "CR", and Series A750
H. 3M, Series A145, Removable Black Line Mask

(Black Tape: for use only on Asphalt Concrete Surfaces)

I. Advanced Traffic Marking Black "Hide-A-Line"
(Black Tape: for use only on Asphalt Concrete Surfaces)

J. Brite-Line "BTR" Black Removable Tape
(Black Tape: for use only on Asphalt Concrete Surfaces)

K. Trelleborg Industries, RB-140
(Black Tape: for use only on Asphalt Concrete Surfaces)

Preformed Thermoplastic (Heated in place)

A. Avery Dennison, "Hotape"
B. Flint Trading, "Premark," "Premark 20/20 Flex," and "Premark 20/20 Flex Plus"
C. Ennis Paint Inc., "Flametape"

Ceramic Surfacing Laminate, 150 mm x 150 mm

A. Highway Ceramics, Inc.

CLASS 1 DELINEATORS

One Piece Driveable Flexible Type, 1700 mm

A. Bunzl Extrusion, "Flexi-Guide Models 400 and 566"
B. Carsonite, Curve-Flex CFRM-400
C. Carsonite, Roadmarker CRM-375
D. FlexStake, Model 654 TM
E. GreenLine Models HWD1-66 and CGD1-66

Special Use Type, 1700 mm

A. Bunzl Extrusion, Model FG 560 (with 450 mm U-Channel base)
B. Carsonite, "Survivor" (with 450 mm U-Channel base)
C. Carsonite, Roadmarker CRM-375 (with 450 mm U-Channel base)
D. FlexStake, Model 604
E. GreenLine Models HWDU and CGD (with 450 mm U-Channel base)
F. Impact Recovery Model D36, with #105 Driveable Base
G. Safe-Hit with 200 mm pavement anchor (SH248-GP1)
H. Safe-Hit with 380 mm soil anchor (SH248-GP2) and with 450 mm soil anchor (SH248-GP3)

Surface Mount Type, 1200 mm

A. Bent Manufacturing Company, Masterflex Model MF-180EX-48
B. Carsonite, "Super Duck II"
C. FlexStake, Surface Mount, Models 704 and 754 TM
D. Impact Recovery Model D48, with #101 Fixed (Surface-Mount) Base
E. Three D Traffic Works "Channelflex" ID No. 522248W

CHANNELIZERS

Surface Mount Type, 900 mm

A. Bent Manufacturing Company, Masterflex Models MF-360-36 (Round) and MF-180-36 (Flat)
B. Bunzl Extrusion, Flexi-Guide Models FG300PE and FG300UR
C. Carsonite, "Super Duck" (Flat SDF-436, Round SDR-336)
D. Carsonite, "Super Duck II" Model SDCF203601MB "The Channelizer"
E. FlexStake, Surface Mount, Models 703 and 753 TM
F. GreenLine, Model SMD-36
G. Hi-Way Safety, Inc. "Channel Guide Channelizer" Model CGC36
H. Impact Recovery Model D36, with #101 Fixed (Surface-Mount) Base
I. Repo, Models 300 and 400
J. Safe-Hit, Guide Post, Model SH236SMA
K. Three D Traffic Works "Channelflex" ID No. 522053W

Lane Separation System

A. Bunzl "Flexi-Guide (FG) 300 Curb System"

B. Qwick Kurb, "Klemmfix Guide System"
C. Recycled Technology, Inc. "Safe-Lane System"

CONICAL DELINEATORS, 1070 mm
(For 700 mm Traffic Cones, see Standard Specifications)
A. Bent Manufacturing Company "T-Top"
B. Plastic Safety Systems "Navigator-42"
C. Radiator Specialty Company "Enforcer"
D. Roadmaker Company "Stacker"
E. TrafFix Devices "Grabber"
F. Three D Traffic Works "Ringtop" TD7000, ID No. 742143

OBJECT MARKERS
Type "K", 450 mm
A. Bunzl, Model FG318PE
B. Carsonite, Model SMD 615
C. FlexStake, Model 701 KM
D. Repo, Models 300 and 400
E. Safe-Hit, Model SH718SMA

Type "K-4" / "Q" Object Markers, 600 mm
A. Bent Manufacturing "Masterflex" Model MF-360-24
B. Bunzl Extrusion, Model FG324PE
C. Carsonite, Super Duck II
D. FlexStake, Model 701KM
E. Repo, Models 300 and 400
F. Safe-Hit, Models SH8 24SMA_WA and SH8 24GP3_WA
G. The Line Connection, Model DP21-4Q
H. Three D Traffic Works "Q" Marker, ID No. 531702W

CONCRETE BARRIER MARKERS AND
TEMPORARY RAILING (TYPE K) REFLECTORS
Impactable Type
A. ARTUK, "FB"
B. Bunzl Extrusion, Models PCBM-12 and PCBM-T12
C. Duraflex Corp., "Flexx 2020" and "Electriflexx"
D. Hi-Way Safety, Inc., Model GMKRM100
E. Plastic Safety Systems "BAM" Models OM-BARR and OM-BWAR
F. Three D Traffic Works "Roadguide" Model TD 9304

Non-Impactable Type
A. ARTUK, JD Series
B. Plastic Safety Systems "BAM" Models OM-BITARW and OM-BITARA
C. Vega Molded Products, Models GBM and JD
D. Plastic Vacuum Forming, “Cap-It C400"

METAL BEAM GUARD RAIL POST MARKERS
(For use to the left of traffic)
A. Bunzl Extrusion, "Mini" (75 mm x 254 mm)
B. Creative Building Products, "Dura-Bull, Model 11201"
C. Duraflex Corp., "Railrider"
D. Plastic Vacuum Forming, “Cap-It C300"

CONCRETE BARRIER DELINEATORS, 400 mm
(For use to the right of traffic)
A. Bunzl Extrusion, Model PCBM T-16
B. Safe-Hit, Model SH216RBM

CONCRETE BARRIER-MOUNTED MINI-DRUM (260 mm x 360 mm x 570 mm)

A. Stinson Equipment Company "SaddleMarker"

SOUND WALL DELINEATOR

(Applied vertically. Place top of 75 mm x 300 mm reflective element at 1200 mm above roadway)

A. Bunzl Extrusion, PCBM S-36

GUARD RAILING DELINEATOR

(Place top of reflective element at 1200 mm above plane of roadway)

Wood Post Type, 686 mm

A. Bunzl Extrusion, FG 427 and FG 527
B. Carsonite, Model 427
C. FlexStake, Model 102 GR
D. GreenLine GRD 27
E. Safe-Hit, Model SH227GRD
F. Three D Traffic Works "Guardflex" TD9100

Steel Post Type

A. Carsonite, Model CFGR-327 with CFGRBK300 Mounting Bracket

RETROREFLECTIVE SHEETING

Channelizers, Barrier Markers, and Delineators

A. Avery Dennison T-6500 Series (For rigid substrate devices only)
B. Avery Dennison WR-6100 Series
C. Nippon Carbide Industries, Flexible Ultralite Grade (ULG) II
D. Reflexite, PC-1000 Metalized Polycarbonate
E. Reflexite, AC-1000 Acrylic
F. Reflexite, AP-1000 Metalized Polyester
G. Reflexite, Conformalight, AR-1000 Abrasion Resistant Coating
H. 3M, High Intensity

Traffic Cones, 330 mm Sleeves

A. Reflexite SB (Polyester), Vinyl or "TR" (Semi-transparent)

Traffic Cones, 100 mm and 150 mm Sleeves

A. Nippon Carbide Industries, Flexible Ultralite Grade (ULG) II
B. Reflexite, Vinyl, "TR" (Semi-transparent) or "Conformalight"
C. 3M Series 3840
D. Avery Dennison S-9000C

Barrels and Drums

A. Avery Dennison WR-6100
B. Nippon Carbide Industries, Flexible Ultralite Grade (ULG) II
C. Reflexite, "Conformalight", "Super High Intensity" or "High Impact Drum Sheeting"
D. 3M Series 3810

Barricades: Type I, Medium-Intensity (Typically Enclosed Lens, Glass-Bead Element)

A. American Decal, Adcolite
B. Avery Dennison, T-1500 and T-1600 series
C. 3M Engineer Grade, Series 3170

Barricades: Type II, Medium-High-Intensity (Typically Enclosed Lens, Glass-Bead Element)

A. Avery Dennison, T-2500 Series
B. Kiwalite Type II
C. Nikkalite 1800 Series

Signs: Type II, Medium-High-Intensity (Typically Enclosed Lens, Glass-Bead Element)

A. Avery Dennison, T-2500 Series
B. Kiwalite, Type II
C. Nikkalite 1800 Series

Signs: Type III, High-Intensity (Typically Encapsulated Glass-Bead Element)

A. Avery Dennison, T-5500 and T-5500A Series
B. Nippon Carbide Industries, Nikkalite Brand Ultralite Grade II
C. 3M Series 3870

Signs: Type IV, High-Intensity (Typically Unmetallized Microprismatic Element)

A. Avery Dennison, T-6500 Series
B. Nippon Carbide Industries, Crystal Grade, 94000 Series
C. Nippon Carbide Industries, Model No. 94847 Fluorescent Orange
D. Nippon Carbide Industries, Model No. 94844 Fluorescent Yellow Green

Signs: Type VI, Elastomeric (Roll-Up) High-Intensity, without Adhesive

A. Avery Dennison, WU-6014
B. Novabrite LLC, "Econobrite"
C. Reflexite "Vinyl"
D. Reflexite "SuperBright"
E. Reflexite "Marathon"
F. 3M Series RS34 Orange and RS20 Fluorescent Orange

Signs: Type VII, Super-High-Intensity (Typically Unmetallized Microprismatic Element)

A. 3M LDP Series 3924 Fluorescent Orange
B. 3M LDP Series 3970

Signs: Type VIII, Super-High-Intensity (Typically Unmetallized Microprismatic Element)

A. Avery Dennison, T-7500 Series
B. Avery Dennison, T-7511 Fluorescent Yellow
C. Avery Dennison, T-7513 Fluorescent Yellow Green
D. Avery Dennison, W-7514 Fluorescent Orange
E. Nippon Carbide Industries, Nikkalite Crystal Grade Series 92800
F. Nippon Carbide Industries, Nikkalite Crystal Grade Model 92844 Fluorescent Yellow/Green
G. Nippon Carbide Industries, Nikkalite Crystal Grade Model 92847 Fluorescent Orange

Signs: Type IX, Very-High-Intensity (Typically Unmetallized Microprismatic Element)

A. 3M VIP Series 3981 Diamond Grade Fluorescent Yellow
B. 3M VIP Series 3983 Diamond Grade Fluorescent Yellow/Green
C. 3M VIP Series 3990 Diamond Grade

SPECIALTY SIGNS

A. Hallmark Technologies, Inc., All Sign STOP Sign (All Plastic), 750 mm
B. Reflexite "Endurance" Work Zone Sign (with Semi-Rigid Plastic Substrate)

SIGN SUBSTRATE

Fiberglass Reinforced Plastic (FRP)

A. Fiber-Brite
B. Sequentia, "Polyplate"
C. Inteplast Group "InteCel" (13 mm for Post-Mounted CZ Signs, 1200 mm or less)

Aluminum Composite

A. Alcan Composites "Dibond Material, 2 mm" (for temporary construction signs only)
B. Mitsubishi Chemical America, Alpolic 350 (for temporary construction signs only)

8-1.03 STATE-FURNISHED MATERIALS

Attention is directed to Section 6-1.02, "State-Furnished Materials," of the Standard Specifications and these special provisions.

Padlocks for backflow preventer assembly enclosures and gates will be furnished to the Contractor.

8-1.04 SLAG AGGREGATE

Air-cooled iron blast furnace slag shall not be used to produce aggregate for:

A. Structure backfill material.
B. Pervious backfill material.
C. Permeable material.
D. Reinforced or prestressed portland cement concrete component or structure.
E. Nonreinforced portland cement concrete component or structure for which a Class 1 Surface Finish is required by the provisions in Section 51-1.18B, "Class 1 Surface Finish," of the Standard Specifications.

Aggregate produced from slag resulting from a steel-making process shall not be used for a highway construction project except for the following items:

A. Imported Borrow.
B. Aggregate Subbase.
C. Class 2 Aggregate Base.
D. Asphalt Concrete.

Steel slag to be used to produce aggregate for aggregate subbase and Class 2 aggregate base shall be crushed so that 100 percent of the material will pass a 19-mm sieve and then shall be control aged for a period of at least 3 months under conditions that will maintain all portions of the stockpiled material at a moisture content in excess of 6 percent of the dry mass of the aggregate.

A supplier of steel slag aggregate shall provide separate stockpiles for controlled aging of the slag. An individual stockpile shall contain not less than 9075 tonnes nor more than 45 350 tonnes of slag. The material in each individual stockpile shall be assigned a unique lot number and each stockpile shall be identified with a permanent system of signs. The supplier shall maintain a permanent record of the dates on which stockpiles are completed and controlled aging begun, of the dates when controlled aging was completed, and of the dates tests were made and the results of these tests. Moisture tests shall be made at least once each week. No credit for aging will be given for the time period covered by tests which show a moisture content of 6 percent or less. The stockpiles and records shall be available to the Engineer during normal working hours for inspection, check testing and review.

The supplier shall notify the Transportation Laboratory, 5900 Folsom Boulevard, Sacramento, California 95819, when each stockpile is completed and controlled aging begun. No more aggregate shall be added to the stockpile unless a new aging period is initiated. A further notification shall be sent when controlled aging is completed.

The supplier shall provide a Certificate of Compliance in conformance with the provisions in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications. Each stockpile or portion of a stockpile that is used in the work will be considered a lot. The Certificates of Compliance shall state that the steel slag aggregate has been aged in a stockpile for at least 3 months at a moisture content in excess of 6 percent of the dry mass of the aggregate.

Steel slag used for imported borrow shall be weathered for at least 3 months. Prior to the use of steel slag as imported borrow, the supplier shall furnish a Certificate of Compliance in conformance with the provisions in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications. The Certificate of Compliance shall state that the steel slag has been weathered for at least 3 months.

Each delivery of aggregate containing steel slag for use as aggregate subbase or Class 2 aggregate base shall be accompanied by a delivery tag for each load which will identify the lot of material by stockpile number, where the slag was aged, and the date that the stockpile was completed and controlled aging begun.

Air-cooled iron blast furnace slag or natural aggregate may be blended in proper combinations with steel slag aggregate to produce the specified gradings, for those items for which steel slag aggregate is permitted, unless otherwise provided.

Aggregate containing slag shall meet the applicable quality requirements for the items in which the aggregate is used.

The combined slag aggregate shall conform to the specified grading for the item in which it is used. The grading will be determined by California Test 202, modified by California Test 105 when there is a difference in specific gravity of 0.2 or more between the coarse and fine portion of the aggregate or between blends of different aggregates.

No aggregate produced from slag shall be placed within 0.3-m, measured in any direction, of a non-cathodically protected pipe or structure unless the aggregate is incorporated in portland cement concrete pavement, in asphalt concrete, or in treated base.

When slag is used as aggregate in asphalt concrete, the K_c factor requirements, as determined by California Test 303, will not apply.

Slag aggregate used for embankment construction shall not be placed within 0.46-m of finished slope lines, measured normal to the plane of the slope.

If steel slag aggregates are used to make asphalt concrete, there shall be no other aggregates used in the mixture, except that up to 50 percent of the material passing the 4.75-mm sieve may consist of iron blast furnace slag aggregates or natural aggregates, or a combination thereof. If iron blast furnace aggregates or natural aggregates or a combination thereof are used in the mix, each type of aggregate shall be fed to the drier at a uniform rate. The rate of feed of each type of aggregate shall be maintained within 10 percent of the amount set. Adequate means shall be provided for controlling and checking the accuracy of the feeder.

In addition to the requirements of Section 39-3.01, "Storage," of the Standard Specifications, steel slag aggregate shall be stored separately from iron blast furnace slag aggregate and each type of slag aggregate shall also be stored separately from natural aggregate.

Asphalt concrete produced from more than one of the following shall not be placed in the same layer: steel slag aggregates, iron blast furnace slag aggregates, natural aggregates or any combination thereof. Once a type of aggregate or aggregates is selected, it shall not be changed without prior approval by the Engineer.

If steel slag aggregates are used to produce asphalt concrete, and if the specific gravity of a compacted stabilometer test specimen is in excess of 2.40, the quantity of asphalt concrete to be paid for will be reduced. The stabilometer test specimen will be fabricated in conformance with the procedures in California Test 304 and the specific gravity of the specimen will be determined in conformance with Method C of California Test 308. The pay quantity of asphalt concrete will be determined by multiplying the quantity of asphalt concrete placed in the work by 2.40 and dividing the result by the specific gravity of the compacted stabilometer test specimen. Such reduction in quantity will be determined and applied as often as is necessary to ensure accurate results as determined by the Engineer.

8-1.05 ENGINEERING FABRICS

Engineering fabrics shall conform to the provisions in Section 88, "Engineering Fabrics," of the Standard Specifications.

SECTION 8-2. CONCRETE

8-2.01 PORTLAND CEMENT CONCRETE

Portland cement concrete shall conform to the provisions in Section 90, "Portland Cement Concrete," of the Standard Specifications and these special provisions.

References to Section 90-2.01, "Portland Cement," of the Standard Specifications shall mean Section 90-2.01, "Cement," of the Standard Specifications.

Mineral admixture shall be combined with cement in conformance with the provisions in Section 90-4.08, "Required Use of Mineral Admixtures," of the Standard Specifications for the concrete materials specified in Section 56-2, "Roadside Signs," of the Standard Specifications.

The requirements of Section 90-4.08, "Required Use of Mineral Admixture," of the Standard Specifications shall not apply to Section 19-3.025C, "Soil Cement Bedding," of the Standard Specifications.

The Department maintains a list of sources of fine and coarse aggregate that have been approved for use with a reduced amount of mineral admixture in the total amount of cementitious material to be used. A source of aggregate will be considered for addition to the approved list if the producer of the aggregate submits to the Transportation Laboratory certified test results from a qualified testing laboratory that verify the aggregate complies with the requirements. Prior to starting the testing, the aggregate test shall be registered with the Department. A registration number can be obtained by calling (916) 227-7228. The registration number shall be used as the identification for the aggregate sample in correspondence with the Department. Upon request, a split of the tested sample shall be provided to the Department. Approval of aggregate will depend upon compliance with the specifications, based on the certified test results submitted, together with any replicate testing the Department may elect to perform. Approval will expire 3 years from the date the most recent registered and evaluated sample was collected from the aggregate source.

Qualified testing laboratories shall conform to the following requirements:

A. Laboratories performing ASTM Designation: C 1293 shall participate in the Cement and Concrete Reference Laboratory (CCRL) Concrete Proficiency Sample Program and shall have received a score of 3 or better on all tests of the previous 2 sets of concrete samples.

B. Laboratories performing ASTM Designation: C 1260 shall participate in the Cement and Concrete Reference Laboratory (CCRL) Pozzolan Proficiency Sample Program and shall have received a score of 3 or better on the shrinkage and soundness tests of the previous 2 sets of pozzolan samples.

Aggregates on the list shall conform to one of the following requirements:

A. When the aggregate is tested in conformance with the requirements in California Test 554 and ASTM Designation: C 1293, the average expansion at one year shall be less than or equal to 0.040 percent; or
B. When the aggregate is tested in conformance with the requirements in California Test 554 and ASTM Designation: C 1260, the average of the expansion at 16 days shall be less than or equal to 0.15 percent.

The amounts of cement and mineral admixture used in cementitious material shall be sufficient to satisfy the minimum cementitious material content requirements specified in Section 90-1.01, "Description," or Section 90-4.05, "Optional Use of Chemical Admixtures," of the Standard Specifications and shall conform to the following:

A. The minimum amount of cement shall not be less than 75 percent by mass of the specified minimum cementitious material content.
B. The minimum amount of mineral admixture to be combined with cement shall be determined using one of the following criteria:

    1. When the calcium oxide content of a mineral admixture is equal to or less than 2 percent by mass, the amount of mineral admixture shall not be less than 15 percent by mass of the total amount of cementitious material to be used in the mix.
    2. When the calcium oxide content of a mineral admixture is greater than 2 percent by mass, and any of the aggregates used are not listed on the approved list as specified in these special provisions, then the amount of mineral admixture shall not be less than 25 percent by mass of the total amount of cementitious material to be used in the mix.
    3. When the calcium oxide content of a mineral admixture is greater than 2 percent by mass and the fine and coarse aggregates are listed on the approved list as specified in these special provisions, then the amount of mineral admixture shall not be less than 15 percent by mass of the total amount of cementitious material to be used in the mix.
    4. When a mineral admixture that conforms to the provisions for silica fume in Section 90-2.04, "Admixture Materials," of the Standard Specifications is used, the amount of mineral admixture shall not be less than 10 percent by mass of the total amount of cementitious material to be used in the mix.
    5. When a mineral admixture that conforms to the provisions for silica fume in Section 90-2.04, "Admixture Materials," of the Standard Specifications is used and the fine and coarse aggregates are listed on the approved list as specified in these special provisions, then the amount of mineral admixture shall not be less than 7 percent by mass of the total amount of cementitious material to be used in the mix.

C. The total amount of mineral admixture shall not exceed 35 percent by mass of the total amount of cementitious material to be used in the mix. Where Section 90-1.01, "Description," of the Standard Specifications specifies a maximum cementitious content in kilograms per cubic meter, the total mass of cement and mineral admixture per cubic meter shall not exceed the specified maximum cementitious material content.

8-2.02 CEMENT AND AIR CONTENT

Except for concrete listed below, all concrete which is designated as Class 2 and all concrete for use in structures shall contain not less than 375 kg of cementitious material per cubic meter and shall be air-entrained as provided in Section 90-4, "Admixtures," of the Standard Specifications. The air content at time of mixing and prior to placing shall be 3 percent ± one percent.

A. Paving concrete.
B. Concrete designated by 28-day compressive strength.
C. Concrete designated as Class 1 or by a cementitious material content which exceeds 375 kg/m^3.
D. Seal course concrete.
E. Concrete for deck slabs of bridges and structure approach slabs.
F. Concrete for piling.

SECTION 8-3. WELDING

8-3.01 WELDING

GENERAL

Flux core welding electrodes conforming to the requirements of AWS A5.20 E6XT-4 or E7XT-4 shall not be used to perform welding for this project.

Wherever reference is made to the following AWS welding codes in the Standard Specifications, on the plans, or in these special provisions, the year of adoption for these codes shall be as listed:

AWS Code	Year of Adoption
D1.1	2002
D1.4	1998
D1.5	2002
D1.6	1999

Requirements of the AWS welding codes shall apply unless specified otherwise in the Standard Specifications, on the plans, or in these special provisions. Wherever the abbreviation AWS is used, it shall be equivalent to the abbreviations ANSI/AWS or AASHTO/AWS.

Section 6.1.1.1 of AWS D1.5 is replaced with the following:

Quality Control (QC) shall be the responsibility of the Contractor. As a minimum, the Contractor shall perform inspection and testing of each weld joint prior to welding, during welding, and after welding as specified in this section and as necessary to ensure that materials and workmanship conform to the requirements of the contract documents.

Sections 6.1.3 through 6.1.4.3 of AWS D1.1, Section 7.1.2 of AWS D1.4, and Sections 6.1.1.2 through 6.1.3.3 of AWS D1.5 are replaced with the following:

The QC Inspector shall be the duly designated person who acts for and on behalf of the Contractor for inspection, testing, and quality related matters for all welding.

Quality Assurance (QA) is the prerogative of the Engineer. The QA Inspector is the duly designated person who acts for and on behalf of the Engineer.

The QC Inspector shall be responsible for quality control acceptance or rejection of materials and workmanship, and shall be currently certified as an AWS Certified Welding Inspector (CWI) in conformance with the requirements in AWS QC1, " Standard for AWS Certification of Welding Inspectors."

The QC Inspector may be assisted by an Assistant QC Inspector provided that this individual is currently certified as an AWS Certified Associate Welding Inspector (CAWI) in conformance with the requirements in AWS QC1, "Standard for AWS Certification of Welding Inspectors." The Assistant QC Inspector may perform inspection under the direct supervision of the QC Inspector provided the Assistant is always within visible and audible range of the QC Inspector. The QC Inspector shall be responsible for signing all reports and for determining if welded materials conform to workmanship and acceptance criteria. The ratio of QC Assistants to QC Inspectors shall not exceed 5 to 1.

When the term "Inspector" is used without further qualification, it shall refer to the QC Inspector.

Section 6.14.6, "Personnel Qualification," of AWS D1.1, Section 7.8, "Personnel Qualification," of AWS D1.4, and Section 6.1.3.4, "Personnel Qualification," of AWS D1.5 are replaced with the following:

Personnel performing nondestructive testing (NDT) shall be qualified and certified in conformance with the requirements of the American Society for Nondestructive Testing (ASNT) Recommended Practice No. SNT-TC-1A and the Written Practice of the NDT firm. The Written Practice of the NDT firm shall meet or exceed the guidelines of the ASNT Recommended Practice No. SNT-TC-1A. Individuals who perform NDT, review the results, and prepare the written reports shall be either:

A. Certified NDT Level II technicians, or;
B. Level III technicians who hold a current ASNT Level III certificate in that discipline and are authorized and certified to perform the work of Level II technicians.

Section 6.5.4 of AWS D1.5 is replaced with the following:

The QC Inspector shall inspect and approve each joint preparation, assembly practice, welding technique, joint fit-up, and the performance of each welder, welding operator, and tack welder to make certain that the applicable requirements of this code and the approved Welding Procedure Specification (WPS) are met. The QC Inspector shall examine the work to make certain that it meets the requirements of Sections 3 and 6.26. The size and contour of all welds shall be measured using suitable gages. Visual inspection for cracks in welds and base metal, and for other discontinuities should be aided by strong light magnifiers, or such other devices as may be helpful. Acceptance criteria different from those specified in this code may be used when approved by the Engineer.

Section 6.6.5, "Nonspecified NDT Other than Visual," of AWS D1.1, Section 6.6.5 of AWS D1.4 and Section 6.6.5 of AWS D1.5 shall not apply.

For any welding, the Engineer may direct the Contractor to perform NDT that is in addition to the visual inspection or NDT specified in the AWS or other specified welding codes, in the Standard Specifications, or in these special provisions. Additional NDT required by the Engineer will be paid for as extra work as provided in Section 4-1.03D, "Extra Work," of the Standard Specifications. Should any welding deficiencies be discovered by this additional NDT, all costs associated with the repair of the deficient area, including NDT of the weld and of the weld repair, and any delays caused by the repair, shall be at the Contractor's expense.

Repair work to correct welding deficiencies discovered by visual inspection or NDT, or by additional NDT directed or performed by the Engineer, and any associated delays or expenses caused to the Contractor by performing these repairs, shall be at the Contractor's expense.

The Engineer shall have the authority to verify the qualifications or certifications of any welder, QC Inspector, or NDT personnel to specified levels by retests or other means approved by the Engineer.

Continuous inspection shall be provided when any welding is being performed. Continuous inspection, as a minimum, shall include having a QC Inspector within such close proximity of all welders or welding operators so that inspections by the QC Inspector of each welding operation at each welding location shall not lapse for a period exceeding 30 minutes.

Inspection and approval of all joint preparations, assembly practices, joint fit-ups, welding techniques, and the performance of each welder, welding operator, and tack welder shall be documented by the QC Inspector on a daily basis for each day welding is performed. For each inspection, including fit-up, Welding Procedure Specification (WPS) verification, and final weld inspection, the QC Inspector shall confirm and document compliance with the requirements of the AWS or other specified code criteria and the requirements of these special provisions on all welded joints before welding, during welding, and after the completion of each weld.

When joint weld details that are not prequalified to the details of Section 3 of AWS D1.1 or to the details of Figure 2.4 or 2.5 of AWS D1.5 are proposed for use in the work, the joint details, their intended locations, and the proposed welding parameters and essential variables, will be approved by the Engineer. The Engineer shall have 2 weeks to complete the review of the proposed joint detail locations. In the event the Engineer fails to complete the review within the time allowed, and if, in the opinion of the Engineer, completion of the work is delayed or interfered with by reason of the Engineer's delay in completing the review, the Contractor will be compensated for any resulting loss, and an extension of time will be granted, in the same manner as provided for in Section 8-1.09, "Right of Way Delays," of the Standard Specifications. Upon approval of the proposed joint detail locations and qualification of the proposed joint details, welders and welding operators using these details shall perform a qualification test plate using the WPS variables and the joint detail to be used in production. The test plate shall have the maximum thickness to be used in production and a minimum length of 180 mm and minimum finish welded width 460 mm. The test plate shall be mechanically and radiographically tested. Mechanical and radiographic testing and acceptance criteria shall be as specified in the applicable AWS codes.

In addition to the requirements specified in the applicable code, the period of effectiveness for a welder's or welding operator's qualification shall be a maximum of 3 years for the same weld process, welding position, and weld type. If production welding will be performed without gas shielding, then qualification shall also be without gas shielding. Excluding welding of fracture critical members, a valid qualification at the beginning of work on a contract will be acceptable for the entire period of the contract, as long as the welder's or welding operator's work remains satisfactory.

The Engineer will witness all qualification tests for WPSs that were not previously approved by the Department. An approved independent third party will witness the qualification tests for welders or welding operators. The independent third party shall be a current CWI and shall not be employed by the contractor performing the welding. The Engineer shall have 2 weeks to review the qualifications and copy of the current certification of the independent third party. In the event the Engineer fails to complete the review within the time allowed, and if, in the opinion of the Engineer, completion of the work is delayed or interfered with by reason of the Engineer's delay in completing the review, the Contractor will be compensated

for any resulting loss, and an extension of time will be granted, in the same manner as provided for in Section 8-1.09, "Right of Way Delays," of the Standard Specifications. The Contractor shall notify the Engineer one week prior to performing any qualification tests. Witnessing of qualification tests by the Engineer shall not constitute approval of the intended joint locations, welding parameters, or essential variables.

In addition to the requirements of AWS D1.5 Section 5.12 or 5.13, welding procedures qualification, for work welded in conformance with that code, shall conform to the following requirements:

A. Unless considered prequalified, fillet welds, including reinforcing fillet welds, shall be qualified in each position. The fillet weld soundness test shall be conducted using the essential variables of the WPS as established by the Procedure Qualification Record (PQR.)
B. For qualification of joints that do not conform to Figures 2.4 and 2.5 of AWS D1.5, two WPS qualification tests are required. The tests conforming to AWS D1.5 Section 5.13 shall be conducted using both Figure 5.1 and Figure 5.3. The test conforming to Figure 5.3 shall be conducted using the same welding electrical parameters that were established for the test conducted conforming to Figure 5.1.
C. The travel speed, current, and voltage values that are used for tests conducted per AWS D1.5 Section 5.12 or 5.13 shall be consistent for each weld joint, and shall in no case vary by more than 10 percent for travel speed, 10 percent for current, and 7 percent for voltage.
D. For a WPS qualified in conformance with AWS D1.5 Section 5.13, the values to be used for calculating ranges for current and voltage shall be based on the average of all weld passes made in the test. Heat input shall be calculated using the average of current and voltage of all weld passes made in the test for a WPS qualified in conformance with Section 5.12 or 5.13.
E. To qualify for unlimited material thickness, two qualification tests are required for WPSs utilized for welding material thicknesses greater than 38 mm. One test shall be conducted using 20-mm thick test plates, and one test shall be conducted using test plates with a thickness between 38 mm and 50 mm. Two maximum heat input tests may be conducted for unlimited thickness qualification.
F. Macroetch tests are required for WPS qualification tests, and acceptance shall be per AWS D1.5 Section 5.19.3.
G. When a weld joint is to be made using a combination of qualified WPSs, each process shall be qualified separately.
H. When a weld joint is to be made using a combination of qualified and prequalified processes, the WPS shall reflect both processes and the limitations of essential variables, including weld bead placement, for both processes.
I. Prior to preparing mechanical test specimens, the PQR welds shall be inspected by visual and radiographic tests. Backing bar shall be 75 mm in width and shall remain in place during NDT testing. Results of the visual and radiographic tests shall comply with AWS D1.5 Section 6.26.2, excluding Section 6.26.2.2. Test plates that do not comply with both tests shall not be used.

WELDING QUALITY CONTROL

Welding quality control shall conform to the requirements in the AWS or other specified welding codes, the Standard Specifications, and these special provisions.

Unless otherwise specified, welding quality control shall apply when any work is welded in conformance with the provisions in Section 49, "Piling," Section 52, "Reinforcement," Section 55, "Steel Structures," or Section 75-1.035, "Bridge Joint Restrainer Units," of the Standard Specifications.

The welding of fracture critical members (FCMs) shall conform to the provisions specified in the Fracture Control Plan (FCP) and herein.

The Contractor shall designate in writing a welding Quality Control Manager (QCM). The QCM shall be responsible directly to the Contractor for the quality of welding, including materials and workmanship, performed by the Contractor and subcontractors.

The QCM shall be the sole individual responsible to the Contractor for submitting, receiving, reviewing, and approving all correspondence, required submittals, and reports to and from the Engineer. The QCM shall be a registered professional engineer or shall be currently certified as a CWI or a CAWI.

The QCM shall not be employed or compensated by any subcontractor, or by other persons or entities hired by subcontractors, who will provide other services or materials for the project. The QCM may be an employee of the Contractor.

Welding inspection personnel or NDT firms to be used in the work shall not be employed or compensated by any subcontractor, or by other persons or entities hired by subcontractors, who will provide other services or materials for the project, except for the following conditions:

A. The work is welded in conformance with AWS D1.5 and is performed at a permanent fabrication or manufacturing facility which is certified under the AISC Quality Certification Program, Category Cbr, Major Steel Bridges and Fracture Critical endorsement F.

B. The welding is performed on pipe pile material at a permanent pipe manufacturing facility authorized to apply the American Petroleum Institute (API) monogram for API 5L pipe.

For welding performed at such facilities, the inspection personnel or NDT firms may be employed or compensated by the facility performing the welding.

Prior to submitting the Welding Quality Control Plan (WQCP) required herein, a pre-welding meeting between the Engineer, the Contractor's QCM, and a representative from each entity performing welding or inspection for this project, shall be held to discuss the requirements for the WQCP.

The Contractor shall submit to the Engineer, in conformance with the provisions in Section 5-1.02, "Plans and Working Drawings," of the Standard Specifications, 2 copies of a separate WQCP for each subcontractor or supplier for each item of work for which welding is to be performed.

The Contractor shall allow the Engineer 2 weeks to review the WQCP submittal after a complete plan has been received. No welding shall be performed until the WQCP is approved in writing by the Engineer. In the event the Engineer fails to complete the review within the time allowed, and if, in the opinion of the Engineer, completion of the work is delayed or interfered with by reason of the Engineer's delay in completing the review, the Contractor will be compensated for any resulting loss, and an extension of time will be granted, in the same manner as provided for in Section 8-1.09, "Right of Way Delays," of the Standard Specifications.

An amended WQCP or any addendum to the approved WQCP shall be submitted to, and approved in writing by the Engineer, for proposed revisions to the approved WQCP. An amended WQCP or addendum will be required for revisions to the WQCP, including but not limited to a revised WPS; additional welders; changes in NDT firms, QC, or NDT personnel or procedures; or updated systems for tracking and identifying welds. The Engineer shall have 1 week to complete the review of the amended WQCP or addendum. Work affected by the proposed revisions shall not be performed until the amended WQCP or addendum has been approved. In the event the Engineer fails to complete the review within the time allowed, and if, in the opinion of the Engineer, completion of the work is delayed or interfered with by reason of the Engineer's delay in completing the review, the Contractor will be compensated for any resulting loss, and an extension of time will be granted, in the same manner as provided for in Section 8-1.09, "Right of Way Delays," of the Standard Specifications.

Information regarding the contents, format, and organization of a WQCP, is available at the Transportation Laboratory or the following website:

http://www.dot.ca.gov/hq/esc/Translab/smbresources.htm

After final approval of the WQCP, amended WQCP, or addendum, the Contractor shall submit 7 copies to the Engineer of the approved documents. A copy of the Engineer approved document shall be available at each location where welding is to be performed.

A daily production log for welding shall be kept for each day that welding is performed. The log shall clearly indicate the locations of all welding. The log shall include the welders' names, amount of welding performed, any problems or deficiencies discovered, and any testing or repair work performed, at each location. The daily report from each QC Inspector shall also be included in the log.

The following items shall be included in a Welding Report that is to be submitted to the Engineer within 10 days following the performance of any welding:

A. Reports of all visual weld inspections and NDT.
B. Radiographs and radiographic reports, and other required NDT reports.
C. Documentation that the Contractor has evaluated all radiographs and other nondestructive tests and corrected all rejectable deficiencies, and all repaired welds have been reexamined by the required NDT and found acceptable.
D. Daily production log.

The following information shall be clearly written on the outside of radiographic envelopes: name of the QCM, name of the nondestructive testing firm, name of the radiographer, date, contract number, complete part description, and all included weld numbers or a report number, as detailed in the WQCP. In addition, all innerleaves shall have clearly written on them the part description and all included weld numbers, as detailed in the WQCP.

Reports regarding NDT shall be signed by both the NDT technician and the person that performed the review, and then submitted directly to the QCM for review and signature prior to submittal to the Engineer. Corresponding names shall be clearly printed or typewritten next to all signatures.

The Engineer will review the Welding Report to determine if the Contractor is in conformance with the WQCP. Unless otherwise specified, the Engineer shall be allowed 10 days to review the report and respond in writing after a complete Welding Report has been received. Prior to receiving notification from the Engineer of the Contractor's conformance with the WQCP, the Contractor may encase in concrete or cover welds for which a Welding Report has been submitted. However, should the Contractor elect to encase or cover those welds prior to receiving notification from the Engineer, it is expressly

understood that the Contractor shall not be relieved of the responsibility for incorporating material in the work that conforms to the requirements of the plans and specifications. Material not conforming to these requirements will be subject to rejection. Should the Contractor elect to wait to encase or cover welds pending notification by the Engineer, and in the event the Engineer fails to complete the review within the time allowed, and if, in the opinion of the Engineer, completion of the work is delayed or interfered with by reason of the Engineer's delay in completing the review, the Contractor will be compensated for any resulting loss, and an extension of time will be granted, in the same manner as provided for in Section 8-1.09, "Right of Way Delays," of the Standard Specifications.

The QC Inspector shall provide reports to the QCM on a daily basis for each day that welding is performed.

Except for noncritical weld repairs, the Engineer shall be notified immediately in writing when welding problems, deficiencies, base metal repairs, or any other type of repairs not submitted in the WQCP are discovered, and also of the proposed repair procedures to correct them. The Contractor shall allow the Engineer one week to review these procedures. No remedial work shall begin until the repair procedures are approved in writing by the Engineer. In the event the Engineer fails to complete the review within the time allowed, and if, in the opinion of the Engineer, completion of the work is delayed or interfered with by reason of the Engineer's delay in completing the review, the Contractor will be compensated for any resulting loss, and an extension of time will be granted, in the same manner as provided for in Section 8-1.09, "Right of Way Delays," of the Standard Specifications.

The QCM shall sign and furnish to the Engineer, a Certificate of Compliance in conformance with the provisions in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications for each item of work for which welding was performed. The certificate shall state that all of the materials and workmanship incorporated in the work, and all required tests and inspections of this work, have been performed in conformance with the details shown on the plans, the Standard Specifications, and these special provisions.

PAYMENT

Full compensation for conforming to the requirements of "Welding" shall be considered as included in the contract prices paid for the various items of work involved and no additional compensation will be allowed therefor.

SECTION 9. (BLANK)

SECTION 10. CONSTRUCTION DETAILS

SECTION 10-1. GENERAL

10-1.00 CONSTRUCTION PROJECT INFORMATION SIGNS

Before any major physical construction work readily visible to highway users is started on this contract, the Contractor shall furnish and erect 2 Type 2 Construction Project Information signs at the locations designated by the Engineer.

The signs and overlays shall be of a type and material consistent with the estimated time of completion of the project and shall conform to the details shown on the plans.

The sign letters, border and the Department's construction logos shall conform to the colors (non-reflective) and details shown on the plans, and shall be on a white background (non-reflective). The colors blue and orange shall conform to PR Color Number 3 and Number 6, respectively, as specified in the Federal Highway Administration's Color Tolerance Chart.

The sign message to be used for fund types shall consist of the following, in the order shown:

FEDERAL HIGHWAY TRUST FUNDS
STATE HIGHWAY FUNDS

The sign message to be used for type of work shall consist of the following:

HIGHWAY CONSTRUCTION

The sign message to be used for the Year of Completion of Project Construction will be furnished by the Engineer. The Contractor shall furnish and install the "Year" sign overlay within 10 working days of notification of the year date to be used.

The letter sizes to be used shall be as shown on the plans. The information shown on the signs shall be limited to that shown on the plans.

The signs shall be kept clean and in good repair by the Contractor.

Upon completion of the work, the signs shall be removed and disposed of outside the highway right of way in conformance with the provisions in Section 7-1.13 of the Standard Specifications.

Full compensation for furnishing, erecting, maintaining, and removing and disposing of the construction project information signs shall be considered as included in the contract lump sum price paid for construction area signs and no additional compensation will be allowed therefor.

10-1.01 ORDER OF WORK

Order of work shall conform to the provisions in Section 5-1.05, "Order of Work," of the Standard Specifications and these special provisions.

Attention is directed to "Migratory Birds" and "Clearing and Grubbing" of these special provisions regarding notification requirements and time constraints for performing work.

Attention is directed to "Security Clearance" and "Beginning of Work, Time of Completion and Liquidated Damages" of these special provisions.

The Contractor shall not begin work until security clearance has been obtained from the United States General Services Administration.

The Contractor shall maintain access to all adjacent properties at all times.

Temporary concrete washout facility and temporary concrete washout (Portable) shall be in place prior to the start of any concrete work. Attention is directed to "Temporary Concrete Washout Facility" and "Temporary Concrete Washout (Portable)" of these special provisions.

Fiber rolls shall be installed right before erosion control (Type D) work takes place. Attention is directed to "Water Pollution Control" of these special provisions.

Attention is directed to "Prepaving Conference" and "Just in Time Training," "Pavement Concrete Mix Proportions" and "Test Strip" of these special provisions.

Prior to the initiation of earthwork operations, temporary construction entrances shall be installed. Attention is directed "Temporary Construction Entrance" of these special provision.

Attention is directed to "Move-In/Move-Out (Temporary Erosion Control)" of these special provisions. Several move-ins and move-outs may be required for this project.

The following parcels do not have Right-of-Way clearance therefore the Contractor will not be permitted to enter the parcels, as shown on the plans, until after the Right of Way clearance dates shown:

Parcel Number	Clearance Date
32709	12/01/2006
32733	12/01/2006

If any of these parcels are cleared earlier than the clearance date, the Contractor will be permitted to work within the parcel at that time.

Attention is directed to "Miscellaneous Concrete Construction" of these special provisions regarding constructing a 600 mm by 600 mm test panel prior to constructing curb ramps with detectable warning surfaces.

Temporary railing (Type K), traffic plastic drums and temporary crash cushions shall be secured in place prior to commencing work for which the temporary railing, traffic plastic drums and crash cushions are required.

Attention is directed to "Environmentally Sensitive Area" and "Temporary Fence (Type ESA)" of these special provisions. Prior to beginning work, the boundaries of the Environmentally Sensitive Areas (ESA) shall be clearly delineated in the field. The boundaries shall be delineated by the installation of temporary fence (Type ESA).

Attention is directed to "Water Pollution Control" of these special provisions regarding the submittal and approval of the Storm Water Pollution Prevention Plan prior to performing work having potential to cause water pollution.

The uppermost layer of new pavement shall not be placed until all underlying conduits have been installed.

Attention is directed to "Maintaining Traffic" and "Temporary Pavement Delineation" of these special provisions and to the stage construction sheets of the plans.

Attention is directed to "Progress Schedule (Critical Path Method)" of these special provisions regarding the submittal of a general time-scaled logic diagram within 10 days after approval of the contract. The diagram shall be submitted prior to performing any work that may be affected by any proposed deviations to the construction staging of the project.

The work shall be performed in conformance with the stages of construction shown on the plans. Nonconflicting work in subsequent stages may proceed concurrently with work in preceding stages, provided satisfactory progress is maintained in the preceding stages of construction.

In each stage, after completion of the preceding stage, the first order of work shall be the removal of existing pavement delineation as directed by the Engineer. Pavement delineation removal shall be coordinated with new delineation so that lane lines are provided at all times on traveled ways open to public traffic.

Before obliterating any pavement delineation (traffic stripes, pavement markings, and pavement markers) that is to be replaced on the same alignment and location, as determined by the Engineer, the pavement delineation shall be referenced by the Contractor, with a sufficient number of control points to reestablish the alignment and location of the new pavement

delineation. The references shall include the limits or changes in striping pattern, including one- and 2-way barrier lines, limit lines, crosswalks and other pavement markings. Full compensation for referencing existing pavement delineation shall be considered as included in the contract prices paid for new pavement delineation and no additional compensation will be allowed therefor.

Prior to applying asphalt concrete (Type A), the Contractor shall cover all manholes, valve and monument covers, grates, or other exposed facilities located within the area of application, using a plastic or oil resistant construction paper secured to the facility being covered by tape or adhesive. The covered facilities shall be referenced by the Contractor, with a sufficient number of control points to relocate the facilities after the asphalt concrete (Type A) has been placed. After completion of the asphalt concrete (Type A) operation, all covers shall be removed and disposed of in a manner satisfactory to the Engineer. Full compensation for covering manholes, valve and monument covers, grates, or other exposed facilities, referencing, and removing temporary cover shall be considered as included in the contract price paid per tonne for asphalt concrete (Type A), and no additional compensation will be allowed therefor.

When traffic is moved from an established path to a new path and pavement delineation changes are required, all material and equipment needed for new delineation shall be at the site of the work before any shift of traffic is undertaken. The equipment shall be in good working condition.

Some plants required for this project may not be readily available and may have to be grown specifically for this project. Within 30 days after the contract has been approved, the Contractor shall furnish the Engineer a statement from the vendor that the order for the plants to be grown for this contract, including inspection plants and replacement plants, has been received and accepted by the vendor. The statement from the vendor shall include the names, sizes, and quantities of plants ordered and the anticipated dates of delivery. The Contractor shall notify the Engineer, in writing, when the vendor has started to grow the plants.

Not less than 60 days prior to planting the plants, the Contractor shall furnish the Engineer a statement from the vendor that the order for the plants required for this contract, including inspection plants, has been received and accepted by the vendor. The statement from the vendor shall include the names, sizes, and quantities of plants ordered and the anticipated date of delivery.

The Contractor shall place orders for replacement plants with the vendor at the appropriate time so that the roots of the replacement plants are not in a root-bound condition.

Not less than 60 days prior to applying seeds, the Contractor shall furnish the Engineer a statement from the vendor that the order for the seed required for this contract has been received and accepted by the vendor. The statement from the vendor shall include the names and quantity of seed ordered and the anticipated date of delivery.

Attention is directed to "Irrigation Systems Functional Test" of these special provisions, regarding restrictions for planting operations.

Attention is directed to "Planting" of these special provisions, regarding restrictions for decomposed granite work.

Unless otherwise shown on the plans or specified in these special provisions, conduits to be jacked or drilled or installed by the open trench method for water line crossovers and sprinkler control crossovers shall be installed prior to the installation of other pipe supply lines.

Clearing, grubbing, and earthwork operations shall not be performed in areas where decorative boulders are to be collected until decorative boulders have been removed and stockpiled for future use. Attention is directed to "Earthwork," "Decorative Boulder," and "Decorative Boulder with Engraved Sign," of these special provisions.

Decorative boulders shall be installed prior to rock blanket, decomposed granite, and planting work in areas where both types of work will be performed.

Attention is directed to Section 20-5.027B, "Wiring Plans and Diagrams," of the Standard Specifications regarding submittal of working drawings.

10-1.02 HAZARDOUS MATERIALS MITIGATION PLANS AND REPORTS

Hazardous materials mitigation plans and reports shall consist of a Health and Safety Plan (HSP), Health and Safety Training, Tank Removal Work Plan (TRWP), and Site Investigation (SI) activities associated with the removal of an underground storage tank conforming to the requirements of this special provision, Site Investigation Report of Tank Contents, Site Investigation Report of Surrounding Soil, and Tank Closure Report.

If the Contractor fails to prepare and submit plans or reports that are deemed acceptable by the Engineer, and if, in the opinion of the Engineer, completion of work is impeded by delay in submitting acceptable reports or plans, the State will not be liable to the Contractor for loss of work days due to failure or delay.

APPLICABLE RULES AND REGULATIONS

Hazardous Materials Mitigation Plans and Reports shall be in accordance with the rules and regulations of the following agencies:

1. United States Department of Transportation (USDOT)
2. United States Environmental Protection Agency (USEPA)
3. California Environmental Protection Agency (Cal-EPA)
4. California Department of Toxic Substances Control (DTSC)
5. California Department of Health Services
6. California Integrated Waste Management Board
7. Regional Water Quality Control Board (RWQCB), Region 49
8. State Air Resources Board
9. San Diego Air Pollution Control District (SDAPCD)
10. California Division of Occupational Safety and Health Administration (Cal-OSHA)
11. County of San Diego Department of Environmental Health Services, Site Assessment and Mitigation Division, (http://www.sdcdeh.org/deh/lwq/sam/manual_guidelines.html)

Laws and regulations that govern work related to contaminated soils, and to which reports and plans shall conform, include, but are not limited to:

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

PERMITS, LICENSES, AND REGULATORY OVERSIGHT

The Contractor shall obtain the Tank Closure Permit for the tank from the County of San Diego Department of Environmental Health Services (SDDEHS)El at least 48 hours prior to the start of work. The Contractor shall reimburse San Diego County Department of Environmental Health Services, Underground Storage Tank Program for oversight of the tank removal through the Private Oversight Program (POP). The Contractor shall contact the County of San Diego Building Safety Department regarding the excavations and specifically the need for shoring.

All health and safety plans, work plans and reports are subject to review and approval by SDDEHS. The Contractor shall not implement any plan without prior approval of SDDEHS or documentation that SDDEHS has declined to review the plan.

HEALTH AND SAFETY PLAN (HSP)

The Contractor shall submit a project specific HSP, prepared and signed by a Certified Industrial Hygienist certified in comprehensive practice by the American Board of Industrial Hygiene, for site personnel, including State personnel, to prevent or minimize worker exposure to chemical, physical, and environmental hazards while performing excavation, site investigation, removing the underground storage tank, and handling potentially contaminated soil and tank residues. The contents of the underground tank are unknown, however it is suspected that the tank was used to store fuel such as petroleum chemicals. The HSP shall comply with applicable Cal-OSHA regulatory requirements and shall be submitted at least 15 working days prior to beginning work in the underground storage tank area as shown on the plans. The Contractor shall not work in the underground storage tank area, unless authorized in writing by the Engineer, until the Engineer has accepted the HSP and the SDDEHS has approved the HSP.

Information included in the HSP shall identify potential health and safety hazards associated with performing excavation, subsurface soil investigation, underground storage tank removal, include health and safety provisions when working with soil and tank residues potentially contaminated with chlorinated solvent, heavy metals, and petroleum chemicals. The HSP shall be used to protect workers from physical and chemical hazards and shall be in conformance with DTSC and Cal-OSHA regulations. The requirements of 29CFR1910.120 shall be applied to potentially contaminated soils. At a minimum, the HSP shall identify key site safety personnel, describe risks associated with performing site investigations for underground storage tank removal, training requirements; appropriate personal protective equipment; site-specific medical surveillance requirements; equipment and personnel decontamination requirements, and define appropriate site work zones.

The Contractor shall be responsible for the health and safety of employees and all personnel within site work zones.

Daily safety meetings, health and safety training, use of appropriate personal protective equipment, and appropriate site work zones shall be in compliance with the HSP and applicable DTSC and Cal-OSHA regulations.

The HSP shall include perimeter air monitoring for airborne dust particles during excavation of soil characterized as contaminated. Air Monitoring shall be performed by a Certified Industrial Hygienist (CIH) or an Industrial Hygienist (IH) under the supervision of a CIH. The Contractor, when deemed necessary by the CIH or when the Engineer determines that work is occurring near sensitive receptors, shall include perimeter air monitoring for airborne and volatile petroleum hydrocarbons, and chlorinated solvents as appropriate and shall be reviewed by the Engineer. Air monitoring data shall be

reviewed and validated by a CIH and results shall be submitted to the Engineer within 48 hours after laboratory analyses are completed. Air monitoring samples shall be analyzed by a laboratory certified by the California Department of Health Services Environmental Lab Accreditation Program for all analyses performed and conform to applicable requirements as stated in this special provision.

The Engineer will notify the Contractor of acceptance or rejection of submitted or revised HSPs not more than 10 working days after submittal. The Contractor shall have 5 working days to make necessary revisions.

When the Site Investigation (SI) is completed and analytical results for tank residues are available, the Contractor and the CIH shall revise the HSP for activities associated with excavation and transportation. The revised HSP shall be submitted to the Engineer for review and acceptance. The Engineer will notify the Contractor of acceptance or rejection of revised HSPs not more than 10 working days after submittal. The Contractor shall have 5 working days to make necessary revisions.

Health and Safety Training

Prior to the start of excavation to expose the underground tank, the Contractor shall provide Health and Safety training prepared by a CIH. The Contractor shall provide any subsequent Health and Safety training required until completion of the project. The Contractor shall provide a certification of completion to field personnel including State personnel. The Health and Safety training program shall communicate the potential health and safety hazards associated with work and instruct personnel on procedures for conducting the work safely and minimizing hazards. The level of training provided shall conform to Cal-OSHA regulations and be consistent with the personnel's job function.

The Contractor shall supply Health and Safety training, personal protective equipment, and medical surveillance required by the approved HSP to the personnel working within exclusion zones, including State personnel. The number of State personnel requiring the Health and Safety training, personal protective equipment, and medical surveillance will be 3.

TANK REMOVAL WORK PLAN (TRWP)

The Contractor shall submit a TRWP a minimum of 15 working days prior to beginning work in the area of the underground storage tank. The TRWP and HSP shall be submitted concurrently to the Engineer for review. The TRWP shall be prepared by a Professional Geologist or a Professional Engineer registered in the State of California with experience in environmental engineering and hazardous waste laws and policies. The TRWP shall include:

1. Specific procedures and sampling methodology to conduct a site investigation to evaluate the contents of the underground storage tank;
2. Specific procedures for removal of one underground storage tank;

The TRWP shall describe, at a minimum, means of completing the investigation of tank contents and surrounding soil and methods for underground storage tank removal, and shall meet standards set by local, state and federal regulatory agencies. Deviations from standards shall only be employed when approved in advance, and in writing, by the Engineer. The TRWP shall include, at a minimum, the following:

1. Purpose and scope of the site investigation of tank contents and surrounding soil in association with underground storage tank removal.
2. Evaluation of available area ground water data.
3. Methodology and procedures for tank content sampling.
4. Methodology and procedures for tank removal.
5. Maps of proposed soil sampling locations.
6. Methodology and procedures (drilling method) for soil sampling and proposed number and location of borings.
7. Use of a mobile laboratory certified by the California Department of Health Services Environmental Lab Accreditation Program for the analyses to be run. The mobile laboratory shall be used for samples of tank contents and soil samples collected from excavations.
8. Use of a stationary laboratory certified by the California Department of Health Services Environmental Lab Accreditation Program for analyses that cannot be performed by a mobile laboratory.
9. Sample handling procedures for residues and soil samples and collection and preservation methods.
10. Disposal method for investigation derived wastes and decontamination water.
11. Laboratory and field Quality Assurance/Quality Control (QA/QC) procedures.
12. Laboratory analyses and analytical methodologies.
13. Statistical analysis procedure for soil data results.
14. Schedule for completing the site investigation and tank removal including schedules for draft and final site investigation reports submittal.

Recommendation for soil and tank residue handling procedures if the investigation determines that the materials are (1) not contaminated; (2) contaminated but non-hazardous waste; (3) hazardous waste regulated by the State of California (non-RCRA) or (4) hazardous waste regulated by the Federal Government (RCRA).

The TRWP shall meet the requirements for the design and development of the sampling plan, statistical analysis, and reporting of test results contained in USEPA, SW 846, "Test Methods for Evaluating Solid Waste," Volume II: Field Manual Physical/Chemical, Chapter Nine, Section 9.1 and shall be performed in accordance with these special provisions, as required by the disposal facility that will accept the excavated soils, and approved by the Engineer.

The mobile laboratory shall be certified by the State of California Department of Health Services Environmental Laboratory Accreditation Program (DHS-ELAP) for each analysis run. Mobile laboratory gas chromatograph equipment shall be calibrated on-site at the beginning of each working day: Mobile laboratories shall record gas chromatograph system parameters on the first page of each day's chromatograms. Parameters shall include temperatures of the injector, column, and detector; integrator parameters of the injector, peak markers and baseline offset; column type, length and diameter; and packing material. The name of the operator and the date shall be included. Changes to system parameters shall be documented.

SITE INVESTIGATION (SI)

SI activities shall include investigation of tank contents, preparation of a Site Investigation Letter Report of Tank Contents, investigation of soils surrounding the underground tank and preparation of a Site Investigation Letter Report of Surrounding Soil. The investigation of the tank contents shall occur prior to tank removal and the investigation of the surrounding soil shall occur after tank removal.

Site Investigation (SI) of Tank Contents

Upon the approval of the TRWP and HSP, the Contractor shall excavate to expose the underground tank and conduct a Site Investigation (SI) of residues in the tank in accordance with the approved final TRWP and the requirements of this special provision, and the disposal facility that will be accepting the waste. At a minimum, one sample shall be collected from each end of each tank. Activities during SI of tank contents shall be performed in conformance with the approved HSP and the approved TRWP.

Prior to commencing activities involving disturbance of soil beneath the pavement surface, the Contractor shall obtain an inquiry identification number from Underground Services Alert (USA) and furnish the information to the Engineer 48 hours in advance.

The Engineer shall be notified at least 48 hours before the commencement of fieldwork for sampling tank contents. Sample analyses run on each sample shall conform to the approved TRWP and include, but not be limited to:

a. TPH-gasoline Modified EPA 8015B
b. TPH-diesel Modified EPA 8015B
c. TPH Motor Oil (Modified EPA 8015)
d. Total Recoverable Petroleum Hydrocarbons, method 418.1
e. GC/MS for Volatile organic compounds EPA 8260B
f. GC/MS for Fuel Oxygenate compounds EPA 8260B
g. Total organic lead using the LUFT method

Analyses, except those for organic lead, shall be performed by the on site mobile laboratory. Samples shall be screened for organic lead with a field method, then sent to a stationary lab for confirmation. The Contractor shall transport samples to the laboratory and be responsible for providing sample containers, labels, appropriate preservation and chain of custody records. The Contractor shall provide clear and accurate explanation of analytical results.

Sampling equipment shall be decontaminated prior to the start of sampling and between sampling locations in conformance with the approved final TRWP. At a minimum, decontamination procedures shall include washing all reusable sampling equipment with a mixture of Liquinox, or similar non-phosphate product, and clear water, rinsing in clear water, rinsing in distilled water, and air-drying. Water from decontamination procedures shall be collected and disposed of at an appropriate disposal site at the Contractor's expense. Once used, non-reusable protective equipment shall be collected and disposed of at an appropriate disposal site at the Contractor's expense.

Site Investigation (SI) Letter Report of Tank Contents

Upon completion of the SI of tank contents, the Contractor shall prepare a SI Letter Report of Tank Contents that includes at a minimum:

a. Brief investigative summary and project description.
b. Investigative results and significant field observations.

c. Data evaluation and discussion for the purposes of waste classification.
d. Statistical analysis of sample results for waste classification in accordance with EPA SW-846 Guidelines and the methodologies stipulated in the final TRWP if appropriate.
e. Laboratory analytical results for samples of the tank residues.
f. Conclusions describing types, levels, and estimated amounts of contamination and
g. Recommendations for:
    a. waste classification of residues in the underground storage tanks and disposal options based on applicable State and Federal and local laws and regulations;
    b. analytical testing of soil samples from surrounding soils.

Tank Removal

After removal or of the tank, soil samples shall be collected from the underground storage tank excavation under the observance and requirements of local regulatory agencies and in conformance with the approved TRWP. Discrete soil samples shall be obtained from the bottom and sides of the excavation after the tank has been removed and from product-piping trenches. Samples shall be collected under the supervision of a California Registered Geologist or Certified Engineering Geologist and the Engineer.

Soil samples shall be obtained by driving pre-cleaned 150 mm long stainless steel sample tubes into the undisturbed soil. Soil sample tubes shall be subsequently sealed at both ends with Teflon tape, capped, labeled, and placed in a chilled cooler pending transport under chain-of-custody protocols to the laboratory.

If groundwater is encountered, groundwater samples shall be obtained from the tank excavations under the direction of the Engineer, and under the guidelines of the SDDEHS and the Regional Water Quality Control (RWQCB). Groundwater shall be purged to allow fresh formation water to infiltrate excavations. Groundwater samples shall be obtained utilizing disposable polyethylene bailers.

Soil and groundwater samples shall be analyzed in accordance with SDDEHS and RWQCB recommendations for Preliminary Evaluation and Investigation of underground tank sites and the approved TRWP.

Sample analyses run on each sample shall include, but not be limited to:

a. TPH-gasoline Modified EPA 8015 B
b. TPH-diesel Modified EPA 8015 B
c. TPH Motor Oil (Modified EPA 8015)
d. Total Recoverable Petroleum Hydrocarbons, method 418.1
e. GC/MS for Volatile organic compounds EPA 8260B
f. GC/MS for Fuel Oxygenate compounds EPA 8260B
g. Total organic lead using the LUFT method

Analyses, except those for organic lead, shall be performed by the on site mobile laboratory. Samples shall be screened for organic lead with a field method, then sent to a stationary lab for confirmation. The Contractor shall transport samples to the laboratory and be responsible for providing sample containers, labels, appropriate preservation and chain of custody records. The Contractor shall provide clear and accurate explanation of analytical results.

Sampling equipment shall be decontaminated prior to the start of sampling and between sampling locations in conformance with the approved final TRWP. At a minimum, decontamination procedures shall include washing all reusable sampling equipment with a mixture of Liquinox, or similar non-phosphate product, and clear water, rinsing in clear water, rinsing in distilled water, and air-drying. Water from decontamination procedures shall be collected and disposed of at an appropriate disposal site at the Contractor's expense. Once used, non-reusable protective equipment shall be collected and disposed of at an appropriate disposal site at the Contractor's expense.

Site Investigation (SI) Letter Report of Surrounding Soil

Upon completion of the SI of surrounding soil, the Contractor shall prepare a SI Letter Report of Surrounding Soil that includes at a minimum:

a. Brief investigative summary and project description.
b. Investigative results and significant field observations.
c. Data evaluation and discussion for the purposes of waste classification.
d. Statistical analysis of sample results for waste classification in accordance with EPA SW-846 Guidelines and the methodologies stipulated in the final TRWP if appropriate.
e. Laboratory analytical results for samples of the surrounding soil.

f. Conclusions describing types, levels, and estimated amounts of contamination and recommendations for waste classification of residues in surrounding soil and disposal options based on applicable Local, State, and Federal laws and regulations.

Attention is directed to "Excavation (Contaminated Soil)" of these special provisions.

Field QA/QC

Field QA/QC procedures for tank content sampling and surrounding soils shall be reported in summary form for samples submitted and shall include the following:

A. One equipment blank for every chain of custody by pouring de-ionized water onto the sampling device and into a laboratory container.
B. For water sampling events, one trip blank for every ice chest or sample shipment container.

The contents of each ice chest or refrigerated container constitute an individual group of water samples. Trip blanks shall be clean water samples that shall be opened at the site in the same location as field sampling. Trip blanks shall be analyzed for the same compounds as other samples.

Laboratory QA/QC

Laboratory QA/QC for tank contents and surrounding soil samples shall be performed for each analytical method with specificity for every appropriately requested or representative analyte listed in the test method. QA/QC data shall be reported in summary form for submitted samples. Laboratory QA/QC procedures specified by each test method shall include the following:

A. One method blank for every 10 samples, batch of samples or type of matrix, whichever is more frequent.
B. One sample analyzed in duplicate for every 10 samples, batch of samples or type of matrix, whichever is more frequent.
C. One spiked sample for every 10 samples, batch of samples or type of matrix, whichever if more frequent, with spikes made at 10 times the detection limit or at the analyte level.

Where the test method does not specify QA/QC procedures, the above will apply.

Trip blanks, laboratory blanks, spiked samples, and duplicate sample analyses shall be reported on laboratory testing reports or QA/QC summary reports. Spiked samples shall be reported as percent spike recovery.

Acetone, methylene chloride, chloroform, and methyl ethyl ketone (MEK) detected in soil and ground water contaminants shall be considered laboratory contaminants. The laboratory testing report shall address laboratory contaminants and include an evaluation of whether laboratory processes introduced these chemicals into samples.

The Contractor shall submit the lab's QA/QC summary reports which at a minimum shall include the following:

A. Temperature of Incoming Samples
B. Constituent/Analyte
C. Specific Test Method
D. Date (include holding timetable for more than 50 samples)
E. Detection Limit of the Specific Test Method (mg/kg or mg/liter)
F. Percent Accuracy
G. Percent Precision
H. Signature of Laboratory Manager or Director

CLOSURE REPORT

The Contractor shall submit a draft Closure Report within 15 days of the completion of tank removal and excavation, and disposal of tank contents and contaminated soil, for review and approval by the Engineer and SDDEHS. The Closure Report shall be labeled with the contract number, project name, location, date, and name of the Contractor. The Closure Report shall include, but not be limited to:

A. Investigative summary and project description.
B. Field investigative methods and deviations from the approved TRWP.
C. Detailed investigative results and field observations for both the tank contents and surrounding soils.
D. Data evaluation and discussion, including maps showing sampling and feature locations.

E. Statistical analysis of sample results in accordance with EPA SW-846 Guidelines and the methodologies stipulated in the final TRWP.
F. Summary of laboratory results.
G. Conclusions describing types, levels, and estimated amounts of contamination and recommendations for waste classification of residues in the underground storage tank and disposal options for any contaminated soils based on applicable State and Federal laws and regulations.
H. Appendices containing data used to support the report, such as complete laboratory analysis reports and chain-of-custody documents.

The Engineer will have 15 days to review the draft Closure Report. Review time for SDDEHS will be negotiated with SDDEHS in consultation with the Engineer. If revisions are required, as determined by the Engineer or SDDEHS, the Contractor shall revise and resubmit the Closure Report within 5 days of receipt of the Engineer's comments. The Engineer will have 5 days to review the revisions. Upon the review and comments by the Engineer, the Contractor shall prepare and submit a final Closure Report that addresses and incorporates the comments from the Engineer. Disposal of residues and contaminated soils from the underground storage tank will be determined by the Engineer based on the results, conclusions, and recommendations of the approved final SI Report. A copy of the Closure Report shall be submitted to the SDDEHS for final tank closure approval.

MEASUREMENT AND PAYMENT

The contract lump sum price paid for Hazardous Materials Mitigation Plans and Reports shall include full compensation for furnishing all labor, materials, tools, equipment, work plans, Site Investigation (SI), reports, and incidentals, and for doing all the work involved in hazardous materials mitigation plans and reports, including revising the plans and reports as necessary, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

10-1.03 WATER POLLUTION CONTROL

Water pollution control work shall conform to the provisions in Section 7-1.01G, "Water Pollution," of the Standard Specifications and these special provisions.

This project lies within the boundaries of the San Diego Regional Water Quality Control Board (RWQCB).

The State Water Resources Control Board (SWRCB) has issued a permit to the Department which governs storm water and non-storm water discharges from its properties, facilities and activities. The Department's Permit is entitled: "Order No. 99-06-DWQ, NPDES No. CAS000003, National Pollutant Discharge Elimination System (NPDES) Permit, Storm Water Permit and Waste Discharge Requirements (WDRs) for the State of California, Department of Transportation Properties, Facilities, and Activities." Copies of the Department's Permit are available for review from the SWRCB, Storm Water Permit Unit, 1001 "I" Street, P.O. Box 1977, Sacramento, California 95812-1977, Telephone: (916) 341-5254, and may also be obtained from the SWRCB Internet website at: http://www.swrcb.ca.gov/stormwtr/caltrans.html.

The Department's Permit references and incorporates by reference the current Statewide General Permit issued by the SWRCB entitled "Order No. 99-08-DWQ, National Pollutant Discharge Elimination System (NPDES) General Permit No. CAS000002, Waste Discharge Requirements (WDRs) for Discharges of Storm Water Associated with Construction Activity," which regulates discharges of storm water and non-storm water from construction activities disturbing 0.4-hectare or more of soil in a common plan of development. Sampling and analysis requirements as specified in SWRCB Resolution No. 2001-46 are added to the Statewide General Permit. Copies of the Statewide General Permit and modifications thereto are available for review from the SWRCB, Storm Water Permit Unit, 1001 "I" Street, P.O. Box 1977, Sacramento, California 95812-1977, Telephone: (916) 341-5254 and may also be obtained from the SWRCB Internet website at: http://www.swrcb.ca.gov/stormwtr/construction.html.

The NPDES permits that regulate this project, as referenced above, are hereafter collectively referred to as the "Permits."

This project shall conform to the Permits and modifications thereto. The Contractor shall maintain copies of the Permits at the project site and shall make the Permits available during construction.

The Permits require the preparation of a Storm Water Pollution Prevention Plan (SWPPP). The SWPPP shall be prepared in conformance with the requirements of the Permits, the Department's "Storm Water Pollution Prevention Plan (SWPPP) and Water Pollution Control Program (WPCP) Preparation Manual," and the Department's "Construction Site Best Management Practices (BMPs) Manual," including addenda to those permits and manuals issued up to and including the date of advertisement of the project. These manuals are hereinafter referred to, respectively, as the "Preparation Manual" and the "Construction Site BMPs Manual," and collectively, as the "Manuals." Copies of the Manuals may be obtained from the Department of Transportation, Material Operations Branch, Publication Distribution Unit, 1900 Royal Oaks Drive, Sacramento, California 95815, Telephone: (916) 445-3520, and may also be obtained from the Department's Internet website at: http://www.dot.ca.gov/hq/construc/stormwater/stormwater1.htm.

The Contractor shall know and fully comply with applicable provisions of the Permits and all modifications thereto, the Manuals, and Federal, State, and local regulations and requirements that govern the Contractor's operations and storm water

and non-storm water discharges from both the project site and areas of disturbance outside the project limits during construction. Attention is directed to Sections 7-1.01, "Laws to be Observed," and 7-1.12, "Indemnification and Insurance," of the Standard Specifications.

The Permits shall apply to storm water and certain permitted non-storm water discharges from areas outside the project site which are directly related to construction activities for this contract including, but not limited to, asphalt batch plants, material borrow areas, concrete plants, staging areas, storage yards and access roads. The Contractor shall comply with the Permits and the Manuals for those areas and shall implement, inspect and maintain the required water pollution control practices. The Engineer shall be allowed full access to these areas during construction to assure Contractor's proper implementation of water pollution control practices. Installing, inspecting and maintaining water pollution control practices on areas outside the highway right of way not specifically arranged and provided for by the Department for the execution of this contract, will not be paid for.

The Contractor shall be responsible for penalties assessed or levied on the Contractor or the Department as a result of the Contractor's failure to comply with the provisions in this section "Water Pollution Control" including, but not limited to, compliance with the applicable provisions of the Permits, the Manuals, and Federal, State and local regulations and requirements as set forth therein.

Penalties as used in this section, "Water Pollution Control," shall include fines, penalties and damages, whether proposed, assessed, or levied against the Department or the Contractor, including those levied under the Federal Clean Water Act and the State Porter-Cologne Water Quality Control Act, by governmental agencies or as a result of citizen suits. Penalties shall also include payments made or costs incurred in settlement for alleged violations of the Permits, the Manuals, or applicable laws, regulations, or requirements. Costs incurred could include sums spent instead of penalties, in mitigation or to remediate or correct violations.

RETENTION OF FUNDS

Notwithstanding any other remedies authorized by law, the Department may retain money due the Contractor under the contract, in an amount determined by the Department, up to and including the entire amount of Penalties proposed, assessed, or levied as a result of the Contractor's violation of the Permits, the Manuals, or Federal or State law, regulations or requirements. Funds may be retained by the Department until final disposition has been made as to the Penalties. The Contractor shall remain liable for the full amount of Penalties until such time as they are finally resolved with the entity seeking the Penalties.

Retention of funds for failure to conform to the provisions in this section, "Water Pollution Control," shall be in addition to the other retention amounts required by the contract. The amounts retained for the Contractor's failure to conform to provisions in this section will be released for payment on the next monthly estimate for partial payment following the date when an approved SWPPP has been implemented and maintained, and when water pollution has been adequately controlled, as determined by the Engineer.

When a regulatory agency identifies a failure to comply with the Permits and modifications thereto, the Manuals, or other Federal, State or local requirements, the Department may retain money due the Contractor, subject to the following:

A. The Department will give the Contractor 30 days notice of the Department's intention to retain funds from partial payments which may become due to the Contractor prior to acceptance of the contract. Retention of funds from payments made after acceptance of the contract may be made without prior notice to the Contractor.
B. No retention of additional amounts out of partial payments will be made if the amount to be retained does not exceed the amount being withheld from partial payments pursuant to Section 9-1.06, "Partial Payments," of the Standard Specifications.
C. If the Department has retained funds, and it is subsequently determined that the State is not subject to the entire amount of the Costs and Liabilities assessed or proposed in connection with the matter for which the retention was made, the Department shall be liable for interest on the amount retained for the period of the retention. The interest rate payable shall be 6 percent per annum.

During the first estimate period that the Contractor fails to conform to the provisions in this section, "Water Pollution Control," the Department may retain an amount equal to 25 percent of the estimated value of the contract work performed.

The Contractor shall notify the Engineer immediately upon request from the regulatory agencies to enter, inspect, sample, monitor, or otherwise access the project site or the Contractor's records pertaining to water pollution control work. The Contractor and the Department shall provide copies of correspondence, notices of violation, enforcement actions or proposed fines by regulatory agencies to the requesting regulatory agency.

STORM WATER POLLUTION PREVENTION PLAN PREPARATION, APPROVAL AND AMENDMENTS

As part of the water pollution control work, a Storm Water Pollution Prevention Plan (SWPPP) is required for this contract. The SWPPP shall conform to the provisions in Section 7-1.01G, "Water Pollution," of the Standard Specifications,

the requirements in the Manuals, the requirements of the Permits, and these special provisions. Upon the Engineer's approval of the SWPPP, the SWPPP shall be considered to fulfill the provisions in Section 7-1.01G, "Water Pollution," of the Standard Specifications for development and submittal of a Water Pollution Control Program.

No work having potential to cause water pollution, shall be performed until the SWPPP has been approved by the Engineer. Approval shall not constitute a finding that the SWPPP complies with applicable requirements of the Permits, the Manuals and applicable Federal, State and local laws, regulations, and requirements.

The Contractor shall designate a Water Pollution Control Manager. The Water Pollution Control Manager shall be responsible for the preparation of the SWPPP and required modifications or amendments, and shall be responsible for the implementation and adequate functioning of the various water pollution control practices employed. The Contractor may designate different Water Pollution Control Managers to prepare the SWPPP and to implement the water pollution control practices. The Water Pollution Control Managers shall serve as the primary contact for issues related to the SWPPP or its implementation. The Contractor shall submit to the Engineer a statement of qualifications, describing the training, previous work history and expertise of the individual selected by the Contractor to serve as Water Pollution Control Manager. The Water Pollution Control Manager shall have a minimum of 24 hours of formal storm water management training or certification as a Certified Professional in Erosion and Sediment Control (CPESC). The Engineer will reject the Contractor's submission of a Water Pollution Control Manager if the submitted qualifications are deemed to be inadequate.

The SWPPP shall apply to the areas within and those outside of the highway right of way that are directly related to construction operations including, but not limited to, asphalt batch plants, material borrow areas, concrete plants, staging areas, storage yards, and access roads.

The SWPPP shall incorporate water pollution control practices in the following categories:

A. Soil stabilization.
B. Sediment control.
C. Wind erosion control.
D. Tracking control.
E. Non-storm water management.
F. Waste management and materials pollution control.

The following contract items of work shall be incorporated into the SWPPP as "Temporary Water Pollution Control Practices": Temporary Erosion Control, Temporary Fiber Roll, Temporary Concrete Washout Facility, Temporary Construction Entrance, Temporary Drainage Inlet Protection, Street Sweeping and Temporary Concrete Washout (Portable). The Contractor's attention is directed to the special provisions provided for Temporary Water Pollution Control Practices.

The following contract items of work, as shown on the project plans or as specified elsewhere in these special provisions, shall be identified in the SWPPP as permanent water pollution control practices: Fiber Rolls. These permanent water pollution control practices shall be constructed as specified in "Order of Work" of these special provisions, and utilized during the construction period. The Contractor shall maintain and protect the permanent water pollution control practices throughout the duration of the project and shall restore these controls to the lines, grades and condition shown on the plans prior to acceptance of the contract.

The SWPPP shall include, but not be limited to, the items described in the Manuals, Permits and related information contained in the contract documents. The SWPPP shall also include a copy of the following: Notification of Construction.

The Contractor shall develop and include in the SWPPP the Sampling and Analysis Plan(s) as required by the Permits, and modifications thereto, and as required in "Sampling and Analytical Requirements" of this section.

The Contractor shall develop a Water Pollution Control Schedule that describes the timing of grading or other work activities that could affect water pollution. The Water Pollution Control Schedule shall be updated by the Contractor to reflect changes in the Contractor's operations that would affect the necessary implementation of water pollution control practices.

The Contractor shall complete the "Construction Site BMPs Consideration Checklist" presented in the Preparation Manual and shall incorporate water pollution control practices into the SWPPP. Water pollution control practices include the "Minimum Requirements" and other Contractor-selected water pollution control practices from the "Construction Site BMPs Consideration Checklist" and the "Project-Specific Minimum Requirements" identified in the Water Pollution Control Cost Break-Down of this section.

Within 20 working days after the approval of the contract, the Contractor shall submit 3 copies of the draft SWPPP to the Engineer. The Engineer will have 10 working days to review the SWPPP. If revisions are required, as determined by the Engineer, the Contractor shall revise and resubmit the SWPPP within 10 working days of receipt of the Engineer's comments. The Engineer will have 5 working days to review the revisions. Upon the Engineer's approval of the SWPPP, 4 approved copies of the SWPPP, incorporating the required changes, shall be submitted to the Engineer. In order to allow construction activities to proceed, the Engineer may conditionally approve the SWPPP while minor revisions are being completed. In the event the Engineer fails to complete the review within the time allowed, and if, in the opinion of the Engineer, completion of

the work is delayed or interfered with by reason of the Engineer's delay in completing the review, the Contractor will be compensated for resulting losses, and an extension of time will be granted, in the same manner as provided for in Section 8-1.09, "Right of Way Delays," of the Standard Specifications.

The Contractor shall prepare an amendment to the SWPPP when there is a change in construction activities or operations which may affect the discharge of pollutants to surface waters, ground waters, municipal storm drain systems, or when the Contractor's activities or operations violate a condition of the Permits, or when directed by the Engineer. Amendments shall identify additional water pollution control practices or revised operations, including those areas or operations not identified in the initially approved SWPPP. Amendments to the SWPPP shall be prepared and submitted for review and approval within a time approved by the Engineer, but in no case longer than the time specified for the initial submittal and review of the SWPPP. At a minimum, the SWPPP shall be amended annually and submitted to the Engineer 25 days prior to the defined rainy season.

The Contractor shall keep one copy of the approved SWPPP and approved amendments at the project site. The SWPPP shall be made available upon request by a representative of the Regional Water Quality Control Board, State Water Resources Control Board, United States Environmental Protection Agency, or the local storm water management agency. Requests by the public shall be directed to the Engineer.

COST BREAK-DOWN

The Contractor shall include a Water Pollution Control Cost Break-Down in the SWPPP which itemizes the contract lump sum for water pollution control work. The Contractor shall use the Water Pollution Control Cost Break-Down provided in this section as the basis for the cost break-down submitted with the SWPPP. The Contractor shall use the Water Pollution Control Cost Break-Down to identify items, quantities and values for water pollution control work, excluding Temporary Water Pollution Control Practices for which there are separate bid items. The Contractor shall be responsible for the accuracy of the quantities and values used in the cost break-down submitted with the SWPPP. Partial payment for the item of water pollution control will not be made until the Water Pollution Control Cost Break-Down is approved by the Engineer.

Attention is directed to "Time-Related Overhead" of these special provisions regarding compensation for time-related overhead.

Line items indicated in the Water Pollution Control Cost Break-Down in this section with a specified Estimated Quantity shall be considered "Project-Specific Minimum Requirements." The Contractor shall incorporate Project-Specific Minimum Requirements with Contractor-designated quantities and values into the Water Pollution Control Cost Break-Down submitted with the SWPPP.

Line items indicated in the Water Pollution Control Cost Break-Down in this section without a specified Estimated Quantity shall be considered by the Contractor for selection to meet the applicable "Minimum Requirements" as defined in the Manuals, or for other water pollution control work as identified in the "Construction Site BMPs Consideration Checklist" presented in the Preparation Manual. In the Water Pollution Control Cost Break-Down submitted with the SWPPP, the Contractor shall list only those water pollution control practices selected for the project, including quantities and values required to complete the work for those items.

The sum of the amounts for the items of work listed in the Water Pollution Control Cost Break-Down shall be equal to the contract lump sum price bid for water pollution control. Overhead and profit, except for time-related overhead, shall be included in the individual items listed in the cost break-down.

WATER POLLUTION CONTROL COST BREAK-DOWN

Contract No. 11-256504

ITEM	ITEM DESCRIPTION	UNIT	ESTIMATED QUANTITY	VALUE	AMOUNT
SS-3	Hydraulic Mulch	M2			
SS-5	Soil Binders	M2			
SS-6	Straw Mulch	M2			
SS-7	Geotextiles, Plastic Covers & Erosion Control Blankets/Mats	M2			
SS-9	Earth Dikes/Drainage Swales & Lined Ditches	M			
SC-1	Silt Fence	M			
SC-4	Check Dam	EA			
SC-6	Gravel Bag Berm	M			
SC-8	Sandbag Barrier	M			
SC-9	Straw Bale Barrier	M			
WE-1	Wind Erosion Control	LS			
NS-1	Water Conservation Practices	LS			
NS-2	Dewatering Operations	EA			
NS-3	Paving and Grinding Operations	LS			
NS-6	Illicit Connection/Illegal Discharge Detection and Reporting	LS			
NS-7	Potable Water/Irrigation	LS			
NS-9	Vehicle and Equipment Fueling	LS			
NS-10	Vehicle and Equipment Maintenance	LS			
NS-12	Concrete Curing	LS			
NS-14	Concrete Finishing	LS			
WM-1	Material Delivery and Storage	LS			
WM-2	Material Use	LS			
WM-3	Stockpile Management	LS			
WM-4	Spill Prevention and Control	LS			
WM-5	Solid Waste Management	LS			
WM-6	Hazardous Waste Management	LS			
WM-7	Contaminated Soil Management	LS			
WM-9	Sanitary/Septic Waste Management	LS			

ITEM	ITEM DESCRIPTION	UNIT	ESTIMATED QUANTITY	VALUE	AMOUNT
WM-10	Liquid Waste Management	LS			

TOTAL _____

Adjustments in the items of work and quantities listed in the approved cost break-down shall be made when required to address amendments to the SWPPP, except when the adjusted items are paid for as extra work.

No adjustment in compensation will be made to the contract lump sum price paid for water pollution control due to differences between the quantities shown in the approved cost break-down and the quantities required to complete the work as shown on the approved SWPPP. No adjustment in compensation will be made for ordered changes to correct SWPPP work resulting from the Contractor's own operations or from the Contractor's negligence.

The approved cost break-down will be used to determine partial payments during the progress of the work and as the basis for calculating the adjustment in compensation for the item of water pollution control due to increases or decreases of quantities ordered by the Engineer. When an ordered change increases or decreases the quantities of an approved cost break-down item, the adjustment in compensation will be determined in the same manner specified for increases and decreases in the quantity of a contract item of work in conformance with the provisions in Section 4-1.03B, "Increased or Decreased Quantities," of the Standard Specifications. If an ordered change requires a new item which is not on the approved cost break-down, the adjustment in compensation will be determined in the same manner specified for extra work in conformance with Section 4-1.03D, "Extra Work," of the Standard Specifications.

If requested by the Contractor and approved by the Engineer, changes to the water pollution control practices listed in the approved cost break-down, including addition of new water pollution control practices, will be allowed. Changes shall be included in the approved amendment of the SWPPP. If the requested changes result in a net cost increase to the lump sum price for water pollution control, an adjustment in compensation will be made without change to the water pollution control item. The net cost increase to the water pollution control item will be paid for as extra work as provided in Section 4-1.03D, "Extra Work," of the Standard Specifications.

SWPPP IMPLEMENTATION

Unless otherwise specified, upon approval of the SWPPP, the Contractor shall be responsible throughout the duration of the project for installing, constructing, inspecting, maintaining, removing, and disposing of the water pollution control practices specified in the SWPPP and in the amendments. Unless otherwise directed by the Engineer, the Contractor's responsibility for SWPPP implementation shall continue throughout temporary suspensions of work ordered in conformance with the provisions in Section 8-1.05, "Temporary Suspension of Work," of the Standard Specifications. Requirements for installation, construction, inspection, maintenance, removal, and disposal of water pollution control practices shall conform to the requirements in the Manuals and these special provisions.

If the Contractor or the Engineer identifies a deficiency in the implementation of the approved SWPPP or amendments, the deficiency shall be corrected immediately unless requested by the Contractor and approved by the Engineer in writing, but shall be corrected prior to the onset of precipitation. If the Contractor fails to correct the identified deficiency by the date agreed or prior to the onset of precipitation, the project shall be in nonconformance with this section, "Water Pollution Control." Attention is directed to Section 5-1.01, "Authority of Engineer," of the Standard Specifications, and to "Retention of Funds" of this section for possible nonconformance penalties.

If the Contractor fails to conform to the provisions of this section, "Water Pollution Control," the Engineer may order the suspension of construction operations until the project complies with the requirements of this section.

Implementation of water pollution control practices may vary by season. The Construction Site BMPs Manual and these special provisions shall be followed for control practice selection of year-round, rainy season and non-rainy season water pollution control practices.

Year-Round Implementation Requirements

The Contractor shall have a year-round program for implementing, inspecting and maintaining water pollution control practices for wind erosion control, tracking control, non-storm water management, and waste management and materials pollution control.

The National Weather Service weather forecast shall be monitored and used by the Contractor on a daily basis. An alternative weather forecast proposed by the Contractor may be used if approved by the Engineer. If precipitation is predicted, the necessary water pollution control practices shall be deployed prior to the onset of the precipitation.

Disturbed soil areas shall be considered active whenever the soil disturbing activities have occurred, continue to occur or will occur during the ensuing 21 days. Non-active areas shall be protected as prescribed in the Construction Site BMPs Manual within 14 days of cessation of soil disturbing activities or prior to the onset of precipitation, whichever occurs first.

Rainy Season Implementation Requirements

Soil stabilization and sediment control practices shall be provided throughout the rainy season, defined as between October 1 and May 1.

An implementation schedule of required soil stabilization and sediment control practices for disturbed soil areas shall be completed no later than 20 days prior to the beginning of each rainy season. The implementation schedule shall identify the

soil stabilization and sediment control practices and the dates when the implementation will be 25 percent, 50 percent and 100 percent complete, respectively. For construction activities beginning during the rainy season, the Contractor shall implement applicable soil stabilization and sediment control practices.

Throughout the defined rainy season, the active disturbed soil area of the project site shall be not more than 1.7 hectares. The Engineer may approve, on a case-by-case basis, expansions of the active disturbed soil area limit. Soil stabilization and sediment control materials shall be maintained on site sufficient to protect disturbed soil areas. A detailed plan for the mobilization of sufficient labor and equipment shall be maintained to deploy the water pollution control practices required to protect disturbed soil areas prior to the onset of precipitation.

Non-Rainy Season Implementation Requirements

The non-rainy season shall be defined as days outside the defined rainy season. The Contractor's attention is directed to the Construction Site BMPs Manual for soil stabilization and sediment control implementation requirements on disturbed soil areas during the non-rainy season. Disturbed soil areas within the project shall be protected in conformance with the requirements in the Construction Site BMPs Manual with an effective combination of soil stabilization and sediment control.

MAINTENANCE

To ensure the proper implementation and functioning of water pollution control practices, the Contractor shall regularly inspect and maintain the construction site for the water pollution control practices identified in the SWPPP. The construction site shall be inspected by the Contractor as follows:

A. Prior to a forecast storm.
B. After a precipitation event which causes site runoff.
C. At 24 hour intervals during extended precipitation events.
D. Routinely, a minimum of once every two weeks outside of the defined rainy season.
E. Routinely, a minimum of once every week during the defined rainy season.

The Contractor shall use the Storm Water Quality Construction Site Inspection Checklist provided in the Preparation Manual or an alternative inspection checklist provided by the Engineer. One copy of each site inspection record shall be submitted to the Engineer within 24 hours of completing the inspection.

REPORTING REQUIREMENTS

Report of Discharges, Notices or Orders

If the Contractor identifies discharges into surface waters or drainage systems in a manner causing, or potentially causing, a condition of pollution, or if the project receives a written notice or order from a regulatory agency, the Contractor shall immediately inform the Engineer. The Contractor shall submit a written report to the Engineer within 3 days of the discharge event, notice or order. The report shall include the following information:

A. The date, time, location, nature of the operation, type and quantity of discharge, including the cause or nature of the notice or order.
B. The water pollution control practices deployed before the discharge event, or prior to receiving the notice or order.
C. The date of deployment and type of water pollution control practices deployed after the discharge event, or after receiving the notice or order, including additional measures installed or planned to reduce or prevent reoccurrence.
D. An implementation and maintenance schedule for affected water pollution control practices.

Report of First-Time Non-Storm Water Discharge

The Contractor shall notify the Engineer at least 3 days in advance of first-time non-storm water discharge events, excluding exempted discharges. The Contractor shall notify the Engineer of the operations causing non-storm water discharges and shall obtain field approval for first-time non-storm water discharges. Non-storm water discharges shall be monitored at first-time occurrences and routinely thereafter.

Annual Certifications

By June 15 of each year, the Contractor shall complete and submit an Annual Certification of Compliance, as contained in the Preparation Manual, to the Engineer.

WATER POLLUTION CONTROL TRAINING

The Contractor's management and supervisory personnel along with workers involved with the placement and maintenance of non-storm and storm water pollution prevention "Best Management Practices" shall be trained on general non-storm and storm water pollution control requirements consistent with the "Construction Site Best Management Practices (BMPs) Manual". The training is to be provided by the Contractor. The amount of training provided should be commensurate with the job performed by the employee.

SAMPLING AND ANALYTICAL REQUIREMENTS

The Contractor is required to implement specific sampling and analytical procedures to determine whether BMPs implemented on the construction site are:

A. preventing pollutants that are known or should be known by permittees to occur on construction sites that are not visually detectable in storm water discharges, to cause or contribute to exceedances of water quality objectives.

Non-Visible Pollutants

The project has the potential to discharge non-visible pollutants in storm water from the construction site. The project SWPPP shall contain a Sampling and Analysis Plan (SAP) that describes the sampling and analysis strategy and schedule to be implemented on the project for monitoring non-visible pollutants in conformance with this section.

The SAP shall identify potential non-visible pollutants that are known or should be known to occur on the construction site associated with the following: (1) construction materials, wastes or operations; (2) known existing contamination due to historical site usage; or (3) application of soil amendments, including soil stabilization products, with the potential to alter pH or contribute toxic pollutants to storm water. Planned material and waste storage areas, locations of known existing contamination, and areas planned for application of soil amendments shall be shown on the SWPPP Water Pollution Control Drawings.

The SAP shall identify a sampling schedule for collecting a sample down gradient from the applicable non-visible pollutant source and a sufficiently large uncontaminated control sample during the first two hours of discharge from rain events during daylight hours which result in a sufficient discharge for sample collection. If run-on occurs onto the non-visible pollutant source, a run-on sample that is immediately down gradient of the run-on to the Department's right of way shall be collected. A minimum of 72 hours of dry weather shall occur between rain events to distinguish separate rain events.

The SAP shall state that water quality sampling will be triggered when any of the following conditions are observed during the required storm water inspections conducted before or during a rain event:

A. Materials or wastes containing potential non-visible pollutants are not stored under watertight conditions.
B. Materials or wastes containing potential non-visible pollutants are stored under watertight conditions, but (1) a breach, leakage, malfunction, or spill is observed; and (2) the leak or spill has not been cleaned up prior to the rain event; and (3) there is the potential for discharge of non-visible pollutants to surface waters or drainage system.
C. Construction activities, such as application of fertilizer, pesticide, herbicide, methyl methacrylate concrete sealant, or non-pigmented curing compound have occurred during a rain event or within 24 hours preceding a rain event, and there is the potential for discharge of pollutants to surface waters or drainage system.
D. Soil amendments, including soil stabilization products, with the potential to alter pH levels or contribute toxic pollutants to storm water runoff have been applied, and there is the potential for discharge of pollutants to surface waters or drainage system (unless independent test data are available that demonstrate acceptable concentration levels of non-visible pollutants in the soil amendment).
E. Storm water runoff from an area contaminated by historical usage of the site is observed to combine with storm water, and there is the potential for discharge of pollutants to surface waters or drainage system.

The SAP shall identify sampling locations for collecting down gradient and control samples, and the rationale for their selection. The control sampling location shall be selected where the sample does not come into contact with materials, wastes or areas associated with potential non-visible pollutants or disturbed soil areas. Sampling locations shall be shown on the SWPPP Water Pollution Control Drawings. Only trained personnel shall collect water quality samples and be identified in the SAP. Qualifications of designated sampling personnel shall describe training and experience, and shall be included in the SWPPP. The SAP shall state monitoring preparation, sample collection procedures, quality assurance/quality control, sample labeling procedures, sample collection documentation, sample shipping and chain of custody procedures, sample numbering system, and reference the construction site health and safety plan.

The SAP shall identify the analytical method to be used for analyzing down gradient and control samples for potential non-visible pollutants on the project. For samples analyzed in the field by sampling personnel, collection, analysis, and equipment calibration shall be in conformance with the Manufacturer's specifications. For samples that will be analyzed by a

laboratory, sampling, preservation, and analysis shall be performed by a State-certified laboratory in conformance with 40 CFR 136. The SAP shall identify the specific State-certified laboratory, sample containers, preservation requirements, holding times, and analysis method to be used. A list of State-certified laboratories that are approved by the Department is available at the following internet site: http://www.dhs.ca.gov/ps/ls/elap/html/lablist_county.htm.

Analytical Results and Evaluation

The Contractor shall submit a hard copy and electronic copy of water quality analytical results and quality assurance/quality control data to the Engineer within 5 days of sampling for field analyses and within 30 days for laboratory analyses. Analytical results shall be accompanied by an evaluation from the Contractor to determine if down gradient samples show elevated levels of the tested parameter relative to levels in the control sample. If down gradient or downstream samples, as applicable, show increased levels, the Contractor will assess the BMPs, site conditions, and surrounding influences to determine the probable cause for the increase. As determined by the assessment, the Contractor will repair or modify BMPs to address increases and amend the SWPPP as necessary. Electronic results (in one of the following file formats: .xls, .txt, .csv, .dbs, or .mdb) shall have at a minimum the following information: sample identification number, contract number, constituent, reported value, method reference, method detection limit, and reported detection limit. The Contractor shall document sample collection during rain events.

Water quality sampling documentation and analytical results shall be maintained with the SWPPP on the project site until a Notice of Completion has been submitted and approved.

If construction activities or knowledge of site conditions change, such that discharges or sampling locations change, the Contractor shall amend the SAP in conformance with this section, "Water Pollution Control."

PAYMENT

The contract lump sum price paid for prepare storm water pollution prevention plan shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals for doing all the work involved in developing, preparing, obtaining approval of, revising, and amending the SWPPP, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

Full compensation for water pollution control training shall be considered as included in the contract lump sum price paid for prepare storm water pollution prevention plan, and no additional compensation will be allowed therefor.

Attention is directed to Section 9-1.06, "Partial Payments," and Section 9-1.07, "Payment After Acceptance," of the Standard Specifications. Payments for prepare storm water pollution prevention plan will be made as follows:

A. After the SWPPP has been approved by the Engineer, 75 percent of the contract item price for prepare storm water pollution prevention plan will be included in the monthly partial payment estimate.
B. After acceptance of the contract in conformance with the provisions in Section 7-1.17, "Acceptance of Contract," of the Standard Specifications, payment for the remaining 25 percent of the contract item price for prepare storm water pollution prevention plan will be made in conformance with the provisions in Section 9-1.07.

The contract lump sum price paid for water pollution control shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in installing, constructing, removing, and disposing of water pollution control practices, including non-storm water management, and waste management and materials pollution water pollution control practices, except those for which there is a contract item of work as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

Storm water sampling and analysis will be paid for as extra work as provided in Section 4-1.03D, "Extra Work," of the Standard Specifications. No payment will be made for the preparation, collection, analysis, and reporting of storm water samples required where appropriate BMPs are not implemented prior to a rain event, or if a failure of a BMP is not corrected prior to a rain event.

For items identified on the approved Water Pollution Control Cost Break-Down, the cost of maintaining the temporary water pollution control practices shall be divided equally by the State and the Contractor as follows:

Soil Stabilization

Temporary water pollution control practices except:
SS-1 Scheduling
SS-2 Preservation of Existing Vegetation

Sediment Control

Temporary water pollution control practices

Wind Erosion Control

No sharing of maintenance costs will be allowed.

Non-Storm Water Management

No sharing of maintenance costs will be allowed.

Waste Management & Materials Pollution Control

No sharing of maintenance costs will be allowed.

The division of cost will be made by determining the cost of maintaining water pollution control practices in conformance with the provisions in Section 9-1.03, "Force Account Payment," of the Standard Specifications and paying to the Contractor one-half of that cost. Cleanup, repair, removal, disposal, improper installation, and replacement of water pollution control practices damaged by the Contractor's negligence, shall not be considered as included in the cost for performing maintenance.

The provisions for sharing maintenance costs shall not relieve the Contractor from the responsibility for providing appropriate maintenance on items with no shared maintenance costs.

Full compensation for non-shared maintenance costs of water pollution control practices, as specified in this section, "Water Pollution Control," shall be considered as included in the contract lump sum price paid for water pollution control and no additional compensation will be allowed therefor.

Water pollution control practices for which there is a contract item of work, will be measured and paid for as that contract item of work.

10-1.04 TEMPORARY EROSION CONTROL

Temporary erosion control shall conform to the provisions for erosion control in Section 20-3, "Erosion Control," of the Standard Specifications and these special provisions.

Temporary erosion control shall be furnished, applied, maintained, and later removed at locations shown on the approved Storm Water Pollution Prevention Plan in conformance with "Water Pollution Control" of these special provisions, and in conformance with details shown on the plans and these special provisions.

Temporary erosion control work shall consist of applying erosion control materials to embankment slopes, excavation slopes and other areas designated on the plans. Temporary erosion control work shall be completed in the designated areas during the period starting October 1 and ending May 1, or within 14 days after an area becomes inactive during this period as defined in "Water Pollution Control" of these special provisions.

Temporary erosion control shall be used as water pollution control practices for soil stabilization. The Storm Water Pollution Prevention Plan shall include the use of temporary erosion.

Temporary erosion control shall be applied when an area is ready to receive temporary erosion control as determined by the Engineer and in conformance with the provisions in "Move-in/Move-out (Temporary Erosion Control)" of these special provisions.

MATERIALS

Materials shall conform to the provisions in Section 20-2, "Materials," of the Standard Specifications and these special provisions.

Stabilizing Emulsion

Stabilizing emulsion shall conform to the provisions in Section 20-2.11, "Stabilizing Emulsion," of the Standard Specifications and these special provisions. The requirement of an effective life of at least one year for stabilizing emulsion shall not apply. Stabilizing emulsion shall be in a dry powder form, may be reemulsifiable, and shall be a processed organic adhesive.

APPLICATION

Temporary erosion control materials shall be applied in one separate application in the following sequence:

A. The following mixture in the proportions indicated shall be applied with hydro-seeding equipment:

Material	Kilograms Per Hectare (Slope Measurement)
Fiber	3000
Stabilizing Emulsion (solids)	200

B. The ratio of total water to total stabilizing emulsion in the mixture shall be as recommended by the manufacturer.

MAINTENANCE

Temporary erosion control shall be reapplied on the same day the damage occurs. Temporary erosion control shall be reapplied when the area treated with temporary erosion control becomes exposed or exhibits visible erosion.

REMOVAL

Temporary erosion control shall be removed. Removal shall consist of mechanically incorporating the temporary erosion control into the soil with tracklaying equipment, disking, or other methods approved by the Engineer.

MEASUREMENT AND PAYMENT

Temporary erosion control work will be measured by the square meter or hectare, whichever is designated in the Engineer's Estimate. The quantity of temporary erosion control to be paid for by the square meter or hectare will be calculated on the basis of actual or computed slope measurements.

The contract price paid per square meter or hectare for temporary erosion control shall include full compensation for furnishing all labor, (except maintenance), materials, tools, equipment, and incidentals, and for doing all the work involved in temporary erosion control, complete in place, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

Temporary erosion control disturbed or displaced by the Contractor’s vehicles, equipment, or operations shall be reapplied at the Contractor's expense.

The cost of maintaining the temporary erosion control will be borne equally by the State and the Contractor.

The division of cost will be made by determining the cost of maintaining temporary erosion control in conformance with the provisions in Section 9-1.03, "Force Account Payment," of the Standard Specifications and paying to the Contractor one-half of that cost. Clean-up, repair, removal, disposal, replacement because of improper installation, and replacement of temporary erosion control damaged as a result of the Contractor's negligence will not be considered as included in the cost for performing maintenance.

Cleanup, repair, removal, disposal, or replacement of temporary erosion control due to improper installation or the Contractor's negligence will not be considered as included in the cost for performing maintenance.

10-1.05 STREET SWEEPING

Street sweeping shall be conducted where sediment is tracked from the project site onto paved roads, as described in the approved Storm Water Pollution Prevention Plan in accordance with "Water Pollution Control" of these special provisions, and as directed by the Engineer.

Street sweeping shall be one of the water pollution control practices for sediment control. The Storm Water Pollution Prevention Plan shall include the use of street sweeping. Street sweeping shall be performed in accordance with Section 4, SC—7 in the Construction Site Best Management Practices Manual of the Caltrans Storm Water Quality Handbooks.

The number of street sweepers shall be as designated in the approved Storm Water Pollution Prevention Plan. The Contractor shall maintain at least one sweeper on the project site at all times in good working condition during the period that sweeping work is required. Sweepers shall be self-loading, motorized, and shall have spray nozzles. Sweepers may include a vacuum apparatus.

Street sweeping shall commence at the beginning of clearing and grubbing and shall continue until completion of the project, or as directed by the Engineer. Street sweeping shall be performed immediately after soil disturbing activities occur or offsite tracking of material is observed. Street sweeping shall be performed so that dust is minimized. If dust generation is excessive or sediment pickup is ineffective as determined by the Engineer, the use of water or a vacuum will be required.

At the option of the Contractor, collected material may be temporarily stockpiled in accordance with the approved Storm Water Pollution Prevention Plan. Collected material shall be disposed of at least once per week.

Material collected during street sweeping operations shall be disposed of in conformance with Section 7—1.13, "Disposal of Material Outside The Highway Right Of Way,” of the Standard Specifications.

MEASUREMENT AND PAYMENT

The contract lump sum price paid for street sweeping shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals and for doing all the work involved in street sweeping, including disposal of collected material, as shown on the plans, as specified in the Standard Specifications, these special provisions, and as directed by the Engineer.

The costs involved in providing street sweeping in addition to that required in the approved Storm Water Pollution Prevention Plan and this section will be borne equally by the State and the Contractor. The division of cost will be made by determining the cost of providing street sweeping in conformance with the provisions in Section 9-1.03, "Force Account Payment," of the Standard Specifications, and paying to the Contractor one-half of that cost.

10-1.06 TEMPORARY INLETS

Temporary inlets shall be furnished, installed, maintained, and later removed as shown on the plans, as specified in these special provisions and as directed by the Engineer.

The type of temporary inlet to be installed at each location shall be at the option of the Contractor; however, the inlet shall be capable of sustaining the intended load and of discharging a quantity of water equivalent to the type and size of inlet shown on the plans. Adequacy as to equivalent strength and capacity shall be subject to approval, in writing, by the Engineer.

Used materials may be installed provided the used materials are good, sound and are suitable for the purpose intended, as determined by the Engineer.

Temporary inlets that are damaged from any cause during the progress of the work shall be repaired or replaced by the Contractor at the Contractor's expense.

When no longer required for the work as determined by the Engineer, temporary inlets shall be removed. Removed facilities shall become the property of the Contractor and shall be removed from the site of the work, except as otherwise provided in this section.

Temporary inlet will be measured by the unit as determined from actual count in place. The temporary inlet will be measured one time only and no additional measurement will be recognized.

The contract unit price paid for temporary inlet shall include full compensation for furnishing all labor, materials, tools, equipment and incidentals, and for doing all the work involved in temporary inlet, complete in place, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

Full compensation for maintaining, removing and disposing of temporary inlets shall be considered as included in the contract unit prices paid for temporary inlets and no additional compensation will be allowed therefor.

10-1.07 TEMPORARY CONCRETE WASHOUT FACILITY

Temporary concrete washout facilities shall be constructed, maintained, and later removed at the locations shown on the approved Storm Water Pollution Prevention Plan in conformance with "Water Pollution Control" of these special provisions, and in conformance with details shown on the plans and these special provisions.

Temporary concrete washout facilities shall be one of the water pollution control practices for waste management and materials pollution control. The Storm Water Pollution Prevention Plan shall include the use of temporary concrete washout facilities.

MATERIALS

Plastic Liner

Plastic liners shall be single ply, new polyethylene sheeting, a minimum of 0.25-mm thick and shall be free of holes, punctures, tears or other defects that compromise the impermeability of the material. Plastic liners shall not have seams or overlapping joints.

Gravel-filled Bags

Gravel bag fabric shall be nonwoven polypropylene geotextile (or comparable polymer) and shall conform to the following requirements:

Specification	Requirements
Mass per unit area, grams per square meter, min. ASTM Designation: D 5261	270
Grab tensile strength (25-mm grip), kilonewtons, min. ASTM Designation: D4632*	0.89
Ultraviolet stability, percent tensile strength retained after 500 hours, ASTM Designation: D4355, xenon arc lamp method	70

* or appropriate test method for specific polymer

Gravel bags shall be between 600 mm and 800 mm in length, and between 400 mm and 500 mm in width.

Yarn used for binding gravel bags shall be as recommended by the manufacturer or bag supplier and shall be of a contrasting color.

Gravel shall be between 10 mm and 20 mm in diameter, and shall be clean and free from clay balls, organic matter, and other deleterious materials.

The opening of gravel-filled bags shall be secured to prevent gravel from escaping. Gravel-filled bags shall be between 13 kg and 22 kg in mass.

Straw Bales

Straw for straw bales shall conform to the provisions in Section 20-2.06, "Straw," of the Standard Specifications.

Straw bales shall be a minimum of 360 mm in width, 450 mm in height, 900 mm in length and shall have a minimum mass of 23 kg. The straw bale shall be composed entirely of vegetative matter, except for binding material.

Straw bales shall be bound by either wire, nylon or polypropylene string. Jute or cotton binding shall not be used. Baling wire shall be a minimum 1.57 mm in diameter. Nylon or polypropylene string shall be approximately 2 mm in diameter with 360 N of breaking strength.

Stakes

Stakes shall be wood or metal. Wood stakes shall be untreated fir, redwood, cedar, or pine and cut from sound timber. They shall be straight and free of loose or unsound knots or other defects which would render them unfit for the purpose intended. Wood stakes shall be a minimum 50 mm x 50 mm in size. Metal stakes may be used as an alternative, and shall be a minimum 13 mm in diameter. Stakes shall be a minimum 1.2 m in length. The tops of the metal stakes shall be bent at a 90-degree angle or capped with an orange or red plastic safety cap that fits snugly to the metal stake. The Contractor shall submit a sample of the metal stake and plastic cap, if used, for the Engineer's approval prior to installation.

Staples

Staples shall be as shown on the plans. An alternative attachment device such as geotextile pins or plastic pegs may be used instead of staples. The Contractor shall submit a sample of the alternative attachment device for the Engineer's approval prior to installation.

Signs

Wood posts for signs shall conform to the provisions in Section 56-2.02B, "Wood Posts," of the Standard Specifications. Lag screws shall conform to the provisions in Section 56-2.02D, "Sign Panel Fastening Hardware," of the Standard Specifications.

Plywood shall be freshly painted for each installation with not less than 2 applications of flat white paint. Sign letters shown on the plans shall be stenciled with commercial quality exterior black paint. Testing of paint will not be required.

INSTALLATION

Temporary concrete washout facilities shall be as follows:

A. Temporary concrete washout facilities shall be installed prior to beginning placement of concrete and located a minimum of 15 m from storm drain inlets, open drainage facilities, and water courses unless determined infeasible by the Engineer. Temporary concrete washout facilities shall be located away from construction traffic or access areas at a location determined by the Contractor and approved by the Engineer.
B. A sign shall be installed adjacent to each washout facility at a location determined by the Contractor and approved by the Engineer. Signs shall be installed in conformance with the provisions in Section 56-2.03, "Construction," and Section 56-2.04, "Sign Panel Installation," of the Standard Specifications.
C. The length and width of a temporary concrete washout facility may be increased from the minimum dimensions shown on the plans, at the Contractor's expense and upon approval of the Engineer.

D. Temporary concrete washout facilities shall be constructed in sufficient quantity and size to contain liquid and concrete waste generated by washout operations for concrete wastes. These facilities shall be constructed to contain liquid and concrete waste without seepage, spills, or overflow.
E. Berms for below grade temporary concrete washout facilities shall be constructed from compacted native material. Gravel may be used in conjunction with compacted native material.
F. A plastic liner shall be installed in below grade temporary concrete washout facilities.

Details for an alternative temporary concrete washout facility shall be submitted to the Engineer for approval at least 7 days prior to installation.

When temporary concrete washout facilities are no longer required for the work, as determined by the Engineer, the hardened concrete and liquid residue shall be removed and disposed of in conformance with the provisions in Section 15-3.02, "Removal Methods," of the Standard Specifications. Temporary concrete washout facilities shall be disposed of in conformance with the provisions in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications.

Ground disturbance, including holes and depressions, caused by the installation and removal of the temporary concrete washout facilities shall be backfilled and repaired in conformance with the provisions in Section 15-1.02, "Preservation of Property," of the Standard Specifications.

MAINTENANCE

Temporary concrete washout facilities shall be maintained to provide adequate holding capacity with a minimum freeboard of 300 mm. Maintaining temporary concrete washout facilities shall include removing and disposing of hardened concrete and returning the facilities to a functional condition. Hardened concrete materials shall be removed and disposed of in conformance with the provisions in Section 15-3.02, "Removal Methods," of the Standard Specifications. Holes, rips, and voids in the plastic liner shall be patched and repaired by taping or the plastic liner shall be replaced. The plastic liner shall be replaced when patches or repairs compromise the impermeability of the material as determined by the Engineer.

Gravel bags shall be replaced when the bag material is ruptured or when the yarn has failed, allowing the bag contents to spill out.

Temporary concrete washout facilities shall be repaired or replaced on the same day the damage occurs. Damage to temporary concrete washout facilities resulting from the Contractor's vehicles, equipment, or operations shall be repaired at the Contractor’s expense.

MEASUREMENT AND PAYMENT

Quantities of temporary concrete washout facilities will be measured as units determined from actual count in place.

The contract unit price paid for temporary concrete washout facility shall include full compensation for furnishing all labor, materials, tools, equipment and incidentals, and for doing all the work involved in constructing a temporary concrete washout facility, complete in place, including excavation and backfill, maintenance, and removal, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

10-1.08 TEMPORARY CONCRETE WASHOUT (PORTABLE)

A portable temporary concrete washout shall be furnished, maintained, and removed as specified in the approved Storm Water Pollution Prevention Plan in conformance with "Water Pollution Control" of these special provisions and as directed by the Engineer.

A portable temporary concrete washout shall consist of a commercially available drum at a minimum size of 208-liter or alternate container upon written approval from the Engineer. The drum shall be stenciled "Concrete Waste Material." The letters shall be black and 100 mm in height on a white background. The top of the stenciling shall be 300 mm from the top of the barrel.

PLACEMENT

A portable temporary concrete washout shall be as follows:

A. A portable temporary concrete washout shall be in place prior to placement of concrete and shall be located in the immediate area of the concrete work as approved by the Engineer. The temporary concrete washout shall be located away from construction traffic or public access areas. After initial placement, temporary concrete washout shall be moved as needed for concrete construction work. When the temporary concrete washout is no longer required, as determined by the Engineer, it shall be removed and disposed of in conformance with the provisions in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications.

B. A sign shall be installed adjacent to each washout at a location determined by the Contractor and approved by the Engineer. Signs shall be installed in conformance with the provisions in Section 12-3.06B, "Portable Signs" of the Standard Specifications. Each portable sign shall consist of a base, framework and a sign panel. The sign panel shall be made out of plywood and shall have a minimum size of 610 mm by 1200 mm. The sign panel shall read "Concrete Washout" with black letters, 150 mm in height, on a white background.
C. The Contractor shall provide sufficient temporary concrete washout capacity to contain liquid and concrete waste generated by washout operations without seepage or spills.

Maintaining the portable temporary concrete washout shall include removing and disposing of concrete waste. Concrete waste material generated shall be removed each day and disposed of in conformance with the provisions in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way" of the Standard Specifications.

The Contractor shall provide the name and location of the disposal facility to the Engineer before disposal of solid and liquid concrete waste. The Contractor shall provide verification that the off-site commercial or noncommercial disposal site has a permit issued by the California Regional Water Quality Control Board (RWQCB). If the disposal site is located outside of the State of California, the Contractor shall provide a copy of the permit issued by the state or local agency having jurisdiction over the disposal site.

When relocating or transporting a portable temporary concrete washout, the portable washout shall be properly secured to prevent spilling of concrete waste material.

PAYMENT

The contract lump sum price paid for temporary concrete washout (portable) shall include full compensation for furnishing all labor, materials, tools, equipment, including the sign, and incidentals, and for doing all the work involved in furnishing, placing, maintaining, repairing, replacing, transporting, disposing of concrete waste, and removing the washout, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

10-1.09 TEMPORARY FIBER ROLL

Temporary fiber roll shall be furnished, installed, maintained, and later removed at the locations shown on the approved Storm Water Pollution Prevention Plan in conformance with "Water Pollution Control" of these special provisions, and in conformance with details shown on the plans and these special provisions.

Temporary fiber roll shall be installed on excavation and embankment slopes and other disturbed soil areas, active or nonactive.

Temporary fiber roll shall be one of the water pollution control practices for sediment control. The Storm Water Pollution Prevention Plan shall include the use of temporary fiber roll.

At the option of the Contractor, temporary fiber roll shall be installation Type 1 or Type 2.

MATERIALS

Fiber Roll

Fiber roll shall be either:

A. Constructed with a premanufactured blanket consisting of either wood excelsior, rice or wheat straw, or coconut fibers or a combination of these materials. The blanket shall be between 2.0 m and 2.4 m in width and between 20 m and 29 m in length. Wood excelsior shall be individual fibers, of which 80 percent shall be 150 mm or longer in length. The blanket shall have a photodegradable plastic netting or biodegradable jute, sisal, or coir fiber netting on at least one side. The blanket shall be rolled along the width and secured with jute twine spaced 2 m apart along the full length of the roll and placed 150 mm from the ends of each roll. The finished roll shall be between 200 mm and 250 mm in diameter, a minimum of 6 m in length, and shall weigh a minimum 0.81-kg/m. More than one blanket may be required to achieve the finished roll diameter. When more than one blanket is required, blankets shall be jointed longitudinally with an overlap of 150 mm along the length of the blanket.
B. A premanufactured roll of rice or wheat straw, wood excelsior, or coconut fiber encapsulated within a photodegradable plastic or biodegradable jute, sisal, or coir fiber netting. The netting shall have a minimum durability of one year after installation. The netting shall be secured tightly at each end of the roll. Rolls shall be between 200 mm and 300 mm in diameter. Rolls between 200 mm and 250 mm in diameter shall have a minimum weight of 1.6 kg/m and a minimum length of 6 m. Rolls between 250 mm and 300 mm in diameter shall have a minimum weight of 4.5 kg/m and a minimum length of 3 m.

Stakes

Wood stakes shall be a minimum of 19 mm x 19 mm in size for Type 1 installation, or a minimum of 19 mm x 38 mm in size for Type 2 installation, and sufficient length as shown on detail. Stakes shall be driven to a maximum of 50 mm above, or flush with the top of the roll. Wood stakes shall be untreated fir, redwood, cedar, or pine and cut from sound timber. They shall be straight and free of loose or unsound knots and other defects which would render them unfit for the purpose intended. Metal stakes shall not be used.

Rope

Rope shall be biodegradable, such as sisal or manila, with a minimum diameter of 6.35 mm.

INSTALLATION

Temporary fiber roll shall be installed as follows:

A. Temporary fiber roll installation (Type 1): Furrows shall be constructed to a depth between 50 mm and 100 mm, and to a sufficient width to hold the fiber roll. Stakes shall be installed 1.2 m apart along the length of the fiber rolls and stopped at 300 mm from each end of the rolls. Stakes shall be driven to a maximum of 50 mm above, or flush with the top of the roll.
B. Temporary fiber roll installation (Type 2): Rope and notched stakes shall be used to restrain the fiber rolls against the slope. Stakes shall be installed 600 mm apart along the length of the fiber rolls and stopped at 300 mm from each end of the rolls. Stakes shall be driven into the slope until the notch is even with the top of the fiber roll. Rope shall be knotted at each stake and laced between stakes. After installation of the rope, stakes shall be driven into the slope such that the rope will hold the fiber roll tightly to the slope. Furrows will not be required.
C. Temporary fiber rolls shall be installed as shown on the plans.
D. The bedding area for the fiber roll shall be cleared of obstructions including rocks, clods, and debris greater than 25 mm in diameter before installation.
E. Temporary fiber rolls shall be installed approximately parallel to the slope contour.
F. Temporary fiber rolls shall be installed before the application of other temporary erosion control or soil stabilization materials in the same area.

When no longer required, as determined by the Engineer, temporary fiber rolls shall be removed and disposed of in conformance with the provisions in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications. Temporary fiber rolls may be abandoned in place when approved in writing by the Engineer.

Ground disturbances including holes and depressions caused by the installation and removal of the temporary fiber roll shall be backfilled and repaired in conformance with the provisions in Section 15-1.02, "Preservation of Property," of the Standard Specifications.

MAINTENANCE

Temporary fiber rolls shall be maintained to disperse concentrated water runoff and to reduce runoff velocities. Split, torn, or unraveling rolls shall be repaired or replaced. Broken or split stakes shall be replaced. Sagging or slumping fiber rolls shall be repaired with additional stakes or replaced. Locations where rills and other evidence of concentrated runoff have occurred beneath the rolls shall be corrected. Temporary fiber rolls shall be repaired or replaced within 24 hours of identifying the deficiency.

MEASUREMENT AND PAYMENT

Quantities of temporary fiber rolls to be paid for will be determined by the meter measured along the centerline of the installed roll. Where temporary fiber rolls are joined and overlapped, the overlap will be measured as a single installed roll.

The contract price paid per meter for temporary fiber roll shall include full compensation for furnishing all labor, (except maintenance), materials, tools, equipment, and incidentals, and for doing all the work involved in installing temporary fiber rolls, complete in place, including furrow excavation and backfill, and removal, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

Damage to temporary fiber rolls resulting from the Contractor's vehicles, equipment, or operations shall be repaired at the Contractor's expense.

The cost of maintaining temporary fiber rolls will be borne equally by the State and the Contractor. The division of cost will be made by determining the cost of maintaining temporary fiber rolls in conformance with the provisions in Section 9-1.03, "Force Account Payment," of the Standard Specifications and paying half of that cost to the Contractor.

Cleanup, repair, removal, disposal, or replacement due to improper installation or the Contractor's negligence will not be considered as included in the cost for performing maintenance.

10-1.10 TEMPORARY FENCE (TYPE ESA)

Temporary fence (Type ESA) shall be furnished, installed, maintained, and later removed in conformance with the details shown on the plans, as specified in these special provisions and as directed by the Engineer.

MATERIALS

Used materials may be installed provided the used materials conform to these special provisions. Materials for temporary fence (Type ESA) shall conform to the following:

High Visibility Fabric

High visibility fabric shall be machine produced, orange colored mesh manufactured from polypropylene or polyethylene. High visibility fabric may be made of recycled materials. Materials shall not contain biodegradable filler materials that can degrade the physical or chemical characteristics of the finished fabric. High visibility fabric shall be fully stabilized ultraviolet resistant, shall be a minimum of 1.22 m in width with a maximum mesh opening of 50 mm x 50 mm. High visibility fabric shall be furnished in one continuous width and shall not be spliced to conform to the specified width dimension.

Posts

Posts for temporary fence (Type ESA) shall be of one of the following:

A. Wood posts shall be fir or pine, shall have a minimum cross section of 50 mm x 50 mm, and a minimum length of 1.6 m. The end of the post to be embedded in the soil shall be pointed. Wood posts shall not be treated with wood preservative.
B. Steel posts shall have a "U", "T", "L" or other cross sectional shape that resists failure by lateral loads. Steel posts shall have a minimum mass per length of 1.1 kg/m and a minimum length of 1.6 m. One end of the steel post shall be pointed and the other end shall have a high visibility colored top.

Fasteners

Fasteners for attaching high visibility fabric to the posts shall be as follows:

A. The high visibility fabric shall be attached to wooden posts with commercial quality nails or staples, or as recommended by the manufacturer or supplier.
B. Tie wire or locking plastic fasteners shall be used for attaching the high visibility fabric to steel posts. Maximum spacing of tie wire or fasteners shall be 600 mm along the length of the steel post.

Signs

The sign legend and dimensions shall be as shown on the plans. The sign shall be weatherproof and fade-proof and may include plastic laminated printed paper affixed to an inflexible weatherproof backer board. The sign panel shall be affixed to the high visibility fabric with tie wire or locking plastic fasteners. The top of the sign panel shall be flush with the top of the high visibility fabric. Sign panels shall be placed at 30 m apart along the length of the temporary fence (Type ESA), and at each end of the fence.

INSTALLATION

Temporary fence (Type ESA) shall be installed as follows:

A. All fence construction activities shall be conducted from outside the ESA as shown on the plans or as staked.
B. Posts shall be embedded in the soil a minimum of 380 mm. Post spacing shall be 2.5 m maximum from center to center and shall at all times support the fence in a vertical position.
C. Temporary fence (Type ESA) shall be constructed prior to clearing and grubbing work, shall enclose the foliage canopy (drip line) of protected plants, and shall not encroach upon visible roots of the plants.

When Type ESA temporary fence is no longer required, as determined by the Engineer, the temporary fence shall become the property of the Contractor and shall be removed and disposed of in conformance with the provisions in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications, except when reused as provided in this section.

Holes caused by the removal of temporary fence (Type ESA) shall be backfilled in conformance with the provisions in Section 15-1.02, "Preservation of Property," of the Standard Specifications.

MAINTENANCE

Temporary fence (Type ESA) that is damaged during the progress of the work shall be repaired or replaced by the Contractor the same day the damage occurs.

MEASUREMENT AND PAYMENT

Temporary fence (Type ESA) shall be measured and paid for in the same manner specified for permanent fence as provided in Section 80, "Fences," of the Standard Specifications.

Full compensation for maintaining, removing, and disposing of temporary fence (Type ESA) shall be considered as included in the contract price paid per meter for temporary fence (Type ESA) and no additional compensation will be allowed therefor.

10-1.11 TEMPORARY CONSTRUCTION ENTRANCE

Temporary construction entrances shall be constructed, maintained, and later removed at the locations shown on the approved Storm Water Pollution Prevention Plan in conformance with "Water Pollution Control" of these special provisions, and in conformance with details shown on the plans and these special provisions.

Temporary construction entrances shall be one of the water pollution control practices for tracking control. The Storm Water Pollution Prevention Plan shall include the use of temporary construction entrances.

Temporary construction entrances shall be Type 2.

MATERIALS

Temporary Entrance Fabric

Temporary entrance fabric shall be manufactured from polyester, nylon, or polypropylene material, or any combination thereof. Temporary entrance fabric shall be a nonwoven, needle-punched fabric, free of needles which may have broken off during the manufacturing process. Temporary entrance fabric shall be permeable and shall not act as a wicking agent.

Temporary entrance fabric shall be manufactured from virgin, recycled, or a combination of virgin and recycled polymer materials. No virgin or recycled materials shall contain biodegradable filler materials that can degrade the physical or chemical characteristics of the finished fabric. The Engineer may order tests to confirm the absence of biodegradable filler materials in conformance to the requirements in ASTM Designation: E 204 (Fourier Transformed Infrared Spectroscopy-FTIR).

Temporary entrance fabric shall conform to the following requirements:

Specification	Requirements
Mass per unit area, grams per square meter, min. ASTM Designation: D 5261	235
Grab tensile strength (25-mm grip), kilonewtons, min. ASTM Designation: D4632*	0.89
Elongation at break, percent min. ASTM Designation: D4632*	50
Toughness, kilonewtons, min. (percent elongation x grab tensile strength)	53

* or appropriate test method for specific polymer

Rocks

Rocks shall conform to the material quality requirements in Section 72-2.02, "Materials," of the Standard Specifications for shape and for apparent specific gravity, absorption, and durability index. Rocks used for the temporary entrance shall conform to the following sizes:

Square Screen Size (inch)	Percentage Passing	Percentage Retained
150	100	0
75	0	100

Corrugated Steel Panels

Corrugated steel panels shall be prefabricated and shall be pressed or shop welded, with a slot or hooked section to facilitate coupling at the ends of the panels.

INSTALLATION

Temporary construction entrances shall be installed as follows:

A. Prior to placing the temporary entrance fabric, the areas shall be cleared of all trash and debris. Vegetation shall be removed to the ground level. Trash, debris, and removed vegetation shall be disposed of in conformance with the provisions in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications.
B. A sump shall be constructed within 6 m of each temporary construction entrance as shown on the plans.
C. Before placing the temporary entrance fabric, the ground shall be graded to a uniform plane. The relative compaction of the top 0.5-m shall be not less than 90 percent. The ground surface shall be free of sharp objects that may damage the temporary entrance fabric, and shall be graded to drain to the sump as shown on the plans.
D. Temporary entrance fabric shall be positioned longitudinally along the alignment of the entrance, as directed by the Engineer.
E. The adjacent ends of the fabric shall be overlapped a minimum length of 300 mm.
F. Rocks to be placed directly over the fabric shall be spread in the direction of traffic, longitudinally and along the alignment of the temporary construction entrance.
G. During spreading of the rocks, vehicles or equipment shall not be driven directly on the fabric. A layer of rocks a minimum 150 mm thick shall be placed between the fabric and the spreading equipment to prevent damage to the fabric.
H. For Type 2 temporary construction entrances, a minimum of 6 coupled panel sections shall be installed for each temporary construction entrance. Prior to installing the panels, the ground surface shall be cleared of all debris to ensure uniform contact with the ground surface.

Fabric damaged during rock placement shall be repaired by placing a new piece of fabric over the damaged area. The piece of fabric shall be large enough to cover the damaged area and provide a minimum 450-mm overlap on all edges.

Details for a proposed alternative temporary construction entrance or alternative sump shall be submitted to the Engineer for approval at least 7 days prior to installation. The Contractor may eliminate the sump if approved in writing by the Engineer.

If buildup of soil and sediment deter the function of the temporary construction entrance, the Contractor shall immediately remove and dispose of the soil and sediment, and install additional corrugated steel panels and spread additional rocks to increase the capacity of the temporary construction entrance at the Contractor's expense.

When no longer required as determined by the Engineer, temporary construction entrances shall be removed and disposed of in conformance with the provisions in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications.

Ground disturbance, including holes and depressions, caused by the installation and removal of the temporary construction entrance, including the sumps, shall be backfilled and repaired in conformance with the provisions in Section 15-1.02, "Preservation of Property," of the Standard Specifications.

While the temporary construction entrance is in use, pavement shall be cleaned and sediment removed at least once a day, and as often as necessary when directed by the Engineer. Soil and sediment or other extraneous material tracked onto existing pavement shall not be allowed to enter drainage facilities.

MAINTENANCE

The Contractor shall maintain temporary construction entrances throughout the contract or until removed. The Contractor shall prevent displacement or migration of the rock surfacing or corrugated steel panels. Significant depressions resulting from settlement or heavy equipment shall be repaired by the Contractor, as directed by the Engineer.

Temporary construction entrances shall be maintained to minimize tracking of soil and sediment onto existing public roads.

Temporary construction entrances shall be repaired or replaced on the same day the damage occurs. Damage to the temporary construction entrance resulting from the Contractor's vehicles, equipment, or operations shall be repaired at the Contractor's expense.

MEASUREMENT AND PAYMENT

Quantities of temporary construction entrances will be determined from actual count in place.

The contract unit price paid for temporary construction entrance shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in constructing temporary construction entrance, complete in place, including excavation and backfill, and removal, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

The cost of maintaining the temporary construction entrance will be borne equally by the State and the Contractor. The division of cost will be made be determining the cost of maintaining temporary construction entrance in conformance with the provisions in Section 9-1.03, "Force Account Payment," of the Standard Specifications and paying to the Contractor one-half of that cost.

Cleanup, repair, removal, disposal, or replacement due to improper installation or the Contractor's negligence will not be considered as included in the cost for performing maintenance.

10-1.12 MOVE-IN/MOVE-OUT (TEMPORARY EROSION CONTROL)

Move-in/move-out (temporary erosion control) shall include moving onto the project when an area is ready to receive temporary erosion control as determined by the Engineer, setting up required personnel and equipment for the application of erosion control materials, and moving out all personnel and equipment when temporary erosion control in that area is completed.

When areas are ready to receive applications of temporary erosion control, as determined by the Engineer, the Contractor shall begin erosion control work in that area within 5 working days of being notified by the Engineer.

Attention is directed to the requirements of temporary erosion control specified elsewhere in these special provisions.

Quantities of move-in/move-out (temporary erosion control) will be determined as units from actual count. A move-in followed by a move-out will be considered one unit.

The contract unit price paid for move-in/move-out (temporary erosion control) shall include full compensation for furnishing all labor, materials (excluding temporary erosion control materials), tools, equipment, and incidentals and for doing all the work involved in moving in and removing from the project all personnel and equipment necessary for application of temporary erosion control, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

10-1.13 TEMPORARY DRAINAGE INLET PROTECTION

Temporary drainage inlet protection shall be constructed, maintained, and removed at the locations shown on the approved Storm Water Pollution Prevention Plan in accordance with "Water Pollution Control" of these special provisions, and in accordance with the details shown on the plans and these special provisions.

Temporary drainage inlet protection shall be one of the water pollution control practices for sediment control. The Storm Water Pollution Prevention Plan shall include the use of temporary drainage inlet protection.

The Contractor shall select the appropriate drainage inlet protection in accordance with the details to meet the conditions around the drainage inlet. Throughout the duration of the contract, the Contractor shall provide protection to meet the changing conditions around the drainage inlet.

Temporary drainage inlet protection shall be Type 3A, Type 3B or Type 4B.

MATERIALS

Erosion Control Blanket

The erosion control blanket shall be a rolled erosion control product (RECP) and shall be classified either as temporary and degradable or long-term and nondegradable, and shall conform to one of the following:

A. Temporary and degradable:

1. Machine produced mats consisting of curled wood excelsior with 80 percent of the fiber 150 mm or longer. The excelsior blanket shall be of consistent thickness with wood fiber evenly distributed over the entire area of the blanket. The top surface of the blanket shall be covered with an extruded photodegradable plastic netting or lightweight nonsynthetic netting. The blanket shall be smolder resistant without the use of chemical additives and shall be nontoxic and noninjurious to plant and animal life. The excelsior blanket shall be furnished in rolled strips with a minimum mass per unit area of 0.40-kg/m^2.
2. Machine produced mats consisting of 70 percent straw and 30 percent coconut fiber with an extruded photodegradable plastic netting or lightweight nonsynthetic netting on the top and bottom surfaces of the blanket. The straw and coconut shall adhere to the netting using thread or glue strip. The straw and coconut blanket shall be of consistent thickness, and straw and coconut fiber shall be evenly distributed over the entire area of the blanket. The straw and coconut fiber blanket shall be furnished in rolled strips with a minimum mass per unit area of 0.27-kg/m^2.
3. Machine produced mats that are 100 percent coir consisting of coconut fiber with an extruded photodegradable plastic netting or lightweight nonsynthetic netting on the top and bottom surfaces of the blanket. The coconut fiber shall adhere to the netting using thread or glue strip. The coconut blanket shall be of consistent thickness, with coconut fiber evenly distributed over the entire area of the blanket. The coconut fiber blanket shall be furnished in rolled strips with a minimum mass per unit area of 0.27-kg/m^2.

4. Machine woven netting that is 100 percent spun coir consisting of coconut fiber with an average open area of 63 percent to 70 percent. Coconut coir netting shall be furnished in rolled strips with a minimum mass per unit area of 0.40-kg/m^2.

B. Long-term and nondegradable:

1. Geotextile blanket shall conform to the provisions for rock slope protection fabric (Type A) in Section 88-1.04, "Rock Slope Protection Fabric," of the Standard Specifications.

Staples

Staples shall be as shown on the plans. An alternative attachment device such as geotextile pins or plastic pegs may be used instead of staples. The Contractor shall submit a sample of the alternative attachment device for the Engineer's approval prior to installation.

Gravel-filled Bags

Gravel-filled bag fabric shall be nonwoven polypropylene geotextile or polymer material and shall conform to the following requirements:

Specification	Requirements
Mass per unit area, grams per square meter, minimum. ASTM Designation: D 5261	270
Grab tensile strength (25-mm grip), kilonewtons, minimum. ASTM Designation: D4632*	0.89
Ultraviolet stability, percent tensile strength retained after 500 hours, ASTM Designation: D4355, xenon arc lamp method	70

* or appropriate test method for specific polymer

Gravel-filled bags shall be between 600 mm and 800 mm in length, and between 400 mm and 500 mm in width.

Yarn used for binding gravel bags shall be as recommended by the manufacturer or bag supplier and shall be of a contrasting color.

Gravel shall be between 10 mm and 20 mm in diameter, and shall be clean and free from clay balls, organic matter, and other deleterious materials. The opening of gravel-filled bags shall be secured to prevent gravel from escaping. Gravel-filled bags shall be between 13 kg and 22 kg in mass.

Silt Fence

At the Contractor's option, temporary silt fence shall be prefabricated or constructed with silt fence fabric, posts, and fasteners.

Silt fence fabric shall conform to the following requirements:

Specification	Requirements
Width, mm, min.	900
Grab tensile strength (25-mm grip), kilonewtons, minimum. in each direction ASTM Designation: D 4632 or appropriate test method for specific polymer	0.55
Elongation, percent minimum in each direction ASTM Designation: D 4632 or appropriate test method for specific polymer	15
Permittivity, 1/sec., minimum. ASTM Designation: D 4491	1.5
Flow rate, liters per minute per square meter, minimum. ASTM Designation: D 4491	400
Ultraviolet stability, percent tensile strength retained after 500 hours, minimum. ASTM Designation: D 4355 (xenon-arc lamp and water spray weathering method)	70

Silt fence fabric shall be geotextile manufactured from woven polypropylene or polymer material. Silt fence fabric may be made of recycled materials. No materials shall contain biodegradable filler materials that can degrade the physical or chemical characteristics of the finished fabric. The Engineer may order tests to confirm the absence of biodegradable filler materials in conformance to the requirements in ASTM Designation: E 204.

Posts for temporary silt fences shall be one of the following:

A. Posts shall be untreated fir, redwood, cedar, or pine, shall be cut from sound timber, and shall be straight and free of loose or unsound knots and other defects which would render them unfit for the purpose intended. Wood post shall be a minimum of 34 mm x 40 mm in size, and 4 feet in length. The end of the post to be embedded in the soil shall be pointed.
B. Posts shall be steel and have a "U," "T," "L," or other cross sectional shape that can resist failure from lateral loads. The steel posts shall have a minimum mass per length of 1.1 kg/m and a minimum length of 1.2 m. One end of the steel posts shall be pointed and the other end shall be capped with an orange or red plastic safety cap which fits snugly to the steel post. The Contractor shall submit to the Engineer for approval a sample of the capped steel post prior to installation.

Fasteners for attaching silt fence fabric to posts shall be as follows:

A. When prefabricated silt fence is used, posts shall be inserted into sewn pockets.
B. Silt fence fabric shall be attached to wooden posts with nails or staples as shown on the plans or as recommended by the manufacturer or supplier. Tie wire or locking plastic fasteners shall be used to fasten the silt fence fabric to steel posts. Maximum spacing of fasteners shall be 200 mm along the length of the steel post.

Foam Barriers

The foam barrier fabric cover and skirt shall be a woven polypropylene fabric with a minimum tensile strength of 0.44-kN, conforming to ASTM Designation: D 4632. The prefabricated fabric shall be high visibility orange in color that is integral to the fabric; painting shall not be allowed. The fabric shall have an ultraviolet stability exceeding 70 percent.

The foam core shall be urethane foam and shall be shaped and dimensioned as shown on the plans.

Adhesive for foam barriers shall be a solvent-free rubber modified asphalt emulsion. The color of the emulsion shall be brown when wet and shall have a drying period of not more than 3 hours.

Anchoring nails or spikes for foam barriers shall be a minimum of 25 mm in length and capable of penetrating concrete or asphalt surfaces.

INSTALLATION

Temporary drainage inlet protection shall be installed at drainage inlets in paved and unpaved areas as follows:

A. Temporary drainage inlet protection shall be installed such that ponded runoff does not encroach on the traveled way or overtop the curb or dike. Gravel-filled bags shall be placed to control ponding and prevent runoff from overtopping the curb or dike.
B. The bedding area for the temporary drainage inlet protection shall be cleared of obstructions including rocks, clods, and debris greater than 25 mm in diameter prior to installation.
C. A temporary linear sediment barrier shall be installed up-slope of the existing drainage inlet and parallel with the curb, dike, or flow line to prevent sediment from entering the drainage inlet.

Erosion Control Blanket and Geotextile Fabric

The erosion control blanket and geotextile fabric shall be secured to the surface of the excavated sediment trap with staples and embedded in a trench adjacent to the drainage inlet. The perimeter edge of the erosion control blanket and geotextile fabric shall be anchored in a trench.

Silt Fence

Silt fence shall be installed along the perimeter of the erosion control blanket or geotextile fabric, with the posts facing the drainage inlet. The trench shall be backfilled and tamped to secure the silt fence fabric in the bottom of the trench.

Gravel-filled Bags

Gravel-filled bags shall be stacked to form a gravel bag barrier. The gravel-filled bags shall be placed so that the bags are tightly abutted and overlap the joints in adjacent rows. A spillway shall be created by removing one or more gravel-filled bags from the upper layer of the gravel bag barrier.

Gravel-filled bags shall only be use within shoulder areas when placed behind temporary railing (Type K).

Foam Barriers

Foam barriers shall be installed in individual sections adjacent to existing drainage inlets. Foam barriers shall be securely attached to the pavement according to the angle and spacing shown on the plans. Foam barriers shall be installed

flush against the sides of concrete or asphalt concrete curbs, dikes, and pavement with the inner material and fabric cover cut smoothly and evenly to provide a tight flush joint.

REMOVAL

When the temporary drainage inlet protection is no longer required the protection materials shall be removed and disposed of in accordance with the provisions in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications.

Holes, depressions, or other ground disturbance caused by the removal of the temporary drainage inlet protection shall be backfilled and repaired in accordance with the provisions in Section 15-1.02, "Preservation of Property," of the Standard Specifications.

MAINTENANCE

Temporary drainage inlet protection shall be maintained to provide sediment holding capacity and to reduce runoff velocities. Temporary drainage inlet protection shall be repaired or replaced immediately after the damage occurs.

Sediment deposits, trash, and debris shall be removed from temporary drainage inlet protection as needed or when directed by the Engineer. Removed sediment shall be deposited within the project limits so that the sediment is not subject to erosion by wind or by water. Trash and debris shall be removed and disposed of in accordance with the provisions in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications.

At locations where rills and other evidence of concentrated runoff have occurred beneath the drainage inlet protection, the protection shall be adjusted to prevent another occurrence.

Temporary silt fence shall be repaired or replaced when silt fence fabric becomes split, torn, or unraveled. Sagging or slumping silt fence shall be repaired with additional stakes or replaced. Broken or split stakes shall be replaced. Temporary silt fence shall be maintained to provide a sediment holding capacity of approximately 1/3 the height of the silt fence fabric above ground.

Sediment in excess of 50 mm above the surface of the erosion control blanket or geotextile fabric shall be removed.

Sediment deposits shall be removed when the deposit is 1/3 the height of the gravel bag barrier or one half the height of the spillway; whichever is less.

Gravel-filled bags shall be replaced when the bag material ruptures or when the binding fails.

Foam barriers shall be repaired or replaced when the geotextile fabric cover becomes split, torn, or unraveled. Foam barriers that become detached or dislodged shall be reattached to the pavement. Sediment deposits shall be removed when the deposit reaches 1/3 of the foam barrier height.

MEASUREMENT

Quantities of temporary drainage inlet protection will be determined from actual count in place. The protection will be measured one time only and no additional measurement will be recognized.

PAYMENT

The contract unit price paid for temporary drainage inlet protection shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in constructing the temporary drainage inlet protection, complete in place, including removal of materials, including cleanup and disposal of retained sediment and debris, and backfilling and repairing holes, depressions and other ground disturbance, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

No additional compensation will be made if the temporary drainage inlet protection changes during the course of construction.

The cost of maintaining, repairing, removing, and disposing of the temporary drainage inlet protection will be borne equally by the State and the Contractor. The division of cost will be made by determining the cost of maintaining temporary drainage inlet protection in accordance with the provisions in Section 9-1.03, "Force Account Payment," of the Standard Specifications and paying to the Contractor one-half of that cost.

Cleanup, repair, removal, disposal, or replacement due to improper installation, or as a result of the Contractor's negligence will not be considered as included in the cost for performing maintenance.

10-1.14 DAMAGE REPAIR

Attention is directed to Section 7-1.16, "Contractor's Responsibility for the Work and Materials," and Section 7-1.165, "Damage by Storm, Flood, Tsunami or Earthquake," of the Standard Specifications.

10-1.15 PROGRESS SCHEDULE (CRITICAL PATH METHOD)

The Contractor shall submit to the Engineer practicable critical path method (CPM) progress schedules in conformance with these special provisions. Whenever the term "schedule" is used in this section it shall mean CPM progress schedule.

Attention is directed to "Payments" of Section 5 of these special provisions.

The provisions in Section 8-1.04, "Progress Schedule," of the Standard Specifications shall not apply.

DEFINITIONS

The following definitions shall apply to this section:

A. ACTIVITY.—A task, event or other project element on a schedule that contributes to completing the project. Activities have a description, start date, finish date, duration and one or more logic ties.
B. BASELINE SCHEDULE.—The initial schedule representing the Contractor's work plan on the first working day of the project.
C. CONTRACT COMPLETION DATE.—The current extended date for completion of the contract shown on the weekly statement of working days furnished by the Engineer in conformance with the provisions in Section 8-1.06, "Time of Completion," of the Standard Specifications.
D. CRITICAL PATH.—The longest continuous chain of activities for the project that has the least amount of total float of all chains. In general, a delay on the critical path will extend the scheduled completion date.
E. CRITICAL PATH METHOD (CPM).—A network based planning technique using activity durations and the relationships between activities to mathematically calculate a schedule for the entire project.
F. DATA DATE.—The day after the date through which a schedule is current. Everything occurring earlier than the data date is "as-built" and everything on or after the data date is "planned."
G. EARLY COMPLETION TIME.—The difference in time between an early scheduled completion date and the contract completion date.
H. FLOAT.—The difference between the earliest and latest allowable start or finish times for an activity.
I. MILESTONE.—An event activity that has zero duration and is typically used to represent the beginning or end of a certain stage of the project.
J. NARRATIVE REPORT.—A document submitted with each schedule that discusses topics related to project progress and scheduling.
K. NEAR CRITICAL PATH.—A chain of activities with total float exceeding that of the critical path but having no more than 10 working days of total float.
L. SCHEDULED COMPLETION DATE.—The planned project finish date shown on the current accepted schedule.
M. STATE OWNED FLOAT ACTIVITY.—The activity documenting time saved on the critical path by actions of the State. It is the last activity prior to the scheduled completion date.
N. TIME IMPACT ANALYSIS.—A schedule and narrative report developed specifically to demonstrate what effect a proposed change or delay has on the current scheduled completion date.
O. TOTAL FLOAT.—The amount of time that an activity or chain of activities can be delayed before extending the scheduled completion date.
P. UPDATE SCHEDULE.—A current schedule developed from the baseline or subsequent schedule through regular monthly review to incorporate as-built progress and any planned changes.

GENERAL REQUIREMENTS

The Contractor shall submit to the Engineer baseline, monthly update and final update schedules, each consistent in all respects with the time and order of work requirements of the contract. The project work shall be executed in the sequence indicated on the current accepted schedule.

Schedules shall show the order in which the Contractor proposes to carry out the work with logical links between time-scaled work activities, and calculations made using the critical path method to determine the controlling operation or operations. The Contractor is responsible for assuring that all activity sequences are logical and that each schedule shows a coordinated plan for complete performance of the work.

The Contractor shall produce schedules using computer software and shall furnish compatible software for the Engineer's exclusive possession and use. The Contractor shall furnish network diagrams, narrative reports, tabular reports and schedule data as parts of each schedule submittal.

Schedules shall include, but not be limited to, activities that show the following that are applicable to the project:

A. Project characteristics, salient features, or interfaces, including those with outside entities, that could affect time of completion.
B. Project start date, scheduled completion date and other milestones.
C. Work performed by the Contractor, subcontractors and suppliers.

D. Submittal development, delivery, review and approval, including those from the Contractor, subcontractors and suppliers.
E. Procurement, delivery, installation and testing of materials, plants and equipment.
F. Testing and settlement periods.
G. Utility notification and relocation.
H. Erection and removal of falsework and shoring.
I. Major traffic stage switches.
J. Finishing roadway and final cleanup.
K. State-owned float as the predecessor activity to the scheduled completion date.

Schedules shall have not less than 50 and not more than 500 activities, unless otherwise authorized by the Engineer. The number of activities shall be sufficient to assure adequate planning of the project, to permit monitoring and evaluation of progress, and to do an analysis of time impacts.

Schedule activities shall include the following:

A. A clear and legible description.
B. Start and finish dates.
C. A duration of not less than one working day, except for event activities, and not more than 20 working days, unless otherwise authorized by the Engineer.
D. At least one predecessor and one successor activity, except for project start and finish milestones.
E. Required constraints.
F. Codes for responsibility, stage, work shifts, location and contract pay item numbers.

The Contractor may show early completion time on any schedule provided that the requirements of the contract are met. Early completion time shall be considered a resource for the exclusive use of the Contractor. The Contractor may increase early completion time by improving production, reallocating resources to be more efficient, performing sequential activities concurrently or by completing activities earlier than planned. The Contractor may also submit for approval a cost reduction incentive proposal in conformance with the provisions in Section 5-1.14, "Cost Reduction Incentive," of the Standard Specifications that will reduce time of construction.

The Contractor may show a scheduled completion date that is later than the contract completion date on an update schedule, after the baseline schedule is accepted. The Contractor shall provide an explanation for a late scheduled completion date in the narrative report that is included with the schedule.

State-owned float shall be considered a resource for the exclusive use of the State. The Engineer may accrue State-owned float by the early completion of review of any type of required submittal when it saves time on the critical path. The Contractor shall prepare a time impact analysis, when requested by the Engineer, to determine the effect of the action in conformance with the provisions in "Time Impact Analysis" specified herein. The Engineer will document State-owned float by directing the Contractor to update the State-owned float activity on the next update schedule. The Contractor shall include a log of the action on the State-owned float activity and include a discussion of the action in the narrative report. The Engineer may use State-owned float to mitigate past, present or future State delays by offsetting potential time extensions for contract change orders.

The Engineer may adjust contract working days for ordered changes that affect the scheduled completion date, in conformance with the provisions in Section 4-1.03, "Changes," of the Standard Specifications. The Contractor shall prepare a time impact analysis to determine the effect of the change in conformance with the provisions in "Time Impact Analysis" specified herein, and shall include the impacts acceptable to the Engineer in the next update schedule. Changes that do not affect the controlling operation on the critical path will not be considered as the basis for a time adjustment. Changes that do affect the controlling operation on the critical path will be considered by the Engineer in decreasing time or granting an extension of time for completion of the contract. Time extensions will only be granted if the total float is absorbed and the scheduled completion date is delayed one or more working days because of the ordered change.

The Engineer's review and acceptance of schedules shall not waive any contract requirements and shall not relieve the Contractor of any obligation thereunder or responsibility for submitting complete and accurate information. Schedules that are rejected shall be corrected by the Contractor and resubmitted to the Engineer within 5 working days of notification by the Engineer, at which time a new review period of one week will begin.

Errors or omissions on schedules shall not relieve the Contractor from finishing all work within the time limit specified for completion of the contract. If, after a schedule has been accepted by the Engineer, either the Contractor or the Engineer discover that any aspect of the schedule has an error or omission, it shall be corrected by the Contractor on the next update schedule.

COMPUTER SOFTWARE

The Contractor shall submit to the Engineer for approval a description of proposed software before delivery. The software shall be the current version of Primavera SureTrak Project Manager for Windows, or equal, and shall be compatible with Windows NT (version 4.0) operating system. If software other than SureTrak is proposed, it shall be capable of generating files that can be imported into SureTrak.

The Contractor shall furnish schedule software and all original software instruction manuals to the Engineer with submittal of the baseline schedule. The furnished schedule software shall become the property of the State and will not be returned to the Contractor. The State will compensate the Contractor in conformance with the provisions in Section 4-1.03, "Extra Work," of the Standard Specifications for replacement of software which is damaged, lost or stolen after delivery to the Engineer.

The Contractor shall instruct the Engineer in the use of the software and provide software support until the contract is accepted. Within 20 working days of contract approval, the Contractor shall provide a commercial 8-hour training session for 2 Department employees in the use of the software at a location acceptable to the Engineer. It is recommended that the Contractor also send at least 2 employees to the same training session to facilitate development of similar knowledge and skills in the use of the software. If software other than SureTrak is furnished, then the training session shall be a total of 16-hours for each Department employee.

NETWORK DIAGRAMS, REPORTS AND DATA

The Contractor shall include the following for each schedule submittal:

A. Two sets of originally plotted, time-scaled network diagrams.
B. Two copies of a narrative report.
C. Two copies of each of 3 sorts of the CPM software-generated tabular reports.
D. One 1.44-megabyte 90 mm (3.5 inch) floppy diskette containing the schedule data.

The time-scaled network diagrams shall conform to the following:

A. Show a continuous flow of information from left to right.
B. Be based on early start and early finish dates of activities.
C. Clearly show the primary paths of criticality using graphical presentation.
D. Be prepared on E-size sheets, 860 mm x 1120 mm (34 inch x 44 inch).
E. Include a title block and a timeline on each page.

The narrative report shall be organized in the following sequence with all applicable documents included:

A. Contractor's transmittal letter.
B. Work completed during the period.
C. Identification of unusual conditions or restrictions regarding labor, equipment or material; including multiple shifts, 6-day work weeks, specified overtime or work at times other than regular days or hours.
D. Description of the current critical path.
E. Changes to the critical path and scheduled completion date since the last schedule submittal.
F. Description of problem areas.
G. Current and anticipated delays:

    1. Cause of delay.
    2. Impact of delay on other activities, milestones and completion dates.
    3. Corrective action and schedule adjustments to correct the delay.

H. Pending items and status thereof:

    1. Permits
    2. Change orders
    3. Time adjustments
    4. Non-compliance notices

I. Reasons for an early or late scheduled completion date in comparison to the contract completion date.

Tabular reports shall be software-generated and provide information for each activity included in the project schedule. Three different reports shall be sorted by (1) activity number, (2) early start and (3) total float. Tabular reports shall be 215 mm x 280 mm (8 1/2 inch x 11 inch) in size and shall include, as a minimum, the following applicable information:

A. Data date
B. Activity number and description
C. Predecessor and successor activity numbers and descriptions
D. Activity codes
E. Scheduled, or actual and remaining durations (work days) for each activity
F. Earliest start (calendar) date
G. Earliest finish (calendar) date
H. Actual start (calendar) date
I. Actual finish (calendar) date
J. Latest start (calendar) date
K. Latest finish (calendar) date
L. Free float (work days)
M. Total float (work days)
N. Percentage of activity complete and remaining duration for incomplete activities.
O. Lags
P. Required constraints

Schedule submittals will only be considered complete when all documents and data have been provided as described above.

PRE-CONSTRUCTION SCHEDULING CONFERENCE

The Contractor shall schedule and the Engineer will conduct a pre-construction scheduling conference with the Contractor's project manager and construction scheduler within 10 working days of the approval of the contract. At this meeting the Engineer will review the requirements of this section of the special provisions with the Contractor.

The Contractor shall submit a general time-scaled logic diagram displaying the major activities and sequence of planned operations and shall be prepared to discuss the proposed work plan and schedule methodology that comply with the requirements of these special provisions. If the Contractor proposes deviations to the construction staging of the project, then the general time-scaled logic diagram shall also display the deviations and resulting time impacts. The Contractor shall be prepared to discuss the proposal.

At this meeting, the Contractor shall additionally submit the alphanumeric coding structure and the activity identification system for labeling the work activities. To easily identify relationships, each activity description shall indicate its associated scope or location of work by including such terms as quantity of material, type of work, bridge number, station to station location, side of highway (such as left, right, northbound, southbound), lane number, shoulder, ramp name, ramp line descriptor or mainline.

The Engineer will review the logic diagram, coding structure, and activity identification system, and provide any required baseline schedule changes to the Contractor for implementation.

BASELINE SCHEDULE

Beginning the week following the pre-construction scheduling conference, the Contractor shall meet with the Engineer weekly until the baseline schedule is accepted by the Engineer to discuss schedule development and resolve schedule issues.

The Contractor shall submit to the Engineer a baseline schedule within 20 working days of approval of the contract. The Contractor shall allow 3 weeks for the Engineer's review after the baseline schedule and all support data are submitted. In addition, the baseline schedule submittal will not be considered complete until the computer software is delivered and installed for use in review of the schedule.

The baseline schedule shall include the entire scope of work and how the Contractor plans to complete all work contemplated. The baseline schedule shall show the activities that define the critical path. Multiple critical paths and near-critical paths shall be kept to a minimum. A total of not more than 50 percent of the baseline schedule activities shall be critical or near critical, unless otherwise authorized by the Engineer.

The baseline schedule shall not extend beyond the number of working days specified in these special provisions. The baseline schedule shall have a data date of the first working day of the contract and not include any completed work to date. The baseline schedule shall not attribute negative float or negative lag to any activity.

If the Contractor submits an early completion baseline schedule that shows contract completion in less than 85 percent of the working days specified in these special provisions, the baseline schedule shall be supplemented with resource allocations for every task activity and include time-scaled resource histograms. The resource allocations shall be shown to a level of

detail that facilitates report generation based on labor crafts and equipment classes for the Contractor and subcontractors. The Contractor shall use average composite crews to display the labor loading of on-site construction activities. The Contractor shall optimize and level labor to reflect a reasonable plan for accomplishing the work of the contract and to assure that resources are not duplicated in concurrent activities. The time-scaled resource histograms shall show labor crafts and equipment classes to be utilized on the contract. The Engineer may review the baseline schedule activity resource allocations using Means Productivity Standards or equivalent to determine if the schedule is practicable.

UPDATE SCHEDULE

The Contractor shall submit an update schedule and meet with the Engineer to review contract progress, on or before the first day of each month, beginning one month after the baseline schedule is accepted. The Contractor shall allow 2 weeks for the Engineer's review after the update schedule and all support data are submitted, except that the review period shall not start until the previous month's required schedule is accepted. Update schedules that are not accepted or rejected within the review period will be considered accepted by the Engineer.

The update schedule shall have a data date of the twenty-first day of the month or other date established by the Engineer. The update schedule shall show the status of work actually completed to date and the work yet to be performed as planned. Actual activity start dates, percent complete and finish dates shall be shown as applicable. Durations for work that has been completed shall be shown on the update schedule as the work actually occurred, including Engineer submittal review and Contractor resubmittal times.

The Contractor may include modifications such as adding or deleting activities or changing activity constraints, durations or logic that do not (1) alter the critical path(s) or near critical path(s) or (2) extend the scheduled completion date compared to that shown on the current accepted schedule. The Contractor shall state in writing the reasons for any changes to planned work. If any proposed changes in planned work will result in (1) or (2) above, then the Contractor shall submit a time impact analysis as described herein.

TIME IMPACT ANALYSIS

The Contractor shall submit a written time impact analysis (TIA) to the Engineer with each request for adjustment of contract time, or when the Contractor or Engineer consider that an approved or anticipated change may impact the critical path or contract progress.

The TIA shall illustrate the impacts of each change or delay on the current scheduled completion date or internal milestone, as appropriate. The analysis shall use the accepted schedule that has a data date closest to and prior to the event. If the Engineer determines that the accepted schedule used does not appropriately represent the conditions prior to the event, the accepted schedule shall be updated to the day before the event being analyzed. The TIA shall include an impact schedule developed from incorporating the event into the accepted schedule by adding or deleting activities, or by changing durations or logic of existing activities. If the impact schedule shows that incorporating the event modifies the critical path and scheduled completion date of the accepted schedule, the difference between scheduled completion dates of the two schedules shall be equal to the adjustment of contract time. The Engineer may construct and utilize an appropriate project schedule or other recognized method to determine adjustments in contract time until the Contractor provides the TIA.

The Contractor shall submit a TIA in duplicate within 15 working days of receiving a written request for a TIA from the Engineer. The Contractor shall allow the Engineer 2 weeks after receipt to approve or reject the submitted TIA. All approved TIA schedule changes shall be shown on the next update schedule.

If a TIA submitted by the Contractor is rejected by the Engineer, the Contractor shall meet with the Engineer to discuss and resolve issues related to the TIA. If agreement is not reached, the Contractor will be allowed 15 days from the meeting with the Engineer to give notice in conformance with the provisions in Section 9-1.04, "Notice of Potential Claim," of the Standard Specifications. The Contractor shall only show actual as-built work, not unapproved changes related to the TIA, in subsequent update schedules. If agreement is reached at a later date, approved TIA schedule changes shall be shown on the next update schedule. The Engineer will withhold remaining payment on the schedule contract item if a TIA is requested by the Engineer and not submitted by the Contractor within 15 working days. The schedule item payment will resume on the next estimate after the requested TIA is submitted. No other contract payment will be retained regarding TIA submittals.

FINAL UPDATE SCHEDULE

The Contractor shall submit a final update, as-built schedule with actual start and finish dates for the activities, within 30 days after completion of contract work. The Contractor shall provide a written certificate with this submittal signed by the Contractor's project manager and an officer of the company stating, "To my knowledge and belief, the enclosed final update schedule reflects the actual start and finish dates of the actual activities for the project contained herein." An officer of the company may delegate in writing the authority to sign the certificate to a responsible manager.

RETENTION

The Department will retain an amount equal to 25 percent of the estimated value of the work performed during each estimate period in which the Contractor fails to submit an acceptable schedule conforming to the requirements of these special provisions as determined by the Engineer. Schedule retentions will be released for payment on the next monthly estimate for partial payment following the date that acceptable schedules are submitted to the Engineer or as otherwise specified herein. Upon completion of all contract work and submittal of the final update schedule and certification, any remaining retained funds associated with this section, "Progress Schedule (Critical Path Method)", will be released for payment. Retentions held in conformance with this section shall be in addition to other retentions provided for in the contract. No interest will be due the Contractor on retention amounts.

PAYMENT

Progress schedule (critical path method) will be paid for at a lump sum price. The contract lump sum price paid for progress schedule (critical path method) shall include full compensation for furnishing all labor, material, tools, equipment, and incidentals, including computer software, and for doing all the work involved in preparing, furnishing, and updating schedules, and instructing and assisting the Engineer in the use of computer software, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

Payments for the progress schedule (critical path method) contract item will be made progressively as follows:

A. A total of 25 percent of the item amount or a total of 25 percent of the amount listed for progress schedule (critical path method) in "Payments" of Section 5 of these special provisions, whichever is less, will be paid upon achieving all of the following:

   1. Completion of 5 percent of all contract item work.
   2. Acceptance of all schedules and TIAs required to the time when 5 percent of all contract item work is complete.
   3. Delivery of schedule software to the Engineer.
   4. Completion of required schedule software training.

B. A total of 50 percent of the item amount or a total of 50 percent of the amount listed for progress schedule (critical path method) in "Payments" of Section 5 of these special provisions, whichever is less, will be paid upon completion of 25 percent of all contract item work and acceptance of all schedules and TIAs required to the time when 25 percent of all contract item work is complete.
C. A total of 75 percent of the item amount or a total of 75 percent of the amount listed for progress schedule (critical path method) in "Payments" of Section 5 of these special provisions, whichever is less, will be paid upon completion of 50 percent of all contract item work and acceptance of all schedules and TIAs required to the time when 50 percent of all contract item work is complete.
D. A total of 100 percent of the item amount or a total of 100 percent of the amount listed for progress schedule (critical path method) in "Payments" of Section 5 of these special provisions, whichever is less, will be paid upon completion of all contract item work, acceptance of all schedules and TIAs required to the time when all contract item work is complete, and submittal of the certified final update schedule.

If the Contractor fails to complete any of the work or provide any of the schedules required by this section, the Engineer shall make an adjustment in compensation in conformance with the provisions in Section 4-1.03C, "Changes in Character of Work," of the Standard Specifications for the work not performed. Adjustments in compensation for schedules will not be made for any increased or decreased work ordered by the Engineer in furnishing schedules.

10-1.16 TIME-RELATED OVERHEAD

The Contractor will be compensated for time-related overhead as described below and in conformance with “Force Account Payment” of these special provisions. The Contractor will not be compensated for time-related overhead for delays to the controlling operations caused by the Engineer that occur prior to the first working day, but will be compensated for actual overhead costs incurred, as determined by an independent Certified Public Accountant audit examination and report.

Attention is directed to "Beginning of Work, Time of Completion and Liquidated Damages," "Force Account Payment," and "Progress Schedule (Critical Path Method)" of these special provisions.

The provisions in Section 9-1.08, "Adjustment of Overhead Costs," of the Standard Specifications shall not apply.

Time-related overhead shall consist of those overhead costs, including field and home office overhead, that are in proportion to the time required to complete the work. Time-related overhead shall not include costs that are not related to time, including but not limited to, mobilization, licenses, permits, and other charges incurred only once during the contract. Time-related overhead shall not apply to subcontractors of any tier, suppliers, fabricators, manufacturers, or other parties associated with the Contractor.

Field office overhead expenses include time-related costs associated with the normal and recurring operations of the construction project, and shall not include costs directly attributable to the work of the contract. Time-related costs of field office overhead include, but are not limited to, salaries, benefits, and equipment costs of project managers, general superintendents, field office managers and other field office staff assigned to the project, and rent, utilities, maintenance, security, supplies, and equipment costs of the project field office.

Home office overhead or general and administrative expenses refer to the fixed costs of operating the Contractor's business. These costs include, but are not limited to, general administration, insurance, personnel and subcontract administration, purchasing, accounting, and project engineering and estimating. Home office overhead costs shall exclude expenses specifically related to other contracts or other businesses of the Contractor, equipment coordination, material deliveries, and consultant and legal fees.

The quantity of time-related overhead associated with a reduction in contract time for cost reduction incentive proposals accepted and executed in conformance with the provisions in Section 5-1.14, "Cost Reduction Incentive," of the Standard Specifications shall be considered a construction cost attributable to the resultant estimated net savings due to the cost reduction incentive.

If the final increased quantity of time-related overhead exceeds 149 percent of the number of working days specified in the Engineer's Estimate, the Contractor shall, within 60 days of the Engineer's written request, submit to the Engineer an audit examination and report performed by an independent Certified Public Accountant of the Contractor's actual overhead costs. The audit examination and report shall depict the Contractor's project and company-wide financial records and shall specify the actual overall average daily rates for both field and home office overhead for the entire duration of the project, and whether the costs have been properly allocated. The rates of field and home office overhead shall exclude unallowable costs as determined in the Federal Acquisition Regulations, 48 CFR, Chapter 1, Part 31.

Independent Certified Public Accountant's audit examinations shall be performed in conformance with the requirements of the American Institute of Certified Public Accountants Attestation Standards. Audit examinations and reports shall determine if the rates of field office overhead and home office overhead are:

A. Allowable in conformance with the requirements of the Federal Acquisition Regulations, 48 CFR, Chapter 1, Part 31.
B. Adequately supported by reliable documentation.
C. Related solely to the project under examination.

Within 20 days of receipt of the Engineer's written request, the Contractor shall make its financial records available for audit by the State for the purpose of verifying the actual rate of time-related overhead specified in the audit submitted by the Contractor. The actual rate of time-related overhead specified in the audit, submitted by the Contractor, will be subject to approval by the Engineer.

If the Engineer requests the independent Certified Public Accountant audit, or if it is requested in writing by the Contractor, the contract item payment rate for time-related overhead, in excess of 149 percent of the number of working days specified in the Engineer's Estimate, will be adjusted to reflect the actual rate.

The cost of performing an independent Certified Public Accountant audit examination and submitting the report, requested by the Engineer, will be borne equally by the State and the Contractor. The division of the cost will be made by determining the cost of providing an audit examination and report in conformance with the provisions of Section 9-1.03B, "Work Performed by Special Forces or Other Special Services," of the Standard Specifications, and paying to the Contractor one-half of that cost. The cost of performing an audit examination and submitting the independent Certified Public Accountant audit report for overhead claims other than for the purpose of verifying the actual rate of time-related overhead shall be entirely borne by the Contractor. The cost of performing an audit examination and submitting the independent Certified Public Accountant audit report to verify actual overhead costs incurred prior to the first working day shall be entirely borne by the Contractor.

The quantity of time-related overhead to be paid will be measured by the working day, designated in the Engineer's Estimate as WDAY. The estimated number of working days is the number of working days, excluding days for plant establishment, as specified in "Beginning of Work, Time of Completion and Liquidated Damages" of these special provisions. The quantity of time-related overhead will be increased or decreased only as a result of suspensions or adjustments of contract time which revise the current contract completion date, and which satisfy any of the following criteria:

A. Suspensions of work ordered in conformance with the provisions in Section 8-1.05, "Temporary Suspension of Work," of the Standard Specifications, except:

    1. Suspensions ordered due to weather conditions being unfavorable for the suitable prosecution of the controlling operation or operations.

2. Suspensions ordered due to the failure on the part of the Contractor to carry out orders given, or to perform the provisions of the contract.
3. Suspensions ordered due to factors beyond the control of and not caused by the State or the Contractor, for which the Contractor is granted extensions of time in conformance with the provisions of the third paragraph of Section 8-1.07, "Liquidated Damages," of the Standard Specifications.
4. Other suspensions that mutually benefit the State and the Contractor.

B. Extensions of contract time granted by the State in conformance with the provisions in the fifth paragraph in Section 8-1.07, "Liquidated Damages," of the Standard Specifications and set forth in approved contract change orders, in conformance with the provisions in Section 4-1.03, "Changes," of the Standard Specifications.
C. Reductions in contract time set forth in approved contract change orders, in conformance with the provisions in Section 4-1.03, "Changes," of the Standard Specifications.

In the event an early completion progress schedule, as defined in "Progress Schedule (Critical Path Method)" of these special provisions, is submitted by the Contractor and approved by the Engineer, the amount of time-related overhead eligible for payment will be based on the total number of working days for the project, in conformance with the provisions in "Beginning of Work, Time of Completion and Liquidated Damages" of these special provisions, rather than the Contractor's early completion progress schedule.

The contract price paid per working day for time-related overhead shall include full compensation for time-related overhead, including the Contractor's share of costs of the independent Certified Public Accountant audit of overhead costs requested by the Engineer, as specified in these special provisions, and as directed by the Engineer.

The provisions in Sections 4-1.03B, "Increased or Decreased Quantities," and 4-1.03C, "Changes in Character of the Work," of the Standard Specifications shall not apply to the contract item of time-related overhead.

Full compensation for additional overhead costs incurred during days of inclement weather when the contract work is extended into additional construction seasons due to delays caused by the State shall be considered as included in the time-related overhead paid during the contract working days, and no additional compensation will be allowed therefor.

Full compensation for additional overhead costs involved in performing additional contract item work that is not a controlling operation shall be considered as included in the contract items of work involved and no additional compensation will be allowed therefor.

Full compensation for overhead, other than time-related overhead measured and paid for as specified above, and other than overhead costs included in the markups specified in "Force Account Payment" of these special provisions, shall be considered as included in the various items of work and no additional compensation will be allowed therefor.

Overhead costs incurred by subcontractors of any tier, suppliers, fabricators, manufacturers, and other parties associated with the Contractor shall be considered as included in the various items of work and as specified in Section 9-1.03, “Force Account Payment,” of the Standard Specifications.

For the purpose of making partial payments pursuant to the provisions in Section 9-1.06, "Partial Payments," of the Standard Specifications, the number of working days to be paid for time-related overhead in each monthly partial payment will be the number of working days, specified above to be measured for payment that occurred during that monthly estimate period, including compensable suspensions and right of way delays. Working days granted by contract change order due to extra work or changes in character of the work, will be paid for upon completion of the contract. The amount earned per working day for time-related overhead shall be the lesser of the following amounts:

A. The contract item price.
B. Twenty percent of the original total contract amount divided by the number of working days specified in "Beginning of Work, Time of Completion and Liquidated Damages," of these special provisions.

After the work has been completed, except plant establishment work, as provided in Section 20-4.08, "Plant Establishment Work," of the Standard Specifications, the amount of the total contract item price for time-related overhead not yet paid will be included for payment in the first estimate made after completion of roadway construction work, in conformance with the provisions in Section 9-1.06, "Partial Payments," of the Standard Specifications.

10-1.17 OBSTRUCTIONS

Attention is directed to Section 8-1.10, "Utility and Non-Highway Facilities," and Section 15, "Existing Highway Facilities," of the Standard Specifications and these special provisions.

Attention is directed to the existence of certain underground facilities that may require special precautions be taken by the Contractor to protect the health, safety and welfare of workers and of the public. Facilities requiring special precautions include, but are not limited to: conductors of petroleum products, oxygen, chlorine, and toxic or flammable gases; natural gas in pipelines greater than 150 mm in diameter or pipelines operating at pressures greater than 415 kPa (gage); underground

electric supply system conductors or cables, with potential to ground of more than 300 V, either directly buried or in a duct or conduit which do not have concentric grounded or other effectively grounded metal shields or sheaths.

If these facilities are not located on the plans in both alignment and elevation, no work shall be performed in the vicinity of the facilities, except as provided herein for conduit to be placed under pavement, until the owner, or the owner's representative, has located the facility by potholing, probing or other means that will locate and identify the facility. Conduit to be installed under pavement in the vicinity of these facilities shall be placed by the trenching method in conformance with the provisions in "Conduit" of these special provisions. If, in the opinion of the Engineer, the Contractor's operations are delayed or interfered with by reason of the utility facilities not being located by the owner or the owner's representative, the State will compensate the Contractor for the delays to the extent provided in Section 8-1.09, "Right of Way Delays," of the Standard Specifications, and not otherwise, except as provided in Section 8-1.10, "Utility and Non-Highway Facilities," of the Standard Specifications.

The Contractor shall notify the Engineer and the appropriate regional notification center for operators of subsurface installations at least 2 working days, but not more than 14 calendar days, prior to performing any excavation or other work close to any underground pipeline, conduit, duct, wire or other structure. Regional notification centers include, but are not limited to, the following:

Notification Center	Telephone Number
Underground Service Alert-Northern California (USA)	1-800-642-2444 1-800-227-2600
Underground Service Alert-Southern California (USA)	1-800-422-4133 1-800-227-2600

No excavation shall be performed within 1.2 m (4 feet) of the following utilities until the owner, or the owner's representative has located the facility by pot holing, probing, or other means that will positively locate and identify the facility both horizontally and vertically. The utility company will be allowed 20 working days to perform this work

The utility owner or the owner's representative shall be present whenever any excavation is performed within 1.2 meters of the following utilities.

Owner	Type	Location
SDGE	Underground Electrical	"SD 188" Line Sta 10+00 – 12+80
SDGE	Underground Electrical	"T" Line Sta 11+00 – 11+43

The following utility facilities will be relocated during the progress of the contract. The Contractor shall notify the Engineer, in writing, prior to doing work in the vicinity of the facility. The utility facility will be relocated within the listed working days, as defined in Section 8-1.06, "Time of Completion," of the Standard Specifications, after the notification is received by the Engineer:

Utility	Location	Working Days
SDGE Overhead Electric	As Shown on Drawing U-3	20
ATT Overhead Telephone	As Shown on Drawing U-3	10

Installation of the following utility facilities will require coordination with the Contractor's operations. The Contractor shall make the necessary arrangements with the utility company, through the Engineer, and shall submit a schedule of work, verified by a representative of the utility company. The schedule of work shall provide not less than the following number of notification days (N Days), and working days (W Days) as defined in Section 8-1.06, "Time of Completion," of the Standard Specifications for the utility company to complete their work:

The Utility Working Days shall not begin until both the notification and site preparation requirements have been met.

Utility Owner and type of facility	Location	Utility N/W Days	Site Prep by Contractor	Utility Co. Work
SDGE Electrical	As Shown on U-3	40/20	None	Relocate Facilities Outside of Construction Area
ATT Telephone	As Shown on U-3	20/10	None	Relocate Facilities Outside of Construction Area

Refer to the Utility N/W Days column:

N. The minimum number of working days from the date the Engineer receives written notification that a site will be ready for utility work to the date the site is actually ready for utility work
W. The number of working days needed by the utility company to complete the listed Utility Co. Work.

10-1.18 RIGHT OF WAY OBSTRUCTIONS

Attention is directed to the Parcel numbers 32709 and 32733 shown on the plans which do not have Right of way clearance.

It is anticipated that these Right of ways be obtained by 12/01/06.

The Contractor will not be permitted to enter these parcels until the clearances are obtained.

In the event that the Right of ways mentioned above are not obtained by the date specified and, if in the opinion of the Engineer, the Contractor's operations are delayed or interfered with by reason of the Right of way clearances not obtained by the date specified, the State will compensate the Contractor for the delays to the extent provided in Section 8-1.09, "Right of Way Delays," of the Standard Specifications.

10-1.19 MOBILIZATION

Mobilization shall conform to the provisions in Section 11, "Mobilization," of the Standard Specifications.

10-1.20 CONSTRUCTION AREA TRAFFIC CONTROL DEVICES

Flagging, signs, and temporary traffic control devices furnished, installed, maintained, and removed when no longer required shall conform to the provisions in Section 12, "Construction Area Traffic Control Devices," of the Standard Specifications and these special provisions.

Category 1 temporary traffic control devices are defined as small and lightweight (less than 45 kg) devices. These devices shall be certified as crashworthy by crash testing, crash testing of similar devices, or years of demonstrable safe performance. Category 1 temporary traffic control devices include traffic cones, plastic drums, portable delineators, and channelizers.

If requested by the Engineer, the Contractor shall provide written self-certification for crashworthiness of Category 1 temporary traffic control devices at least 5 days before beginning any work using the devices or within 2 days after the request if the devices are already in use. Self-certification shall be provided by the manufacturer or Contractor and shall include the following:

A. Date,
B. Federal Aid number (if applicable),
C. Contract number, district, county, route and kilometer post of project limits,
D. Company name of certifying vendor, street address, city, state and zip code,
E. Printed name, signature and title of certifying person; and
F. Category 1 temporary traffic control devices that will be used on the project.

The Contractor may obtain a standard form for self-certification from the Engineer.

Category 2 temporary traffic control devices are defined as small and lightweight (less than 45 kg) devices that are not expected to produce significant vehicular velocity change, but may cause potential harm to impacting vehicles. Category 2 temporary traffic control devices include barricades and portable sign supports.

Category 2 temporary traffic control devices shall be on the Federal Highway Administration's (FHWA) list of Acceptable Crashworthy Category 2 Hardware for Work Zones. This list is maintained by FHWA and can be located at:

http://safety.fhwa.dot.gov/roadway_dept/road_hardware/listing.cfm?code=workzone

The Department also maintains this list at:

http://www.dot.ca.gov/hq/traffops/signtech/signdel/pdf/Category2.pdf

Category 2 temporary traffic control devices that have not received FHWA acceptance shall not be used. Category 2 temporary traffic control devices in use that have received FHWA acceptance shall be labeled with the FHWA acceptance letter number and the name of the manufacturer. The label shall be readable and permanently affixed by the manufacturer. Category 2 temporary traffic control devices without a label shall not be used.

If requested by the Engineer, the Contractor shall provide a written list of Category 2 temporary traffic control devices to be used on the project at least 5 days before beginning any work using the devices or within 2 days after the request if the devices are already in use.

Category 3 temporary traffic control devices consist of temporary traffic-handling equipment and devices that weigh 45 kg or more and are expected to produce significant vehicular velocity change to impacting vehicles. Temporary traffic-handling equipment and devices include crash cushions, truck-mounted attenuators, temporary railing, temporary barrier, and end treatments for temporary railing and barrier.

Type III barricades may be used as sign supports if the barricades have been successfully crash tested, meeting the NCHRP Report 350 criteria, as one unit with a construction area sign attached.

Category 3 temporary traffic control devices shall be shown on the plans or on the Department's Highway Safety Features list. This list is maintained by the Division of Engineering Services and can be found at:

http://www.dot.ca.gov/hq/esc/approved_products_list/HighwaySafe.htm

Category 3 temporary traffic control devices that are not shown on the plans or not listed on the Department's Highway Safety Features list shall not be used.

Full compensation for providing self-certification for crashworthiness of Category 1 temporary traffic control devices and for providing a list of Category 2 temporary traffic control devices used on the project shall be considered as included in the prices paid for the various items of work requiring the use of the Category 1 or Category 2 temporary traffic control devices and no additional compensation will be allowed therefor.

10-1.21 CONSTRUCTION AREA SIGNS

Construction area signs for temporary traffic control shall be furnished, installed, maintained, and removed when no longer required in conformance with the provisions in Section 12, "Construction Area Traffic Control Devices," of the Standard Specifications and these special provisions.

Attention is directed to "Furnish Sign" of these special provisions.

Attention is directed to the provisions in "Prequalified and Tested Signing and Delineation Materials" of these special provisions. Type II retroreflective sheeting shall not be used on construction area sign panels. Type III, IV, VII, VIII, or IX retroreflective sheeting shall be used for stationary mounted construction area sign panels.

Attention is directed to "Construction Project Information Signs" of these special provisions regarding the number and type of construction project information signs to be furnished, erected, maintained, and removed and disposed of.

Unless otherwise shown on the plans or specified in these special provisions, the color of construction area warning and guide signs shall have black legend and border on orange background, except W10-1 or W47(CA) (Highway-Rail Grade Crossing Advance Warning) sign shall have black legend and border on yellow background.

Orange background on construction area signs shall be fluorescent orange.

Repair to construction area sign panels will not be allowed, except when approved by the Engineer. At nighttime under vehicular headlight illumination, sign panels that exhibit irregular luminance, shadowing or dark blotches shall be immediately replaced at the Contractor's expense.

The Contractor shall notify the appropriate regional notification center for operators of subsurface installations at least 2 working days, but not more than 14 calendar days, prior to commencing excavation for construction area sign posts. The regional notification centers include, but are not limited to, the following:

Notification Center	Telephone Number
Underground Service Alert-Northern California (USA)	(800) 642-2444 (800) 227-2600
Underground Service Alert-Southern California (USA)	(800) 422-4133

Excavations required to install construction area signs shall be performed by hand methods without the use of power equipment, except that power equipment may be used if it is determined there are no utility facilities in the area of the proposed post holes. The post hole diameter, if backfilled with portland cement concrete, shall be at least 100 mm greater than the longer dimension of the post cross-section.

Construction area signs placed within 4.6 m from the edge of the travel way shall be mounted on stationary mounted sign supports as specified in "Construction Area Traffic Control Devices" of these special provisions.

The Contractor shall maintain accurate information on construction area signs. Signs that are no longer required shall be immediately covered or removed. Signs that convey inaccurate information shall be immediately replaced or the information shall be corrected. Covers shall be replaced when they no longer cover the signs properly. The Contractor shall immediately restore to the original position and location any sign that is displaced or overturned, from any cause, during the progress of work.

10-1.22 MAINTAINING TRAFFIC

Attention is directed to Sections 7-1.08, "Public Convenience," 7-1.09, "Public Safety," and 12, "Construction Area Traffic Control Devices," of the Standard Specifications and to the provisions in "Public Safety" of these special provisions and these special provisions. Nothing in these special provisions shall be construed as relieving the Contractor from the responsibilities specified in Section 7-1.09.

Attention is directed to "Traffic Plastic Drums" of these special provisions regarding using plastic drums in place of portable delineators, cones, or Type I or II barricades.

Lane closures shall conform to the provisions in section "Traffic Control System for Lane Closure" of these special provisions.

Personal vehicles of the Contractor's employees shall not be parked on the traveled way including any section closed to public traffic.

Whenever work vehicles or equipment are parked on the shoulder within 1.8 m of a traffic lane, the shoulder area shall be closed with fluorescent orange traffic cones or portable delineators placed on a taper in advance of the parked vehicles or equipment and along the edge of the pavement at 7.5-meter intervals to a point not less than 7.5 m past the last vehicle or piece of equipment. A minimum of 9 traffic cones or portable delineators shall be used for the taper. A W20-1 (ROAD WORK AHEAD) or W21-5b (RIGHT/LEFT SHOULDER CLOSED AHEAD) or C24(CA) (SHOULDER WORK AHEAD) sign shall be mounted on a portable sign stand with flags. The sign shall be placed where designated by the Engineer. The sign shall be a minimum of 1200 mm x 1200 mm in size. The Contractor shall immediately restore to the original position and location a traffic cone or delineator that is displaced or overturned, during the progress of work.

Lanes shall be closed only during the hours shown on the charts included in this section "Maintaining Traffic." Except work required under Sections 7-1.08 and 7-1.09, work that interferes with public traffic shall be performed only during the hours shown for lane closures.

Designated legal holidays are: January 1st, the third Monday in February, the last Monday in May, July 4th, the first Monday in September, November 11th, Thanksgiving Day, and December 25th. When a designated legal holiday falls on a Sunday, the following Monday shall be a designated legal holiday. When November 11th falls on a Saturday, the preceding Friday shall be a designated legal holiday.

Minor deviations from the requirements of this section concerning hours of work which do not significantly change the cost of the work may be permitted upon the written request of the Contractor if, in the opinion of the Engineer, public traffic will be better served and the work expedited. These deviations shall not be adopted by the Contractor until the Engineer has approved the deviations in writing. Other modifications will be made by contract change order.

Chart No. 1
Conventional Highway Lane Requirements

Direction: Northbound / Southbound SD-188

Location: Mexico Border To 0.2 km north of Thing Rd

	a.m.												p.m.											
FROM HOUR TO HOUR	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
Mondays through Thursdays	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	
Fridays	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	
Saturdays	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	
Sundays	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	
Day before designated legal holiday	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	
Designated legal holidays																									

Legend:

R	A minimum of one paved traffic lane, not less than 3.60 m wide, shall be open for use by public traffic. (Reversing Control).
	No work that interferes with public traffic will be allowed

REMARKS:.

NOTE: When Reverse Traffic Control is used:
1. Close one traffic lane and stop public traffic for periods not to exceed ten minutes.
2. Maximum length of one-way control shall be 480 m.

KP: 0.0 / 0.4

Chart No. 2
Road Lane Requirements

Direction: Eastbound / Westbound "Thing Rd"

Location: At RTE 188

	a.m.												p.m.											
FROM HOUR TO HOUR	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
Mondays through Thursdays	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	
Fridays	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	
Saturdays	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	
Sundays	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	
Day before designated legal holiday	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	
Designated legal holidays																									

Legend:

R	A minimum of one paved traffic lane, not less than 3.60 m wide, shall be open for use by public traffic. (Reversing Control).
	No work that interferes with public traffic will be allowed

REMARKS:.

NOTE: When Reverse Traffic Control is used:
1. Close one traffic lane and stop public traffic for periods not to exceed ten minutes.

KP : 0.16

Pedestrian access facilities shall be provided through construction areas within the right of way as shown on the plans and as specified herein. Pedestrian walkways shall be surfaced with asphalt concrete, portland cement concrete or timber. The surface shall be skid resistant and free of irregularities. Hand railings shall be provided on each side of pedestrian walkways as necessary to protect pedestrian traffic from hazards due to construction operations or adjacent vehicular traffic.

Railings shall be constructed of wood, S4S, and shall be painted white. Railings and walkways shall be maintained in good condition. Walkways shall be kept clear of obstructions.

Full compensation for providing pedestrian facilities shall be considered as included in the prices paid for the various contract items of work involved and no additional compensation will be allowed therefor.

10-1.23 CLOSURE REQUIREMENTS AND CONDITIONS

Lane closures shall conform to the provisions in "Maintaining Traffic" of these special provisions and these special provisions.

The term closure, as used herein, is defined as the closure of a traffic lane or lanes, including ramp or connector lanes, within a single traffic control system.

CLOSURE SCHEDULE

By noon Monday, the Contractor shall submit a written schedule of planned closures for the following week period, defined as Friday noon through the following Friday noon. Closures involving work (temporary barrier placement and paving operations) that will reduce horizontal clearances, traveled way inclusive of shoulders, to 2 lanes or less shall be submitted not less than 18 working days and no more than 90 working days before the anticipated start of operation. Closures involving work (pavement overlay, overhead sign installation, falsework and girder erection) that will reduce the vertical clearances available to the public, shall be submitted not less than 18 working days and no more than 90 working days before the anticipated start of operation.

The Closure Schedule shall show the locations and times when the proposed closures are to be in effect. The Contractor shall use the Closure Schedule request forms furnished by the Engineer. Closure Schedules submitted to the Engineer with incomplete, unintelligible or inaccurate information will be returned for correction and resubmittal. The Contractor will be notified of disapproved closures or closures that require coordination with other parties as a condition of approval.

CONTINGENCY PLAN

The Contractor shall prepare a contingency plan for reopening closures to public traffic. The Contractor shall submit the contingency plan for a given operation to the Engineer within one working day of the Engineer's request.

LATE REOPENING OF CLOSURES

If a closure is not reopened to public traffic by the specified time, work shall be suspended in conformance with the provisions in Section 8-1.05, "Temporary Suspension of Work," of the Standard Specifications. The Contractor shall not make further closures until the Engineer has accepted a work plan, submitted by the Contractor, that will insure that future closures will be reopened to public traffic at the specified time. The Engineer will have 2 working days to accept or reject the Contractor's proposed work plan. The Contractor will not be entitled to compensation for the suspension of work resulting from the late reopening of closures.

COMPENSATION

The Contractor shall notify the Engineer of delay in the Contractor's operations due to the following conditions, and if, in the opinion of the Engineer, the Contractor's controlling operation is delayed or interfered with by reason of those conditions, and the Contractor's loss due to that delay could not have been avoided by rescheduling the affected closure or by judicious handling of forces, equipment and plant, the delay will be considered a right of way delay within the meaning of Section 8-1.09, "Right of Way Delays," and compensation for the delay will be determined in conformance with the provisions in Section 8-1.09:

A. The Contractor's proposed Closure Schedule is denied and his planned closures are within the time frame allowed for closures in "Maintaining Traffic" of these special provisions, except that the Contractor will not be entitled to compensation for amendments to the Closure Schedule that are not approved.
B. The Contractor is denied a confirmed closure.

Should the Engineer direct the Contractor to remove a closure prior to the time designated in the approved Closure Schedule, delay to the Contractor's schedule due to removal of the closure will be considered a right of way delay within the meaning of Section 8-1.09, "Right of Way Delays," and compensation for the delay will be determined in conformance with the provisions in Section 8-1.09.

10-1.24 TRAFFIC CONTROL SYSTEM FOR LANE CLOSURE

A traffic control system shall consist of closing traffic lanes in conformance with the details shown on the plans, the provisions in Section 12, "Construction Area Traffic Control Devices," of the Standard Specifications, the provisions under "Maintaining Traffic" and "Construction Area Signs" of these special provisions, and these special provisions.

The provisions in this section will not relieve the Contractor from the responsibility to provide additional devices or take measures as may be necessary to comply with the provisions in Section 7-1.09, "Public Safety," of the Standard Specifications.

During traffic stripe operations and pavement marker placement operations using bituminous adhesive, traffic shall be controlled, at the option of the Contractor, with either stationary or moving lane closures. During other operations, traffic shall be controlled with stationary lane closures. Attention is directed to the provisions in Section 84-1.04, "Protection From Damage," and Section 85-1.06, "Placement," of the Standard Specifications.

If components in the traffic control system are displaced or cease to operate or function as specified, from any cause, during the progress of the work, the Contractor shall immediately repair the components to the original condition or replace the components and shall restore the components to the original location.

STATIONARY LANE CLOSURE

When lane closures are made for work periods only, at the end of each work period, all components of the traffic control system, except portable delineators placed along open trenches or excavation adjacent to the traveled way, shall be removed from the traveled way and shoulder. If the Contractor so elects, the components may be stored at selected central locations designated by the Engineer within the limits of the highway right of way.

One-way traffic shall be controlled through the project in conformance with the plan entitled "Traffic Control System for Lane Closure on Two Lane Conventional Highways" and these special provisions.

Utilizing a pilot car will be at the option of the Contractor. If the Contractor elects to use a pilot car, the cones shown along the centerline on the plan need not be placed. The pilot car shall have radio contact with personnel in the work area. The maximum speed of the pilot car through the traffic control zone shall be 40 kilometers per hour.

MOVING LANE CLOSURE

Flashing arrow signs used in moving lane closures shall be truck-mounted. Flashing arrow signs shall be in the caution display mode when used on 2-lane highways. Changeable message signs used in moving lane closure operations shall conform to the provisions in Section 12-3.12, "Portable Changeable Message Signs," of the Standard Specifications, except the signs shall be truck-mounted. The full operation height of the bottom of the sign may be less than 2.1 m above the ground, but should be as high as practicable.

Truck-mounted attenuators (TMA) for use in moving lane closures shall be any of the following approved models, or equal:

A. Hexfoam TMA Series 3000, Alpha 1000 TMA Series 1000 and Alpha 2001 TMA Series 2001, manufactured by Energy Absorption Systems, Inc., One East Wacker Drive, Chicago, IL 60601-2076, Telephone (312) 467-6750.

   1. Distributor (Northern): Traffic Control Service, Inc., 8585 Thys Court, Sacramento, CA 95828, Telephone 1-800-884-8274, FAX (916) 387-9734.
   2. Distributor (Southern): Traffic Control Service, Inc., 1881 Betmor Lane, Anaheim, CA 92805, Telephone 1-800-222-8274.

B. Cal T-001 Model 2 or Model 3, manufacturer and distributor; Hexcel Corporation, 11711 Dublin Boulevard, P.O. Box 2312, Dublin, CA 94568, Telephone (925) 551-4900.

C. Renco Rengard Model Nos. CAM 8-815 and RAM 8-815, manufacturer and distributor, Renco Inc., 1582 Pflugerville Loop Road, P.O. Box 730, Pflugerville, TX 78660-0730, Telephone 1-800-654-8182.

Each TMA shall be individually identified with the manufacturer's name, address, TMA model number, and a specific serial number. The names and numbers shall each be a minimum 13 mm high and located on the left (street) side at the lower front corner. The TMA shall have a message next to the name and model number in 13 mm high letters which states, "The bottom of this TMA shall be _____ mm ± _____ mm above the ground at all points for proper impact performance." A TMA which is damaged or appears to be in poor condition shall not be used unless recertified by the manufacturer. The Engineer shall be the sole judge whether used TMAs supplied under this contract need recertification. Each unit shall be certified by the manufacturer to meet the requirements for TMAs in conformance with the standards established by the Transportation Laboratory.

Approvals for new TMA designs proposed as equal to the above approved models shall be in conformance with the procedures (including crash testing) established by the Transportation Laboratory. For information regarding submittal of new designs for evaluation contact: Transportation Laboratory, 5900 Folsom Boulevard, Sacramento, CA 95819.

New TMAs proposed as equal to approved TMAs or approved TMAs determined by the Engineer to need recertification shall not be used until approved or recertified by the Transportation Laboratory.

PAYMENT

The contract lump sum price paid for traffic control system shall include full compensation for furnishing all labor (except for flagging costs), materials (including signs), tools, equipment, and incidentals, and for doing all the work involved in placing, removing, storing, maintaining, moving to new locations, replacing, and disposing of the components of the traffic control system and for furnishing and operating the pilot car, (including driver, radios, other equipment, and labor required), as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer. Flagging costs will be paid for as provided in Section 12-2.02, "Flagging Costs," of the Standard Specifications.

The adjustment provisions in Section 4-1.03, "Changes," of the Standard Specifications shall not apply to the item of traffic control system. Adjustments in compensation for traffic control system will be made only for increased or decreased traffic control system required by changes ordered by the Engineer and will be made on the basis of the cost of the increased or decreased traffic control necessary. The adjustment will be made on a force account basis as provided in Section 9-1.03, "Force Account Payment," of the Standard Specifications for increased work, and estimated on the same basis in the case of decreased work.

Traffic control system required by work which is classed as extra work, as provided in Section 4-1.03D of the Standard Specifications, will be paid for as a part of the extra work.

10-1.25 TEMPORARY PAVEMENT DELINEATION

Temporary pavement delineation shall be furnished, placed, maintained, and removed in conformance with the provisions in Section 12-3.01, "General," of the Standard Specifications and these special provisions. Nothing in these special provisions shall be construed as reducing the minimum standards specified in the MUTCD, the MUTCD California Supplement, or as relieving the Contractor from the responsibilities specified in Section 7-1.09, "Public Safety," of the Standard Specifications.

GENERAL

Whenever the work causes obliteration of pavement delineation, temporary or permanent pavement delineation shall be in place prior to opening the traveled way to public traffic. Laneline or centerline pavement delineation shall be provided at all times for traveled ways open to public traffic.

The Contractor shall perform the work necessary to establish the alignment of temporary pavement delineation, including required lines or marks. Surfaces to receive temporary pavement delineation shall be dry and free of dirt and loose material. Temporary pavement delineation shall not be applied over existing pavement delineation or other temporary pavement delineation. Temporary pavement delineation shall be maintained until superseded or replaced with a new pattern of temporary pavement delineation or permanent pavement delineation.

Temporary pavement markers, including underlying adhesive, and removable traffic tape which are applied to the final layer of surfacing or existing pavement to remain in place or which conflicts with a subsequent or new traffic pattern for the area shall be removed when no longer required for the direction of public traffic, as determined by the Engineer.

TEMPORARY LANELINE AND CENTERLINE DELINEATION

Whenever lanelines or centerlines are obliterated and temporary pavement delineation to replace the lines is not shown on the plans, the minimum laneline and centerline delineation to be provided for that area shall be temporary pavement markers placed at longitudinal intervals of not more than 7.3 m. The temporary pavement markers shall be the same color as the laneline or centerline the pavement markers replace. Temporary pavement markers shall be, at the option of the Contractor, one of the temporary pavement markers listed for short term day/night use (14 days or less) or long term day/night use (6 months or less) in "Prequalified and Tested Signing and Delineation Materials" of these special provisions. The temporary pavement markers shall be placed in conformance with the manufacturer's instructions. Temporary pavement

markers for long term day/night use (6 months or less) shall be cemented to the surfacing with the adhesive recommended by the manufacturer, except epoxy adhesive shall not be used to place the temporary pavement markers in areas where removal of the temporary pavement markers will be required.

Temporary laneline or centerline delineation consisting entirely of temporary pavement markers listed for short term day/night use (14 days or less), shall be placed on longitudinal intervals of not more than 7.3 m and shall be used for a maximum of 14 days on lanes opened to public traffic. Prior to the end of the 14 days the permanent pavement delineation shall be placed. If the permanent pavement delineation is not placed within the 14 days, the Contractor shall replace the temporary pavement markers and provide additional temporary pavement delineation and shall bear the cost thereof. The additional temporary pavement delineation to be provided shall be equivalent to the pattern specified for the permanent pavement delineation for the area, as determined by the Engineer.

Full compensation for furnishing, placing, maintaining, and removing the temporary pavement markers (including underlying adhesive, layout (dribble) lines to establish alignment of temporary pavement markers or used for temporary laneline and centerline delineation zones) for those areas where temporary laneline and centerline delineation is not shown on the plans and for providing equivalent patterns of permanent traffic lines for those areas when required, shall be considered as included in the contract prices paid for the items of work that obliterated the laneline and centerline pavement delineation and no separate payment will be made therefor.

Traffic stripe (100-mm wide) placed as temporary edgeline delineation that will require removal shall conform to the provisions of "Temporary Traffic Stripe (Tape)" of these special provisions. Where removal of the 100-mm wide traffic stripe will not be required, painted traffic stripe conforming to the provisions of "Temporary Traffic Stripe (Paint)" of these special provisions may be used. The quantity of temporary traffic stripe (tape) or temporary traffic stripe (paint) used for this temporary edgeline delineation will not be included in the quantities of tape or paint to be paid for.

TEMPORARY TRAFFIC STRIPE (TAPE)

Temporary traffic stripe consisting of removable traffic stripe tape shall be applied at the locations shown on the plans. The temporary traffic stripe tape shall be complete in place at the location shown prior to opening the traveled way to public traffic.

Removable traffic stripe tape shall be the temporary removable traffic stripe tape listed in "Prequalified and Tested Signing and Delineation Materials" of these special provisions.

Removable traffic stripe tape shall be applied in conformance with the manufacturer's installation instructions and shall be rolled slowly with a rubber tired vehicle or roller to ensure complete contact with the pavement surface. Traffic stripe tape shall be applied straight on tangent alignment and on a true arc on curved alignment. Traffic stripe tape shall not be applied when the air or pavement temperature is less than 10°C, unless the installation procedures to be used are approved by the Engineer, prior to beginning installation of the tape.

TEMPORARY PAVEMENT MARKING (TAPE)

Temporary pavement marking consisting of removable pavement marking tape shall be applied at the locations shown on the plans. The temporary pavement marking tape shall be complete in place at the location shown, prior to opening the traveled way to public traffic.

Removable pavement marking tape shall be the temporary removable type pavement marking tape listed in "Prequalified and Tested Signing and Delineation Materials" of these special provisions and shall be applied and removed in conformance with the provisions specified for applying and removing the temporary traffic stripe tape.

MEASUREMENT AND PAYMENT

Temporary traffic stripe (tape) will be measured and paid for by the meter, measured along the line of the stripe, with deductions for gaps in broken traffic stripes. Double and 200-mm temporary traffic stripes, shown on the plans as tape, will be measured as 2 temporary traffic stripes (tape). Temporary pavement marking (tape) will be measured and paid for by the square meter for actual area of the pavement marking that receives tape.

The contract price paid per meter for temporary traffic stripe (tape) shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in applying, maintaining and removing temporary traffic stripe tape, complete in place, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

The contract price paid per square meter for temporary pavement marking (tape) shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in applying, maintaining and removing temporary pavement marking tape, complete in place, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

10-1.26 PORTABLE CHANGEABLE MESSAGE SIGN

Portable changeable message signs shall be furnished, placed, operated, and maintained at those locations shown on the plans or where designated by the Engineer in conformance with the provisions in Section 12, "Construction Area Traffic Control Devices," of the Standard Specifications and these special provisions.

The Contractor shall have 3 portable changeable message signs on the project at all times.

10-1.27 TEMPORARY RAILING

Temporary railing (Type K) shall be placed as shown on the plans, as specified in the Standard Specifications or these special provisions or where ordered by the Engineer and shall conform to the provisions in Section 12, "Construction Area Traffic Control Devices," of the Standard Specifications and these special provisions.

Reflectors on temporary railing (Type K) shall conform to the provisions in "Prequalified and Tested Signing and Delineation Materials" of these special provisions.

Attention is directed to "Public Safety" and "Order of Work" of these special provisions.

Temporary railing (Type K) placed in conformance with the provisions in "Public Safety" of these special provisions will be neither measured nor paid for.

10-1.28 TRAFFIC PLASTIC DRUMS

Traffic plastic drums shall conform to the requirements for traffic control devices in Section 12, "Construction Area Traffic Control Devices," of the Standard Specifications and these special provisions.

Traffic plastic drums shall be constructed of low-density polyethylene material and shall be flexible or collapsible upon impact by a vehicle. The traffic plastic drum shall have a weighted base that will separate from the drum. The base shall be of such shape as to preclude rolling upon impact by a vehicle. The base shall be of sufficient weight to maintain the drum in position and upright. The base or external ballast rings shall not exceed 101.6 mm in height, and drum rings shall not exceed 965.2 mm maximum in diameter. The base or external rings placed over and around the drum, resting on the pavement or ground shall contain the ballast for the drums. Ballast for drums shall be sand or water, except sand shall be used in areas susceptible to freezing. The base shall have drain holes to prevent the accumulation of water. Sand bags shall not be used as ballast for drums.

The body of the traffic plastic drum shall be of a fluorescent orange or predominately orange color. Drums shall be a minimum of 914.4 mm in height above the traveled way, and have at least a 457.2 mm minimum width, regardless of orientation.

The markings on drums shall be horizontal, circumferential, alternating orange and white reflective bands 101.6 to 152.4 mm wide. Each drum shall have a minimum of 2 orange and 2 white bands. The top of the uppermost reflective band shall be no lower than 152.4 mm from the top of the drum. Any non-reflective spaces between the bands shall not exceed 50.8 mm in width. The reflective sheeting shall conform to the provisions in "Prequalified and Tested Signing and Delineation Materials" of these special provisions.

Only one type of traffic plastic drum shall be used on the project. The type of traffic plastic drum proposed for use on the project shall be submitted to the Engineer for approval, prior to placement on the project.

In curvilinear alignment traffic plastic drums shall be used only on one side of the traveled way. Traffic plastic drums shall be placed on the alignment and location shown on the plans, or directed by the Engineer. Traffic plastic drums shall be placed uniformly, straight on tangent alignment and on a true arc on curved alignment. All layout work necessary to place the traffic plastic drums to the proper alignment shall be performed by the Contractor.

If traffic plastic drums are displaced or are not in an upright position, from any cause, the traffic plastic drums shall immediately be replaced or restored to their original location, in an upright position, by the Contractor.

At the option of the Contractor, where portable delineators, cones or Type I or II barricades are specified in the specifications or shown on the plans, traffic plastic drums may be used in place of those portable delineators, cones or Type I or II barricades.

At the completion of the project, traffic plastic drums shall become the property of the Contractor and removed from the site of the work.

Traffic plastic drums shall be installed as shown on the plans when temporary railing (Type K) is placed as required by "Public Safety" of these special provisions.

Traffic plastic drums will be measured as units from actual count of the number of traffic plastic drum designated on the plans or ordered by the Engineer. After initial placement of traffic plastic drums, and if ordered by the Engineer, the traffic plastic drums shall be moved from location to location and the cost thereof will be paid for as extra work as provided in Section 4-1.03D. Traffic plastic drums which are used as part of traffic control system in place of cones, delineators or barricades or which are used in accordance with the requirements of "Public Safety" elsewhere in these special provisions or which are placed in excess of the number specified or shown will not be included in the count of traffic plastic drums to be paid for.

The contract unit price paid for traffic plastic drum shall include full compensation for furnishing all labor, materials (including ballast), tools, equipment, and incidentals, and for doing all the work involved in furnishing, placing, maintaining, repairing, replacing and removing the traffic plastic drum, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

10-1.29 TEMPORARY CRASH CUSHION MODULE

This work shall consist of furnishing, installing, and maintaining sand filled temporary crash cushion modules in groupings or arrays at each location shown on the plans, as specified in these special provisions or where designated by the Engineer. The grouping or array of sand filled modules shall form a complete sand filled temporary crash cushion in conformance with the details shown on the plans and these special provisions.

Attention is directed to "Public Safety", and "Order of Work", of these special provisions.

Whenever the work or the Contractor's operations establishes a fixed obstacle, the exposed fixed obstacle shall be protected with a sand filled temporary crash cushion. The sand filled temporary crash cushion shall be in place prior to opening the lanes adjacent to the fixed obstacle to public traffic.

Sand filled temporary crash cushions shall be maintained in place at each location, including times when work is not actively in progress. Sand filled temporary crash cushions may be removed during a work period for access to the work provided that the exposed fixed obstacle is 4.6 m or more from a lane carrying public traffic and the temporary crash cushion is reset to protect the obstacle prior to the end of the work period in which the fixed obstacle was exposed. When no longer required, as determined by the Engineer, sand filled temporary crash cushions shall be removed from the site of the work.

At the Contractor's option, the modules for use in sand filled temporary crash cushions shall be either Energite III Inertial Modules, Fitch Inertial Modules or TrafFix Sand Barrels manufactured after March 31, 1997, or equal:

A. Energite III and Fitch Inertial Modules, manufactured by Energy Absorption Systems, Inc., One East Wacker Drive, Chicago, IL 60601-2076. Telephone (312) 467-6750, FAX (800) 770-6755

   1. Distributor (North): Traffic Control Service, Inc., 8585 Thys Court, Sacramento, CA 95828. Telephone (800) 884-8274, FAX (916) 387-9734
   2. Distributor (South): Traffic Control Service, Inc., 1881 Betmor Lane, Anaheim, CA 92805. Telephone (800) 222-8274, FAX (714) 937-1070

B. TrafFix Sand Barrels, manufactured by TrafFix Devices, Inc., 220 Calle Pintoresco, San Clemente, CA 92672. Telephone (949) 361-5663, FAX (949) 361-9205

   1. Distributor (North): United Rentals, Inc., 1533 Berger Drive, San Jose, CA 95112. Telephone (408) 287-4303, FAX (408) 287-1929
   2. Distributor (South): Statewide Safety & Sign, Inc., P.O. Box 1440, Pismo Beach, CA 93448. Telephone (800) 559-7080, FAX (805) 929-5786

Modules contained in each temporary crash cushion shall be of the same type at each location. The color of the modules shall be the standard yellow color, as furnished by the vendor, with black lids. The modules shall exhibit good workmanship free from structural flaws and objectionable surface defects. The modules need not be new. Good used undamaged modules conforming to color and quality of the types specified herein may be utilized. If used Fitch modules requiring a seal are furnished, the top edge of the seal shall be securely fastened to the wall of the module by a continuous strip of heavy duty tape.

Modules shall be filled with sand in conformance with the manufacturer's directions, and to the sand capacity in kilograms for each module shown on the plans. Sand for filling the modules shall be clean washed concrete sand of commercial quality. At the time of placing in the modules, the sand shall contain not more than 7 percent water as determined by California Test 226.

Modules damaged due to the Contractor's operations shall be repaired immediately by the Contractor at the Contractor's expense. Modules damaged beyond repair, as determined by the Engineer, due to the Contractor's operations shall be removed and replaced by the Contractor at the Contractor's expense.

Temporary crash cushion modules shall be placed on movable pallets or frames conforming to the dimensions shown on the plans. The pallets or frames shall provide a full bearing base beneath the modules. The modules and supporting pallets or frames shall not be moved by sliding or skidding along the pavement or bridge deck.

A Type R or P marker panel shall be attached to the front of the crash cushion as shown on the plans, when the closest point of the crash cushion array is within 3.6 m of the traveled way. The marker panel, when required, shall be firmly fastened to the crash cushion with commercial quality hardware or by other methods determined by the Engineer.

At the completion of the project, temporary crash cushion modules, sand filling, pallets or frames, and marker panels shall become the property of the Contractor and shall be removed from the site of the work. Temporary crash cushion modules shall not be installed in the permanent work.

Temporary crash cushion modules will be measured by the unit as determined from the actual count of modules used in the work or ordered by the Engineer at each location. Temporary crash cushion modules placed in conformance with the provisions in "Public Safety" of these special provisions and modules placed in excess of the number specified or shown will not be measured nor paid for.

Repairing modules damaged by public traffic will be paid for as extra work as provided in Section 4-1.03D of the Standard Specifications. Modules damaged beyond repair by public traffic, when ordered by the Engineer, shall be removed and replaced immediately by the Contractor. Modules replaced due to damage by public traffic will be measured and paid for as temporary crash cushion module.

If the Engineer orders a lateral move of the sand filled temporary crash cushions and the repositioning is not shown on the plans, moving the sand filled temporary crash cushion will be paid for as extra work as provided in Section 4-1.03D of the Standard Specifications and these temporary crash cushion modules will not be counted for payment in the new position.

The contract unit price paid for temporary crash cushion module shall include full compensation for furnishing all labor, materials (including sand, pallets or frames and marker panels), tools, equipment, and incidentals, and for doing all the work involved in furnishing, installing, maintaining, moving, and resetting during a work period for access to the work, and removing from the site of the work when no longer required (including those damaged by public traffic) sand filled temporary crash cushion modules, complete in place, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

10-1.30 EXISTING HIGHWAY FACILITIES

The work performed in connection with various existing highway facilities shall conform to the provisions in Section 15, "Existing Highway Facilities," of the Standard Specifications and these special provisions.

Residue from saw cutting operations shall be removed from the pavement surface by vacuuming or other approved method and shall not be allowed to flow across the pavement nor be left on the surface of the pavement. Residue from saw cutting operations shall be disposed of outside the highway right of way in conformance with the provisions in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications.

Full compensation for conforming to the requirements for the control, removal and disposal of residue resulting from saw cutting operations shall be considered as included in the contract price paid for the item of work involved and no additional compensation will be allowed therefor.

REMOVE TRAFFIC STRIPE AND PAVEMENT MARKING

Traffic stripe and pavement marking shall be removed at the locations shown on the plans and as directed by the Engineer.

Attention is directed to "Water Pollution Control" of these special provisions.

Waste from removal of yellow painted traffic stripe contains lead chromate in average concentrations greater than or equal to 5 mg/L Soluble Lead or 1000 mg/kg Total Lead. Yellow painted traffic stripe exists from Station 11+50 to Station 13+85 on Route 188 and from Station 10+80 to Station 11+70 on Thing Road. Residue produced from when yellow paint is removed may contain heavy metals in concentrations that exceed thresholds established by the California Health and Safety Code and may produce toxic fumes when heated.

The removed yellow paint shall be disposed of at a Class 1 disposal facility or a Class 2 disposal facility permitted by the Regional Water Quality Control Board in conformance with the requirements of the disposal facility operator within 10 days after accumulating 100 kg of residue and dust. The Contractor shall make necessary arrangements with the operator of the disposal facility to test the yellow paint residue as required by the facility and these special provisions. Testing shall include, at a minimum, (1) Total Lead and Chromium by EPA Method 7000 series and (2) Soluble Lead and Chromium by California Waste Extraction Test. From the first 3360 L of waste or portion thereof, if less than 3360 L of waste are produced, a minimum of four randomly selected samples shall be taken and analyzed. From each additional 840 L of waste or portion thereof, if less than 840 L are produced, a minimum of one additional random sample shall be taken and analyzed. The Contractor shall submit the name and location of the disposal facility and analytical laboratory along with the testing requirements to the Engineer not less than 15 days prior to the start of removal of yellow painted traffic stripe. The analytical laboratory shall be certified by the Department of Health Services Environmental Laboratory Accreditation Program. Test results shall be provided to the Engineer for review prior to signing a waste profile as requested by the disposal facility, prior to issuing an EPA identification number, and prior to allowing removal of the waste from the site.

The Contractor shall prepare a project specific Lead Compliance Plan to prevent or minimize worker exposure to lead while handling removed yellow paint residue. Attention is directed to Title 8, California Code of Regulations, Section 1532.1, "Lead," for specific Cal-OSHA requirements when working with lead.

The Lead Compliance Plan shall contain the elements listed in Title 8, California Code of Regulations, Section 1532.1(e)(2)(B). Before submission to the Engineer, the Lead Compliance Plan shall be approved by an Industrial Hygienist certified in Comprehensive Practice by the American Board of Industrial Hygiene. The Plan shall be submitted to the Engineer at least 7 days prior to beginning removal of yellow paint.

Prior to removing yellow painted traffic stripe, personnel who have no prior training, including State personnel, shall complete a safety training program provided by the Contractor that meets the requirements of Title 8, California Code of Regulations, Section 1532.1, "Lead," and the Contractor's Lead Compliance Program.

Personal protective equipment, training, and washing facilities required by the Contractor's Lead Compliance Plan shall be supplied to State personnel by the Contractor. The number of State personnel will be 3.

Where grinding or other methods approved by the Engineer are used to remove yellow painted traffic stripe, the removed residue, including dust, shall be contained and collected immediately. Sweeping equipment shall not be used. Collection shall be by a high efficiency particulate air (HEPA) filter equipped vacuum attachment operated concurrently with the removal operations or other equally effective methods approved by the Engineer. The Contractor shall submit a written work plan for the removal, storage, and disposal of yellow painted traffic stripe to the Engineer for approval not less than 15 days prior to the start of the removal operations. Removal operations shall not be started until the Engineer has approved the work plan.

The removed yellow painted traffic stripe residue shall be stored and labeled in covered containers. Labels shall conform to the provisions of Title 22, California Code of Regulations, Sections 66262.31 and 66262.32. Labels shall be marked with date when the waste is generated, the words "Hazardous Waste", composition and physical state of the waste (for example, asphalt grindings with paint), the word "Toxic", the name and address of the Engineer, the Engineer's telephone number, contract number, and Contractor or subcontractor. The containers shall be a type approved by the United States Department of Transportation for the transportation and temporary storage of the removed residue. The containers shall be handled so that no spillage will occur. The containers shall be stored in a secured enclosure at a location within the project limits until disposal, as approved by the Engineer.

If the yellow painted traffic stripe residue is transported to a Class 1 disposal facility, a manifest shall be used, and the transporter shall be registered with the California Department of Toxic Substance Control. The Engineer will obtain the United States Environmental Protection Agency Identification Number and sign all manifests as the generator within 2 working days of receiving sample test results and approving the test methods.

Nothing in these special provisions shall relieve the Contractor of the Contractor's responsibilities as specified in Section 7-1.09, "Public Safety," of the Standard Specifications.

The contract lump sum price paid for Lead Compliance Plan shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals and for doing all the work involved in preparing the Lead Compliance Plan, including paying the Certified Industrial Hygienist, and for providing personnel protective equipment, training, air monitoring, and medical surveillance, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

Full compensation for providing a written work plan for the removal, storage, and disposal of yellow painted traffic stripe shall be considered as included in the contract items paid per square meter for remove yellow painted traffic stripe and no separate payment will be made therefor.

REMOVE DRAINAGE FACILITY

Existing culverts, and headwalls, where any portion of these structures is within one meter of the grading plane in excavation areas, or within 0.3-m of original ground in embankment areas, or where shown on the plans to be removed, shall be completely removed and disposed of.

REMOVE UNDERGROUND STORAGE TANK

Underground storage tank as shown on the plans, including piping and appurtenances, shall be removed and disposed of.

Attention is directed to "Hazardous Materials Mitigation Plans and Reports," and "Excavation (contaminated soil)" of these special provisions.

The Contractor shall comply with all Federal, State, and local regulatory agencies requirements for tank removal, including regulations related to transporting removed tanks.

Haul and Dispose Contaminated Material

The underground storage tank shall be empty prior to removal. If the tank contains liquids, liquids shall be removed following characterization and disposed of in a manner appropriate to the characterization and as recommended in the Site Investigation (SI) of Tank Contents Report.

The underground tank shall be purged of flammable vapors with dry ice at a minimum of 1.22 kilograms per 1000 liters of tank capacity for a minimum of one hour. The Contractor shall provide a dated receipt for the purchase of a sufficient quantity of dry ice to satisfy these requirements to the Engineer.

The removed tank shall be transported to an approved, certified recycler or landfill by an approved transporter.

If a tank cannot be decontaminated on-site after as much of the contents as possible have been removed, the tank must be transported by a certified hazardous waste hauler to a legal disposal site.

Measurement and Payment

The contract unit price paid for remove underground storage tank shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in removing the underground storage tank, complete in place, including piping and appurtenance, and transporting and disposing of the tank, piping and appurtenance, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

Characterization and disposal of tank contaminated contents will be paid for as extra work as provided in Section 4-l.03D of the Standard Specifications.

REMOVE ROADSIDE SIGN

Existing roadside signs, at those locations shown on the plans to be removed, shall be removed and disposed of.

Existing roadside signs shall not be removed until replacement signs have been installed or until the existing signs are no longer required for the direction of public traffic, unless otherwise directed by the Engineer.

RESET ROADSIDE SIGN

Existing roadside signs, where shown on the plans to be reset, shall be removed and reset.

Each roadside sign shall be reset on the same day that the sign is removed.

Two holes shall be drilled in each existing post as required to provide the breakaway feature shown on the plans.

RELOCATE ROADSIDE SIGN

Existing roadside signs shall be removed and relocated to the new locations shown on the plans.

Each roadside sign shall be installed at the new location on the same day that the sign is removed from its original location.

Two holes shall be drilled in each existing post as required to provide the breakaway feature shown on the plans.

REMOVE CONCRETE

Concrete, where shown on the plans to be removed, shall be removed.

The pay quantities of concrete to be removed will be measured by the cubic meter, measured before and during removal operations.

Concrete removed shall be disposed of outside the highway right of way in conformance with the provisions in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications.

10-1.31 CLEARING AND GRUBBING

Clearing and grubbing shall conform to the provisions in Section 16, "Clearing and Grubbing," of the Standard Specifications and these special provisions.

Vegetation shall be cleared and grubbed only within the excavation and embankment slope lines.

At locations where there is no grading adjacent to a bridge or other structure, clearing and grubbing of vegetation shall be limited to 1.5 m outside the physical limits of the bridge or structure.

Existing vegetation outside the areas to be cleared and grubbed shall be protected from injury or damage resulting from the Contractor's operations.

Activities controlled by the Contractor, except cleanup or other required work, shall be confined within the graded areas of the roadway.

Nothing herein shall be construed as relieving the Contractor of the Contractor's responsibility for final cleanup of the highway as provided in Section 4-1.02, "Final Cleaning Up," of the Standard Specifications.

10-1.32 WATERING

Developing a water supply and applying watering shall conform to the provisions in Section 17, "Watering," of the Standard Specifications.

10-1.33 EARTHWORK

Earthwork shall conform to the provisions in Section 19, "Earthwork," of the Standard Specifications and these special provisions.

Boulders excavated during earthwork operations shall be stockpiled in quantities necessary for use in "Decorative Boulder," as indicated in these special provisions, as shown on the plans, and as directed by the Engineer. Decorative boulder stockpile area shall be located within the project limits, as designated by the Engineer.

Attention is directed to the requirements specified under "Decorative Boulder" elsewhere in these special provisions regarding the removal of the decorative boulders from the stockpile area, transporting, and placing stockpiled decorative boulders.

Full compensation for excavating and stockpiling decorative boulders shall be considered as included in the contract price paid per cubic meter for roadway excavation, and no additional compensation will be allowed therefor.

Surplus excavated material shall become the property of the Contractor and shall be disposed of in conformance with the provisions in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications.

Where a portion of the existing surfacing is to be removed, the outline of the area to be removed shall be cut on a neat line with a power-driven saw to a minimum depth of 50 mm before removing the surfacing. Full compensation for cutting the existing surfacing shall be considered as included in the contract price paid per cubic meter for roadway excavation and no additional compensation will be allowed therefor.

Attention is directed to "Existing Highway Facilities" of these special provisions concerning residue from saw cutting.

Reinforcement or metal attached to reinforced concrete rubble placed in embankments shall not protrude above the grading plane. Prior to placement within 0.6-m below the grading plane of embankments, reinforcement or metal shall be trimmed to no greater than 20 mm from the face of reinforced concrete rubble. Full compensation for trimming reinforcement or metal shall be considered as included in the contract prices paid per cubic meter for the types of excavation shown in the Engineer's estimate, or the contract prices paid for furnishing and placing imported borrow or embankment material, as the case may be, and no additional compensation will be allowed therefor.

10-1.34 EXCAVATION (CONTAMINATED SOIL)

Soils in the vicinity of the underground tank potentially contain contaminants such as, but not limited to, volatile organic compounds (VOCs), including chlorinated solvents, heavy metals, and petroleum hydrocarbons, or combinations thereof.

Attention is directed to "Hazardous Materials Mitigation Plans and Reports," of these special provisions.

The Contractor may be required to excavate, transport, and dispose contaminated soil if required by local regulators and as directed by the Engineer.

Excavation (contaminated soil) shall consist of the following:

1. Preparing an Excavation and Transportation Plan.
2. Excavating, transporting, and disposing of excavated contaminated soil requiring disposal off site.

APPLICABLE RULES AND REGULATIONS

Excavation, transport, and disposal of excavation (contaminated soil) shall be in accordance with the rules and regulations of the following agencies:

1. United States Department of Transportation (USDOT)
2. United States Environmental Protection Agency (USEPA)
3. California Environmental Protection Agency (Cal-EPA)
4. California Department of Toxic Substances Control (DTSC),
5. California Department of Health Services
6. California Integrated Waste Management Board
7. Regional Water Quality Control Board (RWQCB), Region 9
8. State Air Resources Board
9. San Diego Air Pollution Control District (SDAPCD)
10. California Division of Occupational Safety and Health Administration (Cal-OSHA)
11. County of San Diego Department of Environmental Health Services, Site Assessment and Mitigation Division, (http://www.sdcdeh.org/deh/lwq/sam/manual_guidelines.html)

Laws and regulations that govern work related to contaminated soils, and to which reports and plans shall conform, include, but are not limited to:

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

PERMITS AND LICENSES

If tank contents or soil derived from the tank removal activities are determined to be hazardous they shall be disposed by the Contractor at an appropriately permitted land disposal facility. The Engineer will obtain the USEPA Generator Identification Number and Board of Equalization Number and will sign manifests as the Generator.

EXCAVATION AND TRANSPORTATION PLAN (ETP)

The Contractor shall submit an Excavation and Transportation Plan to address off-site disposal requirements if material is determined to be contaminated or hazardous waste. The ETP shall incorporate and address contaminated soil including volatile organic compounds (VOCs), chlorinated solvents, heavy metals, petroleum hydrocarbons, or combinations thereof. Characterization of soil shall be determined based on the results, conclusions, and recommendations of the approved final Site Investigation (SI) of Surrounding Soil Report.

Within 15 days after approval of final SI of Surrounding Soil Report, the Contractor shall submit 3 copies of the ETP to the Engineer. The ETP shall be signed by a California Professional Engineer or a California Professional Geologist with experience in waste characterization and disposal. The Engineer will have 15 days to review the ETP. If revisions are required, as determined by the Engineer, the Contractor shall revise and resubmit the ETP within 7 days of receipt of the Engineer's comments. The Engineer will have 7 days to review the revisions. Upon the Engineer's approval of the Excavation and Transportation Plan, 3 copies of the final ETP incorporating the required changes shall be submitted to the Engineer. Minor changes or clarifications to the initial submittal may be made and attached as amendments to the ETP. To allow construction to proceed, the Engineer may conditionally approve the ETP while minor revisions or amendments are being completed.

The Excavation and Transportation Plan shall conform to the regulations of the Department of Toxic Substance Control and the California Division of Occupational Safety and Health Administration (Cal-OSHA) and be consistent with the approved Health and Safety Plan (HSP). The plan shall contain, but not be limited to the following elements:

1. Excavation schedule (by location and date)
3. Results of sampling and analysis for contaminated underground storage tank locations
4. Dust control measures
5. Air monitoring if required by the HSP

    A. Location and type of equipment
    B. Sampling frequency
    C. Analytical laboratory

6. Transportation equipment and routes
7. Method for preventing spills and tracking soil onto public roads
8. Truck waiting and staging areas
9. Site for disposal of hazardous waste
10. Site for disposal of designated waste
11. Spill Contingency Plan for excavated contaminated soil

Contaminated soil shall be transferred directly to registered transport vehicles or storage containers approved for transportation of contaminated soil by the United States Department of Transportation. Excavated contaminated soil shall not be stockpiled at the site.

Prior to leaving the exclusion zone, loose and extraneous soil shall be removed from surfaces outside the cargo areas of the transporting vehicles and placed in the cargo area or back in the excavation, and the cargo shall be covered with tarpaulins or other cover, as outlined in the approved ETP. No contaminated soil shall be deposited on public roads. The Contractor shall indemnify the State from any cost due to spillage during loading or transport of the contaminated or hazardous soil to the disposal or treatment facility.

Excavated soil characterized as contaminated shall be transported to and disposed of at a permitted facility by the Contractor in conformance with Division 4.5 of Title 22 of the California Code of Regulations, Section 2521 of Title 23 of the California Code of Regulations, and Section 7-1.13, "Disposal of Material Outside the Highway Right of Way" of the Standard Specifications, and these special provisions.

The Contractor shall excavate within the excavation limits shown on the plans, specified in the Standard Specifications or directed by the Engineer, transport, and dispose of contaminated soil off-site, based on the results, conclusions, and recommendations of the sampling, analysis, and SI for Surrounding Soil Report. Contaminated soil shall be disposed of within California at a disposal site operating under a permit from the California Environmental Protection Agency.

Disposal of additional soil resulting from the Contractor's option to slope excavations in lieu of shoring or excavation operations outside roadway excavation pay limits will be at the Contractor's expense. The Contractor shall verify the condition of excess soils and shall handle in accordance with local, state, and federal regulations.

MEASUREMENT AND PAYMENT

Excavation (contaminated soil) will be paid for as extra work as provided in Section 4-l.03D of the Standard Specifications.

10-1.35 CONTROLLED LOW STRENGTH MATERIAL

Controlled low strength material shall consist of a workable mixture of aggregate, cementitious materials, and water and shall conform to the provisions for slurry cement backfill in Section 19-3.062, "Slurry Cement Backfill," of the Standard Specifications and these special provisions.

At the option of the Contractor, controlled low strength material may be used as structure backfill for pipe culverts, except that controlled low strength material shall not be used as structure backfill for culverts having a diameter or span greater than 6.1 m.

When controlled low strength material is used for structure backfill, the width of the excavation shown on the plans may be reduced so that the clear distance between the outside of the pipe and the side of the excavation, on each side of the pipe, is a minimum of 300 mm. This minimum may be reduced to 150 mm when the height of cover is less than or equal to 6.1 m or the pipe diameter or span is less than 1050 mm.

Controlled low strength material in new construction shall not be permanently placed higher than the basement soil. For trenches in existing pavements, permanent placement shall be no higher than the bottom of the existing pavement permeable drainage layer. If a drainage layer does not exist, permanent placement in existing pavements shall be no higher than 25 mm below the bottom of the existing asphalt concrete surfacing or no higher than the top of base below the existing portland cement concrete pavement. The minimum height that controlled low strength material shall be placed, relative to the culvert invert, is 0.5 diameter or 0.5 height for rigid culverts and 0.7 diameter or 0.7 height for flexible culverts.

When controlled low strength material is proposed for use, the Contractor shall submit a mix design and test data to the Engineer for approval prior to excavating the trench for which controlled low strength material is proposed for use. The test data and mix design shall provide for the following:

A. A 28-day compressive strength between 345 kPa and 690 kPa for pipe culverts having a height of cover of 6.1 m or less and a minimum 28-day compressive strength of 690 kPa for pipe culverts having a height of cover greater than 6.1 m. Compressive strength shall be determined in conformance with the requirements in ASTM Designation: D 4832.
B. Cement shall be any type of portland cement conforming to the requirements in ASTM Designation: C 150; or any type of blended hydraulic cement conforming to the requirements in ASTM Designation: C 595M or the physical requirements in ASTM Designation: C 1157M. Testing of cement will not be required.
C. Admixtures may be used in conformance with the provisions in Section 90-4, "Admixtures," of the Standard Specifications. Chemical admixtures containing chlorides as Cl in excess of one percent by mass of admixture, as determined in conformance with the requirements of California Test 415, shall not be used. If an air-entraining admixture is used, the maximum air content shall be limited to 20 percent. Mineral admixtures shall be used at the Contractor's option.

Materials for controlled low strength material shall be thoroughly machine-mixed in a pugmill, rotary drum or other approved mixer. Mixing shall continue until the cementitious material and water are thoroughly dispersed throughout the material. Controlled low strength material shall be placed in the work within 3 hours after introduction of the cement to the aggregates.

When controlled low strength material is to be placed within the traveled way or otherwise to be covered by paving or embankment materials, the material shall achieve a maximum indentation diameter of 76 mm prior to covering and opening to public traffic. Penetration resistance shall be measured in conformance with the requirements in ASTM Designation: D 6024.

Controlled low strength material used as structure backfill for pipe culverts will be considered structure backfill for compensation purposes.

10-1.36 DECORATIVE BOULDER

Attention is directed to "Earthwork" of these special provisions regarding decorative boulder excavation and stockpiling.

Decorative boulder shall consist of removing naturally occurring boulders from the stockpile area, transporting the boulders from the stockpile area to the proposed decorative boulder placement areas, and placing the boulders in their final position.

Decorative boulders shall be placed at the locations shown on the plans, in accordance with these special provisions, the Standard Specifications and as directed by the Engineer.

Decorative boulders shall consist of the following approximate sizes and quantities:

Type	Approximate Size (m)	Quantity (EA)
1	1.0 (W) Min x 1.65 (H) Min - 2.2 (H) Max	1
2	1.2 (W) x 1.5 (H)	1
3	3.02 (W) x 1.23 (H)	1
4	1.5 (W) x 1.8 (H)	1

Decorative boulders shall be obtained from within the project limits. Decorative boulders have been marked in the field and shall be removed and stockpiled prior to the start of clearing and grubbing work. The Engineer shall approve decorative boulders to be used prior to the boulders being removed and stockpiled.

Decorative boulders shall be protected from damage, chipping, scratching or scarring. If boulders are damaged as a result of the Contractor's operations, they shall be replaced at the Contractor's expense in accordance with Section 15-2.05, "Reconstruction," the Standard Specifications.

The areas to receive the decorative boulders shall be cleared as specified under "Roadside Clearing" of these special provisions.

After clearing, the areas shall be excavated to a depth of 150-200 mm below the proposed finished grade elevations and graded to a smooth uniform surface.

Decorative boulders shall then be placed at the locations shown on the plans and backfilled to the proper rough grade and finished grade elevations.

Final placement of the decorative boulders shall be as approved by the Engineer.

Decorative boulder will be measured and paid for by the unit from the actual count in place.

The contract unit price paid for decorative boulder shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in decorative boulder, complete in place, including removing naturally occurring boulders from the stockpile area, transporting the boulders from the stockpile area to the decorative boulder placement area, placing the boulders in their final position at the decorative boulder placement areas, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

10-1.37 DECORATIVE BOULDER WITH ENGRAVED SIGN

Decorative boulder with engraved sign shall consist of engraving two signs into the natural surface of a decorative boulder, as shown on the plans, in conformance with these special provisions, the Standard Specifications and as directed by the Engineer.

Decorative boulder with engraved sign shall conform to the requirements for "Decorative Boulder," of these special provisions.

The engraved letters, "Century Old Style" font, regular, shall be placed on the boulder surfaces as shown on the plans and as approved by the Engineer. If the boulder's surface crumbles or is otherwise unable to be engraved the engraved text may be placed onto granite plaques and the plaques attached to the boulder as directed by the Engineer.

If the Engineer directs the text to be engraved onto granite plaques or other material, the plaques, engraving, and mounting of the plaques onto the boulder will be paid for as extra work as provided in Section 4-l.03D of the Standard Specifications.

Final placement of the decorative boulder with engraved sign shall be approved by the Engineer.

The contract lump sum price paid for decorative boulder with engraved sign shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in decorative boulder with engraved sign, complete in place, as shown on the plans, as specified in the Standard Specifications, these special provisions, and as directed by the Engineer.

10-1.38 MOVE-IN/MOVE-OUT (EROSION CONTROL)

Move-in/move-out (erosion control) shall include moving onto the project when an area is ready to receive erosion control as determined by the Engineer, setting up all required personnel and equipment for the application of erosion control materials and moving out all personnel and equipment when erosion control in that area is completed.

When areas are ready to receive applications of erosion control (Type D), as determined by the Engineer, the Contractor shall begin erosion control work in that area within 5 working days of the Engineer's notification to perform the erosion control work.

Attention is directed to the requirements of erosion control (Type D) elsewhere in these special provisions.

Quantities of move-in/move-out (erosion control) will be determined as units from actual count as determined by the Engineer. For measurement purposes, a move-in followed by a move-out will be considered as one unit.

The contract unit price paid for move-in/move-out (erosion control) shall include full compensation for furnishing all labor, materials (excluding erosion control materials), tools, equipment, and incidentals and for doing all the work involved in moving in and removing from the project all personnel and equipment necessary for application of erosion control (Type D), as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

No adjustment of compensation will be made for any increase or decrease in the quantities of move-in/move-out (erosion control) required, regardless of the reason for the increase or decrease. The provisions in Section 4-1.03B, "Increased or Decreased Quantities," of the Standard Specifications shall not apply to the item of move-in/move-out (erosion control).

10-1.39 EROSION CONTROL (TYPE D)

Erosion control (Type D) shall conform to the provisions in Section 20-3, "Erosion Control," of the Standard Specifications and these special provisions and shall consist of applying erosion control materials to embankment and excavation slopes and other areas disturbed by construction activities.

Erosion control (Type D) shall be applied when an area is ready to receive erosion control as determined by the Engineer and in conformance with the provisions in "Move-in/Move-out (Erosion Control)" of these special provisions.

Prior to installing erosion control materials, soil surface preparation shall conform to the provisions in Section 19-2.05, "Slopes," of the Standard Specifications, except that rills and gullies exceeding 50 mm in depth or width shall be leveled. Vegetative growth, temporary erosion control materials, and other debris shall be removed from areas to receive erosion control.

MATERIALS

Materials shall conform to the provisions in Section 20-2, "Materials," of the Standard Specifications and these special provisions.

Seed

Seed shall conform to the provisions in Section 20-2.10, "Seed," of the Standard Specifications. Individual seed species shall be measured and mixed in the presence of the Engineer.

Seed shall be delivered to the project site in unopened separate containers with the seed tag attached. Containers without a seed tag attached will not be accepted.

A sample of approximately 30 g of seed will be taken from each seed container by the Engineer.

Legume Seed

Legume seed shall be pellet-inoculated or industrial-inoculated and shall conform to the following:

A. Inoculated seed shall be inoculated in conformance with the provisions in Section 20-2.10, "Seed," of the Standard Specifications.
B. Inoculated seed shall have a calcium carbonate coating.
C. Industrial-inoculated seed shall be inoculated with Rhizobia and coated using an industrial process by a manufacturer whose principal business is seed coating and seed inoculation.
D. Industrial-inoculated seed shall be sown within 180 calendar days after inoculation.
E. Legume seed shall consist of the following:

LEGUME SEED

Botanical Name (Common Name)	Percent Germination (Minimum)	Kilograms Pure Live Seed Per Hectare (Slope Measurement)
Lupinus bicolor (Pigmy Leaved Lupine)	45	5
Lotus scoparius (Deerweed)	35	3

Non-Legume Seed

Non-legume seed shall consist of the following:

NON-LEGUME SEED

Botanical Name (Common Name)	Percent Germination (Minimum)	Kilograms Pure Live Seed Per Hectare (Slope Measurement)
Adenostoma fasciculatum (Chamise)	15	2
Artemisia californica (California Sagebrush)	45	1
Eriogonum fasciculatum (California Buckwheat)	35	5
Eriophyllum confertiflorum (Golden Yarrow)	35	0.5
Lasthenia californica (Dwarf Goldfields)	35	0.5
Nassella lepida (Foothill Needlegrass)	35	3
Viguiera laciniata (San Diego Sunflower)	30	1

Commercial Fertilizer

Commercial fertilizer shall conform to the provisions in Section 20-2.02, "Commercial Fertilizer," of the Standard Specifications and shall have a guaranteed chemical analysis of 6 percent nitrogen, 20 percent phosphoric acid and 20 percent water soluble potash.

Compost

At the option of the Contractor, compost may be either A, B, or any combination of both:

A. Green material consisting of chipped, shredded, or ground vegetation; or clean processed recycled wood products.
B. Class A, exceptional quality biosolids composts, conforming to the requirements in United States Environmental Protection Agency (EPA) regulation 40 CFR, Part 503c.

Compost shall not contain paint, petroleum products, herbicides, fungicides or other chemical residues harmful to plant or animal life. Other deleterious material, plastic, glass, metal or rock shall not exceed 0.1-percent by weight or volume.

Compost shall be thermophilically processed for 15 days. During this process, the compost shall be maintained at minimum internal temperature of 55˚C and be thoroughly turned at least 5 times. A 90-day curing period shall follow the thermophilic process.

Compost shall be screened through a screen no larger than 12 mm.

Compost shall measure at least 6 on the maturity and stability scale with a Solvita test kit.

A Certificate of Compliance for compost shall be furnished to the Engineer in conformance with the provisions in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications. The Certificate of Compliance shall state the Solvita maturity and stability scale test result of the compost.

Stabilizing Emulsion

Stabilizing emulsion shall conform to the provisions in Section 20-2.11, "Stabilizing Emulsion," of the Standard Specifications and these special provisions.

Stabilizing emulsion shall be in a dry powder form, may be reemulsifiable, and shall be a processed organic adhesive used as a soil tackifier.

APPLICATION

Erosion control materials shall be applied in two separate applications in the following sequence:

A. The following mixture in the rates indicated shall be applied with hydro-seeding equipment within 60 minutes after the seed has been added to the mixture:

Material	Kilograms Per Hectare (Slope Measurement)
Legume Seed	8
Non-Legume Seed	13
Fiber	800

Material	Cubic Meter Per Hectare (Slope Measurement)
Compost	2

B. The following mixture in the rates indicated shall be applied with hydro-seeding equipment:

Material	Kilograms Per Hectare (Slope Measurement)
Fiber	1500
Commercial Fertilizer	25
Stabilizing Emulsion (Solids)	175

Material	Cubic Meter Per Hectare (Slope Measurement)
Compost	2

The ratio of total water to total stabilizing emulsion in the mixture shall be as recommended by the manufacturer.

The rates of erosion control materials may be changed by the Engineer to meet field conditions.

MEASUREMENT AND PAYMENT

Compost (erosion control) will be measured by the cubic meter in the vehicle at the point of delivery in conformance with the provisions in Section 9-1.01, "Measurement of Quantities," of the Standard Specifications.

The contract price paid per cubic meter for compost (erosion control) shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in applying compost for erosion control, complete in place, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

10-1.40 FIBER ROLLS

Fiber rolls shall be furnished and installed in conformance with details shown on the plans for "Temporary Fiber Roll" and these special provisions, and as directed by the Engineer.

Attention is directed to "Order of Work" regarding order of installation for fiber rolls.

Fiber roll shall consist of installing fiber rolls on excavation and embankment slopes and disturbed areas.

At the option of the Contractor, fiber rolls shall be Type 1 or Type 2.

MATERIALS

Materials for fiber rolls shall be in conformance with the provisions specified for materials in "Temporary Fiber Roll" of these special provisions.

INSTALLATION

Installation for fiber rolls shall be in conformance with the provisions specified for installation in "Temporary Fiber Roll" of these special provisions, except that fiber rolls will be left on place at the end of the construction period.

MEASUREMENT AND PAYMENT

The quantity of fiber rolls to be paid for will be measured by the meter, along the centerline of the installed roll. Where fiber rolls are joined and overlapped, the joint will be measured as a single installed rolls.

The contract price paid per meter for fiber rolls shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in installing fiber rolls, complete in place, including furrow

excavation and backfill, repairing or replacing of fiber rolls, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

10-1.41 ROCK BLANKET

Rock blanket shall be placed as shown on the plans and in conformance with these special provisions.

MATERIALS

Rock for the rock blanket shall be clean, natural rock obtained from a single source. Rock shall have at least one flat side. At the Contractor's option, rock for rock blanket may be obtained from within the project limits.

Rock shall conform to the following grading:

Screen Size (Millimeters)	Percentage Passing (By Mass)
355	100
254	60-100
200	0-40

A sample of the rock shall be submitted to the Engineer for approval prior to delivery of the rock to the project site or prior to the collection of rock from within the project limits.

Rock shall be set in place on a sand base. Sand shall be clean, washed, plaster sand, and shall be free of clay, organic material and other deleterious matter.

SITE PREPARATION

Prior to beginning rock blanket work, areas to receive the rock blanket shall be cleared in conformance with the provisions in "Roadside Clearing" of these special provisions.

After clearing, the areas shall be graded to a smooth uniform surface and compacted to a minimum relative compaction of 90 percent.

PLACEMENT

Rock shall be placed with the flat side facing upward as shown on the plans. The finished surface of rock blanket shall not vary in height more than 15 mm from edge of one rock to the edge of the next.

MEASUREMENT AND PAYMENT

Rock blanket will be measured by the square meter as determined from actual measurements made parallel to the ground slope.

The contract price paid per square meter for rock blanket shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in placing rock blanket, complete in place, including sand, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

10-1.42 IRRIGATION CROSSOVERS

Irrigation crossovers shall conform to the provisions in Section 20-5, "Irrigation Systems," of the Standard Specifications and these special provisions.

Conduits shall be placed in open trenches in conformance with the provisions in Section 20-5.03B, "Conduit for Irrigation Crossovers," of the Standard Specifications.

Conduits shall be corrugated high density polyethylene (CHDPE) pipe. Corrugated high density polyethylene pipe shall conform to the requirements in ASTM Designation: F 405 or F 667, or AASHTO Designation: M 252 or M 294 and shall be Type S. Couplings and fittings shall be as recommended by the pipe manufacturer.

Water line crossovers shall conform to the provisions in Section 20-5.03C, "Water Line Crossovers," of the Standard Specifications.

Sprinkler control crossovers shall conform to the provisions in Section 20-5.027D, "Sprinkler Control Crossovers," of the Standard Specifications.

Installation of pull boxes shall conform to the provisions in Section 20-5.027I, "Conductors, Electrical Conduit and Pull Boxes," of the Standard Specifications. When no conductors are installed in electrical conduits, pull boxes for irrigation crossovers shall be installed on a foundation of compacted soil.

10-1.43 IRRIGATION SLEEVE

Irrigation sleeves shall be polyvinyl chloride (PVC) plastic pipe and shall conform to the provisions in Section 20-2.15B(1), "Plastic Pipe Supply Line," of the Standard Specifications and these special provisions.

Irrigation sleeves 150 mm or larger in diameter shall be Schedule 40.

Fittings shall be Schedule 80.

Irrigation sleeves shall be installed where shown on the plans.

Irrigation sleeves shall be installed not less than 0.45-m below finished grade measured to the top of the sleeve. Sleeves shall extend 150 mm beyond paving. The ends of the sleeve shall be capped until use.

The quantity of 150 mm irrigation sleeve to be paid for will be the slope length designated by the Engineer. Irrigation sleeve placed in excess of the length designated by the Engineer will not be paid for.

The contract price paid per meter for 150 mm irrigation sleeve shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in 150 mm irrigation sleeve, complete in place, as shown on the plans, as specified in the Standard Specifications, these special provisions, and as directed by the Engineer.

10-1.44 AGGREGATE SUBBASE

Aggregate subbase shall be Class 4 and shall conform to the provisions in Section 25, "Aggregate Subbases," of the Standard Specifications and these special provisions.

The restriction that the amount of reclaimed material included in Class 4 aggregate subbase not exceed 50 percent of the total volume of the aggregate used shall not apply. Aggregate for Class 4 aggregate subbase may include reclaimed glass. Aggregate subbase incorporating reclaimed glass shall not be placed at locations where surfacing will not be placed over the aggregate subbase.

The percentage composition by mass of Class 4 aggregate subbase shall conform to the following grading requirements:

Grading Requirements (Percentage Passing)

Sieve Sizes	Operating Range	Contract Compliance
150-mm	100	100
100-mm	90-100	87-100
4.75-mm	35-100	30-100
600-µm	0-60	0-65
75-µm	0-20	0-23

Class 4 aggregate subbase shall also conform to the following quality requirements:

Quality Requirements

Test	Operating Range	Contract Compliance
Sand Equivalent	25 Min.	22 Min.
Resistance (R-value)	----	60 Min.

The provisions of the last 4 paragraphs in Section 25-1.02A, "Class 1, Class 2, and Class 3 Aggregate Subbases," of the Standard Specifications shall apply to Class 4 aggregate subbase.

At the option of the Contractor, Class 1 aggregate subbase conforming to the grading and quality requirements in Section 25-1.02A, may be used in place of Class 4 aggregate subbase. The restriction that the amount of reclaimed material included in Class 1 aggregate subbase not exceed 50 percent of the total volume of the aggregate used shall not apply. Aggregate for Class 1 aggregate subbase may include reclaimed glass. Aggregate subbase incorporating reclaimed glass shall not be placed at locations where surfacing will not be placed over the aggregate subbase. Once a class of aggregate subbase is selected, the class shall not be changed without written approval of the Engineer.

Regardless of the class of aggregate subbase supplied under the provisions of this section, payment for all aggregate subbase will be made as Class 4 aggregate subbase.

10-1.45 AGGREGATE BASE

Aggregate base shall be Class 2 and shall conform to the provisions in Section 26, "Aggregate Bases," of the Standard Specifications and these special provisions.

The restriction that the amount of reclaimed material included in Class 2 aggregate base not exceed 50 percent of the total volume of the aggregate used shall not apply. Aggregate for Class 2 aggregate base may include reclaimed glass. Aggregate base incorporating reclaimed glass shall not be placed at locations where surfacing will not be placed over the aggregate base.

10-1.46 ASPHALT CONCRETE

Asphalt concrete and asphalt concrete base shall be Type A and shall conform to the provisions in Section 39, "Asphalt Concrete," of the Standard Specifications and these special provisions.

The grade of asphalt binder to be mixed with aggregate for Type A asphalt concrete and asphalt concrete base shall be Grade PG 64-10 conforming to the provisions in Section 92, "Asphalts," of the Standard Specifications.

The asphalt content of the asphalt mixture will be determined in conformance with the requirements in California Test 379, or in conformance with the requirements in California Test 382.

When portland cement concrete is placed on asphalt concrete base, the finished surface of the asphalt concrete base shall not extend above the grade established by the Engineer. Asphalt concrete base with a surface higher than the grade established by the Engineer shall be cold planed until the surface of asphalt concrete base conforms to the tolerances specified. Cold planing equipment shall be power driven and specifically designed to produce a smooth surface that conforms to the straight edge requirements specified in Section 39-6.03, "Compacting" of the Standard Specifications. Asphalt concrete base with a surface lower than 15 mm below the grade established by the Engineer shall be removed and replaced with asphalt concrete base which complies with requirements of these specifications.

Paint binder (tack coat) shall be applied to existing surfaces to be surfaced and between layers of asphalt concrete, except when eliminated by the Engineer.

Paint binder (tack coat) shall be, at the option of the Contractor, either slow-setting asphaltic emulsion, rapid-setting asphaltic emulsion or paving asphalt. Slow-setting asphaltic emulsion and rapid-setting asphaltic emulsion shall conform to the provisions in Section 39-4.02, "Prime Coat and Paint Binder (Tack Coat)," and the provisions in Section 94, "Asphaltic Emulsions," of the Standard Specifications. When paving asphalt is used for paint binder, the grade will be determined by the Engineer. Paving asphalt shall conform to the provisions in Section 39-4.02, "Prime Coat and Paint Binder (Tack Coat)," and the provisions in Section 92, "Asphalts," of the Standard Specifications.

Paint binder (tack coat) shall be applied in the liter per square meter range limits specified for the surfaces to receive asphalt concrete in the tables below. The exact application rate within the range will be determined by the Engineer.

Application Rates for Asphaltic Emulsion Paint Binder (Tack Coat) on Asphalt Concrete (except Open Graded) and on Portland Cement Concrete Pavement (PCCP)		
Type of surface to receive paint binder (tack coat)	Slow-Setting Asphaltic Emulsion L/m^2(Note A)	Rapid-Setting Asphaltic Emulsion L/m^2(Note B)
Dense, compact surfaces, between layers, and on PCCP	0.20 – 0.35	0.10 – 0.20
Open textured, or dry, aged surfaces	0.35 – 0.90	0.20 – 0.40

Note A: Slow-setting asphaltic emulsion is asphaltic emulsion diluted with additional water. Water shall be added and mixed with the asphaltic emulsion (containing up to 43 percent water) so the resulting mixture contains one part asphaltic emulsion and not more than one part added water. The water shall be added by the emulsion producer or at a facility that has the capability to mix or agitate the combined blend.

Note B: Undiluted rapid-setting asphaltic emulsion.

Application Rates for Paint Binder (Tack Coat) on Asphalt Concrete (except Open Graded) and on Portland Cement Concrete Pavement (PCCP)	
Type of surface to receive paint binder (tack coat)	Paving Asphalt L/m^2
Dense, compact surfaces, between layers, and on PCCP	0.05 – 0.10
Open textured, or dry, aged surfaces	0.10 – 0.25

When asphaltic emulsion is used as paint binder (tack coat), asphalt concrete shall not be placed until the applied asphaltic emulsion has completely changed color from brown to black.

The miscellaneous areas to be paid for at the contract price per square meter for place asphalt concrete (miscellaneous area), in addition to the prices paid for the materials involved, shall be limited to the areas listed on the plans.

If the Contractor selects the batch mixing method, asphalt concrete shall be produced by the automatic batch mixing method in conformance with the provisions in Section 39-3.03A(2), "Automatic Proportioning," of the Standard Specifications.

In addition to the provisions in Section 39-5.01, "Spreading Equipment," of the Standard Specifications, asphalt paving equipment shall be equipped with automatic screed controls and a sensing device or devices.

When placing asphalt concrete to the lines and grades established by the Engineer, the automatic controls shall control the longitudinal grade and transverse slope of the screed. Grade and slope references shall be furnished, installed, and maintained by the Contractor. Should the Contractor elect to use a ski device, the minimum length of the ski device shall be 9 m. The ski device shall be a rigid one piece unit and the entire length shall be utilized in activating the sensor.

When placing the initial mat of asphalt concrete on existing pavement, the end of the screed nearest the centerline shall be controlled by a sensor activated by a ski device not less than 9 m long. The end of the screed farthest from centerline shall be controlled by a sensor activated by a similar ski device or by an automatic transverse slope device set to reproduce the cross slope designated by the Engineer.

When paving contiguously with previously placed mats, the end of the screed adjacent to the previously placed mat shall be controlled by a sensor that responds to the grade of the previously placed mat and will reproduce the grade in the new mat within a 3-mm tolerance. The end of the screed farthest from the previously placed mat shall be controlled in the same way it was controlled when placing the initial mat.

Should the methods and equipment furnished by the Contractor fail to produce a layer of asphalt concrete conforming to the provisions, including straightedge tolerance, of Section 39-6.03, "Compacting," of the Standard Specifications, the paving operations shall be discontinued and the Contractor shall modify the equipment or methods, or furnish substitute equipment.

Should the automatic screed controls fail to operate properly during a day's work, the Contractor may manually control the spreading equipment for the remainder of that day. However, the equipment shall be corrected or replaced with alternative automatically controlled equipment conforming to the provisions in this section before starting another day's work.

The area to which paint binder has been applied shall be closed to public traffic. Care shall be taken to avoid tracking binder material onto existing pavement surfaces beyond the limits of construction.

The Contractor shall schedule paving operations so that each layer of asphalt concrete is placed on contiguous lanes of the traveled way during each work shift. At the end of each work shift, the distance between the ends of the layers of asphalt concrete on adjacent lanes shall not be greater than 3 m or less than 1.5 m. Additional asphalt concrete shall be placed along the transverse edge at the end of each lane and along the exposed longitudinal edges between adjacent lanes, hand raked, and compacted to form temporary conforms. Kraft paper, or other approved bond breaker, may be placed under the conform tapers to facilitate the removal of the taper when paving operations resume.

Shoulders adjacent to a lane being paved shall be surfaced prior to opening the lane to public traffic.

Asphalt concrete surfacing shall be placed on existing surfacing, including curve widening, chain control lanes, turnouts, left turn lanes, and public and private road connections shown on the plans, unless otherwise directed by the Engineer.

The aggregate from each separate bin used for asphalt concrete and asphalt concrete base, Type A, except for the bin containing the fine material, shall have a Cleanness Value of 57 minimum for contract compliance and a value of 65 minimum for operating range as determined by California Test 227, modified as follows:

A. Tests will be performed on the material retained on the 2.36-mm sieve from each bin and will not be a combined or averaged result.
B. Each test specimen will be prepared by hand shaking for 30 seconds, a single loading of the entire sample on a 305-mm diameter, 4.75-mm sieve, nested on top of a 305-mm diameter, 2.36-mm sieve.
C. Where a coarse aggregate bin contains material which will pass the maximum size specified and is retained on a 9.5-mm sieve, the test specimen mass and volume of wash water specified for 25-mm x 4.75-mm aggregate size will be used.
D. Samples will be obtained from the weigh box area during or immediately after discharge from each bin of the batching plant or immediately prior to mixing with asphalt in the case of continuous mixers.
E. The Cleanness Value of the test sample from each of the bins will be separately computed and reported.

At drier-drum and continuous plants with cold feed control, Cleanness Value test samples will be obtained from the discharge of each coarse aggregate storage. An aggregate sampling device shall be provided which will provide a 25-kg sample of each coarse aggregate.

If the results of the Cleanness Value tests do not meet the requirements specified for operating range but meet the contract compliance requirements, placement of the material may be continued for the remainder of that day. However, another day's work may not be started until tests, or other information, indicate to the satisfaction of the Engineer that the next material to be used in the work will comply with the requirements specified for operating range.

If the results of the Cleanness Value tests do not meet the requirements specified for contract compliance, the material which is represented by these tests shall be removed. However, if requested by the Contractor and approved by the Engineer, material having a Cleanness Value of 48 or greater may remain in place and accepted on the basis of a reduced payment for material left in place.

Asphalt concrete or asphalt concrete base that is accepted on the basis of reduced payment will be paid for at the contract prices for the items of asphalt concrete or asphalt concrete base involved multiplied by the following factors:

Test Value	Pay Factor
56	0.90
55	0.85
54	0.80
53	0.75
52	0.70
51	0.65
50	0.60
49	0.55
48	0.50

If asphalt concrete or asphalt concrete base is accepted on the basis of reduced payment due to a Cleanness Value of 48 to 56 and also accepted on the basis of aggregate grading or Sand Equivalent tests not meeting the contract compliance requirements, the reduced payment for Cleanness Value shall apply and payment by the Contractor to the State for asphalt concrete not meeting the contract compliance requirements for aggregate grading or Sand Equivalent shall not apply.

10-1.47 JOINTED PLAIN CONCRETE PAVEMENT

GENERAL

Jointed plain concrete pavement shall be constructed in conformance with the provisions in Section 40, "Portland Cement Concrete Pavement," of the Standard Specifications and these special provisions, and as shown on the plans.

Insert method for forming joints in pavement shall not be used.

PREPAVING CONFERENCE

Supervisory personnel of the Contractor and subcontractors who are to be involved in the concrete paving work shall meet with the Engineer at a prepaving conference, at a mutually agreed time, to discuss methods of accomplishing the paving work.

The Contractor shall provide a facility for the prepaving conference within 5 km of the construction site or at a nearby location agreed to by the Engineer. Attendance at the prepaving conference is mandatory for the Contractor's project superintendent, paving construction foreman, subcontractor's workers, including foremen and personnel performing saw cutting, joint sealing, concrete plant manager, and concrete plant operator. Conference attendees shall sign an attendance sheet provided by the Engineer. Production and placement shall not begin nor proceed unless the above-mentioned personnel have attended the mandatory prepaving conference.

JUST-IN-TIME TRAINING

Attending a 4-hour Just-In-Time Training (JITT) shall be mandatory, and consist of a formal joint training class on portland cement concrete and paving techniques. Construction operations for portland cement concrete paving shall not begin until the Contractor's and the Engineer's personnel have completed the mandatory JITT. The Contractor's personnel included in the list of participants for the prepaving conference as well as the Engineer's representatives shall attend JITT. JITT shall be in addition to the prepaving conference.

The JITT class will be conducted for not less than 4 hours on portland cement concrete pavement and paving techniques. The training class may be an extension of the prepaving conference and shall be conducted at a project field location convenient for both the Contractor and the Engineer. The JITT class shall be completed at least 15 days, not including Saturdays, Sundays or holidays, prior to the start of portland cement concrete paving operations. The class shall be held during normal working hours.

The JITT instructor shall be experienced in the construction methods, materials, and test methods associated with construction of portland cement concrete pavement and paving techniques. The instructor shall not be an employee of the Contractor or a member of the Engineer's field staff. A copy of the course syllabus, handouts, and presentation material shall be submitted to the Engineer at least 7 days before the day of the training. The Contractor and the Engineer shall mutually agree to course instructor, the course content, and training site. The instructor shall issue a certificate of completion to the participants upon completion of the class. The certificate of completion shall include the course title, date and location of the class, the name of the participant, instructor's name, location and telephone number.

The Contractor's or Engineer's personnel involved with portland cement concrete paving operations will not be required to attend JITT if they have completed equivalent training within the previous 12 months of the date of the JITT for this project. The Contractor shall provide a certificate of class completion as described above for each staff member to be

excluded from the JITT class. The Engineer will provide the final determination for exclusion of staff member's participation. Attendees of the JITT shall complete, and submit to the Engineer, an evaluation of the training. The Engineer will provide the course evaluation form.

Just-In-Time Training shall not relieve the Contractor of responsibility under the contract for the successful completion of the work in conformance with the requirements of the plans and specifications.

TEST STRIP

At the beginning of paving operations, the Contractor shall construct a test strip of concrete pavement from 200 m to 300 m in length. The paving width for the test strip shall be the same as that intended by the Contractor for production work. The Contractor shall use the same equipment to construct the test strip for the remainder of the paving operations, except as specified in this section. The Contractor shall not begin paving operations until the test strip has been evaluated in conformance with the provisions in Section 40-1.10, "Final Finishing," of the Standard Specifications regarding surface straight edge requirements, and "Profile Index" in this section; for dowel and tie bar alignment verification; concrete quality (except modulus of rupture); and pavement thickness. Additional test strips will be required when:

A. A portion of a test strip fails to conform to the provisions in Section 40-1.10, "Final Finishing," of the Standard Specifications for straight edge requirements;
B. A portion of the test strip fails to conform to profile requirements;
C. The Contractor proposes different paving equipment, including a batch plant, paver, dowel bar inserter, tie bar inserter, tining, or curing equipment;
D. The dowel bar tolerances are not met;
E. The pavement thickness deficiency is greater than 15 mm after grinding; or
F. A change in concrete mix proportions has occurred.

The Contractor shall perform coring of the test strips as part of the dowel and tie bar placement tolerance verification, and pavement thickness verification. The Engineer will select a minimum of six dowel bars that will be cored for each test strip. The Engineer will have the option of selecting up to 6 tie bars that will be cored for each test strip. After removal of cores, voids in concrete pavement shall be cleaned and filled with hydraulic cement grout conforming to the provisions in "Core Drilling for Dowel Placement Alignment Assurance Testing" in this section.

Before mechanical dowel bar inserters are used, the Contractor shall demonstrate that the insertion equipment will not leave surface irregularities such as depressions, dips, or high areas adjacent to the dowel bar insertion point, or voids or segregation around dowel bars.

Before placement of the test strip, the Contractor shall submit a written procedure to locate transverse weakened plane joints that will coincide with the center of the dowel bars being placed and locating the tie bars along the longitudinal joints. This procedure shall be submitted prior to the prepaving conference, and shall describe the control of inadvertent covering of paint markings after applying curing compound, excessive paint spray producing too large a paint dot marking for the accuracy required, misalignment by transferring marking spots, and inadequate staking of joints.

Construction of concrete pavement shall not proceed until the Engineer has completed an evaluation of the test strip. The Engineer shall be allowed 3 days, not including Saturdays, Sundays and legal holidays, to evaluate the test strip. If, in the opinion of the Engineer, the Contractor's controlling operation is delayed or interfered with by reason of the Engineer not completing the evaluation of the test strip within the time specified, the delay will be considered a right of way delay in conformance with the provisions in Section 8-1.09, "Right of Way Delays," of the Standard Specifications. Test strips failing to conform to the specifications for concrete pavement shall be removed. Additional test strips shall be constructed until the Contractor constructs a test strip that conforms to the specifications for concrete pavement. Additional test strips shall conform to the requirements in this section, except the test strip shall be 200 m in length.

Prior to constructing additional test strips, the Contractor shall change methods or equipment to construct a test strip that conforms to the provisions in Section 40-1.10, "Final Finishing," of the Standard Specifications, "Profile Index" of this section, and dowel bar alignment verification, without grinding or other corrective work.

The Engineer may waive the initial test strip if the Contractor proposes to use a batch plant mixer and paving equipment with the same personnel that were satisfactorily used on a Department project within the preceding 12 months. The personnel shall be individuals listed in the prepaving conference used on a preceding Department project.

Materials resulting from the construction and removal of rejected test strips shall become the property of the Contractor and shall be removed and disposed of in conformance with the provisions in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications.

MATERIALS

Concrete

Attention is directed to Section 90, "Portland Cement Concrete," of the Standard Specifications, regarding mix proportions for concrete being determined by the Contractor.

Primary aggregate gradings shall conform to the gradation requirements of Section 90-3, "Aggregate Gradings," of the Standard Specifications. When combined in the proportions determined by the Contractor, the percent passing the 9.5 mm sieve and retained on the 2.36 mm sieve shall not be less than 16 percent of the total aggregate.

The cementitious material content shall not exceed 400 kg/m^3.

Tie Bars

Tie bars shall be deformed reinforcing steel bars conforming to the requirements of ASTM Designation: A 615/A 615M, Grade 280 or 420; ASTM Designation: A 615/A 615M (Grade 280 or 420), A996/A996M or A706/A706M. Tie bars shall be epoxy-coated in conformance with the requirements in ASTM Designation: A 934/A 934M or A 775/A 775M and the provisions in Section 52-1.02B, "Epoxy-coated Reinforcement," of the Standard Specifications, except the epoxy-coating thickness after curing shall be between 175 to 400 micrometers (7 to 16 mils). Fabrication, sampling and jobsite handling shall conform to the requirements in ASTM Designation: D 3963 and the provisions in Section 52-1.02B, "Epoxy-coated Reinforcement," of the Standard Specifications, except the 2 samples shall be 750 mm long. Epoxy-coated tie bars shall not be bent.

Epoxy (Drill and Bond)

Epoxy for bonding tie bars and dowel bars to portland cement concrete shall be a two-component, epoxy-resin, conforming to the requirements of ASTM Designation: C 881, Type V, Grade 3 (Non-Sagging), Class A, B or C. The class used shall be dependent on the internal temperature of the hardened concrete at the time the epoxy is to be applied. Class A shall be used when the internal temperature is below 4°C, but not lower than recommended by the manufacturer. Class B shall be used when the internal temperature is from 4°C to 15°C. Class C shall be used when the internal temperature is above 15°C, but not higher than recommended by the manufacturer. A Certificate of Compliance in conformance with the provisions in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications shall be furnished with the epoxy. A copy of the manufacturer's recommended installation procedure shall be provided to the Engineer at least 7 days prior to the start of work. Epoxy shall be applied in conformance with the manufacturer's recommendations.

Dowel Bars

Dowel bars shall be plain round smooth, epoxy-coated steel conforming to the requirements in ASTM Designation: A 615/A 615M, Grade 280 or 420, the details shown on the plans and the provisions in Section 52-1.02B, "Epoxy-coated Reinforcement," of the Standard Specifications, except that the two samples required in ASTM Designation D 3963/D 3963M shall be 460 mm long. Epoxy coating of dowel bars shall conform to the provisions in ASTM Designation: A 884/A 884M, Class A, Type 1 or Type 2, except that the bend test shall not apply.

Dowel bars shall be free from burrs or other deformations detrimental to free movement of the bars in the concrete.

Bond Breaker

Dowel bars shall be lubricated with a bond breaker over the entire bar. A bond breaker application of petroleum paraffin based lubricant or white-pigmented curing compound shall be used to coat the dowel bars completely prior to placement. Oil and asphalt based bond breakers shall not be used. Paraffin based lubricant shall be Dayton Superior DSC BB-Coat or Valvoline Tectyl 506 or an approved equal. Paraffin based lubricant shall be factory applied. White pigmented curing compound shall conform to the requirements of ASTM Designation: C 309, Type 2, Class A, and shall contain 22 percent minimum nonvolatile vehicles consisting of at least 50 percent paraffin wax. Curing compound shall be applied in 2 separate applications, the last application not more than 8 hours prior to placement of the dowel bars. Each application of curing compound shall be applied at the approximate rate of one liter per 3.7 m^2.

Dowel Bar Baskets

Dowel bar baskets shall be manufactured with a minimum welded wire gage number of MW 65. Baskets shall be either U-frame or A-frame shape. J-frame shapes shall not be used. Baskets shall be fabricated in conformance with the requirements in ASTM Designation: A 82. Welding of baskets shall conform to the requirements in AASHTO Designation: M 254. A broken weld will be a cause for rejection of the basket. Baskets shall be Class A, Type 1 epoxy-coated in conformance with the requirements in ASTM Designation: A 884/A 884M. Fabrication and job-site handling shall conform to the requirements in ASTM Designation: D 3963 and the provisions in Section 52-1.02B, "Epoxy-coated Reinforcement," of the Standard Specifications, except that sampling of epoxy-coated wire reinforcement will not be required. A Certificate of Compliance conforming to the provisions in Section 6-1.07, "Certificates of Compliance," shall be furnished for each

shipment of epoxy-coated wire reinforcement certifying that the coated bars conform to the requirements in ASTM Designation: A 884/A 884M and the provisions in Section 52-1.02B, "Epoxy-coated Bar Reinforcement," of the Standard Specifications. The Certificate of Compliance shall include the certifications specified in ASTM Designation: A 884/A 884M and a statement that the coating material has been pre-qualified by acceptance testing performed by the Valley Forge Laboratories, Inc., Devon, Pennsylvania.

Concrete fasteners shall be used for anchoring dowel bar baskets to lean concrete base, asphalt concrete base, asphalt treated permeable base, or cement treated permeable base. Concrete fasteners shall be driven fasteners such as concrete nails, used specifically for fastening to hardened concrete, or asphalt concrete base. Concrete fasteners shall conform to the requirements of ASTM Designation: F 1667. Concrete nails used as fasteners on lean concrete base or asphalt concrete base shall have a minimum shank diameter of 4 mm with a minimum shank length of 64 mm. Concrete nails used as fasteners on asphalt treated or cement treated permeable base shall have a minimum shank diameter of 4 mm with a minimum shank length of 120 mm. Shank length shall be the distance from the point to the bottom of the nail head. Clips and washers shall be commercial quality manufactured for use with dowel bar baskets. The surface of concrete fasteners, clips, and washers shall be either zinc electroplated or galvanized with a minimum coating thickness of 0.005-mm.

Tie Bar Baskets

Tie bar baskets shall be manufactured with a minimum welded wire gage number of MW 65. Baskets shall be either U-frame or A-frame shape. J-frame shapes shall not be used. Tie bar baskets shall be fabricated in conformance with the requirements in ASTM Designation: A 82. Welding of baskets shall conform to the requirements in AASHTO Designation: M 254. A broken weld will be a cause for rejection of the basket. Baskets shall be Class A, Type 1 epoxy-coated in conformance with the requirements in ASTM Designation: A 884/A 884M. Fabrication and job-site handling shall conform to the requirements in ASTM Designation: D 3963 and the provisions in Section 52-1.02B, "Epoxy-coated Reinforcement," of the Standard Specifications, except that sampling of epoxy-coated wire reinforcement will not be required. A Certificate of Compliance conforming to the provisions in Section 6-1.07, "Certificates of Compliance," shall be furnished for each shipment of epoxy-coated wire reinforcement certifying that the coated bars conform to the requirements in ASTM Designation: A 884/A 884M and the provisions in Section 52-1.02B, "Epoxy-coated Bar Reinforcement," of the Standard Specifications. The Certificate of Compliance shall include the certifications specified in ASTM Designation: A 884/A 884M and a statement that the coating material has been pre-qualified by acceptance testing performed by the Valley Forge Laboratories, Inc., Devon, Pennsylvania.

Concrete fasteners shall be used for anchoring tie bar baskets to lean concrete base, asphalt concrete base, asphalt treated permeable base, or cement treated permeable base. Concrete fasteners shall be driven fasteners such as concrete nails, used specifically for fastening to hardened concrete, or asphalt concrete base. Concrete fasteners shall conform to the requirements of ASTM Designation: F 1667. Concrete nails used as fasteners on lean concrete base or asphalt concrete base shall have a minimum shank diameter of 4 mm with a minimum shank length of 64 mm. Concrete nails used as fasteners on asphalt treated or cement treated permeable base shall have a minimum shank diameter of 4 mm with a minimum shank length of 120 mm. Shank length shall be the distance from the point to the bottom of the nail head. Clips and washers shall be commercial quality manufactured for use with tie bar baskets. The surface of concrete fasteners, clips, and washers shall be either zinc electroplated or galvanized with a minimum coating thickness of 0.005-mm.

Reinforcement

Reinforcement shall be epoxy coated and shall conform to the provisions in Section 52, "Reinforcement," of the Standard Specifications.

Silicone Joint Sealant

Low modulus silicone joint sealant shall be furnished in a one-part silicone formulation. Acid cure sealant shall not be used. The compound shall be compatible with the surface to which it is applied and shall conform to the following requirements:

Property	Test Method	Requirement
Tensile stress, 150% elongation, 7-day cure at 25°± 1°C and 45% to 55% R.H.[e]	ASTM D 412 (Die C)	310 kPa max.
Flow at 25° ± 1°C	ASTM C 639[a]	Shall not flow from channel
Extrusion Rate at 25° ± 1°C	ASTM C 603[b]	75-250 g/min.
Specific Gravity	ASTM D 792 Method A	1.01 to 1.51
Durometer Hardness, at –18°C, Shore A, cured 7 days at 25° ± 1°C	ASTM C 661	10 to 25
Ozone and Ultraviolet Resistance, after 5000 hours	ASTM C 793	No chalking, cracking or bond loss
Tack free at 25° ± 1°C and 45% to 55% R.H.[e]	ASTM C 679	Less than 75 minutes
Elongation, 7 day cure at 25° ± 1°C and 45% to 55% R.H.[e]	ASTM D 412 (Die C)	500 percent min.
Set to Touch, at 25° ± 1°C and 45% to 55% R.H.[e]	ASTM D 1640	Less than 75 minutes
Shelf Life, from date of shipment	—	6 months min.
Bond, to concrete mortar-concrete briquettes, air cured 7 days at 25° ± 1°C	AASHTO T 132[c]	345 kPa min.
Movement Capability and Adhesion, 100% extension at –18°C after, air cured 7 days at 25° ± 1°C, and followed by 7 days in water at 25° ± 1°C	ASTM C 719[d]	No adhesive or cohesive failure after 5 cycles

Notes:

a. ASTM Designation: C 639 Modified (15 percent slope channel A).

b. ASTM Designation: C 603, through 3-mm opening at 345 kPa.

c. Mold briquettes in conformance with AASHTO Designation: T 132, sawed in half and bonded with a 1.5 mm maximum thickness of sealant and tested in conformance with AASHTO Designation: T 132. Briquettes shall be dried to constant mass at 100 ± 5° C.

d. Movement Capability and Adhesion: Prepare 305 mm x 25 mm x 75 mm concrete blocks in conformance with ASTM Designation: C 719. A sawed face shall be used for bond surface. Seal 50 mm of block leaving 12.5 mm on each end of specimen unsealed. The depth of sealant shall be 9.5 mm and the width 12.5-mm.

e. R.H. equals relative humidity.

The silicone joint sealant shall be formulated to cure rapidly enough to prevent flow after application on grades of up to 15 percent.

A Certificate of Compliance for the silicone sealant shall be furnished to the Engineer in conformance with the provisions in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications. The Certificate shall also be accompanied with a certified test report of the results of the required tests performed on the sealant material within the previous 12 months prior to proposed use. The Certificate and accompanying test report shall be provided for each lot of silicone joint sealant prior to use on the project.

Foam Backer Rods

Foam backer rods shall be Type 1, conforming to the requirements of ASTM Designation: D 5249. Foam backer rods shall have a diameter prior to placement at least 25 percent greater than the width of the sawcut and shall be expanded, crosslinked, closed-cell polyethylene foam that is compatible with the joint sealant so that no bond or adverse reaction occurs between the rod and sealant. Hot applied sealant that will melt the foam backer rod shall not be used. The Contractor shall submit a manufacturer's data sheet verifying that the foam backer rod is compatible with the sealant to be used.

Joint Filler Material

Joint filler material shall be preformed expansion joint filler for concrete (bituminous type), conforming to the requirements of ASTM Designation: D 994.

A Certificate of Compliance for the joint filler material shall be furnished to the Engineer in conformance with the provisions in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications. The certificate shall be accompanied with a certified test report of the results of the required tests performed on the joint filler material within the previous 12 months prior to proposed use. The certificate and accompanying test report shall be provided for each lot of joint filler material prior to use on the project.

Hydraulic Cement Grout (non-shrink)

Hydraulic cement grout (non-shrink) shall conform to the requirements in ASTM Designation: C 1107. At the Contractor's option, clean, uniformly rounded aggregate filler may be used to extend the grout. The extension of grout shall not exceed 60 percent of the mass of the grout or the maximum amount of grout extension recommended by the manufacturer, whichever is less. The moisture content of the aggregate filler shall not exceed 0.5 percent. Grading of the aggregate filler shall conform to the following:

Sieve Size	Percentage Passing
12.5 mm	100
9.5 mm	85-100
4.75 mm	10-30
2.36 mm	0-10
1.10 mm	0-5

PAVEMENT CONCRETE MIX PROPORTIONS

The Contractor shall determine the mix proportions for pavement concrete. Section 40-1.015, "Cement Content," of the Standard Specifications shall not apply. The laboratory used to develop the mix proportions shall meet the requirements of ASTM Designation: C 1077, and shall have current AASHTO accreditation for test methods AASHTO Designation: T 97 or ASTM Designation: C 78, and AASHTO Designation: T 126 or ASTM Designation: C 192.

The minimum cementitious materials content or the maximum water to cementitious materials ratio shall be determined in conformance with the requirements in California Test 559. Trial mixtures shall be made no more than 24 months before field qualification. The minimum cementitious materials content or the maximum water to cementitious materials ratio shall be that determined from the trial mixtures curve to produce a minimum modulus of rupture of 3.9 MPa at 28 days age and 4.5 MPa at 42 days age. To account for variances in materials, production of concrete, and modulus of rupture testing, the Contractor shall include as part of the proposed mix proportions an increase to the cementitious material content or a decrease to the water to cementitious materials ratio, determined from trial mixtures, to ensure that portland cement concrete produced during paving operations conforms to the requirements in "Modulus of Rupture," in this section.

At least 14 days prior to field qualification, the Contractor shall submit the proposed pavement concrete mix proportions with laboratory test reports. Laboratory test reports shall include modulus of rupture determined for each trial mixture at ages of 10, 21, 28 and 42 days in conformance with the applicable portions of California Test 559.

Field Qualification

Field qualification of proposed mix proportions will be required prior to placement of pavement concrete. The Contractor shall perform field qualification and submit certified test data to the Engineer. Field qualification data shall be based upon the proposed use of materials, mix proportions, mixing equipment, procedures and size of batch.

Proposed concrete mix proportions will be field qualified when the test results of five beams from a single batch of concrete indicate the average modulus of rupture is at least 3.9 MPa with no single beam lower than 3.8 MPa at an age of the Contractor's choice but not later than 28 days. Beams shall be tested for modulus of rupture at a minimum of 10, 21, and 28 days of age. Test specimens shall be made and tested in conformance with the requirements in California Test 523.

The certified field qualification test data reports shall include the following:

A. Date of mixing,
B. Mixing equipment and procedures used,
C. Volume of batch in cubic meters and the mass or volume,
D. Type and source of ingredients used,
E. Penetration and slump of the concrete,
F. The air content of the concrete, and
G. The age at time of testing and strength of concrete specimens tested.

Field qualification test data reports shall be signed by a certified representative in charge of the laboratory that performed the tests.

If the Contractor changes a source of supply or proportions, the Contractor shall submit a new proposed mix design and furnish samples from the new source, or sources, at least 60 days prior to their intended use. The new mix proportions shall be trial batched and field qualified, unless, the Engineer determines the change is not substantive. No extension of contract time will be allowed for the time required to perform the sampling, testing, preparing and qualifying new mix proportions for new aggregate sources proposed by the Contractor.

MODULUS OF RUPTURE

The Engineer will test portland cement concrete pavement for modulus of rupture in conformance with the requirements in California Test 523. Acceptance will be on a lot basis. Each lot shall not to exceed 750 m^3 of concrete pavement. The Engineer will determine sample locations. A minimum of six beam specimens shall be made from each sample. Beam specimens will be tested for modulus of rupture at 10, 21, and 28 days. The modulus of rupture for each lot will be calculated by averaging the results of two beams representing that lot tested at 28 days of age. The difference in modulus of rupture between each individual beam result shall not exceed 0.44-MPa.

The Contractor shall perform sampling and testing of beam specimens to determine if concrete pavement has achieved a modulus of rupture of 2.4 MPa when requesting early use of concrete pavement in conformance with the provisions in Section 90-8.03, "Protecting Concrete Pavement," of the Standard Specifications. Beam specimens shall be made and tested in conformance with the requirements in California Test 523.

INSTALLING TIE BARS

Tie bars shall be installed at longitudinal contact joints and longitudinal weakened plane joints as shown on the plans. Contiguous width of new portland cement concrete pavement tied together with tie bars shall not exceed 15 m. Tie bars shall not be installed at joints between portland cement concrete and asphalt concrete pavements.

Tie bars shall be installed at longitudinal joints by one of the following methods:

A. Drilling and bonding tie bars with two-component, epoxy-resin that conforms to this section. Drilled holes shall be cleaned in conformance with the epoxy manufacturer's instructions and shall be dry at the time of placing the epoxy and tie bars. Tie bars will be rotated 180º while being inserted into the epoxy filled holes. Immediately after inserting the tie bars into the epoxy, the tie bars shall be supported as necessary to prevent movement during curing and shall remain undisturbed until the epoxy has cured as specified by the manufacturer instructions. Tie bars that are improperly placed or bonded, as determined by the Engineer, will be rejected. If rejected, new holes shall be drilled and new tie bars shall be placed and securely bonded to the concrete. Rejected tie bars shall be cut flush with the joint face. Exposed ends of tie bars shall be epoxy coated. The center of the new holes shall be offset 75 mm horizontally from the center of the rejected hole to maintain the minimum clearance to the dowel bar. Work necessary to correct improperly bonded tie bars shall be performed at the Contractor's expense.
B. Inserting tie bars into the plastic slipformed concrete before finishing the concrete. Inserted tie bars shall have full contact between the bar and the concrete. When tie bars are inserted through the pavement surface, the concrete over the tie bars shall be reworked and refinished so that there is no evidence on the surface of the completed pavement that there has been an insertion performed. Loose tie bars shall be replaced by drilling and bonding as described in A above, at the Contractor's expense.
C. Using threaded dowel splice couplers fabricated from deformed bar reinforcement material, free of external welding or machining. Threaded dowel splice couplers shall be accompanied by a Certificate of Compliance in conformance with the provisions in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications, and shall be accompanied with installation instructions. Installation of threaded dowel splice couplers shall conform to the requirements of the manufacturer's recommendations.
D. Using tie bar baskets that conform to these special provisions.

Tie bars shall be oriented perpendicular to the pavement joint and parallel with the surface of the pavement at mid-slab depth. Tie bar alignment tolerances shall conform to the requirements for dowel bars except embedment length tolerance shall be ±50 mm.

If tie bar baskets are used, they shall be anchored to the base to hold the tie bars at the specified depth and alignment during concrete placement without displacement. A minimum of 8 alternating, equally spaced, concrete fasteners with clips shall be used to anchor each basket (4 per lower runner wire). Temporary spacer wires shall be cut or removed after the baskets are anchored into position before concrete placement. Concrete pavement shall not be placed if the baskets are not in place at least 60 m in advance of the concrete placement operation. The Engineer may waive this requirement upon written request by the Contractor in areas where access is restricted or other construction limitations are encountered. The Contractor shall demonstrate that the baskets are anchored and shall not shift during concrete placement. The Contractor shall provide longer concrete nails than the minimum lengths for the varying bases beneath the portland cement concrete when baskets demonstrate movement.

Full compensation for providing longer concrete nails shall be considered as included in the contract unit price paid per cubic meter for concrete pavement and no additional compensation will be allowed therefor.

DOWEL PLACEMENT

Dowel bars shall be centered on the joint within a tolerance of ±50 mm in the longitudinal direction directly over the contact joint or sawcut for the transverse weakened plane joints, as shown on the plans. Prior to placement of dowel bars, the Contractor shall submit to the Engineer a written procedure to identify the transverse weakened plane joint locations relative to the middle of the dowel bars and the procedure for consolidating concrete around the dowel bars.

Dowel bars shall be placed at transverse weakened plane joints within shoulder areas except at drainage inlets.

Dowel bars shall be placed at longitudinal joints as shown on the plans.

Dowel bars shall be placed as shown on the plans by using dowel bar baskets.

When dowel bar baskets are used, they shall be anchored to the base to hold the dowel bars at the specified depth and alignment during concrete placement without displacement. A minimum of 8 alternating, equally spaced, concrete fasteners with clips shall be used to anchor each 3.6 m dowel bar basket (4 per lower runner wire). At least 10 concrete fasteners shall be used for basket sections greater than 3.6 m and less than or equal to 4.9 m. Temporary spacer wires connecting dowel bar baskets shall be cut or removed after the dowel bar baskets are anchored into position prior to concrete placement. Paving shall be suspended when dowel bar baskets are not in place at least 60 m in advance of the concrete placement operation. The Engineer may waive this requirement upon written request by the Contractor, in areas, where access is restricted, or other construction limitations are encountered. The Contractor shall demonstrate to the Engineer's satisfaction that dowel bar baskets are adequately anchored and not shift during concrete placement. The Contractor shall provide longer concrete nails than the minimum lengths for the varying bases beneath the portland cement concrete when anchored dowel bar baskets demonstrate movement.

Full compensation for providing longer concrete nails shall be considered as included in the contract unit price paid per cubic meter for concrete pavement and no additional compensation will be allowed therefor.

Dowel bar placement at transverse and longitudinal weakened plane joints	
Horizontal offset	±25 mm
Longitudinal translation	±50 mm
Horizontal skew	9 mm
Vertical skew	9 mm
Vertical depth	(d/3 +12 mm) from pavement surface to top of dowel bar or –15 mm below planned placement

Note: d = pavement thickness in mm

CORE DRILLING FOR DOWEL BAR AND TIE BAR PLACEMENT ALIGNMENT ASSURANCE TESTING

Coring to confirm dowel bar and tie bar placement, alignment, and concrete consolidation shall be provided by the Contractor throughout the project, at locations determined by the Engineer. Each day's paving shall be cored within 2 days by performing a minimum of 2 and a maximum of 4 tests for dowel bar placement and position for every 1670 m^2 of doweled pavement or fraction thereof and one test for tie bar placement and position for every 3340 m^2 of pavement with tie bars. One test shall consist of drilling two cores, one on each end of a dowel bar to expose both ends and allow measurement for proper alignment. The minimum core hole diameter shall be 127 mm. If the cores indicate that dowel bars or tie bars are not within the allowable tolerances or if air voids exist surrounding the dowel bars or tie bars, additional cores will be required to determine the limits and severity of unacceptable work.

The holes shall be cored by methods that will not damage the concrete adjacent to the holes. Immediately after coring, the concrete cores shall be submitted to the Engineer for inspection, and the cores shall be identified by the Contractor with a location description.

After removal of cores, core hole voids in concrete pavement shall be cleaned and filled with hydraulic cement grout (non-shrink). After placement of hydraulic cement grout, the material while still plastic shall be finished and textured to match the adjacent pavement surface. The backfill material shall be the same level as the pavement surface.

Water for core drilling operations shall be from a local domestic water supply, and shall contain not more than 1000 parts per million of chlorides as CL, nor more than 1300 parts per million of sulfates as SO_4, nor shall it contain impurities in a sufficient amount to cause discoloration of the concrete or produce etching of the surface.

Water from core drilling operations shall not be permitted to fall on public traffic, to flow across shoulders or lanes occupied by public traffic, or to flow into gutters or other drainage facilities.

Dowel bar and tie bar alignment shall be within the specified tolerances. If dowel bars or tie bars are found to be installed improperly, the paving operations shall not continue until the Contractor has demonstrated to the Engineer that the problem which caused the improper dowel bar or tie bar positioning has been corrected.

Dowel bars in rejected joints shall be replaced by the Contractor by saw cutting on each side of the rejected joint a minimum of 0.9-m, lifting out concrete to be removed, installing new dowel bars at the new transverse joints, installing dowel bars and preformed sponge rubber expansion joint filler along the longitudinal joints, placing concrete, and installing

new joints. Preformed sponge rubber expansion joint filler shall conform to the requirements in ASTM Designation: D 1752. New dowel bar holes shall be drilled, not more than 3 mm greater than the dowel bar diameter, by the use of an automatic dowel-drilling rig for the dowels to be installed at the contact joints. Dowel bars shall be placed, as shown on the plans, for the 2 new transverse contact joints. Original exposed tie bars, located within the slab replacement area, shall be cut flush with the lane or pavement edge and dowel bars shall be installed to replace the tie bars at an offset of 75 mm, horizontally from the tie bar location. Holes for dowel bars to be placed along the longitudinal joint shall be drilled, not more than 3 mm greater than the dowel bar diameter, by the use of an automatic dowel-drilling rig for the dowel bars to be installed at the contact joints.

When requested by the Contractor and approved by the Engineer, dowel bars which are more than ±50 mm but less than ±75 mm from being centered directly over the sawcut for the transverse weakened plane joint, may remain in place, and the Contractor shall pay to the State the amount of $32.30 per square meter for the quantity of concrete pavement panels represented by the cores indicating incorrect dowel bar alignment or improper concrete consolidation around dowels. The quantity of concrete pavement area used to determine the amount of payment to the State will be calculated using the panel dimensions for panels adjacent to and inclusive of the joints with incorrect dowel bar alignment or improper concrete consolidation around dowel bars. The Department will reduce compensation from moneys due, or that may become due to the Contractor under the contract. This reduced compensation shall be in addition to other adjustments for incorrect tie bar alignment or improper concrete consolidation around tie bars as specified in these special provisions and for pavement thickness deficiency in conformance with the provisions in Section 40-1.135, "Pavement Thickness," of the Standard Specifications and in addition to other adjustments for deficient Cleanness Value and coarse aggregate grading; and for deficient Sand Equivalent and fine aggregate grading in conformance with the provisions in Section 90-2.02, "Aggregate," of the Standard Specifications.

Tie bars which are not within the specified tolerance for placement and position, as determined from inspection and measurements of cores, may remain in place when requested by the Contractor and approved by the Engineer. The Contractor shall pay to the State the amount of $16.15 per square meter for the quantity of concrete pavement panels represented by the cores indicating incorrect tie bar alignment or improper concrete consolidation around tie bars. The quantity of concrete pavement area used to determine the amount of payment to the State will be calculated using the panel dimensions for panels adjacent to and inclusive of the joints with incorrect tie bar alignment or improper concrete consolidation around tie bars. The Department will reduce compensation from moneys due, or that may become due to the Contractor under the contract. This reduced compensation will be in addition to other adjustments for incorrect dowel bar alignment or improper concrete consolidation around dowel bars as specified in these special provisions and for pavement thickness deficiency in conformance with the provisions in Section 40-1.135, "Pavement Thickness," of the Standard Specifications and in addition to other adjustments for deficient Cleanness Value and coarse aggregate grading; and for deficient Sand Equivalent and fine aggregate grading in conformance with the provisions in Section 90-2.02, "Aggregate," of the Standard Specifications.

LIQUID JOINT SEALANT INSTALLATION

The joint sealant detail for transverse and longitudinal joints, as shown on the plans, shall apply only to weakened plane joints. Weakened plane joints shall be constructed by the sawing method. Should grinding or grooving be required over or adjacent to joints after sealant has been placed, the joint materials shall be removed and disposed of in conformance with the provisions in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications, and replaced at the Contractor's expense. Immediately after sawing, a water wash using less than 0.7 MPa pressure shall be used to remove the slurry from the sawing operation.

Transverse weakened plane joints shall be Type B as shown on the plans. Longitudinal weakened plane joints shall be Type B as shown on the plans.

Seven days after the concrete pavement placement and not more than 4 hours before placing backer rods and joint sealant materials, the joint walls shall be cleaned by the dry sand blast method and other means as necessary to remove from the joint objectionable material such as soil, asphalt, curing compound, paint and rust. Sand blasting shall be performed in at least 2 passes, one for each side of the joint, with the nozzle held at an angle to the joint within 25 to 51 mm of the pavement. After cleaning the joint, traces of sand, dust and loose material shall be removed from and near the joint for a distance along the pavement surfaces of at least 50 mm on each side of the joint by the use of a vacuum device. Surface moisture or dampness shall be removed at the joints by means of compressed air or moderate hot compressed air or other means approved by the Engineer. Drying procedures that leave a residue or film on the joint wall shall not be used. Sandblasting equipment shall have a maximum nozzle diameter size of 6 ± 1-mm and a minimum pressure of 0.62-MPa.

Backer rods shall be installed when the temperature of the portland cement concrete pavement is above the dew point of the air and when the air temperature is 4°C or above. Backer rod shall be installed when the joints to be sealed have been properly patched, cleaned and dried, as determined by the Engineer. Methods of placing backer rod that leave a residue or film on joint walls shall not be used.

Immediately after placement of the backer rod, joint sealant shall be placed in the clean, dry, prepared joints as shown on the plans. The joint sealant shall be applied using a mechanical device with a nozzle shaped to fit inside the joint to introduce the sealant from inside the joint. Adequate pressure shall be applied to the sealant to ensure that the sealant material is extruded evenly and that full continuous contact is made with the joint walls. After application of the sealant, the surface of the sealant shall be recessed as shown on the plans.

Failure of the joint material in either adhesion or cohesion will be cause for rejection of the joint. The finished surface of joint sealant shall conform to the dimensions and allowable tolerances shown on the plans. Rejected joint materials or joint material whose finished surface does not conform to the dimensions shown on the plans, as determined by the Engineer, shall be repaired or replaced, at the Contractor's expense, with joint material that conforms to the requirements.

After each joint is sealed, surplus joint sealer on the pavement surface shall be removed. Traffic shall not be permitted over the sealed joints until the sealant is tack free and set sufficiently to prevent embedment of roadway debris into the sealant.

PREFORMED COMPRESSION JOINT SEAL INSTALLATION

Longitudinal seals shall be installed before installing transverse seals. Longitudinal seals shall be continuous except at intersections with transverse seals. Transverse seals shall be installed in one continuous piece throughout each transverse joint. After the longitudinal seal is completed and the transverse seal is ready to be installed, a single cut with a sharp instrument or saw shall be made across the longitudinal seal at the middle of the intersection with the transverse seal. After the initial cut of the longitudinal seal, if the longitudinal joint material does not relax enough to allow proper installation of the transverse seal, the longitudinal joint material shall be trimmed precisely to accommodate the transverse seal and form a tight seal between the 2 joints.

An installation machine specifically designed for the installation of preformed compression joint seals shall be used to install the seal at the specified depth without cutting, nicking, or twisting the seal. The installation machine shall install the seal with no more than 4 percent stretch in the installed seal. Hand installation methods of installing seals will not be permitted.

The percentage of stretch shall be determined by laying a length of the preformed compression joint seal material cut to the exact length of the pavement joint to be sealed. The length shall then be measured. The cut length of preformed compression joint seal material shall then be installed in the joint. Excess amount of seal material remaining at the end of the joint shall be measured as the amount of stretch. The measured amount of stretch shall be divided by the original measured length to determine the percentage of stretch.

The completed seal shall not be twisted or have deformities that prevent the seal from making complete continuous contact with the joint walls. Seals installed that are twisted or deformed, or do not make continuous contact with joint walls or with greater than 4 percent stretch of the joint material will be rejected and removed.

CONSTRUCTING TRANSVERSE CONTACT JOINTS

A transverse contact (construction) joint shall be constructed, including dowel bars, at the end of each day's work or where concrete placement is interrupted for more than 30 minutes, to coincide with the next weakened plane joint location.

If sufficient concrete has not been mixed to form a slab to match the next weakened plane joint, when an interruption occurs, the excess concrete shall be removed and disposed of back to the last preceding joint. The cost of removing and disposing of excess concrete shall be at the Contractor's expense. Excess material shall become the property of the Contractor and shall be disposed of in conformance with the provisions in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications.

A metal or wooden bulkhead (header) shall be used to form the joint. The bulkhead shall be designed to accommodate the installation of dowel bars.

CONSTRUCTING TRANSVERSE JOINT CONNECTIONS AND ANCHORS

Concrete pavement joints at transitions to asphalt concrete pavement, pavement end anchors and bridge approach slabs shall conform to the details as shown on the plans. Paint binder shall be applied to the concrete surface that asphalt concrete pavement will contact. Paint binder shall be applied in conformance with the provisions in Section 39, "Asphalt Concrete," of the Standard Specifications.

PROFILE INDEX

The pavement surface shall be profiled, by the Contractor not more than 10 days following concrete placement, in the presence of the Engineer, using a California Profilograph or equivalent in conformance with the requirements in California Test 526, except a blanking band of zero (null) shall be used to determine the Profile Index. Two profiles shall be made within each traffic lane, one meter from and parallel with each lane line.

Profiled pavement shall conform to the following Profile Index requirements:

A. Pavement on tangent alignment and pavement on horizontal curves having a centerline radius of curve 600 m or more shall have a Profile Index of 64 mm or less for each 0.1-km.
B. Pavement on horizontal curves having a centerline radius of curve 300 m or more but less than 600 m and pavement within the superelevation transition of those curves shall have a Profile Index of 128 mm or less for each 0.1-km.

Individual high points in excess of 7.5 mm, as determined by measurements of the profilogram in conformance with the requirements in California Test 526, except using a blanking band of zero (null), shall be reduced by grinding in conformance with the requirements in Section 40-1.10, "Final Finishing," of the Standard Specifications until the high points as indicated by reruns of the profilograph do not exceed 7.5 mm.

Pavement grinding shall not be performed before 10 days have elapsed after concrete placement, nor before the concrete has developed a modulus of rupture of at least 3.8 MPa.

CONSTRUCTING WEAKENED PLANE JOINTS (EARLY ENTRY SAW METHOD)

The Contractor may construct weakened plane joints using lighter weight concrete saws (early entry saws) specifically designed for sawing fresh concrete without the use of water. The early entry saws shall be capable of sawing joints within 2 hours of cure time after placement of the concrete pavement without ravelling or tearing, as defined in Section 40-1.08B(1), "Sawing Method," of the Standard Specifications. Joints sawed with early entry saws that develop random cracking shall be removed to the nearest controlled joint and replaced with concrete pavement containing dowel bars and tie bars in conformance with these special provisions and as shown on the plans. The removal and replacement work shall be at the Contractor's expense. Weakened plane joints not sawed within 2 hours of placing concrete pavement shall be sawed by conventional power driven wet-type concrete saws in conformance with the requirements of Section 40-1.08B(1), "Sawing Method," of the Standard Specifications.

Sawed grooves shall be cut to a maximum of 3 mm in width for longitudinal and transverse weakened plane joints made with early entry saws. The minimum depth of cut shall be calculated utilizing the formula in Section 40-1.08B(1), "Sawing Method," of the Standard Specifications except $d = t/4$.

TIE BARS ALONG LONGITUDINAL JOINT FOR SHORT RADIUS CURVES

When paving along short radius curves, the transverse joints shall be maintained in a single continuous straight line across lanes, through the radius point. Tie bars shall maintain minimum clearance from the transverse joint as shown on the plans. If the inside or outside curve of the panel does not allow equal uniform spacing of tie bars at 710 mm between tie bars, then the tie bars shall be equally spaced so that a minimum spacing of 375 mm to a maximum spacing of 710 mm is maintained between tie bars. Additional tie bars shall be considered as included in the contract price paid per cubic meter for concrete pavement and no additional compensation will be allowed therefore.

If dowel bars are specified along longitudinal joint for short radius curves, then dowel bars shall conform to the requirements of this special provision for tie bars spacing and tolerance.

MEASUREMENT AND PAYMENT

Sealing longitudinal and transverse weakened plane joints, and longitudinal isolation joints in portland cement concrete pavement will be measured by the meter. When a test strip conforms to the specifications for concrete pavement and remains a part of the project paving surface, the sealed pavement joints will be measured and paid for as seal pavement joint.

The contract price paid per meter for seal pavement joint shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in sealing pavement joints complete in place, including sawing, cleaning and preparing the joints in the concrete pavement, furnishing and installing backer rod, repairing and patching spalled or raveled sawed joints, and replacing or repairing rejected joints, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

Concrete pavement will be measured by the cubic meter in conformance with the provisions in Section 40-1.13, "Measurement," of the Standard Specifications. No deduction will be made for the volume of epoxy-coated dowel bars, epoxy-coated tie bars and, when used, tie bar baskets with fasteners and dowel bar baskets with fasteners, in the concrete pavement. When a test strip conforms to the specifications for concrete pavement and remains a part of the project paving surface, the concrete will be measured and paid for as concrete pavement.

The contract price paid per cubic meter for concrete pavement shall include full compensation for furnishing all labor, materials (including cementitious material in the amount determined by the Contractor), tools, equipment, and incidentals, and for doing all the work involved in constructing the portland cement concrete pavement complete in place, including furnishing and placing epoxy-coated dowel bars, epoxy-coated tie bars and, when used, any tie bar baskets and dowel bar baskets with fasteners, submittal to the Engineer all test data for determination of mix proportions of concrete for concrete pavement and for providing the facility, Contractor personnel and all the work involved in arranging and holding the prepaving conference, for constructing and repairing all joints; for performing all profile checks for Profile Index and furnishing final profilograms to the Engineer; for grooving and grinding required for final finishing; and for removing, and

replacing pavement for deficient thickness, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

Full compensation for drilling holes and bonding tie bars with epoxy resin shall be considered as included in the contract price paid per cubic meter for concrete pavement and no additional compensation will be allowed therefor.

Full compensation for coring test strips for evaluation by the Engineer and for back-filling core holes with hydraulic cement grout when the test strip remains in place as part of the concrete pavement; and for constructing, coring and removing and disposing of test strips that are rejected shall be considered as included in the contract price paid per cubic meter for concrete pavement and no additional compensation will be allowed therefor.

Costs for providing JITT will be determined in conformance with the provisions in Section 9-1.03, "Force Account Payment," of the Standard Specifications, except no markups shall be added, and the Contractor will be paid for one half of the JITT cost. Costs for providing JITT shall include training materials, class site, and the JITT instructor including the JITT instructor's travel, lodging, meals and presentation materials. All costs incurred by the Contractor or Engineer for attending JITT shall be borne by the party incurring the costs.

Full compensation for core drilling for dowel bar or tie bar alignment and backfilling with hydraulic cement grout shall be considered as included in the contract price per cubic meter for concrete pavement and no additional compensation will be allowed therefor.

If the initial cores show that dowel bars or tie bars are out of alignment tolerances and the Engineer orders additional dowel bar or tie bar coring, full compensation for drilling the additional cores shall be considered as included in the contract price per cubic meter for concrete pavement and no additional compensation will be allowed therefor.

If the initial cores show that dowel bars or tie bars are within alignment tolerances and the Engineer orders more dowel bar coring the additional cores will be paid for as extra work in conformance with the provisions in Section 4-1.03D, "Extra Work," of the Standard Specifications.

Full compensation for furnishing and placing epoxy coated reinforcement for transition end panel shall be considered as included in the contract price paid per cubic meter for concrete pavement and no additional compensation will be allowed therefore.

Full compensation for furnishing and placing paint binder (tack coat) for transition end panel shall be considered as included in the contract price paid per cubic meter for concrete pavement and no additional compensation will be allowed therefore.

10-1.48 PILING

GENERAL

Piling shall conform to the provisions in Section 49, "Piling," of the Standard Specifications, and these special provisions.

Unless otherwise specified, welding of any work performed in conformance with the provisions in Section 49, "Piling," of the Standard Specifications, shall be in conformance with the requirements in AWS D1.1.

Foundation recommendations are included in the "Information Handout" available to the Contractor as provided for in Section 2-1.03, "Examination of Plans, Specifications, Contract, and Site of Work," of the Standard Specifications.

Attention is directed to "Welding" of these special provisions.

CAST-IN-DRILLED-HOLE CONCRETE PILES

Cast-in-drilled-hole concrete piling shall conform to the provisions in Section 49-4, "Cast-In-Place Concrete Piles," of the Standard Specifications and these special provisions.

The provisions of "Welding" of these special provisions shall not apply to temporary steel casings.

Cast-in-drilled-hole concrete piles 600 mm in diameter or larger may be constructed by excavation and depositing concrete under slurry.

Materials

Concrete deposited under slurry shall have a nominal penetration equal to or greater than 90 mm. Concrete shall be proportioned to prevent excessive bleed water and segregation.

Concrete deposited under slurry shall contain not less than 400 kg of cementitious material per cubic meter.

The combined aggregate grading used in concrete for cast-in-drilled-hole concrete piling shall be either the 25-mm maximum grading, the 12.5-mm maximum grading, or the 9.5-mm maximum grading and shall conform to the requirements in Section 90-3 "Aggregate Gradings," of the Standard Specifications.

Mineral Slurry

Mineral slurry shall be mixed and thoroughly hydrated in slurry tanks, and slurry shall be sampled from the slurry tanks and tested before placement in the drilled hole.

Slurry shall be recirculated or continuously agitated in the drilled hole to maintain the specified properties.

Recirculation shall include removal of drill cuttings from the slurry before discharging the slurry back into the drilled hole. When recirculation is used, the slurry shall be sampled and tested at least every 2 hours after beginning its use until tests show that the samples taken from the slurry tank and from near the bottom of the hole have consistent specified properties. Subsequently, slurry shall be sampled at least twice per shift as long as the specified properties remain consistent.

Slurry that is not recirculated in the drilled hole shall be sampled and tested at least every 2 hours after beginning its use. The slurry shall be sampled midheight and near the bottom of the hole. Slurry shall be recirculated when tests show that the samples taken from midheight and near the bottom of the hole do not have consistent specified properties.

Slurry shall also be sampled and tested prior to final cleaning of the bottom of the hole and again just prior to placing concrete. Samples shall be taken from midheight and near the bottom of the hole. Cleaning of the bottom of the hole and placement of the concrete shall not start until tests show that the samples taken from midheight and near the bottom of the hole have consistent specified properties.

Mineral slurry shall be tested for conformance to the requirements shown in the following table:

MINERAL SLURRY		
PROPERTY	REQUIREMENT	TEST
Density (kg/m^3) - before placement in the drilled hole - during drilling - prior to final cleaning - immediately prior to placing concrete	1030* to 1110* 1030* to 1200*	Mud Weight (Density) API 13B-1 Section 1
Viscosity (seconds/liter) bentonite attapulgite	29 to 53 29 to 42	Marsh Funnel and Cup API 13B-1 Section 2.2
pH	8 to 10.5	Glass Electrode pH Meter or pH Paper
Sand Content (percent) - prior to final cleaning - immediately prior to placing concrete	less than or equal to 4.0	Sand API 13B-1 Section 5
*When approved by the Engineer, slurry may be used in salt water, and the allowable densities may be increased up to 32 kg/m^3. Slurry temperature shall be at least 4 degrees Celsius when tested.		

Any caked slurry on the sides or bottom of hole shall be removed before placing reinforcement. If concrete is not placed immediately after placing reinforcement, the reinforcement shall be removed and cleaned of slurry, the sides of the drilled hole cleaned of caked slurry, and the reinforcement again placed in the hole for concrete placement.

Synthetic Slurry

Synthetic slurries shall be used in conformance with the manufacturer's recommendations and these special provisions. The following synthetic slurries may be used:

PRODUCT	MANUFACTURER
SlurryPro CDP	KB Technologies Ltd. Suite 216 735 Broad Street Chattanooga, TN 37402 (800) 525-5237
Super Mud	PDS Company c/o Champion Equipment Company 8140 East Rosecrans Ave. Paramount, CA 90723 (562) 634-8180
Shore Pac GCV	CETCO Drilling Products Group 1350 West Shure Drive Arlington Heights, IL 60004 (847) 392-5800

Inclusion of a synthetic slurry on the above list may be obtained by meeting the Department's requirements for synthetic slurries. The requirements can be obtained from the Office of Structure Design, P.O. Box 942874, Sacramento, CA 94274-0001.

Synthetic slurries listed may not be appropriate for a given site.

Synthetic slurries shall not be used in holes drilled in primarily soft or very soft cohesive soils as determined by the Engineer.

A manufacturer's representative, as approved by the Engineer, shall provide technical assistance for the use of their product, shall be at the site prior to introduction of the synthetic slurry into a drilled hole, and shall remain at the site until released by the Engineer.

Synthetic slurries shall be sampled and tested at both mid-height and near the bottom of the drilled hole. Samples shall be taken and tested during drilling as necessary to verify the control of the properties of the slurry. Samples shall be taken and tested when drilling is complete, but prior to final cleaning of the bottom of the hole. When samples are in conformance with the requirements shown in the following tables for each slurry product, the bottom of the hole shall be cleaned and any loose or settled material removed. Samples shall be obtained and tested after final cleaning with steel reinforcement in place and just prior to placing concrete.

SlurryPro CDP synthetic slurries shall be tested for conformance to the requirements shown in the following table:

SLURRYPRO CDP KB Technologies Ltd.		
PROPERTY	REQUIREMENT	TEST

Density (kg/m^3) - during drilling - prior to final cleaning - just prior to placing concrete	less than or equal to 1075* less than or equal to 1025*	Mud Weight (Density) API 13B-1 Section 1
Viscosity (seconds/liter) - during drilling -prior to final cleaning - just prior to placing concrete	53 to 127 less than or equal to 74	Marsh Funnel and Cup API 13B-1 Section 2.2
pH	6 to 11.5	Glass Electrode pH Meter or pH Paper
Sand Content (percent) - prior to final cleaning - just prior to placing concrete	less than or equal to 0.5	Sand API 13B-1 Section 5
*When approved by the Engineer, slurry may be used in salt water, and the allowable densities may be increased up to 32 kg/m^3. Slurry temperature shall be at least 4 degrees Celsius when tested.		

Super Mud synthetic slurries shall be tested for conformance to the requirements shown in the following table:

SUPER MUD PDS Company		
PROPERTY	REQUIREMENT	TEST

Density (kg/m^3) - prior to final cleaning - just prior to placing concrete	less than or equal to 1025*	Mud Weight (Density) API 13B-1 Section 1
Viscosity (seconds/liter) - during drilling - prior to final cleaning - just prior to placing concrete	34 to 64 less than or equal to 64	Marsh Funnel and Cup API 13B-1 Section 2.2
pH	8 to 10.0	Glass Electrode pH Meter or pH Paper
Sand Content (percent) - prior to final cleaning -just prior to placing concrete	less than or equal to 0.5	Sand API 13B-1 Section 5
*When approved by the Engineer, slurry may be used in salt water, and the allowable densities may be increased up to 32 kg/m^3. Slurry temperature shall be at least 4 degrees Celsius when tested.		

Shore Pac GCV synthetic slurries shall be tested for conformance to the requirements shown in the following table:

Shore Pac GCV CETCO Drilling Products Group		
PROPERTY	REQUIREMENT	TEST
Density (kg/m^3) - prior to final cleaning - just prior to placing concrete	less than or equal to 1025*	Mud Weight (Density) API 13B-1 Section 1
Viscosity (seconds/liter) - during drilling - prior to final cleaning - just prior to placing concrete	35 to 78 less than or equal to 60	Marsh Funnel and Cup API 13B-1 Section 2.2
pH	8.0 to 11.0	Glass Electrode pH Meter or pH Paper
Sand Content (percent) - prior to final cleaning -just prior to placing concrete	less than or equal to 0.5	Sand API 13B-1 Section 5
*When approved by the Engineer, slurry may be used in salt water, and the allowable densities may be increased up to 32 kg/m^3. Slurry temperature shall be at least 4 degrees Celsius when tested.		

Water Slurry

At the option of the Contractor water may be used as slurry when casing is used for the entire length of the drilled hole. Water slurry shall be tested for conformance to the requirements shown in the following table:

WATER SLURRY		
PROPERTY	REQUIREMENT	TEST
Density (kg/m^3) - prior to final cleaning - just prior to placing concrete	1017 *	Mud Weight (Density) API 13B-1 Section 1
Sand Content (percent) - prior to final cleaning -just prior to placing concrete	less than or equal to 0.5	Sand API 13B-1 Section 5
*When approved by the Engineer, salt water slurry may be used, and the allowable densities may be increased up to 32 kg/m^3.		

Construction

The Contractor shall submit a placing plan to the Engineer for approval prior to producing the test batch for cast-in-drilled-hole concrete piling and at least 10 working days prior to constructing piling. The plan shall include complete descriptions, details, and supporting calculations as listed below:

A. Requirements for all cast-in-drilled hole concrete piling:

1. Concrete mix design, certified test data, and trial batch reports.
2. Drilling or coring methods and equipment.
3. Proposed method for casing installation and removal when necessary.
4. Plan view drawing of pile showing reinforcement and inspection pipes, if required.
5. Methods for placing, positioning, and supporting bar reinforcement.
6. Methods and equipment for accurately determining the depth of concrete and actual and theoretical volume placed, including effects on volume of concrete when any casings are withdrawn.
7. Methods and equipment for verifying that the bottom of the drilled hole is clean prior to placing concrete.
8. Methods and equipment for preventing upward movement of reinforcement, including the Contractor's means of detecting and measuring upward movement during concrete placement operations.

B. Additional requirements when concrete is placed under slurry:

1. Concrete batching, delivery, and placing systems, including time schedules and capacities therefor. Time schedules shall include the time required for each concrete placing operation at each pile.
2. Concrete placing rate calculations. When requested by the Engineer, calculations shall be based on the initial pump pressures or static head on the concrete and losses throughout the placing system, including anticipated head of slurry and concrete to be displaced.
3. Suppliers' test reports on the physical and chemical properties of the slurry and any proposed slurry chemical additives, including Material Safety Data Sheet.
4. Slurry testing equipment and procedures.
5. Methods of removal and disposal of excavation, slurry, and contaminated concrete, including removal rates.
6. Methods and equipment for slurry agitating, recirculating, and cleaning.

In addition to compressive strength requirements, the consistency of the concrete to be deposited under slurry shall be verified before use by producing a test batch. The test batch shall be produced and delivered to the project under conditions and in time periods similar to those expected during the placement of concrete in the piles. Concrete for the test batch shall be placed in an excavated hole or suitable container of adequate size to allow for testing as specified herein. Depositing of test batch concrete under slurry will not be required. In addition to meeting the specified nominal penetration, the test batch shall meet the following requirements:

A. For piles where the time required for each concrete placing operation, as submitted in the placing plan, will be 2 hours or less, the test batch shall demonstrate that the proposed concrete mix design achieves either a penetration of at least 50 mm or a slump of at least 125 mm after twice that time has elapsed.
B. For piles where the time required for each concrete placing operation, as submitted in the placing plan, will be more than 2 hours, the test batch shall demonstrate that the proposed concrete mix design achieves either a penetration of at least 50 mm or a slump of at least 125 mm after that time plus 2 hours has elapsed.

The time period shall begin at the start of placement. The concrete shall not be vibrated or agitated during the test period. Penetration tests shall be performed in conformance with the requirements in California Test 533. Slump tests shall be performed in conformance with the requirements in ASTM Designation: C 143. Upon completion of testing, the concrete shall be disposed of in conformance with the provisions in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications.

The concrete deposited under slurry shall be carefully placed in a compact, monolithic mass and by a method that will prevent washing of the concrete. Concrete deposited under slurry need not be vibrated. Placing concrete shall be a continuous operation lasting not more than the time required for each concrete placing operation at each pile, as submitted in the placing plan, unless otherwise approved in writing by the Engineer. The concrete shall be placed with concrete pumps and delivery tube system of adequate number and size to complete the placing of concrete in the time specified. The delivery tube system shall consist of one of the following:

A. A tremie tube or tubes, each of which are at least 250 mm in diameter, fed by one or more concrete pumps.
B. One or more concrete pump tubes, each fed by a single concrete pump.

The delivery tube system shall consist of watertight tubes with sufficient rigidity to keep the ends always in the mass of concrete placed. If only one delivery tube is utilized to place the concrete, the tube shall be placed near the center of the drilled hole. Multiple tubes shall be uniformly spaced in the hole. Internal bracing for the steel reinforcing cage shall accommodate the delivery tube system. Tremies shall not be used for piles without space for a 250-mm tube.

Spillage of concrete into the slurry during concrete placing operations shall not be allowed. Delivery tubes shall be capped with a watertight cap, or plugged above the slurry level with a good quality, tight fitting, moving plug that will expel the slurry from the tube as the tube is charged with concrete. The cap or plug shall be designed to be released as the tube is charged. The pump discharge or tremie tube shall extend to the bottom of the hole before charging the tube with concrete. After charging the delivery tube system with concrete, the flow of concrete through a tube shall be induced by slightly raising the discharge end. During concrete placement, the tip of the delivery tube shall be maintained as follows to prevent reentry of the slurry into the tube. Until at least 3 m of concrete has been placed, the tip of the delivery tube shall be within 150 mm of the bottom of the drilled hole, and then the embedment of the tip shall be maintained at least 3 m below the top surface of the concrete. Rapid raising or lowering of the delivery tube shall not be permitted. If the seal is lost or the delivery tube becomes plugged and must be removed, the tube shall be withdrawn, the tube cleaned, the tip of the tube capped to prevent entrance of the slurry, and the operation restarted by pushing the capped tube 3 m into the concrete and then reinitiating the flow of concrete.

When slurry is used, a fully operational standby concrete pump, adequate to complete the work in the time specified, shall be provided at the site during concrete placement. The slurry level shall be maintained within 300 mm of the top of the drilled hole.

A log of concrete placement for each drilled hole shall be maintained by the Contractor when concrete is deposited under slurry. The log shall show the pile location, tip elevation, dates of excavation and concrete placement, total quantity of concrete deposited, length and tip elevation of any casing, and details of any hole stabilization method and materials used. The log shall include a 215 mm x 280 mm sized graph of the concrete placed versus depth of hole filled. The graph shall be plotted continuously throughout placing of concrete. The depth of drilled hole filled shall be plotted vertically with the pile tip oriented at the bottom and the quantity of concrete shall be plotted horizontally. Readings shall be made at least at each 1.5 m of pile depth, and the time of the reading shall be indicated. The graph shall be labeled with the pile location, tip elevation, cutoff elevation, and the dates of excavation and concrete placement. The log shall be delivered to the Engineer within one working day of completion of placing concrete in the pile.

After placing reinforcement and prior to placing concrete in the drilled hole, if drill cuttings settle out of the slurry, the bottom of the drilled hole shall be cleaned. The Contractor shall verify that the bottom of the drilled hole is clean.

If temporary casing is used, concrete placed under slurry shall be maintained at a level at least 1.5 m above the bottom of the casing. The withdrawal of casings shall not cause contamination of the concrete with slurry.

Acceptance Testing and Mitigation

Vertical inspection pipes for acceptance testing shall be provided in all cast-in-drilled-hole concrete piles that are 600 mm in diameter or larger, except when the holes are dry or when the holes are dewatered without the use of temporary casing to control ground water.

Inspection pipes shall be Schedule 40 polyvinyl chloride pipes with a nominal inside diameter of 50 mm. Each inspection pipe shall be capped top and bottom and shall have watertight couplers to provide a clean, dry and unobstructed 50-mm diameter clear opening from 1.0 m above the pile cutoff down to the bottom of the reinforcing cage.

If the Contractor drills the hole below the specified tip elevation, the reinforcement and the inspection pipes shall be extended to 75 mm clear of the bottom of the drilled hole.

Inspection pipes shall be placed around the pile, inside the outermost spiral or hoop reinforcement, and 75 mm clear of the vertical reinforcement, at a uniform spacing not exceeding 840 mm measured along the circle passing through the centers of inspection pipes. A minimum of 2 inspection pipes per pile shall be used. When the vertical reinforcement is not bundled and each bar is not more than 26 mm in diameter, inspection pipes may be placed 50 mm clear of the vertical reinforcement. The inspection pipes shall be placed to provide the maximum diameter circle that passes through the centers of the inspection pipes while maintaining the clear spacing required herein. The pipes shall be installed in straight alignment, parallel to the main reinforcement, and securely fastened in place to prevent misalignment during installation of the reinforcement and placing of concrete in the hole.

The Contractor shall log the location of the inspection pipe couplers with respect to the plane of pile cut off, and these logs shall be delivered to the Engineer upon completion of the placement of concrete in the drilled hole.

After placing concrete and before requesting acceptance tests, each inspection pipe shall be tested by the Contractor in the presence of the Engineer by passing a 48.3-mm diameter rigid cylinder 610 mm long through the complete length of pipe. If the 48.3-mm diameter rigid cylinder fails to pass any of the inspection pipes, the Contractor shall attempt to pass a

32.0-mm diameter rigid cylinder 1.375 m long through the complete length of those pipes in the presence of the Engineer. If an inspection pipe fails to pass the 32.0-mm diameter cylinder, the Contractor shall immediately fill all inspection pipes in the pile with water.

The Contractor shall replace each inspection pipe that does not pass the 32.0-mm diameter cylinder with a 50.8-mm diameter hole cored through the concrete for the entire length of the pile. Cored holes shall be located as close as possible to the inspection pipes they are replacing and shall be no more than 150 mm inside the reinforcement. Coring shall not damage the pile reinforcement. Cored holes shall be made with a double wall core barrel system utilizing a split tube type inner barrel. Coring with a solid type inner barrel will not be allowed. Coring methods and equipment shall provide intact cores for the entire length of the pile concrete. The coring operation shall be logged by an Engineering Geologist or Civil Engineer licensed in the State of California and experienced in core logging. Coring logs shall include complete descriptions of inclusions and voids encountered during coring, and shall be delivered to the Engineer upon completion. Concrete cores shall be preserved, identified with the exact location the core was recovered from within the pile, and made available for inspection by the Engineer.

Acceptance tests of the concrete will be made by the Engineer, without cost to the Contractor. Acceptance tests will evaluate the homogeneity of the placed concrete. Tests will include gamma-gamma logging. Tests may also include crosshole sonic logging and other means of inspection selected by the Engineer. The Contractor shall not conduct operations within 8.0 m of the gamma-gamma logging operations. The Contractor shall separate reinforcing steel as necessary to allow the Engineer access to the inspection pipes to perform gamma-gamma logging or other acceptance testing. After requesting acceptance tests and providing access to the piling, the Contractor shall allow 3 weeks for the Engineer to conduct these tests and make determination of acceptance if the 48.3-mm diameter cylinder passed all inspection pipes, and 4 weeks if only the 32.0-mm diameter cylinder passed all inspection pipes. Should the Engineer fail to complete these tests within the time allowance, and if in the opinion of the Engineer, the Contractor's controlling operation is delayed or interfered with by reason of the delay in inspection, the delay will be considered a right of way delay as specified in Section 8-1.09, "Right of Way Delays," of the Standard Specifications.

All inspection pipes and cored holes in a pile shall be dewatered and filled with grout after notification by the Engineer that the pile is acceptable. Placement and removal of water in the inspection pipes shall be at the Contractor’s expense. Grout shall conform to the provisions in Section 50-1.09, "Bonding and Grouting," of the Standard Specifications. The inspection pipes and holes shall be filled using grout tubes that extend to the bottom of the pipe or hole or into the grout already placed.

If acceptance testing performed by the Engineer determines that a pile does not meet the requirements of the specifications, then that pile will be rejected and all depositing of concrete under slurry or concrete placed using temporary casing for the purpose of controlling groundwater shall be suspended until written changes to the methods of pile construction are approved in writing by the Engineer.

The Contractor shall submit to the Engineer for approval a mitigation plan for repair, supplementation, or replacement for each rejected cast-in-drilled-hole concrete pile, and this plan shall conform to the provisions in Section 5-1.02, "Plans and Working Drawings," of the Standard Specifications. Prior to submitting this mitigation plan, the Engineer will hold a repair feasibility meeting with the Contractor to discuss the feasibility of repairing rejected piling. The Engineer will consider the size of the defect, the location of the defect, and the design information and corrosion protection considerations for the pile. This information will be made available to the Contractor, if appropriate, for the development of the mitigation plan. If the Engineer determines that it is not feasible to repair the rejected pile, the Contractor shall not include repair as a means of mitigation and shall proceed with the submittal of a mitigation plan for replacement or supplementation of the rejected pile.

If the Engineer determines that a rejected pile does not require mitigation due to structural, geotechnical, or corrosion concerns, the Contractor may elect to 1) repair the pile per the approved mitigation plan, or 2) not repair anomalies found during acceptance testing of that pile. For such unrepaired piles, the Contractor shall pay to the State, $400 per cubic meter for the portion of the pile affected by the anomalies. The volume, in cubic meters, of the portion of the pile affected by the anomalies, shall be calculated as the area of the cross-section of the pile affected by each anomaly, in square meters, as determined by the Engineer, multiplied by the distance, in meters, from the top of each anomaly to the specified tip of the pile. If the volume calculated for one anomaly overlaps the volume calculated for additional anomalies within the pile, the calculated volume for the overlap shall only be counted once. In no case shall the amount of the payment to the State for any such pile be less than $400. The Department may deduct the amount from any moneys due, or that may become due the Contractor under the contract.

Pile mitigation plans shall include the following:

A. The designation and location of the pile addressed by the mitigation plan.
B. A review of the structural, geotechnical, and corrosion design requirements of the rejected pile.
C. A step by step description of the mitigation work to be performed, including drawings if necessary.
D. An assessment of how the proposed mitigation work will address the structural, geotechnical, and corrosion design requirements of the rejected pile.

E. Methods for preservation or restoration of existing earthen materials.
F. A list of affected facilities, if any, with methods and equipment for protection of these facilities during mitigation.
G. The State assigned contract number, bridge number, full name of the structure as shown on the contract plans, District-County-Route-Kilometer Post, and the Contractor's (and Subcontractor's if applicable) name on each sheet.
H. A list of materials, with quantity estimates, and personnel, with qualifications, to be used to perform the mitigation work.
I. The seal and signature of an engineer who is licensed as a Civil Engineer by the State of California.

For rejected piles to be repaired, the Contractor shall submit a pile mitigation plan that contains the following additional information:

A. An assessment of the nature and size of the anomalies in the rejected pile.
B. Provisions for access for additional pile testing if required by the Engineer.

For rejected piles to be replaced or supplemented, the Contractor shall submit a pile mitigation plan that contains the following additional information:

A. The proposed location and size of additional piling.
B. Structural details and calculations for any modification to the structure to accommodate the replacement or supplemental piling.

All provisions for cast-in-drilled-hole concrete piling shall apply to replacement piling.

The Contractor shall allow the Engineer 3 weeks to review the mitigation plan after a complete submittal has been received.

Should the Engineer fail to review the complete pile mitigation submittal within the time specified, and if, in the opinion of the Engineer, the Contractor's controlling operation is delayed or interfered with by reason of the delay in reviewing the pile mitigation plan, an extension of time commensurate with the delay in completion of the work thus caused will be granted in conformance with the provisions in Section 8-1.09, "Right of Way Delays," of the Standard Specifications.

When repairs are performed, the Contractor shall submit a mitigation report to the Engineer within 10 days of completion of the repair. This report shall state exactly what repair work was performed and quantify the success of the repairs relative to the submitted mitigation plan. The mitigation report shall be stamped and signed by an engineer that is licensed as a Civil Engineer by the State of California. The mitigation report shall show the State assigned contract number, bridge number, full name of the structure as shown on the contract plans, District-County-Route-Kilometer Post, and the Contractor (and Subcontractor if applicable) name on each sheet. The Engineer will be the sole judge as to whether a mitigation proposal is acceptable, the mitigation efforts are successful, and to whether additional repairs, removal and replacement, or construction of a supplemental foundation is required.

MEASUREMENT AND PAYMENT (PILING)

Measurement and payment for the various types and classes of piles shall conform to the provisions in Sections 49-6.01, "Measurement," and 49-6.02, "Payment," of the Standard Specifications and these special provisions.

Full compensation for slurry, depositing concrete under slurry, test batches, inspection pipes, filling inspection holes and pipes with grout, drilling oversized cast-in-drilled-hole concrete piling, filling cave-ins and oversized piles with concrete, and redrilling through concrete, shall be considered as included in the contract lump sum price paid for the item requiring the cast-in-drilled-hole concrete pile foundation and no additional compensation will be allowed therefor.

10-1.49 CONCRETE STRUCTURES

Portland cement concrete structures shall conform to the provisions in Section 51, "Concrete Structures," of the Standard Specifications and these special provisions.

10-1.50 STEEL STRUCTURES

Construction of steel structures shall conform to the provisions in Section 55, "Steel Structures," of the Standard Specifications and these special provisions.

Attention is directed to "Welding" in Section 8, "Materials," of these special provisions.

The following substitutions of high-strength steel fasteners shall be made:

METRIC SIZE SHOWN ON THE PLANS	SIZE TO BE SUBSTITUTED
ASTM Designation: A 325M (Nominal bolt diameter (mm))	ASTM Designation: A 325 (Nominal bolt diameter (inch))
13, 12.70, or M12	1/2
16, 15.88, or M16	5/8
19, 19.05, or M20	3/4
22, 22.22, or M22	7/8
24, 25, 25.40, or M24	1
29, 28.58, or M27	1 1/8
32, 31.75, or M30	1 1/4
38, 38.10, or M36	1 1/2

MATERIALS

High-strength fastener assemblies and other bolts attached to structural steel with nuts and washers shall be zinc-coated. When direct tension indicators are used in these assemblies, the direct tension indicator and all components of the fastener assembly shall be zinc-coated by the mechanical deposition process.

ROTATIONAL CAPACITY TESTING PRIOR TO SHIPMENT TO JOB SITE

Rotational capacity tests shall be performed on all lots of high-strength fastener assemblies prior to shipment of these lots to the project site. Zinc-coated assemblies shall be tested after all fabrication, coating, and lubrication of components has been completed. One hardened washer shall be used under each nut for the tests.

The requirements of this section do not apply to high-strength cap screws or high-strength bolts used for slip base plates.

Each combination of bolt production lot, nut lot, and washer lot shall be tested as an assembly.

A rotational capacity lot number shall be assigned to each combination of lots tested. Each shipping unit of fastener assemblies shall be plainly marked with the rotational capacity lot number.

Two fastener assemblies from each rotational capacity lot shall be tested.

The following equipment, procedure, and acceptance criteria shall be used to perform rotational capacity tests on and determine acceptance of long bolts. Fasteners are considered to be long bolts when full nut thread engagement can be achieved when installed in a bolt tension measuring device:

A. Long Bolt Test Equipment:

1. Calibrated bolt tension measuring device with adequate tension capacity for the bolts being tested.
2. Calibrated dial or digital torque wrench. Other suitable tools will be required for performing Steps 7 and 8 of the Long Bolt Test Procedure. A torque multiplier may be required for large diameter bolts.
3. Spacer washers or bushings. When spacer washers or bushings are required, they shall have the same inside diameter and equal or larger outside diameter as the appropriate hardened washers conforming to the requirements in ASTM Designation: F436.
4. Steel beam or member, such as a girder flange or cross frame, to which the bolt tension measuring device will be attached. The device shall be accessible from the ground.

B. Long Bolt Test Procedure:

1. Measure the bolt length. The bolt length is defined as the distance from the end of the threaded portion of the shank to the underside of the bolt head.
2. Install the nut on the bolt so that 3 to 5 full threads of the bolt are located between the bearing face of the nut and the underside of the bolt head. Measure and record the thread stickout of the bolt. Thread stickout is determined by measuring the distance from the outer face of the nut to the end of the threaded portion of the shank.
3. Insert the bolt into the bolt tension measuring device and install the required number of washers, and additional spacers as needed, directly beneath the nut to produce the thread stickout measured in Step 2 of this procedure.
4. Tighten the nut using a hand wrench to a snug-tight condition. The snug tension shall not be less than the Table A value but may exceed the Table A value by a maximum of 2 kips.

Table A

High-Strength Fastener Assembly Tension Values to Approximate Snug-Tight Condition	
Bolt Diameter (inches)	Snug Tension (kips)
1/2	1
5/8	2
3/4	3
7/8	4
1	5
1 1/8	6
1 1/4	7
1 3/8	9
1 1/2	10

5. Match-mark the assembly by placing a heavy reference start line on the face plate of the bolt tension measuring device which aligns with 1) a mark placed on one corner of the nut, and 2) a radial line placed across the flat on the end of the bolt, or on the exposed portions of the threads of tension control bolts. Place an additional mark on the outside of the socket that overlays the mark on the nut corner such that this mark will be visible while turning the nut. Make an additional mark on the face plate, either 2/3 of a turn, one turn, or 1 1/3 turn clockwise from the heavy reference start line, depending on the bolt length being tested as shown in Table B.

Table B

Required Nut Rotation for Rotational Capacity Tests[a,b]	
Bolt Length (measured in Step 1)	Required Rotation (turn)
4 bolt diameters or less	2/3
Greater than 4 bolt diameters but no more than 8 bolt diameters	1
Greater than 8 bolt diameters, but no more than 12 bolt diameters[c]	1 1/3
(a) Nut rotation is relative to bolt, regardless of the element (nut or bolt) being turned. For bolts installed by 1/2 turn and less, the tolerance shall be plus or minus 30 degrees; for bolts installed by 2/3 turn and more, the tolerance shall be plus or minus 45 degrees. (b) Applicable only to connections in which all material within grip of the bolt is steel. (c) When bolt length exceeds 12 diameters, the required rotation shall be determined by actual tests in a suitable tension device simulating the actual conditions.	

6. Turn the nut to achieve the applicable minimum bolt tension value listed in Table C. After reaching this tension, record the moving torque, in foot-pounds, required to turn the nut, and also record the corresponding bolt tension value in pounds. Torque shall be measured with the nut in motion. Calculate the value, T (in ft-lbs), where T=[(the measured tension in pounds) x (the bolt diameter in inches) / 48 in/ft].

Table C

Minimum Tension Values for High-Strength Fastener Assemblies	
Bolt Diameter (inches)	Minimum Tension (kips)
1/2	12
5/8	19
3/4	28
7/8	39
1	51
1 1/8	56
1 1/4	71
1 3/8	85
1 1/2	103

7. Turn the nut further to increase bolt tension until the rotation listed in Table B is reached. The rotation is measured from the heavy reference line made on the face plate after the bolt was snug-tight. Record this bolt tension.
8. Loosen and remove the nut and examine the threads on both the nut and bolt.

C. Long Bolt Acceptance Criteria:

1. An assembly shall pass the following requirements to be acceptable: 1) the measured moving torque (Step 6) shall be less than or equal to the calculated value, T (Step 6), 2) the bolt tension measured in Step 7 shall be greater than or equal to the applicable turn test tension value listed in Table D, 3) the nut shall be able to be removed from the bolt without signs of thread stripping or galling after the required rotation in Step 7 has been achieved, 4) the bolt does not shear from torsion or fail during the test, and 5) the assembly does not seize before the final rotation in Step 7 is reached. Elongation of the bolt in the threaded region between the bearing face of the nut and the underside of the bolt head is expected and will not be considered a failure. Both fastener assemblies tested from one rotational capacity lot shall pass for the rotational capacity lot to be acceptable.

Table D

Turn Test Tension Values	
Bolt Diameter (inches)	Turn Test Tension (kips)
1/2	14
5/8	22
3/4	32
7/8	45
1	59
1 1/8	64
1 1/4	82
1 3/8	98
1 1/2	118

The following equipment, procedure, and acceptance criteria shall be used to perform rotational capacity tests on and determine acceptance of short bolts. Fasteners are considered to be short bolts when full nut thread engagement cannot be achieved when installed in a bolt tension measuring device:

A. Short Bolt Test Equipment:

1. Calibrated dial or digital torque wrench. Other suitable tools will be required for performing Steps 7 and 8 of the Short Bolt Test Procedure. A torque multiplier may be required for large diameter bolts.
2. Spud wrench or equivalent.
3. Spacer washers or bushings. When spacer washers or bushings are required, they shall have the same inside diameter and equal or larger outside diameter as the appropriate hardened washers conforming to the requirements in ASTM Designation: F436.

4. Steel plate or girder with a hole to install bolt. The hole size shall be 1.6 mm greater than the nominal diameter of the bolt to be tested. The grip length, including any plates, washers, and additional spacers as needed, shall provide the proper number of threads within the grip, as required in Step 2 of the Short Bolt Test Procedure.

B. Short Bolt Test Procedure:

1. Measure the bolt length. The bolt length is defined as the distance from the end of the threaded portion of the shank to the underside of the bolt head.
2. Install the nut on the bolt so that 3 to 5 full threads of the bolt are located between the bearing face of the nut and the underside of the bolt head. Measure and record the thread stickout of the bolt. Thread stickout is determined by measuring the distance from the outer face of the nut to the end of the threaded portion of the shank.
3. Install the bolt into a hole on the plate or girder and install the required number of washers and additional spacers as needed between the bearing face of the nut and the underside of the bolt head to produce the thread stickout measured in Step 2 of this procedure.
4. Tighten the nut using a hand wrench to a snug-tight condition. The snug condition shall be the full manual effort applied to the end of a 305 mm long wrench. This applied torque shall not exceed 20 percent of the maximum allowable torque in Table E.

Table E

Maximum Allowable Torque for High-Strength Fastener Assemblies	
Bolt Diameter (inches)	Torque (ft-lbs)
1/2	145
5/8	285
3/4	500
7/8	820
1	1220
1 1/8	1500
1 1/4	2130
1 3/8	2800
1 1/2	3700

5. Match-mark the assembly by placing a heavy reference start line on the steel plate or girder which aligns with 1) a mark placed on one corner of the nut and 2) a radial line placed across the flat on the end of the bolt or on the exposed portions of the threads of tension control bolts. Place an additional mark on the outside of the socket that overlays the mark on the nut corner such that this mark will be visible while turning the nut. Make 2 additional small marks on the steel plate or girder, one 1/3 of a turn and one 2/3 of a turn clockwise from the heavy reference start line on the steel plate or girder.
6. Using the torque wrench, tighten the nut to the rotation value listed in Table F. The rotation is measured from the heavy reference line described in Step 5 made after the bolt was snug-tight. A second wrench shall be used to prevent rotation of the bolt head during tightening. Measure and record the moving torque after this rotation has been reached. The torque shall be measured with the nut in motion.

Table F

Nut Rotation Required for Turn-of-Nut Installation[a,b]	
Bolt Length (measured in Step 1)	Required Rotation (turn)
4 bolt diameters or less	1/3
(a) Nut rotation is relative to bolt, regardless of the element (nut or bolt) being turned. For bolts installed by 1/2 turn and less, the tolerance shall be plus or minus 30 degrees. (b) Applicable only to connections in which all material within grip of the bolt is steel.	

7. Tighten the nut further to the 2/3-turn mark as indicated in Table G. The rotation is measured from the heavy reference start line made on the plate or girder when the bolt was snug-tight. Verify that the radial line on the bolt end or on the exposed portions of the threads of tension control bolts is still in alignment with the start line.

Table G

Required Nut Rotation for Rotational Capacity Test	
Bolt Length (measured in Step 1)	Required Rotation (turn)
4 bolt diameters or less	2/3

8. Loosen and remove the nut and examine the threads on both the nut and bolt.

C. Short Bolt Acceptance Criteria:

1. An assembly shall pass the following requirements to be acceptable: 1) the measured moving torque from Step 6 shall be less than or equal to the maximum allowable torque from Table E, 2) the nut shall be able to be removed from the bolt without signs of thread stripping or galling after the required rotation in Step 7 has been achieved, 3) the bolt does not shear from torsion or fail during the test, and 4) the assembly shall not seize before the final rotation in Step 7 is reached. Elongation of the bolt in the threaded region between the bearing face of the nut and the underside of the bolt head will not be considered a failure. Both fastener assemblies tested from one rotational capacity lot shall pass for the rotational capacity lot to be acceptable.

INSTALLATION TENSION TESTING AND ROTATIONAL CAPACITY TESTING AFTER ARRIVAL ON THE JOB SITE

Installation tension tests and rotational capacity tests on high-strength fastener assemblies shall be performed by the Contractor prior to acceptance or installation and after arrival of the fastener assemblies on the project site. Installation tension tests and rotational capacity tests shall be performed at the job-site, in the presence of the Engineer, on each rotational capacity lot of fastener assemblies.

The requirements of this section do not apply to high-strength cap screws or high-strength bolts used for slip base plates.

Installation tension tests shall be performed on 3 representative fastener assemblies in conformance with the provisions in Section 8, "Installation," of the RCSC Specification. For short bolts, Section 8.2, "Pretensioned Joints," of the RCSC Specification shall be replaced by the "Pre-Installation Testing Procedures," of the "Structural Bolting Handbook," published by the Steel Structures Technology Center, Incorporated.

The rotational capacity tests shall be performed in conformance with the requirements for rotational capacity tests in "Rotational Capacity Testing Prior to Shipment to Job Site" of these special provisions.

At the Contractor's expense, additional installation tension tests, tests required to determine job inspecting torque, and rotational capacity tests shall be performed by the Contractor on each rotational capacity lot, in the presence of the Engineer, if 1) any fastener is not used within 3 months after arrival on the jobsite, 2) fasteners are improperly handled, stored, or subjected to inclement weather prior to final tightening, 3) significant changes are noted in original surface condition of threads, washers, or nut lubricant, or 4) the Contractor's required inspection is not performed within 48 hours after all fasteners in a joint have been tensioned.

Failure of a job-site installation tension test or a rotational capacity test will be cause for rejection of unused fasteners that are part of the rotational capacity lot.

When direct tension indicators are used, installation verification tests shall be performed in conformance with Appendix Section X1.4 of ASTM Designation: F959, except that bolts shall be initially tensioned to a value 5 percent greater than the minimum required bolt tension.

SEALING

When zinc-coated tension control bolts are used, the sheared end of each fastener shall be completely sealed with non-silicone type sealing compound conforming to the provisions in Federal Specification TT-S-230, Type II. The sealant shall be gray in color and shall have a minimum thickness of 1.3 mm. The sealant shall be applied to a clean sheared surface on the same day that the splined end is sheared off.

WELDING

Table 2.2 of AWS D1.5 is superseded by the following table:

Base Metal Thickness of the Thicker Part Joined, mm	Minimum Effective Partial Joint Penetration Groove Weld Size, * mm
Over 6 to 13 inclusive	5
Over 13 to 19 inclusive	6
Over 19 to 38 inclusive	8
Over 38 to 57 inclusive	10
Over 57 to 150 inclusive	13
Over 150	16

* Except the weld size need not exceed the thickness of the thinner part

Dimensional details and workmanship for welded joints in tubular and pipe connections shall conform to the provisions in Part A, "Common Requirements of Nontubular and Tubular Connections," and Part D, "Specific Requirements for Tubular Connections," in Section 2 of AWS D1.1.

The requirement of conformance with AWS D1.5 shall not apply to work conforming to Section 56-1, "Overhead Sign Structures," or Section 86-2.04, "Standards, Steel Pedestals and Posts," of the Standard Specifications.

10-1.51 ROADSIDE SIGNS

Roadside signs shall be furnished and installed at the locations shown on the plans or where designated by the Engineer and in conformance with the provisions in Section 56-2, "Roadside Signs," of the Standard Specifications and these special provisions.

The Contractor shall furnish roadside sign panels in conformance with the provisions in "Furnish Sign" of these special provisions.

Wood posts shall be pressure treated after fabrication in conformance with the provisions in Section 58, "Preservative Treatment of Lumber, Timber and Piling," of the Standard Specifications and AWPA Use Category System: UC4A, Commodity Specification A or B.

10-1.52 INSTALL ROADSIDE SIGN PANEL ON EXISTING POST

Roadside sign panels shall be installed on existing posts at the locations shown on the plans or where designated by the Engineer and in conformance with the provisions in Section 56-2.04, "Sign Panel Installation," of the Standard Specifications and these special provisions.

The Contractor shall furnish roadside sign panels in conformance with the provisions in "Furnish Sign" of these special provisions.

Cutting the ends of wood posts in the field and field application of wood preservatives shall conform to the provisions in Section 56-2.02B, "Wood Posts," of the Standard Specifications.

Two holes shall be drilled in each existing post as required to provide a breakaway feature as shown on the plans.

Existing sign panels, as shown on the plans, shall be removed and disposed of as provided in Section 15, "Existing Highway Facilities," of the Standard Specifications.

Installing roadside sign panels on existing posts will be paid for by the unit as determined from actual count in place.

The contract unit price paid for install roadside sign panel on existing post shall include full compensation for furnishing all labor, materials (except sign panels), tools, equipment, and incidentals, and for doing all the work involved in installing roadside sign panels on existing posts (including drilling holes in existing posts, removing, and disposing of existing sign panels), complete in place, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

10-1.53 FURNISH SIGN

Signs shall be fabricated and furnished in accordance with details shown on the plans, the Traffic Sign Specifications, and these special provisions.

Traffic Sign Specifications for California sign codes are available for review at the Department's internet site:

http://www.dot.ca.gov/hq/traffops/signtech/signdel/specs.htm

Traffic Sign Specifications for signs referenced with Federal MUTCD sign codes can be found in Standard Highway Signs Book, administered by the Federal Highway Administration, which is available for review at the following Internet website:

http://mutcd.fhwa.dot.gov/ser-pubs.htm

Information on cross-referencing California sign codes with the Federal MUTCD sign codes is available at the Department's internet site:

http://www.dot.ca.gov/hq/traffops/signtech/signdel/specs.htm

Temporary or permanent signs shall be free from blemishes that may affect the serviceability and detract from the general sign color and appearance when viewing during daytime and nighttime from a distance of 8 m. The face of each finished sign shall 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 shall be free of router chatter marks, burns, sharp edges, loose rivets, delaminated skins, excessive adhesive over spray and aluminum marks.

QUALITY CONTROL FOR SIGNS

The requirements of "Quality Control for Signs" in this section shall not apply to construction area signs.

No later than 14 days before sign fabrication, the Contractor shall submit a written copy of the quality control plan for signs to the Transportation Laboratory, Materials Engineering and Testing Services (METS), Telephone (916) 227-7291. METS will have 10 days to review the quality control plan. Sign fabrication shall not begin until METS approves the Contractor's quality control plan in writing. The Contractor shall submit to the Engineer at least 3 copies of the approved quality control plan. The quality control plan shall include, but not be limited to the following requirements:

1. Identification of the party responsible for quality control of signs,
2. Basis of acceptance for incoming raw materials at the fabrication facility,
3. Type, method and frequency of quality control testing at the fabrication facility,
4. List (by manufacturer and product name) of process colors, protective overlay film, retroreflective sheeting and black non-reflective film,
5. Recommended cleaning procedure for each product,
6. Method of packaging, transport and storage for signs.

No legend shall be installed at the project site. Legend shall include letters, numerals, tildes, bars, arrows, route shields, symbols, logos, borders, artwork, and miscellaneous characters. The style, font, size, and spacing of the legend shall conform to the Standard Alphabets published in the FHWA Standard Highway Signs Book. The legend shall be oriented in the same direction in accordance with the manufacturer's orientation marks found on the retroreflective sheeting.

On multiple panel signs, legend shall be placed across joints without affecting the size, shape, spacing, and appearance of the legend. Background and legend shall be wrapped around interior edges of formed panel signs as shown on plans to prevent delamination.

The following notation shall be placed on the lower right side of the back of each sign where the notation will not be blocked by the sign post or frame:

1. PROPERTY OF STATE OF CALIFORNIA.
2. Name of the sign manufacturer.
3. Month and year of fabrication.
4. Type of retroreflective sheeting
5. Manufacturer's identification and lot number of retroreflective sheeting.

The above notation shall be applied directly to the aluminum sign panels in 6-mm upper case letters and numerals by die-stamp and applied by similar method to the fiberglass reinforced plastic signs. Painting, screening, or engraving the notation will not be allowed. The notation shall be applied without damaging the finish of the sign.

Signs with a protective overlay film shall be marked with a dot of 10 mm diameter. The dot placed on white border shall be black while the dot placed on black border shall be white. The dot shall be placed on the lower border of the sign before application of the protective overlay film and shall not be placed over the legend and bolt holes. The application method and exact location of the dot shall be determined by the manufacturer of the signs.

For sign panels that have a minor dimension of 1220 mm or less, no splice will be allowed in the retroreflective sheet except for the splice produced during the manufacturing of the retroreflective sheeting. For sign panels that have a minor dimension greater than 1220 mm, only one horizontal splice will be allowed in the retroreflective sheeting.

Unless specified by the manufacturer of the retroreflective sheeting, splices in retroreflective sheeting shall overlap by a minimum of 25 mm. Splices shall not be placed within 50 mm from edges of the panels. Except at the horizontal borders, the splices shall overlap in the direction from top to bottom of the sign to prevent moisture penetration. The retroreflective sheeting at the overlap shall not exhibit a color difference under the incident and reflected light.

Signs exhibiting a significant color difference between daytime and nighttime shall be replaced immediately at the Contractor's expenses.

Repairing sign panels will not be allowed except when approved by the Engineer.

The Department will inspect signs at the Contractor’s facility and delivery location, and in accordance with Section 6, "Control of Materials," of the Standard Specifications. The Engineer will inspect signs for damage and defects before and after installation.

Regardless of kind, size, type, or whether delivered by the Contractor or by a common carrier, signs shall be protected by thorough wrapping, tarping, or other methods to ensure that signs are not damaged by weather conditions and during transit. Signs shall be dry during transit and shipped on palettes, in crates, or tier racks. Padding and protective materials shall be placed between signs as appropriate. Finished sign panels shall be transported and stored by method that protects the face of signs from damage. The Contractor shall replace wet, damaged, and defective signs at the Contractor's expense.

Signs shall be stored in dry environment at all times. Signs shall not rest directly on the ground or become wet during storage. Signs, whether stored indoor or outdoor, shall be free standing. When stored outdoor, signs shall be placed at a minimum spacing of 100 mm apart. In areas of high heat and humidity signs shall be stored in enclosed climate-controlled trailers or containers. Signs shall be stored indoor if duration of the storage will exceed 30 days.

Screen processed signs shall be protected, transported and stored as recommended by the manufacturer of the retroreflective sheeting.

When requested, the Contractor shall provide the Engineer test samples of signs and materials used at various stages of production. Sign samples shall be 300 mm x 300 mm in size with applied background, letter or numeral, and border strip.

The Contractor shall assume the costs and responsibilities resulting from the use of patented materials, equipment, devices, and processes for the Contractor’s work.

SHEET ALUMINUM

Alloy and temper designations for sheet aluminum shall be in accordance with ASTM Designation: B209.

The Contractor shall furnish the Engineer a Certificate of Compliance in accordance to Section 6-1.07, "Certificates of Compliance," of the Standard Specifications for the sheet aluminum.

Sheet aluminum shall be pretreated in accordance to ASTM Designation: B449. Surface of the sheet aluminum shall be cleaned, deoxidized, and coated with a light and tightly adherent chromate conversion coating free of powdery residue. The conversion coating shall be Class 2 with a mass between 108 mg/m^2 and 377 mg/m^2, and an average mass of 269 mg/m^2. Following the cleaning and coating process, the sheet aluminum shall be protected from exposure to grease, oils, dust, and contaminants.

Sheet aluminum shall be free of buckles, warps, dents, cockles, burrs, and defects resulting from fabrication.

Base plate for standard route marker shall be die cut.

RETROREFLECTIVE SHEETING

The Contractor shall furnish retroreflective sheeting for sign background and legend in accordance with ASTM Designation: D4956 and "Prequalified and Tested Signing and Delineation Materials" of these special provisions.

Retroreflective sheeting shall be applied to sign panels as recommended by the retroreflective sheeting manufacturer without stretching, tearing, and damage.

Class 1, 3, or 4 adhesive backing shall be used for Type II, III, IV, VII, VIII, and IX retroreflective sheeting. Class 2 adhesive backing may also be used for Type II retroreflective sheeting. The adhesive backing shall be pressure sensitive and fungus resistant.

When the color of the retroreflective sheeting determined from instrumental testing is in dispute, the Engineer's visual test will govern.

PROCESS COLOR AND FILM

The Contractor shall furnish and apply screened process color, non-reflective opaque black film, and protective overlay film of the type, kind, and product that are approved by the manufacturer of the retroreflective sheeting.

The Contractor shall furnish the Engineer a Certificate of Compliance in accordance to Section 6-1.07, "Certificates of Compliance," of the Standard Specifications for the screened process color, non-reflective opaque black film, and protective overlay film.

The surface of the screened process color shall be flat and smooth. When the screened process colors determined from the instrumental testing in accordance to ASTM Designation: D4956 are in dispute, the Engineer's visual test will govern.

The Contractor shall provide patterns, layouts, and set-ups necessary for the screened process.

The Contractor may use green, red, blue, and brown reverse-screened process colors for background and non-reflective opaque black film or black screened process color for legend. The coefficient of retroreflection for reverse-screened process colors on white retroreflective sheeting shall not be less than 70 percent of the coefficient of retroreflection specified in ASTM Designation: D4956.

The screened process colors and non-reflective opaque black film shall have the same outdoor weatherability as that of the retroreflective sheeting.

After curing, screened process colors shall withstand removal when tested by applying 3M Company Scotch Brand Cellophane Tape No. 600 or equivalent tape over the color and removing with one quick motion at 90°angle.

SINGLE SHEET ALUMINUM SIGN

Single sheet aluminum signs shall be fabricated and furnished with or without frame. The Contractor shall furnish the sheet aluminum in accordance to "Sheet Aluminum" of these special provisions. Single sheet aluminum signs shall be fabricated from sheet aluminum alloy 6061-T6 or 5052-H38.

Single sheet aluminum signs shall not have a vertical splice in the sheet aluminum. For signs with depth greater than 1220 mm, one horizontal splice will be allowed in the sheet aluminum.

Framing for single sheet aluminum sign shall consist of aluminum channel or rectangular aluminum tubing. The framing shall have a length tolerance of ±3 mm. The face sheet shall be affixed to the frame with rivets of 5-mm diameter. Rivets shall be placed within the web of channels and shall not be placed less than 13 mm from edges of the sign panels. Rivets shall be made of aluminum alloy 5052 and shall be anodized or treated with conversion coating to prevent corrosion. The exposed portion of rivets on the face of signs shall be the same color as the background or legend where the rivets are placed.

Finished signs shall be flat within a tolerance of ±3 mm per meter when measured across the plane of the sign in all directions. The finished signs shall have an overall tolerance within ±3 mm of the detailed dimensions.

Aluminum channels or rectangular aluminum tubings shall be welded together with the inert gas shielded-arc welding process using E4043 aluminum electrode filler wires as shown on the plans. Width of the filler shall be equal to wall thickness of smallest welded channel or tubing.

MEASUREMENT AND PAYMENT

Furnishing signs (except for construction area signs) will be measured by the square meter to the nearest 0.10-m2, of the sign panel types installed in place.

Installation of sign panels will be measured and paid for as per Sections 56-2.05, "Measurement," and 56-2.06, "Payment," of the Standard Specifications except all references to State-furnished materials is deleted.

The contract price paid per square meter for furnish sign of the types specified in the Engineer's estimate shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in fabricating and furnishing the signs, including removable sign panel frame and fastening hardware, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

10-1.54 PLASTIC PIPE

Plastic pipe shall conform to the provisions in Section 64, "Plastic Pipe," of the Standard Specifications.

10-1.55 REINFORCED CONCRETE PIPE

Reinforced concrete pipe shall conform to the provisions in Section 65, "Reinforced Concrete Pipe," of the Standard Specifications and these special provisions.

Where embankment will not be placed over the top of the pipe, a relative compaction of not less than 85 percent shall be required below the pipe spring line for pipe installed using Method 1 backfill in trench, as shown on Standard Plan A62D. Where the pipe is to be placed under the traveled way, a relative compaction of not less than 90 percent shall be required unless the minimum distance between the top of the pipe and the pavement surface is the greater of 1.2 m or one half of the outside diameter of the pipe.

Except as otherwise designated by classification on the plans or in the specifications, joints for culvert and drainage pipes shall conform to the plans or specifications for standard joints.

When reinforced concrete pipe is installed in conformance with the details shown on Standard Plan A62DA, the fifth paragraph of Section 19-3.04, "Water Control and Foundation Treatment," of the Standard Specifications shall not apply.

When solid rock or other unyielding material is encountered at the planned elevation of the bottom of the bedding, the material below the bottom of the bedding shall be removed to a depth of 1/50 of the height of the embankment over the top of the culvert, but not less than 150 mm nor more than 300 mm. The resulting trench below the bottom of the bedding shall be backfilled with structure backfill material in conformance with the provisions in Section 19-3.06, "Structure Backfill," of the Standard Specifications.

The excavation and backfill below the planned elevation of the bottom of the bedding will be paid for as extra work as provided in Section 4-1.03D, "Extra Work," of the Standard Specifications.

The Outer Bedding shown on Standard Plan A62DA shall not be compacted prior to placement of the pipe.

10-1.56 CORRUGATED METAL PIPE

Corrugated steel culverts shall conform to the provisions in Section 66, "Corrugated Metal Pipe," of the Standard Specifications and these special provisions.

Corrugated steel pipe shall be fabricated from zinc-coated steel sheet.

10-1.57 MISCELLANEOUS FACILITIES

Flared end sections and precast concrete pipe risers shall conform to the provisions in Section 70, "Miscellaneous Facilities," of the Standard Specifications.

10-1.58 GRATED LINE DRAIN

This work shall consist of furnishing and installing precast grated line drain, with necessary fittings, coupling systems, frames, grates and associated items as shown on the plans and in conformance with these special provisions.

The interior surface of the grated line drain, below the level of the frame and grate and associated connections, shall be smooth. Grated line drain channel sections shall be manufactured of monolithic polymer concrete with no side extensions.

Monolithic polymer concrete shall be made from a composition of aggregate and polyester resin or vinylester resin and shall have the following properties when tested as follows:

PROPERTY	ASTM TEST METHOD	VALUE
Tensile Strength, MPa	C 307	10 min.
Compressive Strength, MPa	C 579	80 min.
Bending Strength, MPa	C 580	20 min.
Moisture Absorption, %	C 140	0.5 max.
Chemical Resistance	C 267	Pass
Freeze/Thaw, number of cycles w/o weight loss	C 666	1600 min.

The manufacturer of the grated line drain shall furnish the Engineer a Certificate of Compliance in conformance with the provisions in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications.

Grated line drain frames and grates shall be manufactured of ductile iron conforming to the provisions in Section 75-1.02, "Miscellaneous Iron and Steel," of the Standard Specifications. The frames and grates need not be galvanized or coated with asphalt paint. Bolts, nuts, frame anchors, and other connecting hardware shall conform to the provisions in Section 75-1.02, "Miscellaneous Iron and Steel," of the Standard Specifications.

Frames and grates, when installed in conformance with the manufacturer's recommendations and these special provisions, shall be classified as heavy duty (112 kN proof load) when tested in accordance with Commercial Item Description A-A-60005 for "Frames, Covers, Gratings, Steps, Manhole, Sump and Catch Basin." Frames and grates shall be matchmarked in pairs before delivery to the work and grates shall fit into the frames without rocking.

Frames shall be secured to the surrounding concrete backfill with steel anchoring rods as shown on the plans. Other methods may be used to secure the frame to the concrete backfill or grated line drain wall provided that a minimum pullout resistance of 10 kN per meter of length of grated line drain frame is maintained.

Grates and frames shall be one piece or the grates shall be removable. Removable grates shall be held in place by locking devices that are tamper resistant. Removable grates shall provide a minimum repetitive pullout resistance of 5 kN per meter of length after completion of 1000 hours of salt spray testing in conformance with the requirements in ASTM Designation: B 117. When a combination of one piece frame and grate and removable grates are used, the locations of the removable grates shall be shown on the plans.

Except for grates installed within designated pedestrian paths of travel, grates shall accept inflow of runoff through openings. The openings shall consist of a minimum of 60 percent of the total top surface area of the grate, with individual openings or slots having a dimension not greater than 50 mm measured in the direction of the grated line drain flow line. Grates installed within designated pedestrian paths of travel shall be certified as conforming to the requirements of the "Americans with Disabilities Act."

Grated line drains shall be installed in trenches excavated to the lines and grades established by the Engineer. The bottom of the trench shall be graded and prepared to provide a firm and uniform bearing throughout the entire length of the grated line drain.

Grated line drains shall be installed and jointed in conformance with the manufacturer's recommendations.

Grated line drains shall be installed to the lines and grades with sections closely jointed and secured to ensure that no separation of the line drains occurs during backfilling.

The frame or grate of the grated line drain shall not extend above the level of the surrounding concrete backfill.

Grated line drains shall be connected to new or existing drainage facilities as shown on the plans.

Excavation and backfill shall conform to the provisions in Section 19-3, "Structure Excavation and Backfill," of the Standard Specifications.

Backfill for the grated line drains shall be either minor concrete or Class 3 concrete conforming to the provisions in Section 90, "Portland Cement Concrete," of the Standard Specifications, except that minor concrete shall contain not less than 300 kg of cement per cubic meter.

Concrete backfill shall be placed in the trench as shown on the plans. Concrete backfill shall be placed against undisturbed material at the sides and bottom of the trench and in a manner that will prevent floating or shifting of the grated line drain and voids in, or segregation of, the concrete. Foreign material which falls into the trench, prior to or during placement of the concrete, shall be immediately removed. Where necessary, earth plugs shall be constructed and compacted at the ends of the planned concrete backfill to contain the concrete within the trench.

Concrete backfill shall be finished flush with the adjacent surfacing.

The surface of the concrete shall be textured with a broom or burlap drag to produce a durable skid-resistant surface.

The length the grated line drain to be paid for will be the length measured by the meter along the pavement surface as designated by the Engineer. No payment will be made for grated line drain placed in excess of the designated length.

The contract price paid per meter for grated line drain shall include full compensation for furnishing all labor, materials (including frames and grates), tools, equipment, and incidentals, and for doing all the work involved in installing grated line drains, complete in place, including excavation and backfill, connecting grated line drains to new or existing facilities, concrete collars, reinforcement, and other connecting devices, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

10-1.59 SLOPE PROTECTION

Slope protection shall be placed or constructed in conformance with the provisions in Section 72, "Slope Protection," of the Standard Specifications and these special provisions.

Rock slope protection fabric shall be woven or nonwoven type fabric, Type A or Type B, at the option of the Contractor.

10-1.60 MISCELLANEOUS CONCRETE CONSTRUCTION

Minor concrete (miscellaneous construction) and minor concrete (curb and gutter) shall conform to the provisions in Section 73, "Concrete Curbs and Sidewalks," of the Standard Specifications and these special provisions.

Curb ramp detectable warning surface shall consist of raised truncated domes constructed or installed on curb ramps in conformance with the details shown on the plans and these special provisions. At the option of the Contractor, the detectable warning surface shall be prefabricated, cast-in-place, or stamped into the surface of the curb ramp. The color of the detectable warning surface shall be yellow conforming to Federal Standard 595B, Color No. 33538.

Prefabricated detectable warning surface shall be in conformance with the requirements established by the Department of General Services, Division of State Architect and be attached in conformance with the manufacturer's recommendations.

Cast-in-place and stamped detectable warning surfaces shall be painted in conformance with the provisions in Section 59-6, "Painting Concrete," of the Standard Specifications.

The finished surfaces of the detectable warning surface shall be free from blemishes.

Prior to constructing the cast-in-place or stamping the detectable warning surface, the Contractor shall demonstrate the ability to produce a detectable warning surface conforming to the details shown on the plans and these special provisions by constructing a 600-mm by 600-mm test panel.

The manufacturer shall provide a written 5-year warranty for prefabricated detectable warning surfaces, guaranteeing replacement when there is defect in the dome shape, color fastness, sound-on-cane acoustic quality, resilience, or attachment. The warranty period shall begin upon acceptance of the contract.

Full compensation for constructing or furnishing and installing curb ramp detectable warning surfaces shall be considered as included in the contract price paid per cubic meter for minor concrete (miscellaneous construction) and no separate payment will be made therefor.

10-1.61 STATE SEAL

State seal shall consist of preparing, staining and etching the concrete surface with the seal for the State of California in accordance with these special provisions, the Standard Specifications and as directed by the Engineer.

Concrete for the state seal shall be constructed as part of minor concrete (miscellaneous construction).

Ten days in the advance of starting staining and etching of the concrete surface with the state seal, the Contractor shall construct a test panel approximately 750 mm by 750 mm with 600 mm diameter state seal. The concrete shall be stained and etched, until a final texture and color are produced that complies with the color and texture of the referee panel. When ordered by the Engineer, additional test panels shall be constructed and finished until a satisfactory texture and color is obtained. The referee sample shall be used as the standard of comparison for the state seal test panel.

The referee sample is located at the California Highway Patrol Otay Mesa Inspection Facility, 2335 Enrico Fermi, San Diego, California. The state seal is located in the sidewalk, in front of the main entrance to the facility.

The test panel shall be constructed on the job site using the materials, mix design, and construction techniques to be used in the actual construction. The test panel shall become the property of the State after acceptance by the Engineer. The test panel shall be delivered to the Engineer.

The surfaces of the concrete to be stained shall be prepared by a light water blasting of the surface as necessary to remove any oil, grease, curing compounds, sealer or other contaminants. The concrete surface shall be thoroughly dry at the time stain is applied.

The coloring agent shall be a penetrating stain mix (cementitious substrate concrete surface treatment using a water/acid solution combined with metallic salts), compatible color finish designed for exterior application on new or old concrete with field evidence of resistance to moisture, alkali, acid and mildew, mold and fungus discoloration or degradation. The coloring agent shall be breathable, allowing moisture and vapor transmission. The stain shall be formulated and applied so that the color of the stained concrete matches the referee sample described elsewhere in these special provisions.

Each coat of stain shall be thoroughly cured before the succeeding coat is applied. Areas not to be stained or etched shall be protected so that they remain stain and etch-free.

The contract lump sum price paid for state seal shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in state seal, complete in place, as specified in the Standard Specifications, these special provisions, and as directed by the Engineer.

10-1.62 MISCELLANEOUS IRON AND STEEL

Miscellaneous iron and steel shall conform to the provisions in Section 75, "Miscellaneous Metal," of the Standard Specifications.

10-1.63 CHAIN LINK FENCE

Chain link fence shall be Type CL – 1.8 and chain link gates shall be Type CL-1.8 and shall conform to the provisions in Section 80, "Fences," of the Standard Specifications.

10-1.64 MARKERS AND DELINEATORS

Markers and delineators shall conform to the provisions in Section 82, "Markers and Delineators," of the Standard Specifications and these special provisions.

Markers and delineators on flexible posts shall conform to the provisions in "Prequalified and Tested Signing and Delineation Materials" of these special provisions. Flexible posts shall be made from a flexible white plastic which shall be resistant to impact, ultraviolet light, ozone, and hydrocarbons. Flexible posts shall resist stiffening with age and shall be free of burns, discoloration, contamination, and other objectionable marks or defects which affect appearance or serviceability.

Retroreflective sheeting for metal and flexible target plates shall be the retroreflective sheeting designated for channelizers, markers, and delineators conforming to the requirements in ASTM Designation: D 4956-95 and in conformance with the provisions in "Prequalified and Tested Signing and Delineation Materials" of these special provisions.

10-1.65 CABLE RAILING

Cable railing shall conform to the provisions in Section 83-1, "Railings," of the Standard Specifications.

10-1.66 CONCRETE BARRIER

Concrete barriers shall conform to the provisions in Section 83-2, "Barriers," of the Standard Specifications and these special provisions.

The provisions of the third paragraph in Section 83-2.02D(4), "Finishing," of the Standard Specifications shall not apply.

Concrete barrier markers shall conform to the provisions in "Prequalified and Tested Signing and Delineation Materials" of these special provisions. At those locations shown on the plans, concrete barrier markers shall be cemented to the barrier in conformance with the manufacturer's recommendations.

10-1.67 THERMOPLASTIC TRAFFIC STRIPE AND PAVEMENT MARKING

Thermoplastic traffic stripes (traffic lines) and pavement markings shall be applied in conformance with the provisions in Section 84, "Traffic Stripes and Pavement Markings," of the Standard Specifications and these special provisions.

Thermoplastic material shall be free of lead and chromium, and shall conform to the requirements in State Specification PTH-02ALKYD.

Retroreflectivity of the thermoplastic traffic stripes and pavement markings shall conform to the requirements in ASTM Designation: D 6359-99. White thermoplastic traffic stripes and pavement markings shall have a minimum initial retroreflectivity of 250 $mcd \cdot m^{-2} \cdot lx^{-1}$. Yellow thermoplastic traffic stripes and pavement markings shall have a minimum initial retroreflectivity of 150 $mcd \cdot m^{-2} \cdot lx^{-1}$.

Where striping joins existing striping, as shown on the plans, the Contractor shall begin and end the transition from the existing striping pattern into or from the new striping pattern a sufficient distance to ensure continuity of the striping pattern.

Thermoplastic traffic stripes shall be applied at the minimum thickness and application rate as specified below. The minimum application rate is based on a solid stripe of 100 mm in width.

Minimum StripeThickness (mm)	Minimum Application Rate (kg/m)
2.5	0.5

Thermoplastic traffic stripes and pavement markings shall be free of runs, bubbles, craters, drag marks, stretch marks, and debris.

At the option of the Contractor, permanent traffic striping and pavement marking tape conforming to the provisions in "Prequalified and Tested Signing and Delineation Materials" of these special provisions may be placed instead of the thermoplastic traffic stripes and pavement markings specified herein. Permanent tape, if used, shall be installed in conformance with the manufacturer's specifications.

If permanent tape is placed instead of thermoplastic traffic stripes and pavement markings, the tape will be measured and paid for by the meter as thermoplastic traffic stripe and by the square meter as thermoplastic pavement marking.

10-1.68 PAINT TRAFFIC STRIPE

Painted traffic stripes (traffic lines), including traffic stripes shown on the traffic handling sheets of the plans, shall be applied in conformance with the provisions in Section 84, "Traffic Stripes and Pavement Markings," of the Standard Specifications and "Paint Traffic Stripe" of these special provisions.

Traffic stripe paint shall conform to the requirements in State Specification No. PTWB-01.

The color of the painted traffic stripes shall conform to the requirements in ASTM Designation: D 6628-01.

Retroreflectivity of the paint traffic stripes shall conform to the requirements in ASTM Designation: D 6359-99. White painted traffic stripes shall have a minimum initial retroreflectivity of 250 $mcd \cdot m^{-2} \cdot lx^{-1}$. Yellow painted traffic stripes shall have a minimum initial retroreflectivity of 150 $mcd \cdot m^{-2} \cdot lx^{-1}$.

At the option of the Contractor, permanent traffic striping tape conforming to the provisions in "Prequalified and Tested Signing and Delineation Materials" of these special provisions may be placed instead of painted traffic stripes. Permanent tape, if used, shall be placed in conformance with the manufacturer's specifications.

If permanent tape is placed instead of painted traffic stripes, the tape will be measured and paid for by the meter as paint traffic stripe of the number of coats designated in the Engineer's Estimate.

Where striping joins existing striping, as shown on the plans, the Contractor shall begin and end the transition from the existing striping pattern into or from the new striping pattern a sufficient distance to ensure continuity of the striping pattern.

10-1.69 PAVEMENT MARKERS

Pavement markers shall be placed in conformance with the provisions in Section 85, "Pavement Markers," of the Standard Specifications and these special provisions.

Attention is directed to "Traffic Control System For Lane Closure" of these special provisions regarding the use of moving lane closures during placement of pavement markers with bituminous adhesive.

The Contractor shall furnish the Engineer certificates of compliance for the pavement markers in conformance with the provisions in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications.

Retroreflective pavement markers shall be marked as abrasion resistant on the body of the markers.

SECTION 10-2 HIGHWAY PLANTING AND IRRIGATION SYSTEMS

10-2.01 GENERAL

The work performed in connection with highway planting and irrigation systems shall conform to the provisions in Section 20, "Erosion Control and Highway Planting," of the Standard Specifications and these special provisions.

COST BREAK-DOWN

The Contractor shall furnish the Engineer a cost break-down for the contract lump sum items of highway planting and irrigation system. Cost break-down tables shall be submitted to the Engineer for approval within 15 working days after the contract has been approved. Cost break-down tables will be approved, in writing, by the Engineer before any partial payment will be made for the applicable items of highway planting and irrigation system involved.

Attention is directed to "Time-Related Overhead" of these special provisions regarding compensation for time-related overhead.

Cost break-downs shall be completed and furnished in the format shown in the samples of the cost break-downs included in this section. Line item descriptions of work shown in the samples are the minimum to be submitted. Additional line item descriptions of work may be designated by the Contractor. If the Contractor elects to designate additional line item descriptions of work, the quantity, value and amount for those line items shall be completed in the same manner as for the unit descriptions shown in the samples. The line items and quantities given in the samples are to show the manner of preparing the cost break-downs to be furnished by the Contractor.

The Contractor shall determine the quantities required to complete the work shown on the plans. The quantities and their values shall be included in the cost break-downs submitted to the Engineer for approval. The Contractor shall be responsible for the accuracy of the quantities and values used in the cost break-downs submitted for approval.

The sum of the amounts for the line items of work listed in each cost break-down table for highway planting and for irrigation system work shall be equal to the contract lump sum price bid for Highway Planting and Irrigation System, respectively. Overhead and profit, except for time-related overhead, shall be included in each individual line item of work listed in a cost break-down table.

No adjustment in compensation will be made in the contract lump sum prices paid for highway planting and irrigation system due to differences between the quantities shown in the cost break-downs furnished by the Contractor and the quantities required to complete the work as shown on the plans and as specified in these special provisions.

Individual line item values in the approved cost break-down tables will be used to determine partial payments during the progress of the work and as the basis for calculating an adjustment in compensation for the contract lump sum items of highway planting and irrigation system due to changes in line items of work ordered by the Engineer. When the total of ordered changes to line items of work increases or decreases the lump sum price bid for either Highway Planting or Irrigation System by more than 25 percent, the adjustment in compensation for the applicable lump sum item will be determined in the same manner specified for increases and decreases in the total pay quantity of an item of work in Section 4-1.03B, "Increased or Decreased Quantities," of the Standard Specifications.

HIGHWAY PLANTING COST BREAK-DOWN

Contract No. 11-256504

UNIT DESCRIPTION	UNIT	APPROXIMATE QUANTITY	VALUE	AMOUNT
ROADSIDE CLEARING	LS	LUMP SUM		
PLANT (GROUP A)	EA	473		
PLANT (GROUP B)	EA	40		
PLANT (GROUP U)	EA	82		
COMMERCIAL FERTILIZER (PACKETS)	EA	306		
COMMERCIAL FERTILIZER (SLOW RELEASE)	KG	28		
IRON SULFATE	KG	75		
DECOMPOSED GRANITE	M3	210		

TOTAL _____

IRRIGATION SYSTEM COST BREAK-DOWN

Contract No. 11-256504

UNIT DESCRIPTION	UNIT	APPROXIMATE QUANTITY	VALUE	AMOUNT
CONTROL AND NEUTRAL CONDUCTORS	LS	LUMP SUM		
8 STATION SOLAR IRRIGATION CONTROLLER	EA	1		
40 MM BACKFLOW PREVENTER ASSEMBLY	EA	1		
BACKFLOW PREVENTER ASSEMBLY ENCLOSURE	EA	1		
75 MM GALVANIZED STEEL PIPE	M	4		
25 MM PLASTIC PIPE (SUPPLY LINE) (PR-200)	M	1686		
32 MM PLASTIC PIPE (SUPPLY LINE) (PR-200)	M	90		
40 MM PLASTIC PIPE (SUPPLY LINE) (PR-200)	M	196		
50 MM PLASTIC PIPE (SUPPLY LINE) (PR-200)	M	70		
65 MM PLASTIC PIPE (SUPPLY LINE) (PR-200)	M	41		
25 MM REMOTE CONTROL VALVE	EA	8		
25 MM GATE VALVE	EA	5		
40 MM GATE VALVE	EA	1		
50 MM GATE VALVE	EA	2		
65 MM GATE VALVE	EA	2		
SPRINKLER (TYPE A-5)	EA	14		
SPRINKLER (TYPE C-2)	EA	135		

TOTAL _____

10-2.02 (BLANK)

10-2.03 (BLANK)

10-2.04 HIGHWAY PLANTING

The work performed in connection with highway planting shall conform to the provisions in Section 20-4, "Highway Planting," of the Standard Specifications and these special provisions.

HIGHWAY PLANTING MATERIALS

Decomposed Granite

Decomposed granite shall be placed at the locations shown on the plans, in accordance with these special provisions, the Standard Specifications and as directed by the Engineer.

Attention is directed to "Planting" of these special provisions regarding sequencing of the work.

Decomposed granite shall be igneous rock obtained from a single source. Color shall be tan and shall be approved by the Engineer prior to installation.

Decomposed granite shall be free from vegetable matter and other deleterious substances, and shall be of such nature that it can be compacted readily under manual tamping to form a firm base.

Decomposed granite shall conform to the following requirements:

Grading Requirements

Sieve Size	Percent Passing
38-mm	100
25-mm	90-100
4.75-mm	50-100
600-µm	25-55
75-µm	5-18

Quality Requirements

Test	Operating Range	Contract Compliance
Sand Equivalent	-----	20
Resistance (R-value)	-----	60

Filter fabric shall conform to Section 88, "Engineering Fabrics," of the Standard Specifications.

The areas to receive the decomposed granite shall be cleared as specified under "Roadside Clearing" of these special provisions.

Earthwork shall conform to the provisions in Section 19, "Earthwork," of the Standard Specifications and these special provisions.

After clearing, the areas shall be excavated to the depth shown on the plans, graded to a smooth uniform surface and tamped to form a firm and stable base.

Surplus excavated material shall become the property of the Contractor and shall be disposed of outside the highway right of way in conformance with the provisions in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications.

Decomposed granite shall be spread and raked to evenly blend the different gradation sizes and graded to form a smooth uniform surface. Decomposed granite shall be manually tamped to compress material and prevent uneven settling.

When decomposed granite is placed in plant basins, as shown on the plans, care shall be taken to not damage plant leaves or stems.

Commercial Fertilizer (Slow Release)

Commercial fertilizer (slow release) shall be a pelleted or granular form, shall be slow or controlled release with a nutrient release over an 8- to 12-month period, and shall fall within the following guaranteed chemical analysis range:

Ingredient	Percentage
Nitrogen	16-21
Phosphoric Acid	6-8
Water Soluble Potash	4-12

Commercial Fertilizer (Packets)

Commercial fertilizer (packet) shall be slow or controlled release and shall be in a biodegradable packet form. The packet shall gradually release nutrients over a 12-month period. Each packet shall have a mass of 10 g ± 1 g and shall have the following guaranteed chemical analysis:

Ingredient	Percentage
Nitrogen	20
Phosphoric Acid	10
Water Soluble Potash	5

ROADSIDE CLEARING

Prior to preparing planting areas and decomposed granite areas or commencing irrigation trenching operations for planting areas, trash and debris shall be removed from these areas and a distance of 3 m beyond the edges of those areas.

In addition to removing trash and debris, the project area shall be cleared as specified herein:

A. Weeds shall be killed and removed within planting areas where plants are to be planted in groups or rows 4.6 m or less apart and from within an area extending 2 m beyond the outer limits of the groups or rows of plants.
B. Weeds shall be killed and removed within an area 2 m in diameter centered at each plant location where the plants are to be planted more than 4.6 m apart.
C. Weeds shall be killed and removed from within areas where decomposed granite or rock blankets are to be placed as shown on the plans.

After the initial roadside clearing is complete, additional roadside clearing work shall be performed as necessary to maintain the areas, as specified above, in a neat appearance until the start of the plant establishment period. This work shall include the following:

A. Trash and debris shall be removed.
B. Rodents shall be controlled.
C. Weed growth shall be killed before the weeds reach the seed stage of growth or exceed 150 mm in length, whichever occurs first.
D. Weeds in plant basins, including basin walls, shall be removed by hand pulling, after the plants have been planted.

Weed Control

Weed control shall also conform to the following:

A. Stolon type weeds shall be killed with glyphosate.
B. Tumbleweeds shall be removed by hand pulling before the tumbleweeds reach a height of 150 mm.
C. Removed weeds shall be disposed of outside the highway right of way in conformance with the provisions in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications.

Roadside clearing work shall not include work required to be performed as clearing and grubbing as specified in Section 16, "Clearing and Grubbing," of the Standard Specifications.

PESTICIDES

Pesticides used to control weeds shall conform to the provisions in Section 20-4.026, "Pesticides," of the Standard Specifications. Except as otherwise provided in these special provisions, pesticide use shall be limited to the following materials:

Diquat
Glyphosate
Sethoxydim

Glyphosate shall be used to kill stolon type weeds.

If the Contractor elects to request the use of other pesticides on this project, the request shall be submitted, in writing, to the Engineer not less than 15 days prior to the intended use of the other pesticides. Except for the pesticides listed in these special provisions, no pesticides shall be used or applied without prior written approval of the Engineer.

Pesticides shall not be applied within the limits of the plant basins. Pesticides shall not be applied in a manner that allows the pesticides to come in contact with the foliage and woody parts of the plants.

PLANTING

Commercial fertilizer (pelleted) and iron sulfate shall be applied or placed at the time of planting and at the rates shown on the Plant List and in conformance with the provisions in Section 20-4.05, "Planting," of the Standard Specifications and these special provisions.

Commercial fertilizer packets shall be placed in the backfill of each plant at the time of planting and at the rate shown on the Plant List to within 150 to 200 mm of the soil surface and approximately 25 mm from the roots. When more than one fertilizer packet is required per plant, the packets shall be distributed evenly around the root ball.

Attention is directed to "Irrigation Systems Functional Test" of these special provisions regarding functional tests of the irrigation systems. Planting shall not be performed in an area until the functional test has been completed for the irrigation system serving that area.

Upon completion of planting work, including the formation of plant basins, decomposed granite may be placed.

PLANT ESTABLISHMENT WORK

The plant establishment period shall be Type 2 and shall not be less than 250 working days.

Attention is directed to "Relief From Maintenance and Responsibility" in these special provisions regarding relief from maintenance and protection.

Commercial fertilizer (slow release) shall be applied to trees, shrubs, vines and ground cover during the first week of April and July of each year. Commercial fertilizer shall be applied at the rates shown on the plans and shall be spread with a mechanical spreader wherever possible.

During the plant establishment period, the plants shall be watered utilizing the solar irrigation controller. A watering schedule appropriate for the season shall be submitted to the Engineer during the first week of March, June, September and November for use during the plant establishment period.

The seasonal watering schedules shall be entered into the controllers by the Contractor.

Weeds within plant basins, including basin walls shall be controlled by hand pulling.

Weeds within decomposed granite areas and outside of plant basins shall be controlled by killing or hand pulling.

At the option of the Contractor, plants of a larger container size than those originally specified may be used for replacement plants during the first 125 working days of the plant establishment period. The use of plants of a larger container size than those originally specified for replacement plants shall be at the Contractor's expense.

After 125 working days of the plant establishment period have been completed, replacement of plants, except for ground cover plants, shall be No. 5 size for No. 1 size plants; No. 15 size for No. 5 size plants; and other plant replacement plants shall be the same size as originally specified.

Wye strainers on backflow preventers shall be cleaned at least 15 days prior to the completion of the plant establishment period.

The final inspection shall be performed in conformance with the provisions in Section 5-1.13, "Final Inspection," of the Standard Specifications and shall be completed a minimum of 20 working days before the estimated completion of the contract.

10-2.05 IRRIGATION SYSTEMS

Irrigation systems shall be furnished and installed in conformance with the provisions in Section 20-5, "Irrigation Systems," of the Standard Specifications, except materials containing asbestos fibers shall not be used.

Attention is directed to the provisions in "Obstructions" of these special provisions, regarding work over or adjacent to existing underground facilities. Excavation for proposed irrigation facilities shall not be started until the existing underground facilities have been located.

Method A pressure testing shall conform to the provisions in Section 20-5.03H(1), "Method A", of the Standard Specifications, except leaks that develop in the tested portion of the system shall be located and repaired after each test period when a drop of more than 35 kPa is indicated by the pressure gage. After the leaks have been repaired, the one hour pressure test shall be repeated and additional repairs made until the drop in pressure is 35 kPa or less.

Pipe supply lines shall be pressure tested in conformance with the provisions in Section 20-5.03H, "Pressure Testing," of the Standard Specifications, except the pipe (supply line) on the discharge side of the control valve shall be tested by Method B as specified in Section 20-5.03H(2), "Method B," of the Standard Specifications.

VALVE BOXES

Valve boxes shall conform to the provisions in Section 20-2.24, "Valve Boxes," of the Standard Specifications, except as otherwise provided herein.

Valve boxes shall be fiberglass or reinforced plastic.

Covers for plastic valve boxes shall be glass fiber reinforced plastic or plastic.

Valve boxes with plastic covers shall be identified on the top surface of the covers by branding the appropriate abbreviations for the irrigation facilities contained in the valve boxes as shown on the plans. Valve boxes that contain remote control valves shall be identified by the appropriate letters and numbers (controller and station numbers). The letters and numbers shall be 50 mm in height.

Valve boxes with glass fiber reinforced plastic covers shall be identified on the top surface of the covers by labels containing the appropriate abbreviation for the irrigation facility contained in the valve box as shown on the plans. Valve boxes that contain remote control valves shall be identified by the appropriate letters and numbers (controller and station numbers). Labels for valve boxes shall conform to the provisions in Section 20-5.03F, "Valves and Valve Boxes," of the Standard Specifications.

Label material shall be plate plastic or polyurethane.

GATE VALVES

Gate valves shall be as shown on the plans and in conformance with the provisions in Section 20-2.28, "Gate Valves," of the Standard Specifications and these special provisions.

Gate valves shall have a solid bronze or brass wedge.

ELECTRIC AUTOMATIC IRRIGATION COMPONENTS

Irrigation Controllers (Solar)

The solar automatic irrigation controller shall conform to the following:

A. Photovoltaic 8-station irrigation controller, photovoltaic power system, computer with lockable, waterproof, vandal resistant case, shall be manufactured as one complete unit.
B. All power will be provided by an internal photovoltaic system. Power shall be available for continuous 24-hour operation under the minimum light equivalent to 25 percent of ambient light at 55 degrees latitude.
C. The computer liquid-crystal display will be powered by a 9-volt battery key mechanism.
D. The irrigation controller shall have an output digital control pulse at 3.5-volts which will operate a valve solenoid actuator within 300 meter distance.
E. Irrigation controller shall be fully automatic and capable of operating a complete one day to 90 day cycle, scheduling up to 32 totally independent programs, each having its own start time, day cycle, assigned stations, duration, and program time. Each station shall be capable of one minute to 24 hours in one minute increments with separate setting for hours and minutes.
F. Irrigation controller shall have an emergency program backup system with a user-defined fail-safe program and system parameters which are stored in non-erasable memory.
G. Irrigation controller shall be installed on a vertical mounting tube, mounted as shown on the plans and in accordance with the manufacturer's specifications.
H. Low voltage control and neutral conductors and splice connectors shall be manufactured by the same company.
I. The watering time of each station shall be displayed on the face of the control panel.

The irrigation controller shall be enclosed in the backflow preventer assembly enclosure, as shown on the plans.

Electric Remote Control Valves

Electric remote control valves shall conform to the provisions in Section 20-2.23, "Control Valves," of the Standard Specifications and the following:

A. Valves shall be brass construction.
B. Valves shall be angle pattern (bottom inlet) or straight pattern (side inlet) as shown on the plans.
C. Valves shall be equipped with a self flushing feature manufactured to be used with reclaimed water. Valves shall not have external tubing.
D. Valve solenoids for solar controller shall be DC latching and operate on 3.5 V and shall be compatible with the controller.
E. Valves shall have manual external and manual internal bleed capability.
F. Valve solenoids shall be one piece with plunger and spring secured to the solenoid.

Pull Boxes

Pull box installations shall conform to the provisions in Section 20-5.027I, "Conductors, Electrical Conduits and Pull Boxes," of the Standard Specifications.

Conductors

Low voltage, as used in this section "Conductors," shall mean 36 V or less.

Low voltage control and neutral conductors in pull boxes and valve boxes, at irrigation controller terminals, and at splices shall be marked as follows:

A. Conductor terminations and splices shall be marked with adhesive backed paper markers or adhesive cloth wrap-around markers, with clear, heat-shrinkable sleeves sealed over the markers.
B. Non-spliced conductors in pull boxes and valve boxes shall be marked with clip-on, "C" shaped, white extruded polyvinyl chloride sleeves. Marker sleeves shall have black, indented legends of uniform depth with transparent overlays over the legends and "chevron" cuts for alignment of 2 or more sleeves.

Markers for the control conductors shall be identified with the appropriate number or letter designations of irrigation controllers and station numbers. Markers for neutral conductors shall be identified with the appropriate number or letter designations of the irrigation controllers.

The color of low voltage neutral and control conductor insulation, except for the striped portions, shall be homogeneous throughout the entire thickness of the insulation.

Insulation for conductors may be UL listed polyethylene conforming to UL44 test standards with a minimum insulation thickness of 1.05 mm for wire sizes 10AWG and smaller.

At the option of the Contractor, other types of splice sealing materials and methods may be used provided other materials and methods have been approved in writing by the Engineer prior to installation of the connectors.

IRRIGATION SYSTEMS FUNCTIONAL TEST

Functional tests for the irrigation controllers and associated automatic irrigation systems shall conform to the provisions in Section 20-5.027J, "Testing," of the Standard Specifications and these special provisions.

Tests shall demonstrate to the Engineer, through one complete cycle of the irrigation controllers in the automatic mode, that the associated automatic components of the irrigation systems operate properly. If automatic components of the irrigation systems fail a functional test, these components shall be repaired at the Contractor's expense and the testing repeated until satisfactory operation is obtained.

Associated automatic components shall include, but not be limited to, booster pump system, and remote control valves.

Upon completion of work on an irrigation system, including correction of deficiencies and satisfactory functional tests for the systems involved, the plants to be planted in the area watered by the irrigation system may be planted provided the planting areas have been prepared as specified in these special provisions.

PIPE

Steel Pipe

Galvanized steel pipe supply line installed between the irrigation system booster pump and the backflow preventer assembly shall be installed not less than 450 mm below finished grade, measured to the top of the pipe.

Plastic Pipe

Plastic pipe supply lines shall be polyvinyl chloride (PVC) 1120 or 1220 pressure rated pipe with the minimum pressure rating (PR) of 200.

Plastic pipe supply lines less than 100 mm in diameter shall have solvent cemented type joints. Primers shall be used on the solvent cemented type joints.

Plastic pipe supply lines (main) shall have a minimum cover of 0.45 m.

Fittings for plastic pipe supply lines with a pressure rating (PR) of 315 shall be Schedule 80.

THRUST BLOCKS

Thrust blocks shall be installed in accordance with the plans and these special provisions. Thrust blocks shall be installed on the main supply line at all changes in direction and terminus run.

Concrete shall conform to the special provision in Section 20-2.26, "Concrete," of the Standard Specifications.

BACKFLOW PREVENTER ASSEMBLIES

Backflow preventers shall conform to the provisions in Section 20-2.25, "Backflow Preventers," of the Standard Specifications and these special provisions.

Backflow preventers shall have current approval from the University of Southern California Foundation for Cross-Connection Control and Hydraulic Research (USC Foundation).

Before backflow preventer assembly installation, the Contractor shall provide the Engineer with the portion of the USC Foundation "List of Approved Backflow Prevention Assemblies" showing type of assembly, manufacturer's name, model number, edition of the manual under which the assembly was approved, approval date and the last renewal date.

The "List of Approved Backflow Prevention Assemblies" is available to Foundation Members. Membership information to join the USC Foundation is available at:

http://www.usc.edu/dept/fccchr/membership.html

Questions concerning the USC Foundation "List of Approved Backflow Prevention Assemblies" can be answered by calling the Foundation at toll free (866) 545-6340.

Pressure loss through the backflow preventers shall not exceed the following:

BACKFLOW PREVENTER SIZE (millimeters)	FLOW RATE (Liters per minute)	PRESSURE LOSS (kPa)
40	360	50

Backflow preventer assemblies shall be painted with a minimum of 2 applications of a commercial quality enamel paint. The color of the paint shall be black.

BACKFLOW PREVENTER ASSEMBLY ENCLOSURE

Enclosures shall be fabricated of structural steel angles and flattened expanded metal and shall be installed over backflow preventer assemblies on a portland cement concrete pad as shown on the plans and in conformance with these special provisions.

Metal for sides, ends and top panels shall be fabricated from No. 9 expanded metal. The flattened expanded metal openings shall be approximately 20 mm by 45 mm in size.

Expanded metal panels shall be attached to the steel frames by a series of welds, not less than 6.4 mm in length and spaced not more than 100 mm on centers, along the edges of the enclosure.

Padlocks will be State-furnished in accordance with "State-furnished Materials" of these special provisions.

Enclosures shall be galvanized, after fabrication, in conformance with the provisions in Section 75-1.05, "Galvanizing," of the Standard Specifications.

Concrete for the concrete pad shall conform to Section 90-10, "Minor Concrete," of the Standard Specifications.

Hold down bolt assemblies shall be galvanized and shall be installed when the portland cement concrete pad is still plastic. Nuts shall be hexagonal and washers shall be the lock type.

Enclosures shall be painted with one application of a commercial quality pre-treatment, vinyl wash primer and a minimum of one application of a commercial quality, exterior enamel for metal. The finish color shall be light brown.

All parts of the backflow preventer assembly enclosure, including hold down assemblies, may be constructed of stainless steel instead of standard steel materials specified above. Stainless steel enclosures shall conform to the provisions herein except galvanizing, priming and painting shall not be required. Stainless steel enclosures shall be powder coated a black color by the manufacturer.

The minimum clearance between the backflow preventer assembly and the backflow preventer assembly enclosure shall be as shown on the plans.

TESTING NEW BACKFLOW PREVENTERS

New backflow preventers shall be tested for proper operation in conformance with the provisions in Section 20-5.03J, "Check and Test Backflow Preventers," of the Standard Specifications and these special provisions.

Tests for new backflow preventers shall be satisfactorily completed after installation and before operation of the irrigation systems.

New backflow preventers shall be retested one year after the satisfactory completion of the previous test, and each year thereafter until the plant establishment period is completed. An additional test shall be provided not more than 10 days prior to acceptance of the contract.

SPRINKLERS

Sprinklers shall conform to the type, pattern, material, and operating characteristics listed in the "Sprinkler Schedule" shown on the plans.

FINAL IRRIGATION SYSTEM CHECK

A final check of new irrigation facilities shall be performed not more than 40 working days and not less than 30 working days prior to acceptance of the contract.

The length of watering cycles using potable water measured by water meters for the final check of irrigation facilities will be determined by the Engineer.

Remote control valves connected to new irrigation controllers shall be checked for automatic performance when the controllers are in automatic mode.

Unsatisfactory performance of irrigation facilities installed or modified by the Contractor shall be repaired and rechecked at the Contractor's expense until satisfactory performance is obtained, as determined by the Engineer.

Nothing in this section "Final Irrigation System Check" shall relieve the Contractor of full responsibility for making good or repairing defective work or materials found before the formal written acceptance of the entire contract by the Director.

Full compensation for checking the irrigation systems prior to the acceptance of the contract shall be considered as included in the contract lump sum price paid for plant establishment work and no additional compensation will be allowed therefor.

SECTION 10-3. SIGNALS, LIGHTING AND ELECTRICAL SYSTEMS

10-3.01 DESCRIPTION

Modifying lighting shall conform to the provisions in Section 86, "Signals, Lighting and Electrical Systems," of the Standard Specifications and these special provisions.

10-3.02 COST BREAK-DOWN

Cost break-downs shall conform to the provisions in Section 86-1.03, "Cost Break-Down," of the Standard Specifications and these special provisions.

The Engineer shall be furnished a cost break-down for each contract lump sum item of work described in this Section 10-3.

The cost break-down shall be submitted to the Engineer for approval within 15 days after the contract has been approved. The cost break-down shall be approved, in writing, by the Engineer before any partial payment for the items of electrical work will be made.

10-3.03 FOUNDATIONS

Reinforced cast-in-drilled-hole concrete pile foundation for lighting standards shall conform to the provisions in "Piling" of these special provisions.

10-3.04 STANDARDS, STEEL PEDESTALS, AND POSTS

Standards, steel pedestals, and posts for traffic signal and lighting standards shall conform to the provisions in Section 86-2.04, "Standards, Steel Pedestals and Posts," of the Standard Specifications, "Steel Structures" of these special provisions, and the following requirements.

Steel bolts not designated on the plans as high-strength (HS) or stainless steel shall be for general applications and shall conform to the requirements in ASTM Designation: A 307.

Where the plans refer to the side tenon detail at the end of the signal mast arm, the applicable tip tenon detail may be substituted.

The sign mounting hardware shall be installed at the locations shown on the plans.

Handhole reinforcement rings for standards, steel pedestals, and posts shall be continuous around the handholes.

All ferrous metal parts of tubular sign structures shall be galvanized and shall not be painted.

10-3.05 CONDUIT

Conduit to be installed underground shall be Type 3 unless otherwise specified.

The conduit in a foundation and between a foundation and the nearest pull box shall be Type 3.

Conduit sizes shown on the plans and specified in the Standard Specifications and these special provisions are referenced to metallic type conduit. When rigid non-metallic conduit is required or allowed, the nominal equivalent industry size shall be used as shown in the following table:

Size Designation for Metallic Type Conduit	Equivalent Size for Rigid Non-metallic Conduit
21	20
27	25
41	40
53	50
63	65
78	75
103	100

When Type 3 conduit is placed in a trench (not in pavement or under portland cement concrete sidewalk), after the bedding material is placed and the conduit is installed, the trench shall be backfilled with commercial quality concrete, containing not less than 250 kg of portland cement per cubic meter, to not less than 100 mm above the conduit before additional backfill material is placed.

Conduit runs shown on the plans to be located behind curbs may be installed in the street, within 0.9-m of, and parallel with the face of the curb, by the "Trenching in Pavement Method" in conformance with the provisions in Section 86-2.05C, "Installation," of the Standard Specifications. Pull boxes shall be located behind the curb or at the locations shown on the plans.

After conductors have been installed, the ends of conduits terminating in pull boxes, and service equipment enclosures shall be sealed with an approved type of sealing compound.

At those locations where conduit is required to be installed under pavement and existing underground facilities require special precautions in conformance with the provisions in "Obstructions" of these special provisions, conduit shall be placed by the "Trenching in Pavement Method" in conformance with the provisions in Section 86-2.05C, "Installation," of the Standard Specifications.

10-3.06 PULL BOXES

Grout shall not be placed in the bottom of pull boxes.

Where the sump of an existing pull box is disturbed by the Contractor's operation, the sump shall be reconstructed as shown on Standard Plan ES-8.

10-3.07 CONDUCTORS AND WIRING

Splices of conductors shall be insulated with heat-shrink tubing of the appropriate size after thoroughly painting the spliced conductors with electrical insulating coating.

Heat-shrink tubing shall be heated as recommended by the manufacturer.

The minimum insulation thickness, at any point, for Type USE, RHH or RHW wire shall be 1.0 mm for conductor sizes No. 14 to No. 10, inclusive, and 1.3 mm for No. 8 to No. 2, inclusive. The minimum insulation thickness, at any point, for Type THW and TW wires shall be 0.69 mm for conductor sizes No. 14 to No. 10, inclusive, 1.02 mm for No. 8, and 1.37 mm for No. 6 to No. 2, inclusive.

10-3.08 BONDING AND GROUNDING

Bonding and grounding shall conform to the provisions in Section 86-2.10, "Bonding and Grounding," of the Standard Specifications and these special provisions.

Bonding jumpers in standards with handholes and traffic pull box lid covers shall be attached by a UL listed lug using 4.5-mm diameter or larger brass or bronze bolts and shall run to the conduit or bonding wire in the adjacent pull box. The grounding jumper shall be visible after the standard has been installed and the mortar pad and cap have been placed on the foundation.

Standards without handholes shall have bonding accomplished by jumpers attached to UL listed ground clamps on each anchor bolt.

For slip base standards or slip base inserts, bonding shall be accomplished by jumpers attached to UL listed ground clamps on each anchor bolt, or a UL listed lug attached to the bottom slip base plate with a 4.5-mm diameter or larger brass or bronze bolt.

Equipment bonding and grounding conductors are required in conduits, except when the conduits contain combinations of loop lead-in cable, fiber optic cable, or signal interconnect cable. A No. 8 minimum, bare copper wire shall run continuously in circuits, except for series lighting circuits, where No. 6 bare copper wire shall run continuously. The bonding

wire size shall be increased to match the circuit breaker size in conformance with the Code, or shall be as shown on the plans. Conduits to be installed for future conductors, may omit the copper wire.

Bonding of metallic conduits in metal pull boxes shall be by means of bonding bushings and bonding jumpers connected to the bonding wire running in the conduit system.

SECTION 10-4. RELOCATION OF UTILITY FACILITIES

10-4.01 GENERAL DESCRIPTION

Relocating the utility facilities shall consist of modifying the existing utility facilities and constructing or installing new facilities in accordance with the provisions of the following publications: "Greenbook" Standard Specifications for Public Works Construction, 2003 edition, herein known as the "Utility Standard Specifications", 2003 Regional Supplement to "Greenbook" Standard Specifications for Public Works Construction, 2003 edition, the Standard Specifications; Sections 1 through 9, Section 15, "Existing Highway Facilities", and Section 70, "Miscellaneous Facilities"; as shown on the plans, these Special Provisions and as directed by the Engineer.

Except for Sections 15 and 70, Sections 10 through 95 of the Standard Specifications shall not apply to the work in this Section 10-4 except when specific reference is made thereto.

If parking is to be restricted during construction, the Contractor shall post "Tow-Away/No Parking" signs 24 hours in advance after receiving approval from the Engineer. The sign shall contain "days/hours" information and be posted so as to be reasonably seen by the public.

The Contractor shall notify the Engineer 3 working days in advance of any lane, street or alley closures or implementing any construction detour.

The Contractor shall keep the streets in and adjacent to the construction area clean at all times. Streets shall be swept before washing.

EXCAVATION

Excavation shall conform to the provisions in Section 19.3, "Structure Excavation and Backfill," of the State Standard Specifications and to the lines and grades shown on the plans and as directed by the Engineer.

TRENCH EXCAVATION

Whenever work involves trench excavation, the Contractor shall provide all necessary shoring, bracing, sloping, or other provisions to be made for worker protection from hazard of caving ground during the excavation. If such plan varies from the shoring system standards established by the Construction Safety Orders of the Division of Industrial Safety, a Civil Engineer or Structural Engineer registered in the State of California shall prepare the plans.

Contractor shall comply with the Safety Orders of California, Code of Regulations: Title 8, Section 1539 (Excavation, Trenches, Earthwork).

Trench excavation shall conform to the provisions in Sections 5-1.02A, "Trench Excavation Safety Plans," and Section 19-1.02 "Preservation of Property," of the State Standard Specifications, the contract plans, and these Special Provisions.

The narrowest practicable trench width at top of pipe which will allow proper densification of pipe zone bedding and backfill materials shall be maintained regardless of the type of soil or the method of densification. The width of trench at bottom of pipe shall be determined by the space required for proper and effective use of tamping equipment, but not less than pipe OD plus 600 millimeters.

TRENCH EXCAVATION AND PLACEMENT OF BEDDING

Excavate the trench to the lines and grades shown on the plans with allowance for 150 mm of pipe bedding material. The trench section shall be as shown on the plans.

The maximum length of open trench shall be 152 m except by permission of the Engineer. The distance is the collective length at any location, including open excavation and pipe laying, which has not been backfilled to the elevation of the surrounding grade.

Trench walls shall be sloped or shored per the requirements of CAL-OSHA.

The trench bottom shall be graded to provide a smooth, firm, and stable foundation that is free from rocks and other obstructions.

Place the specified thickness of bedding material over the full width of the trench. Grade the top of the pipe base ahead of the pipe laying to provide a firm, uniform support along the full length of pipe.

Excavate bell holes at each joint to permit proper assembly and inspection of the entire joint.

Trenches for main pipelines and all appurtenances shall be backfilled with the materials and methods as specified for the Pipe Zone, Trench Zone and Pavement Zone.

Trench widths shall be in accordance with the plans.

Trench depth shall be as required to install pipelines in accordance with the plans and these Specifications. Unless shown otherwise in the plans, the minimum cover for pipelines shall be as follows:

Pipeline Application	Minimum Cover Required
Potable Water	0.91 m
Recycled Water	1.22 m
Sewer	1.52 m

Safe and suitable ladders, which project 600 millimeters above the top of the trench, shall be provided for all trenches over 1.2 meter in depth. One ladder shall be provided for each 15 meters of open trench or fraction thereof, and be so located that workers in the trench need not move more than 7.6 meters to a ladder.

The Contractor's design and installation of shoring shall be consistent with the rules, orders, and regulations of CAL-OSHA.

Excavations shall be shored, sheeted, and supported such that the walls of the excavation will not slide or settle and all existing improvements of any kind, either on public or private property, will be fully protected from damage.

The sheeting and shoring shall be arranged so as not to place any stress on portions of the completed work until the general construction has proceeded far enough to provide ample strength.

Care shall be exercised in the moving or removal of trench shields, sheeting, and shoring to prevent the caving or collapse of the excavation faces being supported.

Protection of workers within trenches shall be as required by the California Labor Code and in accordance with these Special Provisions.

All excavations shall be performed in a safe manner and shall be protected and supported in accordance with CAL-OSHA regulations.

Barriers and traffic delineators shall be placed in accordance with the requirements of the agency having jurisdiction.

Shoring is considered to be adequate sheeting, shoring, bracing, or equivalent method for:

A. Protection of life and limb, which shall conform to applicable safety orders.
B. Protection of existing underground and aboveground private and public improvements;
C. The remedy of any and all conditions encountered, regardless of depth, (including, but not limited to trench sloughing, pavement separation, etc,) during the construction of the project.

Should a bracing system utilize steel H-beams or piles or other similar vertical supports, driving of said vertical supports will not be permitted except for the last 1.2 meter above the bottom of pile, except where this procedure is impracticable. The vertical support may then be driven to the required depth, not to exceed 1.2 meter. During the drilling and driving operations the Contractor shall take care to avoid damage to utilities.

At locations where the drilling of such holes is impracticable because of the existence of rocks, running sand, or other similar conditions, and provided said impracticability is demonstrated to the satisfaction of the Engineer by actual drilling operations by the Contractor, the Engineer may, upon request of the Contractor, approve the use of means other than drilling for the purpose of placing the vertical support. Such other means, however, must be of a nature, which will accomplish, as nearly as possible, the purpose of the drilling, namely, the prevention of damage to existing surface or subsurface improvements, both public and private.

FOUNDATION STABILIZATION

When unsuitable soil materials are encountered, the unsuitable material shall be removed to the depth determined necessary in the field by the Engineer, and as acceptable to the Engineer. The sub-grade shall be restored with compacted Imported Granular Material or crushed rock as recommended by the Engineer. Place the appropriate bedding or base material on this restored foundation.

When rock encroachment is encountered, the rock shall be removed to a point below the intended trench or excavation sub-grade as determined necessary in the field by the Engineer, and as acceptable to the Engineer. The sub-grade shall be restored with compacted Imported Granular Material as recommended by the Engineer. Place the appropriate bedding or base material on this restored foundation.

When excessively wet, soft, spongy, or similarly unstable material is encountered at the surface upon which the bedding or base material is to be placed, the unsuitable material shall be removed to the depth determined necessary in the field by the Engineer, and as acceptable to the Engineer. Restore the trench with crushed rock enclosed in filter fabric as directed by the Engineer. Larger size rocks, up to 75 mm, with appropriate gradation, may be used if recommended by the Engineer. Place the appropriate bedding or base material on this restored foundation.

DEWATERING

The Caltrans inspector shall be present for all dewatering.

The Contractor shall abide by all applicable local, state and federal regulations, and by the conditions of the Regional Water Quality Control Board. The Contractor shall provide effective measures where necessary to prevent operations from producing dust in an amount damaging to property or causing a nuisance as determined by the Engineer. The Contractor shall be responsible for any damage due to dust originating from its operations.

The Contractor shall anticipate and correct any erosion problem arising from its operations. The Contractor shall abide by the conditions of the Regional Water Quality Control Board, General Construction Activity Storm Water Permit and the project Storm Water Pollution Prevention Plan (SWPPP).

WATER IN TRENCH

The Contractor shall provide and maintain at all times during construction ample means and devices to promptly remove and dispose of all water from any source entering excavations or other parts of the work. Dewatering shall be performed by methods that will ensure a dry excavation and preservation of the final lines and grades of the bottoms of excavations. Dewatering methods may include well points, sump points, suitable rock or gravel placed as pipe bedding for drainage and pumping, temporary pipelines, or other means, all subject to the approval of the Engineer. The cost of all dewatering activities shall be borne by the Contractor.

In no case shall the sewers be used as drains for water without the approval of the Engineer. Sewer systems shall not be used as drains for dewatering trenches or excavations, nor for disposal of collected or accumulated groundwater, without the approval of the agency of jurisdiction.

Concrete shall not be poured in water, nor shall water be allowed to rise around concrete or mortar until it has set at least four hours.

The Contractor is responsible for meeting all Federal, State, and local laws, rules and regulations regarding the treatment and disposal of water from dewatering operations at the construction site.

The Contractor shall keep the excavation free from water during construction. Where groundwater is encountered, the static water level shall be drawn down a minimum of 300 millimeters below the bottom of the excavation to maintain the undisturbed state of the native soils to prevent softening of the bottom of the excavation, and to allow the placement of any fill to the specified density. Disposal of the water shall not damage property or create a public nuisance. The Contractor shall have on hand pumping equipment and machinery in good working condition for emergencies. Dewatering systems shall operate continuously until the backfill has been completed to 300 millimeters above the normal static groundwater level. Water may be discharged into an existing storm drain, channel, or street gutter only with the approval of the Engineer.

Dewatering systems shall not remove natural soils.

Release of the ground water to its static level shall be controlled to prevent the disturbance of the natural foundation soils or compacted fill and to prevent flotation or movement of structures or pipes.

Crushed rock shall be used for drainage when required by the Engineer. When crushed rock is used, filter fabric shall be installed between the rock and backfill material. Crushed rock shall be the 25 millimeters crushed rock gradation as specified in Section 200-1.2, "Crushed Rock and Rock Dust," of the Utility Standard Specifications.

When crushed rock for drainage is so ordered by the Engineer, crushed rock will be paid for as extra work as provided in Section 4-1.03D of the State Standard Specifications.

Full compensation for dewatering, shall be considered as included in the contract prices paid for the various items of work, and no additional compensation shall be allowed therefore.

EXCESS TRENCH EXCAVATION

Wherever the Contractor over-excavates the bottom of a trench, the bottom of the trench for water mains shall be backfilled with "Bedding For Water Pipe" listed elsewhere in these Special Provisions.

Overexcavations shall be corrected by backfilling with approved imported granular material or crushed rock, compacted to 90 percent relative compaction, as directed by the Engineer.

The Contractor shall remove and legally dispose of all excess excavated material and demolition debris.

It is the intent of these specifications that all surplus material shall be legally disposed of by the Contractor. Before acceptance of the work by the Engineer, the Contractor shall provide the Engineer with written releases signed by all property owners with whom the Contractor has entered into agreements for disposing of excess excavated material, absolving the Engineer from any liability connected therewith.

Over excavation and associated bedding not ordered by the Engineer shall be at the Contractor’s expense.

ADDITIONAL BEDDING

When so ordered by the Engineer, additional bedding required below sub grade to replace soft or unstable material will be paid for as extra work as provided in Section 4-1.03D of the State Standard Specifications.

Material for additional bedding shall be the 25 millimeters crushed rock gradation as specified in Section 200-1.2, "Crushed Rock and Rock Dust," of the Utility Standard Specifications.

IMPORTED BACKFILL

The densification method for imported backfill material shall be the same as the method for non-imported backfill.

A minimum relative compaction of 90 percent shall be achieved.

Separate payment for imported backfill will be made only when the excavation is done in heavy clay, highly expansive or other deleterious material, and imported backfill is ordered by the Engineer. The Engineer will be responsible for decisions whether or not the excavated material is suitable for backfill and when separate payment is made for imported backfill.

TRENCH RESURFACING

Trench resurfacing where required shall consist of asphalt concrete or Portland cement concrete as per Section 39, "Asphalt Concrete" or Section 90, "Portland Cement Concrete," of the State Standard Specifications and these Special Provisions, as shown on the plans, and as directed by the Engineer.

Whenever excavation is made through pavement, sidewalk, driveway or drainage ditch, temporary bituminous resurfacing 50 millimeter thick shall be placed and maintained according to Section 306-1.5.1, "Temporary Resurfacing," of the Utility Standard Specifications unless permanent pavement is placed within 24 hours after backfill of trench.

COORDINATION

The Contractor shall notify the Engineer at least 10 working days in advance of his intent to begin work on the existing water pipe.

The Contractor shall provide for a safe 1.2 m wide pedestrian walkway to all places of business, and for all residences during construction.

The Contractor shall not allow sewage to be discharged onto the ground or into any stream, creek or storm drain.

The Contractor shall distribute printed notices of proposed utility work to all occupants along streets where construction work is to be performed at least one week before starting such work written in English and Spanish.

The Contractor shall notify the owner or occupant (if not owner occupied) of the closure of the driveways to be closed more than one 8-hour day at least 3 working days prior to the closure. The Contractor shall minimize the inconvenience and minimize the time period that the driveways will be closed. The Contractor shall fully explain to the owner/occupant how long the work will take and when closure is to start.

The Contractor shall perform his work in such a manner that existing private and/or public utilities will not be disturbed for a period of time in excess of 4 hours. Utility service shall not be interrupted prior to 8:00 a.m. or after 4:00 p.m. unless otherwise approved in writing by the Engineer.

The Contractor shall cooperate with the utility owner's personnel in order to facilitate their inspection work and shall allow them access to the site of the work.

Approvals and instructions from the utility owner's personnel will be transmitted to the Contractor through the Engineer.

STORAGE OF MATERIALS

All materials for use in the work shall be stored by the Contractor in such manner as to prevent damage from exposure to the elements, admixture of foreign materials, or from any other cause. The Contractor shall be entirely responsible for damage or loss by weather or other causes. The Material Safety Data Sheets (MSDS) for all products to be used in the work shall be kept on-site by the Contractor, and the material manufacturer's recommendations for proper storage of its products shall be strictly followed.

Materials shall not be stored without the written permission of the Engineer. The Contractor shall be responsible to provide its own storage area or property. Materials for use on the work shall be stored on private property only as allowed by law and with the written permission of the property owner, and a copy of such permission shall be provided to the Engineer. In addition, a release letter signed by said property owner and stating that materials are no longer stored on the property and that Contractor has restored the area to original condition is required prior to the filing of the Notice of Completion.

EXISTING UTILITIES

The Contractor's attention is directed to the possible existence of pipe and other underground improvements that may or may not be shown on the plans. Once discovered, the Contractor shall preserve and protect all such improvements whether shown on the plans or not. The Contractor shall provide and install suitable safeguards, and shall be responsible for the care and protection of all existing sewer and water facilities, telephone conduit, gas mains, culverts, or other above-ground or below-ground facilities or structures which may be encountered in or near the area of work. It shall be the responsibility of the Contractor to notify each agency of jurisdiction and utility company and to make arrangements for location of facilities

prior to beginning construction. In the event of damage to existing facilities during the progress of the work, such facilities shall be replaced or restored to original condition, as determined by the Engineer, at the Contractor's expense.

Where a possible at-grade conflict with existing underground utilities appears on the plans, unless prior pothole information is shown, the Contractor shall determine its location a minimum of 150 meters ahead of the work prior to trenching. Grade and alignment changes shall be made only if approved by the Engineer.

The horizontal and vertical locations shown for the existing underground utilities are approximate. It will be the responsibility of the Contractor to locate all utility lines in the construction area prior to excavation. Any damage to existing utility, structure, or service, whether or not indicated on the plans shall be repaired at the Contractor's expense in a manner approved by the Engineer.

Attention is directed to "Obstructions" elsewhere in these Special Provisions.

All existing services must remain in service during construction. Contractor to provide and install all high -lines as needed to provide constant service.

The Contractor shall be responsible for determining in advance the location, elevation, alignment and pipe type and size of all existing pipelines to which connections are to be made. Potholing to determine location will be allowed only after providing the Engineer with three (3) day's advance notice. The Contractor is required to contact Underground Service Alert (USA) at 1-800-227-2600 or 1-800-422-4133 for mark-out of all utilities in the area of the work.

Any pot holing required will be paid for as extra work as provided in Section 4-1.03D of the State Standard Specifications.

Where a water distribution main is shown on the plans, it shall be assumed that every property is served by that water main.

Where existing underground utilities are undercut, particular care shall be exercised in selecting, placing, and compacting the backfill material under and around such utility to assure firm support. For at least 300 millimeters all around the undercut utility, the backfill material shall have a sand equivalent of 50 and a relative compaction of 95 percent.

Where, in the opinion of the Engineer, the native soil is unsuitable for supporting the undercut utility; the material shall be removed. The resulting depression shall be backfilled with suitable backfill material. Such excavation and backfill below the planned elevation of the bottom of the trench will be paid for as extra work as provided in Section 4-1.03D of the State Standard Specifications.

Where a 25 mm or smaller water service is damaged during trenching operation, a minimum of 1.2 meter section of such service shall be removed and replaced with two 45 degrees elbows and new copper tubing bent to a 300 millimeters minimum radius.

The Contractor's attention is directed to Section 7-1.11, "Preservation of Property", of the State Standard Specifications. The Contractor shall be careful to avoid damage to water services, sewer laterals, water and sewer mains during trenching operations. In the event damage is done requiring new service connections and water main repairs, the Contractor shall pay for work required to be done by the utility owner. If requested by the Contractor and approved by the Engineer, the Contractor may perform said repairs. The Contractor shall make every effort to provide continuous service to the utility customers.

The Contractor shall alter, relocate or reconstruct portions of existing utility service connections, such as water, which may or may not have been shown on the plans, or not accurately shown on the plans, but which are found to interfere with the work. Such work will be paid for at the unit prices for the various contract items of work involved, except for the following:

A. The service connection is not shown on the plans or marked in the field.
B. The service connection will conflict with the plan elevation of the new main.

Upon discovery of service connections not shown on the plans or marked in the field that conflict with the plan elevation of the new main, the Contractor shall immediately notify the Engineer. When so ordered by the Engineer, protection or relocation of the items listed above will be paid for as extra work as provided in Section 4-1.03D of the State Standard Specifications.

If the Contractor, either before commencing work or during the course of the work, finds any discrepancy between the specifications or plans and the physical conditions at the site of the work, Contractor shall promptly notify the Engineer in writing of such discrepancy.

WATER FOR CONSTRUCTION PURPOSES

The Contractor shall furnish all water required for construction, including water for flushing. The water and meter shall be paid for by the Contractor in accordance with the rates and rules of the water supplier.

No compensation shall be paid the Contractor for water for the initial filling or refilling, for testing or re-testing, and for re-flushing the pipeline.

The size and location of temporary meters shall be determined by the Contractor and approved by the Engineer.

BURIED WATER LINE WARNING AND IDENTIFICATION TAPE

Warning/identification tape shall be used to identify location of underground utilities and to act as a warning against accidental dig-ins of buried utilities. Warning/identification tape shall be used on all underground water and recycled water mains, potable and recycled water irrigation systems, sewer mains, and all related appurtenances. Warning/identification tape shall also be used on cathodic protection wiring systems and tracer wire brought into and out of access ports.

Warning/identification tape shall be as indicated below and in accordance with the Approved Materials List.

Tape shall be an inert plastic film (non-metallic) formulated for prolonged underground use that will not degrade when exposed to alkalies, acids and other destructive substances commonly found in soil.

Tape shall be puncture-resistant and shall have an elongation of two times its original length before parting.

Tape shall be colored to identify the type of utility intended for identification. Printed message and tape color shall be as follows:

Printed Message	Tape Color
Caution: Waterline Buried Below	Blue
Caution: Recycled Waterline Buried Below	Purple
Caution: Sewerline Buried Below	Green
Caution: Cathodic Protection Cable Buried Below	Red
Caution: Electric Line Buried Below	Red

Ink used to print messages shall be permanently fixed to tape and shall be black in color with message printed continuously throughout.

Tape shall be minimum 0.102 mm thick x 150 mm wide with a printed message on one side. Tape used with the installation of onsite potable and recycled water irrigation systems shall be a minimum of 75 mm wide.

Warning/Identification Tape shall be installed as described below in accordance with these Special Provisions.

Tape shall be placed 300 mm above and centered over the utility intended for identification. Tape used with onsite potable and recycled water irrigation systems shall be installed at 150 mm above the pipe.

Tape shall be installed with the printed side up and run continuously along the entire length of the utility intended for identification. Tape shall be installed on the main piping and all appurtenant laterals, including blowoffs, air valve assemblies, fire hydrants, and services. Tape splices shall overlap a minimum of 600 mm for continuous coverage.

Tape shall be installed prior to placement of the Trench Zone Backfill.

BURIED WATER LINE IDENTIFICATION TRACER WIRE

Tracer wire shall be used on all buried water and recycled water mains for the purpose of providing a continuous signal path used to determine pipe alignment after installation. Tracer wire is not required in installation of sewer mains.

Tracer wire shall be as indicated below and shall be selected from the Approved Materials List.

Tracer wire shall be Number 14 AWG solid copper UF type wire with cross-linked polyethylene insulation. The insulation shall be white or yellow in color.

Wire splices (at pipe tees, crosses and laterals) shall be accomplished using a direct bury silicone-filled capsule tube with standard wire nut or silicone-filled wire nut connectors of the appropriate size selected from the Approved Materials List.

Tracer wire shall be installed as described below in accordance with these Special Provisions.

Tracer wire shall be installed with all water and recycled water mains.

Wire shall be placed on the top centerline of the pipeline and shall run continuously along the entire length of pipe prior to placement of trench backfill. Wire shall be mechanically and electrically continuous throughout the pipeline, including within pipe casings.

Tracer wire shall be secured to the pipe at 1.8 m intervals with plastic adhesive tape, duct tape or plastic tie straps. The wire may alternately be secured to the pipe by looping the tracer wire around itself such that tracer wire remains continuous atop the pipe during backfill operations.

Tracer wire access ports shall be installed in accordance with the plans within the concrete splash pad of all fire hydrants installed as a part of the work. Tracer may terminate within meter boxes, blow off boxes, CP test boxes or air valve enclosures only as directed by the Engineer at intervals of not more than 305 m. Locations of all tracer wire access ports installed shall be noted on the As-Built drawings.

Wire shall extend into the access port and terminate with a coiled 600 mm length of wire. All tracer wire not located atop pipe shall be installed within a conduit at a minimum depth of 600 mm in accordance with the plans.

Splices shall be installed only when necessary and shall be made using a wire connector selected from the Approved Materials List.

The Contractor shall test tracer wire for electrical continuity in the presence of the Engineer prior to the installation of any paving over atop pipelines or appurtenances. Testing shall be accomplished using a Progressive Electronics 77M tone generator, or similar device, and a testing telephone handset.

POLYETHYLENE ENCASEMENT

Polyethylene encasement shall be used for all ferrous metal materials not otherwise protectively coated.

Polyethylene wrap shall be used for the protection of buried ductile-iron fittings and valves.

Polyethylene sleeves shall be used for the protection of buried ductile iron pipe.

Polyethylene encasement shall be as indicated below and shall be selected from the Approved Materials List. Polyethylene materials shall be kept out of direct sunlight exposure.

Polyethylene sleeves shall be a minimum 0.305 mm thick polyethylene plastic in accordance with AWWA C105.

Polyethylene wrap shall be a minimum 0.203 mm thick polyethylene plastic in accordance with AWWA C105.

Polyethylene wrap and sleeves shall be clear for use with potable water and purple for use with recycled water.

Polyethylene or vinyl adhesive tape a minimum of 50 mm wide or plastic tie straps shall be used to secure polyethylene encasement.

Polyethylene encasement shall completely encase and cover all metal surfaces.

Pipe: All ductile-iron pipe shall be encased with polyethylene sleeves in accordance with Method A described in AWWA C105, or with polyethylene wrap in accordance with Method C described in AWWA C105.

Fittings: Fittings such as tees, bends and reducers shall be encased with polyethylene wrap in accordance with AWWA C105.

Valves: Valves shall have only the stem and operating nut exposed and the wrap shall be attached so that valve operation will not disturb the wrapping or break the seal.

Polyethylene sleeves shall be secured with polyethylene or vinyl adhesive tape or plastic tie straps at the ends and quarter points along the sleeve in a manner that will hold the sleeve securely in place during backfill. Polyethylene wrap shall be secured with polyethylene or vinyl adhesive tape in a manner that will hold the wrap securely in place during backfill. The polyethylene wrap shall extend at least 300 mm into adjacent polyethylene wrap before taping. Any damage that occurs during installation shall be repaired with polyethylene or vinyl adhesive tape prior to backfilling.

CURB IDENTIFICATION

The Contractor shall mark the location of all water and water laterals at the curb crossing by stamping the face of the curb in 50 mm high letters as described below:

A. Potable water laterals shall be stamped with a letter "W".
B. Recycled water laterals shall be stamped with a letter "RW".
C. Sewer laterals shall be stamped with a letter "S".

CONCRETE FOR ANCHOR, VALVE, AND THRUST BLOCKS

Concrete thrust and anchor blocks shall be used, at all unrestrained fittings or as required for hydrostatic testing, and shall conform to Section 90-10, "Minor Concrete," of the State Standard Specifications.

Concrete thrust and anchor blocks shall be poured against wetted, undisturbed soil in accordance with the plans and as directed by the Engineer. The concrete shall be placed so that fittings and valves will be accessible for repairs or replacement. Prior to filling the pipeline with water, the concrete for thrust and anchor blocks shall cure for the following number of days:

A. Thrust Blocks 3 days minimum (unless approved by Engineer)
B. Anchor Blocks 7 days minimum

Pipe Thrust

The following table lists the resulting thrust from the noted fitting for each pipe size. The thrust amount shown is for each 70,307 Kg/m2 of test pressure. (For instance, if the test pressure is required to be 90,000 Kg/m2, multiply the value in the table by (90,000/70,307).

Pipe Size	Tees and Dead Ends	90 Degree Bend	45 Degree Bend	22-1/2 Degree Bend	11-1/4 Degree Bend
100 mm	839 Kg	1,184 Kg	644 Kg	327 Kg	177 Kg
150 mm	1,724 Kg	2,436 Kg	1,320 Kg	667 Kg	363 Kg
200 mm	2,985 Kg	4,218 Kg	2,286 Kg	1,157 Kg	626 Kg
250 mm	4,876 Kg	6,895 Kg	3,738 Kg	1,891 Kg	1,025 Kg
300 mm	6,945 Kg	9,816 Kg	5,316 Kg	2,694 Kg	1,461 Kg
400 mm	12,193 Kg	17,241 Kg	9,340 Kg	4,731 Kg	2,563 Kg

Safe Soil Bearing Load

Soil	SAFE BEARING LOAD
Muck, peat, etc.***	0 Kg/m
Soft Clay	2,441 Kg/m 2
Fine Sand	4,882 Kg/m 2
Decomposed Granite (D.G.)	7,324 Kg/m 2
Sandy Gravel	9,765 Kg/m 2
Cemented Sandy Gravel	9.765 Kg/m 2
Hard Shale	12,206 Kg/m 2
Granite	48,824 Kg/m 2

***In muck or peat soils, competent resistance shall be achieved by removal and replacement with a ballast of sufficient stability to resist the intended thrusts. Consult the Engineer.

Thrust Block Placement and Sizing

Thrust blocks shall be located at all unrestrained pipe fittings and bear against firm, undisturbed soil. The thrust blocks shall be centered on the fitting so that the bearing area is exactly opposite the resultant direction of the thrust, refer to the plans. Care shall be taken to prevent the placed thrust block concrete from eliminating maintenance access to the valve operators. The shape and location of all thrust block excavations shall be approved by the Engineer prior to pouring concrete. The size, in sq. ft., of the thrust block can be calculated by dividing the thrust by the safe bearing load. For instance, use a 300 mm pipe, 45 Degree bend, at 140,614 Kg/m2 test pressure, with a D.G. trench the value of 5,316 Kg of thrust can be obtained from the upper chart and 7,324 Kg/m2. safe bearing load from the lower chart as follows:

5,316 Kg x (140,614 / 70,307) / 7,324 Kg/m2 = 1.45 m2

Therefore, for this example, the trench wall adjacent to the fitting shall be excavated to the dimensions of 1.22 m x 1.22 m or 1.07 m x 1.52m or some closely approximate multipliers to achieve the minimum required 1.45 m2. bearing area.

Anchor Block Placement and Sizing

A. For all vertical bends in pipelines (downward bends) that do not have restrained joints, the fittings shall be retained in place by means of an anchor block. The block shall be sized to withstand the thrust exerted for the particular deflection angle at the required test pressure plus 10 percent (Do not rely on the restraining benefit from the soil). The Engineer shall verify the size chosen and the reinforcing steel required.
B. The size, m3. of the anchor block can be calculated by dividing the thrust by the unit weight of concrete (i.e. one m3 of concrete weighs approximately 2322 Kg). For instance, use the same mm pipe, 45 Degree bend, at 140,614 Kg/m2 test pressure - the value of 5,316 Kg of thrust can be obtained from the upper chart:

5,316 Kg x 2 / 2322 Kg = 4.58 m3 (plus 10 percent) = 5.04 m3

Therefore, for this example, the anchor block shall be 1.68 m x 1.68 m x 1.83 m or 1.83 m x 1.83 m x 1.52 m, or some closely approximate multipliers to achieve a minimum of 5.04 m3 of concrete.

Valve support blocks shall be installed as described below and in accordance with the plans:

A. Support blocks below valves shall be cut into the side of the trench a minimum of 300 mm.
B. Support blocks shall extend up to the height of adjoining pipe and shall have a minimum depth below the valve of 300 mm.
C. Support blocks shall be installed so that the valves will be accessible for repairs.

Unless otherwise directed, blocking shall be placed so that joints of pipe and fitting will be accessible for repair. Refer to the project plans for the sizes of the various anchor and thrust blocks. Additional concrete required for thrust blocks, due to soil conditions, will be paid for as extra work as provided in Section 4-1.03D of the State Standard Specifications.

HYDROSTATIC TESTING OF MAINS

The Contractor shall notify the Engineer at least 3 working days in advance of performing any pressure test. No pressure test shall be made on Saturdays, Sundays or designated legal holidays as per Section "Maintaining Traffic" elsewhere in these Special Provisions unless approved in writing by the Engineer.

The pipeline shall be hydrostatically tested by the Contractor in the presence of the Engineer, after all pipe and appurtenances have been installed as shown on the staging plans. All permanent thrust blocks and anchors shall be in place and shall have set the required period of time prior to testing. Testing shall not begin until the pipe trench has been backfilled and compacted a minimum of 750 millimeters above the top of pipe and the anchor, thrust, and supporting concrete has attained a compressive strength of 1 400 kPa.

Steel pipelines shall not be tested before the mortar lining and coating on all of the pipe lengths in the line have attained an age of 14 days. Cement mortar lined pipe shall not be filled with water until a minimum of 8 hours has elapsed after the last joint has been mortared.

Potable water shall be used for hydrostatic testing when such testing is performed separately from disinfecting operations. Make up water for testing shall also be potable water.

Temporary blocking during the tests will be permitted only at temporary plugs, caps or where directed by the Engineer.

All valves and appurtenances shall be operated during the test period. The test shall be conducted with the valves in the open position.

All valves, air vacuum assemblies, blow-offs, and services shall be monitored during the test for possible leakage and repairs made if necessary before the test proceeds.

For pipe lines with a porous lining such as cement mortar the pipe shall be filled with water and placed under a 35 kPa pressure for a minimum of 48 hours prior to the actual hydrostatic test.

Before applying the specified test pressure, care shall be taken to release all air within the pipe and appurtenances to be tested. Air shall be released through services, fire hydrants, air release valves, or other approved methods.

The Contractor shall furnish all materials including water, equipment, bracing, connections, labor and expense required for testing of pipeline. He shall be responsible for the result of any failure under test, which is attributable to defective material and/or workmanship furnished by him or to his negligence or improper conduct of the test.

Hydrostatic testing of pipelines shall be performed prior to or concurrently with the disinfection operations. In the event repairs are necessary, as indicated by the hydrostatic test, the Engineer may require additional disinfection in accordance.

Hydrostatic testing shall be performed prior to connections to existing mains. Authorization for connection to the existing system shall be given only on the basis of acceptable hydrostatic, disinfection and bacteriological test results.

Potable water shall be used for hydrostatic testing of potable and recycled water mains when such testing is performed separately from disinfection operations.

Potable water shall be supplied by a source as approved by the Engineer. Make-up water for testing shall also be potable water.

A chlorinated water solution shall be used to charge the line and for make-up water when hydrostatic testing and disinfection operations are combined.

Well water shall not be used for hydrostatic testing or any other purposes in new or existing pipelines.

Testing water shall be supplied through a metered connection equipped with a backflow prevention device at the point of connection to the potable water source used.

The Contractor shall provide any temporary piping needed to deliver potable water to the piping that is to be tested.

At the onset of testing, all valves, air vacuum assemblies, blowoffs, and services shall be monitored for possible leakage and repairs made, if necessary, before the test proceeds. The appurtenances shall be monitored through the duration of the testing.

Before applying the specified test pressure, care shall be taken to release all air within the pipe and appurtenances to be tested. Air shall be released through services, fire hydrants, air release valves, or other approved locations.

A five (5) hour hydrostatic pressure test shall be performed after the pipe and all appurtenances have been installed and after any trench backfill compaction with heavy-duty compaction equipment has been completed. The hydrostatic test

pressure shall be 345 kPa above the class rating of the pipe at the lowest point in the section being tested, or as directed by the Engineer, and shall be at least equal to the design class of the pipe at the highest point in the line.

The test pressure shall be applied and continuously maintained by pumping for a period of four (4) hours. During the pumping phase of the test, the test pressure shall be maintained at not less than 95 percent of the specified test pressure at all times.

At the end of the fourth (4th) hour, the pressure shall meet the requirements stated above. Pumping shall then be discontinued for one hour and the drop in pressure shall be recorded. Pumping shall then be resumed to restore the initial test pressure, and the quantity of water pumped into the line shall be accurately measured. This measured quantity shall not exceed that which would result from leakage at the following rates:

A. The allowable leakage for steel (flanged or welded) and ductile iron (flanged) pipe shall be zero.
B. The leakage for polyvinyl chloride (PVC) pipe, and for steel or ductile- iron pipes with rubber joints shall be considered as the total amount of water pumped into the pipe system after the fifth (5th) hour of testing. Allowable leakage during the fifth (5th) hour shall be in accordance with the plans, calculated using the following formula:

0.4625 liters x nominal diameter of pipe (mm) x length of pipe (m) /
[24 (hrs) x 1000 (m)]

If the leakage exceeds the allowable loss, the leak points shall be located and repaired as required by the Engineer. All defective pipe, fittings, valves and other appurtenances discovered shall be removed and replaced with sound material. Additional disinfection shall be performed as necessary. The hydrostatic test shall be repeated until the leakage does not exceed the rate specified above. All visible leaks shall be similarly repaired.

DISINFECTION OF PIPING

All water mains and appurtenances taken out of service for inspection, repairs, or other activity that might lead to contamination shall be disinfected before they are returned to service.

All new water mains and temporary high lines shall be disinfected prior to connection to the existing system.

All components incorporated into a connection to the existing system shall be disinfected prior to installation.

A written disinfection and dechlorination plan signed by a certified chlorinator shall be submitted to the Engineer for review and approval prior to starting disinfection operations.

Chlorination and dechlorination shall be performed by competent individuals knowledgeable and experienced in the operation of the necessary application and safety equipment in accordance with applicable Federal, State and Local laws and regulations. The transport, storage and handling of these materials shall be performed in accordance with Code of Federal Regulations (CFR) 1910.120 Hazardous Waste Operations and Emergency Response, CFR 49.172 Hazardous Materials Regulations, and the General Industry Safety Orders of the California Code of Regulations, Title 8, Section 5194.

The specified disinfection of the pipelines may be performed concurrently with the hydrostatic testing. In the event repairs are necessary, as indicated by the hydrostatic test, additional disinfection may be required by the Engineer in accordance with this specification.

Prior to connection to existing mains, disinfection and bacteriological testing shall be performed in accordance with this specification, and hydrostatic testing shall be performed. Authorization for connection to the existing system shall be given only on the basis of acceptable hydrostatic, disinfection and bacteriological test results.

Liquid chlorine contains 100 percent available chlorine and is packaged in steel containers in net weights of 68.1 kg or 907.2 kg.

Liquid chlorine shall be used with appropriate gas flow chlorinators, heaters, and injectors to provide a controlled, high-concentration solution feed to the water. The chlorinators and injectors shall be the vacuum-operated type.

Sodium hypochlorite is available in liquid form in glass or plastic containers, ranging in size from 0.95 L to 18.93 L. The solution contains approximately 10 percent to 15 percent available chlorine.

Tablet or granular hypochlorite shall not be used at any time.

Disinfections of pipelines shall not proceed until all appurtenances and any necessary sample ports have been installed and the Engineer provides authorization.

Every effort shall be made to keep the water main and its appurtenances clean and dry during the installation process.

All piping, valves, fittings, and appurtenances which become contaminated during installation shall be cleaned, rinsed with potable water, and then sprayed or swabbed with a 5 percent sodium hypochlorite disinfecting solution prior to installation.

Water mains under construction that become flooded by storm water, runoff, or ground water shall be cleaned by draining and flushing with metered potable water until clear water is evident. Upon completion, the entire main shall be disinfected using a method approved by the Engineer.

Liquid Chorine (Gas)

A. Only vacuum-operated equipment shall be used. Direct-feed chlorinators, which operate solely from gas pressure in the chlorine cylinder, shall not be permitted. The equipment shall incorporate a backflow prevention device at the point of connection to the potable water source used to fill the line being tested.

B. The chlorinating agent shall be applied at the beginning of the system to be chlorinated and shall be injected through a corporation stop, a hydrant, or other approved connection to ensure treatment of the entire system being disinfected.

C. Only a certified, licensed chlorination and testing contractor shall perform gas chlorination work. The chlorination contractor must also possess a Grade II Treatment Plant Operator Certification from the State of California if required by the Engineer.

Sodium Hypochlorite Solution (Liquid)

A. Sodium hypochlorite solution shall be used for cleaning and swabbing piping and appurtenances immediately prior to installation and for disinfecting all components of connections to the existing system.

B. Sodium hypochlorite solution may be used for the initial disinfection of newly installed water mains. The solution shall be applied at a terminus of the system to be chlorinated using an injector, which can adjust the amount of solution being injected into the piping system. The solution shall be injected in the appropriate concentration to achieve the specified concentration range of chlorine throughout the entire piping system. Where pumping equipment is used in conjunction with an injector, an integral backflow prevention device shall be installed and connected to the potable water supply.

C. Water trucks, pumping equipment, piping, appurtenances and all other equipment in contact with potable water shall be disinfected prior to use.

D. Sodium hypochlorite solution may also be used to increase the total chlorine residual if the concentration from the initial chlorination of the system is found to be low. The solution shall be added to the system in sufficient amounts at appropriate locations to insure that the disinfecting solution is present at a concentration within the specified range throughout the piping system.

The pipeline shall be filled at a rate not to exceed 1,135 liters per minute, or a velocity of 0.3 m per second, whichever is less.

Disinfections shall result in an initial total chlorine concentration of 25-mg/l. This concentration shall be evenly distributed throughout the system to be disinfected.

All valves shall be operated with the disinfection solution present in the pipeline. All appurtenances such as air-vacuum relief valves, blowoffs, hydrants, backflow prevention devices, and water service laterals shall be flushed with the treated water a sufficient length of time to insure a chlorine concentration within the specified range in all components of each appurtenance. (Note the limitations for discharge of chlorinated water outlined below.)

The Engineer will verify the presence of the disinfection solution throughout the system by sampling and testing for acceptable chlorine concentrations at the various appurtenances and/or at the test ports provided by the Contractor. Areas of the system found to be below the specified chlorine concentration level shall receive additional flushing as noted above and/or additional disinfection solution as necessary. (Note the limitations for discharge of chlorinated water outlined below.) Addition of disinfection solution after the initial charging of the line shall be made by either the liquid chlorine (gas) method, or the sodium hypochlorite method as directed by the Engineer.

The chlorinated water shall be retained in the system for a minimum of 24 hours. The Engineer will test the total chlorine residual. The system shall contain a total chlorine residual of not less than 80 percent of the initial total chlorine residual before the 24-hour soaking period began. If the total chlorine residual has decreased more than 20percent, the system shall be soaked for an additional 24-hour period. If the total chlorine residual has not decreased after this additional 24-hour period, the system shall be flushed in accordance with the procedure detailed herein. If the total chlorine residual has decreased, the system shall be flushed in accordance with the procedure detailed herein, and shall be re-disinfected.

Following a successful retention period as determined by the Engineer, the chlorinated water shall be flushed from the system at its extremities and at each appurtenance, using potable water from a source designated by the Engineer. The minimum water velocity during flushing shall be 0.9 meters per second or as directed by the Engineer. Flushing shall continue until the replacement water in the new system is equal in chlorine residual to the potable source of supply as verified by the Engineer. (Note the limitations for discharge of chlorinated water outlined below.)

The Engineer will perform bacteriological sampling and testing as specified herein.

Indiscriminate onsite disposal or discharge to sewer systems, storm drains, drainage courses or surface waters of chlorinated water is prohibited.

The environment, which the chlorinated water is to be discharged, shall be examined by the Engineer. Where necessary, federal, state and local regulatory agencies should be contacted to determine Special Provisions for the disposal of chlorinated water. Any indication that the discharge of chlorinated water may cause damage to the environment shall require

the neutralizing of the chlorine residual by means of a reducing agent in accordance with AWWA C651 and the requirements of this specification.

In locations where chlorine neutralization is required, the reducing agent shall be applied to the water as it exits the piping system. The Contractor shall monitor the chlorine residual during the discharge operations. Total residual chlorine limits in these locations, and for the discharge of chlorinated water from the testing of pipelines to surface waters of the San Diego Region are as follows:

Total Residual Chlorine Effluent Limitations	
30-Day Average	0.002 mg/l
Average Daily Maximum	0.008 mg/l
Instantaneous Maximum	0.02 mg/l

The various methods of dechlorination available can remove residual chlorine to concentrations below standard analytical methods of detection, 0.02 mg/l, which will assure compliance with the effluent limit. The Contractor will perform all necessary tests to ensure that the total residual chlorine effluent limitations listed above are met.

In locations where no hazard to the environment is evident based on the joint examination described above, the chlorinated water may be broadcast for dust control on the surface of the immediate site. Care shall be exercised in broadcasting the water to prevent runoff.

The Engineer will perform bacteriological sampling and testing of all new system installations. The testing methodology employed by the Engineer shall be as set forth in "Standard Methods for the Examination of Water and Waste Water" (current edition). Testing requirements are as set forth in the California Domestic Water Quality and Monitoring Regulations and commensurate with current requirements for surface water testing. The Engineer will analyze the samples for the presence of coliform bacteria and heterotrophic-type bacteria (heterotrophic plate count). The evaluation criteria employed by the Engineer for a passing test sample is as follows:

A. Coliform bacteria: no positive sample, and
B. Heterotrophic plate count (HPC): 500 colony forming units/ml or less.

If the initial disinfection fails to produce satisfactory bacteriological test results, the pipeline system shall be re-flushed and re-sampled. If the second set of samples does not produce satisfactory results, the pipeline system shall be re-chlorinated, flushed, and re-sampled. The chlorination, flushing, and sampling procedure shall continue until satisfactory results are obtained. Re-disinfection and retesting shall be at the Contractor's expense.

Pipes, fittings, valves and all other components incorporated into connections with the existing system shall be spray disinfected or swabbed with a liquid chlorine solution in accordance with AWWA C651 and as specified herein. Upon connection to the main, the line shall be flushed as directed by the Engineer. Disinfection by this method is generally limited to assemblies of 6 m or less in length. Alternate methods such as "predisinfection" prior to installation in accordance with AWWA C651 may be required at the discretion of the Engineer.

VALVE TESTING PROCEDURES

Manufacturer Factory Testing Requirements

The manufacturer shall test each resilient wedge gate valve in accordance with AWWA C509 or AWWA C515, and these Special Provisions, prior to shipping the valve.

Each resilient wedge gate valve shall be hydrotested by the manufacturer after the interior and exterior coatings have been applied and cured.

Each resilient wedge gate valve shall be dry film thickness tested and holiday detection tested by the manufacturer prior to the valve being shipped.

Each resilient wedge gate valve shall be operated from the fully closed to fully open to fully closed positions prior to the completed valve being shipped.

Prior to shipment, the manufacturer shall provide notarized certification that each resilient wedge gate valve supplied has successfully completed the tests required by AWWA, ANSI, ASTM and these Special Provisions.

Each valve shall be shipped with end seals and wrapped in shipping plastic.

Testing Requirements Prior to Installation

Valve testing, shall be provided by either the supplier or the Contractor at no cost to the Engineer. Valves failing to pass the testing regimen specified shall be either replaced or repaired at no cost to the Engineer. Replaced or repaired valves shall be tested as specified in these Special Provisions.

Testing of valves shall not be scheduled until a submittal has been processed and approved by the Engineer.

Valves shall be tested within a 80-km radius of the Engineer's office.

Valves shall be tested in the presence of the Engineer. It is the responsibility of the either the supplier or the Contractor to schedule the witnessing of the testing with the Engineer assigned to the project. Requests for valve testing shall be made to the Engineer 5 working days in advance of the desired testing date.

All valves shall be mil thickness tested, holiday detection tested and hydrotested by either the supplier or the Contractor prior to installation in the field. Generally, the valves will be tested at the supplier's facility prior to shipment to the field.

A representative sample of resilient wedge gate valves on a project may be selected for testing by the Engineer. The Engineer shall indicate on the approved submittal when resilient wedge gate valves have been selected for testing.

The procedures and requirements for the testing of valves shall be as described in these Special Provisions. Butterfly valves shall be required to pass all tests prior to being incorporated into the project. When selected for testing, resilient wedge gate valves shall be required to pass the Hydrotesting phase in accordance with these Special Provisions.

Valves not passing the tests required shall be replaced or repaired at the discretion of the Engineer. Replaced valves shall be in accordance with these Special Provisions. Repaired valves shall repeat the phase of the required testing, which was failed in addition to the phases not yet completed. Repaired valves, may be rejected and required to be replaced if it repeatedly fails any phase of the testing.

Testing Media

The testing media for hydrostatic testing shall be an approved source of potable water. Testing with a gaseous media shall be prohibited.

Testing Equipment Furnished by the Supplier or Contractor

The supplier or the Contractor shall furnish all necessary manpower and hydrotesting equipment, including test pump, hoses, gages, blind flanges and a safe means of turning the valves over. Insufficient manpower, substandard or unsafe equipment shall be ground for the Engineer to cancel the testing until adequate manpower and acceptable equipment have been provided.

Testing of valves shall be in the following order:

A. Pre-Test Inspection
B. Hydrostatic Test
C. Dry Film Thickness Test
D. Holiday Detection Test

Pre-Testing Inspection

On the date and time agreed the Engineer shall travel to the testing site. The testing site must be within a 80-km radius of the Engineer's office.

The Engineer responsible for the project will receive one copy of the valve submittal. The Engineer shall take the submittal to the testing site to verify the valves to be tested correspond to those on the approved submittal.

Upon arrival at the testing site, the Engineer shall assess the readiness of the tester's personnel to perform the testing. If there is not sufficient manpower and equipment present to perform the tests in a timely manner, the Engineer is to cancel the testing scheduled for that day. The Engineer is to inform the tester of the reason(s) for canceling the test and instruct the tester to reschedule the testing.

Visually inspect each valve (class and configuration), operation of valve, and it's actuator for compliance with the submittal. Valves not in compliance with the approved submittal shall be rejected.

Visually inspect each valve for obvious damage or substandard construction. Valves found to be damaged or of substandard construction shall be rejected. Record the model and serial number of each valve and its actuator on the Valve Inspection Record Sheet.

Hydrostatic Testing Procedures

Each valve shall be tested on both sides at its rated pressure. During the hydrostatic test, there shall be no leakage through the valve body, end joints, or shaft seals, nor shall any part of the valve be permanently deformed.

The testing medium shall be water. Under no circumstances is a gas to be used as the test medium.

The test duration on each side of the valve is 15 minutes. The test equipment will be disconnected during this time.

Valves require careful handling when turning them over. The Engineer shall stop the testing activity if the manner used by the tester to handle the valves is unsafe or will result in damage to the valve. The flange faces are especially susceptible to damage if the valve is not properly handled.

Valves exhibiting no visible leakage, no decrease in the initial test pressure or no deformation shall be considered passed.

Valves exhibiting visible leakage a decrease in the initial test pressure or deformation shall be considered rejected. Valves, which fail the hydrotest test, shall be either repaired or replaced at the Engineer's discretion.

Personnel authorized by the valve manufacturer shall only repair valves permitted by the Engineer to be repaired. Unless the valve manufacturer has authorized them, supplier or contractor personnel shall not be permitted to perform repairs.

Indicate on the Valve Testing Sheet the results of the hydro test.

Dry Film Thickness Testing Procedure

The dry film thickness gage shall be calibrated prior to beginning the taking of the mil readings and periodically during the testing. Use plastic shims or standardized plates and follow the instructions provided with the instrument.

A minimum of four readings should be taken on each side of the disc and a minimum of three reading on each side of the interior of the valve body. Some readings should be taken near edges and around intricate assemblies are where the coating is likely to be thin.

Mark the spot and mil reading at each location where the reading were taken with a felt tip pen. More readings many be taken at the discretion of the Engineer.

The minimum dry film thickness of any reading shall be a minimum 0.2 mm. Mark with felt pen any location where the coating thickness is less than minimum dry film thickness required.

Valves with adequate coating thickness shall be considered passed and the results indicated on the valve testing form. Proceed to the Holiday Detection phase of the testing.

Valves with inadequate coating thickness in any location shall be rejected. Qualified personnel approved by the valve manufacturer shall repair valves with unacceptable coating in accordance with the valve manufacturer's recommendations in a facility.

Holiday Detection Testing Procedure

The interior surface of each valve shall be tested in accordance with NACE Standard RPO490-90, (Holiday Detection of Fusion-Bonded Coatings) and NACE Standard RPO274-98, (High Voltage Electrical Inspection of Pipeline Coatings) using a high voltage as described above.

Assure the instruments to be used are properly calibrated, batteries charged, and in proper working order prior to use.

High-Voltage Holiday Detector set-up:

A. Select output voltage (on the detector) to the desired setting. Use 100 volts per mil thickness. The 8-mil thickness specified requires a setting of 800 volts.
B. Connect the ground wire to the valve to be tested. Assure a sound metallic contact is achieved. Plug the ground wire into the detector.
C. Select the appropriate powerpack, wand length, and electrode (stainless brush or rubber paddle) to be used. Assemble the powerpack, wand electrode and plug the assembly into the high voltage port on the detector.
D. Turn the detector switch on. An audible tone will be heard if the instrument is ready to use. Verify the working of the instrument by running wand across the ground bare metallic surface of the valve. A buzz tone will be heard.

The surface to detected should be dry. A wet surface will "carry over" a holiday in an area.

Cover all surface area with the electrode in a slow thorough motion, testing all interior coated surfaces. Most holidays are found on or around casting numbers, nuts, bolts, and sharp edges. When a holiday is detected, circle area with a black permanent felt pen.

Valves with no holidays in the coating shall be considered passed and the results indicated on the Valve Testing Sheet. Proceed to the Hydrotesting phase of the testing.

Valves with holiday(s) in the coating in any location shall be rejected. Qualified personnel approved by the valve manufacturer shall repair valves with unacceptable coating in accordance with the valve manufacturer's recommendations in a facility. Indicate on the Valve Testing Form that the valve failed this portion of the test.

Reporting and Marking

The Engineer shall record the results of each phase of the testing of each valve on the Valve Testing Sheet.

The Engineer shall mark the flange of each side of the valve to indicate the results of the test. The required marking convention is shown on the Valve Testing Sheet.

Marking shall be made using a white metal marker.

The markings should be made on the portion of the valve flange that will be readily visible in the field. For valves to be used in buried service, the markings should be oriented toward the top of the trench.

The Engineer shall visually check each valve in the field for proper markings prior to installation. Any valve not displaying the proper markings shall be immediately rejected and the contractor instructed to remove it from the site.

10-4.02. WATER SYSTEM RELOCATION

GENERAL DESCRIPTION

Relocate 100 mm water pipe along State Route 188 and a 50 mm water line transverse State Route 188 at Thing Road. The relocated 100 mm water pipe will rejoin the existing water pipe at the southern end incorporating a 100 mm gate valve and at the northern end incorporating a 100 mm gate valve. The 50 mm water line, served from the 100 mm water pipe, crosses State Route 188 and rejoins the existing line incorporating a 50 mm gate valve. Valve material shall comply with Section 212-2.2.2, Utility Standard Specifications.

CONNECTIONS TO EXISTING WATER MAINS

Unless otherwise indicated on the plans or specifically directed by the Engineer, all connections to existing facilities, including wet taps on active pipelines and cut-in installations, shall be performed by the Contractor. When the plans indicate wet taps or cut-in installations are to be performed by Contractor, such work shall be performed in strict accordance with the following procedures. The Engineer must approve all work performed by Contractor prior to allowing access to the work site by Utility Owner personnel.

The Contractor shall furnish the tapping sleeve or tee, valves and all other materials as called for on the plans or as required for completion of the work and in accordance with the Approved Materials List. The Contractor shall provide all equipment and labor required for the excavation and installation of the connection including but not limited to thrust blocks, backfill and pavement replacement. In certain circumstances the Contractor may be required to provide a water truck, high line, and fittings as part of the equipment for making the connections. In addition, the Contractor shall assist the Utility Owner in alleviating any hardship incurred during a shutdown for connections. Emergency standby equipment or materials may be required of the Contractor by the Engineer.

The tapping machine shall have the ability to positively flush all shavings and other residue created when installing tapped outlets of 100 mm or larger.

The shell cutter bell on the tapping machine shall be tapped with a 50 mm minimum outlet.

A ball valve shall be installed on the outlet to regulate flow.

A hose and filter shall be connected to the ball valve to retrieve shavings and residue generated during the tapping process.

A multi-toothed shell cutter is required to minimize the size of shavings generated when tapping PVC pipe. The shell cutter pilot tool shall be designed to capture the coupon generated by performing the wet tap.

The tapping machine shall be filled with water prior to commencing the tapping procedure.

Wet taps or cut-in tee and valve installations shall be performed as follows:

Prior to construction, Contractor shall pothole the existing pipe at the location of the proposed connection. The Engineer shall inspect the pothole prior to Contractor's repair of trench. Contractor shall record the following information on As-Built drawings:

A. Pipe size, outside diameter.
B. Pipe type such as ACP, PVC, Ductile-Iron or Steel.
C. Pipe class and/or pressure rating.
D. Elevation, grade, and alignment.
E. Location of collars, pipe bells, fittings or couplings, if found.
F. Potential conflicts with existing utilities.

The new pipeline shall have successfully passed pressure testing, disinfection, and bacteriological testing in accordance with these Special Provisions prior to proceeding with the connection to the existing pipeline.

After the Engineer has given approval to proceed with the connection, the Contractor shall schedule with the Engineer for the wet tap or cut-in installation.

A. Shutdowns will be scheduled at the convenience of the Utility Owner. Shutdowns may be scheduled for nights or weekends if required.
B. The Contractor shall give the Engineer a minimum of five (5) working days notice prior to any proposed excavation or shutdown of existing mains or services. Scheduling shall be subject to approval by the Engineer.
C. The Engineer may postpone or reschedule any shutdown operation if, for any reason, the Engineer believes that the Contractor is improperly prepared with competent personnel, equipment, or materials to proceed with the connection.

D. If progress in completing the connection within the time specified is inadequate, the Engineer may order necessary corrective measures. Corrective measures may consist of directing Utility Owner personnel or another contractor to complete the work. All costs for corrective measures shall be borne by the Contractor.

Contractor may proceed with excavation only when pothole has been completed, materials have been approved and delivered, wet tap or cut-in installation has been scheduled and a copy of the approved traffic control plan has been supplied to the Engineer.

A. The Contractor shall saw-cut pavement, excavate and provide and install shoring and steel plating, when necessary, one day prior to the wet tap or cut-in installation.
B. The Contractor shall provide lights, barricades and traffic control in accordance with the agency of jurisdiction and as deemed necessary for the excavation by the Engineer.
C. The Contractor shall de-water existing mains where cut-in installations are required in the presence of the Engineer. The Contractor shall be prepared to deal with leaking valves and water from those valves to complete the shutdown. Only Utility Owner personnel are authorized to operate existing valves. The Contractor shall be responsible for any and all damage resulting from unauthorized operation of existing facilities.
D. In areas where cut-ins are to be performed the Contractor shall line the bottom of the trench with 300 to 450 mm of 19 mm rock and install a 300 to 400 mm deep sump for dewatering the trench bottom.
E The Contractor shall perform the following work for wet taps and cut-in installations:

1. Wet taps: Disinfect and install the tapping saddle and tapping valve and perform tapping operations in accordance with these Special Provisions.
2. Cut-ins: Cut and remove portions of existing mains, and disinfect and install tees, valves, couplings, and appurtenances required to complete the closure. The Contractor shall discard pipe and appurtenances removed from service in accordance with the Special Provisions.

F. After the Contractor has performed tapping or cut-in operations, and the Engineer has given approval to proceed, the Contractor shall complete the installation as shown on the plans in accordance with the Special Provisions including, but not limited to:

1. Disinfecting and installing the pipe section(s) necessary to make the closure to the new system.
2. Installing and setting the valve gate well(s) in accordance with the plans.
3. Installing thrust and anchor blocks.
4. Completing all backfill and compaction of the trench.
5. Repairing or replacing pavement as necessary in accordance with agency of jurisdiction requirements.

BEDDING FOR WATER PIPE

Bedding to the spring line shall be placed at approximately the same elevation on each side of the pipe to prevent unequal loading and displacement of the pipe. Bedding shall be a minimum of 150 millimeters below the bottom of the water pipe.

Bedding material shall be the same as "Sand Bedding" listed elsewhere in these Special Provisions.

BACKFILL

The trench backfill shall be placed and mechanically compacted. Compaction shall conform to the Section 19-5, "Compaction," of the Standard Specifications, as shown on the plans and these Special Provisions.

Compaction shall be accomplished by mechanical means. Consolidation by water settling methods such as jetting or flooding is prohibited.

If the backfill fails to meet the specified relative compaction requirements; the backfill shall be reworked until the requirements are met. All necessary excavations for density tests shall be made as directed by the Engineer, and as acceptable to the Engineer. The requirements of the Agency having jurisdiction shall prevail on all public roads.

Compaction tests shall be performed at random depths, and at random intervals not to exceed 45 m, as directed by the Engineer.

Relative compaction shall be determined by the impact or field compaction test made in accordance with ASTM D 1557 Procedure C.

Unless otherwise shown on the plans or otherwise described in the specifications for the particular type of pipe installed, relative compaction in pipe trenches shall be as follows:

A. Pipe zone – 90 percent relative compaction.
B. Trench zone – 90 percent relative compaction.
C. Structural section in paved areas - per agency requirements, 95 percent minimum.
D. Imported Granular Material for over excavation or foundation stabilization – 90 percent relative density.

All excavations are subject to compaction tests.

Imported Granular Material, Sand Bedding:

Imported granular material shall be used within the Pipe Zone for installations of PVC Pressure Pipe, Ductile-Iron Pipe, Cement-Mortar Coated Steel Pipe, Tape-Wrapped Steel Pipe, and Paint-Coated Pipe.

Crushed Rock shall be used in the Pipe Zone on PVC Pipe. Crushed rock shall be clean, crushed stone free of organic matter. Crushed rock shall be certified to contain less than 1 percent asbestos by weight or volume and shall conform to the following gradation and requirements:

Sieve Size	Percent Passing
25 mm	100
19 mm	90-100
12.5 mm	30-60
9.5 mm	0-20
4.75 mm	0-5
2.36 mm	0

Tests	California Test	Requirements
Loss in Los Angeles Rattler (after 500 revolutions	211	
100 Revolutions		15 % Max
500 revolutions		52 % Max

Native materials may not be used in lieu of Imported Granular Material within the trench zone unless such materials meet all of the requirements specified for Imported Granular Material within the pipe zone.

Sand-cement slurry shall consist of two sacks, 85.3 kg of Portland cement per 0.76 cubic meter of sand and sufficient moisture for workability. Approval from the Engineer is required for use of slurry as a backfill material.

Filter fabric shall be manufactured from polyester, nylon, or polypropylene. Material shall be of non-woven construction and shall meet the following requirements:

Grab tensile strength (ASTM D 4632)	45.4 kg minimum for a 25 mm raveled strip
Weight (ASTM D 3776)	152.6 kg/m^2
Apparent opening size (ASTM D 4751)	0.150 mm

Imported granular material shall be free of organic material. The coefficient of uniformity shall be 3 or greater. The material shall be quarry waste or sand. Material shall have a sand equivalent of not less than 30 per ASTM D 2419 and shall conform to the following gradation:

Sieve Size	Percent Passing by Weight
13 mm	100
1 mm	90-100
No. 4	50-100
No. 8	10-60
No. 30	25-60
No. 100	5-20
No. 200	0-12

Sand bedding material shall be placed along the length of the pipe to 150 millimeters above the top of pipe. The Contractor shall use mechanical vibration of the bedding to obtain 90 percent relative density.

Backfill

The trench backfill shall not contain more than 15 percent by volume of clay or adobe. A maximum of 15 percent shall pass a No. 200 sieve. The material shall be at optimum moisture content and shall be compacted in maximum 150 millimeters deep uniform layers on each side of the pipe. Backfill shall be complete prior to hydrostatic tests on the water mains and casings unless otherwise specified or permitted by the Engineer.

Trench backfill shall be compacted to obtain 90 percent relative compaction. For areas within roadways, the top 300 mm shall be compacted to 95 percent relative compaction.

Water consolidation shall not be used.

The use of a backhoe mounted compaction wheel is prohibited within the sand bedding.

Should evidence of pipe settlement be observed during any stage of backfilling by mechanical means, such operations shall be immediately discontinued and the remainder of backfilling in the affected portions of the trench shall be backfilled by methods as approved by the Engineer.

WATER MAIN REMOVAL AND DISPOSAL OF ABANDONED WATERLINE

Existing water mains to be removed shall be removed and disposed of. Attention is directed to "Disposal of Friable Asbestos" and "Disposal of Non-Friable Asbestos" elsewhere in these Special Provisions. All resulting openings shall be plugged with minor concrete.

Before excavating for new water pipes that are to replace existing pipes or services, the Contractor shall make provisions for the continuation and maintenance of service to customers as directed by the Engineer.

Abandonment or removal from service of existing water pipes, appurtenances or water services shown on the plans or as called for by the Engineer shall be as indicated below and in accordance with the Special Provisions. All materials removed during construction operations shall be salvaged or disposed of.

Existing pipe 100 mm and smaller that are to be abandoned in place shall have a short section of pipe removed and pipe ends plugged with concrete.

Water services to be removed shall be removed in accordance with the plans.

Pipelines shall not be removed until their use is no longer required. The Contractor shall notify the Engineer in advance of any intended pipeline abandonment.

Existing pipe and appurtenances to be removed by excavation shall be removed from the ground as indicated on the plans or as directed by the Engineer. All materials removed during construction operations shall be salvaged or disposed of.

Removal of asbestos-cement pipe (ACP) and appurtenances shall be in accordance with all applicable State and Federal requirements.

Backfill, compaction, and surface repair of all excavations for removal of pipe and appurtenances shall be made in accordance with the plans and the Special Provisions.

When the Contractor is required to remove existing pipe and appurtenances, or portions thereof from the ground, such materials may at the discretion of the Engineer, be considered salvage. All valves shall be salvaged and returned to the Utility Owner. All materials identified as salvage are considered property of the Utility Owner.

The Contractor shall remove and temporarily stockpile all materials identified as salvage in a safe location that will not disrupt traffic or shall deliver salvage to the Utility Owner's Field Operations Yard as directed by the Engineer.

The Contractor shall legally dispose of all other materials in an appropriate manner. Disposal is the responsibility of the Contractor. Obtain concurrence from the agency having disposal jurisdiction with respect to disposal sites and transportation methods.

Removal of water pipes shall include valves with valve box and cover. Valves to be removed shall be removed entirely with the valve box and cover.

All material from the removed water pipes and its appurtenances, except valves, shall become the property of the Contractor at the time of its removal from the trench, unless otherwise specified or shown on the plans. Such material shall not be allowed to accumulate along the line of work, but shall be removed from the area at the earliest practical time.

PIPE LAYING-GENERAL

Pipe laying shall conform to the State Standard Specifications and these Special Provisions. The pipe shall be laid in accordance with the manufacturer's recommendations, and shall be laid to the lines and grades shown on the plans except as amended and supplemented by the manufacturer's tabulated layout schedule and approved by the Engineer. Internal bracing installed at fabrication shall be maintained until pipe zone compaction is complete.

Necessary facilities, including slings, shall be provided by the Contractor for lowering and properly placing the pipe sections and fittings in the trench without damage.

Trenches shall be in a reasonable dry condition when pipe is laid. The Contractor shall take all necessary precautions to prevent the pipe from floating due to water entering the trench from any source, and he shall assume full responsibility for any damage due to this cause.

When the exterior joint weld is less than a complete circumferential weld extreme caution shall be exercised to assure that there is no damage to the rubber gasket in the pipe joint. The Engineer reserves the right to limit the size of welding rod and the thickness of pass as well as control of amperage used for making the welds. Where joints on the existing pipe are to be field welded, the mortar on the entire joint shall be removed, cleaned and refilled with mortar after welding is completed.

Bedding shall provide uniform and adequate longitudinal support under the full length of pipe. Bell holes at each joint shall be provided to permit the joint to be assembled properly while maintaining uniform pipe support.

All connecting parts of the pipe, rings, couplings, and fittings shall be cleaned before assembly, shall be tightly fitted together and care taken to secure true alignment and grade.

The rubber gasket joint shall be made by properly lubricating the rubber gasket with a suitable vegetable compound soap before it is placed in the groove at the spigot end. The gasket shall be stretched over the spigot end of the pipe and carefully seated in the groove, with care taken to equalize the stress in the gasket around the circumference of the joint. The gasket shall not be twisted, rolled, cut, crimped, or otherwise injured or forced out of position during the closure of the joint. A "feeler" gage shall be used to check the position of the rubber gasket after the joint has been telescoped.

The Contractor shall keep the pipe and appurtenances clean during the progress of the work. Dirt, rocks, or other foreign materials shall be removed from the interior of the pipe before and during installation. All openings in the pipeline shall be closed at the end of each day's operations or whenever the workmen are to be absent from the work area. This may require the use of a plywood or steel bulkhead. All surface or groundwater shall be prevented from entering the pipe and shall be removed from the trench.

Each section of pipe shall be carefully lowered into the trench using slings in such a way that the coating and lining are not damaged by flexure or abrasion. The spigot shall be entered into the bell or collar and forced home. The joint shall be made carefully to avoid undue stressing of, or impact damage to, the pipe and gasket, and stabbing as a method of installation will not be permitted. Unless otherwise detailed on the plans, pipe shall not be set on blocks of any kind (including wood) in the trench bottom. If blocking becomes necessary, bags filled with sand may be placed under the pipe. These bags shall be broken after the haunches are packed.

The pipe shall not be dragged along the bottom of the trench, but shall be securely supported by the slings until the joint is assembled. Each spigot shall be inserted into the bell or collar the distance shown on the approved fabrication drawings so as to avoid cumulative gain or loss of laying length.

Suitable excavations shall be provided in the bedding material for removal of the slings, without damaging the coating, after assembly of the joint. These sling removal holes shall be filled, the pipe length securely blocked in its proper alignment, and the pipe barrel partially backfilled.

Unless the sheeting or shoring is to be cut off and left in place, densification of bedding for pipe shall be accomplished after the sheeting or shoring has been removed from the bedding zone. Alternate methods of pipe bedding, which are recommended by the pipe manufacturer, may be used if approved by the Engineer.

All joints shall be cleaned with a wire brush and welded before coating repair. All jetting locations shall be sufficient to thoroughly saturate the bedding material around the pipe.

DISPOSAL OF ASBESTOS

Disposal of Non-Friable Asbestos

Disposal of non-friable asbestos-containing materials shall be in accordance with the County of San Diego Guidelines. Guidelines may be obtained at the Solid Waste Division, County of San Diego, Public Works Division, Building 2, 5555 Overland Avenue, San Diego, CA 92123.

Full compensation for the disposal of non-friable asbestos containing materials shall be considered as included in the contract unit price paid for remove pipeline and no separate payment will be made therefore.

Disposal of Friable Asbestos

All friable asbestos containing materials (materials that can be crumbled, pulverized, or reduced to powder in hand) are regulated as a hazardous waste and shall be transported by a licensed hazardous waste hauler and disposed of in an appropriate landfill.

Full compensation for the disposal of friable asbestos-containing materials shall be considered as included in the contract unit price paid for remove pipeline and no separate payment will be made therefore.

DELIVERY, STORAGE, AND HANDLING OF POLYVINYL CHLORIDE (PVC) WATER PIPE

Polyvinyl chloride pressure pipe shall be stored in the field by supporting the pipe uniformly as specified in AWWA Manual M23. Do not stack pipe higher than 1.2 m or stack the pipe with weight on the bell ends. Cover stored PVC pipe to protect it from the sun's ultraviolet radiation.

Overly faded pipe, which is determined by the Engineer to be of suspect quality shall not be used and shall be removed from the project site immediately. PVC pipe, which has been gouged, shall not be used. PVC pipe, which has received minor scratches during handling, may be used solely at the discretion of the Engineer. Pipe which has been contaminated with any petroleum products (inside or outside) shall not be installed.

PVC pipe shall be installed in the trench using bell holes at each joint to prevent the pipe from being supported by the bell end or coupling. The identification strip marking shall be continuously aligned on the top of the installed pipe.

A 2 m section of PVC pipe shall be used into and out of all fittings and valves.

Where pipe sections less than the standard pipe lengths are required, the pipe sections shall be installed in accordance with the manufacturer's installation guide.

Installation of pipe shall not vary more than 30 mm vertically or 35 mm horizontally from the alignment shown on the approved plans.

Cutting and milling shall be accomplished with tools intended for such use to create a machined end equal in workmanship to the milled ends of the pipe as furnished by the manufacturer. Milling shall not result in undercutting the wall thickness and must be approved by the Engineer prior to installation.

A cleaning tool approved by the Engineer shall be pulled through the pipe during installation to remove dirt, rocks, or foreign materials. The tool shall be designed to fit closely without damaging the pipe during the cleaning operation. The tool shall be examined as it is pulled up to the end of each joint of pipe and any foreign material shall be removed. All openings in the pipeline shall be sealed to protect the pipe from the intrusion of groundwater or any other foreign material at all times.

All connecting parts of pipe, rings, coupling and castings shall be clean before assembly. Assembly of the couplings and rings shall be in accordance with the manufacturer's recommendations. Lubricant and rubber rings shall be supplied by the pipe manufacturer. The use of excessive lubricant will not be permitted.

After the spigot end has been inserted into the bell or coupling to the proper insertion mark the elastomeric ring shall be checked for grooving or improper assembly by passing a feeler gauge around the completed joint.

Bronze saddles shall be used on all 25 mm and 50 mm services or appurtenance connections. Saddles shall be located a minimum of 0.6 m from any pipe joint, and from other saddles or fittings. Multiple saddles installed on the same side of a single pipe length shall be staggered 30 degrees so as not to form a weak line in the pipe. Tapping tools and shell cutters of the kind and type recommended by the manufacturer shall be used. Saddles shall be installed to manufacturers' specified torque.

Tapping saddles shall be installed a minimum of 0.6 m from the edge of the saddle to any other saddle, pipe joint or other fitting. Multiple taps of 150 mm or larger shall not be made in the same joint of pipe without the approval of the Engineer.

The entire exterior surface area of valves and fittings shall be coated with 20 mils of lap cement and wrapped in 8 mils thick polyethylene sheet plastic.

DELIVERY, STORAGE AND HANDLING OF VALVES

Valves shall be delivered and stored in accordance with AWWA C550. The port openings shall be covered with plastic, cardboard, or wood while in transit and during storage in the field. These shall remain in place until the valve is ready to be installed. Valves shall not be stored in contact with the ground. Valves shall not be stacked.

INSTALLATION OF VALVES

Valves shall be installed with the bolt holes straddling the centerline of the pipe and the operating nut in the vertical position. Joints shall be cleaned as listed elsewhere in these Special Provisions. Valves shall be installed in accordance with the manufacturer's recommendations and in accordance with applicable specifications for the pipe material and joint type being used for the valve and water mains.

HI-LINE

All hi-line, fittings and service connections shall be furnished, installed and connections made by the Contractor.

The Contractor shall be responsible for disinfecting all hi-line, connections, flushing and assisting in taking water samples for bacteriological tests. Refer to disinfection and bacteriological test procedures listed elsewhere in these special provisions.

Following disinfection and acceptance of the hi-line as a potable water system, the Contractor shall maintain continuous service through the hi-line piping to all consumers normally served, both directly and indirectly, by the pipeline. Upon completion of the work, the hi-line piping shall be removed or abandoned by the Contractor.

The hi-line shall be installed in such a manner that it will not present a hazard to traffic and will not interfere with access to homes and driveways along its route.

All pipe, valves, fittings, hose and connections furnished by the Contractor shall be of good quality, suitable for conveying potable water. Only hot dipped galvanized pipe and fittings or Schedule 80 polyvinyl chloride (PVC) pipe shall be used for hi-line piping. All polyvinyl chloride piping must be labeled "N.S.F." tested for a potable water system.

TEMPORARY BLOW-OFFS

The Contractor shall install temporary caps, plugs, thrust blocks, and temporary blow-offs for testing water mains**.** Caps and plugs installed by the Contractor to temporarily close the ends of new mains adjacent to points of connections shall contain 50 mm outlets with corporation stops. Corporation stops shall protrude free from thrust blocks and be available for use in relieving pressure in the mains prior to connecting. Caps and outlets will be the property of the Contractor and may be claimed after connections are made.

After testing, the Contractor shall supply and install the connections and equipment necessary to convey the discharge water to a storm drain adequate for the discharge volume.

If the new water main is to be installed and tested in sections, caps and plugs installed by the Contractor to temporarily close the ends of each section of new water main shall contain 50 millimeters outlets with gate valves. Valves shall protrude free from thrust blocks and be used for testing and relieving pressure. Valves, outlets and thrust blocks used for the temporary blow-off shall remain the property of the Contractor and be entirely removed before connecting the pipeline to an adjacent section.

GASKETS

Rubber-ring gaskets shall comply with AWWA C200 according to the applicable joint type and pressure rating of the piping system and shall be suitable for potable water service.

Flange gaskets shall comply with AWWA C207. Flange gaskets shall be 3.18 mm thick acrylic or aramid fibers bound with nitrile for all sizes of pipe. Gaskets shall be full-face type with pre-punched holes or ring-type extending to the inner edge of the bolt circumference of the flange.

In the event of encountering organic solvents or petroleum products during the course of the work, alternate gasket materials or joint treatment will be required as directed by the Engineer.

All rubber gaskets shall be bonded along the entire buried length of metallic pipe.

BOLTS AND NUTS

Bolts and nuts shall be as indicated below and shall be selected from the Approved Materials List.

Cadmium-plated, zinc-plated or fluoropolymer coated bolts and nuts shall be used for the installation of pipelines up to 500 mm diameter and shall be carbon steel conforming to ASTM A307, Grade A, unless otherwise indicated on the plans. Bolts shall be standard ANSI B1.1, Class A coarse threads. Nuts shall be standard ANSI B1.1, Class 2H coarse threads.

Stainless steel bolts and nuts shall be used for the installation of pipelines 600 mm diameter and larger and for submerged flanges. Bolts and nuts shall be Type 316 stainless steel conforming to ASTM A193, Grade B8M for bolts, and Grade 8M for nuts.

All bolt heads and nuts shall be hexagonal, except where special shapes are required. Bolts shall be of such length that not less than 6.4 mm or more than 12.7 mm shall project past the nut in tightened position.

All bolts and nuts shall be new and unused. Bolts and nuts shall be cleaned, if needed, by wire brushing and lubricated prior to assembly.

Tighten nuts uniformly and progressively.

Buried bolts and nuts shall receive a heavy coat of protective grease coating selected from the Approved Materials List prior to being wrapped with polyethylene.

All stainless steel bolts shall be coated with an anti-seize compound selected from the Approved Materials List.

Bolts and nuts shall not be reused once tightened. Used bolts and nuts shall be discarded and removed from the job.

FIELD PAINTING AND COATING

The Contractor shall provide notice 3 working days in advance of field operations involving surface preparation and coating application.

The Engineer will determine compliance of the preparation of the shop and field prepared surface.

Notify the Engineer 48 hours in advance of field operations involving surface preparation and coating application.

The Engineer will inspect shop-and field-prepared surfaces. The Contractor shall not proceed with paint application until the surface preparation has been approved by the Engineer.

The Engineer will inspect application of all prime, intermediate, finish, and touch-up coatings to verify the integrity of the coating and compliance with the specifications. Each coating application will be checked and deficiencies marked. Items exhibiting an improper finish or color, or insufficient surface preparation or dry film thickness shall be prepared as necessary and corrected, utilizing the specified paint materials to obtain compliance.

In addition to touch up painting and coating, all metallic appurtenances of the elements not protected from corrosion by another system shall be painted with a two part coating. The Engineer will inspect application of all touch up, primer, intermediate and finish coatings to determine the integrity of the coating and compliance with the required dry film thickness. Each coating application will be checked and deficiencies marked. Items exhibiting an improper finish or color, or insufficient surface preparation or dry film thickness, shall be prepared as necessary and corrected, utilizing the specified paint materials to obtain compliance.

Under no circumstances shall the specified paint materials be used where they may come in contact with the public water supply or for buried installations. Those products are intended for exposed exterior use only.

All colors and shades of colors of all coats of paints and protective coating material shall be as selected by the Engineer. Each coat shall be of a slightly different shade, as directed by the Engineer, to facilitate inspection of surface coverage of each coat.

Color Schedule

The following tables designate the color coding and type of paint which shall be used to identify potable and recycled facilities. A description of specific paint types to be used can be found in the Approved Materials List.

ITEM	COLOR	PAINT TYPE
Fire Hydrant	Safety Yellow	Silicone Alkyd
Blow Off Box Lids	Safety Yellow	Silicone Alkyd
Gate Well Lids- Potable Valves Acrylic Latex	Safety Yellow	Waterbase
Gate Well Lids- Fire Hydrant Valves Acrylic Latex	White	Waterbase
Air/Vac Assemblies	Safety Yellow	Silicone Alkyd
Air/Vac Enclosures	Chocolate Brown	Fusion
Water Test Station Enclosures Bonded Polyester	Chocolate Brown	Fusion
Protector Posts	Safety Yellow	Silicone Alkyd
Vault Piping Machine	Gray	Silicone Alkyd
Above Ground Piping Machine	Gray	Silicone Alkyd
Normally Closed Valve	Safety Red	Silicone Alkyd

The following items or materials are not to be field painted unless specifically required elsewhere in the Special Provisions:

A. Buried mortar-coated pipe and fittings
B. Stainless steel
C. Interior surfaces of valves, fittings and pipe
D. Nameplates
E. Grease fittings
F. Brass, copper or bronze, except as required for reclaimed water system identification.
G. Buried pipe and appurtenances, except as required in the piping specifications.

Painting:

Paint, coating products and color selections shall be selected from the table above and the Approved Materials List.

All materials of a specified painting system, including primer, intermediate and finish coats, shall be produced by the same manufacturer.

Additives shall be used only as recommended by the paint manufacturer and as permitted by the Engineer.

Deliver all paint products to the job site in the original, unopened containers.

Coating systems shall be as follows:

Silicone-Alkyd Enamel Paint System:

All materials of a specified system including prime, intermediate, finish, and touch-up coats shall be provided by the same manufacturer in accordance with the Approved Materials List. Thinners, cleaners, driers, and other additives shall be as recommended by the coating manufacturer for the specified system.

Primer: Field-applied, single-component, VOC-compliant, solvent-curing primer. The primer shall be as recommended by the manufacturer for the substrate to be painted with the silicone alkyd enamel finish paint. Intermediate primer coats may be required by the manufacturer of the painting system.

Intermediate and Finish Coats: The silicone alkyd finish paint shall be an industrial-type single-component, high-solids, high-gloss, VOC-compliant, lead-free alkyd enamel. The silicone alkyd paint shall contain 30 percent silicone and a minimum 47 percent solids by volume. The silicone alkyd paint system to be used shall be easily applied by brush, roller or spray. The silicone alkyd enamel system shall be used as a protective coating and for applying color code identification to the exterior of potable and recycled water facilities.

Waterborne Acrylic Latex Painting System:

All materials of a specified system including prime, intermediate, finish, and touch-up coats shall be provided by the same manufacturer selected from the Approved Materials List. No solvent-based thinners, cleaners, driers and other additives are required for this painting system.

The water facility items requiring color code identification with this paint system can be found under Color Schedule shown above.

100 percent waterborne acrylic latex paint shall be a rapid-drying paint, resistant to weather and abrasion, containing a minimum of 100 percent solids by volume. The waterborne acrylic latex painting system shall be used to apply color code identification to fire hydrant valve gate well lids.

If any of the following minimum conditions are present, the application of coatings shall be delayed or postponed until conditions are favorable.

A. During rain, fog, or mist, or when the relative humidity exceeds 80 percent.
B. When the surface to be coated is wet, moist, or contaminated with any foreign matter.
C. When the surrounding air temperature or the temperature of the surface to be coated is below 4 ˚C.
D. When the temperature of the surface to be coated is more than 13˚ C below the air temperature or when the surface temperature is 50˚ C or above.
E. When the surface temperature is less than 13˚ C above the dew point or is expected to be within 4 hours after application of coating.
F. If a change in weather conditions results in damage to a newly-applied coating, the affected coatings shall be restored to their specified condition as directed by the Engineer.

Surfaces not to be painted shall be protected as follows:

A. Remove, mask, or otherwise protect hardware, switch plates, aluminum surfaces, machined surfaces, couplings, shafts, nameplates and other surfaces not intended to be painted. Provide drop cloths to prevent paint materials from falling on or marring adjacent surfaces. Protect working parts of mechanical and electrical equipment from damage during surface preparation and the painting process.

Prior to field touch up of shop applied prime coat, prepare the surface per manufacturer's recommendations and as directed by the Engineer. Reapply primer as required to cover all scratched, abraded, or deficient areas.

Do not prepare more surface area than can be coated in the same work day. Surface preparation shall conform to the Steel Structures Painting Council specifications as follows:

Item	Specification
Solvent Cleaning	SP 1
Hand Tool Cleaning	SP 2
Power Tool Cleaning	SP 3
White Metal Blast Cleaning	SP 5
Commercial Blast Cleaning	SP 6
Brush-off Blast Cleaning	SP 7
Picking	SP 8
Near-White Blast Cleaning	SP 10

Wherever the words "solvent cleaning", "hand tool cleaning", "wire brushing", or "blast cleaning" or similar words are used in these Special Provisions or in paint manufacturer's specifications, they shall be understood to refer to the applicable Surface Preparation Specifications of Steel Structures Painting Council listed above.

Surface preparation shall be as recommended by the product manufacturer or as directed by the Engineer in the field. In general, surface preparation shall be either SP1, SP2, or SP3. Water blasting or sandblasting may be utilized as required by field conditions or as directed by the Engineer.

Unless otherwise directed by the Engineer, do not sandblast items that have previously been factory primed or painted.

Application shall be as follows:

A. Work shall conform to the requirements of Steel Structures Painting Council PA-1, "Shop, Field, and Maintenance Painting" unless the recommendations of the coating manufacturer are more restrictive, including the selection of spray equipment, brushes, rollers, mixing, drying time, temperature and humidity limitations during application, and safety precautions. Procedures for the application of coatings will be reviewed by the Engineer.
B. Stir, strain, and keep coating materials at a uniform consistency during application. Where thinning is permitted by the Engineer, do not reduce the coating material more than is necessary to obtain the proper application characteristics and to obtain the specified dry film thickness. Do not exceed the maximum rate allowed by the manufacturer. Do not flood the coating material surface with thinner prior to mixing. Stir coating materials at all times when adding thinner.
C. Apply each coating evenly, free of brush marks, sags, runs, bridges, shiners, laps or other imperfections and evidence of poor workmanship. Visible areas of chipped, peeled, or abraded paint shall be hand or power sanded, feathering the edges. The areas shall then be primed and finish coated in accordance with the specifications. Finished surfaces shall be free from defects and blemishes prior to final acceptance.

The following items shall be field painted using a silicone-alkyd system and shall be color coded in accord with the specifications utilizing appropriate pigments added to the coating by the manufacturer:

The following items shall be field painted using the silicone alkyd enamel paint system.

A. All recycled water ferrous metal piping and appurtenances, including meters, blowoff-piping, backflow preventers, where located above ground, exposed, or in vaults.
B. All potable water ferrous metal piping and appurtenances where located above ground, exposed, or in vaults.
C. All potable water fire hydrant bodies, blowoff box lids, the exterior of air/vacuum assemblies and protector posts around potable water facilities.
D. All recycled water gate well lids and frames, the exterior of air/vacuum assemblies and protector posts around recycled water facilities.
E. Normally closed valves.

The silicone alkyd enamel painting system shall consist of a prime coat, an intermediate coat (if required) and sufficient finish coats to provide a total dry film thickness of 0.152 mm to 0.203 mm. Apply the coatings in accordance with the manufacturer's recommended film thickness, adding finish coats as necessary to meet the minimum total dry film thickness specified above.

Observe minimum and maximum re-coat times as specified by the manufacturer. If these times are exceeded, the surface shall be prepared as recommended by the manufacturer and as directed by the Engineer prior to receiving additional coats.

The following items shall be field painted using the waterborne acrylic latex system:

A. Potable water fire hydrant valve gate well lids and frames.

The waterborne acrylic latex paint system shall consist of two coats of paint to provide a total dry film thickness of 0.203 mm to 0.305 mm. Apply the paint system in accordance with the manufacturer's recommendations. Add finish coats as necessary to achieve the mil thickness specified above.

10-4.03 MATERIALS FOR WATER SYSTEM WORK

GENERAL

Waterlines shall consist of PVC pressure pipe, fittings, closure pieces, supports, bolts, nuts, gaskets, jointing materials, fire hydrants, valves, and appurtenances as required for a complete and operable system.

Pressure rating of pipe and fittings used in connections shall meet or exceed the pressure rating of the mainline pipe.

Unless otherwise required in these special provisions or shown on the plans, materials for this project shall be those included on the latest Approved Materials List.

All material for water system work shall be new. Previously used material will not be accepted.

WATER MAIN

All water pipe and fittings shall be Polyvinyl Chloride Pipe (PVC).

POLYVINYL CHLORIDE (PVC) PRESSURE PIPE

Polyvinyl chloride pressure pipe shall conform to the Utility Standard Specifications and these special provisions.

PVC pipe shall conform to AWWA C900 and C905 pipe with rubber ring bell end or plain end with rubber ring coupling. The minimum SDR rating shall be 35. Couplings for plain pipe shall be furnished with two elastomeric gaskets. Solvent welded joints are not permitted. For 100 mm thru 300 mm PVC, deflections at the joints shall not be permitted. Curves and deflections shall be made only with the use of high deflections C900 PVC couplings or the approved ductile iron fittings. The maximum deflection per coupling shall be per the manufacturer's recommendation. The working/shop plans shall clearly indicate the location of the couplings and the pipe lengths. Minimum allowable radius for PVC pipe, using deflector couplings shall be per the manufacturer's recommendation.

Pipe Length	Minimum Allowable Radius
7 m	75 m
3 m	35 m

Mechanical joint fittings shall be used and shall conform to AWWA: C 153 and AWWA: C 111 of the latest edition. Bolt holes in the flanges of the mechanical joint fitting shall straddle the vertical centerline of the fitting. The fitting shall be cement-mortar lined in accordance with AWWA C 104. The outside shall be polyethylene-encased in accordance with the requirements of AWWA C 105. Gland shall be made of ductile iron and shall be factory-stamped. Ductile iron from which the glands are cast shall have a minimum elongation of 5 percent. Bolts shall be tee heads made of high-strength low-alloy steel or ductile iron per AWWA C 111.

Installation of mechanical joints shall conform to Appendix A of AWWA: C 111. Bolts and nuts shall be coated with rust-preventative grease.

Solvent cement joints or push or push-on fittings shall not be used.

SALVAGE FIRE HYDRANT

All material removed for the existing fire hydrant lines, except gate valves and fire hydrant heads shall become property of the Contractor at the time of its removal from the trench, unless otherwise specified or shown on the plans. Such material shall not be allowed to accumulate along the line of work, but shall be removed from the area at the earliest practical time. All valves and fire hydrant heads shall be salvaged and returned to the Engineer.

VALVE BOX AND EXTENSION STEMS

Valve Stem Extensions shall be installed when the valve operating nut is more than 1.5 m below grade. Stem extensions shall be of sufficient length to bring the operating nut to a point between 300 mm and 450 mm below the gate well lid.

Stem extensions shall be complete with operating nut, location ring, and lower socket to fit valve-operating nut. The configuration of the extension stem nut shall match that of the valve it operates.

Stem extensions shall be square fiberglass tubing glued together to make a continuous one-piece unit used to a maximum length of 2.4 m.

Steel stem extensions shall be used where the maximum length of the extension exceeds 2.4 m or at the request of the Engineer. Steel stem extensions may be round or square hot-dipped galvanized steel tubing of solid design (no pinned couplings permitted) with guides.

GATE WELLS

Gate wells shall be installed as shown on the plans and as described below.

Gate wells shall be installed with lids flush with the final surface. No more than two 25 mm adjustment rings shall be used. Gate wells and adjustment rings shall be accurately cut perpendicular to the length of the piping used.

Gate wells shall be color coated to identify the type and use of the valve installed.

A. The inside portion of the gate well lid and interior portion of PVC gate well shall be identified with a minimum 50 mm diameter painted identification marking.
B. Paint color shall be as follows:

1. Color Gate Well Lid and PVC Gate Well for:

Red	Normally Closed System Valves (NCV)
White	Resilient Wedge Gate Valves (RWGV)
Green	Butterfly Valves (BFV)

C. The top exterior portion of the gate well lid and ring shall be coated in accordance with these Special Provisions.

GATE VALVES – RESILIENT WEDGE

Resilient wedge gate valves (RWGV's) shall be installed on potable and recycled water mains and appurtenances in accordance with the plans.

Resilient wedge gate valves shall be used for open/closed operations, throttling service and frequent operation after long periods of inactivity.

In general, resilient wedge gate valves shall be used when valves are required on pipelines and appurtenances 100 mm through 300 mm

The following items shall be submitted for review and approval by the Engineer prior to ordering or delivery of resilient wedge gate valves:

An affidavit from the valve manufacture stating that valves have successfully passed hydrostatic tests in accordance with AWWA C509 and manufacturer's own coatings tests.

The valve manufacturer's catalog data showing the size to be used, valve dimensions, pressure rating and materials of construction.

Manufacturer's catalog data and proof of NSF certification for the lining materials to be used.

Valves shall be the same size as the line in which they are installed unless otherwise noted on the plans.

Valve ends shall be compatible with the piping system in which they are being installed in accordance with the plans or directed by the Engineer.

Resilient wedge gate valves shall be hydrostatically tested and valve coatings shall be holiday detected prior to shipment to the field in accordance with the testing procedures described elsewhere in these Special Provisions. Valves delivered to the site prior to successful hydrostatic testing and holiday detection shall be subject to rejection.

Valves shall be delivered and stored in accordance with AWWA C550. The port openings shall be covered with plastic, cardboard or wood while in transit and during storage in the field. These covers shall remain in place until valves are ready to be installed. Valves shall not be stored in contact with bare ground. Valves shall not be stacked.

Polyethylene wrap shall be used for the buried installation of resilient wedge gate valves.

Resilient wedge gate valves and appurtenant components and materials shall be selected from the Approved Materials List.

RWGV's shall be ductile-iron in accordance with AWWA C509 and C515 except as modified herein.

Each valve shall have a smooth unobstructed waterway free from any sediment pockets.

All RWGV's shall be leak-tight at their rated pressure.

RWGV's shall have a non-rising low-zinc bronze or stainless steel stem, opened by turning left (counterclockwise).

Stem seals shall be the O-ring type incorporating a minimum of two rings as required by AWWA C509.

Low-friction torque-reduction thrust washers or bearings shall be provided on the stem collar.

Wedge (gate) shall be fully encapsulated with a bonded-in-place Nitrile elastomer covering. Minimum thickness of the rubber seating area shall be 6.35 mm.

Valves for buried applications shall be provided with a 50 mm square operating nut, and valves located above ground or in structures shall be equipped with a hand wheel in accordance with AWWA C509 unless otherwise indicated on the plans.

RWGV interior and exterior surfaces (except for the encapsulated disc) shall be coated as described below:

A. All bolts and nuts used in the construction of RWGV's shall be Type 316 stainless steel.
B. Epoxy linings and coatings for valves shall be provided in accordance with AWWA C210, C213 and C550, with the following modifications:

1. Epoxy lining and coating of valve surfaces shall be performed by the manufacturer in a facility with qualified personnel, where the environment can be controlled. Epoxy lining and coating of valves in the field is prohibited.
2. Repairs made to manufactures applied coatings shall be performed in a facility with qualified personnel, where the environment can be controlled. The facility shall be approved by the valve manufacturer.
3. Surface preparation shall be in conformance with the requirements in Surface Preparation Specification No. 5, "White-Metal Blast Cleaning," of the Steel Structures Painting Council.
4. Liquid epoxy lining and coating materials shall be listed in the NSF Listing for Drinking Water Additives, Standard 61, certified for use in contact with potable water.
5. The minimum dry film thickness for epoxy linings shall be 0.203 mm Liquid epoxy lining shall be applied in two (2) coats in accordance AWWA C210.
6. Powder epoxy coating materials shall contain one hundred percent solids, in accordance with AWWA C213.

Gate wells and extension stems for buried valves shall be selected from the Approved Materials List.

Polyethylene wrap shall be in accordance with and selected from the Approved Materials List.

Install valves with the bolt holes straddling the vertical centerline of pipe and the operating nut in the vertical position unless otherwise noted on the plans.

Valves shall be installed in accordance with the manufacturer's recommendations and the applicable section of these specifications for the piping material and joint type being used.

Installation of polyethylene wrap for buried valves shall be in accordance with the plans.

Concrete thrust, anchor, and support blocks shall be installed in accordance with the plans. The concrete shall be placed so that valves and valve operators will be accessible for repairs or replacement.

Gate wells and extension stems for buried valves shall be installed in accordance with the plans.

Disinfections and flushing of valves shall be completed as part of the process of disinfecting the main pipeline. The valves shall be operated during the disinfection period to completely disinfect all internal parts.

Valves shall be hydrostatically tested in conjunction with the pipeline in which they are installed.

The exterior of valves installed above ground or exposed in vaults or enclosures shall be field painted in accordance with these Special Provisions.

50 MM COPPER PIPE FOR SERVICES LINES

50 mm copper pipe for future water meter as shown on the plans shall be furnished and installed in conformance with the provisions in Section 20-5, "Irrigation System," of the Standard Specifications and shall conform to the requirements of ASTM B 88 or ASTM B 88 M (Metric), Type A seamless water tube. Copper tubing shall be soft or rigid. Components shall be selected from the proper Approved Materials List in accordance with the plan details.

FIRE HYDRANTS

Fire hydrants shall be installed as shown on the plans.

Wet-barrel hydrants shall generally be used for pressures up to 1.38 MPa.

System pressures up to and including 1.03 MPa require standard wet-barrel hydrants, and pressures up to 1.38 MPa require high-pressure wet-barrel hydrants in accordance with the Approved Materials List.

Dry-barrel hydrants shall generally be used for pressure ranges in excess of 1.38 MPa up to 1.72 MPa as specifically shown on the plans.

Hydrant outlet sizes and configuration shall be as shown on the plans or as directed by the fire department of jurisdiction.

Hydrants shall generally have the following number and size of outlets as directed by the fire department of jurisdiction:

A. Residential: One 64 mm outlet and one 100 mm outlet
B. Commercial: Two 64 mm outlets and one 100 mm outlet.
C. Industrial: One 64 mm outlet and two 100 mm outlets.

Fire hydrants shall be delivered and stored in accordance with AWWA C210, AWWA C213, and AWWA C550. The port openings shall be covered with plastic, cardboard or wood while in transit and during storage in the field. These covers

shall remain in place until the valve is ready to be installed. Fire hydrants shall not be stored in contact with bare ground. Fire hydrants shall not be stacked.

Fire hydrants and appurtenances shall be selected from the Approved Materials List.

Dry-barrel fire hydrants shall comply with AWWA C502 and these specifications unless otherwise indicated on the plans.

Wet-barrel fire hydrants shall comply with AWWA C503 and these Special Provisions unless otherwise indicated on the plans.

The interior of ductile-iron hydrants shall be fusion-epoxy lined per AWWA C550.

All outlets shall be provided with National Standard Fire-Hose Threads. Outlets shall be equipped with brass or ductile iron caps with chains.

Wet-barrel fire hydrant flanges and appurtenant bury ells and spools shall incorporate a six-hole bolt pattern.

Fire hydrant break-off check valves shall be in accordance with the Approved Materials List.

Hydrant flange bolts and nuts shall be selected from the Approved Materials List.

Wet barrel fire hydrants not equipped with break-off check valves shall be installed with break-away flange bolts selected from the Approved Materials List. The hollow shafts of break-away bolts shall be filled with silicone sealant. Bolts and nuts shall be zinc-plated A307 carbon steel.

Fire hydrant assemblies shall be installed at locations shown on the plans or as directed by the fire department of jurisdiction in accordance with the plans.

The location and port orientation of the Fire Hydrant shall be in accordance with the plans.

Fire hydrant flange bolts shall be set with nuts on top. Torque nuts uniformly and progressively in accordance with the manufacturer's recommendations. Fill the hollow bolt shafts of break-away bolts with silicone sealant.

Depending on location, fire hydrant assemblies may require protection posts or concrete retaining walls. When required by the Engineer, or when shown on the plans, protection posts or retaining walls shall be installed in accordance with the plans.

The fire hydrant assembly shall be disinfected as part of the process of disinfecting the main pipeline. The assembly valves shall be operated and the assembly flushed to completely disinfect all internal parts.

Fire hydrant assemblies shall be hydrostatically tested in conjunction with the pipeline to which it is connected.

The fire hydrant exterior shall be field painted in accordance with the Special Provisions.

10-4.04 WATER MEASUREMENT AND PAYMENT

MEASUREMENT

Water system work performed under these Special Provisions will be designated in the contract item by size, type, thickness, quality, or whatever information is necessary for identification.

The lengths of the various sizes and types of water pipe and welded steel pipe casing to be paid for will be determined by the meter from actual measurements along the centerline of the pipe in place in the completed work. Pipe placed in excess of the length designated by the Engineer will not be paid for. When pipes are cut to fit a structure, the quantity to be paid for will be the length of pipe placed before cutting, measured in one meter increments.

Fittings, including double ball joints and flexible couplings which increase the length of the water pipe and for which no separate contract item is provided, will be measured by the meter for the size of water pipe involved. Fittings will be measured along centerlines to the point of intersections.

Quantities of the various sizes and types of valve, valve assemblies and fire hydrant assemblies, to be paid for will be determined as units from actual count in the completed work.

PAYMENT

Items of work measured as provided in these Special Provisions will be paid for at the contract prices per meter for the various sizes and types of water pipe and at the contract prices per unit for the various sizes and types of valve assemblies, and fire hydrant assemblies.

Full compensation to reconnect 50 mm water service, connect new water pipes to existing mains, water pressure test, removal of water mains for installation of new water pipe, and salvage materials involved in constructing the new water pipe shall be considered as included in the contract prices paid for the various sizes and types of water pipe and no separate payment will be made therefor.

Full compensation for the various sizes and types of anchor blocks, thrust blocks, and support blocks, adapters, services and disposal of friable and non-friable material involved in constructing the water mains shall be considered as included in the contract prices paid for the various items of water mains and no separate payment will be made therefore.

When imported backfill is ordered by the Engineer, it will be paid for as extra work as specified in Section 4-1.03D of the Standard Specifications.

Full compensation for furnishing all labor, materials (including metallic tape locator for non-metallic water pipe), tools, equipment, and incidentals, and for doing all the work involved in relocating the water system, complete and in place shall be considered as included in the prices paid for the various contract items of water systems relocation involved, and no additional compensation will be allowed therefore.

Full compensation for protective work operations required to accommodate or safeguard public traffic or existing facilities (including fencing) and for all trenching and shoring, control of water in and outside the excavations and trenches, shall be considered as included in the prices paid for the various contract items of water systems relocation involved, and no additional compensation will be allowed therefore.

10-4.05 APPROVED MATERIALS LIST

Item	Description	Manufacturer
ACTUATOR	Electric Valve Actuators Used for Valve Control on Motor Operated Valves. Submittal Required.	Auma SG Series EIM Rotork Flo-Loc, FloPak
ADAPTER, FLANGE COUPLING	150 mm and Larger, Mechanical x Flange. Steel or Ductile Iron Construction without Anchor Pins, Epoxy Coated, 304 Stainless Steel Bolts and Nuts	Dresser 127 Ford FFCA Style JCM 301 Powerseal 3521, 3528 Romac FCA501, FC400 Smith-Blair 912, 913
ADAPTER, KAMLOCK	316 Stainless Steel Adapter, MIP x Male Kamlock, 50 mm, 100 mm or 150 mm With 6 mm 304 Stainless Steel Street Ell and Pet Cock Tapped into the Side of the Fitting	OPW Kamlock 600-F-SS
AIR/VACUUM VALVE ENCLOSURE	12 Gauge Steel, Clam Shell Hinged Construction, Powder Polyester Coated. Use Enclosure Size As Indicated Below. 25 mm & 50 mm Air Vac Sizes Use: 400 mm x 600 mm 100 mm & 150 mm Air Vac Sizes Use: 600 mm x 900mm 200 mm Air Vac Size Use: 750 mm x 1,050 mm Potable Water Color: Chocolate Brown Recycled Water Color: OSHA Safety Purple	Pipeline Products VCDD-1624 VCCD-2436 VCCD-3042
AIR/VACUUM VALVE SUCTION SCREEN	For Use on 25 mm and 50 mm Air/Vacuum Installations. FIP Nylon Nut Style with 20 Mesh Stainless Steel Screen.	Christy VC Series McMaster-Carr 9877K52, 9877K65 Northtown Hytech
ANODE, MAGNESIUM	High or Standard Potential Anode with a Galvanized Steel Core Encased in a Square Magnesium Alloy Ingot Pre-Packaged in a Permeable Cotton Cloth Bag Filled with a 75 percent Gypsum, 20 percent Bentonite, 5 percent Sodium Sulfate Mixture. Provide Ingot Weight as Specified on the plans.	
ANTI-SIEZE COMPOUND	For Use on Stainless Steel Bolts and Nuts	Locktite Nevr Sieze
BACKFLOW PREVENTER	Reduced Pressure Principal Type Assemblies as Approved by the State of California, Department of Health Services	List of Approved Backflow Prevention Assemblies

Item	Description	Manufacturer
BOLTS, EXPANSION DROP-IN ANCHOR	13 mm x 75 mm Stainless Steel Heavy Duty Anchor System with Anchor Assembly with Hex Head Threaded Rod and Washer, Drop-in Sleeve and Epoxy Resin Adhesive Capsule. For Use on Air Vac and Water Test Station Enclosures.	Hilti HSLG-R Series U.S. Anchor W Series
BOLTS AND NUTS, 304 SS	Hex-Head Machine, ASTM A193, Grade B8 Bolts and ASTM A194, Grade 8 Nuts	
BOLTS AND NUTS, 316 SS	Hex-Head Machine, ASTM A193, Grade B8M Bolts and ASTM A194, Grade 8M Nuts	
BOLTS AND NUTS, A307	Hex-Head Machine, Cadmium/Zinc Plated, ASTM A307, Grade A Bolts and A307 2H Heavy Hex Nuts	
BOLTS AND NUTS, A307	Hex-Head Machine, Fluoropolymer Coated, ASTM A307, Grade A Bolts and A307 2H Heavy Hex Nuts	Tripac 2000 Blue
BOLTS AND NUTS, A307, BREAK AWAY, 19 mm FOR FIRE HYDRANT AND 150 mm AIR VAC	Wet Barrel Fire Hydrant Flange Bolts, Hex Head Machine, Break Away Bolts, 19 mm x 81mm and Nuts. Bolts Shall Incorporate a 12.3 mm x 47.6 mm Hole Drilled in the Bolt Shaft and Filled with Silicone Sealant. Bolts and Nuts Shall be Zinc Plated ASTM A307 Carbon Steel.	
BOLTS AND NUTS, A307, BREAK AWAY, 15 mm FOR 100 mm AIR VAC	Wet Barrel Fire Hydrant Flange Bolts, Hex Head Machine, Break Away Bolts, 15 mm x 75 mm and Nuts. Bolts Shall Incorporate a 12.3 mm x 47.6 mm Hole Drilled in the Bolt Shaft and Filled with Silicone Sealant. Bolts and Nuts Shall be Zinc Plated ASTM A307 Carbon Steel.	
BONDING AGENT, EPOXY	Epoxy Resin Based Bonding Agent for Bonding New Mortar or Concrete to Existing Concrete	Sika Sikadur 32 Hi-Mod
BUSHING, INSULATING	Nylon, 31 mm x 25 mm, 38 mm x 25 mm, 63 mm x 50 mm	Calpico Corrosion Control Products F.H. Mahoney
CAP, KAMLOCK, DUST, LOCKING	316 Stainless Steel Kamlock Type Dust Cap, 50 mm, 100 mm or 150 mm	OPW Kamlock 700 Type DC-SS
CASING END SEAL	6.25 mm Thick Styrene Butadiene Rubber Sheet End Seal. Use 25 mm Wide Stainless Steel Bands. Zippered End Seals with Stainless Steel Bands May Also be Used.	Advanced Products & Systems Cascade Calpico Pipeline Seal & Insulator Powerseal Raychem

Item	Description	Manufacturer
CASING SPACER	Stainless Steel Casing Spacer, Center Restrained, Position Type with PVC Liner and Non-metallic Anti-friction Runners	Advance Products Systems Cascade Calpico Pipeline Seal & Insulator (PSI) Powerseal Raychem
CATHODIC TEST STATION BOX	25.4 Kg Concrete Body with 5.4 Kg Ductile Iron Lid and Lid Ring. "CP TEST" Shall Be Cast into the Lid in 25 mm Letters. For Cathodic Protection Test Stations, Anode Ground Beds and Insulated Flange Test Stations.	Brooks 1-RT series Farwest Type 1-RT J & R #10-R
CATHODIC WELDING	For Welding Cathodic Bond Wires to Steel Pipelines	Cadweld
CHLORINE	Liquid (Gas) or Sodium Hypochlorite Solution.	
CLAMP, REPAIR	Stainless Steel, Full Circle, Double Lug. For ACP, PVC, DI or CI Pipe, Sizes 100 mm through 500 mm	Adams 220 APAC 402, 422, 432 Cascade CR-2, CRT-2 Ford F2, FS2 JCM 102 Mueller 510 Powerseal Super Seal 3111, 3122, 3132 Romac SS2, CL2 Smith-Blair 227
COATING, INTERNAL PIPE	For Coating the Internal Pipe Lining for an Insulated Flange	Aquatapoxy CCI Hydro-Pox
COATING, MASTIC	Cold Applied Coal Tar or Epoxy Based Single Component, Self-Priming, Heavy Duty Protective Exterior Coating for Buried Concrete	Carboline Bitumastic 50 Devoe Devtar 5A Polykem 938 Tnemec HB Tnemecol 46-465, HB Tneme-Tar 46H-413
COATING, WATERPROOF	Epoxy Resin Based Cemetous Trowel Grade Protective Waterproofing for Concrete	Sika Top Seal 107 STO CR 241
CONNECTOR, TRACER WIRE	Direct Bury Silicone Filled Capsule Tube with Standard Wire Nut or Silicone Filled Wire Nut Connectors for Tracer Wire Connections	3M DBR-6 King 4, 5, 6
COPPER DISC, SOLID	For Plugging Corporation Stops When a Service is to be Abandoned	Ford Disc 3, 4, 6 or 7 A.Y. McDonald 6125 Mueller H-15535
CORPORATION STOP, COMPRESSION X MIP	Bronze Compression x MIP Thread Ball Valve (T-Head only) 25 mm and 50 mm Full Opening	Ford FB1100-Q Series Jones J-1935SG, J-1957SG A.Y. McDonald 4704BQ Mueller B-25028
CORPORATION STOP, MIP X MIP	Bronze MIP x MIP Thread Ball Valve (T-Head only), 25 mm and 50 mm Full Opening	Ford FB500-4, FB500-7 Jones J-1943, J-1956 A.Y. McDonald 3131B Mueller B-20013, B-2969

Item	Description	Manufacturer
CORPORATION STOP, INSULATED	Bronze Compression x MIP Thread Ball Valve (T-Head only) 25 mm Full Opening	A.Y. McDonald 4755DBT Mueller N-35028
COUPLING, COMPRESSION x COMPRESSION	Three Part Compression Coupling (Both Ends) for 25 mm and 50 mm Copper Pipe	Ford C44-Q Series Jones J-2609SG A.Y. McDonald 4758Q Mueller H-15403
COUPLING, C900 PVC DEFLECTION	100 mm through 300 mm Solid PVC for Obtaining Deflection Only. Provides 5 Degree Maximum Deflection	Certainteed Vinyl Iron HD
COUPLING, C900 PVC CLOSURE OR REPAIR	100 mm through 300 mm Solid PVC for Closure or Repair	Certainteed Vinyl Iron HD
COUPLING, C905 PVC CLOSURE, DEFLECTION OR REPAIR	400 mm through 900 mm Solid PVC for Closure, Deflection or Repair	IPEX Nyloplast America Septer
COUPLING, GROOVED	Use for Above Ground DI or Steel Pipe 100 mm or Larger	Grinnell #7001 Tyler 500 Victaulic #44, #77
COUPLING, HALF, STEEL	Forged Steel Half Coupling, ASTM A105, 1,360 kg, NPT Threads	Bonney Forge
COUPLING, INSULATED, COMPRESSION x COMPRESSION	Three Part Compression Insulated Coupling (Both Ends) for 25mm Copper Pipe	A.Y. McDonald 4755DBT Mueller N-35403
COUPLING, FLEXIBLE	150 mm Long PVC Flexible Coupling with Stainless Steel Bands. Use For Securing Gate Valve Cap and Can Assembly to 200 mm Class 200 PVC C900 Gate Well	Calder DFW/HPI Fernco
COUPLING, STRAIGHT FLEXIBLE	100 mm and Larger, Steel or Ductile Iron Construction, Slip x Slip, Epoxy Coated with 304 or 316 Stainless Steel Bolts and Nuts. For Use on AC, PVC, DI, or Steel Pipe.	APAC 301 Ford FC1 Powerseal 3501, 3538 Romac 501 Smith-Blair 441 Viking Johnson MaxiFit
COUPLING, TRANSITION FLEXIBLE	100 mm and Larger, Steel or Ductile Iron Construction, Slip x Slip, Epoxy Coated with 304 or 316 Stainless Steel Bolts and Nuts. For Use on AC, PVC, DI, or Steel Pipe.	APAC 311, 313 Baker Ford FC2A Powerseal 3501, 3538 Romac 501 Smith-Blair 413 Viking Johnson MaxiFit
CUSTOMER SIDE SHUT-OFF VALVE	19 mm and 25 mm Bronze Customer Shut-off (Ball Valve), Inlet Swivel Meter Nut x Outlet FIP Thread, Lockable Tabs, with Lever Handle	Ford B13-332W w/ HT34 B13-444W w/ HT34 Jones J-1908W A.Y. McDonald 6101MWHB Mueller B-24351 w/ B-20298-99000

Item	Description	Manufacturer
CUSTOMER SIDE SHUT-OFF VALVE	38 mm and 50 mm Bronze Customer Shut-off (Ball Valve), Inlet Meter Flange. x Outlet FIP Thread, Lockable Tabs, with Lever Handle	Ford BF13-666W w/HB-67S, BF13-777W w/HB-67S Jones J-1913W A.Y. McDonald 6101MWHB Mueller B-24337
DECOMPOSED GRANITE (DG)	Imported Quarry Decomposed Granite	
DEFLECTION BEND, PVC C900 AND C905	5 degreę Deflection Bend Manufactured from C900 and C905 PVC Pipe	Ipex
DISMANTLING JOINT	Telescoping, Adjustable, Double Flanged Fitting, with High Tensile Strength Zinc Plated Tie Bars. NSF-61 Epoxy or Nylon Interior and Exterior Coating.	Viking Johnson
ELL, BURY, DUCTILE IRON	150 mm x 400 mm Ductile Iron Bury Ells, Long Radius, Flg x MJ/PO (Use of Short Radius Bury Ells with Engineer Approval Only)	Clow Sigma South Bay Foundry
ELL, FIP x COMP, 45 Deg 1/8 BEND	25 mm and 50 mm Bronze Ell, FIP x Compression for Copper Pipe	A.Y. McDonald 4747Q Mueller H-15534
ELL, FIP x OMP, 90 Deg C 1/4 BEND	25 mm and 50 mm Bronze Ell, FIP x Compression for Copper Pipe	Ford L14-44Q, L14-77Q Jones J-2621SG A.Y. McDonald 4779Q Mueller H-15533
ELL, STREET, MIP x FIP STAINLESS STEEL	6mm 304 SS Street Ell for Blowoff Dust Cap	
ELL, SUPER GRIP TYPE	25 mm and 50 mm Bronze Ell Compression x Compression for Copper Pipe	Ford L44-Q Series Jones J-2611SG A.Y. McDonald 4761Q Mueller H-15526
EPOXY ADHESIVE	High-Modulus, Low Viscosity, Epoxy Resin Based Adhesive Suitable for Grouting Bolts or Dowels	Sika Sikadur 31, Sikadur 35
EXPANSION JOINT	For Water Pipeline Bridge Crossings	APAC 703 Dresser 63 Powerseal 3563 Smith-Blair 611, 612
EXPANSION JOINT, RUBBER	Expansion Joints at Reservoir and Pump station Inlet/Outlet Piping to Allow Lateral Movement and Isolate Vibration	General Rubber 1050, 1075 Holz CSM, CR, C11R Mercer 500-700 Metraflex Metro Red Valve Reflex
FAN, VAULT EXHAUST	Electric, 110 Volt, Single Phase, Squirrel Cage Type, Suitable for Wet Locations. Size for 6 Volume Changes per Hour	

Item	Description	Manufacturer
FIRE HYDRANT SPOOL, DUCTILE OR CAST IRON, FLANGED	Ductile or Cast Iron Spool with Integrally Cast Flanges and Machined or Cast Exterior Grooves. Spools 300 mm or Longer Shall Have Grooves 75 mm from Each Flange. Spools Shorter than 300 mm Shall Have One Groove Centered Between the Flanges. Grooves Shall be 5 mm Deep, 2 mm and 6 mm Wide, 2 mm	
FIRE HYDRANT, 1.03 MPa	150 mm Standard 1.03 MPa Wet Barrel Ductile Iron (DI) or Bronze Fire Hydrants with Six-hole Bolt Pattern. DI Hydrants shall be Fusion Epoxy Lined.	AVK 24/70, 24/90 Clow 850 (Ductile-Iron Only), 860 (Ductile-Iron Only), 2050, 2060, 2065 Jones J3700, J3765, J3775
FIRE HYDRANT, 1.38 MPa	150 mm High Pressure 1.38 MPa Wet Barrel, Ductile Iron Fire Hydrant, With Six-hole Bolt Pattern. DI Fusion Epoxy Lined	AVK 24/70, 24/90
FIRE HYDRANT, 1.72 MPa	150 mm High Pressure 1.72 MPa Dry Barrel, Ductile Iron Fire Hydrant, Fusion Epoxy Lined	U.S. Metropolitan 250
FIRE HYDRANT, BREAK – OFF CHECK VALVE	Break-off Valves for Fire Hydrants. Submittal Required	Long Beach Iron LB400
FIRE HYDRANT, CAP	Screwed Brass or Ductile Iron Cap for Fire Hydrant Hose Ports, 63 mm and 100 mm	AVK Jones Long Beach US Pipe
FITTING, DUCTILE IRON	Flanged, Mechanical, Joint or Push-on Tees, Bends, Crosses, Reducers, Adapters, etc., for Water Lines 100 mm and Larger. Manufactured per AWWA C110, C111, C153. (C153 Fittings are not Permitted on C905 Pipe.)	Bachman Griffin Nappco/Sigma Pipeline Components Star Tyler
FITTING, GROOVED	Grooved Ductile Iron Fittings for Grooved End Pipes, 100 mm through 600 mm	Grinnell Tyler G-B Victaulic
GASKET	3.125 mm Thick Full Face or Ring, Aramid Fiber Bound with Nitrile. No Asbestos Content	Calpico Garlock 3000 Johns-Manville Klinger 4401 Tripac 5000
GASKET	1.56 mm Thick, Cloth Inserted Rubber, Full Face or Ring	Calpico Coletech 2000 Garlock Johns-Manville Tripac 2000
GASKET, JOINT RESTRAINT	Rubber Ring Type with Stainless Steel Locking Segments Vulcanized into the Gasket. For Use on PVC Carrier and Casing Pipes.	US Pipe Field Lok 350
GASKET, RUBBER GASOLINE RESISTANT	Gasoline Resistant Pipe Gaskets for Water Mains	Newby

Item	Description	Manufacturer
GASKET, RUBBER RING	3 mm Thick, Rubber Ring Type, 1.72 MPa Maximum. For 100 mm Through 900 mm Pipe Flanges	Calpico Johns-Manville US Pipe
GATE WELL	For Air/Vac Ball Valve Installations: 100 mm SDR-35 PVC Sewer Pipe. For Valve Installations: 200 mm C900, DR14, Class 200 PVC Pressure Pipe. 200 mm Pipe Casing Colors: Potable Water: White or Blue Recycled Water: Purple	Refer to PIPE, PVC C900
GATE WELL CAP- 100 mm	Ductile or Cast Iron Lid Used for Air/Vacuum Device Ball Valve Access, 100 mm Nominal Diameter with a 62 mm Long Skirt.	South Bay Foundry B50
GATE WELL CAP- 200 mm	Ductile or Cast Iron Lid Used for Valve Access, 200 mm Nominal Diameter Lid with a 150 mm Long Skirt and Lifting Slot. Minimum Weight 10 Kg For use in Areas where Speed Limit is Less Than 56 KM/HR.	South Bay Foundry SBF B52
GATE WELL CAP AND CAN ASSEMBLY	Ductile or Cast Iron, Machined Frame with Ductile or Cast Iron Lid. Used for Valve Access. 200 mm Nominal Diameter Lid with a 150 mm Long Skirt and Lifting Slot. Required in Areas Where Speed Limit is 56 KM/HR or Greater.	South Bay Foundry SBF 1208N Assembly
GREASE	For Bolt Corrosion Protection on Buried Bolts, NO-OX-ID Type	Sanchem NO-OX-ID Dearborn Chemical
GROUT	Non-Shrink Cement Based Construction Grout for Crack Repair, Flooring Mortar, Dowel Grouting, Crack Sealing and General Binding	Sika Sikagrout 212 STO Epoxy Binder CR633 STO Epoxy Gel CR635 STO N-S Grout CR732
HUMIDISTAT	120 Volt, 6.0 AMP, Single Phase with Adjustable Low and High Lockable Limit Stops. Adjustable Range of 20 percent to 70 percent Humidity and Suitable for Wet Locations	
INSULATING BLANKET	Insulating Blanket for Corrosion Interference Mitigation	McMaster-Carr
INSULATING COUPLINGS	Insulating Couplings for Corrosion Protection of Pipelines	Romac IC400, IC501
INSULATING GASKET KIT	Insulating Gasket Kits for Corrosion Protection of Pipelines	Advanced Product Systems Calpico PSI - Gasket Seal PSI – Linebacler Farwest
ISOLATOR, VIBRATION	Wire Rope Seimic Support for Pipelines for Isolating Vibrations and Shocks	Enidine Steelpaw

Item	Description	Manufacturer
JOINT RESTRAINT ASSEMBLY	360 Degree Wedge Type Restraint System for Ductile Iron, C900 PVC, and Steel Pipe, Sizes 150 mm Through 750 mm For Use by District Forces Only Where Concrete Thrust Restraint is not Possible. Prior Approval of Engineer is Required.	Ford Uniflange 1300 Series Ford Uniflange 1500 Series Mueller Aquagrip Sigma PV-Lok Star Allgrip series 3600
JOINT SEALING COMPOUND, PLASTIC ROPE	For Use on Pre-cast Vault and Manhole in Grooved Joints Between Sections	Quickset Joint Sealing Compound
LADDER, ALUMINUM, VAULT	High Strength 6061-T6 Aluminum Alloy, 25 mm Diameter Solid Rungs and 450 mm Between Side Rails. Ladder to Exceed Requirements CAL/OSHA Standards	Alaco, Model 560
LADDER, FIBERGLASS, VAULT	Fiberglass Reinforced Plastic, 25 mm Solid Square Rungs with Grit Safety Surface, Ultraviolet Inhibitors. 42 kPa Tensile Strength with a 3 to 1 Safety Factor per OSHA Requirements.	
LIGHT SWITCH, VAULT	120 Volt, 20 AMP, Single Pole, Spring Loaded with Clear Waterproof Cover	
LIGHTS, VAULT	Non-Metallic Incandescent Vaportite, 120 Volt, 6.0 AMP, Wall or Ceiling Mounted, with 100 Watt Bulb with Cage and Glass Protector for Bulb. Suitable for Wet Locations. Two Light Fixtures Per Vault.	
LOAD CENTER, VAULT	125 AMP, Double Pole, 1 Phase, 3 Wire, Solid Neutral 120/240 VAC with Plug-In GFI Breaker	
LUBRICANT, PIPE GASKET	Rubber Gasket Pipe Lubricant for Use on PVC or Ductile Iron Pipe Joints, NSF Listing Required	Christy Pro-Lube Whitlam Blue Lube
MARKER, UTILITY	Flexible Reinforced Polymer Glass Fiber Composite Strip Identification Marker. Branded or Customized Identification Markings for Pipelines and Appurtenances May Be Required	Carsonite CUM-375
METER ADAPTER	For Replacing Large Meters with Smaller Meters	Ford A Series Jones J128H A.Y. McDonald 10J Series Mueller H10889
METER BOX	250 mm x 500 mm Polymer Meter Box and Cover for 25 mm Water Services. Cover Color: Gray for Potable Water Use Purple Lids for Recycled Water Use	Amorcast A6000486SA W/ #A6000483DQ Cover & #A6000487 Read Lid
METER BOX	425 mm x 750 mm Polymer Meter box with 2-Piece Lid for 50 mm Water Services and Blowoff Assemblies Cover Color: Gray for Potable Water Use Purple Lids for Recycled Water Use	Amorcast A6001640PC-12 W/ #A60001643DZ Cover & A6000482 Read Lid

Item	Description	Manufacturer
METER FLANGE	Bronze Meter Flanges for 38 mm and 50 mm Meters with Slotted Holes	Ford CF Series Jones J129 A.Y. McDonald 610F
METER STOP, ANGLE COMPRESSION X METER	25 mm Bronze Angle Meter Stop (Ball Valve) with 90 Degree Lock Wing, Inlet 110 Style Compression x Outlet Swivel Meter Nut	Ford BA43-444W-Q Jones J-1963WSG, A.Y. McDonald 4602BQ Mueller B24258-1
METER STOP, ANGLE COMPRESSION X METER	50 mm Bronze Angle Meter Stop (Ball Valve) with 90 Degree Lock Wing, Inlet 110 Style Compression x Outlet Meter Flange	Ford BFA43-777W-Q Jones J-1975WSG A.Y. McDonald 4602BQ Mueller B-24276
METER, WATER	19 mm Through 50 mm Water Meter with Bronze Body, Bronze Bonnet, Thermoplastic Chamber, and Register Odometer at the Bottom of the Register Face. Odometer and Sweep Hand Read in Cubic meter. Short or Long Pattern Body.	Badger Models 35, 70, 120, 170 Sensus Models SR, SRII Sensus Series W Turbo W-120 DRS, W-160 DRS
MORTAR, REPAIR	Two Component, Low Shrinkage, Cement Based with High Compressive and Bonding Strength	Sika Top 122, 123 STO CR 735, CR 740
NOZZLE, WELD-ON	Weld-on Nozzle with Reinforcing Pad or Collar for Connection to CMC/L Steel Pipe. ASTM A-53B 6 mm Minimum Thickness Seamless Pipe, Concrete Coated, Mortar Lined with AWWA C207 Flange Submittal Required	
PAINT, POLYESTER POWDER	TGIC Polyester Powder For Air Vac and Water Test Station Enclosures	Tiger Dylac Series 49 Porter Paint J-Series Fuller O'Brien PF Series
PAINT, SILICONE ALKYD ENAMEL	One Component, Minimum 46 percent Solids (by Volume), 30 percent Silicone Content (by Volume), High Gloss, VOC Compliant Industrial Grade Paint.	Amteco SA-3 Silicone Poly Plus Carboline Carbocoat 30 Devoe Devshield 475 Dunn Edwards 42-53 Pittsburg Paint 97-480 Porter Guard 2200 Sherwin Williams Steel Master 9500
PAINT, WATERBORNE ACRYLIC LATEX	One Component, Rapid Dry 100 percent Acrylic Latex Waterborne Marking Paint Meeting Cal/Trans Specification #8010-21C-30.	TMT-Pathway Waterborne Traffic Paint #2343A9
PENETRATION SEALS, INTERLOCKING	Mechanical Link Type Interlocking Vault, Casing and Building Penetration Seals	Advance products Systems Interlynx Link Seal
PIPE, ASBESTOS CEMENT	150 mm through 600 mm AWWA C400 Pipe. (Prior Approval and Submittal Required)	

Item	Description	Manufacturer
PIPE, COPPER TUBING	25 mm Type K Soft Seamless Rolled Tubing 50 mm Type K Soft Seamless Straight Lengths 25 mm and 50 mm Type K Rigid Seamless Straight Lengths	Cerro Halstead Lee Mueller Phelps-Dodge
PIPE, DUCTILE IRON	For Water Lines 100 mm and Larger Manufactured per AWWA C111, C115, C150, C151.	American Pipe Griffin Pacific States U.S. Pipe
PIPE, PVC C900	For Water Lines 100 mm through 300 mm and 200 mm Gate Wells. AWWA C900 Class 200 Only	Certainteed Diamond Plastics Extrusion Technologies IPEX J-M Pacific Western VinylTech
PIPE, PVC C905	For Water Lines 400 mm and 500 mm through 900 mm AWWA C905 DR 25 and DR 18	Certainteed Diamond Plactics Extrusion Technologies IPEX J-M Pacific Western Vinyltech
PIPE, STEEL CEMENT LINED AND COATED (CMC/L)	Steel Cylinder (CML/C), Per AWWA M11 and Section 15061. 6 mm Minimum Wall Thickness. Steel Pipes Used for Recycled Water Installation are to be Identified Per District Requirements. Submittal Required	
PLASTIC ENCASEMENT	12-mil Thick Polyethylene Encasement Sleeve for Ductile Iron Pipe (DIP) per AWWA C105 and Recycled PVC, CMC/L, or DIP Non-Purple Water Pipe. Clear Sleeve for Potable Water, Purple Color for Recycled Water	
PLASTIC WRAP	8-mil Thick Polyethylene Encasement for Buried Fittings and Valves Clear Sleeve for Potable Water Purple Color for Recycled Water	
PRIMER, WAX TAPE	Surface Primer for Underground Application of Petrolatum Wax Tape	Carboline Denso Paste Trenton Tem-Coat
PROTECTOR POST, STEEL	100 mm Diameter, 6.25 mm Wall Galvanized A-120 Steel Pipe. Concrete Filled with 100 mm Galvanized Fence Post Cap	
PUMP, SUMP, VAULT	Automatic Submersible, Minimum 1/2 HP, 115 Volt, 60 Hz, 1 Phase, Ball Bearing Motor with Thermal Overload Protection. Either bronze or Epoxy Coated Cast Iron Body.	
RECEPTACLE, GROUND FAULT, VAULT	125 Volt, 20 AMP, Duplex, with Gasketed. Self-Closing Aluminum Cover.	

Item	Description	Manufacturer
REFERENCE ELECTRODE, COPPER SULFATE	High or Standard Potential Electrode with PVC Pipe Housing Pre- Packaged in a Permeable Cotton Cloth Bag Filled with a 50 percent Gypsum 50 percent Powered Bentonite Mixture. Electrode Shall have a Design Life of 15 Years with a Stability of +/- 5 Millivolts Under a 3.0 Microamphere Load. Provide Electrode with Integrally Attached 10 AWG HMW/PE Insulated Wire.	
ROCK, CRUSHED	Washed 10 mm and 19 mm Crushed Rock 10 mm for Use in Meter Boxes Only.	
SEALANT	Chemical Grout for Joint Sealing	3M Scotch Seal
SEISMIC COUPLING	Flexible Expansion joints for Pipelines, Reservoirs, Pump Stations, etc.	EBAA Iron Flex-Tend Romac FlexiJoint Star Pipe Starflex 5000
SEISMIC SENSOR DEVICE	Seismic Sensors for Reservoirs and Pipelines. Submit Required	Submit for Approval
SERVICE SADDLE FOR ACP AND CI PIPE	Cast Brass ASTM B62 Body with Silicone Bronze Double Straps, IP Outlet Sizes 25 mm and 50 mm	Ford 202B Jones J-979 A.Y. McDonald 3826 Mueller BR2B Series Romac 202B Smith-Blair 323
SERVICE SADDLE FOR PVC C900 PIPE	Bronze or Brass Saddle with Stainless Steel Four Bolt Strap(s), IP Thread Outlet for Sizes 25 mm and 50 mm for Pipe Sizes 100 mm through 300 mm	Ford 202BS Jones J-969 A.Y. McDonald 3846 Mueller BR2S Series Romac 202BS Smith-Blair 393
SERVICE SADDLE FOR PVC C905 PIPE	Bronze or Brass Saddle with Stainless Steel Four Bolt Strap(s), IPT Thread Outlet for Sizes 25 mm and 50 mm for Pipe Sizes 400 mm and Larger (Romac Saddle Requires Nylon Bushing)	Ford 202BS Jones J-969 Romac 202N
TAG, BRASS IDENTIFICATION	25 mm Diameter, 18 Gauge Brass with 4.76 mm Die Stamped Letters and Numbers, Suitable for Attachment to Cathodic protection Wires by Means of a Nylon Zip Tie.	
TAPE, OUTER WRAP	Adhesive Plastic Outer Wrap for Wax Petrolatum Tape in Underground Applications	Polyken 960 Trenton Polyply
TAPE, UTILITY	10 to 50 Mil x 50 mm Wide General Utility Tape for Corrosion Protection of Above and Below Ground Pipes and Fittings	Calpico Christy Northtown Polyken 900 Scotchwrap 3M 50, 51

Item	Description	Manufacturer
TAPE, WARNING/ IDENTIFICATION	150 mm wide, Warning/Identification (Non-Metallic) Marking Tape for Buried Facilities.	Calpico, Type 1 Line-Tec, Type B T. Christy Ent., Type 1 Terra Tape, Standard 250 Thor, Elast Tec Northtown
TAPE, WARNING/ IDENTIFICATION FOR RECYCLED IRRIGATION	75 mm wide, Warning/Identification (Non-Metallic) Marking Tape for Buried Irrigation Pipelines. Purple Color with continuous warning "CAUTION RECLAIMED WATER MAIN BURIED BELOW"	Calpico, Type 1 Line-Tec, Type B T. Christy Ent., Type 1 Terra Tape, Standard 250 Thor, Elast Tec Northtown
TAPE, WAX ABOVEGROUND	Petrolatum Saturated Synthetic Fabric Tape for Use on Aboveground Couplings, Flanges, Fittings, Etc.	Trenton #2 Wax-Tape
TAPE, WAX UNDERGROUND	Petrolatum Saturated Synthetic Fabric Tape for Use on Underground Couplings, Flanges, Fittings, Etc. Primer and Outer Wrap Required.	Carboline Densyl Tape Trenton #1 Wax-Tape
TAPPING SLEEVE FOR ACP, CI, DI, AND PVC PIPE	Fabricated Steel Tapping Sleeve for 100 mm Through 300 mm Wet Taps. Epoxy Coated with Stainless Steel Bolts and Nuts.	APAC 502, 512 Baker 428 Series Clow F-5205, F-5207 Ford FTSC JMC 412 Mueller 615, 619 Powerseal 3460 Romac FTS-420 Smith-Blair 622
THREDOLET	Forged Steel Fitting ASTM A105. 1,360 kg, NPT Threads	Bonney Forge
VALVE STEM EXTENSION, FIBERGLASS	Three Part Fiberglass Valve Extension Kit. Use When Extension 2.4 m or Shorter.	Pipeline Products FPU-210, FPT-200, FPL-220
VALVE STEM EXTENSION, STEEL	Round or Square 37 mm Diameter Steel Rod, Welded Construction, Hot Dipped Galvanized with Top Centering Ring and AWWA 50 mm Operating Nuts Top and Bottom. Use When Extension Longer Than 2.4 m.	Pipeline Products SX-900 South Bay Foundry E4160
VALVE, AIR RELEASE, 1.03 MPa	Pressure Air Release Valve, Cast Iron Body with Stainless Steel Internal Parts. 25 mm through 75 mm NPT 100 mm Flanged	APCO 50, 200, 200A Crispin PL10, PL20, PL30, PL41 Val-Matic #38, #45
VALVE, AIR RELEASE, 2.05 MPa	Pressure Air Release Valve, Cast Iron Body with Stainless Steel Internal Parts. 25 mm through 75 mm NPT 100 mm Flanged	APCO 50, 200, 200A Crispin PL10H, PL20H, PL30H, PL42H Val-Matic #38, #45

Item	Description	Manufacturer
VALVE, BALL	25 mm and 50 mm Bronze, Straight, Compression x Compression	Ford B44-444-Q, B44-777-Q Jones J-1949SG A.Y. McDonald 6100Q Mueller B-25209
VALVE, BALL WITH LOCKING TABS	50 mm Bronze, Straight, Compression x Compression with Locking Tabs and Brass Handle	Ford B44-777-QW Jones J-1949SGW A.Y. McDonald 6100WQ Mueller B-25146
VALVE, BALL WITH LOCKING TABS	19 mm Bronze, Straight, FIP x Meter Swivel with Locking Tabs and Purple Handle	Ford B13-332W Jones J-1908W A.Y. McDonald 6100M Mueller B-24351-1
VALVE, BREAK OFF CHECK	Break Off Check Valve for Fire Hydrants. Use when indicated on plans	Long Beach LB 400
VALVE, BUTTERFLY 1.03 MPa	400 mm and Larger, AWWA C504, Class B.. Thermosetting or Fusion Bonded Epoxy Coated and Lined. Class D or E Flange x Flange Ends	Dezurik AWWA M & H 1450, 4500 Mosser 810, 830 Mueller Lineseal III Pratt Groundhog Val-Matic Series 2000
VALVE, BUTTERFLY 1.72 MPa	400 mm and Larger, AWWA C504, Class B. Thermosetting or Fusion Bonded Epoxy Coated and Lined. Class F Flange x Flange Ends	Dezurik BAW 250 M & H 1450, 4500 Mosser 810, 830 Mueller Lineseal XP 250 Pratt Triton HP-250 Val-Matic Series 2000
VALVE, BUTTERFLY 1.03 MPa	100 mm through 300 mm , AWWA C504. Thermosetting or Fusion Bonded Epoxy Coated and Lined. B Class, Class D or E Flange x Flange Ends	Dezurik AWWA Keystone 504 M & H 4500 Mueller Lineseal III Pratt Groundhog Val-Matic Series 2000
VALVE, BUTTERFLY 1.72 MPa	100 mm through 300 mm ,AWWA C504. Thermosetting or Fusion Bonded Epoxy Coated and Lined. B Class, Class F Flange x Flange Ends	Dezurik AWWA Keystone 507 M & H 1450, 4500 Mueller Lineseal XP 250 Pratt triton HP-250 Val-Matic Series 2000
VALVE, BUTTERFLY WAFER 1.03 MPa	400 mm and Larger, Thermosetting or Fusion Bonded Epoxy Coated and Lined Submittal Required	Pratt MKII
VALVE, CHECK	1.03 & 2.07 MPa, Slanting Disc Check Valve 100 mm and Larger	APCO Series 800 Crispin TD Series Val-Matic Series 9000
VALVE, COMBINATION AIR RELEASE & AIR/VACUUM 25 mm AND 50 mm	Single Cast Body with Stainless Steel Internal Parts, BUNA-N seats per AWWA C512, and Epoxy Coated Interior per AWWA C550. N.P.T. Threaded Inlet and Outlet. 2.04 MPa rated Body and Internals.	APCO 143C.2, 145C.2 Cla-Val 33A Crispin UL10, UL20 Val-Matic 201C.2, 202C.2 Vent-O-Mat 025RBX4021, 050RBX4021

Item	Description	Manufacturer
VALVE, AIR RELEASE & AIR/VACCUM, 100 mm AND LARGER	Single Body Style Combination Air Release and Air/Vacuum Valve. Stainless Steel Internal Parts, BUNA-N seats per AWWA C512, with Protection Hood and Epoxy Coated Interior per AWWA C550. Flanged 125# or 250# Inlet. 2.04 MPa Rated Body and Internals.	APCO 152.1, 152.2, 153.1, 153.2, 154.1, 154.2 Cla-Val 354-AV, 354-AV.3, 356-AV, 356-AV.3, 368-AV, 358-AV.3 Crispin UL41, UL42, C61, C62, C81, C82 Val-Matic 104, 154, 106, 156, 108, 158 Vent-O-Mat 100RBX1631, 100RBX4031, 150RBX1631, 150RBX4031, 200RBX1631, 200RBX4031
VALVE, GATE, RESILIENT WEDGE (RWGV)	100 mm Through 300 mm , Non-Rising Low Zinc Bronze or Stainless Steel Stem, Ductile- Iron Body and Bonnet, Encapsulated Wedge per AWWA C509 or C515 with Epoxy Coated Interior. Manufactured to AWWA C509 or C515, with 1.72 MPa Rating.	American FC, Series 2500 AVK 25 Clow 2360 F6100 Series Kennedy Ken-Seal II, KRSR Mueller 2360, 2361 M&H 4067, 7067 US Pipe Metroseal & Metroseal 250
VALVE, GATE, RESILIENT WEDGE, 400 mm AND LARGER	400 mm Through 600 mm , per AWWA C509, Ductile Iron Body, Encapsulated Wedge, Non-Rising Stem, Epoxy Coated Interior per AWWA C550, Minimum 1.36 MPa Rating. Prior Approval and Submittal Required.	Clow F-6100 Series Kennedy Ken-Seal II M&H 4067 Mueller A-2361 U.S. Pipe Metroseal 250
VALVE, INSULATED BALL	25 mm Bronze, Straight, Compression x Compression, Insulated Type	Mueller N-35209
VALVE, PET COCK	6 mm 304 SS Pet Cock Valve for Use on Blowoff Kamlock Adapter	
VALVE, PRESSURE REGULATING 1.03 MPa to 1.72 MPa	19 mm through 50 mm	Cash Acme E55 Watts 223, 25AUB Wilkins 600 Series
VALVE, PRESSURE REGULATING 1.72 MPa to 2.74 MPa	19 mm through 50 mm	Cash Acme E55 Watts N35B Series
VALVE, PRESSURE REDUCING	For Water Main Pressure Reducing, 100 mm through 400 mm	Ames 910/610 Series Cla-Val 90G-01 Singer 106 PR, 206 PR Watts ACV 115E Series
VALVE, PRESSURE RELIEF	For Service Connections, 19 mm	Cash Acme FWC
VALVE, PRESSURE RELIEF AND SUSTAINING	For Water Main Pressure Reducing and Sustaining, 100 mm through 400 mm	Ames 920/620 Series Cla-Val 50-01, 650-01 Singer 106 RPS, 206 RPS Watts ACV 116E Series

Item	Description	Manufacturer
VALVE. BALL, 1.03 MPa	6 mm through 50 mm, FIP Threads with Handle	Apollo 70-100 Series Milwaukee BA-1005 Nibco 560 Series Stockham S-214 Watts WBV-3, WEBS-3
VALVE. BALL, 1.03 MPa	100 mm and Larger, Rubber Seated, AWWA C507. Thermosetting or Fusion Bonded Epoxy Coated.	Pratt
VAULT, ACCESS DOOR ALUMINUM	Aluminum Vault Access Door, Dual Door Configuration, Spring Loaded and Counter Balanced, with Inset for Padlock. H-10 Parkway or H-20 Street Loading Required. Submittal Required.	Bilco Type AD-JL
VAULT, FIBERGLASS REINFORCED PLASTIC (FRP)	For Meter Sizes 75 mm and Larger. 1.82 m Long x 1.2 m Wide x 1.5 m Deep FRP Construction, Minimum H-10 Parkway Loading with Reinforced Plastic Concrete or Aluminum Access Door. Submittal Required.	Armorcast A6001506AMTF
VAULT, LADDER UP	Vault Ladder Extension, Retractable, 1,200 mm Extension.	Bilco Ladder-Up Pipeline Products VL-100

SECTION 11. (BLANK)

SECTION 12. BUILDING WORK

SECTION 12-1. GENERAL REQUIREMENTS

12-1.01 SCOPE

Building work described herein and as shown on the plans shall conform to the requirements of these special provisions and Sections 1 through 9 of the Standard Specifications. Sections 10 through 95 of the Standard Specifications shall not apply to the work in this Section 12 except when specific reference is made thereto.

The building work to be done consists, in general, of new construction at Tecate for a Commercial Vehicle Enforcement Facility (CVEF) and such other items or details, not mentioned above, that are required by the plans, Standard Specifications, or these special provisions shall be performed, placed, constructed or installed.

12-1.02 ABBREVIATIONS

Section 1-1.02, "Abbreviations," of the Standard Specifications is amended by adding the following:

AAMA	American Architectural Manufacturers' Association
ACI	American Concrete Institute
AGA	American Gas Association
AITC	American Institute of Timber Construction
AMCA	Air Movement and Control Association
APA	American Plywood Association
ARI	American Refrigeration Institute
ASHRAE	American Society of Heating, Refrigeration and Air Conditioning Engineers
CBC	California Building Code (2001 Edition)
CEC	California Electrical Code (2001 Edition)
CMC	California Mechanical Code (2001 Edition)
CPC	California Plumbing Code (2001 Edition)
CS	Commercial Standards (US Department of Commerce)
ESO	Electrical Safety Orders
FGMA	Flat Glass Marketing Association
FM	Factory Mutual
FS	Federal Specification
ICBO	International Conference of Building Officials
NAAMM	National Association of Architectural Metal Manufacturers
NBFU	National Board Fire Underwriters
NEC	National Electrical Code
NFPA	National Fire Protection Association or National Forests Products Association
PEI	Porcelain Enamel Institute
PS	Product Standard (US Department of Commerce)
RIS	Redwood Inspection Service
SCPI	Structural Clay Products Institute
SMACNA	Sheet Metal and Air Conditioning Contractors' National Association
SSPC	Steel Structures Paint Council
TCA	Tile Council of America
TPI	Truss Plate Institute
UBC	Uniform Building Code (1997 Edition)
WCLIB	West Coast Lumber Inspection Bureau (stamped WCLB)
WCLB	Grade stamp for WCLIB
WIC	Woodwork Institute of California
WWPA	Western Wood Products' Association

12-1.03 GUARANTEE

The Contractor hereby unconditionally guarantees that the building work will be done in accordance with the requirements of the contract, and further guarantees the building work of the contract to be and remain free of defects in

workmanship and materials for a period of one year from the date of acceptance of the contract, unless a longer guarantee period is required elsewhere in these special provisions. The Contractor hereby agrees to repair or replace any and all building work, together with any other adjacent work which may be displaced in so doing, that may prove to be not in accordance with the requirements of the contract or that may be defective in its workmanship or material within the guarantee period specified, without any expense whatsoever to the Department, ordinary wear and tear and unusual abuse or neglect excepted.

The performance bond for contract price of the building work, shall remain in full force and effect during the guarantee period.

The Contractor further agrees, that within 10 calendar days after being notified in writing by the Department of any building work not in accordance with the requirements of the contract or any defects in the building work, he shall commence and prosecute with due diligence all work necessary to fulfill the terms of this guarantee, and shall complete the work within a reasonable period of time, and, in the event he fails to comply, he does hereby authorize the Department to proceed to have such work done at the Contractor's expense and he shall honor and pay the cost and charges therefor upon demand. The Department shall be entitled to all costs and expenses, including reasonable attorney's fees, necessarily incurred upon the Contractor's refusal to honor and pay the above costs and charges.

12-1.04 AREAS FOR CONTRACTOR'S USE

No area is available within the contract limits for the exclusive use of the Contractor. The Contractor shall arrange with the Engineer for areas to store equipment and materials within the work area.

12-1.05 COOPERATION

Attention is directed to Sections 7-1.14, "Cooperation," and 8-1.10, "Utility and Non-Highway Facilities," of the Standard Specifications and these special provisions.

Work by State forces will be in progress within the contract limits during the working period for this contract.

The Contractor shall comply with all security policies and normal working hours of the State concerning the Tecate Commercial Vehicle Enforcement Facility.

The Contractor shall plan his work to minimize interference with State forces and the public. Interruptions to any services for the purpose of making or breaking a connection shall be made only after consultation with and for such time periods as directed by the Engineer.

12-1.06 SUBMITTALS

Working drawings, material lists, descriptive data, samples and other submittals specified in these special provisions shall be submitted for approval in accordance with the provisions in Section 5-1.02, "Plans and Working Drawings," of the Standard Specifications and these special provisions.

Unless otherwise permitted in writing by the Engineer, all submittals required by these special provisions shall be submitted within 35 days after the contract has been approved.

Attention is directed to the provisions in Section 5-1.01, "Authority of Engineer," of the Standard Specifications. The Engineer may request submittals for materials or products where submittals have not been specified in these special provisions, or may request that additional information be included in specified submittals, as necessary to determine the quality or acceptability of such materials or products.

Attention is directed to Section 6-1.05, "Trade Names and Alternatives," of the Standard Specifications. The second indented paragraph of the first paragraph of said Section 6-1.05 is amended to read:

> Whenever the specifications permit the substitution of a similar or equivalent material or article, no test or action relating to the approval of such substituted material will be made until the request for substitution is made in writing by the Contractor accompanied by complete data as to the equality of the material or article proposed. Such request shall be made within 35 days after the date the contract has been approved and in ample time to permit approval without delaying the work, but need not be made in less than 35 days after award of the contract.

Work requiring the submittal of working drawings, material lists, descriptive data, samples, or other submittals shall not begin prior to approval of said submittal by the Engineer. Fifteen working days shall be allowed for approval or return for correction of each submittal or resubmittal. Should the Engineer fail to complete his review within the time specified and if, in the opinion of the Engineer, the Contractor's controlling operation is delayed or interfered with by reason of the delay in review, an extension of time commensurate with the delay in completion of the work thus caused will be granted as provided in Section 8-1.07, "Liquidated Damages," of the Standard Specifications.

Submittals shall be delivered to the locations indicated in these special provisions. If a specific location is not indicated, the submittal shall be delivered to the Division of Structure Design, Documents Unit, Fourth Floor, Mail Station 9-4/4I, 1801

30th Street, Sacramento, California 95816, telephone (916) 227-8252, or the submittals shall be mailed to the Division of Structure Design, Documents Unit, Mail Station 9-4/4I, P. O. Box 942874, Sacramento, California 94274-0001.

Each submission of drawings, material lists and descriptive data shall consist of at least 5 copies. Two copies will be returned to the Contractor either approved for use or returned for correction and resubmittal.

Each separate item submitted shall bear a descriptive title, the name of the project, district, county, and contract number. Plans and detailed drawings shall be not larger than 559 mm x 914 mm.

The material list shall be complete as to name of manufacturer, catalog number, size, capacity, finish, all pertinent ratings, and identification symbols used on the plans and in the special provisions for each unit.

Parts lists and service instructions packaged with or accompanying the equipment installed in the work shall be delivered to the Engineer at the jobsite. Required operating and maintenance instructions shall be submitted in triplicate.

Manufacturer's warranties for products installed in the work shall be delivered to the Engineer at the jobsite.

Unapproved samples and samples not incorporated in the work shall be removed from State property, when directed by the Engineer.

12-1.07 PROGRESS SCHEDULE

A progress schedule shall be submitted in duplicate for the building work in accordance with the requirements in Section 8-1.04, "Progress Schedule," of the Standard Specifications.

12-1.08 SCHEDULE OF VALUES

The Contractor shall prepare and submit to the Engineer for approval 2 copies of a Schedule of Values within 15 working days of approval of the contract covering each lump sum item for building work. Fifteen working days shall be allowed for approval or return for correction of each submittal or resubmittal. Should the Engineer fail to complete his review within the time specified and if, in the opinion of the Engineer, the Contractor's controlling operation is delayed or interfered with by reason of the delay in review, an extension of time commensurate with the delay in completion of the work thus caused will be granted as provided in Section 8-1.07, "Liquidated Damages," of the Standard Specifications.

The Schedule of Values must be accurately divided into sections representing the cost of each separate building or structure. All work that is not part of a separate building or structure, such as excavation, grading, curbs, gutters, sidewalks, paving, sewer and storm drainage and utility distribution lines are to be included under a specific section as General Work and not included in the building or structure cost. Indirect costs and general condition items are to be listed as a separate line item of work. The sections representing each building or structure must be identified as to the building or structure they represent and be broken down to show the corresponding value of each craft, trade or other significant portion of the work. A sub-total for each section shall be provided.

The Schedule of Values shall be approved by the Engineer before any partial payment estimate is prepared.

The sum of the items listed in the Schedule of Values shall equal the contract lump sum price for building work. Overhead and profit shall not be listed. Bond premium and other such items will not be paid for under the various building work items and shall be included in the mobilization bid item for the entire project.

12-1.09 INSPECTION

All items covered or all stages of work that are not to remain observable must be inspected and approved before progress of work conceals portions to be inspected. The Contractor shall notify the Engineer not less than 72 hours in advance of when such inspection is needed.

12-1.10 OBSTRUCTIONS

Attention is directed to Sections 7-1.11, "Preservation of Property," 7-1.12, "Responsibility for Damage," 7-1.16, "Contractor's Responsibility for the Work and Materials," and 8-1.10, "Utility and Non-Highway Facilities," of the Standard Specifications.

The Contractor shall notify the Engineer and the appropriate regional notification center for operators of subsurface installations at least 5 working days prior to performing any excavation or other work close to any underground pipeline, conduit, duct, wire or other structure. Regional notification centers include but are not limited to the following:

Underground Service Alert
Northern California (USA)
Telephone: 1(800)642-2444

Underground Service Alert
Southern California (USA)
Telephone: 1(800)422-4133

South Shore Utility
Coordinating Council (DIGS)
Telephone: 1(800)541-3447

Western Utilities
Underground Alert, Inc.
Telephone: 1(800)424-3447

12-1.11 PRESERVATION OF PROPERTY

Attention is directed to Sections 7-1.11, "Preservation of Property," 7-1.12, "Responsibility for Damage," 7-1.16, "Contractor's Responsibility for the Work and Materials," and 8-1.10, "Utility and Non-Highway Facilities," of the Standard Specifications.

Operations shall be conducted in such a manner that existing facilities, surfacing, installations, and utilities which are to remain in place will not be damaged. Temporary surfacing, facilities, utilities and installations shall also be protected until they are no longer required. The Contractor, at his expense shall furnish and install piling, sheet piling, cribbing, bulkheads, shores, or whatever means may be necessary to adequately support material carrying such facilities, or to support the facilities themselves and shall maintain such support until they are no longer needed.

12-1.12 UTILITY CONNECTION

The Contractor shall make all arrangements, and obtain all permits and licenses required for the extension of and connection to each utility service applicable to this project, shall furnish all labor and materials necessary for such extensions which are not performed or provided by the utility, and shall furnish and install any intermediate equipment required by the serving utilities.

Upon written request by the Contractor, the State will pay all utility permits, licenses, connection charges, and excess length charges directly to the utility. Such request shall be submitted not less than 45 days before service connections are required.

The costs incurred by the Contractor for the extensions of utilities beyond the limits shown on the plans, and in furnishing and installing any intermediate equipment required by the serving utilities, will be paid for as extra work as provided in Section 4-1.03D of the Standard Specifications.

Full compensation for any costs incurred by the Contractor to obtain the permits and licenses shall be considered as included in the contract lump sum price paid for building work and no additional compensation will be allowed therefor.

12-1.13 TEMPORARY UTILITIES

The Contractor may obtain electrical power and water from existing State electrical power and water outlets within the contract limits free of charge for contract operations where such utilities exist, provided that such utility services are in service and are not required by the State for other purposes and subject to the provisions in the section "Cooperation" of these special provisions.

The Contractor shall make his own arrangements to obtain any additional electrical power and water or other utilities required for his operations and shall make and maintain the necessary service connections at his own expense.

When existing utility systems are being modified, periods of shutdown will be determined by the Engineer.

The Contractor shall provide adequate temporary lighting to perform the work and allow the Engineer to inspect the project as each portion is completed.

The Contractor shall provide and pay for telephone service he may require. State telephone facilities shall not be used.

12-1.14 SANITARY FACILITIES

When operational, State sanitary facilities will be available for use by the Contractor's employees, during normal State working hours. Tools shall not be cleaned nor shall cleaning liquids be disposed of in State sanitary facilities or sewers.

During toilet room renovation or other periods when State-owned sanitary facilities are not operational, the Contractor shall provide and pay for wash facilities, drinking water fixtures and a minimum of two temporary toilet units for State forces. Separate toilet facilities shall be provided for Contractor's personnel. Facilities shall include the periodic flushing, waste removal and cleaning of such facilities. Units shall to be maintained in a clean and sanitary condition, including a supply of toilet tissue, toilet seat covers, paper towels and paper cups. Waste material shall be disposed of off site in a lawful manner. Temporary toilet units shall be single occupant units of the chemical, aerated recirculation or combustion type, properly vented and fully enclosed with a glass fiber reinforced polyester shell or similar nonabsorbent material.

12-1.15 MEASUREMENT AND PAYMENT

The contract lump sum price paid for building work shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in constructing the building work, complete in place, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

Full compensation for any incidental materials and labor, not shown on the plans or specified, which are necessary to complete the buildings and appurtenances shall be considered as included in the contract lump sum price paid for building work and no additional compensation will be allowed therefor.

12-1.16 PROJECT RECORD DRAWINGS

The Contractor shall prepare and maintain one set of project record drawings, using an unaltered set of original project plans, to clearly show all as-constructed information for the project. As a minimum, the information to be shown shall include 1) any plan clarifications or change orders, 2) locations of any underground utilities, or 3) the location, size, type, and manufacturer of all major products or components selected by the Contractor for use in the work.

All markings shall be placed on the project record drawings using red ink or red pencil. Original figures shall not be eradicated nor written over and superseded material shall be neatly lined out. Additional drawings shall be submitted if the required information cannot be clearly shown on the original set of project plans. The additional drawings shall be not less than 279 mm x 432 mm in size and shall have the contract number on each sheet. The Contractor shall sign and date each sheet of the project record drawings to verify that all as-constructed information shown on the drawings is correct.

The Contractor shall periodically review the set of project record drawings with the Engineer during the progress of the work to assure that all changes and other required information are being recorded.

Before completion of the work, the Contractor shall request a review of the project record drawings to determine the completeness and adequacy of them. If the project record drawings are unacceptable, the Contractor shall inspect, measure, and survey the project as necessary to record the required additional information.

The set of completed project record drawings shall be delivered to the Engineer prior to acceptance of the contract.

12-1.17 SUBSTITUTION OF NON-METRIC MATERIALS AND PRODUCTS

Only materials and products conforming to the requirements of the specifications shall be incorporated in the work. When metric materials and products are not available, and when approved by the Engineer, and at no cost to the State, materials and products in the inch-pound (imperial) system which are of equal quality and of the required properties and characteristics for the purpose intended, may be substituted for the equivalent metric materials and products, subject to the following requirements:

> Materials and products shown on the plans or in the special provisions as being equivalent may be substituted for the metric materials and products specified or detailed on the plans.
>
> Before other non-metric materials and products will be considered for use the Contractor shall furnish, at the Contractor's expense, evidence satisfactory to the Engineer that the materials and products proposed for use are equal to or better than the materials and products specified or detailed on the plans. The burden of proof as to the quality and suitability of substitutions shall be upon the Contractor and the Contractor shall furnish all information necessary as required to the Engineer. The Engineer will be the sole judge as to the quality and suitability of the substituted materials and products and the Engineer's decision shall be final.
>
> When the Contractor elects to substitute non-metric materials and products, including materials and products shown on the plans or in the special provisions as being equivalent, a list of substitutions to be made shall be submitted for approval.

The following substitutions of materials and products will be allowed:

SUBSTITUTION TABLE FOR SIZES OF HIGH STRENGTH STEEL FASTENERS, ASTM Designation: A 325M	
METRIC SIZE SHOWN ON THE PLANS mm x thread pitch	IMPERIAL SIZE TO BE SUBSTITUTED inch
M16 x 2	5/8
M20 x 2.5	3/4
M22 x 2.5	7/8
M24 x 3	1
M27 x 3	1-1/8
M30 x 3.5	1-1/4
M36 x 4	1-1/2

SUBSTITUTION TABLE FOR REINFORCEMENT	
METRIC BAR DESIGNATION NUMBER AS SHOWN ON THE PLANS	IMPERIAL BAR DESIGNATION NUMBER TO BE SUBSTITUTED
10	3
13	4
16	5
19	6
22	7
25	8
29	9
32	10
36	11
43	14
57	18

SUBSTITUTION TABLE FOR WELDED PLAIN WIRE REINFORCEMENT, ASTM DESIGNATION: A 185	
	US CUSTOMARY UNITS SIZE TO BE SUBSTITUTED $inch^2$ x 100
MW9	W1.4
MW10	W1.6
MW13	W2.0
MW15	W2.3
MW19	W2.9
MW20	W3.1
MW22	W3.5
MW25	W3.9, except W3.5 in piles only
MW26	W4.0
MW30	W4.7
MW32	W5.0
MW35	W5.4
MW40	W6.2
MW45	W6.5
MW50	W7.8
MW55	W8.5, except W8.0 in piles only
MW60	W9.3
MW70	W10.9, except W11.0 in piles only
MW80	W12.4
MW90	W14.0
MW100	W15.5

The sizes in the following tables of materials and products are exact conversions of metric sizes of materials and products and are listed as acceptable equivalents:

CONVERSION TABLE FOR SIZES OF: (1) STEEL FASTENERS FOR GENERAL APPLICATIONS, ASTM Designation: A 307 or AASHTO Designation: M 314, Grade 36 or 55, and (2) HIGH STRENGTH STEEL FASTENERS, ASTM Designation: A 325 or A 449	
DIAMETER	
METRIC SIZE SHOWN ON THE PLANS mm	EQUIVALENT IMPERIAL SIZE inch
6, or 6.35	1/4
8 or 7.94	5/16
10, or 9.52	3/8
11, or 11.11	7/16
13 or 12.70	1/2
14, or 14.29	9/16
16, or 15.88	5/8
19,or 19.05	3/4
22, or 22.22	7/8
24, 25, or 25.40	1
29, or 28.58	1-1/8
32, or 31.75	1-1/4
35, or 34.93	1-3/8
38 or 38.10	1-1/2
44, or 44.45	1-3/4
51, or 50.80	2
57, or 57.15	2-1/4
64, or 63.50	2-1/2
70 or 69.85	2-3/4
76, or 76.20	3
83, or 82.55	3-1/4
89 or 88.90	3-1/2
95, or 95.25	3-3/4
102, or 101.60	4

CONVERSION TABLE FOR NOMINAL THICKNESS OF SHEET METAL			
UNCOATED HOT AND COLD ROLLED SHEETS		HOT-DIPPED ZINC COATED (GALVANIZED) SHEETS	
METRIC THICK-NESS SHOWN ON THE PLANS mm	EQUIVA-LENT US STAND-ARD GAGE inch	METRIC THICK-NESS SHOWN ON THE PLANS mm	EQUIVA-LENT GALVAN-IZED SHEET GAGE inch
7.94	0.3125		
6.07	0.2391		
5.69	0.2242		
5.31	0.2092		
4.94	0.1943		
4.55	0.1793		
4.18	0.1644	4.270	0.1681
3.80	0.1495	3.891	0.1532
3.42	0.1345	3.510	0.1382
3.04	0.1196	3.132	0.1233
2.66	0.1046	2.753	0.1084
2.28	0.0897	2.372	0.0934
1.90	0.0747	1.994	0.0785
1.71	0.0673	1.803	0.0710
1.52	0.0598	1.613	0.0635
1.37	0.0538	1.461	0.0575
1.21	0.0478	1.311	0.0516
1.06	0.0418	1.158	0.0456
0.91	0.0359	1.006 or 1.016	0.0396
0.84	0.0329	0.930	0.0366
0.76	0.0299	0.853	0.0336
0.68	0.0269	0.777	0.0306
0.61	0.0239	0.701	0.0276
0.53	0.0209	0.627	0.0247
0.45	0.0179	0.551	0.0217
0.42	0.0164	0.513	0.0202
0.38	0.0149	0.475	0.0187

CONVERSION TABLE FOR WIRE		
METRIC THICKNESS SHOWN ON THE PLANS mm	EQUIVALENT USA STEEL WIRE THICKNESS inch	GAGE NO.
6.20	0.244	3
5.72	0.225	4
5.26	0.207	5
4.88	0.192	6
4.50	0.177	7
4.11	0.162	8
3.76	0.148	9
3.43	0.135	10
3.05	0.120	11
2.69	0.106	12
2.34	0.092	13
2.03	0.080	14
1.83	0.072	15
1.57	0.062	16
1.37	0.054	17
1.22	0.048	18
1.04	0.041	19
0.89	0.035	20

CONVERSION TABLE FOR COMMON NAILS				
NAIL SIZE	METRIC mm		ENGLISH inch	
	Length	Diameter	Length	Diameter
8d	63.5	3.33	2 1/2	0.131
10d	76.2	3.76	3	0.148
16d	88.9	4.11	3 1/2	0.162

CONVERSION TABLE FOR LUMBER	
METRIC NOMINAL SURFACE DRY SIZE mm	EQUIVALENT NOMINAL SURFACE DRY U S SIZE inch
51	2
102	4
152	6
203	8
254	10
305	12

CONVERSION TABLE FOR PLYWOOD	
METRIC mm	ENGLISH inch
6.4	1/4
7.9	5/16
9.5	3/8
11.1	7/16
11.9	15/32
12.7	1/2
15.1	19/32
15.9	5/8
18.3	23/32
19.1	3/4
22.2	7/8
25.4	1
28.6	1 1/8

CONVERSION TABLE FOR INSULATION R-VALUE	
METRIC (K m^2/W)	ENGLISH (HR FT^2 F/BTU)
0.5	3
0.7	4
1.4	8
1.9	11
2.3	13
2.5	14
3.3	19
5.3	30

CONVERSION TABLE FOR VAPOR TRANSMISSION RATING	
METRIC (Perm-m)	ENGLISH (perm-inch)
0.29	0.02

CONVERSION TABLE FOR LOW PRESSURE	
METRIC (Pa)	ENGLISH (Inches of Water Column)
30	0.125
60	0.25
90	0.375
120	0.50
150	0.60
155	0.625
175	0.70
185	0.75
200	0.80
250	1.00
310	1.25

CONVERSION TABLE FOR PRESSURE	
METRIC (kPa)	ENGLISH (psi)
10	1.5
210	30
280	40
350	50
690	100
860	125
1040	150
1100	160
1210	175
1380	200
1730	250
2070	300
2170	315
2410	350
2590	375
2760	400
4830	700
5170	750
5520	800
13800	2000
17200	2500
20700	3000
27600	4000
34500	5000
137900	20000

CONVERSION TABLE FOR MIL THICKNESS	
METRIC (mm)	ENGLISH (inch/1000)
0.10	4
0.13	5
0.15	6
0.50	20
0.75	30
1.00	40

CONVERSION TABLE FOR HVAC DUCTING.	
METRIC (mm)	ENGLISH (inch)
100	4
125	5
150	6
175	7
200	8
225	9
250	10
300	12
360	14
410	16
460	18
510	20
560	22
610	24
660	26
710	28
760	30

CONVERSION TABLE FOR MECHANICAL PIPING		
METRIC (GSP, PVC, BSP, DUCTILE IRON)	METRIC (mm)	ENGLISH (inch)
NPS 1/2	15	1/2
NPS 3/4	20	3/4
NPS 1	25	1
NPS 1 1/4	32	1 1/4
NPS 1 1/2	40	1 1/2
NPS 2	50	2
NPS 2 1/2	65	2 1/2
NPS 3	75	3
NPS 4	100	4
NPS 6	150	6

CONVERSION TABLE FOR LUBRICATION PIPING TUBING WALL THICKNESS	
METRIC (mm)	ENGLISH (inch)
2.1	0.083
0.9	0.035

CONVERSION TABLE FOR HOSE/TUBING SIZES O. D.	
METRIC (mm)	ENGLISH (inch)
6	1/4
10	3/8
13	1/2
16	5/8
19	3/4
22	7/8
25	1

CONVERSION TABLE FOR DRUM SIZES			
METRIC		ENGLISH	
L	kg	gallons	pounds
205	180	55	400
60	55	16	120
19	16	5	35

CONVERSION TABLE FOR POWER	
METRIC (kW)	ENGLISH (HP)
0.037	1/20
0.075	1/10
0.18	1/4
0.25	1/3
0.37	1/2
0.55	3/4
0.75	1
1.1	1 1/2
1.5	2
2.2	3
3.7	5
5.5	7 1/2
7.5	10
11	15
15	20
18.5	25
22	30
30	40
37	50
45	60
55	75
75	100
90	120
110	150

CONVERSION TABLE FOR IMPELLER BALANCE		
SYNCHRONOUS RPM	METRIC (g mm/kg)	ENGLISH (ounce-inch/pound)
720	94	0.059
900	73	0.046
1200	54	0.034
1800	41	0.026
3600	17	0.011

CONVERSION TABLE FOR ELECTRICAL CONDUIT	
METRIC SIZE SHOWN ON THE PLANS mm	EQUIVALENT IMPERIAL SIZE inch
16	1/2
21	3/4
27	1
35	1 1/4
41	1 1/2
53	2
103	4

SECTION 12-2. SITEWORK

12-2.01 ROUGH GRADING

PART 1.- GENERAL

SUMMARY.--

Scope.--This work shall consist of rough grading the site in accordance with the details shown on the plans and these special provisions.

Rough grading shall consist of excavation or removal of above grade material regardless of character and subsurface condition; filling of all holes, swales, embankments, and low points to the elevation shown on the plans or specified; and the preparation of basement material for the placing of other material thereon and the establishment of the grading plane.

Earthwork for building construction shall conform to the requirements specified under "Earthwork for Building Work" in this Section 12-2 of these special provisions.

PART 2.- PRODUCTS

Fill material.--

Material from the excavation that is suitable for the required compaction may be used for filling holes, swales and low points. Fill material shall be free of organic material. Rocks and lumps shall be well distributed with sufficient earth or other fine matrix material to produce a dense, compacted fill that is suitable for the construction and load support intended.

The Contractor shall furnish suitable borrow material to offset any material deficiencies developed from grading work.

PART 3.- EXECUTION

EXCAVATION.--

General.--Care shall be exercised to avoid disturbing material below and beyond the limits of excavation. When excavation is carried beyond the limits shown on the plans or specified, such excavation shall be replaced in kind and compacted at the Contractor's expense.

Limits of the excavation shall allow for adequate working space for installing materials and as required for safety of personnel. Such working space excavation shall be replaced in kind and compacted at the Contractor's expense.

Excess and waste materials from the excavation shall become the property of the Contractor and be disposed of outside the highway right of way in accordance with the requirements in Section 7-1.13 of the Standard Specifications.

FILL.--

Subgrade preparation.--Preparation of subgrade material for placing other material thereon shall include fine grading, compaction, reworking as necessary, and preparation of cut, or fill upon which base materials, surfacing, or slabs are to be placed. The upper 200 mm of the subgrade shall have the same compaction as the fill to be placed over it.

Placing.--When footings are to be constructed in fill, the fill shall be constructed to the grading plane required for the building construction prior to excavating for the footings. Fill shall be placed and compacted in layers. The loose thickness of each layer before compaction shall not exceed 150 mm.

Water shall be added to the fill material as needed for compaction.

COMPACTION.--

General--Relative compaction shall be determined in accordance with California Test 216 or 231.22

Relative compaction (95 percent).--In fill relative compaction of not less than 95 percent shall be obtained for a minimum depth of 400 mm below finished grade for the width of the paved areas plus 0.9 meter on each side thereof.

The prisim of fill directly underneath the building foundation and sloping downward at 1:1 shall be compacted to 95 percent.

Relative compaction (90 percent).--Relative compaction of not less than 90 percent shall be obtained in all fill except as specified above.

FIELD QUALITY CONTROL.--

Testing and inspection.--The State will conduct compaction tests during the earthwork operations.

12-2.02 EARTHWORK FOR BUILDING WORK

PART 1.- GENERAL

SUMMARY.--

Scope.--This work shall consist of performing earthwork for building work in accordance with the details shown on the plans and these special provisions.

Earthwork for building work shall consist of structure excavation and structure backfill. Structure excavation shall include excavation for footings, foundations, walls, slabs, tanks, drywells, manholes, oil/water separators, clarifiers, and trenches. Structure backfill shall include 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 shall include any other earthwork, not mentioned, but necessary to complete the building work.

Attention is directed to the Materials Information Handout for information regarding foundation recommendations and reports that were prepared for use during the design of this project.

Attention is directed to the requirements of "Field Engineering" in Section 12-1, "General Requirements," of these special provisions.

Related work.--Leach lines shall be excavated and backfilled in accordance with the requirements specified under "Septic Sewage Disposal System" elsewhere in this Section 12-2.

QUALITY ASSURANCE.--

Samples.--Samples of sand, pea gravel, or crushed stone, weighing not less than 11 kg, shall be submitted to the Engineer at the jobsite for approval.

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, the Contractor shall accurately locate the piping and conduit involved in the work. If the location of the existing piping or conduit deviates from the location shown on the plans by more than 1.5 meters, or, if no elevations are indicated and the piping or conduit is more than 0.9 meter below grade, the cost of the additional excavation, backfill, piping or conduit, and removal and replacement of concrete, if any, will be paid for as extra work as provided in Section 4-1.03D of the Standard Specifications.

Existing surfaced or planted areas.--Existing surfaced or planted areas that are removed, broken or damaged by the Contractor's operations shall be restored to their original condition except as otherwise shown on the plans or specified herein.

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

PART 2.- PRODUCTS

BACKFILL MATERIALS.--

Structure backfill.--

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

Select backfill.--

Select backfill shall conform to the requirements specified under "Aggregate Base," elsewhere in this Section 12-2.

Sand.--

Sand shall be clean, washed sand, free from clay or organic material graded such that 100 percent passes the 6 mm sieve, 90 percent to 100 percent passes the 4.75 mm sieve and not more than 5 percent passes the 75 µm sieve size.

Pea gravel (naturally rounded).--

Pea gravel (naturally rounded) shall be clean, washed, dry density of not less than 1522 kg/m^3, free from clay or organic material and shall conform to the following grading as determined by California Test 202:

Sieve or Screen Size	Percentage Passing
19 mm	100
13 mm	90-100
9.5 mm	40-70
4.75 mm	0-15
2.36 mm	0-3

Pea gravel shall conform to the following requirements:

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

Crushed stone.--

Crushed stone shall be clean, washed, dry density of not less than 1522 kg/m^3, crushed stone or crushed gravel with an angular particle size not less than 3 mm or more than 13 mm.

Sieve or Screen Size	Percentage Passing
13 mm	100
9.5 mm	85-100
4.75 mm	10-30
2.36 mm	0-3

Crushed stone shall conform to the following requirements:

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

PART 3.- EXECUTION

PREPARATION & RESTORATION.--

Sawcutting.--Prior to excavation or trenching, existing surfacing shall be removed to saw cut lines, or to existing wood dividers or expansion joints, if any. The saw cut shall be to a neat line and have a depth not less than 25 mm.

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

STRUCTURE EXCAVATION.--

General.--Unless otherwise noted, all excavation for building work shall be classified as structure excavation.

Footing excavation.--The bottom of excavation shall not be disturbed. The contractor shall excavate by hand to the final grade. The bottom of concrete footings shall 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 on the plans shall be changed to suit field conditions when directed by the Engineer. Solid rock at or near required depths shall not be disturbed. Unsuitable material shall be excavated down to firm bearing as directed by the Engineer. Work and materials required because of excavation in excess of the depths shown on the plans, when such excavation has been ordered by the Engineer, will be paid for as extra work as provided in Section 4-1.03D of the Standard Specifications.

Excavate to the elevations and dimensions within a tolerance of ±12 mm. Limits of the excavation shall allow for adequate working space for installing materials and as required for safety of personnel. Such working space excavation shall be replaced in kind and compacted at the Contractor's expense.

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

At locations and to the limits shown on the plans, material below the bottom of the foundation or footing shall be removed and replaced with select backfill in accordance with the placing and compacting requirements for backfill.

Excavation for pipes and conduits.--Pipes or conduits in the same trench shall have a minimum clear distance between pipes or conduits of 150 mm. Pipes or conduits shall have not less than 0.75 meter of cover from top of pipes or conduits to finished grade unless otherwise shown on the plans or specified.

Trenching shall be of sufficient depth to permit placing a minimum depth of 100 mm of compacted sand under all pipes and conduits.

Excavation adjacent to trees shall be performed by hand methods where necessary to avoid injury to trees and roots. Roots 50 mm in diameter and larger shall be protected with heavy burlap. Roots smaller than 50 mm in diameter adjacent to trees shall be hand trimmed. Cuts through roots 13 mm in diameter and larger shall be sealed with tree trimmers' asphaltic emulsion. If trenches remain open more than 24 hours, the side of the trench adjacent to the tree shall be shaded with burlap and kept damp. Materials shall not be stockpiled within the drip line of trees.

Dewatering.--Excavations shall be kept clear of standing water. Water shall be removed by pumping if necessary. Water removed from excavation shall be carried away from the building site and disposed of in a manner that will not harm State or adjacent property.

STRUCTURE BACKFILLING.--

General.--Unless otherwise noted, all backfill for building work shall be classified as structure backfill. Backfill shall be placed and compacted in horizontal layers, not more than 150 mm thick prior to compaction, and to the lines and grades shown on the plans or to original ground.

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

Select backfill.--At the locations and to the limits shown on the plans, materials below the bottom of footings or foundations shall be removed and replaced with select backfill material in accordance with the placing requirements of structure backfill.

Backfilling pipes and conduits.--Backfill placed under pipe and conduits shall be compacted sand, 100 mm minimum depth. Backfill material placed to a level 150 mm above tops of pipes and conduits shall be sand or fine earth and particles shall not exceed 13 mm in greatest dimension. For wrapped, coated, or plastic pipe or conduits, sand shall be used for backfill. Backfill material placed higher than 150 mm above tops of pipes or conduits shall consist of material free of stones or lumps exceeding 100 mm in greatest dimension except:

(a) The top 300 mm of backfill under roads, walks or paving shall consist of aggregate base material.
(b) The top 150 mm of backfill in planted areas shall consist of topsoil.

Unless otherwise shown on the plans, pipe under roads, with less than 0.75 m of cover over the top of pipe, shall be backfilled with concrete to a level 100 mm above the top of pipe. Concrete for backfill shall be commercial quality concrete containing not less than 350 kg/m^3 of cement.

COMPACTION.--

General.--Relative compaction shall be determined in accordance with California Test 216 or 231.
Unless otherwise noted below, all backfill shall be compacted to a minimum relative compaction of 90 percent.
Unless approved in writing by the Engineer, compaction by jetting or ponding will not be permitted.

Compact original ground.--Original ground surface under fill with surfacing of concrete and asphalt concrete shall be compacted to a relative compaction of not less than 95 percent for a minimum depth of 150 mm.

Subgrade preparation.--Preparation of subgrade material for placing aggregate base, surfacing, or slabs thereon shall include fine grading, compaction, reworking as necessary. The upper 150 mm of the subgrade shall 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 shall be compacted to 95 percent.

Structure backfill.--Structure backfill shall be compacted to not less than 95 percent relative compaction.

Select backfill.--Select backfill shall be compacted to not less than 95 percent relative compaction.
A relative compaction of not less than 95 percent shall be obtained for a minimum depth of 150 mm below the bottom of the excavation before placing select backfill.

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

DISPOSAL.--

Surplus material.--Surplus material from the excavation shall be disposed of at the site of the work as directed by the Engineer.

Surplus material from the excavation shall be removed and disposed of outside the right-of-way in accordance with Section 7-1.13 of the Standard Specifications.

FIELD QUALITY CONTROL.--

Inspection.--When the excavation is substantially completed to grade, the Contractor shall notify the Engineer. No concrete shall be placed until the foundation has been approved by the Engineer.

Testing.--The State will conduct compaction tests during the backfilling and compacting operations.

12-2.03 FREE DRAINING GRANULAR MATERIAL

PART 1.- GENERAL

SUMMARY.--

Scope.--This work shall consist of furnishing and placing free draining granular material beneath slabs in accordance with the details shown on the plans and these special provisions.

PART 2.- PRODUCTS

Free draining granular material.--

Free draining granular material shall be clean, hard, durable, free-draining rock. The material gradation shall be such that all passes the 25 mm screen, and not more than 10 percent passes the 4.75 mm sieve as determined by California Test 202. Granular material shall be free from organic material, clay balls or other deleterious substances.

PART 3.- EXECUTION.--

SPREADING AND CONSOLIDATING.--

General.--Free draining granular material shall be placed, spread and consolidated by tamping or vibrating.

12-2.04 TERMITE CONTROL

PART 1.-GENERAL.--

SUMMARY.--

Scope.--This work shall consist of furnishing and applying soil treatment for termite control in accordance with these special provisions.

SUBMITTALS.--

Product data.--Product labels for the soil treatment material showing descriptive information on the active chemical ingredients, mixing instructions for concentration levels, directions for use, application rates, and precautionary information shall be submitted for approval. Labels shall include an EPA product registration number.

QUALITY ASSURANCE.--

Attention is directed to Section 7-1.01H, "Use of Pesticides," of the Standard Specifications.

Soil treatment operations for control of termites shall be performed by a pest control operator who is licensed by the State of California.

Insecticides used in termite control work shall be approved and registered by the United States Environmental Protection Agency (EPA) and the State of California.

DELIVERY, HANDLING AND STORAGE.--

General.--The storage, mixing and application of chemicals; the cleaning of equipment; and the disposal of product containers shall be in accordance with federal, state and local regulations.

PART 2.-PRODUCTS

Soil treatment material.--

Soil treatment materials for termite control shall be commercial quality and shall be water emulsifiable.

The active chemical ingredient of the termiticide shall be any EPA approved chemical or combinations of chemicals intended for the eradication and control of subterranean termites.

All product containers shall bear the manufacturer's EPA approved label with EPA registration number.

PART 3.-EXECUTION

PREPARATION.--

General.--The Engineer shall be notified not less than 3 working days in advance of the planned termite control work. Similar notice shall be given to any state or local agency which requires that their representative be present during the termite control work.

Soil preparation.--Excavation, embankment construction, backfilling and grading operations shall be completed prior to the application of the soil treatment solution. Deleterious matter that will decrease the effectiveness of the treatment shall be removed from all areas to be treated.

Soil to be treated, except under slabs and foundations and vertical surfaces of trenches, shall be cultivated a minimum of 50 mm in depth, and shall be graded as shown on the plans.

Termite control work shall be performed in the presence of the Engineer unless the Contractor has received written approval from the Engineer to proceed.

MIXING.--

General.--The soil treatment emulsion shall be mixed in accordance with the manufacturer's instructions to achieve the chemical concentration level shown on the EPA approved product label for the type of soil and the area to be treated.

APPLICATION.--

General.--The soil treatment emulsion shall be applied to all soil within the area of the building including floor slab areas, under foundations and footings, to the horizontal and vertical surfaces of excavations and to such other areas or surfaces, not mentioned, but which are required for the complete and total protection of the building. The application shall be in accordance with the instructions shown on the EPA approved product label.

Where free draining material has previously been placed, sufficient amount of dilution shall be added to reach the soil beneath the free draining material.

Treated areas that are subsequently excavated, graded, trenched or filled shall be given an additional application.

PROTECTION.--

General.--Treated areas shall be protected in accordance with the instructions shown on the EPA approved product label until the treated surface is covered by subsequent construction.

If concrete slab cannot be placed over the soil the same day it has been treated, a vapor barrier shall be placed over the treated area to prevent disturbance of the treated soil.

12-2.05 WATER SUPPLY SYSTEM

PART 1.-GENERAL

SUMMARY.--

Scope.--This work shall consist of furnishing and installing a complete water supply system in accordance with the details shown on the plans and these special provisions.

The water supply system shall include all equipment, accessories and appurtenances necessary for the complete installation and operation of said system.

Related work.--Earthwork, foundations, supports, sheet metal, painting, mechanical, electrical, and all other work incidental to and necessary for the proper installation and operation of the water supply system shall conform to the requirements for similar work elsewhere in these special provisions.

QUALITY ASSURANCE.--

Codes and standards.--This work shall conform to the applicable portions of the 2001 California Plumbing Code, California Code of Regulations, Title 24, Part 5, applicable AWWA and NSF standards, the manufacturer's recommendations and the requirements specified herein.

SUBMITTALS.—

Working Drawings.--Working drawings shall show complete layout and details of the tanks, pumps, equipment and materials to be installed. Submittals for the storage and pressure tank shall include, structural calculations, including any support saddles, shown on the plans, and seismic restraint calculations and shall be signed by an Civil or Structural Engineer licensed in the State of California.

Product data.--A material list, including catalog cuts, and descriptive data shall be submitted and complete as to name of manufacturer, catalog number, size, capacity, finish, all pertinent performance ratings, and identification symbols used on the plans and in the special provisions for each item. The items to be submitted shall include, but not necessarily be limited to the following:

Well Pump
Submersible Cable
Submersible Cable Splice Kit
Water Level Indicator System
Sanitary Well Seal
Screened Casing Vent
Pipe and Fittings
Flexible Connector
Storage Tank
Pressure Tank
Ball Valve
Check Valve
Gate Valve
Motorized Ball Valve
Safety Relief Valve
Sampling Valve

Hose Faucet
Wharf Hydrant
Pressure Switch
Float Switch
Air Volume Controller
Sight Gauge and Enclosure
Pressure Gauge
Gauge Cock
Water Meter
Strainer
Enclosure
Meter Box
Valve Box
Underground Tracer Tape

Manufacturer's warranties and guarantees for equipment and materials installed in the work shall be delivered to the Engineer at the jobsite.

CLOSEOUT SUBMITTALS.--

Operation and maintenance manuals.--Prior to completion of the project, 3 bound identified copies of the operation and maintenance instructions and parts lists for equipment furnished shall be delivered to the Engineer at the jobsite. Manuals that are inadequate or incomplete will be returned and the Contractor shall resubmit adequate and complete manuals. Manuals shall be included for the following equipment:

Well Pump
Water Level Indicator System
Motorized Ball Valve
Pressure Switch
Float Switch
Air Volume Controller
Water Meter

Maintenance instructions.--Before completion of the project, one set of maintenance instructions for each pump including the pump curve, shall be encased between two heat fused laminated plastic sheets and shall be attached at a convenient location approved by the Engineer.

PART 2.- PRODUCTS

PUMPS. –

Well pump.--

The well pump shall be a submersible turbine deep well type. The well pump shall include; pump bowls, pump screen, and motor.

The pump bowls, suction bell and discharge case shall be hard, close-grained, cast iron. The pump diffusers shall be bronze. The pump bowl assembly shall have an outside diameter not greater than 105 millimeters. All bolts, studs, and nuts used on the pump bowl assembly shall be nonmagnetic stainless steel.

The pump screens shall be stainless steel or non-magnetic material and shall have a diameter no larger than the suction bell.

The impellers shall be bronze, enclosed type, and shall be dynamically balanced. The bowl bearings shall be bronze or combination bronze and rubber. The impeller shaft shall be stainless steel.

The pump shall be capable of pumping water, under test, at the flow rates and the total heads shown on the plans. The pump shall not load the motor beyond the nameplate rating multiplied by the service factor at any point on the pump curve.

The motor shall be a solid shaft, induction motor, and shall be designed for continuous duty underwater operation. Kilowatt rating, voltage, phase, and RPM shall be as shown on the plans.

Booster pump.--

Booster pump shall be a close-coupled, bronze fitted, single-stage horizontal centrifugal pump with mechanical seal and ball or roller bearings. Pump case shall be close-grained, high strength cast iron with bronze wear ring. Pump shaft shall be carbon steel. Impeller shall be bronze and certified dynamically balanced.

Booster pump shall be capable of pumping water, under test, at the flow rates and the total heads shown on the plans. The pump shall not load the motor beyond its nameplate rating multiplied by its service factor at any point on the pump curve.

The pump motor shall be an open drip proof motor. Three-phase motor shall be NEMA Design B induction motor. Kilowatt rating, voltage, phase and RPM shall be as shown on the plans.

PUMP ENCLOSURES.--

The pump enclosures shall be fabricated from 12 gauge cold rolled steel or marine grade aluminum. The enclosure shall be cleaned and painted with a two part epoxy paint and baked until thoroughly dried. Above ground accessories to the pumps, including valves and galvanized pipe, shall be painted with one application of commercial quality pre-treatment, vinyl wash primer and a minimum of one application of commercial quality fast drying exterior enamel.

The Contractor shall provide the primers and paints.

The pump enclosures shall each have a lockable, hinged lid with gas spring or equivalent lid supports. Contractor shall select and install spring that will make full use of its entire stroke but not force it beyond its specified extended length.

MISCELLANEOUS WELL ACCESSORIES.--

Submersible cable.--

The submersible cable shall consist of 3 No. 8 AWG and one No. 10 AWG ground copper conductors in a flat, single-jacketed, cable assembly. Each conductor shall be insulated with synthetic rubber or plastic suitable for continuous immersion in water. The jacket material shall be oil and water resistant synthetic rubber or other suitable mechanically protective material.

A stainless steel guard shall protect the cable assembly where it passes the pump bowls.

The cable shall be continuous without splices between the well pump control panel and the well pump motor leads.

Submersible cable splice kit.--

The splice at the pump motor leads shall be made with the motor manufacturer's recommended heat shrink splice kit. Electrical tape is not allowed.

Water level indicator system.--

The water level indicator system shall consist of tubing, altitude gauge, hand air pump, and all necessary fittings. The altitude gauge shall have a 100 mm dial face and shall be calibrated in feet of water and adjustable for various lengths of air tubing. The tubing shall be 6 mm diameter, hard plastic tubing with a bend radius of approximately 75 mm and a pressure rating of at least 1380 kPa. The tubing shall extend to the bottom of the bowl assembly. The hand air pump shall be capable of supplying air at 860 kPa.

Sanitary well seal.--

The sanitary well seal shall be a standard commercially manufactured product that seals against the entrance of surface water when the cap screws are tightened to force a rubber packer against the well casing and the discharge pipe. The unit shall be factory painted cast iron. The well seal shall have two tapped openings.

Screened casing vent.--

Screened casing vent shall have dual outlets facing downward, cast iron body and stainless steel or brass screen. The size shall be as shown on the plans.

PIPE AND FITTINGS.--

Galvanized Steel Pipe (GSP).--

Galvanized steel pipe shall be schedule 40 conforming to ASTM Designation: A 53, with 1040 kPa galvanized malleable iron banded screwed fittings and galvanized steel couplings. The weight of the zinc coating shall be not less than 90 percent of that specified in ASTM Designation: A 53.

Polyvinyl chloride (PVC) standard weight pipe and fittings, Schedule 40, conforming to ASTM Designation: D 1785. Pipe shall meet or exceed requirements of National Sanitation Foundation Standard No. 14. Pipe shall have bell ends conforming to ASTM Designation: D 2672. For pipe sizes 75 mm and smaller, plain end pipe with solvent welded fittings conforming to ASTM Designation: D 2241 may be used.

Polyvinyl chloride (PVC) 100 mm diameter and greater.--

Polyvinyl chloride (PVC) plastic pipe and fittings shall conform to AWWA Designation: C900, class 150, Standard Dimension Ratio (SDR) 18. Pipe shall have bell end with a solid cross section elastomeric ring conforming to ASTM Designation: D 1869. Fittings shall be rubber-gasket, push-on joint ductile iron and shall conform to ANSI/AWWA Designation: C110/A21.10. Joints shall be boltless and shall conform to ANSI/AWWA Designation: C111/A21.11.

Unions (for steel pipe).--

Unions (for steel pipe) shall be 1730 kPa, threaded malleable iron, ground joint, brass to iron seat, galvanized or black to match piping.

Flexible connector.--

Flexible connector shall be gasketed short sleeve type connectors consisting of a mild steel middle ring with pipe stop, two rubber compound wedge-section ring gaskets, two mild steel follower rings and sufficient mild steel bolts to compress the gaskets. All ferrous metal parts of the coupling shall be hot-dip galvanized after fabrication.

TANKS.—

Storage tank (steel bolted).--

Storage tank shall be an above ground steel bolted potable water storage tank. Tank dimensions shown on the plans are nominal and may be varied a maximum of 150 mm in diameter or height provided the tank capacity shown on the plans is maintained.

The tank shall include: steel sloped roof deck with screened vent and lockable access hatch, flat bottom, exterior ladder, water level gauge, side access manway, flanged connections for piping as shown on the plans, interior and exterior coatings, and seismic tie down anchors.

Storage tank design shall conform to the requirements of AWWA Standard D 103-97. Interior coating shall be glassed or thermoset epoxy and shall meet all NSF standards for use with potable water.

Exterior coating shall be a dual epoxy primer undercoat and acrylic urethane topcoat. Color shall be as shown on the plans.

Pressure tank.--

Pressure tank shall be a horizontal, epoxy lined, steel pressure vessel, conforming to the ASME Code for unfired pressure vessels. The wall thickness of the tank shall be increased 1.6 mm above nominal design to account for corrosion. The tank shall have a working pressure of 860 kPa and shall be stamped accordingly. The tank shall have a 279 mm x 381 mm oval manhole at one end, lifting lugs, support saddles, and extra-heavy half couplings

welded to the tank. Openings in the tank shall accommodate the piping as shown on the plans. Capacity and/or size shall be as shown on the plans. Where shown on the plans, steel support saddles shall be supplied with the tank.

Epoxy lining of the tank interior shall be NSF approved for potable water applications. Epoxy lining shall not impart any odor or taste. The surface preparation and application rate shall be as per the epoxy lining manufacturer's recommendations.

The exterior surface of the tank shall be factory prepared and primed prior to delivery to the jobsite. Surface preparation and final coating shall be prepared and painted in accordance with the requirements specified for "Shop Primed Steel" under "Painting" in Section 12-9 "Finishes," of these special provisions. Color shall be as shown on the plans.

VALVES.--

Ball valve.--

Ball valve shall be two-piece, minimum 2760 kPa WOG, bronze body and chrome plated or brass ball with full size port. Valve shall be Nibco Scott, T-580; Watts, B-6000; Kitz, 56; or equal.

Check valve (on discharge column).--

Check valve (on discharge column) shall be silent spring loaded type, threaded bronze body, nylon or teflon disc, stainless steel helical spring and shaft, Class 125 and same size as pipe in which installed. Check valve shall be designed to operate in the vertical position.

Check valve (less than 100 mm).--

Check valve (less than 100 mm) shall be silent spring loaded type, threaded bronze body, nylon or teflon disc, stainless steel helical spring and shaft, Class 125 and same size as pipe in which installed.

Gate valve (65 mm and smaller) shall be bronze body and trim, removable bonnet and non rising stem, Class 125 and same size as pipe in which installed. Gate valve shall be Crane, 438; Nibco Scott, T-113; Jenkins, 370; or equal.

Gate valve in nonferrous water piping systems may be solder joint type with bronze body and trim. Valve shall be Kitz, 59; Nibco Scott, S-113; Jenkins, 1240; or equal.

Gate valve (75 mm and larger, above ground).--

Gate valve (75 mm and larger, above ground) shall be iron body with bronze trim, removable bonnet and non-rising stem, class 125 and same size as pipe in which installed. Gate valve shall be Crane, 461; Nibco Scott, F-619; Jenkins, 326; or equal.

Motorized ball valve.--

Motorized ball valve shall consist of a ball valve and actuator. The ball valve shall be two-piece, minimum 2760 kPa WOG, bronze body and chrome plated or brass ball with full size port. The ball valve shall have reinforced Teflon seats and packing. The actuator shall be 115 VAC shaded pole motor completely assembled with UL listed components and standard position indicator. Operator shall have a standard auxiliary SPDT switch, 10 amps rating at 115 VAC, factory lubricated hardened gears, manual override, and be capable of being removed without disassembling the piping. The operator housing shall be NEMA-4 enclosure. Closing time shall be 8 seconds or less.

Safety relief valve.--

Safety relief valve shall be rated for a working pressure of 1380 kPa, factory set to open at 860 kPa and equipped with a manual test lever. The size shall be as shown on the plans.

Sampling valve.--

Sampling valve shall be 13 mm, brass or bronze, rated at 690 kPa minimum, with lever handle and bib nose outlet without threads.

FAUCET AND HYDRANTS.--

Hose faucet.--

Hose faucet shall be compression type, angle pattern, wall flange at exterior locations, tee handle, 20 mm female thread with hose end, rough chrome or nickel plated finish for locations inside building, rough brass finish for others. Hose faucet shall 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 shall be Nibco, No. 63VB; Chicago, No. 13T; or equal.

Wharf hydrant.--

Wharf hydrant shall be bronze, 2070 kPa working pressure, operating nut, lug type reducer and hose cap, and chain. Wharf hydrant shall have standard threads on inlet and National Standard Hose Threads on outlet. Lug type reducer shall have National Standard Hose Threads. Wharf hydrant shall be James Jones; Powhatan; John W. Moon Inc.; or equal.

A wharf hydrant operating nut wrench and hose spanner wrench or the combination type shall be provided for each wharf hydrant.

CONTROLS.--

Pressure switch.--

The pressure switch shall be a diaphragm activated, adjustable differential pressure switch with one normally open and one normally closed, 10-ampere, 120-volt AC, snap action contact in a NEMA Type 4 or 4X enclosure. The switch shall have an adjustable differential range of at least 140 kPa and shall be factory set to de-energize the pump when the water pressure reaches 414 kPa and energize the pump when water pressure drops below 276 kPa.

Float switch.--

Float switch shall be 115-volt, 10-ampere, AC, single-pole, single throw mercury switch in inert synthetic casing. Casing shall be leakproof, shockproof, and corrosion resistant. Switch shall be installed as shown on the plans. Switch shall be supplied with a pipe clamp or cable weight as shown on the plans.

Cable shall be 3-conductor, No. 18 AWG with polyvinyl chloride (PVC) jacket. Cable shall be of sufficient length to extend to the junction box, at the location shown on the plans, without splices.

MISCELLANEOUS EQUIPMENT.--

Air volume controller (AVC).--

The AVC shall be a completely self-contained unit and shall consist of an oilless piston type air compressor, encapsulated solid-state controls, safety valve, pressure switch, and adjustable electrode with a weatherproof cover. The unit shall be rated to operate at tank pressures up to 760 kPa. The air compressor motor shall have thermal overload protection and shall be rated to operate at 120 volts AC.

Sight gauge.--

Sight gauge shall be bronze, water-gauge rated for pressures up to 1725 kPa, with dual hand wheel shut off valves, automatic ball check, 15 mm diameter polycarbonate tube and a 10 mm drain valve. Length of the tube shall be as shown on the plans.

Sight gauge enclosure shall be fabricated of 1.90 mm galvanized steel completely enclosing the sight gauge and shall contain rigid polystyrene foam plastic insulation inside. The enclosure shall have a hinged cover and lockable latch.

Pressure gauge.--

Pressure gauge shall be ANSI standard: B40.1, 65 mm dial, liquid filled, plain case, reset screw, and bottom inlet. Gauge shall read from 0 psi to 100 psi with 1-1/2 % of full range accuracy. Each pressure gauge shall be equipped with a gauge cock and snubber valve.

Gauge cock.--

Gauge cock shall be 6 mm, brass or bronze, and rated for 1040 kPa.

Water meter.--

Water meter shall be disc or turbine type, suitable for water service with a magnetic coupling and a minimum 860 kPa working pressure. Meter size shall be as shown on the plans. Readout shall be in gallons. Water meter shall be Badger; Neptune; Rockwell; Hersey; or equal.

Strainer.--

Strainer shall be wye pattern, cast iron body with a Type 304 stainless steel or monel strainer screen. The strainer screen shall have a open area equal to at least three times the cross-sectional area of pipe in which used, and may be woven wire (20 mesh) or perforated type (850 micron maximum diameter perforations).

Enclosure.--

Enclosure shall be manufactured of high-strength, flame-retardant, maintenance and corrosion-free fiberglass. The enclosure shall contain 2 padlockable doors (one on each long side), hold-downs molded inside the unit at the base to secure the unit to the concrete slab, and perforated steel louvers and baffles. The enclosure color shall be green. The enclosure size shall be as shown on the plans.

Meter box.--

Meter box shall be precast, traffic-rated, concrete box with extensions, as required, and a cast iron cover. Cover shall be factory marked "Water," or "Water Meter" where appropriate. Meter box shall be Bes, Christy, Cook Concrete, or equal. Size shall be as shown on the plans or of adequate size to allow for proper access to equipment.

Valve box.--

Valve box shall be precast, traffic-rated, concrete box with extensions, as required, and a cast iron cover. Cover shall be factory marked "Water". Valve box shall be Bes, Christy, Cook Concrete, or equal. Size shall be as shown on the plans or of adequate size to allow for proper access to equipment.

Underground tracer tape.--

Underground tracer tape shall be permanent, detectable, bright colored, continuous printed plastic tape; not less than 50 mm wide; lettering shall read "CAUTION WATER PIPE BURIED BELOW".

Miscellaneous metals.--

Angle iron, steel supports and other miscellaneous metals required for the water supply system shall be in accordance with the requirements specified under "Miscellaneous Metal" in Section 12-5, "Metals," of these special provisions.

PART 3.- EXECUTION

INSTALLATION.--

PUMPS.--

Well pump.--Prior to installation of the well pump all name tag information shall be properly documented and given to the Engineer. The well pump, motor and discharge pipe shall be installed at the settings shown on the plans unless prior written approval is given by the Engineer.

The splice at the well pump motor leads with the heat shrink tubing shall be as per the manufacturer's recommended procedure.

MISCELLANEOUS WELL ACCESSORIES.--

Submersible cable.--The submersible cable shall be continuous without splices between the well pump control panel and the well pump motor leads.

The cable shall be supported from the discharge pipe with nylon straps at 3-meter intervals.

Water level indicator system.--The water level indicator system shall be installed as shown on the plans. The altitude gauge and all fittings including a Schrader valve shall be adequately secured to the well seal. The hard plastic tubing shall be secured to the discharge pipe with nylon straps at 3-meter intervals.

PIPE AND FITTINGS.—

Pipe and fittings.--Pipe and fittings shall be installed in accordance with the following designated uses, unless otherwise shown on the plans:

Designated Use	Pipe and Fitting Class
Discharge Pipe	GSP
Water pipe above ground outside of buildings	GSP
Water underground 1.5 m beyond the building	GSP, PVC,

Installing piping.--Water piping shall be installed generally level, free of traps and bends, and arranged to conform to the building requirements.

Piping shall not be run in floor fill, except where shown on the plans.

Where pipes pass through exterior walls, a clear space around pipe shall be provided. Space shall be caulked water tight with silicone caulk. PVC pipe sleeves shall be provided where each pipe passes through concrete floors, footings, walls or ceilings. Inside diameter of sleeves shall be at least 20 mm larger than outside diameter of pipe. Sleeves shall be installed to provide at least 10 mm space all around pipe the full depth of concrete. Space between pipes and pipe sleeves shall be caulked watertight.

Cutting pipe.--All pipe shall be cut straight and true and the ends shall be reamed to the full inside diameter of the pipe after cutting.

Damaged pipe.--Pipe that is cracked, bent or otherwise damaged shall be removed from the work.

Pipe joints and connections.--Joints in threaded steel pipe shall be made with teflon tape or a pipe joint compound that is non-hardening and non-corrosive, 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 shall be made tight. Long screw or other packed joints will not be permitted. Any leaky joints shall be remade with new material.

Cleaning and closing pipe.--The interior of all pipe shall be cleaned before installation. All openings shall be capped or plugged as soon as the pipe is installed to prevent the entrance of any materials. The caps or plugs shall remain in place until their removal is necessary for completion of the installation.

Hangers and supports.--Hangers and supports shall 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 shall be spaced and distributed so as to avoid load concentrations and to minimize the loading effect on the building structure.

Hangers and supports shall be sized to fit the outside diameter of pipe or pipe insulation. Hangers shall be removable from around pipe and shall have provisions for vertical adjustment after erection. Turnbuckles may be used.

Hanger rods shall be provided with locknuts at all threaded connections. Hanger rods shall be sized as follows:

Pipe Size	Minimum Hanger Rod Diameter
15 mm to 50 mm	10 mm
65 mm to 87 mm	13 mm
100 mm to 125 mm	16 mm
150 mm	19 mm

Thrust blocks.--Thrust blocks shall be formed by pouring concrete between the pipe and trench wall. Thrust blocks shall be sized and so placed as to take all thrusts created by maximum internal water pressure.

Plastic pipe underground shall be provided with thrust blocks and clamps at changes in direction of piping, connections or branches from mains 50 mm and larger, and all capped connections.

Water pipe near sewers.--Water pipes shall not be run or laid in the same trench as a sewer pipe unless both of the following requirements are met:

1. The bottom of the water pipe, at all points, shall be at least 305 mm above the top of the sewer pipe.
2. The water pipe shall be placed on a solid shelf excavated at one side of the common trench with a minimum clear horizontal distance of at least 305 mm from the sewer pipe.

When a water pipe crosses a sewer pipe, the water pipe shall be laid a minimum of 305 mm above the sewer pipe.

The minimum clear horizontal distance between the water pipe and sewer pipe shall be 1.5 meters, and the water pipe shall be at least 305 mm above the top of the sewer pipe.

TANKS.--

Storage tank.--The storage tank shall be installed in accordance with the requirements in AWWA standard D 103-97.

Pressure tank.--The pressure tank shall be installed, anchored and supported in accordance with the manufacturer's recommendations and as shown on the plans.

Surfaces marred or damaged, as a result of the Contractor's operations shall be repaired, at the Contractor's expense, to match the condition of the surfaces prior to the beginning of the Contractor's operations.

VALVES.--

Valves below ground.--Valves installed below ground shall be installed in an appropriate sized valve or meter box as shown on the plans. The valves shall be installed on a minimum of 150 mm of free draining granular material.

Valves aboveground.--Valves above ground attached to storage tanks shall have a pipe support installed adjacent to the valve.

FAUCETS AND HYDRANTS.—

Hose faucet and hydrants.--Faucets and hydrants shall be installed with outlets 0.5 m above finished grade.

CONTROLS.—

Float switch.--Float switch cable shall be installed with a cable grip bushing and shall be supported at a convenient location to facilitate field adjustment.

MISCELLANEOUS EQUIPMENT.--

AVC.--AVC electrode shall be installed to the elevation shown on the plans. The integral pressure switch shall be adjusted to de-energize the air compressor when the tank pressure reaches 14 kPa above the water pump cut-off pressure.

Water meter.--Water meters installed below ground shall be installed in an appropriate sized meter boxes as shown on the plans. Meters shall be installed on a minimum of 150 mm of free draining granular material.

Enclosure.--Enclosure shall be secured to the concrete slab by mechanical expansion anchors sized according to manufacturer's recommendations. Anchors shall be installed to facilitate future removal.

Meter box.--Meter box shall be installed 90 degrees to finished grade. Extensions shall be provided as required.

A reinforced concrete collar shall be formed and cast-in-place around each meter box as shown on the plans. Collars shall be broom surface finished or shall match the surrounding surface texture.

Where meter boxes are to be installed to grade in areas to be paved or surfaced, no individual structure shall be constructed to final grade until the paving or surfacing has been completed in the indicated area.

Valve box.--Valve box shall be installed 90 degrees to finished grade. Extensions shall be provided as required.

A reinforced concrete collar shall be formed and cast-in-place around each valve box as shown on the plans. Collars shall be broom surface finished or shall match the surrounding surface texture.

Where valve boxes are to be installed to grade in areas to be paved or surfaced, no individual structure shall be constructed to final grade until the paving or surfacing has been completed in the indicated area.

TESTING.--

Pumps.--After the installation work has been completed, the pumping installation shall be tested for conformance with the operating conditions specified herein. The Contractor, at his expense, shall provide the materials and labor required for testing.

Before starting or operating equipment or systems, said systems or equipment shall be flushed and cleaned as required and the equipment shall be lubricated and serviced.

The Engineer shall be notified at least 48 hours in advance of starting the testing.

The measurements of flow shall be by means of venturi meter, a weir, or other reliable means as approved by the Engineer. The water shall be discharged in such a manner that erosion is held to a minimum.

Valves shall be adjusted and the pump operated at no flow, full flow and the flow rates specified on the plans.

The following information shall be tabulated and submitted by the Contractor for each test.

1. Flow rate in liters per minute.
2. Pumping water level in the well for the well pump or the suction pressure for the booster pump in millimeters of .
3. Discharge pressure for the well pump or booster pump in kPa. Discharge pressure for the well pump shall be measured at the well head.
4. Total dynamic head.
5. Current reading of the pump motor in amperes.
6. Motor voltage (loaded and unloaded).

Pipe and fittings.--All piping shall be tested after assembly and prior to backfill, pipe wrapping, connecting fixtures, wrapping joints and covering the pipe. Systems shall show no loss in pressure or visible leaks. The Contractor shall test the system for a period of not less than 4 hours at a pressure of 860 kPa. The water obtained for the test shall be from a potable water supply.

The Contractor shall take precautions to prevent damage to tanks, gauges and appurtenances and to prevent the joints from drawing while pipes are being tested. The Contractor shall repair any damage resulting from or caused by testing pipes..

The system shall be tested as a single unit, or in sections as approved by the Engineer. The Contractor shall furnish necessary materials, test pumps, instruments and labor and notify the Engineer at least 3 working days in advance of testing. After testing, the Contractor shall repair all leaks and retest to determine that leaks have been stopped. Surplus water shall be disposed of after testing as directed by the Engineer.

Storage tank.--The storage tank shall be tested in accordance with the manufacturer's recommended testing procedures. The Contractor shall furnish necessary materials, test pumps, instruments and labor and notify the Engineer at least 3 working days in advance of testing. The Contractor shall make any repairs and retest at no additional cost to the State.

DISINFECTION.--

Storage tank.--The storage tank shall be disinfected in accordance with AWWA Standard C652-02, Chlorination Method 3.

Pipe and fittings.--The Contractor shall flush and disinfect all potable water piping, fixtures and equipment. Calcium hypochlorite granules or tablets, if used, shall not be applied in the dry form, but shall first be dissolved into a solution before application.

The Contractor shall take adequate precautions in handling chlorine so as not to endanger workmen or damage materials. All pipes and fittings shall be completely filled with water containing a minimum of 50 ppm available chlorine. Each outlet in the system shall be opened and water run to waste until a strong chlorine test is obtained. The line shall then be closed and

the chlorine solution allowed to remain in the system for a minimum of 24 hours so that the line shall contain no less than 25 ppm chlorine throughout. After the retention period, the system shall be drained, flushed and refilled with fresh water.

Sampling and testing.--After the disinfection procedure is completed and before the facility is placed into service, the contractor shall sample the water for bacteriological quality. The sample shall be sent to a State certified laboratory for analysis and shall show an absence of coliform organisms. A copy of the results shall be sent directly to the Engineer by the testing laboratory.

If the laboratory results fail to produce satisfactory bacteriological results, the disinfection procedure shall be repeated until a satisfactory result is obtained.

Samples of water shall be obtained from each of the following locations for the initial test and any subsequent testing:

1. Faucets in women's restroom
2. Faucets in men's restroom
3. Hose faucet at wellhead

OPERATIONAL TEST.--

The water supply system shall be operated and checked by the Contractor for a period of at least 3 consecutive 8 hour-days to demonstrate the satisfactory overall operation of the water supply system as a completed unit. The test shall be conducted in the presence of the Engineer. During the test period, final adjustments shall be made to the equipment and components as required to place the system in satisfactory operating condition.

Any equipment, systems, or work found deficient during the test shall be replaced or repaired and retested. The Engineer shall be notified at least 72 hours in advance of starting the initial test and any retesting.

12-2.06 WATER WELL

GENERAL.--This work shall consist of drilling a pilot hole, performing geophysical tests, reaming the bore hole to final diameter and depth, installing casing and screens, developing, testing and disinfecting a water well in accordance with the details shown on the plans and these special provisions.

REGULATIONS.--Attention is directed to the provisions of water well construction and sealing as set forth in the Bulletins 74-81 and 74-90, "Water Well Standards: State of California" issued by the California Department of Water Resources.

WELL PERMIT.--The Contractor shall make all arrangements and obtain a well permit from San Diego County Environmental Health at 858-565-5713 at a cost of $390.00.

EQUIPMENT AND PERSONNEL.--All necessary materials, equipment, labor, transportation, machinery, tools, fuel, water, power, light, sanitary facilities, and all other items incidental to the completion of the work shall be provided by the Contractor. All drilling and reaming shall be accomplished by the direct rotary or reverse rotary method.

ORDER OF WORK.--The order of work shall proceed with accepted water well drilling practices, and in general consists of the following sequence of operations:

1. Drill and sample pilot hole.
2. Run geophysical logs.
3. Ream well to final diameter.
4. Caliper log reamed hole.
5. Set casings and screens and complete well.
6. Develop well and perform development tests.
7. Steady-discharge pump test.
8. Disinfect well.
9. Perform well video survey.

Once work has started on the pilot hole, the work shall be continued without delay to the completion of development, testing and disinfection unless otherwise permitted by the Engineer.

SUBMITTALS.--Material lists, descriptive data, samples and other submittals specified in these special provisions shall be submitted for approval.

Submittals shall include, but not be limited to, the following:

1. One copy of the mechanical analysis results including gradation curves from the drill cutting samples.
2. One copy of the log of the pilot hole after completion of drilling the pilot hole.
3. One field copy of the completed geophysical log upon completion of logging.
4. Manufacturer's information for the casings and well screens.
5. One copy of the filter material gradation analysis.
6. One copy of the results of the water level measurements taken during each of the steady-discharge pump tests.
7. One copy of the "Water Well Driller's Report" with an attachment of one copy of the geophysical log..
8. One copy of the well video survey recorded on a compact disc.

Submittals shall be delivered to the Division of Structure Design, Documents Unit, Fourth Floor, 1801 30th Street, Sacramento, California 95816, (916) 227-8252 or mailed to the Division of Structure Design, Documents Unit, P.O. Box 942874, Mail Station 9-4/4I, Sacramento, California 94274-0001.

Each separate item submitted shall bear a descriptive title, the name of the project, district, county, and contract number. Plans and detailed drawings shall be not larger than 559 mm x 914 mm.

TEMPORARY SHUTDOWN.--Whenever the well site is left unattended for any reason, the bore hole shall be maintained full of drilling fluid as required to maintain bore hole integrity and shall be covered in a manner satisfactory to the Engineer.

WATER SUPPLY.--An adequate supply of water for drilling, developing and testing the well shall be provided in such a manner that a shortage of water will not be a cause for delay in the work.

WELL DRILLER'S REPORT.--Within 30 days after completion of the water well, the Contractor shall submit a complete and accurate "Water Well Driller's Report" to the Department of Water Resources in accordance with the provisions of Section 13750 through 13755 of the California Water Code. A final copy of the geophysical log shall be attached to the "Water Well Driller's Report". A copy of the "Water Well Driller's Report" with one final copy of the geophysical log shall be submitted to the Engineer at the time of filing with the Department of Water Resources.

MOBILIZATION, DEMOBILIZATION, AND FINAL CLEANUP

GENERAL.--The Contractor shall move onto and set up all equipment and machinery at the designated well site. Upon completion of the work, all tools, equipment, machinery, and excess materials shall be removed from the premises. All cuttings, drilling fluid, and rubbish resulting from the work shall be disposed of in a manner approved by the Engineer. All sumps and excavations shall be filled and all ground surfaces disturbed by the well drilling and construction operations shall be restored to as near their original condition as possible, including the repair or replacement, at the Contractor's expense, of any damaged facility.

DRILL PILOT HOLE

GENERAL.--A pilot hole, of 100 mm minimum diameter, shall be drilled to the depth as shown on the plans.

DRILLING FLUID.--Drilling fluid, if used, shall be water except as otherwise provided herein. The fluid level in the pilot hole shall be kept at the ground surface at all times. Should lost circulation or other drilling problems require the addition of small amounts of bentonite, organic-base material, or other material, such material may be added with the approval of the Engineer. Prior to the addition of such material, the Contractor shall submit complete information sheets describing the composition of the materials to be added, including but not limited to Material Safety and Data Sheets (MSDS). The Contractor shall also submit to the Engineer for approval a procedure that will insure the removal of these additives during well development. Toxic or dangerous substances shall not be added to the drilling fluid.

DRILL CUTTING SAMPLES.--One pint of drill cutting samples shall be collected at least once every 1.5 meters from a depth of approximately 12 meters to the bottom of the pilot hole, or as directed by the Engineer. Samples shall be placed in one liter, clean, water-tight rigid containers, securely closed and sealed to avoid spillage and contamination, and clearly marked with the depth interval represented by the sample. Samples shall be made available for inspection at all times.

After the geophysical logging of the pilot hole has been completed, the Contractor, subject to the review of the Engineer, shall select drill-cutting samples in the water production zones. Each sample selected shall have a mechanical analyses

performed by a State certified soils laboratory. A gradation curve for each sample analyzed shall be included along with the mechanical analysis and delivered to the Engineer.

WELL LOG.--During the drilling of the pilot hole, the Contractor shall prepare and shall keep a complete log of the hole, setting forth the following:

1. The reference point of all measurements.
2. The depth at which each change in stratigraphy occurs.
3. The identification of the material of each stratigraphic level (clay, sand, gravel, etc.) and its physical condition (caving, running, squeezing, etc.)
4. The depth of any substantial loss of drilling fluid to the formation and the remedial measures taken.

The log of the pilot hole shall be made available for inspection at all times. One copy of the log of the pilot hole shall be delivered to the Engineer immediately after completion of the drilling of the pilot hole.

GEOPHYSICAL LOGGING.--After the pilot hole has reached its final depth, a geophysical log shall be made of the entire hole. The pilot hole shall be clear of obstructions prior to running the log. Logging shall commence at the bottom of the pilot hole and shall end approximately at the ground surface. The pilot hole shall be kept full of drilling fluid during logging.

The geophysical log shall consist of the following:

1. Spontaneous potential curve
2. Point resistivity curve
3. 1.6 meter lateral resistivity curve

The logging scale shall be subject to approval by the Engineer. The completed geophysical log shall show the mud resistivity (showing temperature) and the mud filtrate resistivity (showing temperature) of the drilling fluid. One field copy of the completed geophysical log shall be delivered to the Engineer immediately on completion of logging.

REAMING WATER WELL

GENERAL.--After the geophysical logging has been completed, the upper portion of the pilot hole shall be reamed to the diameter and depth of the well seal as shown on the plans. After the conductor casing has been placed and sealed, the remainder of the pilot hole shall be reamed to the borehole diameter and depth as shown on the plans.

Following the reaming of the pilot hole, the hole shall be caliper logged. One field copy of the completed caliper log shall be delivered to the Engineer immediately on completion of logging.

After reaming and caliper logging has been completed, the well shall be cased and developed.

CONDUCTOR CASING

GENERAL.--The water well shall be equipped with a conductor casing. The casing shall have an outside diameter as shown on the plans and a wall thickness of 6.35 mm. It is estimated that the conductor casing will be set to the depth as shown on the plans, however, the Engineer may order the setting to a greater depth depending on subsurface conditions. The conductor casing shall extend above the ground surface a sufficient distance so that no surface water can drain into the well.

MATERIALS.--The conductor casing material shall be the same as that specified for "Blank Well Casing" material specified under "Blank Well Casing" elsewhere in these special provisions.

FILTER FEED PIPE.--A filter feed pipe shall be welded to the top of the conductor casing in such a manner that filter material can be added to the well at any time in the future. The filter feed pipe shall be Schedule 40 galvanized steel pipe of the diameter as shown on the plans. The filter feed pipe shall be as shown on the plans and shall be equipped with a screw cap.

WELL SEAL.--After the conductor casing has been landed, a well seal shall be placed between the wall of the reamed bore hole and the conductor casing. The seal shall be composed of a slurry of neat cement and water. The neat cement mixture shall be composed of one bag (42.6 kg) of portland cement to not more than 22.5 liters of clean water. Bentonite may be used up to total of 3 percent of the volume of cement. The sealing material shall be placed in one continuous pour by use of a pressure grout pump from the bottom of the interval to be sealed to the ground surface. Upon completion of the

placement of the well seal material, the slurry shall be visible above the ground surface at all points around the circumference of the conductor casing. After sealing operations are complete, the seal shall be left undisturbed for a period of not less than 48 hours.

WATER TIGHT COVER.—After the installation of the filter material, a watertight cover shall be installed between the conductor casing and the well casing in a manner approved by the Engineer.

BLANK WELL CASING

GENERAL.—The blank well casing shall have an outside diameter, as shown on the plans, and a wall thickness of 6.35 mm. The blank well casing shall extend from the ground surface to the top of the well screen, in between the screened sections and extend from the bottom of the screen to the bottom of the well. The bottom end of the blank casing shall have a bottom plate welded to it in a manner approved by the Engineer.

MATERIALS.--The blank well casing material shall be new and shall conform to the requirements of ASTM Designation: A 139, Grade B, and the following:

1. Requirements for hydrostatic testing shall be waived.
2. The steel from which the casing is manufactured shall contain not less than 0.20 percent copper by ladle analysis.
3. The casing shall contain not more than one continuous spiral seam.

WELDING COLLARS.--The blank well casing shall be equipped with welding collars. All field joints shall be welded and shall be watertight. All welds shall be made using welding rod appropriate for the type of metal to be welded.

All field joints shall be welded and shall be watertight. All welds shall be made using welding rod appropriate for the type of metal to be welded.

Welding collars shall be of the same thickness and shall have the same chemical and physical properties as the corresponding casing section, shall be a minimum of 125 mm in width, shall be rolled to fit the diameter, and shall be welded to the casing section. The inside edge of the collars shall be ground or sufficiently scarfed to remove sharp edges or burrs. Section ends shall be machined flat perpendicular to the axis of the casing and shall not vary more than 0.25 mm at any point from a true plane at right angles to the casing. Three round alignment holes shall be provided in each collar to insure proper matching of the sections.

CENTRALIZERS.--Centralizers shall be commercially manufactured of the type of appropriate material for the intended use.

INSTALLATION.--Installation of the blank well casing shall be as specified under "Well Screen" elsewhere in these Special Provisions.

WELL SCREEN

GENERAL.-- The well screen shall have the same outside diameter as the blank well casing. The wall thickness shall be 6.35 mm. The well screen shall be a total of 12 meters in length. Appropriate welding rings shall be provided for the connection between the blank well casing sections and the well screen. The well screen shall be welded to the blank well casing using an appropriate type of welding rod for the type of metals to be welded.

The screen opening size to be used shall be selected by the Contractor, subject to the review and concurrence of the Engineer based on the filter material gradation and the mechanical analysis of the soil samples collected during the drilling of the pilot hole. The screen opening size and length shall be determined based upon a maximum entrance velocity of 0.03 meter per second at a design pumping rate of 227 liters per minute.

MATERIALS.--The well screen shall be new and shall be manufactured of Type 304 stainless steel wire spirally wrapped on Type 304 stainless steel rods providing a continuous-slot opening. The wire shall be of a general keystone shape, oriented to retard plugging and attached to the outside surface of the rods by welding.

WELL SCREEN SETTINGS.--The final determination of the depth settings and lengths of well screen to be installed shall be made by the Contractor, in writing, subject to the review and concurrence of the Engineer after examination of the geophysical logs. Any change in length of well screen from that specified shall be submitted in writing to the Engineer for approval.

INSTALLATION OF BLANK CASING AND WELL SCREEN.--Sections of blank casing and well screen, herein called the casing string, complete with appropriate centralizers and closed bottom, shall be lowered into the well. In no instance shall the casing string be driven, forced, or allowed to rest on the bottom of the hole. The casing string shall remain suspended from the surface until the filter material has been added to the well.

Centralizers shall be placed 1.5 meters above and 1.5 meters below any section of well screen and at any other location, which the Contractor determines, is necessary to assure plumbness and alignment of the blank casing and well screen. Wherever possible, centralizers shall be placed in clay formation.

FILTER MATERIAL

GENERAL.—The well shall contain filter material in the annular space between the bore hole and casing string from the bottom of the hole to the depth as shown on the plans.

MATERIAL.--Filter material shall be composed of thoroughly washed, sound, durable, well-rounded particles, containing no silt, clay, organic matter, or deleterious materials. The gradation of the filter material shall be determined by the Contractor subject to the review and approval of the Engineer based on the mechanical analyses of the drill cuttings samples collected during the drill pilot hole. The size of the filter material shall be matched to the grain size of the water-bearing stratum. The gradation of the filter material, as determined by a State certified testing laboratory, shall be submitted to the Engineer prior to delivery of the filter material to the well site. Filter material may be delivered in bags, and stacked at the well site or it may be delivered in bulk. If delivered in bulk, it shall be placed on a protective sheet.

INSTALLATION.--After the centralized casing string has been suspended in the hole, the placement of the filter material shall proceed without delay. The filter material shall be placed by a tremie pipe lowered to the bottom of the annular space between the outside of the casing and the wall of the bore hole. As the filter material is poured into the tremie pipe, water shall also be introduced to help carry the filter material. The tremie pipe shall be slowly raised as the filter material fills the annular space. After the pouring of the filter material has commenced, a solution of polyphosphate shall be added to the circulation water. The total amount of polyphosphate added shall be in the amount of 0.6 kilograms per 100 liters of circulation water. Polyphosphates used shall be one of the following: tetra sodium polyphosphate, sodium tripolyphosphate, sodium hexameta phosphate or sodium septaphosphate. The annular space shall be filled from the bottom of the hole back to the ground surface.

The volume of filter material introduced into the well shall be not less than the computed volume of the annular space between the outside of the casing string and the wall of the hole. If the amount of filter material introduced is less than the computed amount, it is an indication of bridging and the Contractor shall perform appropriate corrective measures, to ensure all voids are filled, at no additional cost to the State. The Contractor shall provide a means for the accurate measurement of the volume of filter material added to the well. The surface level of the filter material shall be maintained at all times by adding filter material as needed.

PLUMBNESS AND ALIGNMENT

GENERAL.--After the casing string is installed, alignment and plumbness shall be tested by the Contractor, in the presence of the Engineer, by lowering a minimum 12 meter long section of pipe, or a dummy of the same length, into the well for the full depth of the casing. The difference between the inside diameter of the casing and the outside diameter of the dummy or pipe shall not exceed 25 mm.

If a dummy is used, it shall consist of a rigid spindle with rings. Each ring shall be at least 300 mm wide. The rings shall be truly cylindrical and shall be spaced one at each end of the dummy and one ring in the center. The central member of the dummy shall be rigid, so that it will maintain the alignment of the axis of the rings.

Should the section of pipe or dummy fail to move freely throughout the length of casing in the well to the full depth, or should the well vary from the vertical in excess of two-thirds the inside diameter of the casing per 30 meters in the total depth of the well, the plumbness and alignment of the well shall be corrected by the Contractor at his expense.

WELL DEVELOPMENT

GENERAL.--Within 48 hours after the filter material installation is completed and the casing tested and accepted for alignment and plumbness, the well shall be thoroughly developed by mechanical and chemical methods including surging, backwashing, and pumping with the test pump equipment, to remove any mud cake from the wall of the reamed bore, remove any mud that may have penetrated the water-bearing formation and to stabilize the water-bearing materials and filter material. The methods and procedures used for development shall be at the option of the Contractor.

CLEANING BOTTOM OF WELL.--After developing and before the development tests, the well shall be sounded, and if any material is found inside the well within 1.5 meters of the bottom of the lowest screen, it shall be cleaned out of the well.

DEVELOPMENT TESTS.--All necessary measuring instruments and pumping equipment needed to conduct the testing shall be furnished and installed and then removed upon completion of testing. Measuring instruments shall be capable of indicating the depth of water within 10 seconds of the required time of measurement and shall be accurate to within 30 mm. The test pumping equipment shall be capable of discharging not less than 378 liters per minute at the pumping water level encountered in the well. The pumping unit shall be complete with an ample power source, controls, and appurtenances and shall be capable of being operated without interruption for a period of at least 36 hours. The prime mover shall be equipped with a throttling device so that the discharge can be reduced to 76 liters per minute. The Contractor shall furnish, install, and remove a discharge pipe of sufficient size and length to conduct water from the pumping unit to a point designated by the Engineer.

Development of the well shall be continued until, in the Contractor's opinion, the well is fully developed. The Contractor shall notify the Engineer when the well is developed and ready for testing. The Contractor, in the presence of the Engineer, shall perform three steady-discharge pump tests on the well. The tests shall be of 3 hours duration each at the flow rates of 378, 227 and 76 liters per minute, respectively, during which time water level readings will be taken as specified under "Testing Well" in these special provisions. Each test shall start with the water elevation in the well at the static water level.

Sand production shall be less than 5 parts per million within 15 minutes after commencement of pumping at a rate of 378 liters per minute. Sand production shall be measured by a centrifugal sand separator (Rossum sand sampler) as described in the American Water Works Association Standard for Water Wells (AWWA A 100-97) Appendix E, Section E.4.6 "Measurement of Sand Content."

From the steady discharge pump tests of the well, the Engineer will determine the 3 hour specific capacity of the well in liters per minute per meter of drawdown and the transmissivity of the water-bearing materials in liters per day per meter. The specific capacity will be determined for a pumping rate of 378 liters per minute or a drawdown which is approximately 3 meters above the top of the uppermost well screen after 3 hours of pumping, whichever is achieved first. If the sand production exceeds 5 parts per million or if the Engineer determines that the three hour specific capacity of the well at the selected pumping rate is not equal to or greater than 0.0004 times the transmissivity in liters per day (LPD) per meter, the Contractor shall resume development operations at his own expense, to reduce the sand production or to improve the well's specific capacity as required. If the Contractor is unable to construct and develop the well as specified herein to meet these requirements consistently, the well shall be abandoned as provided for under "Incompletion of Well" in these special provisions.

These tests during the development shall not be counted as part of the pumping tests specified under "Testing Well" in these special provisions.

WATER SAMPLING

GENERAL.--After completion of all well testing, the Contractor shall collect samples of water from the well. Water samples shall be collected in accordance with, and submitted to, a State certified water-testing laboratory for analysis. The results of the water analyses shall be furnished to the Engineer without delay.

The samples shall be analyzed as listed below:

1. **Primary Inorganics.--**Aluminum, antimony, arsenic, barium, beryllium, cadmium, chromium, cyanide, fluoride, lead, mercury, nickel, selenium and thallium.
2. **Asbestos.—**Asbestos.
3. **Nitrate/Nitrite.--**Nitrate (as NO3), nitrite (as nitrogen) and nitrate + nitrite (total nitrogen).
4. **Secondary Standards.--**Aluminum, color, cooper, corrosivity, foaming agents, iron, manganese, methyl-tert-butyl-ether (MTBE), silver, thiobencarb, turbidity, zinc total dissolved solids (TDS), specific conductance, chloride, and sulfate.
5. **General Minerals.--**Bicarbonate, carbonate, hydroxide alkalinity, calcium, magnesium, sodium, hardness and pH.

DISINFECTION

GENERAL.--After all work on the water well has been completed, the well shall be thoroughly disinfected while the test pump is in place. The disinfection shall be conducted in the following manner and in accordance with the provisions set forth for the disinfection of water wells in the Department of Water Resources Bulletins No.74-81 and 74-90:

1. The proper amount of chlorine solution shall be added to the well such that the concentration of chlorine in the well water shall be at least 50 parts per million available chlorine.
2. The pump shall be surged as necessary so as to thoroughly mix the chlorine solution with the water in the well. Water shall then be pumped to waste until the discharged water has a noticeable odor of chlorine.
3. The well shall then be allowed to stand undisturbed for at least 24 hours.
4. The water shall then be pumped to waste until there is no noticeable taste or odor of chlorine.
5. The Contractor shall sample the water pumped from the well. The sample shall be placed in a sterile container, available from laboratories, and sent to a State certified laboratory for bacterial analysis. If the laboratory analysis shows that the water pumped from the well is not free from all harmful bacteria, the disinfection procedure shall be repeated until a subsequent analysis shows the water safe for human consumption.
6. A copy of the analysis shall be delivered to the Engineer.

WELL VIDEO SURVEY

GENERAL.--After the well has been disinfected a video survey shall be made of the inside of the well from the ground surface to the bottom of the well and from the bottom of the well to the ground surface. The survey shall clearly show the interior of the blank casing and well screen through the means of a downward-looking camera having adequate illumination; the depth, in meters, of the camera shall be indicated at all times on the survey. The survey shall be recorded on a standard compact disc, which shall be delivered to the Engineer on completion of the survey.

TESTING WELL

GENERAL.--Within 48 hours after well development, the Contractor shall perform a steady-discharge pump test on the well.

The pumping tests shall be made for a period of 8 hours at a pumping rate of 227 liters per minute followed immediately by a 6-hour recovery test.

During the pumping test, the discharge of the pump shall be measured with an accurate totalizing meter, a circular orifice meter, or a venturi meter approved by the Engineer. The pump discharge shall be maintained at all times during test within plus or minus 5 percent of the pumping rate by means of a valve. Prior to the start of the test, the pump shall be turned off and the static, or non-pumping level shall be determined. The static water level will be considered to be attained when 3 successive water level measurements, spaced 20 minutes apart, show no appreciable rise in water level in the well.

The tests shall be made according to the following schedule:

1. Turn pump on to approved test pumping rate at time t=0.
2. The Contractor shall measure and record depth to water as follows:

    a. Each minute, from t=1 to t=12
    b. Each 2 minutes, from t=14 to t=20
    c. Each 5 minutes from t=25 to t=50
    d. Each 10 minutes from t=60 to t=100
    e. At t=130, t=160, t=200, t=250, t=300 (5 hours)
    f. g. At t=360 (6 hours).

3. Turn pump off at t=360 (6 hours).
4. The Contractor shall measure depth to water and record as follows:

    a. Each minute, from t=360 to t=370
    b. Each 2 minutes, from t=372 to t=380
    c. Each 5 minutes, from t=385 to t=400
    d. Each 10 minutes, from t=410 to t=480 (8 hours).

In the case of failure of the pump operation for a period greater than one percent of the elapsed pumping time from t=0, the test shall be suspended until the static water level has been attained. Should the test be aborted as a result of a deficiency on the part of the Contractor's equipment or personnel, all time consumed in waiting for complete water level recovery and in resuming the pump test to the point where it was aborted or suspended shall be at no cost to the State.

After the pump test has been completed, the record of water level measurements shall be delivered to the Engineer. All sand, silt, and materials from inside the casing shall be removed and the annular space between the casing and the wall of the

hole shall be refilled with filter material to replenish any settlement which may have occurred during development and testing operations.

INCOMPLETION OF WELL

GENERAL.--In the event that the pilot hole or well cannot be completed as specified due to the Contractor's operations, the Contractor, at no expense to the State, shall destroy the pilot hole or water well in the following manner and in accordance with the provisions set forth for the destruction of water wells in the Department of Water Resources Bulletins No.74-81 and 74-90:

1. The pilot hole or well shall be filled with native or other approved materials from the bottom of the well to a depth of 6 meters below ground surface.
2. If there is any casing remaining in the hole at the time of abandonment, an excavation shall be made around it to a depth of 1.5 meters below ground surface. The casing shall be cut off at a depth of 1.5 meters below ground surface and shall be removed and disposed of.
3. The pilot hole or water well shall be filled with neat cement, cement grout, or concrete from a depth of 6 meters to a depth of 1.5 meters. If there is any casing remaining in the hole, the sealing material shall be allowed to spill over into the surrounding excavation to form a cap at least 300 mm thick.
4. After the upper sealing material has set, the remaining portion of the pilot hole or excavation shall be filled and graded with native materials.

After destruction of the pilot hole or water well, the Contractor shall, at no expense to the State, move the drilling equipment a short distance and drill a new pilot hole or water well.

MEASUREMENT AND PAYMENT

No adjustment of the contract unit price will be made for any increase, decrease, or elimination in the quantity of the items of work involved in drill pilot hole, reaming water well, conductor casing, blank well casing, well screen, and testing well regardless of the reason for such increase, decrease, or elimination. The provisions in Section 4-1.03B, "Increased or Decreased Quantities," of the Standard Specifications shall not apply to the items of work involved in drill pilot hole, reaming water well, conductor casing, blank well casing, well screen, and testing well.

Contract items of work involved in drill pilot hole, reaming water well, conductor casing, blank well casing, well screen, and testing well shall be measured and paid in accordance with Section 9, "Measurement and Payment," of the Standard Specifications and these special provisions.

The contract lump sum price paid for well development shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in well development, complete in place, including well permit, development tests, cleaning bottom of well, water sampling, disinfection, and well video survey, as shown on the plans, and these special provisions.

The length of drill pilot hole and reaming water well shall be the measured length from original ground surface to the bottom of the pilot hole or reamed well.

The contract unit price paid per linear meter for drill pilot hole shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in drill pilot hole, complete in place, including drilling fluid, drill cutting samples, well log and geophysical logging, as shown on the plans, specified in the Standard Specifications and these special provisions.

The contract unit price paid per linear meter for reaming water well shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in reaming water well, complete in place, including filter material and installation of filter material, as shown on the plans, specified in the Standard Specifications and these special provisions.

The length of conductor casing, blank well casing and well screen shall be the total measured length in-place in the completed work.

The contract unit price paid per linear meter for conductor casing shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in conductor casing, complete in place, including well seal, as shown on the plans, specified in the Standard Specifications and these special provisions.

The contract unit price paid per linear meter for blank well casing shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in blank well casing, complete in place, as shown on the plans, specified in the Standard Specifications and these special provisions.

The contract unit price paid per linear meter for well screen shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in well screen, complete in place, as shown on the plans, specified in the Standard Specifications and these special provisions.

Testing well shall be measured and paid for by the hour. Testing well shall be the actual time required for the steady-discharge pump test and the 6-hour recovery test.

The contract unit price paid per hour for testing well shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in testing well, complete in place, as specified in these special provisions.

12-2.07 SEPTIC SEWAGE DISPOSAL SYSTEM

PART 1.- GENERAL

SUMMARY.--

Scope.--This work shall consist of furnishing, installing and constructing a septic sewage disposal system in accordance with the details shown on the plans and these special provisions.

Septic sewage disposal system shall include such other materials and appurtenances, not mentioned, which are required for the complete installation and proper operation of the system.

Related work.--Sewer pipes in buildings and to a point 1.5 meters beyond the building shall be as specified in Section 12-15, "Mechanical," of these special provisions.

SUBMITTALS.--

Product data.--Material lists for materials to be used shall be submitted for approval and shall include the name of the manufacturer and the source, model number, description, and standard of manufacture.

Manufacturer's descriptive data and catalog cuts for the following shall be submitted for approval:

Underground tracer tape
Sewer and drain pipe and fittings
Leach line pipe and fittings
Septic tank
Manhole frames and covers
Cleanouts
Valves
Valve and meter boxes
Filter fabric
Monitor well caps
Septic tank outlet filter
Coatings

Samples.—Test results and a representative sample of the following products weighing approximately 11 kg shall be submitted to the Engineer at the jobsite for approval:

Sand
Leach line backfill
Leach line rock
Pea gravel

Working drawings.--Working drawings for each precast septic tank used in the work shall be submitted for approval. Complete bedding, assembly, installation and backfilling instructions shall be submitted for approval.

QUALITY ASSURANCE.--

Codes and standards.--All sanitary sewage work shall conform to the applicable portions of the 2001 California Plumbing Code, California Code of Regulations, Title 24, Part 5.

Certificates of Compliance.--Certificates of compliance shall be furnished for manhole frames and covers in accordance with the requirements specified in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications.

PART 2.- PRODUCTS

MATERIALS.--

IDENTIFICATION.--

Underground tracer tape.--

Underground tracer tape shall be permanent, detectable, bright colored, continuous printed plastic tape intended for direct burial service; not less than 50 mm wide; lettering shall read "CAUTION SEWER BURIED BELOW".

PIPES AND PIPE FITTINGS.--

Sewer and drain pipe and fittings.--

Sewer and drain pipe and fittings shall be polyvinyl chloride (PVC) gravity sewer plastic pipe and fittings conforming to ASTM Designation: D 3034, Standard Dimension Ratio (SDR) 35, with integral bell and bell and spigot rubber gasketed joints or conforming to ASTM Designation: D2665 with solvent welded fittings. Rubber gaskets shall conform to ASTM Designation: F 477. Stainless steel clamps with rubber boots shall not be used.

Sewer and drain pipe adapters.--

Sewer pipe adapters for PVC to cast iron soil or clay pipe shall be appropriately sized PVC flexible coupling manufactured for connecting dissimilar pipes. Adapters shall be attached to piping with adjustable stainless steel band clamps with hex tightening screws. Rubber boots will not be allowed. Sewer and drain pipe adapter shall be Indiana Seal; Fernco; or equal.

Leach line pipe.--

Leach line pipe shall be perforated PVC plastic sewer pipe and fittings, standard dimension ratio, (SDR) 35, conforming to ASTM Designation: D 3034; or perforated PVC drain, waste and vent pipe, (PVC-DWV), conforming to ASTM Designation: D 2665.

Perforations shall be 13 mm or 16 mm in diameter, located in 2 rows 120 degrees apart and spaced at intervals between 75 mm and 125 mm. Piping which is manufactured without the required drain holes shall have the holes drilled using approved drilling equipment and jigs. Burrs on the pipe surfaces resulting from the drilling operation shall be removed.

MANHOLES, METER AND VALVE BOXES.--

Manholes.--

Manholes and distribution box riser sections and cones shall be precast, reinforced concrete conforming to ASTM Designation: C 478M or precast reinforced concrete pipe conforming to ASTM Designation: C 76.

Manhole frame and cover.--

Manhole frame and cover shall be gray cast iron, conforming to ASTM Designation: A 48, Class 30 or greater (traffic type). Cover shall be no bolt, closed pick hole and shall be marked "SS," "SEWER," or "SANITARY SEWER." The side or bottom of the cover shall be machined grooved for an integral O-ring gasket. The frame seat for the bottom O-ring gasket shall be a minimum of 22 mm in width.

Meter box.--

Meter box shall be precast concrete with cast iron cover. Cover shall be factory marked "SEWER," "SS," or "SANITARY SEWER", and shall be traffic rated. Meter box shall be Bes, No. C9W with C15 cover; Christy, No. B9 with B9C cover; Cook Concrete Products, No. 14 with 14-T cover; or equal.

Valve box.--

Valve box shall be precast concrete box with cast iron cover. Cover shall be factory marked "SEWER," "SS," or "SANITARY SEWER", and shall be traffic rated. Valve box shall be Cook Concrete Products, No. 10-T-12; Christy No. G-5C; Brooks, No. 3-RT; or equal with extensions as required.

Septic tank.--

Septic tank shall be a precast reinforced concrete tank of the size shown on the plans. All joints shall be above the normal operating water level. The septic tank shall be listed and approved by either the International Association of Plumbing and Mechanical Officials (IAPMO) or the National Precast Association (NPCA), and the tank shall be marked accordingly.

Cones and risers shall be precast, reinforced concrete, conforming to ASTM Designation: C 478M or precast reinforced concrete pipe conforming to ASTM Designation: C 76.

Outlet filter.--

Outlet filter shall be commercial quality PVC or Ethyl 7042 compound case with a removable, self-cleaning impact styrene filter capable of effectively removing all particles of 3 mm or greater in diameter. Filter shall be multi-purpose, have the equivalent of 2.5 square meters minimum filtering capacity and shall have a capacity of approximately 25 cubic meters per day.

CLEANOUTS.--

Cleanout to grade.--

Cleanout piping shall terminate with an appropriately sized flexible PVC access cap and stainless steel band coupler with hex tightening screw. Rubber coupling or cap will not be allowed. Access cap shall be Indiana Seal; Fernco; or equal.

MONITOR WELLS.--

Monitor wells.--

Monitor wells shall be 150 mm sewer pipe, SDR 35, conforming to ASTM Designation: D 3034; or plastic drain, waste, and vent pipe, conforming to ASTM Designation: D 2665, perforated as shown on the plans, and terminating with an appropriately sized flexible PVC access cap and stainless steel band coupler with hex tightening screw threaded cap fitting.

Cement mortar.--

Cement mortar shall be one part cement to 2 to 3 parts clean plaster or concrete sand mixed with just enough water for suitable consistency.

Sand.--

Sand shall be clean, washed sand, free from clay or organic material graded such that 90 percent to 100 percent passes the 4.75 mm sieve size and not more than 20 passes the 300 µm sieve size.

Leach line backfill.--

Leach line backfill shall be native material free of rocks greater than 50 mm in greatest dimension, vegetable matter, trash or other deleterious material.

Leach line rock.--

Leach line rock shall be washed, clean, graded gravel, rock, or crushed rock varying in size between 19 mm and 64 mm in greatest dimension. Rock shall have not more than 10 percent loss when tested in accordance with California Test 214. Tests may be waived if rock is from an approved supply or is accompanied by a Certificate of Compliance conforming to the requirements specified in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications.

Pea gravel.--

Pea gravel shall be clean aggregate, free from clay or organic material and graded such that 90 percent to 100 percent passes the 4.75 mm sieve size, and not more than 50 percent shall pass the 600 µm sieve size.

Filter fabric.--

Filter fabric shall be commercial quality, chemically stable, non-biodegradable, ultraviolet stabilized, 100 percent polyester, 100 percent polypropylene or 100 percent combined polyester and polypropylene, nonwoven, needle punched permeable geotextile.

Filter fabric shall be shipped in packaging that shall protect filter fabric from ultraviolet radiation and abrasion during storage and handling. Filter fabric shall be Mirafi, 140N; AMOCO Fabrics, 4506; or equal.

Filter fabric shall conform to the following requirements:

Property	Value	Test Designation
Average roll weight	135 grams per square meter, min.	ASTM D 1117
Grab tensile strength, Newtons	504 N ±66 N XMD 490 N ±66 N	ASTM D 5034, 5035 25 mm grip
Grab elongation	MD 50 min.	ASTM D 5034, 5035
Trapezoidal tear strength, Newtons	MD 223 N ±45 XMD 45 220 N ±45	ASTM D 1117
Water passage rate	4000 liters per minute per square meter, min.	ASTM D 4491 (Constant head, 50 mm)
Thickness, mils	0.06 mm	ASTM D 1777
Permeability, cm per sec.	0.3 cm per sec.±0.1 cm per sec.	ASTM D 4491 (Constant head, 50 mm)
AOS (Avg. opening size)	0.21 mm, min.	ASTM D 4751

Epoxy mortar.--

Epoxy mortar shall 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 maximum water absorption of 0.1 percent. Epoxy shall have a pull-off strength of not less than 6895 MPa and a 90 percent cure in 24 hours. Epoxy mortar shall be the type that requires no primer as bonding agent.

COATINGS.--

Bituminous coating.--

Bituminous coating shall conform to ASTM Designations: D 41 and D 449.

PART 3.- EXECUTION

PREPARATION.--

INSTALLATION OF IDENTIFICATION.--

General.--Continuous underground tracer tape shall be installed directly above the buried line and 150 mm to 200 mm below finished grade during backfilling operations.

INSTALLATION OF PIPES AND FITTINGS.--

General.--Sewer and drain pipe shall be installed upgrade (starting from leach field back to septic tank) unless otherwise permitted by the Engineer.

Sewers near water lines.—Sewers near water lines shall be as specified in Section 12-2, "Water Supply System."

Connections between differing pipe types.--Joints between different types of pipes shall be made with sewer pipe adapters intended for that purpose.

Damaged pipe.--Damaged pipe shall be replaced prior to use. Misaligned pipe shall be corrected or replaced prior to use.

Cleaning pipe.--Interior of pipes shall be cleaned of dirt and other materials as the work progresses.
Lines between manholes shall be flushed as necessary to remove collected material.

INSTALLATION OF SEPTIC TANKS, MANHOLES, METER AND VALVE BOXES.--

Sewer structures.--Manufactured sewer structures shall be installed in accordance with the manufacturer's recommendations and to the lines and grades shown on the plans.

All joints and penetrations of septic tanks, septic tank manholes and distribution boxes shall be sealed watertight, inside and outside, with epoxy mortar.

Prior to testing and after the complete installation of tank, barrels, manhole frame and covers, the interior of tank shall be cleaned of all debris.

Collars shall be broom surface finished. Collars shall match existing/finished grade. Compaction prior to formwork shall be as specified elsewhere in these special provisions.

Where manholes, pipe inlets or cleanouts to grade are located in areas to be paved or surfaced, no individual structure shall be constructed to final grade until the paving or surfacing has been completed immediately adjacent to said structure.

INSTALLATION OF CLEANOUTS.--

General.--Cleanouts shall be installed 90 degrees to finished grade and shall terminate in a valve box. A concrete pad shall be provided full width of the trench under a wye branch.

Cleanouts to grade shall be a combination of fittings as shown on the plans. Piping and fittings for 100 mm pipe shall be sewer pipe and for 75 mm and smaller shall be drain pipe.

Collars shall be broom surface finished. Collars shall match existing/finished grade. Compaction prior to form work shall be as specified elsewhere in these special provisions.

INSTALLATION OF LEACH LINES.--

Leach lines.--Leach line construction shall be performed in dry weather. The excavation for leach lines shall not commence until the soil moisture condition is dry to a depth of 50 mm as defined in the following definition from Table 3, "Criteria for Describing Moisture Condition," in ASTM Designation: D 2488: "Absence of moisture, dusty, dry to the touch."

The trenches shall be prepared by carefully raking sidewalls and the bottom to remove any smeared or glazed soil surfaces. All loose material shall be removed from the trench. Sharp objects which may damage the filter fabric shall be removed during backfilling operations.

Leach line trenches shall not remain exposed to the elements for more than one day after excavation. Open trenches shall not, under any circumstances, be exposed to rainfall, or any other external source of moisture.

A single layer of filter fabric extending the full perimeter of the trench shall be placed immediately adjacent to the bottom and sides of the trench prior to placing leach line rock. All splices in the filter fabric shall have a 305 mm minimum overlap. Washed rock shall be placed in the center of the trench to minimize disturbance of the trench sidewalls.

Leach line pipe shall be installed on prepared rock layers to the invert elevations shown on the plans and to flat grades established by accurate survey methods. Pipes shall be within 6 mm of the required grade and installed with perforated sides down.

Washed rock fill material shall be placed evenly on both sides of the leach line pipe and above the pipe in such a manner as to prevent displacement or disturbance of the pipe system.

Leach line crossover inverts shall be placed by accurate survey methods and shall be within 3 mm of the required grade.

Sand and backfill placed above the leach line filter fabric shall be placed without adding water. The backfill material shall be placed in 150 mm maximum thickness lifts and, unless otherwise shown on the plans, mounded 75 mm above the trench. Backfill shall not be compacted.

APPLICATION OF COATINGS.--

General.--The exterior surfaces of concrete sewer structures, except the exterior bottom of tanks, shall be completely coated with 2 applications of bituminous coating, applied at a rate of 2.4 square meters per liter.

The preparation of surfaces to receive coatings shall be in accordance with the coating manufacturer's recommendations.

Concrete surfaces to be coated shall not be coated until 28 days after the last concrete for these structures has been poured.

The edge and bottom of manhole cover seat areas shall be coated with a uniform application of heavy duty, waterproof automotive or industrial grease.

FIELD QUALITY CONTROL.--

TESTING.--

Testing pipes.--All sewer and drain pipes shall be tested for obstructions before covering the pipes by balling and flushing the pipes with an approved commercial sewer cleaning ball. The ball shall be moved slowly through the sewer with a tag line. 100 mm sewer pipe shall be tested by pulling an appropriate sized inflatable plug through the pipe. Obstructions or irregularities shall be removed or repaired.

Sewer and drain pipes shall be tested for leakage for a minimum period of 4 hours by filling with water to an elevation of 1.22 meters above the average invert of sewer, or to the top of the manholes where less than 1.22 meters deep. The system shall show no visible leaks, and the leakage rate shall not exceed 13.25 liters per 24 hours, per 25 mm diameter, per 30.5 meters of pipe. Sewers may be tested in sections with the test water progressively passed down the sewers if feasible. Water shall be released at a rate which will not create water hammer or surge in the plugged section of sewer.

In lieu of hydrostatic test with water, the air test method, "Air Test," as outlined in the California Plumbing Code, may be used.

Testing septic tank.--The septic tank shall be tested for leakage by filling the tank with water to the outlet flow line for a period of 24 hours. All seams and joints shall be left exposed (except the bottom of the tank) for inspection purposes. The tank shall remain watertight. Repairs, if necessary, shall be made at the Contractor's expense.

12-2.08 CLARIFIER SYSTEM

PART 1.- GENERAL

SUMMARY.--

Scope.--This work shall consist of furnishing, installing and constructing a clarifier system and piping.

Clarifier system shall include clarifier tank, pumping system, piping and other fittings and appurtenances, not mentioned, which are required for the complete installation and proper operation of the system.

SUBMITTALS.--

Product data.--Materials list for materials to be used shall be submitted for approval and shall include the name of the manufacturer and the source, model number, description, and standard of manufacture.

Manufacturer's descriptive data and catalog cuts shall also be submitted for approval as follows:

Underground tracer tape
Drain pipe and fittings

Vent pipe and fittings
Force main pipe and fittings
Union
Submersible pump
Flexible hose
Clarifier tank
Manhole
Manhole frame and cover
True union ball valve
Check valve
Sealant
Pipe supports

QUALITY ASSURANCE.--

Codes and standards.-- All wash water work shall conform to the applicable portions of the 2001 California Plumbing Code, California Code of Regulations, Title 24, Part 5.

Certificates of Compliance.--Certificates of compliance shall be furnished for manhole covers and frames in accordance with the requirements specified in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications.

PART 2.- PRODUCTS

IDENTIFICATION.--

Underground tracer tape.--

Underground tracer tape shall be as specified in Section 12-02, "Septic Sewage Disposal System," of these special provisions.

PIPES AND PIPE FITTINGS.—

General.—The Contractor shall install pipes and fittings from the following materials, of the weight and class with the joining method as indicated.

Drain pipe and fittings.--

Drain pipe and fittings shall be shall be as specified in Section 12-02, "Septic Sewage Disposal System," of these special provisions.

Vent pipe and fittings.--

Vent pipe underground shall be plain end schedule 40 polyvinyl chloride (PVC) pipe with solvent welded fittings ASTM Designation: D 2241, Type I, Grade 1, Standard Dimension Ratio (SDR) 21, rated for 1380 kPa.

Vent pipe risers above ground and below ground shall be Schedule 40 galvanized steel pipe conforming to ASTM Designation: A 53, with 1040 kPa galvanized malleable iron banded screwed fittings and galvanized steel couplings. The weight of the zinc coating shall be not less than 90 percent of that specified in ASTM Designation: A 53.

Force main pipe and fittings.--

Force main pipe and fittings shall be polyvinyl chloride (PVC) plastic pipe, Schedule 80, conforming to ASTM Designation: D 1785. Connections may be threaded and/or glued unless otherwise shown on the plans.

PUMPING SYSTEM.--

Submersible pump.--

Submersible pump shall be equipped with an integral float. Volute shall be constructed of stainless steel, with a stainless steel shaft, oil resistant o-rings and mechanical seal and polyamide impeller. Pump shall be capable of pumping 25-mm solids. The oil-filled motor shall have built in thermal protection. All piping, valves and accessories shall be included as shown on the plans.

Float switch shall be attached to pump and shall be 120-volt, 20-ampere, AC, single-pole, double throw mercury switch in inert synthetic casing. Switch shall be leakproof, shockproof, and corrosion resistant. Cable shall be 3-conductor, No. 18 AWG with polyvinyl chloride (PVC) jacket. The difference between the switch activation elevation and deactivation elevation shall not be greater than 50 mm.

Lifting cable.--

Lifting cable shall be stainless steel of adequate strength to raise and lower the pump. All related hardware shall be stainless steel.

True union ball valve.--

True union ball valve shall be minimum 1550 kPa, polyvinyl chloride (PVC) body ball and components, fluorocarbon rubber o-rings, polytetrafluorolethylene (PTFE) seals, true union, factory mounted flanged, true block valve. Valves 102 mm or larger shall be supplied with 50 mm square operating nut. Valve shall be Hayward, Asahi, or equal.

Check valve.--

Check valve shall be polyvinyl chloride (PVC), socket by socket, full flow design, nonmetallic parts, designed for vertical usage, pressure rated to 860 kPa, Buna-N seal and shielded clapper.

Union.--

Unions (for steel pipe) shall be 1730 kPa, threaded malleable iron, ground joint, brass to iron seat, galvanized or black to match piping.

Flexible discharge hose.--

Flexible discharge hose shall be heavy-duty flexible hose; nitrile rubber tube, synthetic fabric reinforcement, carbon steel helix, resistant to oil, detergents ozone and heat. Working pressure shall be 1380 kPa with a temperature range of -7° C to 104° C.

CONCRETE TANKS.--

Three-Cell Clarifier tank.--

Three-Cell Clarifier tank shall be a precast reinforced concrete tank of the size shown on the plans. All joints shall be at the top of the tank above the normal operating water level. The clarifier tank shall be listed and approved by the International Association of Plumbing and Mechanical Officials (IAPMO) and tank shall be marked accordingly.

MANHOLES AND COVERS.--

Manhole.--

Manhole riser sections and cones and grade rings shall be precast, reinforced concrete, conforming to ASTM Designation: C 478M or precast reinforced concrete pipe conforming to ASTM Designation: C 76.

Manhole frame and cover.--

Manhole frame and cover shall be gray cast iron conforming to ASTM Designation: A 48, Class 30B or greater (traffic type). Cover shall be no bolt, closed pick hole and shall be factory marked "CLARIFIER". The bearing surfaces of frames and covers shall be machined grooved for an integral O-ring gasket. The frame seat for the bottom O-ring gasket shall be a minimum of 22 mm in width.

COATINGS.--

Bituminous coating.--

Bituminous coating shall as specified in Section 12-2, "Septic Sewage Disposal System," of these special provisions.

MISCELLANEOUS MATERIALS.--

Cement mortar.--

Cement mortar shall as specified in Section 12-2, "Septic Sewage Disposal System," of these special provisions.

Epoxy mortar.--

Epoxy mortar shall be as specified in Section 12-2, "Septic Sewage Disposal System," of these special provisions.

Sealant.--

Sealant for precast concrete tank shall be closed cell expanded neoprene conforming to ASTM Designation: D 1056, Grade RE 41.

Pipe supports.--

Pipe supports shall consist of non-metallic or metallic construction channel.

PART 3.- EXECUTION

INSTALLATION OF PIPE IDENTIFICATION.--

General.--Continuous underground tracer tape shall be installed directly above all buried pipes and 150 mm to 200 mm below finished grade during backfilling operations. Appropriate tape shall be used for drain, vent and force main pipes.

INSTALLATION OF PIPE AND FITTINGS.--

Connections between differing pipe types.--Joints between different types of pipes shall be made with sewer pipe adapters intended for that purpose.

Damaged pipe.--Damaged pipe shall be replaced prior to use. Misaligned pipe shall be corrected or replaced prior to use.

Cleaning pipe.--Interior of pipes shall be cleaned of dirt and other materials as the work progresses.
Lines shall be flushed as necessary to remove collected material.

Pipe sleeves.--PVC pipe sleeves shall be provided where each pipe passes through concrete floor or slab. Inside diameter of sleeves shall be at least 20 mm larger than outside diameter of pipe. Sleeves shall be installed to provide at least 10 mm space all around pipe the full depth of concrete. Space between pipes and pipe sleeves shall be silicone caulked watertight.

Coring holes shall conform to the requirements specified under "Core Concrete" in this Section 12-2 of these special provisions.

The annular gap between the pipe and sleeve shall be filled with silicone sealant.

Concrete thrust blocks.--Concrete thrust blocks shall be installed at PVC pipe change in direction and all fittings in accordance with the applicable portions of the 1997 Uniform Plumbing Code as amended by the latest edition of the California Building Standards Code.

INSTALLATION OF CONCRETE TANKS.--

General.—Three-Cell Clarifier tank and manhole frames and covers, traffic frames and covers, traffic frames and grates, and other appurtenances shall be installed in accordance with the manufacturer's recommendations and the approved working drawings.

After installation of tank, barrels and manhole frame and covers and prior to testing. Interior of tank shall be cleaned of all debris. All debris from flushing and testing shall be removed prior to use.

INSTALLATION OF MANHOLES.--

General.--Manholes, riser sections, concentric/eccentric cones, and grade rings, including extensions shall be installed in accordance with the plans, these specifications, code and standards and/or the manufacturer's recommendations where applicable when approved by the Engineer.

Joints and penetrations of manholes, risers and cones shall be sealed watertight, inside and outside, with epoxy mortar.

Tank penetrations shall be precast or cored.

Collars shall be broom surface finished. Collars shall match existing/finished grade. Compaction prior to formwork shall be as specified elsewhere in these special provisions.

APPLICATION OF COATINGS.--

General.--The exterior surfaces of concrete structures, except the bottom of tanks, shall be completely coated with 2 applications of bituminous coating, applied at a rate of 2.5 square meters per liter.

Concrete surfaces to be coated shall not be coated until 28 days after the last concrete for these structures has been poured.

The edge and bottom of manhole cover seat areas shall be coated with a uniform application of heavy duty, waterproof automotive or industrial grease.

INSTALLATION OF MISCELLANEOUS MATERIALS.--

Securing pipe.--Pipe in the buildings shall be held in place by construction channel. Material shall be compatible with the piping or neoprene isolators shall be used. Allowances shall be made for expansion and contraction. Horizontal and vertical piping shall be securely supported to prevent swaying, sagging or flexing of joints.

FIELD QUALITY CONTROL.--

General.--All pipes shall be tested for obstructions and leakage before covering. Obstructions or irregularities shall be removed or repaired.

Non-pressure (Drain and vent) pipes shall be tested for leakage for a minimum period of 4 hours by filling with water to an elevation of 1.2 m above the average invert of pipe. The system shall show no visible leaks. Drain and vent pipe may be tested in sections with the test water progressively passed down the pipes if feasible. Water shall be released at a rate that will not create water hammer or surge in the plugged section of pipe.

In lieu of hydrostatic test with water, the air test method, "Air Test," California Plumbing Code, may be used.

The clarifier tank shall be tested for leakage by filling the tank with water to the level of the outflow line for a period of 24 hours. All seams and joints shall be left exposed (except the bottom of the tank) for inspection purposes. The tank shall remain watertight. Repairs, if necessary, shall be made at the Contractor's expense.

12-2.09 PAINTED PAVEMENT MARKINGS

PART 1.- GENERAL.--

Scope.--This work shall consist of furnishing and applying paint for pavement markings in accordance with the details shown on the plans and these special provisions.

Pavement markings include, but are not limited to, word and symbol markings, and parking stall markings.

Alternatives.--At the option of the Contractor, striping tape may be placed instead of the painted pavement markings specified herein.

PART 2.- PRODUCTS.--

Paint.--

Paint shall be top commercial quality for pavement marking, formulated for the use intended, and manufactured by a nationally recognized manufacturer of paint and other coating products.

The kind of paint to be used (solvent or water borne) shall be determined by the Contractor, based on local air pollution control regulations and weather conditions.

Striping tape.--

Striping tape shall be permanent type striping tape. Striping tape shall be Brite-Line, Series 1000; Swarco Industries, Director; 3M Stamark Brand, Pliant Polymer Grade Series 5730; 3M Stamark Brand, Bisymmetric 1.75 Grade Series 5730; or equal.

PART 3.- EXECUTION.--

ALIGNMENT AND LAYOUT.--All necessary alignment and layout work shall be performed by the Contractor, in a manner that will not damage the pavement.

Unless otherwise shown on the plans, the width of parking stall markings shall be 105 mm.

EQUIPMENT AND OPERATION.--Mechanical means shall be used to paint pavement markings.

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

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

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

Rapid dry paint shall be applied only with airless type equipment.

Stencils and hand spray equipment shall be used to paint word and symbol markings. Stencils shall be furnished by the Contractor. The stencil layout shall conform to the dimensions shown on the plans.

SURFACE PREPARATION.--Surfaces which are to receive paint shall be cleaned of all dirt and loose material.

APPLICATION.--Paint shall be applied only on dry surfaces, and only during periods of favorable weather, in accordance with the manufacturer's recommendations.

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

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

Completed pavement markings shall have clean and well-defined edges, and shall conform to the dimensions shown on the plans or as specified in these special provisions.

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

If used, striping tape shall be applied in accordance with the manufacturer’s specifications.

APPLICATION RATES.--Each application of paint shall be applied at the rates recommended by the paint manufacturer for the type of surface involved.

PROTECTION.--Newly placed pavement markings shall 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 shall have a minimum 0.9 m x 0.9 m surface identification with the international symbol of accessibility. The symbol and border shall be white and the background shall be blue conforming to Federal Standard 595B, Color No. 15090.

12-2.10 CHAIN LINK FENCING

PART 1.- GENERAL

SUMMARY.--

Scope.--This work shall consist of furnishing and installing chain link fencing and gates in accordance with the details shown on the plans and these special provisions.

SUBMITTALS.--

Product data.--Manufacturer's descriptive data, material specifications and layout drawings for the fence, gates, and accessories shall be submitted for approval.

PART 2.- PRODUCTS

General.--All ferrous materials shall be new and galvanized. Posts, caps, braces and other rolled or formed elements shall be hot-dip galvanized after rolling or forming.

Style, finish, and color of each fence post shall match that of the other fence components.

MATERIALS.--

Posts and braces.--

Posts and braces shall conform AASHTO Designation: M 181. Minimum nominal thickness before galvanizing shall be 3 mm for posts and 2 mm for braces. Midpoint deflection of posts about major axis shall not be greater than 6 mm and permanent set about either axis shall not be greater than 0.25 mm as determined by California Test 674. Post lengths shall be 815 mm longer than height of fabric. Rainproof caps shall be furnished for tubular posts.

The resisting moment for posts or braces is defined as the product of the member's section modulus about the designated axis and its yield strength. Posts and braces shall have resisting moments not less than the following minimum values:

Item	Resisting Moment
Line posts	1100 N•m perpendicular to fence line. 550 N•m parallel to fence line.
End, latch and corner posts	1900 N•m in any direction.
Braces	550 N•m about the major axis. 400 N•m about the minor axis.

Fabric.--

Fence fabric shall conform to AASHTO Designation: M 181 for Type I zinc coated fabric with Class C coating. Fabric shall be fabricated of 3 mm (11-gage) wire for fences 2135 mm or less in height, 3.8 mm (9-gage) wire for fences over 2135 mm in height, and shall have 50 mm mesh and knuckled finish on top and bottom edges.

WIRE.--

Barbed wire.--

Barbed wire shall conform to ASTM Designation: A 121 and shall be either 2.3 mm (12 1/2-gage) Class 1, 1.7 mm (13 1/2-gage) Class 3, or 1.4 mm (15 1/2-gage) Class 3. The barbed wire shall consist of 2 strands of wire, twisted with 2-point barbs spaced at not less than 100 mm.

Tension wire.--

Tension wire shall be 4.34 mm (7-gage) coil spring wire galvanized in accordance with the provisions of ASTM Designation: A 116 Coating Class 3.

FENCE FITTINGS.--

Tie wires and hog rings.--

Tie wires and hog rings for attaching fabric to tension wire, top rail and intermediate posts shall be a minimum of 3.8 mm (9-gage) wire conforming to ASTM Designation: F 626, and shall have a Class 3 zinc coating.

Post clips.--

Post clips for fastening fabric to H-posts shall be a minimum of 4.94 mm (6-gage) conforming to ASTM Designation: F 626, and shall have a Class 3 zinc coating.

Turnbuckles and truss tighteners.--

Turnbuckles and truss tighteners shall be galvanized, commercial quality steel, malleable iron, or wrought iron. Truss tightener straps shall be at least 6 mm thick. Devices shall develop the truss bar or rod strength.

Truss rod.--

Truss rod shall be 9 mm diameter steel rod equipped with turnbuckle or truss tightener.

Post caps.--

Post caps shall be galvanized steel, malleable iron or wrought iron with loop to receive tension wire of top rail; one per post. Post caps for tubular posts shall be designed to fit snugly over the post.

Extension arms.--

Extension arms shall be the manufacturer's standard extension arm with provisions for anchorage to post; slope upwards from the top of the fence approximately 45 degrees; capable of supporting 91 kg load; fitted with clips or other suitable means for attaching 3 lines of barbed wire.

PRIVACY SLATS:

Material: Aluminum, not less than 0.25 mm thick, sized to fit mesh specified for direction indicated. Color shall be tan selected from manufacturer's standard pallet.

MISCELLANEOUS.--

Concrete.--

Concrete for fence construction shall be commercial quality concrete with not less than 300 kilgrams of cement per cubic meter.

GATES.--

General.--Gates shall be constructed to be opened and closed easily by one person.

Gate fabric shall be as specified for fence fabric and be firmly attached to frames at a maximum spacing not to exceed 380 mm.

When barbed wire is specified for the fence, gates shall have top member extended to accommodate three strands of barbed wire.

Gate frames shall be fabricated of a minimum of 38 mm standard weight steel pipe or rectangular tubular steel except vertical stays may be 25 mm in outside dimension. Gates shall include all necessary fittings, latches, rods, slide rails, axles, hinges and other gate hardware of commercial quality steel, malleable iron or wrought iron.

Swinging gates.--

Swinging gates shall conform to ASTM Designation: F 900, except as modified in this section.

Hinges shall be furnished with large bearing surfaces for clamping in position and designed to swing either 180 degrees outward, 180 degrees inward, or 90 degrees in or out as shown on the plans. Hinges shall not twist or turn under action of the gate.

Latches for swing gates shall be plunger type arranged to engage the stop, except single gates of less than 3 meters wide may have a forked latch. Latches shall have provision for padlock. Latches for double gates shall be capable of securing both leaves with one padlock.

Gate stops shall be provided for all double gates and shall be suitable for setting in concrete.

Hold-open keepers shall be designed to automatically engage gate leaf and hold it open until manually released.

Rolling gate.--

Rolling gates shall conform to ASTM Designation: F 1184, except as modified in this section.

Track shall be fabricated of 50 mm x 50 mm x 6 mm angle with anchors 12 mm diameter by 152 mm long with 50 mm bends as shown on the plans. Anchor shall be placed at 152 mm from ends and at 614 mm on center.

Wheel assembly shall consisting of wheel box and sides with malleable iron, V-groove wheel and axle as recommended by the gate manufacturer. Wheel axle shall be fitted for lubrication.

Gate shall be fitted with a latch with provision for a padlock.

PART 3.- EXECUTION

PREPARATION.--

Clearing.--All earth, trees, brush, and other obstructions which interfere with the proper construction shall be removed and disposed of.

Connections.--Existing cross fences shall be connected to the new fence. Corner posts with braces in every direction of strain shall be placed at junctions with existing fences. The wire in the new and existing fences shall be fastened to the posts.

INSTALLATION.--

General.--Posts shall be set vertically and at not more than 3.0 meter center to center spacing. Fencing shall be erected in straight lines between angle points.

Post setting.--Fence post shall not be driven.

Posts shall be minimum of 0.9 meter below finished grade or 50 mm deeper than the post embedment below finished grade.

Concrete footings for posts shall be crowned at the top.

Bracing.--End, latch and corner posts shall be braced to the nearest line post. Gate posts shall be braced with horizontal compression braces and 9 mm truss rods as tension members. Other braces shall be the same as gate post braces or diagonal braces.

Chain link fabric.--Chain link fabric shall be fastened on the side of the posts designated by the Engineer.

The fabric shall be fastened to end, latch, corner, and gate posts with 6 mm x 19 mm stretcher bars and not less than 3 mm x 19 mm stretcher bar bands spaced at one foot intervals or, in lieu of using stretcher bars and bar bands for fastening fabric to end and corner posts, the fabric may be fastened by threading through loops formed on the posts.

The fabric shall be fastened to line posts with tie wires or post clips and to tension wires and rails with tie wires or hog rings. The fasteners shall be spaced at approximately 350 mm on line posts and at approximately 450 mm on tension wires and rails. Wire ties shall be given at least one complete turn. Hog rings shall be closed with ends overlapping. The tension wires shall be wrapped around terminal posts. The distance from the top of the fabric to the top tension wire shall be 50 mm maximum.

The fabric shall be stretched and securely fastened to the posts and tension wires. Tension wires shall be stretched tight. The bottom tension wire shall be installed on a straight grade between posts by excavating the high points of ground and in no case will filling of depressions between posts be permitted.

Privacy Slats: Install slats in direction indicated, securely locked in place. Install diagonally, for privacy factor of 80 to 85.

Barbed wire.--The top outside barbed wire shall be attached to the extension arm at a point approximately 300 mm from the top of the fence fabric and the other wires shall be attached to the arm uniformly between the top of the fence and the top outside wire.

Gates.--Gates shall be hung and hardware adjusted so gates operate satisfactorily from open or closed position.

Gate stops shall be set in concrete to engage center drop or plunger bar.

FIELD QUALITY CONTROL.--

Gate tests.--Prior to acceptance of the contract, it shall be demonstrated that the gates operate properly under each possible open and closed position specified.

12-2.11 GUARD POSTS

PART 1.- GENERAL

Scope.--This work shall consist of constructing guard posts in accordance with the details shown on the plans and these special provisions.

PART 2.- PRODUCTS

Concrete.--

Concrete for guard posts shall be commercial quality concrete, proportioned to provide a workable mix suitable for the intended use, with not less than 300 kilograms of cement per cubic meter.

PART 3.- EXECUTION

Installation.--Guard posts shall conform to the details shown on the plans.

Painting.--Guard posts shall be prepared and painted in accordance with the requirements specified under "Painting" in Section 12-9, "Finishes," of these special provisions.

12-2.12 ACCESSIBLE PARKING AND AUTHORIZATION SIGNS

PART 1.- GENERAL

SUMMARY.--

Scope.--This work shall consist of furnishing and installing accessible parking and authorization signs in accordance with the details shown on the plans and these special provisions.

SUBMITTALS.--

Product data.--Manufacturer's descriptive data and sign fastening details shall be submitted for approval.

PART 2.- PRODUCTS

Accessible parking stall identification sign.--

Accessible parking stall identification sign shall be a metal sign with baked enamel finish and the international symbol of accessibility. Sign background shall be blue and shall conform to Federal Standard 595B, Color No. 15090. Symbol, lettering and border shall be white and shall conform to Federal Standard 595B, Color No. 17886.

Van accessible sign.--

Van accessible sign shall be a metal sign with baked enamel finish and the international symbol of accessibility. Sign background shall be blue and shall conform to Federal Standard 595B, Color No. 15090. Lettering and border shall be white and shall conform to Federal Standard 595B, Color No. 17886.

Unauthorized vehicles parking sign.--

Unauthorized vehicles parking sign shall be a metal sign with baked enamel finish. Sign background shall be blue and shall conform to Federal Standard 595B, Color No. 15090. Lettering and border shall be white and shall conform to Federal Standard 595B, Color No. 17886. Lettering shall be not less than 25 mm in height and shall read as shown on the plans.

Support post.--

Support post shall be commercial quality, standard weight, galvanized steel pipe. Pipe diameter shall be 35 mm.

Fastening hardware.--

Fastening hardware shall be galvanized or cadmium plated.

Concrete.--

Concrete for support posts shall be commercial quality concrete, proportioned to provide a workable mix suitable for the intended use, with not less than 300 kilograms of cement per cubic meter.

PART 3.- EXECUTION

Installation.--Support posts shall be placed in holes excavated to the depth and cross-section shown on the plans. Posts shall be set vertical and shall be firmly embedded in concrete backfill. The top of the concrete backfill around the post shall be crowned to drain water.

Support posts shall be fitted with a rainproof top.

Sign shall be fastened rigidly and securely to the support post.

The Engineer will provide the Contractor with the necessary information for the disabled authorization sign.

SECTION 12-3. CONCRETE AND REINFORCEMENT

12-3.01 CAST-IN-PLACE CONCRETE

PART 1.- GENERAL

SUMMARY.--

Scope.--This work shall consist of constructing cast-in-place concrete facilities in accordance with the details shown on the plans and these special provisions.

SUBMITTALS.--

Product data.--Manufacturer's descriptive data for admixtures, expansion joint material, vapor barrier, hardener, and sealer shall be submitted for approval.

Descriptive data shall be delivered to the Engineer at the jobsite.

QUALITY ASSURANCE.--

Certificates of Compliance.--Certificates of Compliance shall be furnished for cement, reinforcement, epoxy products, and admixtures in accordance with the requirements specified in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications.

PART 2.- PRODUCTS

CONCRETE MIXES.--

Concrete (structural work).--

Concrete (minor work).--

Commercial quality concrete for concrete curbs, sidewalks, driveways, gutter depressions, new door openings, and collars shall be proportioned to provide a workable mix suitable for the intended use; shall have not less than 300 kg/m^3 of cement; 0 to 50 mm penetration, inclusive, as determined by California Test 533.

The air content of the freshly mixed concrete shall be 6 ± 1 1/2 percent, as determined by California Test 504.

Concrete (sewer structures).--

Commercial quality concrete for sewer structures, vehicle washracks and mudrinse slabs, shall be proportioned to provide a workable mix suitable for the intended use; shall have not less than 400 kg/m^3 total of a mixture of Type II cement and 15 percent by weight of a mineral admixture or Type IP (MS) Modified cement; 0 to 50 mm penetration, inclusive, as determined by California Test 533.

CONCRETE MATERIALS.--

Cement.--

Cement shall conform to ASTM Designation: C 150, Types II, or III portland cement; or Type IP (MS) Modified cement. Type IP (MS) Modified shall conform to ASTM Designation: C 595 and shall be comprised of an intimate mixture of Type II Modified cement and not more than 20 percent of a pozzolanic material.

Aggregates.--

Aggregates shall be free from deleterious coatings, clay balls and other extraneous materials.

Aggregates proposed for use shall conform to the requirements for freezing and thawing shall as determined by California Test 528.

Admixtures.--

Admixtures used in portland cement concrete shall be included on the Department's current list of approved admixtures, and shall conform to ASTM Designation: C 494, Types A, B, D, F or G for chemical admixtures; ASTM Designation: C 260 for air-entraining admixtures; and ASTM Designation: C 618 for mineral admixtures, except loss on ignition shall not exceed 4 percent. Properties of admixtures shall be uniform in each lot.

FORM MATERIALS.--

Forms for exposed finish concrete.--

Forms for exposed surfaces shall be plywood, metal or other panel type materials. Plywood shall be not less than 16 mm thick and without scars, dents, and delaminations. Forms shall be furnished in largest practical pieces to minimize number of joints.

Plywood shall conform to the requirements of U. S. Product Standard PS-1 for Exterior B-B (Concrete Form) Class I.

Forms for edges of slabs shall be nominal 50 mm solid stock lumber, plywood, or metal forms.

Forms for unexposed finish concrete.--

Forms for unexposed finish concrete surfaces shall be plywood, lumber, metal or other acceptable material.

Form ties.--

Form ties shall be factory fabricated, removable or snapoff metal ties for use as necessary to prevent spreading of forms during concrete placement.

Form oil.--

Form oil shall be commercial quality form oil which will permit the ready release of the forms and will not discolor the concrete.

REINFORCING MATERIALS.--

Bar reinforcement.--

Bar reinforcement shall conform to ASTM Designation: A 615/A 615M, Grade 60 [420], or ASTM Designation: A 706/A 706M.

Welded wire fabric.--

Welded wire fabric shall conform to ASTM Designation: A 185.

Bar supports.--

Bar supports for reinforcement shall be precast mortar blocks or ferrous metal chairs, spacers, metal hangers, supporting wires, and other approved devices of sufficient strength to resist crushing under applied loads.

EPOXY.--

General.--Epoxy shall be furnished as 2 components which shall be mixed together at the site of the work.

Epoxy resin adhesive.--

Epoxy resin adhesive shall conform to State of California Specification No. 8040-21M-08 or other epoxy suitable for bonding new concrete to old.

Epoxy mortars.--

Epoxy mortar and epoxy mortar surface treatment shall consist of a commercial quality, trowelable mixture consisting of epoxy and sand. Epoxy shall have a pull-off strength of not less than 6895 MPa and a 90-percent cure in 24 hours. Epoxy shall be of the type that requires no primer as a bonding agent.

Sand.--

Sand for use in epoxy mortars shall be clean and shall have a moisture content of not more than 0.50-percent when tested in accordance with California Test 226.

Sand for epoxy mortar surface treatment shall be graded such that 100-percent passes the 150 µm sieve.

RELATED MATERIALS.--

Anchor bolts, nuts, and washers.--

Nonheaded anchor bolts shall conform to ASTM Designation: F 1554 – 04 Grade 50, with a minimum hook length of 6.2 diameters.

Headed anchor bolts shall conform to ASTM Designation: A 307.

Threaded rods shall conform to ASTM Designation: A 572.

Nuts shall conform to ASTM Designation: A 563M, Grade A.

Washers for anchor bolts shall be commercial quality.
Exposed anchor bolts, nuts, and washers shall be hot dipped galvanized.

Expansion joint material.--

Expansion joint material shall be commercial quality asphalt impregnated pressed fiber sheets, 13 mm minimum thickness.

Vapor barrier.--

Vapor barrier shall be commercial quality polyethylene sheets not less than 0.15 mm thick.

Bond breaker.--

Bond breaker shall be Type I asphalt saturated organic felt or such other material approved by the Engineer.

Type A control joints.--

Type A control joints shall be commercial quality, preformed, T-shaped plastic strips with detachable top flange.

Keyed construction joint forms.--

Keyed construction joint forms shall be commercial quality, galvanized metal or plastic, factory fabricated construction joint forms. Forms shall produce a rabbeted key type joint.

Divider and edger strips.--

Divider and edger strips shall be foundation grade redwood.

Mortar.--

Mortar shall consist of one part cement to 2 parts clean sand and only enough water to permit placing and packing.

Curing compound.--

Curing compound shall be a non-pigmented curing compound with fugitive dye conforming to the requirements of ASTM Designation: C 309, Type 1-D, Class A.

Concrete hardener.--

Concrete hardener shall be commercial quality water borne penetrating type magnesium fluosilicate, zinc fluosilicate or combination thereof.

Concrete sealer.--

Concrete sealer shall be commercial quality VOC-compliant, silane type sealer with hydrophobic and oleophobic properties. Concrete sealer shall be ProSoCo, Inc., Standoff Tile and Masonry Protector (TMP); Tamms Industries, Hey'Di H.O.S.; Textured Coatings of America, Inc., Rainstopper 1750W-Clear; or equal.

Splash block.--

Splash blocks shall be precast concrete splash blocks with depressed runoff trough. Splash blocks shall be 305 mm x 610 mm x 89 mm in size unless otherwise shown on the plans.

ADMIXTURES.--

General.--Admixtures shall be used when specified or ordered by the Engineer and may be used at the Contractor's option to conserve cement or to facilitate any construction operation.

Calcium chloride shall not be used in any concrete.

Admixtures shall be combined with concrete materials by methods that produce uniform properties throughout the concrete.

If more than one admixture is used, said admixtures shall be compatible with each other so that the desirable effects of all admixtures will be realized.

Mineral admixtures may be used to replace up to 15 percent of Type II portland cement provided the weight of mineral admixture used is not less than the weight of cement replaced. Mineral admixtures shall not be used to replace Type IP (MS) Modified or Type III cements. Chemical admixtures may be used to reduce up to 5 percent of the portland cement except that the cement content shall not be less than 300 kg/m^3. When both chemical and mineral admixtures are used with Type II cement, the weight of cement replaced by mineral admixture may be considered as cement in determining the resulting cement content.

Mineral admixtures will be required in the manufacture of concrete containing aggregates that are determined to be "deleterious" or "potentially deleterious" when tested in accordance with ASTM Designation: C 289. The use of mineral admixture in such concrete shall conform to the requirements in this section except that the use of set retarding admixtures will not be permitted.

When the use of a chemical admixture is specified or is ordered by the Engineer, the admixture shall be used at the rate specified or ordered. If no rate is specified or ordered, or if the Contractor uses a chemical admixture for his own convenience, the admixture shall be used at the dosage normally recommended by the admixture manufacturer.

When air-entrainment is specified or is ordered by the Engineer, the air-entraining admixture shall be used in amounts to produce concrete having the specified or ordered air content as determined by California Test 504. If the Contractor uses air-entrainment for his own convenience, the average air content shall not exceed 4 percent and no single test shall exceed 5 1/2 percent.

Chemical admixtures and air-entraining admixtures shall be dispensed in liquid form. Dispensers shall have sufficient capacity to measure at one time the total quantity required for each batch. If more than one liquid admixture is used in the concrete, a separate measuring unit shall be provided for each liquid admixture and dispensing shall be such that the admixtures are not mixed at high concentrations. When air-entraining admixtures are used with other liquid admixtures, the air-entraining admixtures shall be the first to be incorporated into the mix. Unless liquid admixtures are added to premeasured water for the batch, they shall be discharged to flow into the stream of water so that the admixtures are well dispersed throughout the batch.

BAR REINFORCING STEEL.--

Bending.--Reinforcing steel bars shall accurately conform to the dimensions shown on the plans.

Bars shall be bent or straightened in a manner that will not crack or break the material. Bars with kinks or improper bends shall not be used.

Hooks, bends and splices shall conform to the provisions of the Building Code Requirements for Reinforced Concrete of the American Concrete Institute.

MIXING AND TRANSPORTING CONCRETE.--

General.--When a truck mixer or agitator is used for transporting concrete to the delivery point, discharge shall be complete within 1 1/2 hours, or before 250 revolutions of the drum or blades, whichever comes first, after the introduction of cement to the aggregates.

The temperature of mixed concrete, immediately before placing, shall be not less than 10°C nor more than 32°C.

Truck mixers or agitator shall be equipped with electrically or mechanically actuated revolution counters by which the number of revolutions of the drum or blades may readily be verified. The counters shall be of the continuous-registering type, which accurately register the number of revolutions and shall be mounted on the truck so that the Engineer may safely and conveniently inspect them from alongside the truck. Under conditions contributing to quick stiffening of the concrete, or when the temperature of the concrete is 30°C or above, a time less than 1 1/2 hours may be required.

When non-agitating hauling equipment is used for transporting concrete to the delivery point, discharge shall be complete within one hour after the introduction of cement to the aggregates. Under conditions contributing to quick stiffening of the concrete, or when the temperature of the concrete is 30°C, or above, the time between the introduction of cement to the aggregates and discharge shall not exceed 45 minutes.

Each load of concrete for the work shall be accompanied by a trip ticket, a copy of which shall be delivered to the Engineer at the jobsite. The trip ticket shall show volume of concrete, weight of cement and aggregates, quantity of each admixture, quantity of water including water added at the jobsite, time of day the concrete is batched, and revolution counter readings on transit mix trucks at the times the truck is charged and unloaded.

PART 3.- EXECUTION

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 shall 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 shall be no smoother than a wood trowelled surface. Cleaning of the contact surfaces shall remove laitance, curing compounds, debris, dirt and such other substances or materials which would prevent bonding of the fresh concrete.

Abrasive blast methods shall 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 shall be cleaned to remove any substance or material that would prevent bonding of the fresh concrete.

Forms.--Forms shall be mortar tight, true to the dimensions, lines, and grades shown on the plans, securely fastened and supported, and of adequate rigidity to prevent distortion during placing of concrete.

Forms for exposed surfaces shall be constructed with triangular fillets not less than 19 mm x 19 mm attached so as to prevent mortar runs and to produce smooth straight chamfers at all sharp edges of the concrete.

Form fasteners shall be removable without chipping, spalling, heating or otherwise damaging the concrete surface. Form ties shall be removed to a depth of at least 25 mm below the surface of the concrete.

The inside surfaces of forms shall be cleaned of all dirt, mortar and foreign material. Forms shall be thoroughly coated with form oil prior to use.

Forms shall not be stripped until at least 40 hours after placing concrete, except soffit forms and supports shall not be released or removed until at least 10 days after placing concrete.

Anchorages and embedded items shall be placed and rigidly secured at their planned locations prior to placing concrete.

Reglets or embedded flashing shall be installed on concrete forms before the concrete is placed.

Redwood dividers shall have 4 mm x 89 mm galvanized nails partially driven into both vertical faces at 450 mm on centers.

Vapor barrier.--Vapor barrier shall be lapped 150 mm and securely taped at splices. Vapor barrier shall be protected with a 75 mm layer of clean uncompacted sand cover.

Unless otherwise shown on the plans, vapor barrier shall be placed under portions of the floor slab scheduled to receive finish flooring.

Placing reinforcing steel.--Reinforcing steel bars shall be accurately placed to the dimensions shown on the plans.

Bar reinforcement conforming to ASTM Designation: A 615/A 615M, Grade 60 [420], or A 706//A 706M shall be lapped at least 45 diameters.

Bars shall be firmly and securely held in position by means of wiring and approved bar supports. The spacing of supports and ties shall prevent displacement of the reinforcing or crushing of supports.

Tie wire shall be clear of concrete formwork and concrete surfaces.

All reinforcing steel shall be in place and inspected before concrete placement begins. Placing of bars on fresh layers of concrete will not be permitted.

Within areas where epoxy-coated reinforcement is required, tie wire and bar chairs or other metallic devices used to secure or support the reinforcement shall be plastic-coated or epoxy-coated to prevent corrosion of the devices or damage to the coated reinforcement.

Ground bar.--A continuous reinforcing steel bar shall be installed in the building foundation at the location indicated on the plans for the electrical ground bar. The use of epoxy coated reinforcing bar is not permitted. The end of the ground bar shall extend beyond the concrete surface and shall be protected from damage by construction operations.

Hydronic tubing.--Hydronic tubing shall be securely fastened to the bar reinforcing using nylon ties.

The hydronic heating system shall be fully tested prior to placing concrete.

PLACING CONCRETE.--

General.--Concrete shall be placed and consolidated by means of internal vibrators to form dense, homogeneous concrete free of voids and rock pockets.

Forms and subgrade shall be thoroughly moistened with water immediately before placing concrete.

Concrete shall be placed as nearly as possible to its final location and the use of vibrators for extensive shifting of the concrete will not be permitted.

Concrete shall 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 shall be placed in alternate long strips between construction joints and the final slab infilled.

Vibrators used to consolidate concrete containing epoxy-coated bar reinforcement shall have a resilient covering to prevent damage to such reinforcement.

FINISHING CONCRETE SURFACES.--

Finishing unformed surfaces.--Slabs shall be placed full thickness to finish elevation and leveled to screeds by use of long straightedges. The screeds shall be set to grade at approximately 1.8 meter centers. After leveling, screeds shall be removed and the surface shall be floated with wooden floats.

Type A control joint strips shall be inserted into the floated concrete so that the bottom of the top flange is flush with the finish elevation. Strips shall be standard manufactured lengths and shall be placed on an approximate straight line. The top flange of the strips shall be removed after the concrete has set and cured.

The floated surface shall be trowelled with steel trowels. Troweling shall form a dense, smooth and true finish. Walkways, pedestrian ramps, stairs and outdoor slabs for pedestrian traffic shall be given a non-slip broom finish unless a different finish is called for on the plans or in these special provisions.

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 shall be floated to grade and then, before final set of the concrete, the floated surfaces shall be roughened with stiff bristled brushes or rakes.

Finished surfaces of floor slabs shall not deviate more than 3 mm from the lower edge of a 3-meter long straight edge.

Finishing formed surfaces.--Formed concrete surfaces shall 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 shall 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 shall be sanded with power sanders or other approved 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 shall closely match the color of surrounding surfaces.

Nonskid abrasive aggregate finish.--Where shown on the plans, walkways shall receive a nonskid abrasive aggregate (grit) finish. The grit shall be applied uniformly at the rate of not less than 1.5 kg/m^2 and tamped into the floated concrete surface while the concrete is plastic. The grit shall be buried about 0.7-diameter of each particle into the concrete.

CURING CONCRETE.--

General.--Freshly placed concrete shall be protected from premature drying and excessive cold or hot temperatures.

Initial curing of floor slabs shall start as soon as free water has disappeared from the concrete surface. The concrete shall be kept continuously wet by application of water for not less than 7 days after the concrete has been placed.

Cotton mats, rugs, carpets, or sand blankets may be used as a curing medium to retain the moisture during the curing period. Curing materials that will stain or discolor concrete shall not be used on surfaces exposed to view.

Prior to placing the curing medium, the entire surface of the concrete shall be kept damp by applying water with a nozzle that so atomizes the flow that a mist and not a spray is formed, until the surface of the concrete is covered with the curing medium. At the expiration of the curing period, the concrete surfaces shall be cleared of all curing mediums.

Concrete surfaces, other than floor slabs, shall be kept moist for a period of at least 5 days by leaving the forms in place or by covering the exposed surfaces using moist rugs, cotton mats or other curing materials approved by the Engineer.

Concrete curbs, sidewalks, collars, and gutter depressions may be cured with a curing compound.

PROTECTING CONCRETE.--

General.--Concrete shall not be placed on frozen or frost covered surfaces.

Concrete shall be protected from damage due to rain, freezing or inclement weather, and shall be maintained at a temperature of not less than 4°C for 72 hours. When required by the Engineer, the Contractor shall provide a written outline of his proposed methods of protecting concrete.

Vehicles, equipment, or concentrated loads weighing more than 140 kg individually and material stockpiles weighing more than 240 kg/m^2 will not be permitted on the concrete within 10 calendar days after placing.

SPECIAL TREATMENTS.--

Concrete hardener.--Chemical concrete hardener shall be applied to the floor surfaces shown on the plans, prior to the application of concrete sealer. Surfaces shall be clean and dry before the application of hardener.

The solution shall be applied in accordance with the manufacturer's instructions.

After the hardener has dried, the surface shall be mopped with water to remove encrusted salts.

Concrete sealer.--Concrete sealer shall be applied to the concrete surfaces designated on the plans in accordance with the manufacturer's instructions for heavy duty use. The sealer shall be applied to dry concrete surfaces.

Epoxy resin adhesive.--Epoxy resin adhesive shall be applied to concrete surfaces shown on the plans. Epoxy resin adhesive shall be mixed and applied in accordance with the manufacturer's recommendations.

Epoxy mortars.--Epoxy for use as a binder in epoxy mortars shall be thoroughly mixed together before the aggregate is added, and unless otherwise specified, the mix proportions shall consist of one part binder to approximately 4 parts of aggregate, by volume.

All surfaces against which epoxy mortars are to be applied shall be free of rust, paint, grease, asphalt, and loose or deleterious material.

SECTION 12-4. MASONRY

12-4.01 CAST STONE

PART 1.-GENERAL

SUMMARY.—

Scope.—This work shall consist of fabricating, assembling, furnishing, and installing architectural cast stone in accordance with the details shown on the plans and these special provisions.

Related work.--

Sealant and Caulking.--Sealant used in conjunction with the cast stone assembly shall conform to the requirements specified under "Sealant and Caulking" elsewhere in Section 12-7 "Thermal and Moisture Protection." Sealant work shall be coordinated with the working drawing requirements as recommended by the cast stone manufacturer.

DEFINITIONS.—

Cast Stone--Architectural precast concrete building units intended to simulate natural cut stone.

PERFORMANCE REQUIREMENTS.—

Compressive Strength.--Compressive strength shall be 34 MPa, minimum, at 28 days, when tested in accordance with ASTM C 39/C 39M using specimens made in accordance with ASTM C 31/C 31M, determined by average of 3 specimens.

Water Absorption.--6% maximum, when tested in accordance with ASTM C 1195.

Weather Resistance.--Mix design shall be proven by experience to be resistant to degradation by weather.

SUBMITTALS.—

Product Data.--Construction details, material descriptions, dimensions of individual components and profiles, and finishes for cast stone units shall be submitted for approval.

Working drawings.--Submit for approval, fabrication and installation details of cast stone units include dimensions, details of reinforcement and anchorages if any, and indication of finished faces. Building elevations shall be included showing layout of units and locations of joints and anchors. Field dimensions of the spaces where items are to be installed, if critical to proper installation.

Selection Samples.--Two samples, minimum size 300 mm square, shall be submitted representing proposed color and texture, with description of cement, aggregate, and pigments necessary to produce the sample and intended aesthetic effects.

QUALITY ASSURANCE.—

Manufacturer Qualifications.--The Contractor shall utilize a qualified manufacturer having minimum of five years experience in manufacture of cast stone, and having adequate facilities and capacity to produce the quantity and quality specified in the time frame required similar to those indicated for this project.

Installer Qualifications.--The installer shall be regularly engaged and experienced in the installation of cast stone or precast concrete units, employing experienced masons.

Source Limitations for Cast Stone.--Cast stone units materials shall be obtained through one source from a single manufacturer.

Source Limitations for Mortar Materials.--Mortar ingredients of a uniform quality, including color, shall be obtained from one manufacturer for each cementitious component and from one source or producer for each aggregate.

DELIVERY, STORAGE, AND HANDLING.—

General.--Delivery of cast stone shall be coordinated to minimize the need for on-site storage and to avoid delaying the work. Cast stone units shall be packed, handled, and shipped in suitable packs or pallets to prevent damage. Lifting shall be conducted with wide-belt slings; rather than wire rope or ropes that might cause staining. Cast stone units shall be moved, if required, using dollies with wood supports.

Cast stone units shall be stored on wood skids or pallets with nonstaining, waterproof covers arranged to distribute weight evenly and to prevent damage to units. Ventilation shall be provided under covers to prevent condensation. Installation materials shall be stored on elevated platforms, under cover, and in a dry location.

PROJECT CONDITIONS.—

Cold-Weather Requirements.--Frozen materials or materials mixed or coated with ice or frost shall not be used for the work in conformance with construction requirements contained in ACI 530.1/ASCE 6/TMS 602.

Cold-Weather Cleaning.--Liquid cleaning methods shall be used only when air temperature is 4 deg C and above and will remain so until cast stone has dried, but not less than 7 days after completing cleaning.

Hot-Weather Requirements.--Hot-weather construction requirements shall comply to the requirements contained in ACI 530.1/ASCE 6/TMS 602.

PART 2- PRODUCTS

Architectural Cast Stone.--High density concrete; designed by manufacturer to achieve specified strength, color, and texture, desired handling characteristics, and that has a history of successful resistance to freezing and thawing. Cast stone units shall comply with ASTM C 1364 using the vibrant dry tamp or wet-cast method.

Thickness.--63.5 mm, minimum.

Reinforcing.--Cross-section amounting to at least 1/4 of 1 percent of the cross-sectional area of the unit; if unit is more than 305 mm in any dimension, provide reinforcement in both directions to resist effects of temperature variations; minimum cover of concrete equal to two times reinforcing diameter; see drawings for additional requirements.

Color and Texture.--To match Architect's sample, when viewed with unaided eye in good typical lighting at distance of 3050 mm; no obvious repairs or chips when viewed at distance of 6100 mm.

Pigment.--Desired color shall be achieved using only cement and aggregate to extent possible; if pigment is required, limit quantity to 10 percent by weight of cement. A suitable wash shall be provided on exterior sills, copings, projecting courses, and other pieces with exposed top surface, raised fillet at back of window sills, and drip under outer edge of projecting pieces and soffit units.

Diminsional tolerance.--Variation in panel height and width from dimensions indicated on the drawings shall be plus 1.5 mm and minus3 mm, maximum.

Panel Length up to 610 mm.--plus 1.5 mm and minus 3 mm, maximum.
Panel Length 610 to 1525 mm.--plus and minus 3 mm, maximum.
Panel Length 1525 to 3050 mm.--plus 3 mm and minus 5 mm, maximum.

Cement.--ASTM C 150 Type I or II white Portland cement.

Fine Aggregate.--Carefully graded and washed natural sand, or manufactured granite, quartz, or limestone sand, complying with ASTM C 33 with the exception that gradation may vary to achieve desired finish and texture.

Coarse Aggregate.--Carefully graded and washed natural gravel, or crushed graded stone such as granite, quartz, limestone, or other durable stone, complying with ASTM C 33 with the exception that gradation may vary to achieve desired finish and texture.

Pigments.--Inorganic, natural or synthetic iron oxide pigments complying with ASTM C 979 and guaranteed by manufacturer to be lime proof. Exception: Cement grade carbon black pigment is permitted.

Reinforcing.--Reinforcement shall be galvanized or epoxy coated on reinforcing 16 mm in diameter or less unless covered by at least 50 mm of concrete. Bars shall conform to ASTM A 615 Grade 40 or 60, sized as required by the manufacturer for intended use. Wire reinforcement shall conform to ASTM A 82. Welded wire fabric shall conform to ASTM A 185 or A 497. Bar mats shall conform to ASTM A 184/A 184M.

Setting Mortar.--Type S, non-staining.

Pointing Mortar.--1 part ASTM C 91 cement, 1 part ASTM C 207 Type S hydrated lime, 4 parts clean washed sand; color shall be white.

Setting Anchors.--Commercially available stone anchors, dowels, inserts and other anchoring devices; made of zinc alloy, hot-dipped galvanized steel, brass, or Type 302 or 304 stainless steel.

Joint Sealer and Accessory Materials.--As specified in Section 12-7 "Sealant and Caulking" of these special provisions.

PART 3 EXECUTION

EXAMINATION.--

Installation shall not begin until substrates have been properly constructed; and substrates verified to be plumb and true. Field dimensions shall be checked before beginning installation.

PREPARATION.--

Clean surfaces shall be cleaned thoroughly prior to installation. Surfaces shall be prepared using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions. Supplementary temporary and permanent supports shall be installed as required for proper installation.

INSTALLATION.--

General.--Cast stone shall be installed in accordance with the approved working drawings, applicable code and manufacturer's recommendations, plumb and true to line. Shims shall be provided where necessary.

Units shall be set using mortared masonry techniques except where metal anchors are indicated on drawings or working drawings:

1. Wet stone thoroughly just prior to setting by drenching with clean water.
2. Set units in full bed of mortar with vertical joints slushed full.
3. Rake out all joints to depth of 19 mm before mortar sets.
4. Remove mortar splashes and smears immediately using clean water and sponge.
5. Leave vertical joints open at cornices, copings, projecting courses, and other generally horizontal areas.
6. Leave bed joints open at lugged sills and similar units, with only ends embedded in mortar.

Anchored units.--Install anchors, dowels, and other fastening devices as indicated. Level units and adjust for proper joint clearance. Fill anchor, dowel, and other holes full with mortar.

Pointing Mortar Joints.--Scrub entire surface, removing excess mortar, using clean water and fiber brushes. Dampen raked joints and install pointing mortar, compress mortar firmly into joint, and tool to concave surface, and remove excess mortar. Do not perform pointing in freezing weather or when exposed to hot sun unless precautions are taken to provide proper curing of mortar. Replace cracked pointing mortar.

Open Joints.--Install sealant backer, prime joint surfaces, and install sealant with tooled joint surface matching pointed joints; use materials and methods specified in Section 07900. Clean entire surface after pointing mortar has set; use only water and fiber brushes.

CLEANING AND PROTECTION.--

Protect installed units from mud, dirt, cement, paint, sealant, and other materials until completion of project; clean soiled units.

To clean, use fiber brushes and clean water only; DO NOT clean with acid or commercial cleaners unless specifically approved by manufacturer.

Repair or replace damaged units and units that cannot be adequately cleaned before Substantial Completion.

SECTION 12-5. METALS

12-5.01 STRUCTURAL STEEL FOR BUILDINGS

PART 1.- GENERAL

SUMMARY.--

Scope.--This work shall consist of fabricating, assembling, furnishing and erecting structural steel in accordance with the details shown on the plans and these special provisions.

Structural steel consists of:

Wide flange beams and columns, hollow steel sections, angles, channels and shapes used as structural members.

Source quality control.--Materials and fabrication procedures are subject to inspection and tests in mill, shop and field, conducted by the Engineer or a qualified inspection agency. The Contractor or fabricator shall provide access to the Engineer or testing agency to places where the structural steel work is being fabricated or produced so that the required inspection and testing can be accomplished. Such inspections and tests will not relieve the Contractor of responsibility for providing materials and fabrication procedures in compliance with specified requirements. The testing agency may inspect the structural steel at the plant before shipment; however, the Engineer reserves the right, at any time before final acceptance to reject the material that does not conform to the contract requirements.

REFERENCES.--

General.--Structural steel shall be fabricated, assembled and erected in accordance with American Institute of Steel Construction (AISC), "Specifications for the Design, Fabrication and Erection of Structural Steel for Buildings."

Welding shall be in accordance with American Welding Society (AWS) D1.1, "Structural Welding Code - Steel", and Quality Control/ Quality Assurance procedures, in accordance with FEMA (Federal Emergency Management Agency) Publication 350.

SUBMITTALS.--

Product data.--Product data for items to be incorporated into the work, including structural steel, high strength bolts, nuts and washers and alternative connectors, shall be submitted for approval.

Shop drawings.--Shop drawings and calculations shall be submitted for approval.

Shop drawings shall show any changes proposed in the work, details of connections and joints exposed to the weather, details for connections not dimensioned on the plans, the sequence of shop and field assembly and erection, welding sequences and procedures. If required, the location of butt welded splices on a layout drawing of the entire structure, and the location and details of any temporary supports that are to be used.

Calculations and shop drawings for falsework to be used for the erection of structural steel shall be submitted for approval. The falsework shall be designed and constructed to provide the necessary rigidity and to support loads which will be applied. Shop drawings and design calculations shall be stamped and signed by an engineer who is registered as a Civil or Structural Engineer in the State of California. The expiration date of the registration shall be shown.

Working drawings.--Working drawings and calculations shall be submitted for approval.

Working drawings shall show any changes proposed in the work, details of connections and joints exposed to the weather, details for connections not dimensioned on the plans, the sequence of shop and field assembly and erection, welding sequences and procedures. If required, the location of butt welded splices on a layout drawing of the entire structure, and the location and details of any temporary supports that are to be used.

Calculations and working drawings for falsework to be used for the erection of structural steel shall be submitted for approval. The falsework shall be designed and constructed to provide the necessary rigidity and to support loads which will be applied. Working drawings and design calculations shall be stamped and signed by an engineer who is registered as a Civil or Structural Engineer in the State of California. The expiration date of the registration shall be shown.

CLOSEOUT SUBMITTALS.--

Final drawings.--At the completion of each building on the contract, one set of reduced prints on 27 kg (minimum) bond paper, 280 mm x 432 mm in size, of the corrected original tracings of all approved drawings for each building shall be furnished to the Engineer. An index prepared specifically for the drawings for each building containing sheet numbers and titles shall be included on the first reduced print in the set for each building. Reduced prints for each building shall be arranged in the order of drawing numbers shown in the index.

The edge of the corrected original tracing image shall be clearly visible and visually parallel with the edges of the page. A clear, legible symbol shall be provided on the upper left side of each page to show the amount of reduction and a horizontal and vertical scale shall be provided on each reduced print to facilitate enlargement to original scale.

QUALITY ASSURANCE.--

Qualifications for welding.--A certified copy of qualification test record for welders shall be submitted to the Engineer at the jobsite. Descriptive data for equipment for field welding structural steel, including type and electric power requirements, shall be submitted for approval.

Certificates of Compliance.--Certificate of Compliance shall be furnished for structural steel products in accordance with the requirements specified in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications. Certificate of Compliance shall include mill test certificates for each heat number used in the work.

DELIVERY, HANDLING AND STORAGE.--

Structural materials shall be loaded, transported, unloaded and stored so that it is kept clean and undamaged. Material shall be stored above ground on platforms, skids, or other supports. Covers and protection shall be provided to protect the materials from corrosion.

Anchorages and anchor bolts, which are to be embedded in concrete or masonry, shall be delivered in ample time to not delay the work.

PART 2.- PRODUCTS

MATERIALS.--

Steel bars, plates and shapes.--

Steel bars, plates and shapes shall conform to ASTM Designation: A 572/A 572M, Grade 50 [345].

Pipe.--

Pipe shall conform to ASTM Designation: A 53, standard weight, unless otherwise shown on the plans.

Steel tubing.--

Steel tubing shall conform to ASTM Designation: A 500, Grade B=46.

Stud connectors.--

Stud connectors shall conform to ASTM Designation: A 108, Grades 1018 through 1020, cold drawn, either semi- or fully killed.

Anchor bolts, nuts and washers.--

Nonheaded anchor bolts shall conform to ASTM Designation: F 1554 – 04 Grade 55, with a minimum hook length of 6.2 diameters.

Machine bolts, nuts and washers.--

Machine bolts and nuts shall conform to ASTM Designation: F 155 – 04 Grade 55.

Washers for machine bolts shall be commercial quality.

High strength (HS) bolts, nuts and washers.--

High strength (HS) bolts, nuts and washers shall conform to ASTM Designation: A 325M.

Direct tension indicators.--

Direct tension indicators shall conform to ASTM Designation: F 959.

Tension control fasteners.--

Tension control bolts shall have a splined end extending beyond the threaded portion of the bolt and which shears off when the specified bolt tension is attained.

Inorganic zinc primer.--

Inorganic zinc primer shall be a waterborne inorganic zinc primer conforming to the requirements of AASHTO Designation: M 300-92 I, Type II. Inorganic zinc primer shall be listed on the qualified products list which may be obtained from the Transportation Laboratory, (916) 227-7000.

Mortar.--

Mortar shall consist of one part cement, measured by volume, to 2 parts clean sand and only enough water to permit placing and packing.

FABRICATION.--

Shop fabrication and assembly.--Workmanship and finish shall be equal to the best general practice in modern shops.

Cuts shall not deviate more than 2 mm from the intended line. Roughness, notches or gouges shall be removed.

Bearing stiffeners at points of loading shall be square with the web and shall have at least 75 percent of the stiffener in contact with the flanges.

Finished members shall be true to line, shall have square corners and smooth bends and shall be free from twists, kinks, warps, dents and open joints.

Exposed edges and ends of metal shall be dressed smooth, with no sharp edges and with corners slightly rounded.

Stud connectors.--Steel surfaces shall be prepared as recommended by the manufacturer of the stud connectors. Stud connectors shall be welded to the flanges of beams or girders as shown on the plans. Automatic end welding of headed stud connectors shall be in accordance with the manufacturer's instructions.

Connections.--Abutting surfaces at connections shall be clean.

Cutting and welding at the jobsite will not be allowed except as shown on the approved drawings or specifically approved by the Engineer.

Finished holes for bolts shall be cylindrical and perpendicular to the plane of the connection. Subpunched and subdrilled holes shall be 6 mm smaller in diameter than the diameter specified for the finished hole.

Bolted Connections.--Bolts for connecting steel to steel shall be machine bolts conforming to ASTM Designation: A 307 or high-strength bolts conforming to ASTM Designation: A 325M as shown on the plans.

High-strength structural steel bolts, or equivalent fasteners, other bolts attached to structural steel, nuts, and washers shall be galvanized by mechanically deposited coating.

Holes for other work.--Holes for securing other work to structural steel and passage of other work through steel framing members shall be as shown on the approved drawings.

Threaded nuts or specialty items for securing other work to steel members shall be as shown on the approved drawings.

Holes shall be cut, drilled or punched perpendicular to metal surfaces. Holes shall not be flame cut or enlarged by burning. Holes are to be drilled in bearing plates.

SHOP PAINTING.--

General.--Structural steel members, except those to receive sprayed-fireproofing, shall be painted.

Surface preparation.--Surfaces of structural steel to be painted shall be blast cleaned in accordance with Steel Structures Painting Council, SSPC-SP 6, "Commercial Blast Cleaning."

Bolted connections.--Contact surfaces of high strength bolted connections and ungalvanized anchor bolt assemblies shall be blast cleaned and primed with red oxide primer designed for steel surfaces before assembly. The total thickness of primer on each surface shall be between 0.025 mm to 0.076 mm and may be applied in one application.

Painting.--Immediately after surface preparation, surfaces of structural steel shall receive an undercoat of red oxide primer designed for steel surfaces.

PART 3.- EXECUTION

ERECTION AND ASSEMBLY.--

Field splices.--Field splices shall be made only at the locations shown on approved working drawings.

The parts shall be accurately assembled in their final position as shown on the plans and in true alignment with related and adjoining work before final fastening.

All parts shall be supported adequately and at locations to provide a vibration free, rigid, and secure installation.

Bolted connections.--All high strength bolted connections shall be made with high strength bolts installed with direct tension indicator washers or tension control fasteners.

When used, one mechanically galvanized direct tension washer shall be installed with each high strength bolt. Bolts shall be tightened until a direct tension indicator washer gap is 0.13 mm or less. A zero gap will not be cause for rejection.

During installation of tension control bolts, the torque required to turn the nut on the tension control bolt shall be counterbalanced by the torsion shear resistance of the splined end of the bolt.

The bolt head type and head location shall be consistent within a joint.

Nuts shall be on side of member least exposed to view.

Setting bases and bearing plates.--Concrete and masonry surfaces shall be cleaned and roughened to improve bond. Bottom of base and bearing plates shall be clean.

Base plates and bearing plates for structural members shall be set on wedges or other adjusting devices.

Anchor bolts shall be wrench tightened after supported members have been positioned and plumbed.

Mortar shall be solidly packed between bearing surfaces and base or bearing plates to ensure that no voids remain. Exposed surfaces shall be finished and allowed to cure.

FIELD PAINTING.--

Touch-up painting.--After erection, the Contractor shall clean field welds, bolted connections, and abraded areas of shop paint and apply the same materials as applied for shop painting.

Surfaces that are scheduled to receive finish coats shall be painted with an additional prime coat and finish coats in accordance with the requirements specified for shop primed steel under "Painting" in Section 12-9.

QUALITY CONTROL.--

Testing and inspection.--Ultrasonic examination shall be performed by the Contractor on at least 50 percent of all full penetration butt-welded splices in accordance with the requirements of AWS D1.1 and these special provisions.

Welding procedures and methods shall be subject to inspection for conformance with AWS D1.1.

Butt welds shall be tested in accordance with AWS D1.1, Chapter 6, Part C, Ultrasonic Testing of Groove Welds.

Examination, reporting and disposition of tests shall be in accordance with the provisions of 6.12, AWS D1.1.

In addition to ultrasonic examinations by the Contractor, welds may be subject to inspection or non-destructive testing by the Engineer.

When additional inspection or non-destructive testing is required by the Engineer, the Contractor shall provide sufficient access facilities in the shop and at the jobsite to permit the Engineer or his agent to perform such inspection and testing.

The Contractor shall correct all deficiencies in the structural steel work which inspections and laboratory test reports have indicated to be not in compliance with these special provisions. Additional tests shall be performed by the Contractor at his expense to reconfirm any non-compliance of original work, and to show compliance of the corrected work.

12-5.02 COLD FORMED METAL FRAMING

PART 1.- GENERAL

SUMMARY.--

Scope.--This work shall consist of furnishing and installing cold formed metal framing, including load-bearing and non-bearing steel studs, and "C"-shaped steel joists and rafters, in accordance with the details shown on the plans and these special provisions.

SYSTEM DESCRIPTION.--

Loadings.--Components shall be sized to withstand the design loads shown on the plans.

Wall system shall be designed to provide for movement of components without damage, failure of joint seals, undue stress on fasteners, or other detrimental effects when subject to seasonal or cyclical day/night temperature range.

Wall system design shall accommodate construction tolerance, deflection of building structural members, and clearances of intended openings.

REFERENCES.--

Component design.--Structural properties of studs and joists shall be computed in accordance with American Iron and Steel Institute (AISI), "Specification for Designing of Cold-Formed Steel Structural Members."

Welding.--Welding shall be in accordance with American Welding Society (AWS) D1.3, "Structural Welding Code - Sheet Steel."

Welders shall be qualified in accordance with "Welder Qualification," procedures of AWS D1.1, "Structural Welding Code-Steel."

SUBMITTALS.--

Product data.--Manufacturer's descriptive data and installation instructions for each item of cold-formed metal framing and accessories shall be submitted for approval.

Installation instructions shall include instructions for securing studs to tracks and other framing connections.

Working drawings.--Working drawings and calculations for cold formed metal framing components not fully dimensioned in manufacturer's descriptive data shall be submitted for approval.

Working drawings shall include framing members showing size and gage designations, number, type, location and spacing. Working drawings shall include supplemental strapping, bracing, splices, bridging, accessories, and details required for proper installation.

The cold formed metal framing supplier shall submit drawings and calculations stamped by an Engineer who is registered as a Civil or Structural Engineer in the State of California showing that the metal framing and fasteners comply with seismic and wind uplift requirements of the CBC.

QUALITY ASSURANCE.--

Fire-rated assemblies.--Where cold formed metal framing units are components of assemblies indicated to be fire-rated, provide units which have been approved for the rating indicated on the plans.

DELIVERY, STORAGE AND HANDLING.--

General.--Cold formed metal framing components shall be protected from rusting and damage. Components shall be delivered to the jobsite in manufacturer's unopened containers or bundles, fully identified with name, brand, type and grade. Components shall be stored off ground in a dry ventilated space.

PART 2.- PRODUCTS

COLD FORMED METAL FRAMING.--

Steel studs, joists and rafters.--

Load-bearing studs shall be formed to channel shape, punched web, and knurled faces, conforming to ASTM Designation: A 653/A 653M, Grade 50 [340]. Studs shall be 1.21 mm (18-gage) minimum thickness and size as shown on the drawings.

Joists, rafters, and other framing components, 1.21 mm (18-gage) or lighter, shall be fabricated of commercial quality galvanized steel sheets; conforming to ASTM Designation: A 653/A 653M, Grade 33 [230].

Steel Track.--

Track shall be formed steel, channel shape, and same width as studs; solid web; not less than 1.21 mm (18-gage) thickness.

ACCESSORIES.--

Fasteners.--

Fasteners shall be hot-dipped galvanized, self-drilling, self-tapping screws, or bolts, nuts and washers.

Anchorages.--

Anchorages shall be ICC approved for the purpose intended, integral stud type, powder driven or drilled expansion bolts.

FINISHES.--

Studs, track and headers.--

Studs, tracks and headers shall be hot-dipped galvanized to conform to ASTM Designation: A 653M, G60.

Miscellaneous metal parts.--

Miscellaneous parts, including, bracing, furring, plates, gussets, and bridging, shall be hot dipped galvanized to not less than 381 kilograms per square meter.

FABRICATION.--

General.--Cold formed metal framing components shall be fabricated in place or prefabricated into panels to the maximum extent possible prior to erection. Panels shall be fabricated plumb, square, true to line and braced against racking with joints welded. Lifting of prefabricated panels shall be performed in a manner to prevent damage or distortion.

Panels shall be fabricated in jig or templates to hold members in proper alignment and position to assure accurate placement.

Fastenings.--Components shall be fastened by shop welding, bolting or screw fasteners as shown on the approved drawings.

PART 3.- EXECUTION

INSTALLATION.--

Studs.--Studs shall be erected plumb, except as needed for diagonal bracing or similar requirements. Channel tracks shall be aligned accurately to the wall layout at both floor and ceiling. Tracks shall be secured to floor and ceiling with fasteners spaced at not more than 406 mm intervals. Fasteners shall be provided at corners and ends of track.

Studs shall extend from floor to underside of ceiling except at wall openings. Each stud shall be secured to tracks at both top and bottom by bolting or screw fastening at both inside and outside flanges. Field welding shall not be permitted. A 12 mm clearance shall be provided at the top shoes. Door openings shall have double studs continuous across head and from floor to ceiling on each jamb.

Studs at openings shall be fastened solidly and securely to floor clips. Floor clips shall be fastened to the floor with 2 anchors unless otherwise shown on the plans.

Supplemental framing, blocking and bracing shall 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.

One continuous, horizontal 19 mm channel reinforcement shall be placed approximately 152 mm above all wall openings. The reinforcement shall pass through the web openings in the studs and shall extend through the first stud located beyond the double studs at either side of the opening and shall be saddle tied to each stud it passes through.

Joists and rafters.--Joists and rafters shall be installed directly over bearing studs or a load distribution member shall be installed at the top track.

Web stiffeners shall be provided at reaction points where shown on the plans.

Ends of joists shall be reinforced with end clips, steel hangers, steel angle clips, steel stud section, or as otherwise recommended by the manufacturer.

Joists shall be secured to interior support systems to prevent lateral movement of bottom flanges.

12-5.03 BUILDING MISCELLANEOUS METAL

PART 1.- GENERAL

Scope.--This work shall consist of fabricating, furnishing and installing building miscellaneous metal in accordance with the details shown on the plans and these special provisions.

Building miscellaneous metal shall consist of the following:

> Plates, bars and shapes including all anchors, fastenings, hardware, accessories and other supplementary parts necessary to complete the work.

REFERENCES.--

Codes and standards.--Welding of steel shall be in accordance with American Welding Society (AWS) D 1.1, "Structural Welding Code-Steel" and D 1.3, “Structural Welding Code-Sheet Steel.”

SUBMITTALS.--

Product data.--Submit manufacturer's specifications, anchor details and installation instructions for products used in miscellaneous metal fabrications.

Working drawings.--Working drawings of fabricated items shall be submitted for approval.

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 shall be subject to inspection and tests by the Engineer, in mill, shop and field. Such tests will not relieve the Contractor of responsibility of providing materials and fabrication procedures in compliance with specified requirements.

PART 2.- PRODUCTS

MATERIALS.--

Steel bars, plates and hot-rolled shapes.--

Steel bars, plates and hot-rolled shapes shall conform to ASTM Designation: A 572 Grade 50.

Galvanized sheet steel.--

Galvanized sheet steel shall conform to ASTM Designation: A 653/A 653M, Grade 33 [230]. Galvanizing shall be G60 [Z180].

Checkered floor plates.--

Checkered floor plates shall be commercial quality steel with standard raised pattern.

Pipe.--

Pipe shall be commercial quality standard steel pipe.

Steel tubing.--

Steel tubing shall conform to ASTM Designation: A 500, Grade B, or A 501.

Bolts, studs, threaded rods, nuts and washers.--

Bolts, studs, threaded rods, and nuts for general application shall conform to ASTM Designation: A 307.

Washers shall be commercial quality.

Fittings.--

Brackets, bolt, threaded studs, nuts, washers, and other fittings for railings and handrailings shall be commercial quality pipe and fittings.

Expansion anchors.--

Expansion anchors shall be ICBO approved for the purpose intended, integral stud type anchor or internally threaded type with independent stud, hex nut and washer.

Powder driven anchors.--

Powder driven anchors shall be plated, spring steel alloy drive pin or threaded stud type anchors for use in concrete or steel. Spring steel shall conform to ASTM Designation: A 227M, Class 1. The diameter, length and type of shank and the number and type of washer shall be as recommended by the manufacturer for the types and thickness of material being anchored or fastened.

Resin capsule anchors.--

Stud anchors for resin capsule anchors shall conform to ASTM Designation: A 307 threaded steel rod with hex nut and washer and sealed glass capsule or cartridge containing an adhesive composed of unsaturated polyester resin and benzol peroxide coated quartz sand. Resin capsule shall be Hilti; Molly; or equal.

Drainage grates.--

Drainage grates shall be fabricated from steel bars as specified herein; ductile iron castings conforming to ASTM Designation: A 536, Grade 65-45-12; or carbon steel castings conforming to ASTM Designation: A 27M, Grade 65-35.

Mortar.--

Mortar shall consist of one part cement, measured by volume, to 2 parts clean sand and only enough water to permit placing and packing.

FABRICATION.--

Workmanship and finish.--Workmanship and finish shall be equal to the best general practice in modern shops.

Miscellaneous metal shall be clean and free from loose mill scale, flake rust and rust pitting, and shall be well formed and finished to shape and size with sharp lines and angles. Bends from shearing or punching shall be straightened.

The thickness of metal and details of assembly and support shall give ample strength and stiffness.

Built-up parts shall be true to line and without sharp bends, twists and kinks. Exposed ends and edges of metal shall be milled or ground smooth, with corners slightly rounded.

Joints exposed to the weather shall be made up to exclude water.

Galvanizing.--Items indicated on the plans to be galvanized shall be hot-dip galvanized after fabrication. The weight of galvanized coating shall be at least 460 grams per square meter of surface area, except drainage grates shall have at least 610 grams per square meter of surface area.

Painting.--Building miscellaneous metal items not galvanized shall be cleaned and prime painted prior to erection in accordance with the requirements specified for steel and other ferrous metals under "Painting" in Section 12-9, "Finishes," of these special provisions.

Loose bearing and leveling plates.--Loose bearing and leveling plates shall be furnished for steel items bearing on masonry or concrete construction, made flat, free from warps or twists, and of required thickness and bearing area. Plates shall be drilled to receive anchor bolts. Galvanize after fabrication.

Drainage pipes, frames and grates.--Drain piping shall have connections sealed watertight.

Drainage grates shall have end bars of the same cross section as support bars. Connections between end bars and support bars of structural steel shall be welded all around.

Drainage frames shall be angles and plates as shown on the plans.

Drainage grates and frames shall be match marked.

Steel pipe railings and handrailings.--Pipe handrailing shall consist of handrailing elements supported by metal brackets (wall type) or handrailing elements supported by tubular steel posts (post type).

Ends of railing pipe shall be closed, except for a 3 mm diameter weep hole at the low point.

All corners on railings shall be rounded. Simple and compound curves shall 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 shall be provided for interconnections of pipe and attachment of railings and handrails to other work. Inserts and other anchorage devices shall be furnished for connecting railings and handrails to concrete or masonry.

Steel railing shall be galvanized after fabrication. After galvanizing, all elements of the railing shall be free of fins, abrasions, rough or sharp edges, and other surface defects and shall not be kinked, twisted or bent.

PART 3.- EXECUTION

GENERAL.--

Anchorages.--Anchorage devices and fasteners shall 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 shall 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 shall be set on wedges or other adjustable devices. Anchor bolts shall be wrench tightened after the plates have been positioned and plumbed. Mortar shall be packed solidly between bearing surfaces and plates to ensure that no voids remain.

Steel pipe railings and handrailings.--Railings shall be adjusted prior to anchoring to ensure matching alignment at abutting joints. Secure posts and railing ends to building construction as shown on the plans.

Resin capsule anchors shall not to be used for anchoring railings and handrailings.

Powder driven anchors.--Powder driven anchors shall be installed with low velocity powder actuated equipment in accordance with the manufacturer's instructions and State and Federal OSHA regulations.

Resin capsule anchors.--Resin capsule anchors shall be installed in accordance with the manufacturer's instructions.

DAMAGED SURFACES.--

General.--Galvanized surfaces that are abraded or damaged at any time after the application of the zinc coating shall be repaired by thoroughly wire brushing the damaged areas and removing all loose and cracked coating, after which the clean areas shall be painted with 2 applications of unthinned zinc-rich primer (organic vehicle type). Aerosol cans shall not be used.

12-5.04 STAIR NOSING

PART 1.- GENERAL

SUMMARY.--

Scope.--This work shall consist of furnishing and installing stair nosings in accordance with the details shown on the plans and these special provisions.

SUBMITTALS.--

Product data.--Manufacturer's descriptive data and installation instructions shall be submitted for approval.

PART 2.- PRODUCTS

MANUFACTURERS.--

Acceptable manufacturers.--Subject to these special provisions, acceptable manufacturer’s shall be American Safety Tread Co., Inc., Model No. FA-211D, Safety yellow color; Armstrong Products Inc., Model No. S62, Red color; Wooster Products Inc., Model No. WPC, Safety yellow color; or equal.

MATERIALS.--

Stair nosing.-

Stair nosing shall be factory fabricated units made of heavy duty, heat treated 6063-T5 extruded aluminum base with anchors and an abrasive filler.

Stair nosing shall meet OSHA requirements for anti-slip safety on stairs.

The anti-slip filler shall be firmly adhered to the base, and shall be composed of aluminum oxide and an epoxy binder. The color shall extend uniformly throughout out the filler. The filler shall contain not less than 60 percent aluminum oxide.

The base anchor system shall stabilize the nosing, prevent rocking and loosening, and shall permanently lock the nosing into place.

PART 3.- EXECUTION

INSTALLATION.--

General.--The stair nosing shall be securely installed to prevent rocking or other movement during placing of concrete.

SECTION 12-6. WOOD AND PLASTICS

12-6.01 ROUGH CARPENTRY

PART 1.- GENERAL

SUMMARY.--

Scope.--This work shall consist of furnishing and installing materials and performing rough carpentry work including wood framing, furring, and sheathing in accordance with the details shown on the plans and these special provisions.

Rough carpentry includes carpentry work not specified as part of other sections and which is generally not exposed.

SUBMITTALS.--

Product Data.--Manufacturer's material data and installation instructions shall be submitted for gypsum sheathing, framing hardware and underlayments.

Wood treatment data.--Chemical treatment manufacturer's instructions shall be submitted for the handling, sorting, installation, and finishing of treated materials.

For each type of preservative treatment used, certification by treating plant shall include type of preservative solution and pressure process used, net amount of preservative retained and conformance with the applicable standards of the American Wood Preservers 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.

DELIVERY, HANDLING AND STORAGE.--

Delivery and storage.--Materials shall be kept under cover and dry. All materials shall be protected from exposure to weather and contact with damp or wet surfaces with blocking and stickers. All lumber, plywood and other panels shall be stacked in such a manner to provide air circulation within and around the stacks.

PART 2.- PRODUCTS

LUMBER.--

General.--Lumber shall be manufactured to comply with PS 20, "American Softwood Lumber Standard," and with applicable grading rules of inspection.

Softwood lumber shall be quality grade stamped or shall be accompanied by a certificate of inspection. Inspection certificates or grade stamps shall indicate compliance with the grading requirements of WWPA, WCLIB, RIS, or other approved lumber inspection agencies.

All lumber used shall be nominal sized and dressed S4S unless otherwise specified in these special provisions.

Framing lumber shall be solid stock lumber, Douglas Fir-Larch, and the grades indicated under WCLIB or WWPA rules. Moisture content shall not exceed 19 percent and shall be grade stamped "S-Dry."

DIMENSION LUMBER.--

Except as otherwise shown on the plans, lumber shall have the following grades.

Vertical framing lumber.--

Vertical framing lumber, nominal 51 mm x 51 mm through 102 mm x 102 mm, shall be Construction grade or better.

Vertical framing lumber, nominal 51 mm x 152 mm through 102 mm x 152 mm shall be No. 2 or better.

Horizontal framing lumber.--

Horizontal framing lumber, nominal 51 mm x 102 mm and wider, including joists and rafters, shall be No. 2 or better.

Horizontal framing lumber, nominal 102 mm x 102 mm and wider, including joist and rafters, shall be No. 1 or better.

Exposed framing lumber.--

Exposed framing lumber which is not concealed and is to receive a stain or natural finish shall be the same grade and species as indicated for structural framing and hand selected for appearance.

Miscellaneous lumber.--

Miscellaneous lumber for support or attachment of other work including rooftop equipment curbs and support bases, cant strips, bucks, nailers, blocking, furring, grounds, stripping and similar members shall be not less than No. 2 or better.

Lumber in contact with concrete or masonry construction shall be pressure treated Douglas Fir-Larch.

TIMBERS.--

Timbers (nominal 127 mm or thicker).--

Timbers shall be No. 1 or better.

PLYWOODPANELS.--

General.—Plywood panels shall comply with Voluntary Product Standard PS1, "U. S. Product Standard for Construction and Industrial Plywood."

Plywood panels shall be Group 1 unless otherwise noted.

Each plywood panel shall be factory marked with APA or other trademark evidencing compliance with grade requirements.

Structural plywood wall sheathing.--

Structural plywood wall sheathing for walls shall be APA RATED SHEATHING, Exposure 1. Thickness and grade shall be as shown on the plans.

Structural plywood roof sheathing.--

Structure plywood roof sheathing shall be APA RATED SHEATHING, Exposure 1. Span rating, thickness and grade shall be as shown on the plans.

Structure plywood roof sheathing in exposed overhangs shall be APA RATED SHEATHING, A-C, Exterior, Group 1. Thickness shall be the same as the remainder of the sheathing.

Plywood decking.--

Plywood decking shall be APA RATED STURD-I-FLOOR, Exposure 1, with tongue-and-groove edges. Span rating and thickness shall be as shown on the plans.

MISCELLANEOUS MATERIALS.--

Rough Carpentry Hardware.--

Steel plates and rolled sections shall be mild, weldable steel, conforming to AISI grades 1016 through 1030 except 1017.

Nails, screws, bolts, nuts, washers shall be commercial quality. Exposed fasteners shall be hot dipped galvanized or stainless steel.

Joist hangers, clips and other standard framing hardware shall be ICBO approved, commercial quality, galvanized sheet steel or hot dipped galvanized, of the size shown on the plans.

Expansion anchors and powder driven anchors shall be as specified under "Building Miscellaneous Metal," in Section 12-5, "Metals," of these special provisions.

Nails.--

Nails shall conform to ASTM F 1667-95. "Common" nails shall conform to the following table:

Nail Size	Length (mm)	Diameter (mm)
8d	63.5	3.33
10d	76.2	3.76
16d	88.9	4.11

Building paper.--

Building paper shall 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 shall conform to APA Specification: AFG-01.

WOOD TREATMENT BY PRESSURE PROCESS.--

Preservative treatment.--

Preservative treatment shall be copper napthenate, pentachlorophenol or water-borne arsenicals (ACA, CCA or ACZA).

The following items shall 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 shall be thoroughly swabbed with 2 applications of copper napthenate.

Fire retardant treatment.--

Fire retardant treatment shall be paintable, odorless fire retardant preservative applied by pressure treating methods.

PART 3.- EXECUTION

INSTALLATION.--

Wood framing.--Wood framing shall be in accordance with Chapter 23 of the California Building Code.

Framing members shall be of sizes and spacing shown on the plans. Unless otherwise shown on the plans, structural members shall not be spliced between supports.

Wood framing shall be accurately cut and assembled to provide closely fitted members. Framing shall be erected true to the lines and grades shown on the plans and shall be rigidly secured in place as shown and as required by recognized standards. Bracing shall be placed wherever necessary to support all loads on the structure during erection.

The size and spacing of fasteners and the edge distance for nails shall be as shown on the plans.

Nailing schedule shall be as shown on the plans and shall comply with the California Building Code.

Wall coverings exposed to the weather shall have a backing of building paper applied weatherboard fashion to the framing or sheathing. Backing shall be lapped 50 mm at horizontal joints, 152 mm at vertical joints and 305 mm at building corners.

Stair framing.--Stair framing members shall be of the size and spacing shown on the plans.

Stringers shall be notched to receive treads, risers and supports. Effective depth remaining shall be not less than 89 mm.

Plywood panels.--Plywood panels shall be attached to the framing as shown on the plans and these special provisions. All structural plywood sheathing (both roof and wall) shall be nailed with "Common" nails.

Plywood decking shall be glued and nailed to the framing system.

Plywood sheathing shall be nailed to the framing system and shall be continuous over 2 or more supports. Roof and floor panels shall be installed with the long dimension across the supports, with end joints staggered 1.22 m. Wall sheathing shall have all edges blocked. Spacing between panels shall be 3 mm.

PART 1.- GENERAL

SUMMARY.--

Scope.--This work consists of furnishing and erecting laminated veneer lumber members, in accordance with the details shown on the plans and these special provisions.

SUBMITTALS.--

Product data.--Manufacturer's data, current ICBO Evaluation Report, and specifications for laminated veneer lumber, including adhesives, shall be submitted for approval.

QUALITY ASSURANCE.--

Codes and standards.--The laminated veneer lumber manufacturer shall be have a current approved ICBO Evaluation Report for the product.

Factory marks.--Laminated veneer lumber members shall be identified with stamps noting the name of the manufacturer, product name, grade, ICBO evaluation report number, and the quality control agency.

Certificates of Compliance.--Certificates of Compliance shall be furnished for laminated veneer lumber in accordance with the requirements specified in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications.

DELIVERY, STORAGE, HANDLING.--

General.--Laminated veneer lumber members shall be stored in such a manner to prevent warping and damage due to moisture.

Laminated veneer lumber members shall be stored off the ground.

PART 2.- PRODUCTS

Laminated veneer lumber.--

Laminated veneer lumber members shall be constructed by gluing wood veneers together with an exterior type adhesive. The veneer grain shall be parallel to the member length.

Laminated veneer lumber members shall have a minimum allowable bending stress (F_b) of 17.9 Mpa, and a minimum modulus of elasticity (E) of 12 410 Mpa.

FABRICATION.--

General.--Laminated veneer lumber members shall fabricated in accordance with the ICBO Evaluation Report.

PART 3.- EXECUTION

INSTALLATION.--

General.--Miscellaneous steel connectors, anchors and accessories shall be installed as shown on the plans.

Members shall be erected so that a close fit and neat appearance of joints and structure as a whole will not be impaired.

12-6.02 PREFABRICATED WOOD I-BEAM JOISTS

PART 1.- GENERAL.--

Scope.--This work shall consist of designing, fabricating, furnishing and erecting pre-engineered, factory fabricated wood I-beam joists in accordance with the details shown on the plans and these special provisions.

SUBMITTALS.--

Working drawings.--Complete working drawings, erection drawings, if required, and design calculations for the pre-engineered I-beam joists, permanent bracing and connection details shall be submitted for approval. Submittals shall be approved prior to the start of fabrication.

Working drawings and design calculations shall be stamped and signed by an engineer who is registered as a Civil or Structural Engineer in the State of California. The expiration date of the registration shall be shown. Engineer's original signature shall be submitted.

Working drawings shall show the lumber and plywood sizes, species and grades for joist flanges and webs and for temporary and permanent bracing members. Joint and connection details shall be shown.

Working drawings shall include a location plan which shows the location and identification of each joist.

Calculations for the design of the joists, bracing and connections shall include a list of applied loads and load combinations with the resulting member forces and member stresses.

If the design calculations contain or consist of computerized or tabulated calculations, the values pertaining to the design shall be identified, described or indexed in such a manner that a design review can be performed.

QUALITY ASSURANCE.--

Codes and standards.--I-beam joists and permanent bracing shall be designed for the loads shown on the plans. The design shall be in accordance with the requirements of the CBC, the "National Design Specification for Stress-Graded

Lumber and Its Fasteners" by the National Forest Products Association (NFPA), and the "Timber Construction Standards" by the American Institute of Timber Construction (AITC). Joist trusses shall be ICBO approved.

Certificates of Compliance.--Certificates of Compliance shall be furnished for I-beam joists in accordance with the requirements specified in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications.

DELIVERY, STORAGE AND HANDLING.--

General.--I-beam joists shall be transported and handled in such a manner as to prevent damage due to warping, distortion and moisture. Joists shall be stored off the ground.

PART 2.- PRODUCTS.--

I-beam joists.--

I-beam joists shall be factory fabricated, pre-engineered I-beam joists, with solid sawn or laminated wood flanges and plywood or oriented strand board (OSB) webs. Joists shall be sized to fit the location shown on the plans. Lumber sizes, and lumber species and grades shall be as shown on the approved working drawings. Lumber and plywood shall bear grade marks of a recognized grading association and the moisture content of the lumber shall be within the amount specified in the referenced specifications.

Connectors and fasteners.--

Connectors and fasteners shall be as shown on the approved working drawings.

FABRICATION.--

General.--Joists and bracing members shall be accurately cut to provide tightly fitted joints and connections.

Camber, if required by the design, shall be built into the joists.

Each joist shall be stamped or marked with a location identification mark or symbol and with the name and address of the manufacturer.

PART 3.- EXECUTION.--

INSTALLATION AND ERECTION.--

General.--Joists shall be erected plumb and true and shall be secured rigidly in place in accordance with the joist manufacturer's recommendations.

Nails and other fasteners shall be placed as shown on the plans and as recommended by the manufacturer.

Bracing shall be installed during erection to hold the joists plumb and true and in a safe position until sufficient permanent construction is in place to provide full stability.

All permanent bracing shall be secured in place before any sustained permanent loads are applied to the joist system.

Materials loaded on the joist system shall be located in such a manner to insure that the design load is not exceeded in the area of placement of the materials.

12-6.03 FINISH CARPENTRY

PART 1.- GENERAL

SUMMARY.--

Scope.--This work consists of furnishing and installing materials and performing finish carpentry, including exterior and interior trim, plywood soffits and panels and plywood and softwood paneling, as shown on the plans and these special provisions.

Finish carpentry includes carpentry work not specified as part of other sections and which is generally exposed to view.

SUBMITTALS.--

Product data.--Manufacturer's specifications and installation instructions for each item of factory-fabricated siding and paneling.

Samples.--One sample shall be submitted to the Engineer at the jobsite for each species and cut or pattern of finish carpentry as shown below:

Exterior standing and running trim - 610 mm long x full board or molding width, finished on one side and one edge.

Interior standing and running trim - 610 mm long by full board or molding width, finished on one side and one edge.

Siding - 610 mm long, finished on one side and one edge.

Exterior plywood for transparent finish - 610 mm long x panel width, finish shall be applied to upper half of each piece.

Plywood paneling - 610 mm long x full panel width, finished on one side.

QUALITY ASSURANCE.--

Factory marks.--Each piece of lumber and plywood shall be marked with type, grade, mill and grading agency identification. Marks shall be omitted from surfaces to receive transparent finish. A mill certificate stating that material has been inspected and graded in accordance with requirements shall be furnished if marks cannot be placed on concealed surfaces.

PRODUCT DELIVERY, STORAGE AND HANDLING.--

Delivery.--Carpentry materials shall be delivered after painting, wet work and similar operations have been completed.

Protection.--Finish carpentry materials shall be protected during transit, delivery, storage and handling to prevent damage, soiling and deterioration.

PART 2.- PRODUCTS

WOOD PRODUCT QUALITY STANDARDS.--

Softwood lumber.--Softwood lumber shall conform to the requirements of PS 20, "American Softwood Lumber Standard," with applicable grading rules of inspection.

Plywood.--Plywood shall conform to the requirements of Voluntary Products Standard PS-1, "U. S. Product Standard for Construction and Industrial Plywood."

Hardwood lumber.--Hardwood lumber shall conform to the requirements of the National Hardwood Lumber Association (NHLA) rules.

Woodworking.--Woodworking shall conform to the requirements of Woodwork Institute of California (WIC), "Manual of Millwork."

MATERIALS.--

General.--Lumber sizes indicated shall be nominal sizes except as indicated by detailed dimensions. Lumber which is to be dressed or worked and dressed shall be manufactured to the actual sizes as required by PS 20.

Lumber that is to receive a transparent finish (stained or clear) shall be made of solid lumber stock.

Lumber that is to be painted may be solid or glued-up lumber at the contractor's option.

Glued-up lumber for exterior finish work shall comply with PS 56 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 shall be clear, all heart Redwood.
Trim to be painted shall be finished smooth.
Trim which is to be exposed to view and to receive transparent finish (stained or clear) shall be saw textured.

Plywood siding for transparent finish.--

Plywood for transparent finish shall be 16 mm, redwood, APA RATED SIDING 303-6-W, EXT with exterior glue, rough sawn Texture 1-11. Siding shall be factory treated with the manufacturer's standard water repellent preservative.

Plywood paneling and wainscotting.--

Plywood paneling and wainscotting shall be APA Interior Grade A-C, Group 1, Exposure 1 plywood. Thickness shall be as shown on the plans.

Interior standing and running trim.--

Standing and running trim to be painted shall be paint-grade pine, solid stock or finger jointed.

Standing and running trim to have transparent finish shall be solid hardwood, species to be shown on the plans.

Stair treads.--

Exterior stair treads shall be S4S, vertical grain stadium seat stock redwood.

Interior stair treads shall be S3S, C and better grade Douglas fir stepping.

Stair risers.--

Exterior stair risers shall be S4S, select heart structural redwood.

Interior stair risers shall be S4S, No. l grade Douglas fir.

Railings.--

Exterior railings shall be S4S, Select heart structural redwood.

Interior railings shall be S4S, No. 1 grade Douglas fir.

Open shelving.--

Open shelving shall be 19 mm Grade A-C fir plywood with veneer core and 13 mm thick solid stock pine edge banding glued and nailed.

Miscellaneous Materials.--

Nails, screws and other anchoring devices of the type, size, material and finish required shall be provided for secure attachment, concealed where possible.

Fasteners and anchorages for exterior use shall be hot dip galvanized.

Screens for soffit vents shall be 4 x 4 or 8 x 8 mesh, galvanized screen. Open area shall be not less than 50 percent.

Preservative treatment.--

Preservative treatment shall be copper napthenate, pentachlorophenol or water-borne arsenicals (ACA, CCA or ACZA).

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 shall be pressure treated with leach resistant preservative. Each piece of pressure treated lumber shall bear the AWPA label.

All holes, daps, or cuts made after treating shall be thoroughly swabbed with copper napthenate

Fire retardant treatment.--

Fire retardant treatment shall be paintable, odorless fire retardant preservative applied by pressure treating methods.

PART 3.- EXECUTION

INSTALLATION.--

General.--All work shall be installed plumb, level and true with no distortions.

Standing and running trim.--Standing and running trim shall be installed with minimum number of joints possible, using full length pieces to the greatest extent possible.

Exterior joints shall be made water-resistant by careful fitting.

Anchor finish carpentry.--Finish carpentry shall be anchored to framing or blocking built in or attached directly to the substrate.

Interior carpentry shall be attached to grounds, stripping and blocking with countersunk, concealed fasteners and blind nailing where required for complete installation. Fine finish nails shall be used for exposed nailing, countersunk and filled flush with finished surface and matching final finish where transparent finish is indicated.

Finish exterior siding shall be fastened with corrosion resistant nails. The size and spacing of the siding fasteners shall be as shown on the plans. Nails shall be driven flush with the surrounding surfaces, not countersunk. Nails shall be located in the grooves of grooved siding whenever possible.

ADJUSTMENT, CLEANING, FINISHING AND PROTECTION.--

General.--Damaged and defective finish carpentry work shall be repaired or replaced.

All exposed or semi-exposed surfaces shall be cleaned.

Finish carpentry shall be finished in accordance with the requirements specified under "Painting" in Section 12-9, "Finishes," of these special provisions.

12-6.04 CABINETS

PART 1.- GENERAL

SUMMARY.--

Scope.--This work shall consist of furnishing and installing a swinging gate, wood cabinets and plastic laminate tops, splashes and returns as shown on the plans and in these special provisions.

SUBMITTALS.--

Product data.--Manufacturer's product data for plastic laminates and cabinet hardware shall be submitted for approval.

Samples.--Three samples shall be submitted for each of the items shown below:

Wood veneer faced panel products, with or for transparent finish, finished, 203 mm x 254 mm.

Plastic laminate, 203 mm x 254 mm for each type, color, pattern and surface finish.

Working drawings.--Working drawings for cabinets showing location of cabinets, dimensioned plans and elevations, attachment devices and other components shall be submitted for approval. Working drawings shall bear the "WIC Certified Compliance Label" on the first sheet of the drawings.

QUALITY ASSURANCE.--

Codes and standards.--Cabinets and swinging gate shall be manufactured and installed in accordance with the Manual of Millwork of the Woodwork Institute of California (WIC) requirements for the grade or grades specified or shown on the plans.

Certificates of Compliance.--Prior to delivery to the jobsite, the cabinet manufacturer shall issue a WIC Certified Compliance Certificate indicating that the products he will furnish for this job and certifying that they will fully meet all the requirements of the grade or grades specified.

WIC Certified Compliance Label shall be stamped on all cabinet work and swinging gate.

Each plastic laminate top shall bear the WIC Certified Compliance Label.

Prior to completion of the contract, a WIC Certified Compliance Certificate for Installation shall be delivered to the Engineer.

DELIVERY, STORAGE AND HANDLING.--

Protection.--Cabinets shall be protected during transit, delivery, storage and handling to prevent damage, soiling and deterioration.

PART 2.- PRODUCTS

ACCEPTABLE MANUFACTURERS.--

Manufacturers.--Subject to compliance with these specifications, high pressure decorative laminates shall be Consoweld Corp.; Formica Corp.; Nevamar Corp.; or equal.

MANUFACTURED UNITS.--

General.--Cabinets shall be fabricated to the dimensions, profiles, and details shown on the plans with openings and mortises precut, where possible to receive hardware and other items and work.

Fabrication, assembly, finishing, hardware application, and other work shall be completed to the maximum extent possible prior to shipment to the jobsite.

Laminate clad cabinets.--

Laminate clad cabinets shall be custom grade, flush overlay construction.

Laminate cladding shall be high pressure decorative laminate complying with NEMA LD 3. Color, pattern and finish shall be as shown on the plans. Laminate surface and grade shall be as follows:

Horizontal and vertical surfaces other than tops shall conform to GP-50 (1.27 mm nominal thickness).

Postformed surfaces shall conform to PF-42 (1.07 mm nominal thickness).

Laminated counter tops and splashes.--

Laminated counter tops and splashes shall be WIC custom grade.

Surface material shall be high pressure laminated plastic conforming to NEMA LD-3, 1.27 mm thickness.

Unless otherwise shown on the plans, splashes shall be 102 mm high from the surface of the deck. Back splashes shall be continuous formed and coved. Side splashes shall be top set.

Laminated counter tops self edged, counter tops to receive sinks or plumbing fixtures shall have a bullnose.

The underside of tops and backsides of splashes shall be covered with an approved backing sheet.

CABINET HARDWARE AND ACCESSORY MATERIALS.--

General.--Cabinet hardware and accessory materials shall be provided for cabinets.
Hardware shall be provided with standard US 26D metal plated finish or powder coated finish.

Drawer slides.--

Drawer slides shall be side mounting full extension with fully enclosed rolling balls and rollers. Concealed slides and bearings, and positive stop. Capacity shall be not less than 35 kg, except capacity shall be not less than 45 kg for heavy duty drawers.

Door guides.--

Sliding door guides shall be continuous, dual channel, metal guides, top and bottom. Bottom guide shall have crowned track.

Shelf supports.--

Shelf supports shall be adjustable, semi-recessed, chrome finished pressed metal, heavy duty standards and support clip, with one inch adjustment increments.

Cabinet hinges.--

Cabinet hinges shall be steel. Length of jamb leaf shall be 64 mm. The type of hinge shall be all metal construction meeting ANSI/BHMA Grade 1 "performance" and "set" test requirements.
Cabinet hinge manufacturers shall be Stanley, Hager, McKinney, or equal.

Cabinet catches.--

Cabinet catches shall be self aligning magnetic type in aluminum case with zinc plated steel strike.
Cabinet catch manufacturers shall be Stanley, Hager, McKinney, or equal.

Cabinet pulls.--

Cabinet pulls shall be 8 mm diameter rod, with 33 mm projection and 75 mm center to center fastening.
Cabinet pull manufacturers shall be Stanley, Hager, McKinney, or equal.

Cabinet knobs.--

Cabinet knobs shall be cast brass with plated finish, shall be 25 mm diameter with 19 mm projection.
Cabinet knobs manufacturers shall be Stanley, Hager, McKinney, or equal.

FABRICATION.--

Shop assembly.--Nails shall be countersunk and the holes filled, molds shall be neatly mitered and all joints shall be tight and true.

As far as practicable, work shall be assembled at the mill and delivered to the building ready to be set in place. Parts shall be smoothly dressed and interior work shall be belt sanded at the mill and hand sanded at the building. After assembly, work shall be cleaned and made ready for the specified finish.

All work shall be prepared to receive finish hardware. Finish hardware shall be accurately fitted and securely fastened as recommended by the manufacturer. Finish hardware shall not be fastened with adhesives.

Drawers shall be fitted with dust covers of 6 mm plywood or hardboard above compartments and drawers except where located directly under tops.

Precut openings.--Openings for hardware, appliances, plumbing fixtures, and similar items shall be precut where possible. Openings shall be accurately located and templates used for proper size and shape. Edges of cutouts shall be smoothed and edges sealed with a water-resistant coating.

PART 3.- EXECUTION

INSTALLATION.--

Cabinets.--Cabinets shall be installed without distortion so that doors and drawers fit openings properly and are accurately aligned. Hardware shall be adjusted to center doors and drawers in openings and to provide unencumbered operation. Installation of hardware and accessory items shall be completed as indicated on the approved drawings.

Laminate tops.--Laminate tops shall be securely fastened to base units and other support systems as indicated on the approved drawings.

Cabinet hardware.--Doors for cabinets shall be equipped with one pair of hinges and one catch per leaf, unless otherwise shown on the plans. Each door leaf shall be equipped with one pull.

Drawers up to 610 mm wide shall have one pull and drawers over 610 mm wide shall have two pulls.

SECTION 12-7. THERMAL AND MOISTURE PROTECTION

12-7.01 INSULATION (GENERAL)

PART 1.- GENERAL

SUMMARY.--

Scope.--This work shall consist of furnishing and installing insulation in accordance with the details shown on the plans and these special provisions.

Insulation materials shall be as specified in these special provisions, and shall be compatible with existing or new materials incorporated in the building.

SUBMITTALS.--

Product data.--A list of materials, manufacturer's descriptive data, location schedule, and time schedule shall be submitted for approval.

The list of materials to be used shall 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 shall be submitted for approval.

The location schedule shall show where each material is to be installed.

The Contractor shall provide the Engineer at the jobsite with an accurate time schedule of the areas of the building to be insulated each day. The time schedule shall be submitted 3 working days in advance of the work.

Samples.--Samples of insulation material shall be submitted to the Engineer at the jobsite.

QUALITY ASSURANCE.--

Codes and standards.--All insulating materials shall be certified to comply with the California Quality Standards for Insulating Materials and shall be listed in the Department of Consumer Affairs publication "Consumer Guide and Directory of Certified Insulation Material."

DELIVERY, STORAGE AND HANDLING.--

General.--Insulating materials shall be delivered to the jobsite and stored in a safe dry location with labels intact and legible.

Insulating materials shall be protected from physical damage and from becoming wet or soiled.

In the event of damage, materials shall be repaired or replaced as necessary to comply with these specifications.

PART 2.- PRODUCTS (Not applicable.)

PART 3.- EXECUTION (Not applicable.)

12-7.02 BATT AND BLANKET INSULATION

PART 1.- GENERAL

SUMMARY.--

Scope.--This work shall consist of furnishing and installing batt or blanket insulation in accordance with the details shown on the plans and these special provisions.

Batt insulation shall include faced and unfaced batts in walls and ceilings, acoustical batts for sound control and exposed batt or blanket insulation for ceilings and walls.

QUALITY ASSURANCE.--

Laminator's qualifications.--Laminator for bonding polyethylene vapor-retarder to insulating batts shall be approved by the insulation manufacturer.

The name of the laminator shall be submitted with the Product Data.

Codes and standards.--All batt or blanket insulation, including facings such as vapor barriers, shall have a flame-spread rating not to exceed 25 and a smoke density not to exceed 450 when tested in accordance with UBC Standard No. 8-1.

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.

PART 2.- PRODUCTS

INSULATING MATERIALS.--

General.--Fiberglass batts shall be thermal insulation produced by combining glass fibers with thermosetting resins to comply with ASTM Designation: C 665.

Wall insulation.--

Wall insulation shall be R-3.3 K• m^2/W fiberglass batts with paper-laminate vapor-retarder membrane on one face. Insulation shall conform to ASTM Designation: C 665, Type II, Class C.

Ceiling insulation.--

Ceiling insulation shall be R-6.7 K• m^2/W fiberglass batts with paper-laminate vapor-retarder membrane on one face. Insulation shall conform to ASTM Designation: C 665, Type II, Class C.

Acoustical insulation.--

Acoustical insulation shall be 89 mm, unfaced fiberglass insulation batts. Insulation shall conform to ASTM Designation: C 665, Type I.

VAPOR-RETARDERS.--

Paper-laminate vapor-retarder.--

Paper-laminate vapor-retarder shall 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 shall be 0.0076 mm reflective aluminum foil laminated with scrim reinforcing to plastic-coated kraft paper**.**

Polyethylene vapor-retarder.--

Polyethylene vapor-retarder shall be factory-applied, 0.076 mm, 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.

AUXILIARY INSULATION MATERIALS.--

Insulation tape.--

Insulation tape shall be as recommended by the insulation manufacturer.

Insulation adhesive.--

Insulation adhesive shall be the type recommended by the insulation manufacturer and complying with the requirements for fire resistance.

Impaling pins.--

Impaling pins shall be self-adhering wire pins with sheet metal retaining clips and protective rubber tips. Adhesive for pins shall be as recommended by the pin manufacturer.

Line wire.--

Line wire shall be commercial quality 0.89 mm (20-gage) galvanized steel wire.

FABRICATION--

General.--Polyethylene shall be factory laminated to fiberglass batts or blankets by an applicator approved by the manufacturer of the batts or blankets.

PART 3.- EXECUTION

INSTALLATION.--

General.--The vapor retarder on faced batts shall be toward the interior and shall be fastened to provide a sealed retarder. Punctures and holes in the retarder shall be repaired.

Unless otherwise shown on the plans or specified elsewhere in these special provisions, insulation shall be kept 75 mm to 100 mm clear of lighting fixtures and heat producing electrical appliances and equipment.

Installing batt type insulation.--Insulation batts shall be installed to completely fill the space between framing members. Apply a single layer of insulation of required thickness, unless otherwise shown on the plans or required to make up total thickness. Installation shall conform to the manufacturer's recommendations and these special provisions.

12-7.03 RIGID WALL INSULATION

PART 1.- GENERAL

SUMMARY.--

Scope.--This work shall consist of furnishing and installing rigid wall insulation in accordance with the details shown on the plans and these special provisions.

Rigid insulation shall include rigid insulation, wood nailers, fasteners and such other materials, not mentioned, which are required for the complete installation of the rigid insulation system.

QUALITY ASSURANCE.--

Codes and standards.--Rigid foam insulation shall have a flame-spread rating not to exceed 75 and a smoke density not to exceed 450 when tested in accordance with UBC Standard No. 8-1. Rigid foam insulation shall be approved in accordance with UBC Standard 26-3 to be installed exposed, or without a thermal barrier on the room side of the insulation.

PART 2.- PRODUCTS

Rigid insulation.--

Rigid insulation shall be rigid rectangular boards of polyisocyanurate foam with aluminum foil facing on both sides and an aged thermal resistance of R-1.9 K• m^2/W. Facing on exposed insulation shall be white tinted aluminum foil.

Wood nailers.--

Wood nailers shall be Douglas fir, Hem-fir or equivalent western softwood. Nailers in contact with masonry or concrete shall be pressure treated after fabrication. Wood preservatives shall be waterborne type.

Insulation tape.--

Insulation tape shall be as recommended by the insulation manufacturer.

Adhesive.--

Adhesive shall be construction grade panel adhesive as recommended by the insulation manufacturer.

PVC strips.--

PVC strips shall be interlocking male and female white PVC strips.

Fasteners.--

Fasteners shall be concrete nails; Bostich, Pneumatic Nail System; Buildex, Tampcon Fasteners; or equal.

EXECUTION.--

Installation of rigid insulation.--The preparation of the wall surfaces and the installation of insulation shall conform to the manufacturer's recommendations and these special provisions.

Rigid insulation placed behind plywood or gypsum board shall be tight fitting between nominal 51 mm x 102 mm wood nailers laid flat and spaced 0.6 meter on center. Wood nailers shall also be placed at the top and bottom of the plywood or gypsum board.

Exposed rigid insulation shall be installed tight fitting between PVC strips spaced at 1.2 meter on center. PVC strips shall align with the vertical joints of the plywood below. Adhesive shall be applied to the PVC strips and the wall as recommended by the insulation manufacturer. Exposed insulation shall have no horizontal joints between the top of the plywood and the bottom of the trusses.

All joints between insulation boards and between insulation boards and wood nailers shall be taped.

Insulation panels with broken or crushed corners or edges shall be trimmed free of such defects or shall be discarded. Replacement boards less than 300 mm wide shall not be used.

Damaged insulation in the completed work shall be removed and replaced. Insulation that has been wet or is wet shall be considered damaged.

12-7.04 LOOSE-FILL INSULATION

PART 1.- GENERAL

SUMMARY.--

Scope.--This work shall consist of furnishing and pneumatically placing loose-fill insulation in existing stud walls in accordance with the details shown on the plans and these special provisions.

SUBMITTALS.--

Product data.--Descriptive data shall indicate the amount of loose fill insulation material required to completely fill the wall cavities and produce the resistance rating of R-3.3 K• m^2/W in the completed installation.

QUALITY ASSURANCE.--

Codes and standards.--All insulation shall have a flame-spread rating not to exceed 25 and a smoke density not to exceed 450 when tested in accordance with UBC Standard No. 8-1.

PART 2.- PRODUCTS

Insulation.--

Insulation shall be mineral fiber blowing wool consisting of fine glass fibers formed into resilient nodules with a stable thermosetting resin and shall conform to ASTM Designation: C 764, Type I.

PART 3.- EXECUTION

Preparation.--Access to the cavities in the stud walls shall be achieved by removing 35 mm to 75 mm diameter portions of interior wall surface above and below the fire stops. Holes shall be located to limit blowing in the vertical direction to 508 mm upward and 1.2 m downward.

Installation.--The loose fill insulation shall be placed by the double blow method using a swivel nozzle. The lower portion of the cavity shall be filled first and the upper portion last. The cavities shall be completely filled, horizontal surfaces leveled to a uniform thickness, lightly settled to uniform density, but not compacted.

Finish work.--All access holes shall be patched to match the existing surrounding surfaces.

The entire surface of walls that have been insulated and patched shall be painted in accordance with the requirements specified under "Painting" in Section 12-9, "Finishes," of these special provisions.

12-7.05 RIGID ROOF INSULATION

PART 1.- GENERAL

SUMMARY.--

Scope.--This work shall consist of furnishing and installing rigid roof insulation in accordance with the details shown on the plans and these special provisions.

Rigid insulation shall include rigid insulation, underlayment, wood nailers, fasteners and such other materials, not mentioned, which are required for the complete installation of the rigid insulation system. Materials and installation shall be coordinated with the roof covering system to meet the requirements for a Class 1 Factory Mutual approved assembly.

PART 2.- PRODUCTS

Underlayment.--

Underlayment shall be building paper, Type I (No. 15) asphalt roofing felt, or rosin-sized paper.

Rigid roof insulation.--

Rigid roof insulation shall be multilayer, preformed board roof insulation having thermal conductance or resistance as shown on the plans. Glass fiber board conforming to ASTM Designation: C 726, or expanded perlite board conforming to ASTM Designation: C 728, or wood fiber board conforming to ASTM Designation: C 208.

Insulation tape.--

Insulation tape shall be as recommended by the insulation manufacturer.

Bitumen.--

Bitumen shall conform to ASTM Designation: D 312, for Type III roofing asphalt.

Wood nailers.--

Wood nailers shall be Douglas fir, hem-fir or equivalent western softwood pressure treated after fabrication. Wood preservatives shall be waterborne type.

Fastener (wood plank decking)--

Fastener (wood plank decking) shall be barbed shank or annular threaded galvanized roofing nails having 25 mm minimum nominal diameter head or driven through galvanized caps; or power driven roofing staples through galvanized caps.

Fastener (plywood decking).--

Fastener (plywood decking) shall be annular threaded galvanized nails having 25 mm minimum nominal diameter head or driven through galvanized caps; or power driven staple driven through galvanized cap.

Fastener (metal decking).--

Fastener (metal decking) shall be galvanized spring steel barbed clip driven through galvanized 25 mm minimum nominal diameter caps; galvanized hardened steel nail with 25 mm minimum nominal diameter head and serrated shank to provide backout resistance; or threaded self tapping screw driven through 75 mm minimum nominal diameter galvanized cap.

PART 3.-EXECUTION

Preparation.--The preparation of the deck surfaces shall conform to the manufacturer's recommendations and these special provisions.

The deck surface shall be made smooth and level.

Installation.--Underlayment shall be fastened to nailable decks with randomly located roofing nails.

Insulation panels shall be placed in at least 2 layers with end joints staggered and with joints of the second layer offset at least 150 mm from joints in the first layer.

Insulation panels shall be oriented with the long side perpendicular to the direction roofing felts are to be laid. End joints between panels shall be staggered.

Insulation clips and fasteners shall resist the wind uplift classification specified for the roof covering.

Wood nailers shall be thick enough so the tops are flush with surrounding insulation. Perimeter nailers shall extend at least 50 mm beyond flanges of metal flashings or gravel stops. On roofs that are steeper than 50 mm per 305 mm, perimeter wood nailers shall be supplemented by nominal 100 mm wide wood nailers installed parallel to eaves (horizontal) at a maximum spacing of 2.4 meter. Wood nailers shall be securely fastened using at least two 16d nails to each framing member.

The first layer of insulation shall be mechanically fastened as recommended by the manufacturer to meet the requirements of the Factory Mutual Loss Prevention Data 1-28. At least one fastener per 0.2 square meter of insulation panel shall be used. Panels that are cracked or broken by the installation of the mechanical fasteners shall be replaced.

Additional layers of insulation shall be secured with a solid uniform application of hot bitumen applied at the rate of 14.6 kilograms per 10 square meters.

The completed layer of insulation shall be smooth and level, and suitable for the proper bedding of succeeding layers of roofing material.

Insulation shall be laid just before application of roofing felts. Units shall be laid in parallel courses with transverse joints staggered, in moderate contact with adjoining surfaces.

No more insulation shall be laid than can be covered with roofing the same day. Cutoffs of 2 layers of hot mopped Type I (No. 15) asphalt saturated felt shall be installed, not less than 100 mm onto completed work and extended out not less than 150 mm onto the deck, at exposed edges of insulation at the end of each day's work. Cutoffs shall be removed when work is resumed.

Joints in the top layer of glass fiber roof insulation shall be taped with 150 mm wide felt stripping set in hot asphalt mopping.

Continuous joints between insulation units and parallel to decking flutes shall not occur over the flute openings. Both units shall have full edge bearing on rib tops.

Insulation panels with broken or crushed corners or edges shall be trimmed free of such defects or shall be discarded. Replacement boards less than 305 mm wide shall not be used.

Damaged insulation in the completed work shall be removed and replaced. Insulation that has been wet or is wet shall be considered damaged.

12-7.06 METAL ROOF AND SIDING

PART 1.- GENERAL

SUMMARY.--

Scope.--This work shall consist of furnishing and installing manufactured metal roof and siding panels, in accordance with the details shown on the plans and these special provisions.

Metal roof and siding system shall consist of underlayment, prefinished metal roof and siding panels, gutters, downspouts, fasteners, sealants, and accessories and components, not mentioned, which are required for a complete, securely fastened and weathertight installation.

SYSTEM DESCRIPTION.--

Design Requirements.--The roof and siding system shall conform to the wind design requirements for uplift or outward pressures in accordance with Chapter 16 of the CBC for the wind speed and exposure shown on the plans.

SUBMITTALS.--

Product Data.--Manufacturer's technical product data, installation instructions, and recommendations for each type of sheathing material shall be submitted for approval.

Product data shall include the manufacturer's name and a complete material description of all components of the metal sheathing system.

Samples.--Material samples shall include a 305 mm x 305 mm sample of the roofing and siding panels for each color to be installed and a sample of each anchor clip and fastening device.

A sample of each type of snow guard shall be submitted for approval.

Working Drawings.--Working drawings showing the layout and details of the roofing and siding system shall be submitted for approval.

Working drawings shall include 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 of the roof and wall panels with the substrate shown on the plans shall be submitted to verify compliance with the design requirements.

Working drawings and design calculations shall be stamped and signed by an engineer who is registered as a Civil or Structural Engineer in the State of California. The expiration date of the registration shall be shown. The Engineer's signature shall be original.

QUALITY ASSURANCE.--

Certificates of Compliance.--Certificates of compliance shall be furnished for the metal sheathing system in accordance with the requirements specified in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications.

DELIVERY, HANDLING AND STORAGE.--

Delivery and handling.--Metal panels shall be protected against damage and discoloration.

Storage.--Metal panels shall be stored above ground, with one end elevated for drainage and protected against standing water and condensation between adjacent surfaces.

PART 2.- PRODUCTS

MATERIALS.--

SHEET MATERIALS.--

Base metal.--

Base metal shall be cold formed, 0.71 mm (24-gage), galvanized sheet steel conforming to ASTM Designation: A 653/A 653M, 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 conforming to ASTM Designation: A 792/A 792M, Grade 40 [275] with G90 [Z275] coating, extra smooth.

Configuration.--

Metal siding system shall have symmetrically shaped trapezoidal ribs spaced approximately 180 mm on center. The depth of the ribs shall be approximately 38 mm.

METAL FINISHES.--

General.--Coatings shall be applied before or after forming and fabricating panels, as required for maximum coating performance capability.

Colors or color matches shall be as shown on the plans or, if not otherwise shown, shall be as selected by the Engineer from the manufacturer's standard color palette.

Fluoropolymer coating.--

Finish shall be the manufacturer's standard Kynar coating with a baked on primer (0.005 mm) and a finish coat of 0.02 mm nominal for a total dry film thickness of approximately 0.025 mm nominal.

Interior finish shall consist of a 0.004 mm epoxy primer and a backer coat.

MISCELLANEOUS METAL SHAPES.--

Flashings, gutters, and downspouts.--

Flashings, gutters, and downspouts shall be formed from the same material, gage and in the same finish as the metal roofing and siding panels.

Perforated soffit.--

Perforated soffit shall be formed from the same material, gage and in the same finish as the metal sheathing panels.

MISCELLANEOUS MATERIALS.--

Fastener clips.--

Fastener clips shall be noncorrosive, ferrous metal fasteners as recommended by the metal panel system manufacturer to resist the design loads.

Fasteners.--

Fasteners shall be as recommended by the metal panel system manufacturer. Sheet metal screws shall not be used except to fasten trim and flashings.

Underlayment.--

Underlayment shall be as recommended by the metal panel system manufacturer.

Sealant and sealant tape.--

Sealant and sealant tape shall be as recommended by the panel system manufacturer.

Closures.--

Closures shall be rubber, neoprene, closed cell plastic or prefinished metal.

FABRICATION.--

General.--Unless otherwise shown on the plans, or specified herein, roof panels shall be fabricated in continuous lengths for the length of the roof, from ridge or peak to eaves, except such length shall not exceed the manufacturer's maximum production length.

Unless otherwise shown on the plans, or specified herein, siding panels shall be fabricated in continuous lengths for the height of the structure, from eaves to sill, except such length shall not exceed the manufacturer's maximum production length.

Flashings shall be fabricated in the longest practical lengths.

Roofing and siding panels shall be factory formed. Field formed panels are not acceptable.

PART 3.- EXECUTION

INSTALLATION.--

Underlayment.--The roof and siding panels shall be installed over underlayment. Underlayment shall be laid parallel to the eaves, shingle fashion with 152 mm edge laps and 305 mm end laps and shall be fastened as recommended by the metal roofing system manufacturer.

Roof and siding panels.--The roof and siding shall be installed and fastened in accordance with the details shown on the plans and the approved working drawings. Cutting and fitting shall present a neat and true appearance with exposed burrs removed. Openings through roof panels shall be cut square and shall be reinforced as recommended by the metal roofing system manufacturer.

Metal panels shall be adjusted in place and properly aligned for the detailed conditions before fastening. Panels shall not be warped, bowed or twisted. The surface finish on the panels shall not be cracked, blemished or otherwise damaged.

Fasteners shall not be driven through roof panels or batten covers.

Miscellaneous metal shapes.--Trim, fascia, flashings, gutters, downspouts, scuppers, caps, and other prefinished metal work shall be positioned to the correct alignment for each detailed condition. Metal work shall be securely attached to backing construction using fasteners at the spacing shown on approved working drawings. Prefinished metal to be installed over concrete, masonry or plaster shall be back-coated with asphaltic paint as recommended by the metal roofing system manufacturer.

Metal panels, trim, gutters, and other prefinished metal that are marred, punctured, incorrectly bent, or incorrectly installed will be considered damaged and shall be replaced with undamaged units.

Gutters shall be fabricated by the metal panel system manufacturer to the shape and lengths shown on the plans. Expansion joints shall conform to the manufacturer's recommendations and to SMACNA "Architectural Sheet Metal Manual."

The metal panel system shall be installed weathertight. Closures shall be tight fitting and shall be provided at the ends of panels, at the boundary of the roof, and as indicated on the approved working drawings.

CLEAN UP AND CLOSE OUT.--

Clean up.--Adjacent surfaces shall be protected during the roofing system installation and sealant work. Excess sealant shall be removed as the installation progresses.

Roof panels, molding, trim, and other prefinished metal surfaces shall be cleaned after installation as recommended by the manufacturer. Exposed cuts shall be touched-up with a matching durable primer and paint as recommended by the metal roofing system manufacturer.

Touch up.--Damaged paint surfaces shall be touched up by using an air dry touch up paint supplied by the metal roofing system manufacturer. Only a small brush shall 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 shall be removed and replaced.

12-7.07 ALUMINUM COMPOSITE PANELS

PART 1.- GENERAL

SUMMARY.--

This work shall consist of designing, fabricating, furnishing and installing an aluminum composite panel system on the toll plaza structure as shown on the plans and these special provisions. The aluminum composite panel system shall include the aluminum composite panels, sealants, attachments, fasteners and backer rods.

The panels for the aluminum composite panel system shall be aluminum faced composite panels. The panel system used shall be complete with all the required accessories, fasteners and sealants.

SUBMITTALS.--

Manufacturer's descriptive data and fabricator's shop drawings shall be submitted for approval.

Shop drawings shall 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 on the plans shall be submitted to verify compliance with the design requirements.

Shop drawings and design calculations shall be stamped and signed by an engineer who is registered as a Civil or Structural Engineer in the State of California. The expiration date of the registration shall be shown. The Engineer’s signature shall be original.

The engineering calculations for the design of the metal panel system shall include applied loads, load combinations, panel stresses and deflections, fastener loads and stresses and provisions for accommodating the canopy deflections.

Working Drawings.--Working drawings, engineering calculations, five metal panel samples, five panel anchorage system samples, catalog cuts, descriptive data, and installation instructions for sealing system products shall be submitted for approval.

Working drawings shall 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 on the plans shall be submitted to verify compliance with the design requirements.

Working drawings and design calculations shall be stamped and signed by an engineer who is registered as a Civil or Structural Engineer in the State of California. The expiration date of the registration shall be shown. The Engineer’s signature shall be original.

The engineering calculations for the design of the metal panel system shall include applied loads, load combinations, panel stresses and deflections, fastener loads and stresses and provisions for accommodating the canopy deflections.

Design Requirements.--aluminum composite panels shall conform to the wind design requirements for uplift in Chapter 16 of the Uniform Building Code for the wind speed and exposure shown on the plans. The metal panel system shall accommodate all canopy deflections without overstress or distortion.

DELIVERY, HANDLING AND STORAGE.--

Delivery and handling.--Panels shall be protected against damage and discoloration.

Storage.--Panels shall be stored above ground, with one end elevated for drainage and protected against standing water and condensation between adjacent surfaces.

PART 2.- PRODUCTS

MATERIALS.--

SHEET MATERIAL.--

Panels.--

Panels shall match the existing weathered color and one of the following:

1. Composite metal panel shall consist of two exterior sheets of 0.50 mm thick AA5005 aluminum alloy or AA3105 and a core of extruded thermoplastic. The exterior sheets and core shall be bonded together with no glues or adhesives. The panels shall be integrated into a 41 mm maximum depth extruded aluminum edge grip system. The edge grip system shall be of 6063-T5 aluminum alloy.
2. The maximum allowable fabrication tolerances for the panels shall be as follows:

Panel Bow	Maximum of 0.2 percent of length or width panel dimension
Width	3 mm
Length	3 mm
Camber	0.8 mm
End Squareness	0.25 percent of panel width

3. All panels surfaces shall be free of seams, warp, and buckling. The panel lines, breaks and angles shall be sharp and true.
4. The metal panel system shall have an internal drainage system to catch condensation and any other accumulations of moisture and direct it to discharge weeps.
5. Attachment clips, fasteners, furring, shims, brackets and miscellaneous hardware shall be stainless steel and shall be as recommended by the metal panel manufacturer. All fasteners shall be concealed.
6. Acceptable products are Alucobond or Reynold PE.

Sealant.--

Sealant shall be one-part, low modulus, weatherproofing silicone, Dow Corning Corporation, 795 Silicone Building Sealant; General Electric Company, Silpruf Sealant; or equal and shall be as recommended by the metal panel manufacturer.

Backer rod.--

Backer rod shall be round closed cell polyurethane that is compatible with the sealant used and shall be sized such that it must be compressed between 25 and 75 percent of its compressed diameter when instated in the joint.

Bond breaker.--

Bond breaker shall be pressure sensitive adhesive polyurethane tape.

PART 3. -EXECUTION

The alignment and dimensions of the steel members of the canopy shall be verified prior to commencing installation of the metal panel system.

The metal panel system shall be installed rigidly and securely in accordance with the manufacturer's recommendations.

Extreme care shall be exercised in handling, storing, moving and installation the metal panels to avoid twisting, racking, scratching, denting, chipping, staining or any other type of damage or distortion. Panels damaged in handling or installing shall be replaced by the Contractor at his expense.

Panels shall be accurately positioned to maintain the straight joint lines between panels as shown on the plans. joints shall be kept uniform throughout the installation and shall be of sufficient width to accommodate the deflections of the canopy frame and the expansion and contraction of the panels but shall not exceed 12 mm in width.

Adjoining panels shall be aligned and matched to one another at the joints. The surfaces at the edges of each panel shall be flush with the surfaces at the edges of the adjacent panels.

Neoprene isolation material shall be provided to separate adjoining incompatible metals. Nylon washers shall be used to separate canopy members, fasteners, clips, and brackets of ferrous metal (except stainless steel) from aluminum.

Openings through the panels for penetrations shall be cut square to present a neat and true appearance with exposed burrs, removed. Openings shall be reinforced and sealed as recommended by the panel manufacturer.

A dry gasket shall be the primary method to seal joints. The dry gasket shall be compatible with silicone sealants.

Other surfaces necessary to use sealants, shall be clean and shall be free of dust, dirt oil, moisture and other deleterious matter which might adversely affect the adhesion of the sealant. Primer shall be applied in accordance with the sealant manufacturer's instructions. Application of backing materials and sealant shall be in accordance with the panel manufacture's working drawings and the sealant manufacturer's instructions, all as specified under Submittals," in these special provisions.

Joints to be sealed shall be inspected for construction defects which would adversely affect the execution of the work. Unsatisfactory conditions shall be corrected before the joint sealant is applied.

The installation metal panel system shall be weathertight.

The metal panel system shall be thoroughly cleaned after installation to remove excess sealant, tapes, dirt, grease or other unsightly materials. Cleaning shall be in accordance with the panel and sealant manufacturer's instructions.

12-7.08 SHEET METAL FLASHING

PART 1.- GENERAL

SUMMARY.--

Scope.--This work shall consist of fabricating, furnishing and installing sheet metal flashing in accordance with the details shown on the plans and these special provisions.

Sheet metal shall include metal flashings, counterflashings, straps, gutters, downspouts, roof jacks, gravel stops, reglets, copings, scuppers, conductor heads, and screen type vents.

Alternatives.--Premolded roof flashings may be used in lieu of sheet metal flashings where shown on the plans.

QUALITY ASSURANCE.--

Codes and standards.--Sheet metal work shall in accordance with the requirements in the latest edition of the Sheet Metal and Air Conditioning Contractors National Association (SMACNA) "Standard Practice in Architectural Sheet Metal Work."

PART 2.- PRODUCTS

MATERIALS.--

Galvanized sheet steel.--

Galvanized sheet steel shall conform to ASTM Designation: A 653/A 653M with G 90 [Z275] coating, not less than 0.71 mm (24-gage), unless otherwise shown on the plans. Surfaces to be painted shall not have factory coatings on galvanizing that cannot be removed by paint thinner.

Sheet aluminum.--

Sheet aluminum shall be not less than 0.81 mm thick, mill finish, 3003-H14 alloy, conforming to ASTM Designation: B 209M.

Premolded roof flashing.--

Premolded flashing shall be premolded neoprene or ethylene propylene diene monomer (EPDM) flashing, resistant to ozone and ultraviolet. Units shall have overlapping tab to flash the seam.

Hardware and fastenings.--

Hardware and fastening for premolded roof flashings shall be stainless steel.

Solder.--

Solder shall conform to ASTM Designation: B 32, Alloy Grade Sn50.

Soldering flux.--

Soldering flux shall be acid type, conforming to Federal Specification: O-F-506C, Type I, Form A.

Insect screen.--

Insect screen shall be industrial wire cloth and screen, medium grade, 18 mesh, 0.43 mm diameter, 1 mm openings, plain weave, galvanized steel conforming to ASTM Designation: E 437.

Lap joint sealant.--

Lap joint sealant for concealed locations shall be a non-drying butyl.

Flashing cement.--

Flashing cement shall be a bituminous plastic cement, asbestos free, conforming to ASTM Designation: D 4586, Type II.

Sealant.--

Sealant for exposed locations shall be a silicone sealant conforming to ASTM Designation: C 920.

Primer.--

Primer shall be as recommended by the sealant manufacturer.

Coal tar paint.--

Coal tar paint shall be coal-tar epoxy coating conforming to U.S. Corps of Engineers Specification: C-200 or Steel Structures Painting Council Paint Specification: SSPC-16-68T.

FABRICATION.--

General.--Sheet metal shall be assembled to Sheet Metal and Air Conditioning Contractors National Association Standards.

Sheet metal shall be formed to the sizes, shapes and dimensions shown on the plans or as specified herein with angles and lines straight, sharp and in true alignment. The number of joints shall be kept to a minimum.

Angle bends and folds for interlocking the metal shall 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 shall be closed watertight unless slip joints are specifically required. Watertight joints shall be mechanically interlocked and then thoroughly soldered for metals other than aluminum. Watertight joints in aluminum or between aluminum and other metals shall be sealed with acrylic sealant.

Sheet metal joints to be soldered shall be cleaned with steel wool or other means, pre-tinned and soldered watertight.

All joints shall be wiped clean of flux after soldering. Acid flux shall be neutralized by washing the joints with sodium bicarbonate.

Flashings shall have a 45 degree drip return at bottom edges. Unless otherwise shown on the plans, counterflashing shall extend not less than 100 mm over roofing or other materials protected by the counterflashing and shall be arranged so that roofing or materials can be repaired without damage to the counterflashing. Where reglets are indicated, counterflashing shall be fastened by lead wedges or snap-in flashing.

PART 3.- EXECUTION

PREPARATION.--Surfaces to receive sheet metal shall be clean, smooth and free from defects.

PROTECTION.--Aluminum surfaces to be in contact with concrete, mortar, or dissimilar metals shall be given a heavy coat of coal tar paint.

INSTALLATION.--

Roof penetration flashings.--All pipes, ducts, vents and flues passing through roofs shall be made waterproof with flashings of storm collars or counterflashings.

Roof penetration flashings shall be fabricated from galvanized sheet steel, not less than 0.71 mm (24-gage). Size and shape shall be as shown on the plans.

On built-up roofing, 2 flashings shall be furnished for each pipe, vent or flue through roof. Flashings shall be constructed so that the lower flashing shall sit directly on the roof deck, with the top flashing set over it on top of the roof felts.

The lower flashing shall be galvanized sheet metal, 0.71 mm (24-gage), and extend 150 mm minimum from outside of the pipe in all directions and 38 mm above the top of the roofing.

The top flashing shall be galvanized sheet steel or sheet lead as shown on the plans.

Hung gutters.--Hung gutters shall be fabricated from galvanized sheet steel, not less than 0.71 mm (24-gage). Gutters shall be size and shape as shown on the plans.

Gutters shall be fabricated in sections not less than 3 meters in length. Use sections as long as practicable for lengths over 3 meters.

Joints shall be lapped at least 38 mm, rivet and solder watertight. Butt type expansion joints, 19 mm wide, shall be provided at midpoint between down spouts and where expansion joints occur in the structure.

Downspouts.--Downspouts shall be fabricated from galvanized sheet steel, not less than 0.71 mm (24-gage). Size and shape shall be as shown on the plans.

Downspouts shall be installed as shown on the plans, secured to the wall with straps near top, bottom and at intermediate points not more than 2.4 meters apart. Straps shall extend 50 mm out on wall and be secured with suitable anchors.

Unless otherwise shown on the plans, the lower end of downspout shall terminate with mitered 45 degree elbow.

Premolded roof flashings.--Premolded roof flashings shall be installed in accordance with the manufacturer's instructions.

Gravel stops.--Gravel stops shall have upstanding lip, an apron with drip edge and 100 mm minimum width roof flange. Joints between lengths shall be 13 mm wide sliding joints with 305 mm long internal sleeves set in plastic cement. Corners shall be mitered and soldered. Gravel stops shall be set in 6 mm thick bed of plastic cement and stagger nailed at 75 mm centers on the roof flange. Nails shall be 25 mm from the edge of the roof flange. Blind clips of galvanized steel shall be provided.

After metal work is completed and watertight, flashings and gravel stops shall be covered by one of the following methods:

1. The top of the stop flanges and inside the upstanding lip at the joints shall be cleaned with an acid etching detergent, rinsed and dried. A 13 mm thick coat of plastic cement shall be applied on the roof flange and onto the roofing at least 100 mm. A 13 mm thick coat of plastic cement shall be applied 100 mm wide on the upstanding lip at the joints.

A hot mopping of roofing asphalt or a uniform coating of plastic cement shall be applied, over which shall be laid Type IV asphalt saturated felt strips, 255 mm and 330 mm wide, in 2 layers over the flange of the stops feathered out onto the roofing.

12-7.09 SKYLIGHTS

PART 1.- GENERAL

SUMMARY.--

Scope.--This work shall consist of furnishing and installing skylights in accordance with the details shown on the plans and these special provisions.

SYSTEM DESCRIPTION.--

Design requirements.--Skylights shall conform to the requirements on Section 2603.7 of the CBC.
Skylight shall meet UBC Standard 26-6 and 26-7 for CC2 material in accordance with CBC Section 2603.
Skylights shall be rated by the manufacturer to withstand a 200 kilograms per square meter live loading.

SUBMITTALS.--

Product data.--Manufacturer's descriptive data and installation instructions shall be submitted for approval.

Samples.--A sample of the acrylic or fiberglass plastic and the anodized framing shall be submitted for approval.

QUALITY ASSURANCE.--

Certificates of Compliance.--Certificates of compliance shall be furnished for the skylights in accordance with the requirements specified in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications.

PART 2.- PRODUCTS

Skylight.--

Skylight shall be industrial type, curb mounted skylight with light bronze colored acrylic plastic dome mounted in dark bronze colored anodized extruded aluminum framing. Dome shall be distortion free.

Retaining and curb framing shall have full welded corners and condensation weeps to the outside.

PART 3.- EXECUTION

Installation.--Skylights shall be installed rigidly and securely in accordance with the manufacturer's instructions. The installation shall be flashed and shall be weathertight.

Cleaning and protection.--Plastic skylight units shall be cleaned and polished inside and out.

12-7.10 JOINT SEALANT

PART 1.- GENERAL

SUMMARY.--

Scope.--This work shall consist of preparing and placing a joint sealant in accordance with the details shown on the plans and these special provisions.

The sealed joint shall consist of tempered hardboard, expanded polystyrene and a pourable joint seal.

SUBMITTALS.--

Product data.--Manufacturer's descriptive data, specifications and installation instructions shall be submitted to the Engineer at the jobsite for approval.

PART 2.- PRODUCTS

Tempered hardboard.--

Tempered hardboard shall be 3 mm minimum thickness, commercial quality suitable for the use intended. Other facing materials may be used provided they furnish equivalent protection.

Expanded polystyrene.--

Expanded polystyrene shall be commercially available polystyrene board.

Polyethylene foam.--

Polyethylene foam shall be commercial quality, with a continuous, impervious, glazed top surface, suitable for retaining the liquid sealant in the joint while hardening.

Primer.--

Primer shall be as recommended by the sealant manufacturer.

Joint sealant.--

Joint sealant shall be a commercial quality, 2 component polyurethane sealant, which shall be self-levelling and withstand up to 25 percent movement.

PART 3.- EXECUTION

PREPARATION.--

Forming.--Groove for joint seal shall be formed to a uniform width and depth and to the alignment shown on the plans or as ordered by the Engineer. The completed groove shall have a top width within 3 mm of the width shown on the plans and the bottom width shall not vary from the top width by more than 2 mm.

At least 24 hours prior to installing the joint seal, the Contractor shall repair all spalls, fractures, breaks, or voids in the concrete surfaces of the joint groove.

The lip of the joint shall be bevelled by grinding.

Cleaning.--Prior to sealing joints, expanded polystyrene, hardboard, concrete spillage and all foreign material shall be removed from the deck to the bottom of the formed joint.

Prior to placing the joint seal, the joint shall be cleaned by a method which shall include abrasive blast cleaning and then be cleaned with a high pressure air jets to remove all residue and foreign material.

INSTALLATION.--

Materials.--No material shall 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 shall be clearly labeled or each delivery of material in the tanks of 2-component equipment shall 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 shall not be used.

Primer.--A primer shall be applied to the sides of the groove and all exposed vertical surfaces in the joint prior to placing the sealant. Primer shall be dry at the time of placing the sealant. Contaminated primer shall be removed and replaced.

Joint sealant.--The 2-component sealant shall be mixed and placed in the groove in accordance with manufacturer's instructions. Unmixed liquid components which have been exposed to the atmosphere for more than 24 hours, shall not be used.

12-7.11 SEALANTS AND CAULKING

PART 1.- GENERAL

SUMMARY.--

Scope.--This work shall consist of furnishing and applying sealants and caulking which are required for this project, but not specified elsewhere, in accordance with the details shown on the plans and these special provisions.

Related work.--Pourable polyurethane joint sealant shall conform to the requirements under "Joint Sealant" elsewhere in this Section 12-7.

QUALITY ASSURANCE.--

Certificates of Compliance.--Certificates of compliance shall be furnished for the sealants and caulking in accordance with the requirements specified in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications.

SUBMITTALS.--

Product data.--Manufacturer's descriptive data and installation instructions for all sealants shall be submitted for approval.

Samples.--Color samples of all sealants shall be submitted for approval. Unless otherwise shown on the plans, colors will be selected by the Engineer from the manufacturer's standard colors.

PART 2.- PRODUCTS

MATERIALS.--

General.--All sealants, primers and accessories shall be non-staining to adjacent exposed surfaces. Products having similar applications and usage shall be of the same type and same manufacturer. Gun consistency compound shall be used unless otherwise required by the job conditions.

Acrylic sealant.--

Acrylic sealant shall be one compound, solvent release acrylic sealant.

Butyl sealant.--

Butyl sealant shall be one component, skinning type.

Silicone sealant.--

Silicone sealant shall be one component, low modulus building sealant. Sealant shall be tack-free in one hour, shall not sag or flow, shall be ozone resistant and capable of 100 percent extension without failure.

Joint sealant.--

Joint sealant shall be a two-part, non sag polysulfide base, synthetic rubber sealant formulated from liquid polysulfide polymer.

Backer rod.--

Backer rod shall be round, open or closed cell polyurethane. Backer rod shall be sized such that it must be compressed between 25 and 75 percent of its uncompressed diameter during installation in the joint.

Neoprene.--

Neoprene shall conform to the requirements of ASTM Designation: C 542.

PART 3.- EXECUTION

APPLICATION.--

General.--Unless otherwise shown on the plans, sealants shall be applied in accordance with the manufacturer's instructions.

Silicone sealants shall not be used in locations where painting is required.

Butyl sealants shall not be used in exterior applications, and acrylic sealants shall not be used in interior applications.

Sealants shall be applied in a continuous operation for the full length of the joint. Immediately following the application of the sealant, the sealant shall be tooled smooth using a tool similar to that used to produce concave masonry joints. Following tooling, the sealant shall remain undisturbed for not less than 48 hours.

SECTION 12-8. DOORS AND WINDOWS

12-8.01 HINGED DOORS

GENERAL.--This work shall consist of furnishing and installing hinged doors and frames in accordance with the details shown on the plans and these special provisions.

SUBMITTALS.--Manufacturer's descriptive data, installation instructions for fire rated assemblies and a door schedule shall be submitted for approval. The door schedule shall include a description of the type, location and size of each door and frame.

PRODUCTS.--

Metal door.--

Metal door shall be flush, seamless steel door factory prepared and reinforced to receive hardware and having cold rolled stretcher leveled sheet steel face sheets not less than 1.2 mm thick (18-gage). Face sheets shall be bonded with thermosetting adhesive to rigid board honeycomb or precured foam core; or face sheets shall be welded to all parts of an assembled grid of cold formed pressed metal stiffeners and framing members located around edges, ends, openings and at all locations necessary to prevent buckling of face sheets. Seams shall be tack welded, filled and ground smooth. Bottom edge and internal stiffeners of grid type core shall have moisture vents. Welds on exposed surfaces shall be ground smooth. Louvered or glazed openings shall be provided where shown on the plans.

Where fire rated doors are required, doors shall be listed and labeled for the fire rating shown on the plans.

Active leaf of double door shall have a full height astragal of 3 mm flat bar or folded sheet strip, not less than 1.5 mm thick (16-gage), welded on the outside of the active leaf.

Door shall be cleaned and treated by the bonderized process or approved phosphatizing process and then given one factory application of metal protective rust inhibitive primer. Primer shall not contain lead type pigments.

Aluminum door.--

Aluminum door shall be glazed door with medium stiles of not less than 3 mm nominal wall thickness, clear anodized, thermally treated and artificially aged 6061 or 6063 extruded aluminum alloy tubing reinforced to receive hardware.

Glazing for doors.--

Glazing for doors shall be safety glass as specified under "Glazing" in Section 12-8, "Doors and Windows," of these special provisions. Glazing shall be not less than 6 mm thick.

Door louvers.--

Door louvers shall be inverted V-type factory primed, galvanized sheet steel louvers. Exterior door louvers shall not be removable from outside of the building. Louvers at exterior doors shall have inside mounted bronze insect screens.

Pressed metal frame.--

Pressed metal frame shall be not less than 1.5 mm thick (16-gage) sheet steel with integral stop, mitered corners, face welded and ground smooth corners. Frames shall be reinforced for all hardware and shall be cleaned and treated by the bonderized process or an approved phosphatizing process and then given one factory application of metal protective rust inhibitive primer. Primer shall not contain lead type pigments.

Frames for fire rated doors shall be listed for the same rating shown on the plans for fire rated doors.

Aluminum frame.--

Aluminum frame shall be manufactured by aluminum door manufacturer of clear anodized thermally treated and artificially aged 6061 or 6063 aluminum alloy extrusions with minimum nominal wall thickness of 3 mm. Frame shall be reinforced to receive hardware.

Sealants.--

Sealants shall be ultraviolet and ozone resistant, gun grade polysulfide or polyurethane, multicomponent, Federal Specification: TT-S-227.

EXECUTION.--

INSTALLATION.--Doors and frames shall be installed rigidly, securely, plumb and true and in such a manner that the doors operate freely without rubbing or binding. Clearance between frame and door shall be not more than 3 mm. The exterior frame shall be sealed weathertight.

Pressed metal frames shall be secured with clips and anchors as shown on the plans.

Fire rated assemblies shall be installed according to the manufacturer's recommendations.

Fire rated assemblies shall include doors, door frames, automatic smoke-actuated closers, self-closing mechanisms, panic hardware, wire glass, and fire rated louvers. Assemblies shall be approved by the California State Fire Marshal.

PAINTING.--Except for the primer application specified herein, doors and frames shall be cleaned, prepared and painted in accordance with the requirements specified under "Painting" in Section 12-9, "Finishes," of these special provisions.

12-8.02 OVERHEAD COILING DOORS

PART 1. GENERAL

SUMMARY.—

Scope.--This work shall consist of providing and installing overhead coiling (roll-up) doors including framing, bracing, and hardware in accordance with the details shown on the plans and these special provisions.

Related Sections.--

Miscellaneous Metal for miscellaneous steel supports shall conform to the requirements of Section 12-5 "Metals" under "MISCELLANEOUS METAL".
Section 12-8, "FINISH HARDWARE" for lock cylinders and keying.
Painting for field-applied paint finish shall conform to Section 12-9 "Finishes" under "PAINTING."

SYSTEM DESCRIPTION.—

Performance requirements.--Overhead coiling doors shall be capable of withstanding the effects of gravity loads and the following loads and stresses without evidencing permanent deformation of door components:

Wind Load	Uniform pressure (velocity pressure) of 960 Pa, acting inward and outward.
Impact Test for Flying Debris	Doors shall comply with ASTM E 1996, tested according to ASTM E 1886.
Level of Protection	Basic Protection
Wind Zone	Exposure C, 129 km/hr (80mph). Pressure test to 1/2 and 1-1/2 x design pressure (positive and negative).
Operation-Cycle Requirements	Overhead coiling door components and operators shall capable of operating for not less than 50,000 cycles and for 10 cycles per day.

SUBMITTALS.--

The Contractor shall submit the following items for approval:

Shop Drawings.--Shop drawings containing complete schematic diagrams and details required to demonstrate that the system has been coordinated and will properly function as a unit. Drawings shall show proposed layout and anchorage of equipment and appurtenances, and equipment relationship to other parts of the work including clearances for maintenance and operation.

Product Data.--Manufacturer's descriptive data, performance charts, catalog cuts, and installation instructions shall be submitted for approval. Summary of forces and loads on walls and jambs shall be submitted showing conformance to the performance requirements.

Samples.--Color samples of specified surfaces and finishes shall be submitted to match those specified. Finish and color requirements shall not be limited to manufacturer's standard selections in order to meet these requirements. Samples shall include palettes for curtain slats, bottom bar, guides, brackets, and hood.

Operation and Maintenance Data.--Six complete copies of operating instructions shall be provided outlining the procedures required for proper use and operation of the doors. The instructions shall include the manufacturer's name, model number, service manual, parts list, and brief description of all equipment and operating features. Data shall include a complete list of parts and supplies, with current unit prices and source of supply, and a list of the parts recommended by the manufacturer to be replaced after 1 year and 3 years of service. Six complete copies of maintenance instructions explaining

routine maintenance procedures including inspection, adjustments, lubrication, and cleaning. The instructions shall list possible breakdown, methods of repair, and a troubleshooting guide.

DELIVERY AND STORAGE.--

Materials shall be delivered to the job site in the manufacturer's original, unopened packages and shall be stored with protection from the weather, humidity and temperature variations, dirt and dust, or other contaminants.

WARRANTY.--

The Contractor shall provide manufacturer's standard performance guarantees or warranties that extend beyond a 1 year period.

QUALITY ASSURANCE.—

Installer Qualifications: Installer shall be manufacturer's authorized representative who is trained and approved for both installation and maintenance of units required on this project.

Source Limitations.--Overhead coiling doors shall be obtained through one source from a single manufacturer.

PART 2.- PRODUCTS

MANUFACTURERS.—

Available Manufacturers.--Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

Atlas Door; Div. of Clopay Building Products Company, Inc.
Overhead Door Corp.
Windsor Door, a MAGNATRAX Corporation.

DOOR CURTAIN MATERIALS AND CONSTRUCTION.—

Door Curtains.--Overhead coiling door curtain shall be fabricated of interlocking slats, designed to withstand wind loading indicated, in a continuous length for width of door without splices. Unless otherwise indicated, slats shall be provided of thickness and mechanical properties recommended by door manufacturer for performance, size, and type of door indicated, and as follows:

Steel Door Curtain Slats: Zinc-coated (galvanized), cold-rolled structural steel (SS) sheet; complying with ASTM A 653/A 653M, G90 (Z275) coating designation. Minimum base-metal (uncoated) thickness shall be 0.55 mm. Profile of slats shall be curved.

Endlocks and Windlocks for Service Doors.--Malleable-iron casings galvanized after fabrication, secured to curtain slats with galvanized rivets or high-strength nylon. Provide locks on not less than alternate curtain slats for curtain alignment and resistance against lateral movement.

Bottom Bar for Service Doors.--Bottom bar shall consist of 2 angles, each not less than 38 by 38 by 3 mm thick; galvanized, stainless-steel, or aluminum extrusions to suit type of curtain slats.

Curtain Jamb Guides for Service Doors.--Curtain jamb guides shall be fabricated of steel angles or channels and angles, with sufficient depth and strength to retain curtain, to allow curtain to operate smoothly, and to withstand loading. Build up units with not less than 35 mm thick galvanized steel sections complying with ASTM A 36/A 36M and ASTM A 123/A 123M. Bolt holes shall be slotted for guide adjustment. Removable stops shall be provided on guides to prevent overtravel of curtain, and a continuous bar for holding windlocks.

HOODS AND ACCESSORIES.—

Exposed Hood.--Form exposed hood to act as weatherseal and entirely enclose coiled curtain and operating mechanism at opening head. Contour to fit end brackets to which hood is attached. Top and bottom edges shall be rolled and reinforced

for stiffness. Closed ends shall be provided for surface-mounted hoods and fascia provided for any portion of between-jamb mounting projecting beyond wall face. Intermediate support brackets shall be provided as required to prevent sagging.

Fabricate hoods for steel doors of minimum 0.7-mm thick, hot-dip galvanized steel sheet with G90 (Z275) zinc coating, complying with ASTM A 653/A 653M. Shape shall be round.

Weatherseals.-- Replaceable, adjustable, continuous, compressible weather-stripping gaskets shall be provided fitted to bottom and top of exterior doors, unless otherwise indicated. At door head, 3 mm thick, replaceable, continuous sheet shall be used secured to inside of hood.

COUNTERBALANCING MECHANISM.—

General.--Counterbalance doors shall be counterbalanced by means of adjustable-tension, steel helical torsion spring mounted around a steel shaft and contained in a spring barrel connected to door curtain with barrel rings. Grease-sealed bearings or self-lubricating graphite bearings shall be used for rotating members.

Counterbalance barrel shall be fabricated of spring barrel of hot-formed, structural-quality, welded or seamless carbon-steel pipe, of sufficient diameter and wall thickness to support rolled-up curtain without distortion of slats and to limit barrel deflection to not more than 2.5 mm/m of span under full load.

Spring balance shall be provided of one or more oil-tempered, heat-treated steel helical torsion springs. Springs shall be sized to counterbalance weight of curtain, with uniform adjustment accessible from outside barrel. Cast-steel barrel plugs shall be provided to secure ends of springs to barrel and shaft.

Torsion rod shall be fabricated for counterbalance shaft of cold-rolled steel, sized to hold fixed spring ends and carry torsional load.

Mounting brackets shall be provided of manufacturer's standard design, either cast iron or cold-rolled steel plate.

MANUAL DOOR OPERATORS.--

Chain-Hoist Operator.--Manual chain-hoist operator shall be provided consisting of endless steel hand chain, chain pocket wheel and guard, and gear-reduction unit with a maximum 155-N force for door operation. Alloy steel hand chain shall be provided with chain holder secured to operator guide.

FINISHES.—

General.--Finishes shall comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes. Variations in appearance of abutting or adjacent pieces shall be acceptable if they are within one-half of the range of approved samples. Noticeable variations in the same piece shall not be acceptable. Variations in appearance of other components shall be acceptable if they are within the range of approved samples and are assembled or installed to minimize contrast.

Steel and galvanized steel finishes.—

Factory Primer for Field Finish.--Manufacturer's standard primer, compatible with field-applied finish shall be provided according to coating manufacturer's written instructions for cleaning, pretreatment, application, and minimum dry film thickness.

PART 3.- EXECUTION

INSTALLATION.—

Coiling doors shall be installed and operating equipment complete with necessary hardware, jamb and head molding strips, anchors, inserts, hangers, and equipment supports.

ADJUSTING.--

Lubricate bearings and sliding parts and adjust to operate easily, free of warp, twist, or distortion and with weathertight fittings around entire perimeter.

12-8.03 TELESCOPING STEEL DOORS

PART 1.- GENERAL

SUMMARY.--

Scope.--This work shall consist of furnishing and installing telescoping steel doors in accordance with the details shown on the plans and these special provisions.

Telescoping steel doors shall open vertically and shall be electric motor operated all steel service doors of the size and type shown on the plans, with guides, header boxes, door curtains, hardware, fastenings, mechanisms, controls, and such other accessories, not mentioned, that are required for the secure installation and safe operation of the door.

Related work.--Conduit and wiring shall be in accordance with the requirements specified in Section 12-16, "Electrical," of these special provisions.

SYSTEM DESCRIPTION.--

Design requirements.--Telescoping doors shall be designed to withstand a wind pressure of 960 Pa of door area and an air leakage rate not to exceed 0.439 L/s per 305 mm of the door perimeter at 40 km/hr wind velocity when tested in accordance with ASTM Designation: E 283.

Thermal transmittance, "U," shall be not more than 0.51 for the complete door when tested in accordance with ASTM Designation: C 236.

SUBMITTALS.--

Product data.--Manufacturer's descriptive data, installation instructions, and manufacturer's standard color palette shall be submitted for approval.

Working drawings.--Working drawings showing door types, sizes, locations, metal gages, hardware provisions, installation details, and other details of construction shall be submitted for approval. Motor-operated doors shall include wiring diagrams for motors and controls, supporting brackets for motors, location, type, and ratings of motors and safety devices.

CONTRACT CLOSEOUT SUBMITTALS.--

Operation and maintenance manuals.--Operation and maintenance instructions with parts lists, and manufacturer's warranties and guarantees shall be submitted.

Prior to the completion of the contract, 3 identified copies of the operation and maintenance instructions with parts lists for the door assembly, including motor operator, shall be delivered to the Engineer at the jobsite. The instructions and parts lists shall be in a bound manual form and shall be complete and adequate for the equipment installed. Inadequate or incomplete material shall be returned. The Contractor shall resubmit adequate and complete manuals at no expense to the State.

DELIVERY, STORAGE AND HANDLING.--

General.--Doors and accessories shall be protected from damage during delivery, storage and handling. Manufacturer’s brand name shall be clearly visible.

Doors shall be stored in a dry location with adequate ventilation, free from dust and water, and in such a manner as to permit access for inspection and handling. Damaged items which cannot be restored to like-new condition shall be removed and replaced.

PART 2.- PRODUCTS

MANUFACTURED UNITS.--

Telescoping doors.--Telescoping doors shall be motor operated, vertically opening, overhead telescoping type, and shall be designed for use on exterior openings as shown on the plans. Doors shall be operated by electric power with auxiliary hand chain operation. Doors shall be complete with guides, hardware, fastenings, operating mechanisms and accessories. Doors shall be surface mounted type with guides at jambs set back a sufficient distance to provide a clean opening when the door is in an open position.

Telescoping doors are sole source, based upon duty cycle and ease of repair. Or equal submittals will not be considered.

Supplier/Distributor: Byron Epp, Inc
26062 Merit Circle, #107
Laguna Hills, CA 92653
877-377-6030

Arrangements have been made to insure that any successful bidder can obtain the telescoping steel doors from the distributor. The price quoted by the distributor for the telescoping metal door, FOB Laguna Hills, CA is $28,614.77 per door, not including sales tax.

The above price will be firm for orders placed on or before July 2007, provided delivery is accepted within 60 days after the order is placed.

COMPONENTS.--

Curtain.--

Curtain shall be inverted U-shaped, hollow metal panels of G90 galvanized steel not less than 0.76 mm thick (22-gage).

The curtain shall be operated by steel cables, 6 mm diameter with #6x37 IPS fiber core. The two cables shall be attached to the bottom section of the curtain and extend up through the remaining sections to winding drums in the header box.

During closing, the nested sections shall descend as a unit at a rate of approximately 18 meters per minute. Individual sections shall peel off one at a time as hooks in the top edges are engaged by the continuous bottom flanges in the sections above. When the door is fully closed, there shall be no strain on the cables. The bottom sections shall rest on the floor and each other section shall be supported by the unit immediately above.

Curtain side guides.--

Curtain outer side guides shall be constructed of shaped galvanized steel not less than 3.42 mm thick (10-gage) and detachable inner guides of the manufacturer's standard design shall be provided with guide mounting and stiffener angle for anchoring to jamb framing. Both edges of guide shall have a continuous plastic edge strip.

Header box.--

Header box shall be sheet steel not less than 3.42 mm thick (10-gage). Box shall be reinforced to prevent bending or sagging and shall provide a rigid, quiet operating and vibrationless installation. Reinforcement shall be concealed. Header box shall completely enclose motor operator, drive shaft, winding drums, steel cables, switches, sprockets and bearings.

Sill.--

Sill shall be extruded aluminum with vinyl weather seal and shall house a minimum of 3 limit switches per bottom panel. Sill shall be designed to adjust to a maximum floor differential of 50 mm.

Locking devices.--

Locking devices shall be dual locking security bolts which automatically engage in both side guides when door stops in the fully closed position and unlocks automatically before begins to travel upward during opening. Should cable

fail, locking security bolts shall engage in the next lower slot (approximately six total) in the side guides, stopping the downward descent of the curtain.

Weatherstripping.--

Weatherstripping shall be a replaceable seal as recommended by the telescoping door manufacturer.

Door curtain panel weatherseals shall be a continuous strip of fabric backed nylon pile factory applied to the bottom flanges of each door curtain panel before the panel nest is assembled.

Side guide weather seals shall be continuous strips of closed cell sponge neoprene, factory assembled to the plastic wear strip, and shall be provided for field application on the exterior sides of the guides.

Vision panels.--

Vision panels shall be door manufacturer's standard waterproof, transparent plastic, 305 mm x 203 mm high, 2 per door.

Louvers.--

Louvers shall be door manufacturer's standard galvanized steel louver, approximate size 965 mm x 203 mm high, with Z-shaped blades and 6 mm bird screen on the inside, one per door.

ELECTRIC OPERATION.--

General.--Operators shall be complete with electric motor, direct drive, helical type reducer fully enclosed and operating in an oil bath, steel chain and sprockets, magnetic brake, overload protection, brackets, pushbutton controls, geared limit switches, magnetic reversing contractor, and other accessories necessary for proper operation.

Provision shall be made for immediate emergency manual operation of the door by chain-gear mechanism in case of electrical power failure. The emergency manual operating mechanism shall be so arranged that it may be put into and out of operation from the floor, and its use shall not affect the timing of the limit switches. An electrical or mechanical device shall be furnished which will disconnect the motor from the operating mechanism when the emergency manual operating mechanism is engaged.

Motor operator.--

Motor operator shall be high starting torque 208-volt, 3-phase, 2.24 kilowatt motor with reduction gearing to provide a door speed of 12 m/s, solenoid brake, control panel, limit switches for upper and lower limits of door travel, emergency hand chain with electrical interlock to break motor circuit when hand chain is engaged, 3-button control station in a NEMA Type 4 enclosure, reversing magnetic starter, overload protection and prewiring to terminal block. Motor shall be removable for repair without affecting emergency operation.

Controls.--

Controls shall be standard operating control circuit with 3-button control station marked "OPEN", "CLOSE", and "STOP". Control Stations shall be installed as shown on the plans.

Safety edges.--

Safety edges shall be designed so upon contact with an obstruction, the door shall stop and return to the fully open position. Automatic stop device shall be provided when door reaches the fully open or closed position. Additional safety devices shall be provided to back up the primary limit control against overtravel. A safety lock mechanism which activates when the lifting cable fails during operation shall be provided.

FABRICATION.--

Shop finish.--All exposed surfaces or items except operating parts shall be shop primed with the manufacturer's standard shop prime coat. All galvanized or zinc coated surfaces shall be treated for paint adherence before priming. Curtain panels shall have a baked-on epoxy prime coat and a baked-on fluoropolymer finish coat on exposed surfaces. Finish color will be selected by the Engineer from the manufacturer's standard color palette after the award on the contract.

PART 3.- EXECUTION

PREPARATION.--

General.--Openings shall be prepared to the correct dimensions to receive the telescoping doors. Headers shall be level and jambs shall be plumb. Headers and jambs shall not have projections. Overhead tracks or similar assemblies shall not obstruct openings.

Tracks and supports shall be secured, reinforced, laterally braced and supported as necessary to prevent swaying and vibration of the doors.

INSTALLATION.--

General.--Doors and accessories shall be installed in accordance with the door manufacturer's instructions and the approved working drawings, and shall provide an installation which will operate freely without binding.

Anchors and inserts for guides, brackets, motors, switches, controllers and other accessories shall be accurately located and installed as shown in the manufacturer's instructions and the approved working drawings.

Unless shown otherwise on the plans, each telescoping door motor operator control panel shall be located on the interior side of the building and adjacent to the door it controls.

Conduit and wiring shall be installed as shown on the plans. Any material or equipment not mentioned herein or shown on the plans which may be necessary for the completion of the installation and the proper operation of the telescoping steel doors shall be furnished and installed as though shown or provided for.

FIELD QUALITY CONTROL.--

Manufacturer's field service.--The Contractor shall arrange to have an authorized representative of the telescoping door manufacturer present, at the time the telescoping doors are installed, to assist in the door installation.

12-8.04 ALUMINUM ENTRANCE DOOR AND STOREFRONT

GENERAL.--This work shall consist of furnishing and installing aluminum entrance doors and storefront, including aluminum door frames with transom where shown on the plans, complete with all hardware and accessories necessary for a complete weathertight and operable installation, in accordance with the details shown on the plans and these special provisions.

SUBMITTALS.--Complete shop drawings showing elevations of each door type; details of each frame type; typical and special details of construction; location installation requirements for hardware; size, shape, and thickness of materials; finishes; fastenings and method of anchoring; size and spacing of anchors; details of operating hardware; method and materials for weatherstripping; and details of installation.

Exposed surfaces shall be free from defects, scratches, streaks, or other surface blemishes. Color shall be uniform without light and dark spots.

Finish samples shall be a representative section of a specified window with the color finish specified applied to that section. Section shall be a minimum of 203 mm long complete with stops and glazing beads, fasteners and anchors for all substrates on the job.

FINISHES.--Finish on all exposed areas of aluminum windows and components shall be bronze anodized as shown on the plans.

Exposed surfaces shall be free from defects, scratches, streaks, or other surface blemishes.

PRODUCTS.--

Entrance doors.--

Entrance doors shall be prefinished extruded 6063-T5 aluminum alloy, narrow stile type. Kawneer, PPG, Northrop, or equal.

Storefront.--

Storefront shall be prefinished extruded 6063-T5 aluminum alloy, frame size as indicated on the plans. Kawneer, PPG, Northrop, or equal.

Glazing.--

Glazing shall conform to the requirements under "Glazing," in these special provisions.

Screws, fasteners, anchors and accessories.--

Screws, fasteners, anchors and accessories shall be noncorrosive metals compatible with aluminum. Finish shall match adjacent surfaces.

Sealant.--

Sealant shall be self-leveling, non-sag, single component, solvent type acrylic terpolymer, Federal Specification TT-S-230. Color shall match aluminum.

Door closer.--

Door closure shall be LCN 4040, Norton 8400, or equal at each door leaf.

Security lock.--

Security lock shall be a 3 point lock. Cylinders by finish hardware supplier.

FABRICATION.--Door stiles and rails shall be securely joined and reinforced by means of structural corner assemblies, accurately machined and fitted to hairline joinery that develops the members. Joints shall be factory sealed weathertight. Doors shall be adjustable vertically and front to back. All cut-out operations for door hardware operation shall be accurately made and reinforced at the factory. Glass stops for doors shall be snap-on type with non-stretch neoprene beads.

Entrance door hardware, unless otherwise shown on the plans, shall be provided and installed as part of the work. Hardware shall be factory installed as practicable.

EXECUTION.--

PROTECTION.--Materials shall be delivered to the site of the work in original, unopened, unbroken containers, wrappings, or bags with labels intact and legible. Labels shall show the product name, brand, manufacturer, directions, color, and quality, all of which shall be legible at the time of use.

Materials and accessories shall be undamaged and shall be carefully stored off the ground to provide proper ventilation, drainage, and protection against weather, dampness, staining, soiling contamination, deterioration, chipping, and breakage.

INSTALLATION.--Entrance doors and storefront units shall be set straight, level, plumb and in true alignment in prepared openings in accordance with the installation instructions. Entrance doors and storefront shall be centered in the openings. Clearance between the unit and the building framing shall be from 5 mm to 6 mm at the sides and 13 mm at the top.

The installation shall be flashed and sealed weathertight.

Isolation coating shall be provided to separate adjoining incompatible materials.

Both inside and outside surfaces of metal shall be cleaned of all mortar, plaster, paint, and other foreign matter. Surfaces that are stained, discolored, or that cannot be satisfactorily cleaned and repaired shall be replaced with new materials at no additional cost to the State.

Offset pivot hinges shall have a 159 kg minimum capacity.

Push bar and pull handle shall be at each single-acting door leaf. and shall be prefinished to match storefront.

PERFORMANCE.--Deflection of storefront system shall be limited to L/175 when subjected to 0.0073 kg/cm of wind pressure. Note: Higher wind load test pressures may be required. Comply with UBC and the American National Standard A58-1-1972 for applicable wind load test pressure. Provide wind load calculations. Calculations are to be signed by a California Licensed Engineer.

12-8.05 WINDOWS

PART 1.- GENERAL

SUMMARY.--This work shall consist of furnishing and installing windows in accordance with the details shown on the plans and these special provisions.

Windows shall be commercial (C) grade aluminum prime windows unless otherwise shown on the plans.

Windows shall meet the requirement of NAFS-1, "Voluntary Performance Specification for Windows, Skylights, and Glass Doors," and shall meet the C30 (Commercial) product designation unless otherwise shown on the plans. Windows shall be labeled with the AAMA label.

Finish for windows shall be Architectural Class I, clear anodized finish meeting American Architectural Manufacturer's Association Standard 611 unless otherwise shown on the plans.

Glazing for windows shall be in accordance with the requirements specified under "Glazing" in Section 12-8, "Doors and Windows," of these special provisions.

CERTIFICATES OF COMPLIANCE.--Certificates of compliance shall be furnished for all windows in accordance with the requirements specified in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications.

SUBMITTALS.--Manufacturer's descriptive data, installation instructions and schedule shall be submitted for approval.

Manufacturer's descriptive data and installation instructions shall show window elevations, plan views, full size sections, anchoring details to all substrates, anchors and hardware.

Installation schedule shall show location, size and type for each window.

PART 2.- PRODUCTS

Door and transom windows.--

Door and transom windows shall be door or door frame manufacturer's standard window framing, glazing stops and glazing accessories.

Fixed windows.--

Fixed windows shall be non-operable glazed panel inserted into a frame to include muntins, glazing stops, and glazing accessories.

Projected windows.--

Projected windows shall be equipped with glazing accessories, replaceable weatherstripping, vent screens, operating handles and locks on top hinged vents.

One operating pole shall be provided for every 10 windows installed 1.8 m or more above the floor. The operating pole and window operating handle shall be compatible. The bottom of the pole to be within a maximum of 915 mm from finish floor.

Sash shall have block and tackle balances. Spiral or helical balances shall not be used.

Extruded glazing stops, glazing accessories and vent screens shall be provided.

Aluminum.--

Aluminum shall be extruded 6063-T5 aluminum alloy.

Screws, fasteners and window accessories.--

Screws, fasteners and window accessories shall be non-corrosive metals compatible with aluminum except guides and rollers may be vinyl and nylon respectively. Finish for locks, operators, strikes, keepers and other metal hardware shall match window finish.

Weatherstripping.--

Weatherstripping shall be continuous, replaceable type, wool pile mounted in metal or double runs of ultraviolet resistant neoprene or vinyl.

Vent screen.--

Vent screen shall be aluminum frame with 18 x 14 mesh aluminum screening and polyvinyl-chloride splines. Screen frames shall be removable from interior of building. Finish of screen frame shall match window finish.

Sealant.--

Sealant shall be single-component, solvent type acrylic, self-leveling, non-sag, conforming to Federal Specification: TT-S-230.

Tape.--

Tape shall be compatible with sealant; Pecora, "B-44 Extra-Seal;" Pittsburg Plate Glass, "Duribbon;" Protective Treatment, "PTU 606;" Tremco, "440 Tape;" or equal.

PART 3.- EXECUTION

FABRICATION.--Frame and sash shall be accurately machined and fitted to hairline joinery that develops the members. Joints shall be factory sealed weathertight.

Outward opening vents without roto-type operators shall be provided with adjustable sliding friction type hold-open assemblies.

Sash shall be removable from the interior only. Sash shall have concealed condensation weeps to the outside.

DELIVERY AND STORAGE.--Windows shall 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 shall be stored off the ground, kept dry, fully protected from weather and damage

INSTALLATION.--Window units shall be set straight, level, plumb and in true alignment in prepared openings. Windows shall be centered in openings. Clearance between the window unit and the building framing shall be from 4 mm to 6 mm at the sides and 13 mm at the top. Ventilator sash shall be adjusted after glazing for easy, smooth and proper operation.

The installation shall be flashed and sealed weathertight.

All aluminum surfaces in contact with masonry, steel or other incompatible materials shall be isolated with pressure sensitive tape, zinc chromate primer, bituminous paint or such other material recommended by the window manufacturer and approved by the Engineer.

12-8.06 FINISH HARDWARE

PART 1.- GENERAL

SUMMARY.--

This work shall consist of furnishing and installing hardware items for doors in accordance with the details shown on the plans and these special provisions.

Hardware for special doors and frames, if required, shall be as specified under "Hinged Doors" in Section 12-8 "Doors and Windows," of these special provisions.

Hardware assemblies shall comply with the fire code and the disabled accessibility requirements indicated on the plans and specified in these special provisions.

SUBMITTALS.—

Manufacturer's technical information and catalog cuts for each item of door hardware and a door hardware schedule shall be submitted for approval prior to installation.

Manufacturer's catalog cuts shall include catalog numbers, material, grade, type, size, function, design, quality and finish of hardware.

The door hardware schedule shall indicate the location and size of door opening, the door and frame material, and the size, style, finish and quantity of the hardware components required.

FINISHES.—

Hardware shall be provided with standard US 626 metal plated finish.

KEYING INSTRUCTIONS.—

New facilities shall have a building master key system established.

Locks shall have cylinders with figure eight interchangeable cores with six pin barrels. Permanent cores and keys shall be delivered to the Engineer for final installation at completion of project.

The Contractor shall also provide figure eight interchangeable cores for use during construction which shall remain the property of the State.

Key bows shall be stamped "State of California" and "Do Not Duplicate."

PART 2.- PRODUCTS.--

GENERAL.—

Door hardware equal in material, grade, type, size, function, design, quality and manufacture to that specified herein may be submitted for approval.

Butt hinges.--

Butt hinges shall be steel, 1 1/2-pair per door unless otherwise specified or shown on the plans. Nonremovable pins shall be provided at outswing exterior doors. Hinge size shall be 114 mm x 114 mm unless otherwise noted.

Standard weight hinges shall be:

Hager	BB 1279
McKinney	TB 2714
Stanley	BB 179
or equal.	

Heavy weight hinges shall be:

Hager	BB 1168
McKinney	T4B 37869
Stanley	BB 168
or equal.	

Cylindrical locksets, latchsets and privacy sets.--

Cylindrical locksets, latchsets and privacy sets shall be steel chassis, 54 mm diameter, 70 mm backset. Door and frame preparation for cylindrical lockset, latchsets and privacy sets shall conform to ANSI A115.1.

Lever operated lockset shall be:

Best	93K6 AB 9C
Schlage	ND91PD
Falcon	LY501 DG
or equal.	

Lever operated latchset shall be:

Best	93K ON 9C
Falcon	LY101 DG
Schlage	D10S RHO
or equal.	

Lever operated privacy set shall be:

Best	93K OL 9C
Falcon	LY301 DG
Schlage	D40S RHO
or equal.	

Cylindrical dead locks.--

Cylindrical dead locks shall have 25 mm throw bolt with concealed hardened steel inserts and 25 mm diameter bolt housing, 70 mm backset.

Single cylinder dead lock with inside thumb turn shall be:

Best	83T 7K
Falcon	D441
Schlage	B460R
or equal.	

Double cylinder dead lock shall be:

Best	83T 7M
Falcon	D431
Schlage	B462R
or equal.	

Door closers.--

Parallel arms for closers shall be installed at outswing exterior doors. Closers shall have sprayed finish to match other hardware on door.

Door closers shall be:

LCN	4040
Norton	3501-BF
Dorma	7800
or equal.	

Pushplates and pullplates.--

Pushplates and pullplates shall be 102 mm x 406 mm x 1.52 mm (16-gage). Grips shall be 25 mm diameter with 38 mm standoff and 203 mm center to center fastening, unless indicated otherwise.

Pushplates shall be:

Builders Brass	47-E
Quality	40-5
Trimco	1001-3
or equal.	

Pullplates shall be:

Builders Brass	1618-E
Quality	1515
Trimco	1013-3B
or equal.	

Kickplates.--

Kickplates shall be 254 mm in height x 51 mm less than door width x 1.52 mm (16-gage).

Kickplates shall be:

Builders Brass	37X
Quality	48
Trimco	K0050
or equal.	

Mop plates.--

Mop plates shall be stainless steel, 1.52 mm (16-gage), 152 mm in height x 51 mm less than the door width.

Mop plates shall be:

Trimco
Ives
or equal.

Floor mounted stops.--

Floor mounted stops shall be dome type. The height of the stop shall be determined by the clearance required when a threshold is used or not used.

Stops for openings without thresholds shall be:

Builders Brass	8061
Quality	331
Trimco	1210
or equal.	

Stops for openings with thresholds shall be:

Builders Brass	8063
Quality	431
Trimco	1213
or equal.	

Wall or door mounted door stop.--

Wall or door mounted door stop shall have a 95 mm projection and 3-point anchoring.

Wall or door mounted door stop shall be:

Builders Brass	W96
Quality	38
Trimco	1236-1/4-2
or equal.	

Wall mounted door stop and holder.--

Wall mounted door stop and holder shall be:

Builders Brass	W141X
Quality	36/136
Trimco	1207
or equal.	

Wall bumpers.--

Wall bumpers base diameter shall be 64 mm with a 25 mm projection.

Bumpers shall be:

Builders Brass	WC9
Quality	302
Trimco	1270CV
or equal.	

Automatic door bottom.--

Automatic door bottom shall be heavy duty, full mortise.

Bottom shall be:

Pemko	434 AR
Zero	360
or equal.	

Thresholds, rain drips, door sweeps and door shoes.--

Thresholds, rain drips, door sweeps and door shoes shall conform to the sizes and configurations shown on plans. Thresholds at door openings with accessibility requirements shall not exceed 13 mm in height.

Threshold, rain drip, door sweep and door shoe manufacturers shall be Pemko, Reese, Zero, or equal.

Threshold bedding sealant.--

Threshold bedding sealant shall conform to Federal Specification: SS-C-153.

Weatherstrip and draft stop.--

Weatherstrip and draft stop shall conform to the sizes and shapes shown on plans. Assemblies shall be UL listed and shall be provided where shown on the plans or as specified in these special provisions.

Weatherstrip and draft stop manufacturers shall be Pemko, Reese, Zero, or equal.

Door signs and name plates.--

Door signs and name plates shall be as specified under "Signs" in Section 12-10, "Specialties," of these special provisions.

PART 3.- EXECUTION

DOORS AND FRAMES.--Doors and frames shall be set square and plumb and be properly prepared before the installation of hardware.

INSTALLATION.--Hardware items shall be accurately fitted, securely applied, and adjusted and lubricated in accordance with the manufacturer's instructions. Installation shall provide proper operation without bind or excessive play.

Hinges shall be installed at equal spacing with the center of the end hinges not more than 244 mm from the top and bottom of the door. Pushplates and door pulls shall be centered 1118 mm from the finished floor. Locksets, latchsets, privacy sets and panic exit mechanisms shall be 1024 mm from the finished floor. Kickplates shall be mounted on the push side of the doors, 25 mm clear of door edges.

Thresholds shall be set in a continuous bed of sealant material.

Door controls shall be set so that the effort required to operate doors with closers shall not exceed 22.3 N maximum for exterior doors and 22.3 N maximum for interior doors. The effort required to operate fire doors may be increased above the values shown for exterior and interior doors but shall not exceed 66.7 N maximum. Sweep period min 3 seconds per 1133B.25.

Door stops located on concrete surfaces shall be fastened rigidly and securely in place with expansion anchoring devices. Door stops mounted elsewhere shall be securely attached with wood screws or expansion devices as required.

Backing shall be provided in wall framing at wall bumper locations.

The location and inscriptions for door signs and name plates shall be as shown on the plans.

Hardware, except hinges, shall be removed from surfaces to be painted before painting.

Upon completion of installation and adjustment, the Contractor shall deliver to the Engineer all dogging keys, closer valve keys, lock spanner wrenches, and other factory furnished installation aids, instructions and maintenance guides.

DOOR HARDWARE GROUPS AND SCHEDULE.--Hardware groups specified herein shall correspond to those shown on the plans:

GROUP 1

1 1/2-pair butt hinges
1 each lockset
1 each door closer
1 each floor mounted stop
1 each threshold
1 each weatherstrip

GROUP 2

1 1/2-pair butt hinges
1 each lockset
1 each door closer
1 each floor mounted stop
1 each threshold
1 each weatherstrip

GROUP 3

1 1/2-pair butt hinges
each lockset
1 each closer
1 each floor mounted stop

GROUP 4

1 1/2-pair butt hinges
1 each lockset
1 each closer
1 each floor mounted stop
1 each threshold

GROUP 5

1 1/2-pair butt hinges
1 each lockset
1 each door closer
1 each floor mounted stop
1 each threshold
1 each weatherstrip

GROUP 6

1 1/2-pair butt hinges
1 each lockset
1 each door closer
1 each floor mounted stop

12-8.07 GLAZING

PART 1.- GENERAL

SUMMARY.---

This work shall consist of furnishing and installing glazing in accordance with the details shown on the plans and these special provisions.

Glazing shall consist of glass and acrylic sheets for windows, doors and other glazed openings.

All glass shall conform to ASTM Designation: C 1036 and the classifications specified herein and shall be clear glass except as noted.

All acrylic sheets shall conform to ASTM Designation: D 702, Type III, Grade 3.

Safety glass shall be furnished and installed at all locations designated in Consumer Product Safety Commission's Safety Standard For Architectural Glazing Materials 16 CFR 1201.

SUBMITTALS.—

A detailed list of glazing materials including glass, sheet, sealants, tapes, setting blocks, shims, compression seals, and glazing channels shall be submitted for approval. The list shall include a schedule of the materials to be used at each location.

LABELS.—

Each individual pane of heat strengthened or fully tempered glass shall bear an identification label in accordance with ASTM Designation: C 1048.

PART 2.- PRODUCTS

Sheet glass, float glass, or plate glass.--

Sheet glass, float glass, or plate glass shall be Type I, Class 1, Quality q4 or better, double strength for panes to 0.93 m^2, 5 mm thick for panes between 0.93 m^2 and 2.6 m^2, and 6 mm thick for panes over 2.6 m^2, except as otherwise shown on the plans.

Obscure glass.--

Obscure glass shall be Type II, Class 1, Form 3, Quality q8, Finish f1, Pattern p1 or p2; 3 mm thick flat figured glass, one surface smooth, other surface fine grid pattern.

Safety glass.--

Safety glass shall conform to Consumer Product Safety Commission Safety Standard For Architectural Glazing Materials: 16 CFR 1201, and ANSI Standard Z97.1 and shall be one of the following:

Tempered glass.--

Tempered glass shall conform to ASTM Designation: C 1048, Kind FT, Condition A, Type 1, Quality q4 or better.

Laminated glass.--

Laminated glass shall be safety glass, 6 mm minimum thickness, fabricated from 2 pieces of Type I, Class 1, Quality q4 or better glass fused to plastic interlayers.

Wire glass.--

Wire glass shall be Type II, Class 1, Form 1, Mesh m1; 6 mm thick clear polished wire glass with diamond mesh.

60 minute fire rated glass.--

Performance requirements: Fire Rating 60 minutes, in conformance with ASTM E119. The finished door assembly shall comply with ASTM E2074-00

Heat Strengthened glass.--

Heat Strengthened glass shall conform to ASTM Designation: C 1048, Kind HS, Condition A, Type 1, Quality q4 or better.

Bullet resistant glass.--

Bullet resistant glass shall be multiple laminated glass fused to plastic interlayers; one inch minimum thickness; UL rated for medium power small arms.

Detention glass.--

Detention glass shall be clear, 11 mm nominal thickness, laminated heat strengthened or chemically strengthened glass outer layers with 3 mm thick polycarbonate core fused together with polyvinyl butyral interlayers not less than 0.8 mm thickness.

Tinted glass.--

Tinted glass shall be bronze; all the same tint.

Insulating glass assemblies.--

Insulating glass assemblies shall be double pane units consisting of 2 pieces of glass separated by a spacer and hermetically sealed with double seal sealants. The entrapped air shall be at atmospheric pressure and maintained in a hydrated condition by a drying agent located in the spacer

Bullet resistant acrylic plastic sheet.--

Bullet resistant acrylic plastic sheet shall be 32 mm thick, cast acrylic substrate with modified, silica filled, polysiloxane surface coating; UL rated for medium power small arms; 94 percent luminous transmission and one percent haze as determined by ASTM Designation: D 1003-16.

Seals, caulks, putties, setting blocks, shims, tapes, compression seals, felt, spacers, and channels.--

Seals, caulks, putties, setting blocks, shims, tapes, compression seals, felt, spacers, and channels shall be top grade, commercial quality, as recommended by the glass or sheet manufacturer and shall conform to the requirements in the publications of the Flat Glass Marketing Association.

PART 3.- EXECUTION

INSTALLATION.—

Glazing shall conform to the general conditions and applicable details in the publications of the Flat Glass Marketing Association.

Cut edges of tinted glass shall conform to the recommendations of the glass manufacturer. The glazier shall inspect each edge of tinted glass. Panes with edges that do not conform to the manufacturer's standards for tinted glass edges for sunny elevations shall not be used.

Panes shall be bedded fully and evenly, set straight and square within panels in such a manner that the pane is entirely free of any contact with metal edges and surfaces.

For all panes on the exterior of the building, the glazing on both sides of window panes shall provide a watertight seal and watershed. Seals shall extend not more than 2 mm beyond the holding members. A void shall be left between the vertical edges of the panes and the glazing channel. Weep systems shall be provided to drain condensation to the outside.

Panes in assemblies using extruded gasket glazing shall be set in accordance with the assembly manufacturer's instructions using gaskets and stops supplied by the manufacturer.

Laminated glass shall be set on setting blocks.

Whenever welding or burning of metal is in progress within 4.6 m of glazing materials, a protective cover shall be provided over exposed surfaces.

REPLACEMENT AND CLEANING.—

All broken or cracked glass and glass with scratches which reduce the strength shall be replaced before completion of the project.

Panes shall 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 shall be removed during the work life of the sealant.

Solvents and cleaning compounds shall be chemically compatible with materials, coatings and glazing compounds to remain. Cleaners shall not have abrasives that scratch or mar the surfaces.

The protective covering on acrylic sheet surfaces shall be left until construction is completed or 2 weeks after glazing, whichever is shorter. The covering shall be removed before adhesives dry sufficiently to adhere to the sheet during removal rather than the protective membrane.

Acrylic sheets shall be protected against scuffs, scratches and marring of the surface during construction and any such damaged sheet shall be replaced or restored to like new condition. Restoration work shall conform to the manufacturer's recommendations.

All panes shall be cleaned just before the final inspection. All stains and defects shall be removed. Paint, dirt, stains, labels (except etched labels), and surplus glazing compound shall be removed without scratching or marring the surface of the panes or metal work.

SECTION 12-9. FINISHES

12-9.01 GYPSUM BOARD

GENERAL.--This work shall consist of furnishing, installing and finishing gypsum board in accordance with the details shown on the plans and these special provisions.

Where assembly fire ratings are indicated on the plans, construction shall provide the fire resistance in accordance with the applicable standards in the Fire Resistance Design Manual published by the Gypsum Association.

Gypsum board backing for use in restroom and shower areas shall be water-resistant gypsum backing board.

PRODUCTS.--

Gypsum board.--

Gypsum board shall conform to ASTM Designation: C 36/C 36M.

Gypsum backing board.--

Gypsum backing board shall conform to ASTM Designation: C 442/C 442M.

Water-resistant gypsum backing board.--

Water-resistant gypsum backing board shall conform to ASTM Designation: C 630/C C 630M.

Gypsum sheathing board.--

Gypsum sheathing board shall conform to ASTM Designation: C 79/C 79M.

Exterior gypsum soffit board.--

Exterior gypsum soffit board shall conform to ASTM Designation: C 931/C 931M.

Joint tape and joint and finishing compound.--

Joint tape and joint and finishing compound shall conform to ASTM Designation: C 475.

Corner beads, metal trim and control joints.--

Corner beads, metal trim and control joints shall be galvanized steel of standard manufacture.

Resilient metal channel.--

Resilient metal channel shall be galvanized sheet steel channels of standard manufacture for reducing sound transmission in wood frame partitions.

Fasteners.--

Fasteners shall be gypsum wallboard nails conforming to ASTM Designation: C 514 or steel drill screws conforming to ASTM Designation: C 1002.

EXECUTION.--

DELIVERY AND STORAGE.--Materials shall be delivered in original packages, containers or bundles bearing brand name, applicable standard of manufacture, and name of manufacturer or supplier and shall be kept dry and fully protected from weather and direct sunlight exposure. Gypsum board shall be stacked flat with adequate support to prevent sagging or damage to edges, ends and surfaces.

INSTALLATION.-- Gypsum board panels to be installed on ceilings and soffits shall be installed with the long dimension of the panels perpendicular to the framing members. Gypsum board panels to be installed on walls may be installed with the long dimension of the panels either parallel or perpendicular to the framing members. The direction of placing the panels shall be the same on any one wall or partition assembly.

Edges of gypsum board panels shall be butted loosely together. All cut edges and ends shall be smoothed as needed for neat fitting joints.

All edges and ends of gypsum board panels shall coincide with the framing members, except those edges and ends which are perpendicular to the framing members. End joints on ceiling and on the opposite sides of a partition assembly shall be staggered.

Except where closer spacing is shown on the plans, the spacing of fasteners shall not exceed the following:

Nails	175 mm
Screws	300 mm
Screws at perimeter of panels for fire resistive assemblies having metal framing	200 mm

Type S steel drill screws shall be used to fasten gypsum board to metal framing. Nails or Type W steel drill screws shall be used to fasten gypsum board to wood framing. Except as shown on the plans, screws shall not be used in fire resistive assemblies.

Adhesives shall not be used for securing wallboard to framing.

Gypsum board panels shown on the plans for shear wall sheathing or for fire resistive assemblies shall be fastened to all framing members. Gypsum board panels at other locations and gypsum board finish over plywood sheathed shear walls shall be fastened to all framing members except at the following locations:

At internal angles formed by ceiling and walls; ceiling panels shall be installed first with the fasteners terminating at a row 175 mm from the walls, except for walls parallel to ceiling framing. Wall panels shall butt the ceiling panels. The top row of wall panel fasteners shall terminate 200 mm from the ceiling.

At internal vertical angles formed by the walls; fasteners shall not be installed along the edge or end of the panel that is installed first. Fasteners shall be installed only along the edge or end of the panel that butts and overlaps the panel installed first.

Fasteners shall be located at least 10 mm from gypsum board panel edges and ends. Nails shall penetrate into wood framing at least 30 mm. Screws shall penetrate into wood framing at least 20 mm. All metal fasteners shall be driven slightly below surface level without breaking the paper or fracturing the core.

Metal trim shall be installed at all free edges of panels, at locations where gypsum board panels abut dissimilar materials and at locations shown on the plans. Corner beads shall be installed at external corners. Control joints shall be installed at the locations shown on the plans.

Joints between face panels, the internal angles formed by ceiling and walls and the internal vertical angles formed by walls shall be filled and finished with joint tape and at least 3 coats of joint compound. Tape in the corners shall be folded to conform to the angle of the corner. Tape at joints and corners shall be embedded in joint compound.

Dimples at nail and screw heads, dents, and voids or surface irregularities shall be patched with joint compound. Each patch shall consist of at least 3 coats and each coat shall be applied in a different direction.

Flanges of corner beads, control joints and trim shall be finished with a least 3 coats of joint compound.

Each coat of joint compound shall be feathered out onto the panel surface and shall 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 shall be flat and true to the plane of the surrounding surfaces and shall be lightly sanded.

Good lighting of the work area shall be provided during the final application and sanding of the joint compound.

Gypsum board used as backing boards for tile or rigid sheet wall covering or wainscotting shall be water resistant. Joints in backing board shall not be taped or filled and dimples at the fastener heads shall not be patched. Edges of cuts and holes in

backing board shall be sealed with a primer or sealer that is compatible with the wall covering or wainscotting adhesive to be used.

Surfaces of gypsum board to be textured shall receive an orange peel texture, unless otherwise shown on the plans.

12-9.02 CERAMIC AND QUARRY TILE

PART 1.- GENERAL

SUMMARY.--

Scope.--This work shall consist of furnishing and installing ceramic and quarry tile in accordance with the details shown on the plans and these special provisions.

Ceramic tile shall include glazed wall tile, patterned porcelain tile, matte porcelain tile, textured porcelain tile, polished porcelain tile, trim tile, setting materials, grouts and such other materials as maybe required for a complete installation.

SUBMITTALS.--

Product data.--Manufacturer's descriptive data, a list of materials to be used, and installation instructions for all materials required for the work shall be submitted for approval.

Manufacturer's descriptive data shall be submitted for each type of tile, mortar bed materials, bond coat materials and additives, and grout materials and additives.

Materials list and installation instructions shall include all products and materials to be incorporated into the work.

Friction reports shall be submitted for tile products to be used on floors and other pedestrian surfaces.

Samples.--Samples shall include 2 individual samples of each type and color of tile and trim to be installed and shall be of the same size, shape, pattern and finish as the tile and trim to be installed.

QUALITY ASSURANCE.--

Single source responsibility.--Each type and color of tile, grout and setting materials shall be obtained from a single source.

Master Grade Certificates.--Each shipment of tile to the project site shall be accompanied by a Master Grade Certificate issued by the tile manufacturer.

Certificates of Compliance.--Certificates of compliance shall be furnished for bond coat materials, setting bed materials and grout in accordance with the requirements specified in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications.

DELIVERY, STORAGE AND HANDLING.--

Delivery.--Tile and packaged materials shall be delivered to the job site in sealed, unbroken, unopened containers with the labels intact. Tile containers shall bear the Standard Grade label.

Storage and handling.--Materials shall be stored and handled in such a manner as to prevent damage or contamination by water, freezing or foreign matter.

PROJECT CONDITIONS.--

Protection.--Tile work shall be protected and environmental conditions maintained during and after installation to comply with the reference standards and manufacturer's printed instructions.

Temperatures.--Unless otherwise specified in the manufacturer's installation instructions, the ambient temperature shall be maintained at not less than 10°C nor more than 38°C in tiled areas during installation and for 7 days after completion. Exterior work areas shall be shaded from direct sunlight during installation.

Tile shall not be installed when the temperature of the substrate is greater than 32°C or is frost covered.

Illumination.--Interior work areas shall be illuminated to provide the same level and angle of illumination as will be available during final inspection.

PART 2.- PRODUCTS

MANUFACTURERS.--

Available manufacture's.--Subject to compliance with the specifications, tile shall be American Olean Tile Co., Inc.; Summitville Tiles, Inc.; United States Ceramic Tile Co.; or equal.

GENERAL.--

Ceramic tile.--Ceramic tile shall conform to the requirements in ANSI Standard: A137.1, "American National Standard Specifications for Ceramic Tile" for types and grades of tile indicated.
Ceramic tile shall conform to the "Standard Grade" requirements.

Tile installation materials.--Tile installation materials shall conform to the requirements in ANSI standard referenced with products and materials indicated for setting and grouting.

Tile color and size.--Tile color and size shall be as shown on the plans.

Slip resistant tile.--Slip resistant tile shall have sufficient abrasives added such that the static coefficient of friction, wet or dry, shall be not less than 0.6 for walking surfaces and 0.8 for ramps when tested in accordance with ASTM Designation: C 1028.

TILE PRODUCTS.--

Glazed wall tile.--

Glazed wall tile shall be machine made, dust pressed white body clay, and shall have a glossy glaze finish, plain face, and cushion edges. Tile shall be 8 mm nominal thickness.

Ceramic tile trim shall match material, size and finish of field tile. Free edges of tiled areas of walls shall have bullnose type trim. Outside corners shall have bullnose type runner trim (not beads). Reentrant corners shall have cove type trim.

Patterned porcelain tile.--

Patterned porcelain tile shall be machine made, unpolished, dust pressed natural porcelain clay. Tiles shall have less than 0.5 percent water absorption and be suitable for exterior use. Tiles shall be 10 mm nominal thickness. Patterned porcelain shall be slip resistant.

Tile shall have truncated domes, 23 mm diameter, 5 mm nominal height, and center to center spacing of 60 mm. Arrangement of the domes shall be such that there is no break in pattern or spacing when tiles are arranged side by side.

Matte porcelain tile.--

Matte porcelain tile shall be machine made, unpolished, dust pressed natural porcelain clay and shall have a plain face. Tile shall have a nominal thickness of 8 mm. Matte porcelain tile shall be slip resistant.

Matte porcelain trim tile shall include cove type base at walls and single piece intersecting cove base at corners.

Polished porcelain tile.--

Polished porcelain tile shall be machine made, dust pressed natural porcelain clay. Tile shall have less than 0.5 percent water absorption and be suitable for exterior use. Tile shall have a glossy polished finish and plain face. Tiles shall have a nominal thickness of not less than 8 mm.

SETTING MATERIALS.--

Portland cement mortar installation materials.--

Materials for portland cement mortar installation shall conform to the requirements in ANSI Standard: A108.1 as required for installation method designated, unless otherwise indicated.

Membrane.--Membrane shall be asphalt impregnated felt conforming to ASTM Designation: D 226, Type I, or polyethylene film conforming to ASTM Designation: C 171, Type 1.1.2. Polyethylene film shall not be less than 0.1 mm thick.

Reinforcement.--Reinforcement shall be galvanized welded wire fabric with 50 mm x 50 mm - 1.6 mm x 1.6 mm conforming to ASTM Designations: A 82 and A 185 except for minimum wire size. Reinforcement shall be provided in flat sheets.

Metal lath.--Metal lath shall be self furring, galvanized, conforming to ASTM Designation: C 847, flat expanded type weighing not less than 1.4 kg/m^2. Factory assembled metal lath and paper backing may be used where reinforcement over paper is shown on the plans.

Tile bond coat.--

Tile bond coat shall be latex-portland cement bond coat.
Latex-portland cement mortar bond coat shall be a prepackaged mortar mix, conforming to ANSI Standard: A118.4, incorporating a dry acrylic resin, and to which only water is added at the job site. Mortar shall be suitable for exterior use and be labeled for the type of tile to be installed.

Epoxy bond coat.--

Epoxy bond coat shall be a 2 part prepackaged epoxy mortar conforming to ANSI Standard: A118.3, suitable for exterior use. Mortar shall be labeled for the type of tile to be installed.

GROUTING MATERIALS.--

Tile grout.--

Tile grout shall be latex-portland cement grout.

Latex-portland cement grout shall be a prepackaged grout mix, conforming to ANSI Standard: A118.6, incorporating a dry acrylic resin, and to which only water is added at the jobsite. Grout shall be suitable for exterior use and labeled for the type of tile to be installed.

Epoxy grout.--

Epoxy grout shall be a 2 part prepackaged epoxy grout conforming to ANSI Standard: A118.3 and suitable for exterior use. Grout shall be labeled for the type of tile to be used.

Grout pigment.--

Grout pigment shall be chemically inert, fade resistant mineral oxide or synthetic type. Color shall be as shown on the plans.

SEALANTS.--

Sealant.--

Sealant for vertical expansion joints shall be a medium modulus silicone or polyurethane. Sealant for horizontal joints shall be a 2-part polyurethane type material with a Shore Hardness of 35 to 45.

Color of exposed sealants shall match color of grout in tile adjoining sealed joints.

MORTAR BEDS.--

Cement mortar bed.--

Cement mortar bed for walls shall 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 shall be dry mixed, water added, and materials blended to produce a stiff mix. Mortar bed shall be not less than 20 mm in thickness.

Cement mortar bed for floors shall be proportioned of one part cement, 1/10 parts hydrated lime, 5 parts damp sand by volume and only enough water added to provide the necessary workability. Ingredients shall be dry mixed, water added, and materials blended to produce a stiff mix. Mortar bed shall be not less than 32 mm in thickness.

MISCELLANEOUS MATERIALS.--

Sand.--

Sand shall be a natural or manufactured sand conforming to ASTM Designation: C 144, except that no more than 10 percent shall pass the No. 150 µm sieve.

Sealers.--

Sealer for unglazed quarry tile shall be water repellent, clear solution of ammonium cementitious compound, silicone base material, or other commercially manufactured sealer.

Sealer for grout shall be a penetrating proprietary compound designed for sealing grout. Silicone sealers shall not be used.

Cement.--

Cement shall conform to ASTM Designation: C 150, Type I.

Hydrated lime.--

Hydrated lime shall conform to ASTM Designation: C 206, Type S, or ASTM Designation: C 207, Type S.

Water.--

Water shall be clean and potable.

Metal edge strips.--

Metal edge strips shall be stainless steel terrazzo strips, 3 mm wide at top edge with integral provision for anchorage to mortar bed or substrate.

Cementitious tile backer board.--

Cementitious backer board shall be a backing and underlayment panel composed of a concrete core with glass mesh reinforcing on both faces and conforming to the requirements of ANSI Standard: A118.9.

Shower pan.--

Shower pan shall be flexible polyvinyl chloride (PVC) sheeting conforming to ASTM Designation: D 4551, Grade 40, and manufactured for use as a shower membrane.

Solvent cement shall be as recommended by the manufacturer.

MIXING MORTAR AND GROUT.--

Mixing.--Mortar and grout shall be mixed to comply with the requirements of referenced standards and manufacturers for accurately proportioning of materials, 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 for application intended.

PART 3.- EXECUTION

PREPARATION.--

General.--Concrete, mortar, or masonry substrate surfaces which are to receive a mortar bed shall not vary more than 5 mm in 2.4 m from the required plane and shall be true, plumb at vertical surfaces, and square at intersection edges.

Surfaces to receive a mortar setting bed or a bond coat shall be cleaned adequately to assure a tight bond to the applied material. Such cleaning shall leave the surface thoroughly roughened and free from laitance, coatings, oil, sand, dust and loose particles.

The cleaned surfaces which are to receive a mortar bed shall be saturated with water just prior to placing mortar or the cleaned surfaces shall be coated with fresh neat cement slurry. If the surface is saturated with water, excess water shall be removed and the wetted surfaces uniformly dusted with portland cement. The slurry or wetted cement dust shall be broomed to completely coat the surface with a thin and uniform coating just prior to placing the mortar.

Substrates shall be inspected to insure that grounds, anchors, plugs, recessed frames, bucks, drains, electrical work, mechanical work, and similar items in or behind the tile have been installed before proceeding with installation of the tiles.

INSTALLATION.--

General.--Tile installation shall conform to applicable parts of ANSI 108 Series of the tile installation standards included under "American National Standard Specifications for the Installation of Ceramic Tile" and Tile Council of American, "Handbook for Ceramic Tile Installation."

All tile shall be installed on a bond coat over a setting bed. The setting bed shall be a cured cement mortar bed or a prepared, dimensionally stable substrate of concrete, masonry, cementitious backer board, or other cementitious material.

The back face of the tile shall be free of paper, adhesives, fiber mesh, resins, or other materials affecting the bond of the tile to the bedding material.

Tile sheets shall have permanent edge bonding or temporary mounting materials on the exposed face. Water soluble or absorbent adhesives shall not be used for edge bonding. Temporary mounting materials shall allow observation during tile setting operations.

Tile work shall extend into recesses and under or behind equipment and fixtures, to form a complete covering without interruptions, except as shown on the plans. Work shall be terminated neatly at obstructions, edges and corners without disrupting pattern or joint alignments.

Intersections and returns shall be accurately formed. Cutting and drilling of tile shall be performed without marring visible surfaces. Cut edges of tile abutting trim, finish or built-in items shall be carefully ground to produce straight aligned joints. Tile shall be closely fit to electrical outlets, piping, fixtures and other penetrations such that plates, collars, or covers overlap the tile.

Mortar bed placement.--The mortar bed, with or without reinforcement as shown on the plans, shall be placed, consolidated, and finished to the required thickness.

The surface of the mortar bed shall be true and pitched as shown on the plans, without high or low spots. The mortar bed surface shall not vary more than 3 mm in 2.4 m from a plane parallel to the finished tile surface when tile is installed on a cured mortar bed.

In no case shall 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.

Cement mortar beds to receive a tile bond coat shall be damp cured under cover for a minimum of 48 hours at a temperature of not less than 21°C.

Cement mortar beds to receive an epoxy bond coat shall be damp cured under cover for a minimum of 96 hours at a temperature of not less than 21°C and allowed to dry thoroughly prior to setting tile.

Cementitious backer board.--Cementitious backer board shall be installed in accordance with the provisions of ANSI Standard: A118.11.

Shower pan.--Substrate shall be thoroughly cleaned prior to forming the shower pan. Drain shall be a bolt-down clamping ring type with weepholes, installed such that the lip of the drain is flush with the subfloor.

Shower pan shall be turned up for a distance of not less than 152 mm in room areas and 75 mm above curb level in curbed spaces, with sufficient material to fold over and fasten to outside face of curb. Corners shall be dog-earred and folded between pan and studs. Material shall only nailed in the top inch of the upstand.

Shower pan material shall be cut exactly to size of the drain opening, do not trim out to bolt holes, but pierce to accommodate bolts with a tight fit. Place adhesive or mastic between pan and subdrain.

Tile bond coat.--The tile bond coat mortar shall be mixed according to the manufacturer's recommendations. The consistency of the mixture shall be such that ridges formed with the recommended notched trowel shall not flow or slump. Reworking will be allowed provided no water or materials are added. The setting bed surfaces shall be dampened before placing the bond coat as necessary tile installation, but the setting bed shall not be soaked. The setting bed surfaces for epoxy bond coat shall be dry.

The bond coat shall 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 shall be no greater than the area that can be tiled while the bond coat is still plastic. The bond coat shall be combed with a notched trowel as recommended by the manufacturer within 10 minutes before installing tile. Tile shall not be installed on a skinned over bond coat.

Installing tiles.--Tile shall be installed in accordance with the manufacturer's instructions and shall be set solid and shall be well bonded to the substrate.

Tile set on a tile bond coat shall be installed in accordance with ANSI Standard: A108.5, and tile set on an epoxy mortar shall be installed in accordance with ANSI Standard: A108.6.

If tiles are cut, the cuts shall be made with saws. Cut edges shall be rubbed with an abrasive stone to bring the edge of the glaze slightly back from the body of the tile. Cuts shall be accurately made to neatly fit the tile in place. Cut edges shall not be butted against other tile. Cut tile shall be at least half the size of a full size tile.

Tile shall completely cover wall areas behind mirrors and fixtures.

Tile shall be installed so that the finished tile surface does not vary more than 3 mm in 2.4 m from the finished tile surface shown on the plans. In no case shall 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 shall be firmly pressed into the freshly notched bond coat. Tile on interior surfaces shall 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 shall have 100 percent coverage and shall be back-buttered immediately prior to setting the tile.

If tile is face mounted, the paper and glue shall be removed within one hour after tile is installed and all tiles that do not meet the requirements for joints and surface tolerance shall be adjusted or replaced.

Mortar that exudes into the grout spaces between tiles shall be removed to the bottom of tile.

Marble thresholds.--Marble thresholds shall be set in same type of setting bed as abutting tile unless otherwise shown on the plans.

Joints.--Joints between tile shall be continuous both vertically and horizontally. Joints shall be straight and of uniform and equal width. Where tiles on adjoining surface are the same size, the joints shall align, one with the other. Joint width shall be as recommended by the tile manufacturer.

Grouting tile.--Grout shall be mixed, applied and cured in accordance with the manufacturer's recommendations and ANSI Standard: A108.10 for cement grout and ANSI Standard: A108.9 for epoxy grout.

Spacers, strings, ropes, pegs, glue, paper, and face mounting material shall be removed before grouting. Joints between glazed wall tile shall be wetted if they have become dry. Joints for epoxy mortar shall be dry.

Grouting shall not begin until at least 48 hours after installing tile.

A maximum amount of grout shall be forced into the joints between tiles in accordance with the manufacturer's recommendations. The grout shall be finished to the depth of the cushion for cushion edge tile and finished flush with the surface for square edge tile. All gaps and skips in the grout spaces shall be filled.

Mortar or mounting mesh shall not show through the grouted joints.

The finished grout shall have a uniform color and shall be smooth without voids, pinholes or low spots.

Expansion joints shall be kept free of grout or mortar.

Grout shall be protected from freezing or frost for a least 5 days after installation.

Expansion joints.--Expansion joints shall 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 shall not exceed 5 m in any direction.

All expansion joints shall be made with sealant over backer rods. The thickness of sealant at the center of expansion joints shall not exceed the width of the joint. Joint edges shall be primed as recommended by the sealant manufacturer.

Edge strips.--Edge strips shall be installed at openings where the threshold has not been shown on the plans, but where tile floor abuts other flooring materials at the same level. Edge strips shall be installed centered under the closed door, or where there is no door, centered in the opening.

Sounding tile.--Tiled surfaces shall be sounded with a metal bar or chain for improperly bonded tile or setting bed. Tile or setting bed that emits a hollow sound shall be replaced.

Replacement.--Cracked, chipped, broken, or otherwise defective tiles shall be removed and replaced. All tiles which differ more than 2 mm in elevation from adjacent tile edges shall be removed and replaced.

Curing.--After the installation of tile and the grouting of joints, the tile and grout shall be cured by keeping the surface continuously damp for at least 72 hours after grouting. Curing materials shall not stain the tile or grouted joints. Curing methods shall not erode away the grout.

After grouting, horizontal tiled surfaces shall be closed to traffic, and all tiled surfaces shall be kept free from impact, vibration or shock, for at least 72 hours.

Sealing unglazed quarry tile.--Sealer shall be applied to unglazed quarry tile only. The sealer shall be applied in accordance with the manufacturer's recommendations.

CLEANING AND PROTECTION.--

Cleaning tile surfaces.--All exposed tile surfaces shall be cleaned of all grout haze upon completion of grouting. Acids and chemicals used to clean tile shall conform to the tile manufacturer's recommendations. Cleaners shall not be harmful to materials on surfaces of abutting floors, walls, and ceilings. Tile work shall be rinsed thoroughly with clean water before and after using acid or chemical cleaners. After cleaning and rinsing, tile surfaces shall be polished using a soft cloth.

Tile work shall be cleaned and polished again immediately prior to completion of the contract. All dirt, grime, stains, paints, grease, and other discoloring agents or foreign materials shall be removed.

Protection.--After grouting, horizontal tiled surfaces shall be closed to traffic, and all tiled surfaces shall be kept free from impact, vibration or shock, for at least 72 hours after.

Tile surfaces damaged by construction operations shall be retiled.

SCHEDULES.--

Wall tile.--

Wall tile shall be nominal 102 mm x 102 mm glazed wall tile.

Installation on mortar bed, using a tile bond coat and grout, shall conform to the requirements of Method W 222, "Handbook for Ceramic Tile Installation."

Installation on gypsum wallboard, using a tile bond coat and grout, shall conform to the requirements of Method W 243, "Handbook for Ceramic Tile Installation."

Installation on cementitious backer board, using a tile bond coat and grout, shall conform to the requirements of Method W 244, "Handbook for Ceramic Tile Installation."

Installation on concrete and masonry shall be on a mortar bed using tile bond coat and grout, and shall conform to the requirements of Method W 211, "Handbook for Ceramic Tile Installation."

Floor tile.--

Floor tile shall be nominal 102 mm x 102 mm matte porcelain tile installed on a mortar bed using a tile bond coat and grout and shall conform to the requirements of Method F 112, "Handbook for Ceramic Tile Installation."

12-9.03 RESILIENT BASE

GENERAL.--This work shall consist of furnishing and installing resilient base in accordance with the details shown on the plans and these special provisions.

SUBMITTALS.--Manufacturer's descriptive data, installation instructions, color palette, and samples of resilient base shall be submitted for approval. Samples shall be not less than 50 mm in length.

PRODUCTS.--

Resilient base.--

Resilient base shall be manufacturer's best grade, rubber or vinyl base, with premolded internal and external corner pieces. The height and color shall be as shown on the plans.

Adhesive.--

Adhesive shall be as recommended by base manufacturer.

EXECUTION.--

INSTALLATION.--Bases shall be firmly and totally attached to walls with adhesive and shall be accurately scribed to trim, molding and cabinets. All joints shall be tight fitting. Bases between premolded corners or other termini may be installed continuous or installed using one m minimum standard manufactured lengths. Filler pieces shall be not less than 0.5 m.

12-9.04 VINYL COMPOSITION TILE

GENERAL.--This work shall consist of furnishing and installing vinyl composition tile in accordance with the details shown on the plans and these special provisions.

Vinyl composition tile shall consist of vinyl composition tile, edger strips, floor wax and tile manufacturer's recommended primers and adhesives.

SUBMITTALS.--Manufacturer's descriptive data, installation instructions, color and pattern samples shall be submitted for approval. Samples of tile shall be 305 mm x 305 mm in size.

PRODUCTS.--

Vinyl composition tile.--

Vinyl composition tile shall be semi-flexible, 2.38 mm minimum thick, 305 mm x 305 mm tile conforming to Federal Specification: SS-T-312, Type IV. Color and pattern shall be as shown on the plans. Coefficient of friction minimum 0.6.

Primer, leveling compound crack filler and adhesives.--

Primer, leveling compound crack filler and adhesives shall be waterproof types as recommended by the tile manufacturer.

Wax.--

Wax shall be water emulsion, self-polishing type containing not less than 16 percent wax solids, wetting agents, and a nonslip agent. The wax shall meet UL antislip standards.

Edger strips.—

Edger strips shall be commercial quality, stainless steel or aluminum.

EXECUTION.--

PREPARATION.--Before placing adhesives, all surfaces to receive vinyl composition tile shall be made free of localized depressions or bumps. Bumps shall be ground flat. Holes, depressions and cracks shall be filled with crack filler or leveling compound.

Immediately prior to application of the tile flooring, the surface to be covered shall be thoroughly dry, free of paint, oil, grease, mortar, plaster droppings, scaly surfaces or other irregularities and shall be broom clean. Primer, when recommended, shall be thoroughly brushed on the surface at the rate recommended by the adhesive manufacturer and shall be completely dry before the application of adhesives.

The rooms where tile is to be installed shall be maintained at a temperature of at least 21°C for not less than 72 hours before installation, during installation and for 5 days after installation.

APPLICATION.--Tile shall be laid to a true, straight, smooth and even finished surface in accordance with the manufacturer's instructions. Joints shall be tight fitting. Floor covering shall be placed before floor mounted fixtures are installed. After tile has been set, the finished surface shall be rolled and crossrolled with a roller weighing 50 kg or more.

Edger strips shall be installed at free edges.

Where tile patterns between rooms differ, the pattern break at openings shall 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 shall be removed and the floor left broom clean. Tile shall be protected from damage at all times during construction. As a last order of work, tile shall be washed with soap and warm water, rinsed, and then waxed in accordance with the tile manufacturer's printed instructions. Not less than 2 applications of wax shall be placed on the tile flooring.

PATCHING EXISTING TILED FLOORS.--Tile for patching existing floors shall closely match the color and pattern of the existing adjacent floor tile, except tile of contrasting color and pattern may be use when approved by the Engineer.

If the size of existing tile on floors which are to be patched can not be matched, enough existing tile shall be removed to permit the installation of full sized 305 mm x 305 mm tiles. The limits of existing tile removal and new tile installation shall be approved by the Engineer.

REPLACEMENT OF EXISTING TILE.--Replacement of existing tile flooring where ordered by the Engineer will be paid for as extra work in accordance with the requirements specified in Section 4-1.03D of the Standard Specifications.

12-9.05 PAINTING

PART 1.- GENERAL

SUMMARY.--This work shall consist of preparing surfaces to receive coatings, and furnishing and applying coatings, in accordance with the schedules and details shown on the plans, and these special provisions.

The coatings specified in this section are in addition to any factory finishes, shop priming, or surface treatment specified elsewhere in these special provisions.

SUBMITTALS.--Manufacturer's descriptive data, a materials list, and color samples shall be submitted for approval.

Product descriptive data shall include product description, manufacturer's recommendations for product mixing, thinning, tinting, handling, site environmental requirements, product application and drying time.

Materials list shall include manufacturer's name, trade name, and product numbers for each type coating to be applied.

Color samples shall be manufacturer's color cards, approximately 50 mm x 75 mm, for each color of coating shown on the plans. Color samples for stains shall be submitted on wood of the same species, color, and texture as the wood to receive the stain.

REGULATORY REQUIREMENTS.--Coatings and applications shall conform to the rules for control of volatile organic compound emissions adopted by the air quality control district in the air basin in which the coatings are applied.

SITE ENVIRONMENTAL REQUIREMENTS.--Coatings shall not be applied when the air temperature is below 10°C (20°C for varnishes) or when the relative humidity exceeds 75 percent.

The surface to be coated shall be maintained at a minimum temperature of 7°C for a period of 24 hours prior to, and 48 hours after the application of the coating. Heating facilities shall be provided when necessary.

Continuous ventilation shall be provided during application of the coatings.

A minimum lighting level of 865 lux, measured 1 m from the surface to be coated, shall be provided while surfaces are being prepared for coatings and during coating applications.

DELIVERY, STORAGE, AND HANDLING.--Products shall be delivered to the site in sealed, labeled containers and stored in a well ventilated area at an ambient air temperature of not less than 7°C. Container labeling shall include manufacturer's name, type of coating, trade name, color designation, drying time, and instructions for tinting, mixing, and thinning.

MAINTENANCE STOCK.--Upon completion of coating work, a full 3.8 liter container of each type and color of finish coat and stain used shall be delivered to the location at the project site designated by the Engineer. Containers shall be tightly sealed and labeled with color, texture, and room locations where used, in addition to the manufacturer's standard product label.

PART 2.- PRODUCTS

GENERAL.--The products shall be the best quality grade coatings of the specified types as regularly manufactured by nationally recognized paint and varnish manufacturers that have not less than 10 years experience in manufacturing paints and varnishes. Products that do not bear the manufacturer's identification as the best quality grade product shall not be used. Products for each coating system shall be by a single manufacturer and shall not contain lead type pigments.

Thinners, shellac, fillers, patching compounds, coloring tint, and other products required to achieve the specified finish shall be the manufacturer's best quality and shall be used as recommended.

PART 3.- EXECUTION

INSPECTION.--Surfaces to be coated at the jobsite shall be approved by the Engineer prior to the application of coatings. The Contractor shall notify the Engineer at least 3 working days prior to the application of coatings.

SURFACE PREPARATION.--Surfaces scheduled to be coated shall be prepared in accordance with the following, except that the surfaces not specified herein shall be prepared as recommended by the coating manufacturer.

GENERAL.--Hardware, cover plates, light fixture trim, and similar items shall be removed prior to preparing surfaces for coating. Following the application of the finish coating, the removed items shall be reinstalled in their original locations.

GALVANIZED METAL.--Oils, grease, and fabrication lubricants shall be removed by solvent wash. Surfaces shall be cleaned of remaining surface treatments by hand cleaning. New surfaces shall be roughened by hand cleaning or light abrasive blasting.

Abraded or corroded areas shall be hand cleaned and spot coated with one coat of vinyl wash pretreatment. Abraded or corroded areas on new surfaces not scheduled to be painted shall be cleaned by solvent wash, hand cleaned, and given 2 spot applications of zinc rich paint.

PREVIOUSLY COATED AND SHOP PRIMED SURFACES.—Dirt, oil, grease, or other surface contaminants shall be removed by water blasting, steam cleaning, or TSP wash. Minor surface imperfections shall be filled as required for new work. Mildew shall be removed by mildew wash. Chalking paint shall be removed by hand cleaning. The surfaces of existing hard or glossy coatings shall be abraded to dull the finish by hand cleaning or light abrasive blasting. Abrasive blasting shall not be used on wood or non-ferrous metal surfaces.

STEEL AND OTHER FERROUS METALS.--Oils, grease, and fabrication lubricants shall be removed by solvent wash. Dirt, water soluble chemicals, and similar surface contamination shall be removed by detergent wash or steam cleaning. Mill scale and rust shall be removed by hand cleaning or abrasive blasting.

ALUMINUM AND OTHER NON-FERROUS METALS.--Oils, grease, and fabrication lubricants shall be removed by solvent wash. Dirt, water soluble chemicals, and similar surface contamination shall be removed by detergent wash.

GYPSUM BOARD.--Holes, cracks, and other surface imperfections shall be filled with joint compound or suitable filler prior to application of coatings. Taped joints and filled areas shall be hand sanded to remove excess joint compound and filler.

Chipped, peeling, blistered, or loose coatings shall be removed by hand cleaning, water blasting, or abrasive blasting. Bare areas shall be pretreated and primed as required for new work.

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 which 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.

SOLVENT WASH.--Removal of oil, grease, wax, dirt, or other foreign matter by using solvents, such as mineral spirits or xylol, or other approved cleaning compounds.

STEAM CLEANING.--Removal of oil, grease, dirt, rust, scale, 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.

PROTECTION.--The Contractor shall 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 shall be removed by the Contractor at his expense and the original surface restored to the satisfaction of the Engineer.

APPLICATION.--

GENERAL.--Coatings shall be applied in accordance with the printed instructions and at the application rates recommended by the manufacturer to achieve the dry film thickness specified in these special provisions.

Mixing, thinning and tinting shall conform to the manufacturer's printed instructions. Thinning will be allowed only when recommended by the manufacturer.

Coatings shall be applied only when surfaces are dry and properly prepared.

Cleaning and painting shall be scheduled so that dust and other contaminants from the cleaning process will not fall on wet, newly coated surfaces.

Materials required to be coated shall 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.

APPLICATION SURFACE FINISH.--Each coat shall be applied to a uniform finish. Finished surfaces shall 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 shall closely resemble the final color coat, except each application shall provide enough contrast in shade to distinguish the separate applications.

WORK REQUIRED BETWEEN APPLICATIONS.--Each application of material shall be cured in accordance with the coating manufacturer's recommendations before applying the succeeding coating. Enamels and clear finishes shall be lightly sanded, dusted, and wiped clean between applications.

Stain blocking primer shall be spot applied whenever stains bleed through the previous application of a coating.

TIMING OF APPLICATIONS.--The first application of the specified coating system shall be applied prior to any deterioration of the newly prepared surface. Metal surfaces shall be prepared and prime coated the same day that cleaning of bare metal is performed. Additional prime coats shall be applied as soon as drying time of the preceding coat permits.

Metal surfaces shall be prime coated within 12 hours of application of vinyl wash pretreatment.

Shellac sealer shall be allowed to dry at least 12 hours before applying the next coat.

Drying time between applications of water borne coatings shall be at least 12 hours.

APPLICATION METHODS.--Coatings shall be applied by brush, roller or spray. Rollers shall be of a type which do not leave a stippled texture in the paint film. Extension handles for rollers shall not be greater than 2 m in length.

If spray methods are used, surface deviations and imperfections such as, overspray, thickness deviations, lap marks, and orange peel shall be considered as evidence that the work is unsatisfactory and the Contractor shall apply the remainder of the coating by brush or roller, as approved by the Engineer.

DRY FILM THICKNESS.--

Vinyl wash pretreatment	0.007 mm to 0.13 mm, maximum.
Bituminous paint	0.1 mm, minimum.
Epoxy polyamide primer	0.1 mm, minimum.
Aliphatic polyurethane enamel	0.05 mm, minimum.
Other primers, undercoats, sealers, and coatings	As recommended by the manufacturer.

BACKPRIMING.--The first application of the specified coating system shall be applied to all wood surfaces (face, back, edges, and ends) of wood materials that are not factory coated, immediately upon delivery to the project site, except surfaces of interior finish woodwork that adjoin concrete or masonry shall be coated with one application of alkyd exterior wood primer before installation.

When clear or stain type coatings are required on millwork, trim, or paneling, varnish, reduced 25 percent by mineral spirits, shall be used for coating the back faces.

All primed metal surfaces in contact with concrete or concrete block exterior walls shall be coated with a bituminous paint on those surfaces in contact with the wall.

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 shall be coated with a minimum of one application of the finish coat.

FINISHING MECHANICAL AND ELECTRICAL COMPONENTS.--Shop primed mechanical and electrical components shall be finish coated in accordance with the coating system entitled, "Shop Primed Steel." Louvers, grilles, covers, and access panels on mechanical and electrical components shall be removed and coated separately.

Interior surfaces of air ducts which are visible through grilles or louvers shall be coated with one application of flat black enamel, to limit of the sight line.

Exposed conduit, piping, and other mechanical and electrical components visible in public areas shall be painted.

Both sides and all surfaces, including edges and back of wood mounting panels for electrical and telephone equipment shall be finish coated before installing equipment.

CLEANING.--Upon completion of all operations, the coated surfaces shall be thoroughly cleaned of dust, dirt, grease, or other unsightly materials or substances.

Surfaces marred or damaged as a result of the Contractor's operations shall be repaired, at his expense, to match the condition of the surfaces prior to the beginning of the Contractor's operations.

COATING SYSTEMS.--The surfaces to be coated shall be as shown on the plans and as specified elsewhere in these special provisions. When a coating system is not shown or specified for a surface to be finish coated, the coating system to be used shall be as specified for the substrate material. The number of applications specified for each coating system listed herein is a minimum. Additional coats shall be applied if necessary to obtain a uniform color, texture, appearance, or required dry film thickness.

SYSTEM 1- ALUMINUM AND OTHER NON-FERROUS METALS.--

1 pretreat coat:	vinyl wash pretreatment
1 prime coat:	aluminum primer
2 finish coats	acrylic, exterior enamel, semi-gloss

SYSTEM 2- GALVANIZED METAL.--

1 pretreat coat:	vinyl wash pretreatment
1 prime coat:	galvanized metal primer
2 finish coats:	acrylic, exterior enamel, semi-gloss

SYSTEM 3- GYPSUM BOARD.--

1 prime coat:	PVA wall sealer
2 finish coats:	acrylic, interior enamel, semi-gloss

SYSTEM 4- SHOP PRIMED STEEL.--

1 prime coat :	red oxide ferrous metal primer
2 finish coats:	alkyd, exterior enamel, semi-gloss

SYSTEM 5- STEEL AND OTHER FERROUS METALS.--

2 prime coats:	red oxide ferrous metal primer
2 finish coats:	alkyd, exterior enamel, semi-gloss

COLOR SCHEDULE.--Colors shall be as shown on the plans.

12-9.06 ACOUSTIC CEILING TILE

GENERAL.--This work consists of furnishing and installing acoustic tile on ceilings in accordance with the details shown on the plans and these special provisions.

SUBMITTALS.--Manufacturer's descriptive data, installation instructions and 2 samples of the acoustic tile shall be submitted for approval.

PRODUCTS.--

Acoustic tile.--

Acoustic tile shall be 305 mm x 305 mm x 15 mm minimum thickness, square edges, nondirectional natural fissured texture, factory applied, washable, off-white vinyl latex finish. Tile shall conform to ASTM Designation: E 1264, Type III, Form 2. Noise Reduction Coefficient (NRC) shall be minimum 0.65. Panels shall have a flame spread rating not exceeding 25.

Adhesives.--

Adhesives shall be as recommended by acoustic tile manufacturer.

EXECUTION.--

PREPARATION.--Surfaces to receive acoustic tile shall be clean, dry and level and shall be prepared in accordance with the adhesive manufacturer's recommendations.

INSTALLATION.--Tile shall be installed in accordance with the manufacturer's recommendations. Installation of tile shall be restricted to periods when the ambient room temperature is between 13°C and 35°C.

12-9.07 PREFINISHED HARDBOARD

GENERAL.--This work shall consist of furnishing and installing prefinished hardboard wainscotting with aluminum molding trim in accordance with the details shown on the plans and these special provisions.

SUBMITTALS.--Manufacturer's descriptive data, installation instructions and samples of prefinished hardboard and trim shall be submitted for approval. Colors and patterns shall be as shown on the plans will be selected by the Engineer after the award of the contract.

PRODUCTS.--

Prefinished hardboard.--

Prefinished hardboard shall be commercial quality, prefinished, glazed 3 mm thick tempered hardboard with factory applied, water resistant thermosetting plastic finish of not less than mm film thickness. Prefinished hardboard shall conform to Voluntary Product Standard PS 59.

Adhesive.--

Adhesive shall conform to the prefinished hardboard manufacturer's recommendations and the requirements of ASTM Designation: C 557.

Trim.--

Trim shall be extruded, anodized of aluminum alloy.

EXECUTION.--

INSTALLATION.--The hardboard shall be glued in place and nailed in accordance with the manufacturer's recommendations and as specified herein.

Adhesive shall be applied along all edges of the hardboard panels and vertically at 407 mm spacing across the panel width. Adhesive at the edges shall be continuous ribbons 3 mm thick. Adhesive at the vertical locations shall be intermittent beads 76 mm in length with a 153 mm space between beads. Nails shall be driven on 407 mm spacings along the top, bottom, and edges of the panels. Nails shall be concealed behind the trim and shall penetrate at least 19 mm into the framing.

12-9.08 SUSPENDED CEILINGS

GENERAL.--This work shall consist of furnishing and installing suspended ceilings in accordance with the details shown on the plans and these special provisions.

Suspended ceilings shall consist of lay-in acoustical ceilings panels and an exposed grid suspension system. Listed fire rated assemblies shall be installed where shown on the plans.

DESIGN.--The suspension system shall be designed to support the weight of ceiling panels, lighting fixtures, air terminals, service assemblies and such other items, not mentioned, which are supported by the suspended ceiling system.

The deflection of any component of the suspension system shall not exceed 1/360 of the span.

The suspension system shall be designed for seismic restraint in accordance with ASTM Designation: E 580.

Lighting fixture attachments shall be designed for a capacity of 100 percent of the lighting fixture weight acting in any direction.

SUBMITTALS.--Manufacturer's descriptive data and installation instructions and complete working drawings of all supporting details, lighting fixture attachments, lateral force bracing, partition bracing and runner and panel layouts shall be submitted for approval.

PRODUCTS.--

Acoustical panels.--

Acoustical panels shall be factory produced, lay-in panels, 610 mm x 1219 mm x 16 mm thick with non-directional natural fissured surface texture and factory applied, washable, off-white, vinyl latex finish. Panels shall conform to ASTM E 1264 Type III, form 2. Noise Reduction Coefficient (NRC) shall be minimum 0.65. Panels shall have a flame spread rating not exceeding 25.

Suspension system.--

Suspension system shall be galvanized steel, tee shaped main runners and cross runners and wall molding angles or channels conforming to ASTM Designation: C 635, intermediate duty or heavy duty. Runners shall have exposed flanges approximately one inch wide and positive interlocks between main runners and cross runners. Wall moldings shall have a 19 mm wide exposed face. Runners and moldings shall be bonderized and shall have a flat off-white color, factory painted finish unless otherwise shown on the plans.

Wire hangers.--

Wire hangers shall be 2.7 mm (12-gage) minimum, galvanized, soft-annealed, mild steel wire.

Assembly devices, splices, intersection connectors and expansion devices.--

Assembly devices, splices, intersection connectors and expansion devices shall be as recommended by the suspension system manufacturer.

EXECUTION.--

INSTALLATION.--The suspended ceiling shall be installed square, level and true in accordance with the approved working drawings, the manufacturer's installation instructions and the requirements of ASTM Designations: C 636 and E 580 and UBC Standard No. 25-2.

Hangers for the suspension system shall be spaced at not more than 1.2 m on centers and shall be saddle tied or wrapped around the main runner members.

Except as specified herein, all lighting fixtures, air terminals, services or other ceiling supported items shall be positively attached to the suspension system.

Lighting fixtures, air terminals, services or other items weighing less than 25 kg shall have, in addition to the requirements specified herein, two 2.7 mm (12-gage) 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 25 kg shall be supported directly from the structure above.

The ceiling shall be leveled to within 3 mm in 3.6 m.

MAINTENANCE STOCK.--Upon completion of the suspended ceiling work, one unopened carton of acoustical panels shall be delivered to a location at the project site designated by the Engineer.

SECTION 12-10. SPECIALTIES

12-10.01 TACKBOARDS

GENERAL.--This work shall consist of furnishing and installing tackboards in accordance with the details shown on the plans and these special provisions.

SUBMITTALS.--Manufacturer's descriptive data, color and texture samples and installation instructions shall be submitted for approval. Color and texture will be selected by the Engineer after the award of the contract.

PRODUCTS.--

Tackboards.--

Tackboards shall be textured plastic coating on cotton-fabric, pressure laminated to 6 mm thick cork underlayment. Cork underlayment shall be bonded to a 6 mm thick hardboard backing. Tackboard dimensions shall be as shown on the plans.

Border moldings.--

Border moldings shall be factory applied, extruded clear anodized aluminum trim.

EXECUTION.--

INSTALLATION.--Tackboards shall be installed rigidly, securely, plumb and true, and in accordance with the manufacturer's recommendations.

12-10.02 MARKER BOARDS

GENERAL.--This work shall consist of furnishing and installing a marker boards in accordance with the details shown on the plans and these special provisions.

One felt eraser and 12 felt tipped liquid chalk markers of assorted colors shall be furnished for each marker board installed.

SUBMITTALS.--Manufacturer's descriptive data and installation instructions shall be submitted for approval.

PRODUCTS.--

Marker board.--

Marker board shall conform to Porcelain Enamel Institute Standard PEI-S-104, and shall be porcelain enamel surface on 0.61 mm thick (24-gage) sheet steel pressure laminated to 6 mm thick tempered hardboard. Hardboard shall have a backing of 0.38 mm nominal thickness aluminum sheet. Enamel surface shall be suitable for marking with felt tipped liquid chalk markers and erasing with a felt eraser or dry cloth. The enamel surface shall be white in color.

Marker board dimensions shall be as shown on the plans.

Trim and marker tray.--

Trim and marker tray shall be factory installed, satin finish, clear anodized aluminum extrusions.

EXECUTION.--

INSTALLATION.--Marker boards shall be installed rigidly, securely, plumb and true in accordance with the manufacturer's instructions.

12-10.03 LOUVERS

GENERAL.--This work consists of furnishing and installing louvers in accordance with the details shown on the plans and these special provisions.

SUBMITTALS.--Manufacturer's descriptive data and installation instructions shall be submitted for approval.

PRODUCTS.--

Louvers.--

Louvers shall be factory fabricated units of extruded aluminum alloy not less than 2 mm thick (12-gage) or galvanized steel sheet not less than 1.63 mm thick (16-gage) with standard "Z" type blades, and removable bronze 16 x 16 mesh insect screens mounted on the inside of the units.

Gravity units shall have blades center pivoted on a 10 mm diameter aluminum rod set in stainless steel ball bearings with cadmium plated races. Blades of gravity louvers shall be equipped with vinyl bulb seals on the edges.

Louvers shall have integral caulking strips and retaining beads.

The finish on louvers shall be baked on primer and fluorocarbon polymeric resin.

EXECUTION.--

INSTALLATION.--Louvers shall be installed in accordance with the manufacturer's instructions. The completed louver installation shall be weather tight.

PAINTING.--Louvers shall be cleaned, prepared and painted in accordance with the requirements specified under "Painting" in Section 12-9, "Finishes," of these special provisions.

12-10.04 FLAGPOLE

GENERAL.--This work shall consist of designing, furnishing, and installing a groundset flagpole and foundation in accordance with the details shown on the plans and these special provisions.

SUBMITTALS.--Manufacturer's descriptive data and installation instructions shall be submitted for approval.

PRODUCTS.--

Flagpole.--

Flagpole shall be tapered, 10.7 meter exposed height, 6063-T6 aluminum alloy pole with 150 mm diameter aluminum ball, ball bearing non-fouling truck with aluminum body and 102 mm diameter aluminum sleeves, 230 mm cast aluminum cleat and 8 mm polypropylene rope halyards with flag clasps. Aluminum shall be clear anodized after fabrication.

Metal sleeve, sand, wedges and sealant for flagpole foundation.--

Metal sleeve, sand, wedges and sealant for flagpole foundation shall be as recommended by the flagpole manufacturer. Metal sleeve shall be capped and shall have a ground spike with support plate.

Concrete.--

Concrete shall be as specified "Cast-In-Place Concrete" in Section 12-3, "Concrete and Reinforcement," of these special provisions and shall contain not less than 350 kg of cement per cubic meter.

EXECUTION.--The flagpole shall be erected plumb and rigid in accordance with the manufacturer's recommendations. Sand shall be consolidated before placing sealant.

12-10.05 SIGNS

PART 1.- GENERAL

SUMMARY.--

Scope.--This work shall consist of furnishing and installing signs in accordance with the details shown on the plans and these special provisions.

SUBMITTALS.--

Product data.--Manufacturer's descriptive data for sign materials, colors and graphics, and for fastening hardware and material shall be submitted for approval.

PART 2.- PRODUCTS

Plastic signs (permanent room identification).--

Plastic signs for permanent room identification for other than restrooms shall be scratch resistant, non-static, fire retardent, washable melamine laminate with a non-glare surface, not less than 3 mm thick. Letters and numbers

shall be upper case Helvetica, 25 mm in height, 0.80 mm above and integral with sign material, accompanied by Grade 2 Braille.

Grade 2 Braille dots shall be 2.5 mm on centers in each cell with 5 mm space between cells. Dots shall be raised a minimum of 0.6 mm above the background.

Plastic sign (restroom).--

Plastic sign for restroom shall be not less than 6 mm acrylic plastic. Sign background shall be blue and shall conform to Federal Standard 595B, Color No. 15090. Male/female symbol and lettering shall be white and shall conform to Federal Standard 595B, Color No. 17886.

Male restroom identification shall be a male symbol on an equilateral triangle with edges 305 mm long and a vertex pointing upward.

Female restroom identification shall be a female symbol on a 305 mm diameter circle.

Unisex restroom identification shall be a male and female symbol on a 305 mm equilateral triangle superimposed on a 305 mm diameter circle.

Accessible building entrance sign.--

Accessible building entrance sign shall be not less than 3 mm acrylic plastic, not less than 102 mm x 102 mm , with the international symbol of accessibility.

Accessible building entrance sign shall be pressure sensitive decal, not less than 102 mm x 102 mm with the international symbol of accessibility.

Sign background shall be blue and shall conform to Federal Standard 595B, Color No. 15090. Symbol and border shall be white and shall conform to Federal Standard 595B, Color No. 17886.

Metal sign (loft).--

Metal sign for loft shall be sheet steel, not less than 0.76 mm thick (22-gage), black enamel letters on a white enamel background. Sign size shall be 610 mm wide by 457 mm high with 64 mm minimum height letters.

Self-luminous sign (exit).--

Self-luminous sign shall be internally illuminated, self-luminous exit sign powered by permanent integral tritium gas source. Sign shall be listed by the California State Fire Marshal, and UL or other approved testing laboratory.

Sign housing shall be ABS molding. Faceplate shall be acrylic.

Fastening hardware and material.--

Fastening hardware and material shall be as recommended by the sign manufacturer. Fasteners shall be noncorrosive.

PART 3.- EXECUTION

Inscription.--Except for loft and exit signs, sign messages shall be as shown on the plans.
Metal loft sign shall read as follows:

LOFT
LOAD LIMIT
125 LB./SQ.FT.

Installation.--Plastic signs for room identification and restrooms shall be fastened or secured to clean, finished surfaces in accordance with the sign manufacturer's instructions. Signs shall be installed at a location and height as shown on the plans.

Metal signs shall be attached securely with galvanized or cadmium plated fasteners.

Fastening hardware and material shall be installed within the sign as shown on the plans.

12-10.06 WARDROBE LOCKERS

PART 1.- GENERAL

SUMMARY.--

Scope.--This work shall consist of furnishing and installing wardrobe lockers in accordance with the details shown on the plans and these special provisions.

SUBMITTALS.--

Product data.--Manufacturer's descriptive data, installation instructions, and standard color palette shall be submitted for approval.

Unless otherwise shown on the plans, the color will be selected by the Engineer from the standard color palette after the award of the contract.

PART 2.- PRODUCTS

ACCEPTABLE MANUFACTURERS.--

Available manufacturers.--Subject to conformance with the contract provisions, metal lockers shall be Art Metal Products; Lyon Metal Products; Republic Storage Systems; or equal.

Lockers.--

Lockers shall be standard, factory fabricated steel units. Framing shall be 1.52 mm thick (16-gage) and face sheets shall be 0.61 mm (24-gage), except door face sheets shall be 1.5 mm (16-gage).

Lockers shall be equipped with the following: hat shelf located approximately 255 mm 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.

The approximate dimensions of the wardrobe lockers shall be 380 mm wide, 457 mm deep and 1829 mm high.

Closed base.--

Closed base shall be the manufacturer’s standard continuous 152 mm base, fabricated of the same material and designed for use with the lockers provided. Bottoms shall be flanged inward for stiffening. Bases shall have the same finish as the locker units.

Top.--

Top shall 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 shall have the same finish as the locker units.

FABRICATION.--

Shop assembly.--Lockers shall be fabricated square, rigid, and without warp, with metal faces flat and free of dents or distortion.

Frame joints and seams shall be welded. Exposed welds shall be ground smooth. Hinge and latch connections shall be welded or riveted.

Bolts shall be used for assembly and mounting lockers components. Bolt or rivet heads on fronts of locker doors or frame shall not be exposed.

Factory finish.--Lockers shall be chemically pretreated with degreasing and phosphatizing process. Wardrobe lockers shall have a baked enamel finish on all surfaces, exposed and concealed.

PART 3.- EXECUTION

Installation.--Lockers shall be mounted on closed bases at locations shown in accordance with the manufacturer's instructions for plumb, level, rigid, and flush installation.

Wardrobe lockers shall be bolted together at tops and bottoms. The backs of the end lockers shall be bolted to wall anchors with 6 mm bolts installed near the tops of the wardrobe lockers as recommended by the locker manufacturer.

Trim, sloping tops, and metal filler panels, if required, shall be installed using concealed fasteners to provide flush, hairline joints against adjacent surfaces.

The number of lockers shall be as shown on the plans.

12-10.07 WOOD BENCHES

GENERAL.--This work shall consist of furnishing and installing wood benches in accordance with the details shown on the plans and these special provisions.

SUBMITTALS.--Manufacturer's descriptive data and installation instructions shall be submitted for approval.

PRODUCTS.--

Acceptable manufacturer's.--Subject to compliance with these requirements, manufacturer's shall be Penco Products, Inc.; Republic Storage Systems, Inc.; Interior Steel Equipment Co.; or equal.

Seat.--

Seat shall be factory fabricated, laminated seat units of solid birch or other suitable, dense hardwood and manufacturer's standard clear coating. Seat units shall be approximately 240 mm wide by 32 mm thick, in lengths as shown on the plans. Edges of the seat shall be rounded and all surfaces shall be smooth and free of splinters which would snag clothing or skin.

Supports assemblies.--

Supports assemblies shall be standard steel pedestal assemblies with continuously welded top and bottom flange fittings. Flanges shall have provisions for fasteners to the floor and securing to the bench. Pedestal diameter shall be not less than 32 mm. Pedestal color and finish shall be selected from the manufacturer's standard colors.

Fasteners.--

Fasteners for fastening seat units and support assemblies shall be the manufacturer's standard fasteners for the purpose intended.

PART 3.- EXECUTION

Installation.--Bottom flange fittings of the support assemblies shall bear solidly on the floor without rocking and shall be fastened rigidly and securely to the floor in accordance with the manufacturer's recommendations.

12-10.08 FIRE EXTINGUISHERS AND CABINETS

PART 1.- GENERAL

SUMMARY.--

Scope.--This work shall consist of furnishing and installing fire extinguishers with cabinets or mounting brackets in accordance with the details shown on the plans and these special provisions.

REFERENCES.--

General.--Fire Extinguishers shall conform to the requirements in California Code of Regulations, Title 19 Division 1, Chapter 3, "Portable Fire Extinguishers."

SUBMITTALS.--

Product data.--Manufacturer's descriptive data and installation instructions shall be submitted for approval.

QUALITY ASSURANCE.--

Codes and standards.--Fire extinguishers shall be Underwriters Laboratories or Factory Mutual Laboratories approved for the type, rating and classification of extinguisher specified.

PART 2.- PRODUCTS

MANUFACTURER'S.--

Acceptable manufacturers.--Subject to contract compliance, manufacturers shall be J. L. Industries; Larsen's Manufacturing; Potter-Roemer; or equal.

COMPONENTS.--

Fire extinguisher.--

Fire extinguisher shall be fully charged, multi-purpose dry chemical type, with charge indicator, hose and nozzle, and attached service record tag. Fire extinguisher shall be of the capacity and type rating shown on the plans.

Mounting bracket.--

Mounting bracket shall be the manufacturer's standard painted, surface mounted type.

Fire extinguisher cabinet.--

Fire extinguisher cabinet shall be factory fabricated, constructed of steel with a clear plastic panel in a steel door frame, and shall have a baked enamel finish. Color to be selected by the Engineer from the manufacturer's standard colors.

Fire extinguisher cabinet shall be surface mounted, semi-recessed-or fully recessed as shown on the plans.

PART 3.- EXECUTION

INSTALLATION.--

General.--Fire extinguishers shall be installed in locations and at mounting heights shown on the plans, or if not shown, at a height of 1220 mm from the finished floor to the top of the fire extinguisher.

Fire extinguisher mounting brackets and cabinets shall be attached to structure, square and plumb, in accordance with the manufacturer's recommendations.

IDENTIFICATION.--

Bracket-mounted.--Extinguishers shall 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 shall be identified with letter spelling "FIRE EXTINGUISHER" applied to the cabinet door. Letter size, styles, and color shall be selected by the Engineer from manufacturer's standard arrangements.

SERVICING.--

General.--Fire extinguishers shall be serviced, charged, and tagged not more than 5 days prior to contract acceptance.

12-10.09 FREE STANDING STEEL SHELVING

GENERAL.--This work shall consist of furnishing and installing free standing steel shelving in accordance with the details shown on the plans and these special provisions.

SUBMITTALS.--Manufacturer's descriptive data, installation instructions and standard color palette shall be submitted for approval. The color will be selected by the Engineer after the award of the contract.

PRODUCTS.--

Shelving.--

Shelving shall be factory fabricated steel shelves and supports capable of supporting loads of 1200 Pa of shelf area. Shelves shall not deflect more than 8 mm when subjected to the loads specified herein and shall show no permanent deflection after removal of such loads. Shelves shall be supported and attached by means of clips. Studs or bolts shall not be used. Shelves shall be adjustable in vertical increments of 75 mm or less. Shelving shall be of the approximate dimensions and number shown on the plans and shall have a baked enamel finish.

EXECUTION.--Free standing steel shelving shall be installed in accordance with the manufacturer's instructions.

12-10.10 MOP HOLDER

GENERAL.--This work shall consist of furnishing and installing a mop holder in accordance with the details shown on the plans and these special provisions.

SUBMITTALS.--Manufacturer's descriptive data shall be submitted for approval.

PRODUCTS.--

Mop holder.--

Mop holder shall hold 4 mops and shall be fabricated of heavy gauge stainless steel with a polished satin finish. Mop holder consists of spring loaded rubber cams on plated steel retainers. Mop holder shall be A&J Modes UJ13B; Bradley Model 9954; Bobrick Model B-223; or equal.

EXECUTION.--

INSTALLATION.--Mop holder shall be installed rigidly and securely.

12-10.11 TOILET AND SHOWER ACCESSORIES

PART 1.- GENERAL

Scope.--This work shall consist of furnishing and installing toilet and shower accessories in accordance with the details shown on the plans and these special provisions.

SUBMITTALS.--

Product data.--Manufacturer's descriptive data and installation instructions and details shall be submitted for approval.

PART 2.- PRODUCTS

Toilet tissue dispenser.--

Toilet tissue dispenser shall be dual roll, surface mounted, stainless steel with satin finish, approximately 150 mm x 290 mm x 150 mm deep for non accessible stalls and provide 75 mm deep for accessible stalls. Dispenser shall utilize standard toilet tissue rolls. The top roll shall 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 shall be semi-recessed unit of stainless steel with satin finish. The approximate size shall be 355 mm x 1880 mm x 190 mm deep with 102 mm skirt. The paper towel dispenser shall have a capacity of 1000 single fold paper towels. The waste receptacle shall have a capacity of not less than 37 liters. One unit per lavatory.

Toilet seat cover dispenser.--

Toilet seat cover dispenser shall be white plastic dispenser, approximately 210 mm x 320 mm x 48 mm deep, single pack. One dispenser per toilet stall.

Napkin receptacle.--

Napkin receptacle shall be wall hung, white enameled sheet steel napkin receptacle with hinged top and bottom, disposable liner, approximate 3.8 liter capacity container. One receptacle per women's toilet stall.

Clothes hook.--

Clothes hook shall be stainless steel clothes hook with 2 prongs.

Paper towel dispenser.--

Paper towel dispenser shall be white enameled sheet steel towel dispenser with a capacity of 1000 single fold paper towels. One dispenser per lavatory. Protrusion max 102 mm.

Liquid soap dispenser.--

Liquid soap dispenser shall be surface mounted, heavy duty plastic dispenser for industrial use with a capacity of at least 710 mL. One dispenser per lavatory.

Mirror, wall hung.--

Mirror, wall hung shall be Number 1 quality, 6 mm thick, electrolytically copper plated float or plate glass mirror with nonmoisture-absorbing filler. Mirror shall have a heavy gage galvanized steel back and stainless steel frame. The frame shall have a satin finish and shall be mitered and welded and the corners shall be ground smooth. Fasteners shall not penetrate surfaces of the frame exposed to view. Mirror shall conform to Federal Specification: DD-M-411b and shall be guaranteed against silver spoilage for not less than 10 years.

Steel grab bars.--

Steel grab bars shall be stainless steel, 38 mm diameter bars and escutcheon covered integral mounting flanges.

Folding seat.--

Folding seat shall be factory fabricated with teakwood or woodgrain phenolic slats, Type 304 stainless steel tube frame with satin finish, wall bracket and hinge. Wood slats shall be factory stained and varnished. Size shall be as shown on the plans. Folding seat shall be Bradley, Bobrick, or equal.

Privacy curtain.--

Privacy curtain shall be flame resistant, one-way draw, nylon reinforced, anti-bacterial vinyl fabric. Curtain shall be 1.8 meters long.

Privacy curtain rod shall be stainless steel, fixed mounted shower rod with stainless steel mounting plates.

PART 3.- EXECUTION

Installation.--Toilet and shower accessories shall be installed in accordance with the manufacturer's recommendations. Fasteners for mounting accessories shall be concealed and tamper proof.

Expansion anchors shall be used for mounting accessories on masonry or concrete walls.

Toilet and shower accessories shall be mounted after painting work is complete.

All toilet room accessories shall be mounted plumb, secure and rigid. Grab bars shall be supported adequately so the bars will withstand an applied load of 113 kg at any point.

Support assembly for folding seat shall bear solidly on the wall without rocking and shall be fastened rigidly and securely to the wall in accordance with the manufacturer's recommendations.

12-10.12 TRUCK WEIGHING SYSTEM

GENERAL.--This work shall consist of furnishing, installing and constructing a truck weighing system in accordance with the details shown on the plans and these special provisions.

The truck weighing electrical system shall include construction of a scale pit structure, scale pit drainage system and the installation of one truck screening system and one static electronic truck scale weighing system.

The general location of the scale pit and the sump pump piping system for the truck weighing system shall be as shown on the plans.

MANUFACTURER REPRESENTATION.--The Contractor shall provide that a technical representative of the truck scale manufacturer be on call and available at the jobsite within 24 hours of being contacted during the construction, installation, adjusting and testing of the truck weighing system. The technical representative shall have full and complete knowledge of the installation and operation of the scale being installed.

SUBMITTALS.--Manufacturer's descriptive product and material data, design calculations for the static scale, working drawings and installation instructions shall be submitted for approval. Submittals shall be approved prior to the start of fabrication or construction.

Working drawings and design calculations for the static scale deck assembly shall be signed and stamped by an engineer who is registered as a Civil or Structural Engineer in the State of California.

Working drawings shall include complete details of the static scale deck and load cell assembly, including details of concrete, reinforcement and the steel deck forming; size and location of steel support members; and details of bumpers. Working drawings shall also include any modifications to the scale deck and scale pit details shown on the plans which may be required to accommodate the truck static scale system being installed.

PRODUCTS.--

Truck static scale.--

Truck static scale shall be the fully electronic type and shall be 45.4 MT axle load scales 3.7 m wide by 3.7 m long with a 45.4 MT per section concrete deck weigh bridge. Scale shall be four corner load cell type complete with all equipment and appurtenances. Truck scale shall meet the requirements shown on the plans.

Sump pump.--

The sump pump shall be a close coupled submersible type with 32 mm minimum diameter discharge, integral thermal overload protection and Type SO cable. The pump and motor shall be assembled on a single vertical stainless steel shaft fitted with a mechanical seal. The pump control shall be a diaphragm liquid level controller and shall be attached to the sump pump with Type SO cable if externally wired. Kilowatt rating, voltage, phase, RPM, and flow and total dynamic head characteristics shall be as shown on the plans.

Concrete and reinforcement.--

Concrete and reinforcement shall be as specified under Section 12-3, "Concrete and Reinforcement," of these special provisions.

Truck static weighing electrical system.--

Truck static weighing electrical system shall be as specified under "Truck Static weighing Electrical System" Section 12-16, "Electrical," of these special provisions.

EXECUTION.--

INSTALLATION.--The truck weigh scale assemblies and electronic weighing equipment shall be installed in accordance with the manufacturers' instructions and the approved working drawings.

The truck static scale platform shall be installed so that the elevations of the 4 corners do not vary more than 3 mm from the highest point to the lowest point. The scale platform shall be also installed so that the difference in elevation between the adjoining surfaces of the platform and the approach and exit slabs does not exceed 2 mm.

Valves and unions shall be installed horizontally and a minimum of 915 mm above the scale pit floor.

CLEANING AND PAINTING.--Surfaces of structural steel for the scale shall be cleaned and painted in accordance with the requirements specified in Section 59-1, "General," and 59-2, "Painting Structural Steel," of the Standard Specifications.

SECTION 12-11. EQUIPMENT

12-11.01 REFRIGERATOR

GENERAL.--This work shall consist of furnishing and installing an electric refrigerator unit as shown on the plans and these special provisions.

SUBMITTALS.--Manufacturer's descriptive data and installation instructions shall be submitted for approval.

PRODUCTS.--

Refrigerator.--

Refrigerator shall be .42 m3, upright type, Kenmore Model #74814, General Electric, Model TB155P; Hot Point, Model CTHY15EP; or equal.

EXECUTION.--

Installation shall be as recommended by the manufacturer.

Color shall be white.

12-11.02 GARBAGE DISPOSAL

GENERAL.--This work shall consist of furnishing and installing an electric garbage disposal unit as shown on the plans and these special provisions.

SUBMITTALS.--Manufacturer's descriptive data and installation instructions shall be submitted for approval.

PRODUCTS.--

Garbage Disposal.--

Garbage Disposal shall be In Sink Erator Model 777SS; Badger model "Badger 5 Plus"; G E Applance Model GFB760F; Kitchen Aid model KCD1250X.

EXECUTION.--

Installation shall be as recommended by the manufacturer.

12-11.03 MODULAR GAS COOKTOP UNIT AND HOOD

GENERAL.--This work shall consist of furnishing and installing a modular gas cooktop unit and exhaust hood as shown on the plans.

SUBMITTALS.--Manufacturer's descriptive data and installation instructions shall be submitted for approval.

PRODUCTS.--

Modular cooktop unit.--

Modular cooktop unit shall be a 4 burner gas operated unit with an automatic pilotless ignition. Cooktop surface shall be white porcelain enameled.

Unit shall be General Electric Model JGP300EJ, Hotpoint Model JGP300EJ Whirlpool Model RC8400XK or equal.

Non-vented hood.--

Non-vented hood shall be charcoal filter type with a 2-speed fan. Color to match modular cooktop unit.

Non-vented hood shall be General Electric Model JN322J, Hotpoint Model JN322J, Whirlpool Model SC8430SR or equal.

EXECUTION.--

Installation shall be as recommended by the manufacturer.

12-11.04 INSPECTION PIT COVER

PART 1.- GENERAL

SUMMARY.--

Scope.--This work shall consist of furnishing and installing mechanically moving pit covers in accordance with the details shown on the plans and these special provisions.

The pit covers system shall include operators, controls, grating, and necessary hardware.

Electrical work shall be in accordance with the requirements specified under "Electrical Work ," in Division 16, "Electrical," of these special provisions.

SUBMITTALS.--

Product data.--Manufacturer's descriptive data shall be submitted for approval. The Contractor shall provide shop drawings of complete assembly for approval prior to installation.

Manufacturer's descriptive data shall include a complete description, performance data and installation instructions for the materials and equipment specified herein.

CLOSEOUT SUBMITTALS.--

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 specified herein shall be delivered to the Engineer at the jobsite. The instructions and parts lists shall be in a bound manual form and shall be complete and adequate for the equipment installed. Inadequate or incomplete material shall be returned. The Contractor shall resubmit complete manuals at no expense to the State.

WARRANTY.--

Warranties and guarantees.--Manufacturer's warranties and guarantees for materials or equipment used in the work shall be delivered to the Engineer at the jobsite prior to acceptance of the contract.

PART 2.- PRODUCTS

PIT COVER ASSEMBLIES.—

General.—Pit cover assemblies shall heavy duty assemblies with operators, steel grating, safety reversing edges, audible alarm and light, tracks, concrete anchors, and any other hardware necessary for the proper operation of the pit cover system.

Pit Cover Operator.--

Pit Cover Operator shall be hydraulic type, suitable for operating the submitted pit covers. Approved for use by a nationally recognized testing laboratory in accordance with the requirements of **UL325**, fifth edition and **UL991**, second edition.

Operators shall be designed and manufactured for continuous duty. Operators shall be capable of actuating individual pit cover panels up to 15.34 m in length and weighing up to 1814 kg with a drive rail draw force requirement of no less than 136 kg at a preset speed of 0.366 meters per second, except where limited by UL325 Class I and II, then travel speed shall be 0.3048 meters per second.

The unit shall be 208V, three-phase AC voltage. The motor shall be of the high starting torque, continuous duty, and industrial type, protected against overload by either a thermal or current sensing overload device.

The hydraulic system shall be self-contained and shall consist of the electric motor, pump, reservoir, 2-position 4-way control valve, hydraulic "plumbing", and two (2) hydraulic drive motors.

Hydraulic motors shall be self-adjusting for wear compensation.

Pit Cover.--

Pit Cover assembly shall be manufacture in sliding sections, fabricated with 2.3kg galvanized carbon steel grating and 7 mm x 5 mm rectangle tubing, and stainless steel wheels shall be 15mm ball bearing suitable for type of track submitted.

The pit cover shall have a drive rail rigidly attached. The drive rail shall be constructed of high strength 6061-T6 aluminum extrusion. Alternative drive rail shall be 75mm x 100mm x 7mm hot-dipped galvanized steel. The "rail" shall be friction fed through the spring-loaded, hydraulically driven wheels. The pit cover shall be controlled by proximity type limit switch.

MISCELLANEOUS COMPONENTS.--

Limit Switches.--

Limit switches shall be shall be NEMA 4 capacitive proximity limit switches rated for harsh duty. Switch housing shall be one-piece and shall be corrosion resistant stainless steel.

Audible / Strove Light Alarm.--

Audible/ Strove light alarm shall be a combination strove light & alarm type. Alarm shall have a red polycarbonate lens, 85 dB horn @ 2500 mm, 360 degree light pattern, 65 flashes per minute, 120V.

PART 3.- EXECUTION

INSTALLATION.--

General.--The operator shall be installed rigidly and securely as recommended by the manufacturer.

The pit cover system shall be installed in accordance with manufacture's instructions and as shown on working drawings the plans.

FIELD QUALITY CONTROL.—

Final adjustments of the pit cover system shall be performed in such a manner that the systems will operate as specified.

The Contractor shall replace or revise any equipment, systems or work found deficient during tests.

All control devices which are pertinent to the pit cover system, shall be set and adjusted to the satisfaction of the engineer. All operator work shall be done in collaboration with the operator manufacturer's representative.

Project completion tests.--The Engineer shall be notified at least 3 working days in advance of starting project completion tests.

Testing.--All tests, including general performance tests to demonstrate the proper operation of the pit cover system, shall be performed by the Contractor in the presence of the operator manufacturer and the Engineer for a sufficient period of time to show that the system is operating properly.

The Contractor shall demonstrate that the pit cover system works as design, and shall be tested for proper operation of the safety reverse sensors, audible and light components.

12-11.05 COMPRESSED AIR SYSTEMS

PART 1.- GENERAL

SUMMARY.--

Scope.--This work shall consist of furnishing and installing compressed air systems in accordance with the details shown on the plans and these special provisions.

The compressed air system shall include a compressor, regulators, gauges and compressed air piping.

Pipes and fittings shall be in accordance with the requirements specified under "Pipes, Fittings, and Valves," in Section 12-15, "Mechanical," of these special provisions.

Permits to operate.--Attention is directed to the latest Division of Industrial Safety (DIS) regulations regarding tank mounted air compressors.

The Contractor shall provide all permits to operate pressure vessels in accordance with the requirements of the DIS and shall pay all costs for such permits. Such permits shall be posted under glass at the work site.

SUBMITTALS.--

Product data.--Manufacturer's descriptive data shall be submitted for approval.

Manufacturer's descriptive data shall include a complete description, performance data and installation instructions for the materials and equipment specified herein.

CLOSEOUT SUBMITTALS.--

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 specified herein shall be delivered to the Engineer at the jobsite. The instructions and parts lists shall be in a bound manual form and shall be complete and adequate for the equipment installed. Inadequate or incomplete material shall be returned. The Contractor shall resubmit adequate and complete manuals at no expense to the State.

WARRANTY.--

Warranties and guarantees.--Manufacturer's warranties and guarantees for materials or equipment used in the work shall be delivered to the Engineer at the jobsite prior to acceptance of the contract.

PART 2.- PRODUCTS

MISCELLANEOUS COMPONENTS.--

Air compressor.--

Air compressor shall be 2-stage, 1210 kPa design, 860 kPa output, mounted on an ASME code vertical type receiver. The air compressor shall 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 and an automatic tank drain operated by either the compressor unloader or a governor. Motor shall be high efficiency type, open dripproof with class B insulation. Air compressor shall be Champion, Ingersol Rand, Kellogg, or equal.

Pressure regulator.--

Pressure regulator shall be combination type with filter, bowl, pressure regulator and pressure gauge.

The filter bowl shall be the quick disconnect type, plastic with metal guard, manual drain, and 5 micron filter.

Pressure regulator shall be diaphragm controlled, balanced valve type, rated for 0 to 1100 kPa operation and shall be equipped with pressure gage, bottom clean-out plugs and internal strainers. Regulator shall be Wilkerson, Lincoln, Wabco, or equal.

Flexible coupling.--

Flexible coupling shall be brass flexible metal hose with threaded union ends and a minimum working pressure of 1380 kPa.

Pressure gage.--

Pressure gage shall be rotary type ANSI Standard: B40.1, Grade A, with 90 mm dial, liquid filled with cover, plain case, reset screw and bottom inlet. Pressure gage movement shall be phosphor bronze bushed. Gage shall read from 0 kPa to12 kPa. Each gage shall be equipped with a gage cock. Pressure gage shall be Marsh, Ashcroft, US Gage, or equal.

PART 3.- EXECUTION

INSTALLATION.--

General.--Air compressor shall be installed with drain piping, vibration isolation pads and expansion anchors.
Unions shall be installed before and after the pressure regulator/ball valve assembly.

FIELD QUALITY CONTROL.--

Testing.--All tests, including general performance tests to demonstrate the proper operation of the air compressor, shall be performed by the Contractor in the presence of the Engineer.

The air compressor system shall be tested for the operational range, the cut-off pressure and the operation of air drops and system components.

12-11.06 CARBON FILTER (PRESSURIZED)

PART 1.- GENERAL

SUMMARY.--

Scope.--This work shall consist of furnishing and installing a carbon filter (pressurized) and accessories in accordance with the details shown on the plans and these special provisions.

SUBMITTALS.--

Product data.--Manufacturer's descriptive data for carbon filter (pressurized) shall be submitted for approval.

Manufacturer's descriptive data shall include a complete description, performance data and installation instructions for the materials and accessories specified herein.

CLOSEOUT SUBMITTALS.--

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 specified herein shall be delivered to the Engineer at the jobsite. The instructions and parts lists shall be in a bound manual form and shall be complete and adequate for the equipment installed. Inadequate or incomplete material shall be returned. The Contractor shall resubmit adequate and complete manuals at no expense to the State.

WARRANTY.--

Warranties and guarantees.--Manufacturers warranties and guarantees for materials or equipment used in the work shall be delivered to the Engineer at the jobsite prior to acceptance of the contract.

PART 2.- PRODUCTS

Carbon filter (pressurized).--

Filter housing shall be manufactured of polyglass with a pressure rating of 1035 kPa at 49 degrees Celsius. Filter shall be equipped with a top mounted control panel with four inlets; untreated water "in" and backwash "out" on one end, and treated water "out" and backwash "in" on the other. Filter housing shall be minimum 0.111 cubic meters in volume.

Carbon material shall consist of a mixture of active absorbent material and anthracite media. Material shall have a backwashed and drained capacity of 480 Kg per meter^3, mean particle diameter of 0.9 to 1.1 millimeters, Iodine number (min) of 920 milligram per gram, 15% maximum particles greater than #8 US Standard Sieve, 4% maximum particles smaller than #30 US Standard Sieve and 5% maximum moisture packed.

The control panel shall include pressure gauges and power cord. Voltage shall be 115 VAC. Filter shall be controlled by separate flow controller specially designed for commercial applications and shall allow flow rates of up to 100 liters per minute.

PART 3.- EXECUTION

INSTALLATION.--

General.--The carbon filter (pressurized) shall be installed in accordance with the manufacturer's recommendations. The discharge pipe shall be vented separately through the roof. Vent shall extend 610 mm above any portion of the roof within 300 mm of the roof penetration.

Wafer style spring loaded check valves shall be installed on the two discharge lines. Piping shall be installed to provide a minimum headroom clearance of 2.5 meters. Piping shall not be installed in travel areas at floor level.

FIELD QUALITY CONTROL.--

Testing.--Testing of the carbon filter (pressurized) shall be conducted by the Contractor in the presence of the Engineer. The Contractor shall notify the Engineer in writing not less than 5 days prior to the time that testing is to be conducted.

SECTION 12-12. FURNISHINGS

12-12.01 HORIZONTAL BLINDS

PART 1.- GENERAL

SUMMARY.--

Scope.--This work shall consist of furnishing and installing horizontal blinds in accordance with the details shown on the plans and these special provisions.

Horizontal blinds shall be standard, factory manufactured assemblies suitable for use on exterior wall windows.

SUBMITTALS.--

Product data.--Manufacturer's descriptive data, color chips, and installation instructions shall be submitted for approval.

PART 2.- PRODUCTS

Horizontal blinds.--

Horizontal blinds shall be nominal 25 mm wide, spring tempered virgin aluminum alloy horizontal slats supported by braided polyester ladders. Braided ladders shall hold slats at equal spaces, parallel, straight, and shall provide tilt control and adequate overlap of slats. The distance between ladders shall not exceed 585 mm. Slat tilt shall be adjustable by a transparent wand. Blinds shall be adjustable to any height using lift cords.

Hardware shall be enclosed in a metal head and the opening hardware shall be clinched to the head. All metal parts shall have a corrosion resistant coating.

PART 3.- EXECUTION

Installation.--Horizontal blinds shall be installed in accordance with the manufacturer's instructions.

12-12.02 SOLAR CONTROL FILM

PART 1.- GENERAL

Scope.--This work shall consist of furnishing and installing sun control film in accordance with the details shown on the plans and these special provisions.

SUBMITTALS.--

Product data.--Manufacturer's descriptive data and installation instructions shall be submitted for approval.

PART 2.- PRODUCTS

Film.--

Film shall be commercial quality reflective sun control film of standard manufacture, blue-gray in color, uniform in appearance and with no streaks, banding, pin holes, or thin spots. The reflective metal layer shall be protected from ultraviolet degradation.

The film shall reduce the effect of heat and sun by not less than the following:

Heat	75 percent
Glare	85 percent
Fade	85 percent

Adhesive.--

Adhesive shall be as recommended by the sun control film manufacturer.

PART 3.- EXECUTION

Installation.--Sun control film shall be installed on the interior surfaces of the glass openings in the exterior walls shown on the plans.

The glass surface shall be prepared as recommended by the film manufacturer. Film shall be fitted accurately and shall be cut neatly and square and shall come to within 1 mm of seals, stops or glazing compounds. The film shall be bonded securely to the glass surface and shall be free of bubbles, creases, or marks visible at normal viewing distance.

SECTION 12-13. (BLANK)

SECTION 12-14. (BLANK)

SECTION 12-15. MECHANICAL

12-15.01 MECHANICAL WORK

GENERAL.--

Scope.--This work shall consist of performing mechanical work in accordance with the details shown on the plans and these special provisions.

Mechanical work shall include furnishing all labor, materials, equipment and services required for providing heating, ventilating, air conditioning, plumbing and liquefied petroleum gas (LPG) 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 shall be in accordance with the requirements specified for similar type work elsewhere in these special provisions.

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 shall be flashed and sealed watertight in accordance with the requirements specified under "Sheet Metal Flashing" in Section 12-7, "Thermal and Moisture Protection," of these special provisions.

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 shall be submitted for approval.

Manufacturer's descriptive data shall include complete description, performance data and installation instructions for the materials and equipment specified herein. Control and wiring diagrams, rough-in dimensions for plumbing fixtures, and component layout shall be included where applicable.

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

Air Compressor
Clean Outs
Diffuser
Electric Water Cooler
Emergency Eye Wash and Shower
Exhaust Fan
Exhaust Fan hood
Floor Drain
Floor Hydrant
Generator
HVAC System
Kitchen Sink
Lavatory
LPG Regulator
LPG tank
Pump
Register
Service Sink
Shower
Valve Box
Valve
Water Closet
Water Heater

CLOSEOUT SUBMITTALS.--

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 specified herein shall be delivered to the Engineer at the jobsite. The instructions and parts lists shall be indexed and bound in a manual form and shall be complete and adequate for the equipment installed. Inadequate or incomplete material shall be returned. The Contractor shall resubmit adequate and complete manuals at no expense to the State.

Operation and maintenance manuals shall be submitted for the following equipment:

Air Compressor
Electric Water Cooler
Exhaust Fan
Generator
HVAC System
Pumps

QUALITY ASSURANCE.--

Codes and standards.--Mechanical work, including equipment, materials and installation, shall conform to the CBC,CMC, and to the California Code of Regulations, Title 8, Chapter 4, Division of Industrial Safety (DIS).

WARRANTY.--

Warranties and guarantees.--Manufacturer's warranties and guarantees for materials or equipment used in the work shall be delivered to the Engineer at the jobsite prior to acceptance of the contract.

12-15.02 PIPE, FITTINGS AND VALVES

PART 1.- GENERAL

SUMMARY.--

Scope.--This work shall consist of furnishing and installing pipes, fittings and valves in accordance with the details shown on the plans and these special provisions. Pipe, fittings and valves shall 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 shall be in accordance with the requirements specified under "Mechanical Insulation," in this Section 12-15.

The pipe sizes shown on the plans are nominal pipe size. No change in the pipe size shown on the plans shall be permitted without written permission from the Engineer.

The pipe and fitting classes and material descriptions shall be as specified herein. No change in class or description shall be permitted without written permission from the Engineer.

QUALITY ASSURANCE.--

Codes and standards.--Pipe, fittings and valves shall be installed in accordance with the requirements in the CPC, the manufacturer's recommendations and the requirements specified herein.

PART 2.- PRODUCTS

MATERIALS.—

Sump pump.—

The sump pump shall be a close coupled submersible type with 40 mm minimum diameter discharge, integral thermal overload protection and Type SO cable. The pump and motor shall be assembled on a single vertical stainless steel shaft fitted with a mechanical seal. The pump control shall be a diaphragm liquid level controller and shall be attached to the sump pump with Type SO cable if externally wired. Horsepower, voltage, phase, RPM, and flow and total dynamic head characteristics shall be as shown on the plans.

PIPE AND FITTINGS --

Class	Description

A1.--

Schedule 40 galvanized steel pipe conforming to ASTM Designation: A 53, with 1040 kPa galvanized malleable iron banded screwed fittings and galvanized steel couplings. The weight of the zinc coating shall be not less than 90 percent of that specified in ASTM Designation: A 53.

A2.--

Schedule 40 galvanized steel pipe conforming to ASTM Designation: A 53, with black cast iron recessed drainage fittings. For rainwater leaders, neoprene-gasket compression couplings, Smith Blair, Dresser, or equal, may be used. The weight of the zinc coating shall be not less than 90 percent of that specified in ASTM Designation: A 53.

B2.--

Schedule 40 black steel pipe conforming to ASTM Designation: A 53, with 1040 kPa black malleable iron banded screwed fittings and black steel couplings.

Steel pipe coating, where required, shall be factory applied plastic. Pipe coating shall be Standard Pipe Protection, X-Tru-Coat (0.50 mm thick); Pipe Line Service Corporation, Republic; 3M Company, Scotchkote 205 (0.30 mm thick); or equal.

B3.--

Schedule 80 black steel pipe conforming to ASTM Designation: A 53 grade B, 50 mm and smaller shall be 20 700 kPa WOG socket welding fittings and couplings or 13 800 kPa WOG threaded forged steel, ASTM Designation: A 105. 65 mm and larger shall be extra strong weight butt welding fittings and couplings.

C1.--

Hub and plain end cast iron soil pipe with neoprene gaskets conforming to Cast Iron Soil Pipe Institute's Standard 301. Pipe, fittings and gaskets shall be of one manufacturer.

C2.--

Hubless cast iron soil pipe with neoprene gaskets, corrugated stainless steel shields and stainless steel clamps conforming to Cast Iron Soil Pipe Institute's Standard 301. Joint materials shall be furnished by pipe manufacturer.

H1.--

Type DWV hard copper tubing conforming to ASTM Designation: B 306, with DWV drainage fittings, stop type couplings and threaded adapters.

H2.--

Type K hard copper tubing conforming to ASTM Designation: B 88, with wrought copper or cast bronze solder joint pressure fittings, stop type couplings and threaded adapters. Solder shall be lead-free.

H3.--

Type L hard copper tubing conforming to ASTM Designation: B 88, with wrought copper or cast bronze solder joint pressure fittings, stop type couplings and threaded adapters. Solder shall be lead-free.

P3.--

Polyvinyl chloride (PVC) standard weight pipe and fittings, Schedule 40, conforming to ASTM Designation: D 1785. Pipe shall meet or exceed requirements of National Sanitation Foundation Standard No. 14. Pipe shall have bell ends conforming to ASTM Designation: D 2672. For pipe sizes 75 mm and smaller, plain end pipe with solvent welded fittings conforming to ASTM Designation: D 2241, may be used.

Flexible Hose.--

Flexible hose shall be corrosion-resistant, 100% PVC construction. Impact, crushing and kinking resistant. Industrial grade, smooth interior.

Unions (for steel pipe).--

Unions (for steel pipe) shall be 1730 kPa, 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) shall be 1040 kPa cast bronze, ground joint, bronze to bronze seat with silver brazing threadless ends or 860 kPa 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) shall be slip or flange joint unions with soft rubber or leather gaskets. Unions shall be placed on the fixture side of the traps.

Dielectric waterway.--

Dielectric waterway shall be a premanufactured unit that incorporates an insulated interior lining at least 75 mm in length between the 2 pipes being connected while maintaining metal to metal contact on the exterior surface. Dielectric water way shall be listed by IAPMO (International Association of Plumbing and Mechanical Officials).

Insulating union.--

Insulating union or flange as applicable shall be suitable for the service on which used. Connections shall be constructed such that the 2 pipes being connected are completely insulated from each other with no metal to metal contact. Insulating couplings shall not be used. Insulating union shall be F. H. Maloney; Central Plastics; EPCO; or equal.

Insulating connection (to hot water tanks).--

Insulating connection (to hot water tanks) shall be 150 mm minimum, flexible copper tubing with dielectric union at each end and designed to withstand a pressure of 1040 kPa and a temperature of 93°C.

VALVES.--

Gate valve (65 mm and smaller).--

Gate valve (65 mm and smaller) shall be bronze body and trim, removable bonnet and non rising stem, Class 125 and same size as pipe in which installed. Gate valve shall be Crane, 438; Nibco Scott, T-113; Jenkins, 370; or equal.

Gate valve in nonferrous water piping systems may be solder joint type with bronze body and trim. Valve shall be Kitz, 59; Nibco Scott, S-113; Jenkins, 1240; or equal.

Ball valve.--

Ball valve shall be two piece, minimum 2760 kPa WOG, bronze body and chrome plated or brass ball with full size port. Valve shall be Nibco Scott, T-580; Watts, B-6000; Kitz, 56; or equal.

LPG gas valve.--

LPG gas valve shall be listed, 1730 kPa (minimum) WOG bronze ball valve. Valve shall be Jenkins, Model 30-A; Crane, Accesso; Watts; or equal.

Check valve (50 mm and larger).--

Check valve (50 mm and larger) shall be silent wafer type, full faced for installation between 860 kPa 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 shall be APCO, Series 300; CPV, 10D; Metraflex, Series 900; or equal.

FAUCET AND HYDRANTS.--

Hose faucet.--

Hose faucet shall be compression type, angle pattern, wall flange at exterior locations, tee handle, 20 mm female thread with hose end, rough chrome or nickel plated finish for locations inside building, rough brass finish for others. Hose faucet shall 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 shall be Nibco, No. 63VB; Chicago, No. 13T; or equal.

Wall hydrant.--

Wall hydrant shall be 20 mm, exposed, nickel bronze head with bronze casing, and integral vacuum breaker. Operating key shall be provided. Wall hydrant shall be J. R. Smith, Model 5609 QTSAP; Josam, Model 71070; Wade, Model 8630-89; or equal.

Floor hydrant.--

Floor hydrant shall be 20 mm, nickel bronze box with hinged, locking cover, bronze casing and hydrant, integral vacuum breaker and minimum 7 mm drain port. Operating key shall be provided. Box hydrant shall be J. R. Smith, Model 5950; Josam, Model 71980; Zurn, Model 1370; or equal.

CLEANOUTS.--

Cleanout through wall.--

Cleanout through wall shall be cast iron cleanout tee type with polished stainless access plates. Plug shall be countersunk brass or bronze with tapered threads. Cleanout shall be Wade, No. W-8460; Smith, No. 4532; Zurn, No. 1445; or equal.

Cleanout through floor.--

Cleanout through floor shall 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 shall be provided with membrane clamping flange. Plug shall be countersunk brass or bronze with tapered threads. Cleanout shall be Wade, W-7000 Series; Smith, 4023 Series; Zurn, No. 1400; or equal.

Cleanout to grade.--

Cleanout to grade shall be cast iron ferrule type. Plug shall be countersunk brass or bronze with tapered threads. Cleanout to grade shall be Wade, No. W-8450; Smith, 4420; Zurn, No 1440; or equal.

MISCELLANEOUS ITEMS.--

Water hammer arrestor.--

Water hammer arrestor shall be stainless steel body with bellows or piston. Arrestor compression chambers shall be pneumatically charged. Water hammer arrestors shall be tested and certified in accordance with the Plumbing and Drainage Institute Standard: PDI-WH201 and sized as shown on the plans.

Access door.--

Access door shall be 1.52 mm prime coated steel, face mounting square frame, minimum 300 mm x 300 mm door with concealed hinge and screwdriver latch.

Compression stop (exposed).--

Compression stop (exposed) shall 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) shall be long neck, built-in compression stops for required wall thickness, loose key and exposed parts polished chromium plated. Supplies shall be Chicago, 1771; California Brass, No. 172; or equal.

Gas regulator.--

Gas regulator shall be listed as suitable for gas and equipped with full capacity relief valve, low pressure safety shut-off and weatherproof and insect proof vent for outside installation. Capacity shall be as shown on the plans. Gas regulator shall be Fisher; Reliance; Rockwell; or equal.

Pipe hanger (for piping supported from overhead).--

Pipe hanger (for piping supported from overhead) shall be Grinnell, Model 269; Super Struct, C711; or equal.

Pipe wrapping tape and primer.--

Pipe wrapping tape shall be pressure sensitive polyvinyl chloride or pressure sensitive polyethylene tape having nominal thickness of 0.50 mm. Wrapping tape shall be Polyken, 922; Manville, Trantex VID-20; Scotchrap, 51; or equal.

Pipe wrapping primer shall be compatible with the pipe wrapping tape used.

Floor, wall, and ceiling plates.--

Floor, wall, and ceiling plates shall be chromium plated steel or plastic plates having screw or spring clamping devices and concealed hinges. Plates shall be sized to completely cover the hole.

Valve box.--

Valve box shall be precast high density concrete with polyethylene face and cast iron traffic rated cover marked "WATER," "GAS" or "CO-SS" as applicable. Extension shall be provided as required. Valve box shall be Christy, B3; Brooks Products Company, 3TL; Frazer, 3; or equal.

Roof drain.--

Roof drain shall be cast iron body, with integral flashing clamp and gravel stop with seepage openings, 400 mm nominal polyethylene low profile dome, 75 mm caulk or no-hub outlet and underdeck clamp. Roof drain shall be J. R. Smith, 1010; Zurn, Z-100; Wade, W-3500; or equal.

Floor drain.--

Floor drain shall be cast iron body and flashing collar, adjustable nickel bronze 150 mm strainer head with seepage openings and caulk or no-hub outlet. Floor drain shall be round or square as shown on the Architectural plans. Floor drain shall be J. R. Smith, 2005/2010; Wade, W-1100; Zurn, Z-415; or equal.

Floor drain.--(Inspection Bays)

Floor drain shall be heavy duty trench type, ductile iron body and flange. Floor drain shall include ductile iron slotted hole grate, and no-hub single outlet, dome bottom strainer, end plates and gasket. Floor drain shall be as shown on the Architectural plans. Floor drain shall be J. R. Smith, 2885-F; Wade, W-2950; Zurn, Z-664; or equal.

Trench drain.--

Trench drain shall be manufactured, pre-sloped drain system, including molded fiberglass reinforced resin channels, support brackets, heavy duty steel frames and cast-iron slotted grates. Channels shall be provided in minimum one meter nominal modules with outlets, end caps, and connectors. Grates shall have bolted anchorage assemblies.

Trench drain modules shall have a minimum slope of 0.60 percent and minimum flow rate of 280 liters per minute. Trench drain shall be Advanced Building Technologies, Inc., Polydrain; Zurn, Flo Thru; or equal.

Automatic trap primer.--

Automatic trap primer shall be bronze body with removable operating parts and gasketed cover. Primer shall be designed for horizontal in-line installation and have an integral vacuum breaker. Trap primer shall Jonespec, 77250; Zurn, Z-1022; Josam, 88250, or equal.

Tap primer access door.--

Trap primer access door shall be 16-gage stainless steel, face mounting square frame 300mm x300mm door with concealed hinge and screwdriver latch..

PART 3.- EXECUTION

INSTALLATION.--

INSTALLATION OF PIPES AND FITTINGS.--

Pipe and fittings.--Pipe and fittings shall be installed in accordance with the following designated uses:

Designated Use	Pipe and Fitting Class
Domestic water (CW and HW) in buildings	H3
Domestic water underground within 1.5 m of the building	H2
Sanitary drain piping above ground in building	H1,-C1, or C2
Sanitary drain and vent piping underground within 1.5 m of the building	C1 or C2
Sanitary vent piping above ground in building	A2, H1, C1, or C2
Liquefied petroleum gas (LPG), 860 kPa or less, above ground	A1 or B2
LPG, 860 kPa or less, underground	B2 (plastic coated)
LPG, exceeding 860 kPa	B3
Compressed air	A1
Scale pit sump pump piping (inside pit and through wall)	A1
Scale pit sump pump piping (outside pit wall)	P3
Rainwater Downspouts	C1 or C2
Equipment drains and relief valve discharge	H3

Installing piping.--Water piping shall be installed generally level, free of traps and bends, and arranged to conform to the building requirements.

Piping installed underground shall be tested as specified elsewhere in these special provisions before backfilling.

Public use areas, offices, rest rooms, locker rooms, crew rooms,-storage rooms in office areas, hallway type rooms, and similar type use areas shall have concealed piping.

Equipment bay, shall have exposed piping.

Piping shall not be run in floor fill, except as shown on the plans.

Piping shall be installed parallel to walls. All obstructions shall be cleared, headroom preserved and openings and passageways kept clear whether shown or not. Piping shall not interfere with other work.

Where pipes pass through exterior walls, a clear space around pipe shall be provided. Space shall be caulked water tight with silicone caulk.

Underground copper pipe shall have brazed joints. Underground plastic pipe shall be buried with No. 14 solid bare copper wire. Wire ends at pipe ends shall be brought up 200 mm and looped around pipe.

Exposed supply and drain piping in rest rooms shall be chrome finished.

Compressed air piping shall be pitched to low point. Ball valved drips shall be provided at all low points. Branches shall be taken off top of main.

Gas piping shall not be installed under building concrete slabs or structure. An insulating connection and valve shall be installed above ground at each building supply.

Gas piping shall be pitched to equipment or to low point and provided with a 200 mm minimum dirt leg.

Forty-five degree bends shall be used where offsets are required in venting. Vent pipe headers shall be sloped to eliminate any water or condensation.

Vent piping shall extend a minimum of 200 mm above the roof.

Horizontal sanitary sewer pipe inside buildings shall be installed on a uniform grade of not less than 2 percent unless shown otherwise on the plans.

Drainage pipe shall be run as straight as possible and shall have easy bends with long turns.

Wye fittings and 1/8 or 1/16 bends shall 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 shall not be installed below sewer pipe in the same trench or at any crossing, or below sewer pipe in parallel trenches less than 3 m apart.

When a water pipe crosses above a sewer pipe, a vertical separation of at least 300 mm between the top of the sewer and the bottom of the water pipe shall be maintained.

When water and sewer pipe is installed in the same trench, the water pipe shall be on a solid shelf at least 300 mm above the top of the sewer pipe and 300 mm to one side.

Pipe sleeves.--The Contractor shall provide sleeves, inserts and openings necessary for the installation of pipe, fittings and valves. Damage to surrounding surfaces shall be patched to match existing.

PVC pipe sleeves shall be provided where each pipe passes through concrete floors, footings, walls or ceilings. Inside diameter of sleeves shall be at least 20 mm larger than outside diameter of pipe. Sleeves shall be installed to provide at least 10 mm space all around pipe the full depth of concrete. Space between pipes and pipe sleeves shall be caulked watertight.

Pipe penetrations in fire rated assemblies.--Where pipes pass through fire rated wall, floor or ceiling assemblies, the penetration shall be protected in accordance with the requirements specified under "Through-Penetration Firestopping," in Section 12-7, "Thermal and Moisture Protection," of these special provisions.

Cutting pipe.--All pipe shall be cut straight and true and the ends shall be reamed to the full inside diameter of the pipe after cutting.

Damaged pipe.--Pipe that is cracked, bent or otherwise damaged shall be removed from the work.

Pipe joints and connections.--Joints in threaded steel pipe shall 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 shall be made tight. Long screw or other packed joints will not be permitted. Any leaky joints shall be remade with new material.

Exposed polished or enameled connections to fixtures or equipment shall be made with special care, showing no tool marks or threads.

Cleaning and closing pipe.--The interior of all pipe shall be cleaned before installation. All openings shall be capped or plugged as soon as the pipe is installed to prevent the entrance of any materials. The caps or plugs shall remain in place until their removal is necessary for completion of the installation.

Securing pipe.--Pipe in the buildings shall be held in place by iron hangers, supports, pipe rests, anchors, sway braces, guides or other special hangers. Material for hangers and supports shall be compatible with the piping or neoprene isolators shall be used. Allowances shall be made for expansion and contraction. Steel pipe shall have hangers or supports every 3 m. Copper pipe 25 mm or smaller shall have hangers or supports every 2 m and sizes larger than 25 mm shall have hangers or supports every 3 m. Plastic pipe shall have hangers or supports every 1 m. Cast iron soil pipe with neoprene gaskets shall be supported at each joint. Vertical pipes shall be supported with clamps or straps. Horizontal and vertical piping shall be securely supported and braced to prevent swaying, sagging or flexing of joints.

Hangers and supports.--Hangers and supports shall 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 shall be spaced and distributed so as to avoid load concentrations and to minimize the loading effect on the building structure.

Hangers and supports shall be sized to fit the outside diameter of pipe or pipe insulation. Hangers shall be removable from around pipe and shall have provisions for vertical adjustment after erection. Turnbuckles may be used.

Materials for holding pipe in place shall be compatible with piping material.

Hanger rods shall be provided with locknuts at all threaded connections. Hanger rods shall be sized as follows:

Pipe Size	Minimum Hanger Rod Diameter
15 mm to 50 mm	10 mm
65 mm to 87 mm	13 mm
100 mm to 125 mm	16 mm

Wrapping and coating steel pipe.--Steel pipe buried in the ground shall be wrapped or shall be plastic coated as specified herein:

1. Wrapped steel pipe shall be thoroughly cleaned and primed as recommended by the tape manufacturer.
2. Tapes shall be tightly applied with 1/2 uniform lap, free from wrinkles and voids with approved wrapping machines and experienced operators to provide not less than 1.00 mm thickness.
3. Plastic coating on steel pipe shall be factory applied. Coating imperfections and damage shall be repaired to the satisfaction of the Engineer.
4. Field joints, fittings and valves for wrapped and plastic coated steel pipe shall be covered to provide continuous protection by puttying and double wrapping with 0.50 mm thick tape. Wrapping at joints shall extend a minimum of 150 mm over the adjacent pipe covering. Width of tape for wrapping fittings shall not exceed 50 mm. Adequate tension shall be applied so tape will conform closely to contours of fittings. Putty tape insulation compounds approved by the Engineer shall be used to fill voids and provide a smooth even surface for the application of the tape wrap.

Wrapped or coated pipe, fittings, and filed joints shall be approved by the Engineer after assembly. Piping shall be placed on temporary blocks to allow for inspection. Deficiencies shall be repaired to the satisfaction of the Engineer before backfilling or closing in.

Thrust blocks.--Thrust blocks shall be formed by pouring concrete between pipe and trench wall. Thrust blocks shall be sized and so placed as to take all thrusts created by maximum internal water pressure.

Plastic pipe underground shall be provided with thrust blocks and clamps at changes in direction of piping, connections or branches from mains 50 mm and larger, and all capped connections.

Union.--Unions shall be installed where shown and at each threaded or soldered connection to equipment and tanks. Unions shall be located so piping can be easily disconnected for removal of equipment or tanks. Unions shall be omitted at compression stops.

Dielectric waterway.--Dielectric waterway shall 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 shall be provided where shown and at the following locations:

1. In metallic water, gas and air service connections into each building. Insulating connections shall 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 shall be bonded in accordance with the CEC. Bonding shall all be coordinated with electrical work.

Compression stop.--Each fixture, including hose faucets, shall 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 on the plans or otherwise permitted by the Engineer.

INSTALLATION OF VALVES.--

Exterior valves.--Exterior valves located underground shall be installed in a valve box marked "Water." Extensions shall be provided as required.

INSTALLATION OF FAUCETS AND HYDRANTS.--

Hose faucet and hydrants.--Faucets and hydrants shall be installed with outlets 0.5 m above finished grade.

INSTALLATION OF CLEANOUTS.--

Cleanouts.--A concrete pad 0.5 m long and 100 mm thick shall be placed across the full width of trench under cleanout Wye or 1/8 bend. Cast iron soil pipe (C1 or C2) and fittings shall be used from Wye to surface. Required clearance around cleanouts shall be maintained.

Cleanout risers outside of a building installed in a surface other than concrete shall terminate in a cleanout to grade. Cleanout to grade shall terminate in a valve box with cover marked "CO-SS". Top of box shall be set flush with finished grade. Cleanout plug shall be 100 mm below grade and shall be located in the box to provide sufficient room for rodding.

Cleanout risers installed in tile and concrete floors, including building aprons and sidewalks, shall terminate in a cleanout through floor.

INSTALLATION OF MISCELLANEOUS ITEMS.--

Water hammer arrestor.--Water hammer arrestor shall be installed so that they are vertical and accessible for replacement. Water hammer arrestor shall be installed with access door when in walls or there is no access to ceiling crawl spaces. Access door location shall be where shown on the plans or as approved by the Engineer.

Gas appliance connection.--Gas valve and flexible connector shall be provided for gas piping at each appliance. Appropriately rated gas cocks may be used in 15 mm gas pipe. Cock or valve shall be within one meter of the appliance.

Gas regulator.--Gas regulator shall be installed complete with dirt leg, capped test tee, union, insulating union, gas valve and fittings.

Trench Drain.--Trench drain shall be installed where shown on the plans. Support brackets, leveling devices, trenching, and bedding concrete shall in accordance with the manufacturer's recommendations. Grates shall be installed flush with the finished floor, and each grate section shall be bolted to the trench drain frame.

Flushing completed systems.--All completed systems shall be flushed and blown out.

Chlorination.--The Contractor shall flush and chlorinate all domestic water piping and fixtures.

Calcium hypochlorite granules or tablets, if used, shall not be applied in the dry form, but shall first be dissolved into a solution before application.

The Contractor shall take adequate precautions in handling chlorine so as not to endanger workmen or damage materials. All pipes and fittings shall be completely filled with water containing a minimum of 50 ppm available chlorine. Each outlet in the system shall be opened and water run to waste until a strong chlorine test is obtained. The line shall then be closed and the chlorine solution allowed to remain in the system for a minimum of 24 hours so that the line shall contain no less than 25 ppm chlorine throughout. After the retention period, the system shall be drained, flushed and refilled with fresh water.

FIELD QUALITY CONTROL.--

Testing.--The Contractor shall test piping at completion of roughing in, before backfilling, and at other times as directed by the Engineer.

The system shall be tested as a single unit, or in sections as approved by the Engineer. The Contractor shall furnish necessary materials, test pumps, instruments and labor and notify the Engineer at least 3 working days in advance of testing. After testing, the Contractor shall repair all leaks and retest to determine that leaks have been stopped. Surplus water shall be disposed of after testing as directed by the Engineer.

The Contractor shall take precautions to prevent joints from drawing while pipes and appurtenances are being tested. The Contractor shall repair damage to pipes and appurtenances or to other structures resulting from or caused by tests.

General tests.--All piping shall be tested after assembly and prior to backfill, pipe wrapping, connecting fixtures, wrapping joints and covering the pipe. Systems shall show no loss in pressure or visible leaks.

The Contractor shall test systems according to the following schedule for a period of not less than 4 hours:

Test Schedule		
Piping System	Test Pressure	Test Media
Sanitary sewer and vent	3.0 m head	Water
Water	860 kPa	Water
Gas)	690 kPa	Air
Air	860 kPa	Air
Force Main	860 kPa	Water

During testing of water systems, valves shall be closed and pipeline filled with water. Provisions shall be made for release of air.

Sanitary sewers shall be cleared of obstructions before testing for leakage. The pipe shall be proved clear of obstructions by pulling an appropriate size inflatable plug through the pipe. The plug shall be moved slowly through the pipe with a tag line. The Contractor shall remove or repair any obstructions or irregularities.

12-15.03 MECHANICAL INSULATION

PART 1.- GENERAL

SUMMARY.--

Scope.--This work shall consist of furnishing and installing mechanical insulation in accordance with the details shown on the plans and these special provisions.

Piping insulation shall be installed on all domestic cold and 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, shall be insulated.

Duct insulation shall be installed on all rigid ductwork installed in concealed non-conditioned spaces.

Duct liner shall be installed in all rectangular ductwork installed in exposed non-conditioned spaces and in exterior locations. Plenum liner shall be installed in all plenums in non-conditioned spaces or in walls facing a non-conditioned space.

QUALITY ASSURANCE.--

Codes and standards.--Mechanical insulation shall conform to California State Energy Commission regulations and, where applicable, shall meet American Society of Testing and Materials (ASTM) standards.

All materials shall bear the label of the Underwriters Laboratory (UL) or other approved testing laboratory indicating that the materials proposed for use conform to the required fire hazard ratings.

Pipe safety insulation shall conform to Section 1504(b) of the CPC.

PART 2.- PRODUCTS

MATERIAL.--

General.--All pipe insulation and wrapping material, including adhesives and jackets, located within buildings shall 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 in accordance with ASTM Designation: E 84.

Duct insulation and wrapping material, including adhesives and jackets, located within buildings shall be certified to have a composite flame spread of not more than 25 and smoke development rating of not more than 50 when tested in accordance with ASTM Designation: E 84.

Exterior piping insulation

Piping insulation shall be polyurethane foam insulation with a service temperature range of 0°C to 120°C. A 0.15 mm vapor barrier shall be applied over the top off the insulation. The vapor barrier shall be installed with an adhesive as recommended by the manufacturer.

PVC jacket.--

PCV jacket shall be rated for a service temperature of 80°C. PVC jacket shall include covers specifically designed to cover pipe fittings.

Pipe insulation.--

Pipe insulation shall be closed cell, elastomeric material in a flexible tubular form. Insulation shall have a service temperature range between -40°C and 93°C, a minimum vapor transmission rating of 0.29 Perm-m, and a minimum thermal resistance of R-0.5 $K \bullet m^2/W$.

Pipe safety insulation.--

Pipe safety insulation for P-traps, hot water supply pipes and angle valves shall be molded closed cell vinyl or closed cell foam with exterior vinyl surface. Pipe safety insulation shall be configured to protect against contact. Pipe safety insulation shall be Truebro Inc., Handi Lav-guard; Plumberex Specialty Products, Handy Shield; or equal.

External duct insulation.--

External duct insulation shall be 38 mm thick, 0.5 kg density glass-fiber blanket type. Material and coatings shall be fire resistive and shall be approved by the State Fire Marshal. External duct insulation shall 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 shall be 25 mm minimum thickness. Material and coatings shall be fire resistive and shall be approved by the State Fire Marshal. Liner shall be Gustin-Bacon, Ultra-Liner duct insulation; Owens-Corning Fiberglas, Type CE; Gustin-Bacon, coated insulation Board No. 90-A; Owens-Corning Fiberglas 0.7 kg density coated flexible duct liner; Johns-Manville, MicroBar, or 0.7 kg density coated Microlite; Pittsburgh Plate Glass, Superfine 0.7 kg density coated interior duct insulation; or equal.

Adhesive.--

Adhesive shall be non-flammable type: Benjamin Foster Company, No. 85-20 Spark Safe; Goodloe E. Moore Company, Tuff Bond No. 6; Permacel, No. PA-3l0; 3M, No. 38 Insulation Adhesive; Swift's, No. 7228 brush type or No. 7336 spray type; Chicago Mastic, 17-461; or equal.

Studs.--

Studs shall be cement-in-place type, pneumatic driven type or percussive welding type, and shall have 25 mm minimum diameter washers.

Insulation inserts.--

Insulation inserts at pipe hangers supports for pipes NPS 2 or larger shall be calcium silicate, cellular glass, or other acceptable material of the same thickness as the adjacent insulation and not less than 6 kg density.

PART 3.- EXECUTION

INSTALLATION.--

General.--Insulation materials shall be neatly installed with smooth and even surfaces, jackets drawn tight and smoothly cemented down.

Insulation material shall 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 shall be in accordance with the following, except that unions, unless integral with valves, and flexible connections shall not be insulated.

a. Where insulation butts against flanges or is discontinued, insulation shall be tapered to pipe to allow for covering jacket to completely seal off end of insulation.

   Insulation shall 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 shall be applied to fittings, valves, and strainers and troweled smooth to thickness of adjacent covering. Strainer cleanout plugs shall remain accessible. Covers fabricated from molded pipe covering may be used in lieu of cement, provided covers are neat and well secured.

b. Jacket flap shall be sealed down with factory applied self-sealing lap. Seams shall be lapped not less than 40 mm. Jacket shall be secured with aluminum bands installed at 300 mm centers.

c. Exposed outdoor insulation shall have an additional 0.40 mm minimum thickness aluminum jacket applied over the completed insulation. The jacket shall have a factory applied moisture barrier and shall be Childers; Smith; or equal.

   End joints shall be lapped with aluminum holding traps located directly over the lap. Additional aluminum holding straps shall be placed at 200 mm centers. Jacket at ells and tees shall be mitered, or premanufactured fitting jackets shall be provided, with additional aluminum holding bands, as required. All joints shall be sealed watertight using silicon type, heat resistant sealant.

d. In-ground insulation shall have an additional PVC jacket applied over the completed insulation and vapor barrier. PVC jacket shall be made watertight with adhesive or sealant as recommended by the PVC jacket manufacturer.

Pipe insulation, where used, shall be installed on hot and cold 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 shall be installed in accordance with the manufacturer's recommendations.

Duct insulation.--Ragged edges shall be repaired or taped. Coverings shall be neatly finished at joints and edges. Each joint shall have a 50 mm minimum lap.

Where transitions are made between externally covered ducts and lined ducts, the lined duct shall be overlapped 200 mm with external covering.

Insulation shall be flush with but not cover control devices, damper controls or access doors.

Before insulation is wrapped around concealed ducts, an adhesive shall be spot applied at a maximum of 100 mm centers on each side of the ducts to prevent sagging of the insulation. Insulation shall be wrapped entirely around the ducts and shall be wired securely in place with No. 16 copper clad wire, metal bands at least 10 mm wide or plastic ties. Supports shall be spaced a maximum of 300 mm on centers. Metal bands shall be installed with the use of a banding machine. Seams in the insulation shall be taped.

The finished insulation covering shall be even and level and shall not contain humps.

Plenum and duct liner.--Plenums and exposed ducts shall be lined with plenum and duct liner. Plenums and ducts shall be sized to provide the clear inside dimensions shown on plans after the liner is installed .

The insulation shall be applied with coated side exposed to air stream to prevent surface erosion.

The lining shall be fastened in place with adhesive and with studs with washers spaced a maximum of 500 mm on center each way.

Applying adhesive.--The adhesive shall be liberally applied over entire interior surfaces of ducts or plenums.

Stud installation.--Studs shall be installed as follows:

a. Cement-In-Place Type Studs.--Cement-in-place type studs shall be cemented in place with adhesives manufactured for this purpose and shall be as recommended by the stud manufacturer. Cement-in-place type studs shall be used where concrete walls form part of plenum.

b. Percussive Welding Type Studs.--Percussive welding type studs shall be carefully welded in place with current settings that will not appreciably burn galvanizing on opposite side of the sheet metal.

Pneumatic Driven Type Studs.--At locations where pneumatic driven type studs are used, hardened steel backup plates or dollies shall be used under the sheet metal.

12-15.04 PLUMBING FIXTURES

PART 1.- GENERAL

SUMMARY.--

Scope.--This work shall consist of furnishing and installing plumbing fixtures in accordance with the details shown on the plans and these special provisions.

PART 2.- PRODUCTS

General.--Plumbing fixtures shall be white in color and shall meet the following requirements:

Water closet (disabled accessible, 6 liters per flush, floor mounted with tank).--

Disabled accessible water closet shall be 6 liters per flush maximum, vitreous china, siphonable jet, 410 mm to 440 mm high elongated bowl, close coupled tank, floor mounted, with solid plastic open front elongated seat with check hinges. Water closet shall meet or exceed Americans with Disabilities Accessibility Act Guidelines (ADAAG) and ANSI Standards: A117.1 and A112.19.2. Closet and accessories shall be of the following types or equal:

	American Standard	Crane	Universal Rundle
Closet	“Cadet 17 EL1.6/PA" 2168.100 or 4086.800	"Hymont” 3-154E or 3-152 with3-655	“Atlas 1.5” UR 4078-341 or UR 4078-342
Seat	Church 5321.070	Olsonite 95	Benke 527

Lavatory (wall-mounted).--

Lavatory shall be vitreous china, with back, integral perforated grid drain, drilled for 102 mm centers, size 508 mm x 457 mm, with single extra long lever mixing faucet and chair carrier with concealed arms. Lavatory shall be equipped with temperature controls to limit the hot water supply to 43°C. Lavatory shall be equipped with a flow limiting device that limits the flow rate of hot water to no more than 2 liters per minute. Lavatory and accessories shall be of the following types or equal:

	Eljer	Crane	Kohler
Lavatory	"Lucerne" 0355.012	"Norwich" 1-194-V	"Greenwich" K-2032
Drain	--	C-1065-G or Moen 52659	K-7715
Supplies	Brass Craft FR1711C	C-1151 or Moen 52664	K-7605
Faucet	2385.130	Moen 8400	K-15592-5
Trap	32 mm chromium plated brass exposed bent tube adjustable 1.37 mm (17-gage) minimum thickness.		
Carrier	Concealed wall mounted carrier with leveling screws and locking devices; Zurn, J.R. Smith, Josam, Wade, Jonespec, or equal.		

Mop sink.--

Mop sink shall be acid resisting enameled cast iron, 711 mm x 711 mm outside dimensions, 75 mm trap, vinyl coated rim guard, vacuum breaker faucet with hose and wall hook. Sink and accessories shall be of the following types or equal:

	American Standard	Eljer	Kohler
Mop sink	"Florwell" 7740.020	"Custodial" 242-0050	"Whitby" K-6710
Strainer	7721.038	803-0630	K-9146
Faucet	8344.111	749-1450	K-8928

Service sink.--

Service sink shall be acid resisting enameled cast iron, plain undrilled back, stainless steel strainer, stainless steel or chrome plated sheet brass rim guard on three sides, size approximately 560 mm x 460 mm, with 75 mm trap with cleanout and floor mounting flange. Sink and accessories shall be of the following types or equal:

	American Standard	Eljer	Kohler
Service sink	"Lakewell" 7692.023	242-0120	"Bannon" K-6718
Strainer	8301.061	-----	-----
Trap	7798.176	804-1060 w/strainer	K-6673 w/strainer
Faucet	Bucket hook, vacuum breaker, integral stops, top brace, long spout with hose threads.		
	8344.111	749-1200	K8907

Kitchen sink.--

Kitchen sink shall be single compartment, self reaming stainless steel, 3-hole faucet drilling integral soap dish, stainless steel strainer. Satin finish with standard drain. Single lever chrome finish mixing faucet, no splash swing spout.

Water heater (LPG).--

Water heater shall be minimum capacity as shown on plans, designed for minimum 860 kPa, glass lined, and equipped with LPG pressure regulator, magnesium anodes, cold water drop tube, high temperature energy shut-off device, valved drain, high density R-1.4 K• m^2/W minimum foam insulation and finished with a steel jacket with baked enamel finish. Water heater shall meet the requirements of the California Energy Commission.

Water heater shall be equipped with an ASME labeled, tank mounted, pressure and temperature relief valve sized for maximum input.

Expansion Tank.--

Expansion tank shall diaphragm type, or bladder type. Expansion tank shall be factory pre-charged, welded steel and an internal butyl diaphragm or butyl bladder. ANSI/NSF6 approved and ASME rated. Install at 1800 mm from floor and as shown on the plans and manufacturer recommendations.

Electric water cooler (wall mounted).--

Electric water cooler shall be wall mounted, simulated recessed, and shall produce a minimum of 28 liters of 10°C water per hour based on an inlet water temperature of 27°C and an ambient room temperature of 32°C. Cooler shall have self-closing, pushbutton bubbler with guard, automatic stream regulator, loose key stop, adjustable thermostat, and cast brass P-trap. Compressor shall be hermetically sealed, positive start with fan cooled condenser. Electric water cooler shall be provided with 3-wire grounded cord and plug.

Electric water cooler shall have stainless steel top and steel cabinet with baked enamel finish.

Electric water cooler shall be Haws, HWSR8; Elkay, EHF-8; Sunroc, PSR-8; or equal.

Electric water cooler (disabled accessible, wall mounted).--

Electric water cooler shall be wall mounted, wheelchair accessible, and shall produce a minimum of 28 liters of 10°C water per hour based upon an inlet water temperature of 27°C and an ambient room temperature of 32°C. Cooler shall have self closing, front and side mounted pushbar actuators, shielded bubbler, automatic stream regulator, loose key stop, adjustable thermostat and cast brass P-trap.

Compressor shall be hermetically sealed, positive start with fan cooled condenser and shall be mounted above the cooler top. Cooler shall be provided with 3-wire grounded plug and cord.

Electric water cooler shall be Haws, HWCA8D; Sunroc, HCWC-8S; Elkay, EHFS-8; or equal.

Emergency eyewash and shower.--

Emergency eyewash and shower shall be separate drench shower and eye bath, 32 mm minimum, galvanized steel pipe stand with 229 mm floor mounting flange and equipped with 216 mm x 279 mm pictorial and worded emergency identification sign.

Shower head shall have a 254 mm diameter ABS plastic head with a stay-open ball valve operated by a rigid pullrod with triangular handle.

Eyewash shall have a 254 mm diameter stainless steel bowl, anti-surge heads and circular chrome plated spray ring to bathe the entire face, dust cover assembly, and a stay-open ball valve operated by a flag handle. Eyewash unit shall be mounted on the shower pipe stand.

Emergency eyewash and shower shall be Haws, 8346; Speakman, SE-607; Western, 9231; or equal.

PART 3.- EXECUTION

INSTALLATION.--

General.--All finish for exposed metal on any fixture, including wall flanges, bolts, nuts and washer, shall be polished chrome plated.

Fixtures shall be sealed to wall or floor with silicone caulk bead.

All exposed metal surfaces on fixture supports shall be enameled to harmonize with fixtures.

Wall mounted fixtures shall be installed on concealed chair carriers designed to support weight of fixture from the floor, made for the specific fixture to be supported and for the particular installation conditions.

All fixtures, including showers, shall be provided with accessible metal stop valves.

Hot water supply, trap and tailpiece on lavatories shall be wrapped with insulating material.

Flush valves for fixtures designated on the plans as disabled accessible shall be installed so that the valve handle is on the widest side of the toilet space.

FIXTURE MOUNTING HEIGHTS.--

General.--Unless otherwise noted, fixtures shall be mounted at the heights shown on the plans.

Service sink.--Service sink double faucet shall be mounted on wall above sink back with spout outlet face 400 mm above service sink rim.

Mop sink.--Mop sink double faucet shall be mounted on wall above sink back with spout outlet face one meter above the floor.

Water heater.--Water heater shall be installed with seismic restraints, inlet ball valve and insulating connections, and 20 mm pressure and temperature relief drain pipe.

Emergency eyewash and shower.--Emergency eyewash and shower shall be installed with a rigid bracket located 1.2 m above the floor. Bracket shall be minimum 1.52 mm (16-gage) steel and shall be braced to the wall.

FIELD QUALITY CONTROL.--

Testing.--The Contractor shall test piping in accordance with the requirements specified elsewhere in these special provisions.

All installed fixtures shall be tested for proper operation after all plumbing work has been completed.

12-15.05 WHEELCHAIR ACCESSIBLE SHOWER UNIT

PART 1.- GENERAL

SUMMARY.--

Scope.--This work shall consist of furnishing and installing a wheelchair accessible shower unit and fittings in accordance with the details shown on the plans and these special provisions.

SUBMITTALS.--

Product data.--Manufacturer's descriptive data, installation instructions and color palette shall be submitted for approval. The color will be selected from the manufacturer's standard product line by the Engineer after approval of the contract.

QUALITY ASSURANCE.--

Codes and standards.--Shower units shall conform to the requirements of the California State Accessibility Standards contained in the CBC.

PART 2.- PRODUCTS

Shower stall.--

Shower stall shall be single unit, single piece construction with clear interior dimensions of 1065 mm wide, 1220 mm deep, with an entrance width of 915 mm, and no obstruction at the threshold. Shower stall shall be fabricated from gel-coated fiberglass or acrylic with a Class I Flame Spread. Shower unit shall be reinforced to accommodate the grab bars and seat.

Shower unit shall have a threshold or recessed drop, a maximum of 13 mm in height, sloped at an angle not exceeding 45 degrees from the horizontal. The floor shall be slip-resistant, sloping a maximum of 4 percent to a drain located near the rear wall.

Shower unit shall 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 1112 N 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 1525 mm 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 shall be Crane; Florestone; Maron and Associates; or equal.

PART 3.- EXECUTION

INSTALLATION.--

General.--Shower shall be installed with the manufacturer's instructions. All joints shall be sealed and caulked watertight.

12-l5.06 LIQUEFIED PETROLEUM GAS (LPG) SYSTEM

PART 1.- GENERAL

SUMMARY.--

Scope.--This work shall consist of furnishing and installing a liquefied petroleum gas (LPG) distribution system in accordance with the details shown on the plans and these special provisions.

The LPG distribution system shall include an LPG storage tank, pipe, fittings, valves and such other system components necessary for the proper installation and operation of the LPG system.

Permits.--The Contractor shall obtain the required permits to operate pressure vessels in accordance with the requirements of the State Division of Industrial Safety (DIS), shall pay the costs for such permits and shall perform all required tests. Such permits shall be posted under glass at the site of the work.

QUALITY ASSURANCE.--

Codes and standards.--All work performed and materials installed shall conform to the California Building Standards Code, Title 24, Part 4 and Part 5; the California Code of Regulations, Title 8, Chapter 4, Subchapter l, Article 5; and National Fire Protection Association (NFPA) Standard No. 58-2001.

PART 2.- PRODUCTS

Tank.--

Tank shall be constructed and stamped for 1730 kPa working pressure in accordance with the ASME Code for "Unfired Pressure Vessels for Petroleum Liquids and Gases." Tank shall have certification of testing for 2590 kPa. Tank shall include a rainhood with top opening for relief valve and welded steel supports with provisions for bolting to the concrete foundation. Tank shall be shop prime painted with 2 coats of red oxide ferrous metal primer. Primer shall not contain lead pigments.

Tank valves, fittings, regulators and accessories.--

Tank valves, fittings, regulators and accessories shall be UL listed and labeled. Valves, fittings, regulators and accessories shall be as required by the California Codes listed above and shall be Rego, Fisher, Rockwell, or equal.

Pipe and fittings (at the tank and underground).--

Pipe and fittings shall be as specified under "Pipe, Fittings and Valves" in Section 12-15, "Mechanical," of these special provisions. Piping below grade shall be factory coated.

Warning signs.--

Warning signs shall be sheet steel, not less than 1.2 mm thick (18-gage) with a baked enamel coating and shall have red letters on a white background.

PART 3.- EXECUTION

INSTALLATION.--

General.--The LPG tank and system components shall be installed in accordance with NFPA Standard No. 58-2001, the manufacturer's instructions and the approved installation drawings.

Foundation.--The tank shall be installed on a concrete foundation. The tank installation shall include seismic restraint and provisions for expansion and contraction. Neoprene or asphalt impregnated felt anti-corrosion pads shall be installed between the saddle and the concrete foundation.

The concrete foundation shall be constructed in accordance with the requirements specified for minor work under "Cast-In-Place Concrete" in Section 12-3, Concrete and Reinforcement," of these special provisions.

All openings shall be capped until ready for field connections. Piping shall be supported adequately, with allowance for swing joint movement.

Piping installation.--Piping shall be buried 900 mm minimum depth and shall be provided with cathodic protection. Insulating unions shall be installed at least 150 mm above grade between the coated pipe and the above ground pipe lines.

Joints for underground piping shall be cleaned, primed and wrapped in accordance with the requirements specified under "Pipes, Fittings and Valves" in Section 12-15, "Mechanical," of these special provisions. The cleaning, priming and wrapping of pipe joints shall be completed after testing the piping system.

Coated pipe inspection.--The coating on all coated pipe shall be inspected for flaws prior to any testing, and shall be reinspected after testing and before the cleaning, priming and wrapping of the joints.

Finish painting.--After installation of the tank, all areas where the shop applied primer has been damaged or has deteriorated shall be thoroughly cleaned and spot painted with primer. Spot painted areas shall be approved by the Engineer prior to the application of the finish coats.

Two applications of the finish coating shall be applied to shop primed steel surfaces exposed to view after the erection of the tank has been completed. The finish coating shall be white gloss, exterior, alkyd enamel.

The word "FLAMMABLE" shall be painted on each side of the tank. Sign lettering shall be standard-type not less than 100 mm in height. The lettering color shall be red and shall be in sharp contrast to the color of the tank.

Warning sign installation and application.--Four warning signs with the words "NO SMOKING, OPEN FLAMES OR OTHER SOURCE OF IGNITION PERMITTED WITHIN 15.2 METERS (50 FEET)" shall be placed at the locations shown on the plans. Sign lettering shall be standard-type not less than 38 mm in height. The lettering color shall be in sharp contrast to the color of the sign.

FIELD QUALITY CONTROL.--

Testing.--After construction, installation and pipe testing, the LPG system shall be pressure tested with air or nitrogen. The system shall be tested for a minimum time period of 30 minutes at 1380 kPa. If any leaks are detected during the test, the system shall be repaired and retested until no leaks are detected.

After the pressure tests have been completed, the LPG system shall be purged 5 times with methanol (methyl alcohol), using one-liter per 1000 liters water capacity, to remove moisture from the system.

After testing and purging the system, the tank shall be filled to 25 percent of the water capacity of the tank, measured in liters, with State-furnished LPG as provided under "State-Furnished Materials" in Section 8, "Materials," of these special provisions.

An operational test shall be performed on the LPG system upon completion of the pressure tests, the purging of the system and the delivery of the State furnished LPG fuel. The operational test shall consist of operating all LPG equipment for a period of three 24-hour days.

12-15.07 HEATING, VENTILATING AND AIR CONDITIONING EQUIPMENT AND SYSTEMS

PART 1.- GENERAL

Scope.--This work shall consist of furnishing, installing and testing heating, ventilating and air conditioning (HVAC) equipment and systems in accordance with the details shown on the plans and these special provisions.

The performance rating and electric service of the HVAC equipment shall be as shown on the plans.

Temperature controls.--Thermostats, relays, timer switches, and other sensor type control devices required for this work shall be furnished and installed by the supplier of the heating, ventilating and air conditioning equipment. All temperature control wiring shall be furnished and installed in accordance with the requirements specified in Section 12-16, "Electrical," of these special provisions.

Codes and standards.--Equipment and systems shall conform to California State Energy Commission Regulations and, where applicable, shall be American Refrigeration Institute (ARI), American Gas Association (AGA), Sheet Metal and Air Conditioning Contractors National Association, Inc. (SMACNA), and Air Movement and Control Association (AMCA) approved for performance ratings and application shown on the plans.

Any appliance for which there is a California standard established in the Appliance Efficiency Standards may be installed only if the manufacturer has certified to the Commission, as specified in those regulations, that the appliance complies with the applicable standards for that appliance. Space conditioning equipment may be installed only if the manufacturer has certified that the equipment meets or exceeds all applicable efficiency requirements listed in the Energy Efficiency Standards.

PART 2.- PRODUCTS

HEATING AND COOLING UNITS.--

Combination heating/cooling unit (single package - rooftop).--

Combination heating/cooling unit shall be standard, commercial quality, single package, curb mounted unit with weatherproof acoustically lined cabinet. The cabinet shall have convenient access panels and a baked-on enamel finish. The roof curb shall be insulated and shall be supplied by the unit manufacturer.

Unit shall be provided with positive pressure combustion and mechanical flue gas venting and furnace safety controls.

Unit shall be provided with an economizer.

Economizer.--

Economizer shall be modulating type assembly either provided by the manufacturer or fabricated to match the unit. The economizer shall be complete with damper motor and linkage for full range modulation of the outdoor and return air dampers, barometric damper, 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 125 meters per minute, all installed in an enclosure similar in color to the basic unit with paint applied by the manufacturer of the economizer. Barometric damper area shall be equal to outside air intake area and be capable of relieving 100 percent of the rated air conditioning unit. The economizer shall be constructed to meet SMACNA requirements and working drawings shall be submitted prior to fabrication.

Electric heater.—

Electric heater shall be quartz tube type, 1000 watts, 208V, single phase. All components shall be factory assembled. Heater shall be provided with junction box secured to the unit, an anodized aluminum rectangular reflector, baked on enamel finish, corrosion resistant painted aluminized steel housing, zinc plated heavy-gage safety screen and mounting brackets.

Controls and supports shall be provided as shown on plans.

Duct heater.--

Duct heater shall be slip-in type with galvanized steel frame, hinged access door, NEMA Type 1 construction, listed safety disconnect switch, limit control with automatic reset and air pressure switch. Air pressure switch shall be diaphragm type that will shut off heater if no duct air flow is present or loss of duct air flow occurs. Duct heater rating shall be as shown on the plans.

FANS AND VENTILATORS.--

Exhaust fan (ceiling mounted).--

Exhaust fan shall be ceiling mounted, AMCA certified and shall be equipped with grille, backdraft damper and metal housing. Exhaust fan motor shall have integral thermal overload protection. Ceiling exhaust fan shall be Breidert, ILG, Penn, or equal.

Vestibule supply fan (ceiling mounted).--

Vestibule supply fan shall be ceiling mounted, AMCA certified and shall be equipped with grille, backdraft damper and metal housing. Supply fan motor shall have integral thermal overload protection. Supply fan shall be Breidert, ILG, Penn, or equal

Inspection Pit supply fan.--

Inspection pit supply fan shall be AMCA certified. Inspection pit supply fan shall be belt drive, single width single inlet type, and shall be equipped with metal housing, centrifugal fan wheel, backdraft damper and bird screen. Noise rating and capacity shall be as shown on the plans. Centrifugal blower. shall have an all-aluminum non-overloading backwardly incline wheel. Wheel shall be statically and dynamically balanced. Fan motor and fan assembly shall be isolated from base with rubber vibration isolators. Fan motor shall have integral thermal overload protection. Inspection pit supply fan shall have a local disconnect. Roof fan shall be Penn; ILG; Cook; or equal.

Fan shall be AMCA certified and exhaust fan motor shall be equipped with integral thermal overload protection and local disconnect.

Combination heat lamp/light/fan.--

Combination heat lamp/light/fan shall be ceiling mounted, recessed type unit with metal housing, grille and backdraft damper. Ducting size shall be as required by-the manufacturer. Combination heat lamp/light/fan shall be Broan, No. 164; Nutone, No. 9427; or equal.

Roof fan.--

Roof fan shall be AMCA certified and shall be equipped with metal housing, centrifugal fan wheel, backdraft damper and bird screen. Fan motor and fan assembly shall be isolated from base with rubber vibration isolators. Fan motor shall have integral thermal overload protection. Roof fan shall be completely weatherproof and shall have a disconnect means under the hood. Roof curb shall be insulated and shall be supplied by the fan manufacturer. Roof fan shall be Penn; Jenn-Air; Cook; or equal.

HVAC CONTROLS.--

Thermostat (office only).--

Thermostat shall be 24-volt, 7-day programmable, electronic heating/cooling thermostat, with the ability to program the fan-on mode during normal working hours, and fan-off mode during unoccupied periods. Thermostat shall be provided with sub-base selector switches for "AUTO-HEAT-OFF-COOL" and fan "AUTO-ON". Thermostat shall be auto-changeover type, and have full temperature range setback capacity. Thermostat shall be Robertshaw, 7900; Honeywell, T7300; or equal.

AUXILIARY HVAC COMPONENTS.--

Unless specified herein, all components shall be sized and have the characteristics as shown on the plans.

Rigid ductwork.--

Rigid ductwork shall be galvanized steel sheet metal conforming to the latest edition of the SMACNA "Low Velocity Duct Construction Standards." Galvanized steel shall 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 shall be prefabricated type.

Duct supports.--

Duct supports shall be hot-dip galvanized steel.

Flexible ductwork.--

Flexible ductwork shall be UL 181, Class 1 air duct rated and shall meet the requirements of NFPA 90-A. Duct shall have steel helix wire, flexible insulation, minimum thermal resistance of R-0.7 (m^2*K/W), and flame resistant vapor barrier. Inner and outer surfaces shall be non-metallic. Outer surface shall be Copolymer or Mylar, factory applied.

Flexible connection.--

Flexible connection shall be prefabricated type and shall 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 shall be rectangular or square type. Diffuser shall 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 shall have individually adjustable curved blades, counter-sunk screw holes, shall be surface mounted, with face velocity less than 3.05 m/s; Titus, 250; Air Mate, 400-O; Hart and Cooley, A40; or equal.

Return register (for gypsum board ceilings).--

Return register for gypsum board ceilings shall be rectangular or square, and shall be steel with oven baked-on enamel bone white dull finish or extruded aluminum, fixed bar type, die formed louvers set at 45 degrees, 13 mm spacing maximum, surface mounted; Titus, 335; Air Mate, 280; or equal.

Ceiling diffuser (for suspended ceilings).--

Ceiling diffuser for suspended ceilings shall be 610 mm square. Diffuser shall be steel with oven baked-on enamel bone white dull finish or extruded aluminum, perforated face hinged for easy access, and shall be fitted with fully

adjustable air pattern controllers, a removable core, and a standard flanged frame; Titus, PAS; Air Mate, 700; or equal.

Return register (for suspended ceilings).--

Return register for suspended ceilings shall be 610 mm square, steel or extruded aluminum, perforated face hinged for easy access; Air Mate, 700RA; Titus, PAR; or equal.

Outlet louvers.--

Outlet louvers shall be 612 mm square, steel or extruded aluminum with Bird screen.

Volume damper.--

Volume damper shall be opposed blade type, operable from face with screw driver or Allen-head wrench, shall be same manufacturer as diffuser or may be furnished as part of the diffuser.

Combination smoke and fire damper.--

Combination smoke and fire damper shall be approved or listed by the State Fire Marshal. Damper assembly shall be 1 1/2 hour fire rated under UL Standard 555 and be a Leakage Rated Damper for use in smoke control systems meeting the requirements of the latest version of UL 555S. Combination smoke and fire damper shall be equipped with a fusible link rated at 74°C, have a 115-volt shaded pole motor actuator and an approved smoke detector. Bearings shall be stainless steel sleeve turning in an extruded hole in the frame. Damper and actuator shall be supplied as a single entity which meets all applicable UL Standards. Damper shall have all galvanized steel parts. Damper shall be installed at the locations shown on the plans.

Balance damper.--

Balance damper shall be butterfly type, 1.52 mm (16-gage) minimum galvanized steel blade, end bearings with steel shaft and locking and indicator operator. Balance damper shall be Ventlock, Young, Anemostat, or equal.

Air filter (for HVAC units).--

Air filter shall be permanent metal viscous impingement type, constructed of aluminum or galvanized steel, 50 mm minimum thickness and be approved for Class 2 use. Filter shall have a minimum efficiency rating of 50 percent as determined when tested in accordance with ASHRAE Test Standard 52. Filter shall be mounted in 1.52 mm (16-gage) galvanized steel holding frames. Two cans of recharging adhesive shall be provided with the filter and shall be nearly odorless, have a high flash point, rapid wetting characteristics, dye tracer and be water soluble. Filter shall be Airspan, Type AF, Eco-Air Products, Inc., Type HIA; Snyder General, Type AAF; or approved equal.

Refrigerant and condensate drain piping.--

Refrigerant and condensate drain piping shall be rigid, Type L copper tubing with brazed solder fittings. The suction line shall be insulated, with vapor barrier and shall be weatherproofed for exterior installation. Factory sealed tubing shall not be used.

PART 3.- EXECUTION

INSTALLATION.--

Heaters.--Furnace shall be installed in such a manner as to insure adequate furnace clearance and separation of combustion air and circulating air. Appliances shall be connected to a rigidly mounted gas pipe supply system by an AGA approved flex connector and gas valve.

Ventilators--Exhaust ducts connected to exhaust fans shall be routed as shown on the plans and shall terminate in a weatherproof cap. Duct sizes shall be as shown on the plans or as recommended by the manufacturer, whichever is larger.

Roof fans shall be curb mounted.

Condensate drains.--Air conditioning unit shall be provided with condensate drain trap and piping. Outdoor piping shall extend to the nearest roof drain, or as shown on the plans. Air gap shall be installed where required by code.

Mounting heights.--Thermostats shall be installed as shown on the plans.

Air outlets.--Volume dampers shall be furnished and installed for all diffusers. Blocking shall be provided on all sides of air outlets between ceiling or wall joists. Collars shall be supplied for all outlets and shall be taped and sealed in place.

Vents and flues.--Vents and flues shall be securely fastened to the building construction, shall be provided with a collar at all ceiling penetrations and shall terminate with a weather cap fabricated of the same material.

Access door.--Access doors shall be provided in rigid ducts and plenums for access to volume dampers, and control devices located within such ductwork; and shall be provided at such other locations as shown on the plans.

Ducts and vents.--Ductwork within the building shall be installed to clear lighting fixtures, doors, windows and other obstructions. Ductwork shall preserve head room and shall keep openings and passageways clear whether shown on plans or not.

Ductwork shall be installed and braced according to the latest edition of the SMACNA "HVAC Duct Construction Standards."

Slopes in sides at transitions shall be approximately one to five. The ductwork system shall not contain abrupt changes or offsets of any kind unless otherwise shown on the plans.

Where ducts pass through walls, floors or ceilings, galvanized sheet metal or steel angle collars shall be installed around the ducts.

Duct sections shall be connected by beaded sleeve-type couplings using joint sealer as recommended by the duct manufacturer. Duct sections shall be mechanically fastened with pop rivets or sheet metal screws and sealed with mastic or insulated, reinforced silver tape.

Flexible connections shall be provided at both inlet and outlet of fan coil and ventilating units.

Sheet metal plenums shall 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 shall be sealed with sealant and taped.

Ductwork identification.--Ductwork shall be identified as follows:

Duct Description	Identification Symbol
Supply duct	S
Return duct	R
Exhaust duct	EXH
Outside air duct	OA

Identification symbol letters shall be stenciled at locations visible from the access routes to be used by maintenance workers. Such letters shall be painted with black colored paint and shall be a minimum of 50 mm high.

FIELD QUALITY CONTROL.--

Pre-test requirements.--Before starting or operating systems, equipment shall be cleaned and checked for proper installation, lubrication and servicing.

In each system, at least one air path, from fan to final outlet, shall have all balance dampers open. The final air quantities shall be achieved by adjusting the volume dampers or the fan RPM.

Final adjustments and balancing of the systems shall be performed in such a manner that the systems will operate as specified and as shown on the plans.

The Contractor shall 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 shall be set and adjusted to deliver the required quantities of air and at temperatures specified by the Engineer. All control work shall be done in collaboration with the control manufacturer's representative.

Project completion tests.--The Engineer shall be notified at least 3 working days in advance of starting project completion tests.

The project completion tests shall consist of the following:

1. **Air Systems.--**All air systems shall be tested and balanced to the conditions set forth on the plans and in these special provisions. This work shall 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 shall include operation of the heating, cooling, and ventilating systems for not less than two 8-hour days, each system shall operate at not less than 90 percent of their full specified capacities.

   The required data shall be accurately measured. The data shall be measured during one operational cycle in the presence of the Engineer and shall be submitted for approval.

   The following data shall be measured and tabulated:

   a. Ambient temperatures and conditions, °C
   b. Supply and return air quantities, L/sec, each room
   c. Thermostat set point, °C
   d. Air temperatures at room center, °C
   e. Fan motor amperages and voltages
   f. System static pressures, Pa

SECTION 12-16. ELECTRICAL

12-16.01 ELECTRICAL WORK

PART 1.- GENERAL

SUMMARY.--

Scope.--This work shall consist of performing electrical work in accordance with the details shown on the plans, the provisions of Section 56, "Signs," and the provisions of Section 86, "Signal, Lighting and Electrical Systems," of the Standard Specifications and these special provisions.

Electrical work shall include furnishing all labor, materials, equipment and services required to construct and install the complete electrical system shown on the plans and the work of installing electrical connections for the thermostats, motors, and controls specified elsewhere in these special provisions.

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 shall be coordinated with the work of other trades. Equipment requiring maintenance and inspection shall be located where it is readily accessible for the performance of such maintenance and inspection.

Related work.--Earthwork, foundations, sheet metal, painting, mechanical and such other work incidental to and necessary for the proper installation and operation of the electrical work shall be done in accordance with the requirements specified for similar work elsewhere in these special provisions.

Portland cement concrete shall conform to Section 90-10, "Minor Concrete," of the Standard Specifications and shall not contain not less than 275 kilograms of cement per cubic meter, except concrete for reinforced pile foundation shall contain not less than 335 kilograms of cement per cubic meter. Section 90-10.06, "Measurement and Payment," of the Standard Specifications shall not apply.

CLOSEOUT SUBMITTALS.--

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 specified herein shall be delivered to the Engineer at the jobsite. The instructions and parts lists shall be in a bound manual form and shall be complete and adequate for the equipment

installed. Inadequate or incomplete material will be returned. The Contractor shall resubmit adequate and complete manuals at no expense to the State.

Manuals shall be submitted for the following equipment:

Standby Generator
Truck overheight indicators
Truck static weighing components
Public address system components
Closed circuit television system components
Fire alarm system
Intrusion alarm system

QUALITY ASSURANCE.--

Codes and standards.--All work performed and materials installed shall be in accordance with the CEC and the California Code of Regulations, Title 8, Chapter 4, "Electrical Safety Orders."

Warranties and guarantees.--Manufacturer's warranties and guarantees for materials or equipment used in the work shall be delivered to the Engineer at the jobsite prior to acceptance of the contract.

TESTING.--

After the electrical system and vehicle monitoring and signal system installation work has been completed, all electrical systems shall be tested in the presence of the Engineer to demonstrate that the electrical system functions properly. The Contractor shall make necessary repairs, replacements, adjustments and retests at his expense.

Electrical systems shall be tested in accordance with Section 86-2.14B, "Field Testing," and Section 86-2.14C, "Functional Testing," of the Standard Specifications and these special provisions.

The insulation resistance test shall not be performed on cables rated less than 600 volts.

Paragraphs 2, 3, 4, 5, and 6 of Section 86-2.14C, "Functional Testing," are deleted, and the following are added:

The Contractor shall be responsible for the compatibility and adjustment of all systems and components as necessary for the successful operation of the electrical service, lighting system, the vehicle monitoring and signal system, and the building electrical system.

The functional test shall be 5 days of continuous trouble-free operation. In the event any of the above systems fail to perform satisfactorily during the functional test, the test shall be repeated at a later date and all costs to the State for observing the subsequent test will be at the Contractor's expense. Such costs will be deducted from payments due the Contractor.

During the test period, the State will maintain the system or systems and will pay the cost of electrical energy for the operation of the facilities that are undergoing testing. The cost of any maintenance necessary, except electrical energy, shall be at the Contractor's expense and will be deducted from payments due the Contractor.

12-16.02 BASIC MATERIALS AND METHODS

PART 1.- GENERAL

SUMMARY.--

Scope.--This work shall consist of furnishing and installing conduits, conductors, cables, fittings, and wiring devices in accordance with the details shown on the plans and these special provisions.

Conduits, conductors, fittings, and wiring devices shall include those accessories and appurtenances, not mentioned, that are required for the proper installation and operation of the electrical system.

Related work.--Roof penetrations shall be flashed and sealed watertight conforming to the requirements specified under "Sheet Metal Flashing" in Section 12-7, "Thermal and Moisture Protection," of these special provisions.

Where conduits pass through fire rated walls, floor or ceiling assemblies, the penetrations shall be protected in accordance with the requirements specified under "Through-Penetration Firestopping" in Section 12-7, "Thermal and Moisture Protection," of these special provisions.

SUBMITTALS.--

Product data.--A list of materials and equipment to be installed and the manufacturer's descriptive data shall be submitted for approval. Any other data as requested by the Engineer shall also be submitted for approval.

Manufacturer's descriptive data shall include complete description, performance data and installation instructions for the materials and equipment specified herein. Control and wiring diagrams, rough-in dimensions for recessed junction and pull boxes, and component layout shall be included where applicable. All control and power conductors on the shop drawings shall be identified with wire numbers.

PART 2.- PRODUCTS

CONDUITS AND FITTINGS.--

Rigid steel conduit and fittings.--

Rigid steel conduit shall be threaded, full weight rigid steel, hot-dip galvanized inside and outside with steel or malleable iron fittings. Fittings shall be threaded unless otherwise specified or shown on the plans.

Split or three-piece couplings shall be electroplated, malleable cast iron couplings.

Insulated grounding bushings shall be threaded malleable cast iron body with plastic insulated throat and steel, lay-in ground lug with compression screw.

Insulated metallic bushings shall be threaded malleable cast iron body with plastic insulated throat.

Electrical metallic tubing (EMT) and fittings.--

Electrical metallic tubing shall be formed of cold rolled strip steel, electrical resistance welded continuously along the longitudinal seam with zinc coating outside and enamel or lacquer coating inside.

Couplings shall be electroplated, rain and concrete tight, gland compression type, steel body couplings with malleable iron nuts.

Connectors shall be electroplated, rain and concrete tight, gland compression type, steel body connectors with male hub, malleable iron nut and insulated plastic throat.

Flexible metallic conduit and fittings.--

Flexible metallic conduit shall be fabricated in continuous lengths from galvanized steel strip, spirally wound and formed to provide an interlocking design.

Fittings shall be electroplated screw-in type with malleable cast iron body and threaded male hub with insulated throat.

Liquid tight flexible metallic conduit and fittings.--

Liquid tight flexible metallic conduit shall be fabricated in continuous length from galvanized sheet steel, spirally wound and formed to provide an interlocking design with an extruded polyvinyl chloride cover.

Fittings shall be electroplated, malleable cast iron body, with cap nut, grounding ferrule, and connector body with insulated throat.

Rigid non-metallic conduit and fittings.--

Rigid non-metallic conduit shall be Schedule 40, high impact, nonconducting, self-extinguishing polyvinyl chloride (PVC) rigid non-metallic conduit for direct underground burial.

Couplings shall 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 shall be PVC adapters with threads on one end and socket type on the other end.

CABLES AND CONDUCTORS.—

Cables.--

Cables shall be selected and sized by the manufacturer supplying the device or equipment to which it is connected, except cables for loop detectors shall conform to the requirements of Section 86-5.01A(4), "Construction Materials," of the Standard Specifications for Type B lead –in cable. Cables for the public address system and CCTV system shall be as specified under "Public Address System," and "CCTV Camera System," of these special provisions.

Ethernet cable shall be category 5, Type E, 2 twisted pairs, 24 AWG, stranded copper conductors, individually shielded complete with drain wire. Ethernet cable shall be Belkin Company, part number A7J304-1000-BLH, or equal.

Power cable shall be 14 AWG, 19-strand minimum , 3 twisted shielded copper conductors with drain wire. Cable shall be Standard Wire and Cable Company, part number D-4900, or equal.

Conductors.--

Conductors shall be stranded copper wire.

Conductor insulation types unless otherwise shown or specified, shall be as follows:

1. Conductors across hinges of control panel enclosures shall be Type MTW.
2. Conductors shall be type XHHW-2 in wet, underground, and outdoor locations.
3. Conductors shall be type THHN in dry locations.

Wire connections and devices.--

Wire connections and devices shall be pressure or compression type, except that connectors for No. 10 AWG and smaller conductors in dry locations may be preinsulated spring-pressure type.

ELECTRICAL BOXES.--

Outlet, device and junction boxes.--

Unless otherwise shown or specified, boxes shall be galvanized steel boxes with knock-outs and shall be the size and configuration best suited to the application indicated on the plans. Minimum size of outlet, receptacle, switch or junction boxes shall be 100 mm square by 40 mm deep, except that switch boxes for the installation of single switches and outlet boxes for flush-mounted light fixtures shall be 50 mm by 75 mm by 40 mm deep.

Multiple switches shall be installed in standard gang boxes, unless otherwise specified or shown on the plans.

Cast metal boxes shall be cast iron boxes with threaded hubs and shall be of the size and configuration best suited to the application shown on the plans.

Flush-mounted boxes shall have stainless steel covers, one mm thick. Cover screws shall be metal with finish to match cover finish.

Unless otherwise shown or specified, surface-mounted boxes shall have galvanized steel covers with metal screws.

Weatherproof junction boxes shall have cast metal covers with gaskets.

Weatherproof switch and receptacle boxes shall have gasketed covers with gasketed hinged flaps to cover switches and receptacles.

Sectional device plates will not be permitted.

Underground pull boxes.--

Pull boxes shall be reinforced concrete box with cover with hold down bolts. No. 5 pull box shall be Brooks Products No. 5; Christy Concrete Products, N30; or equal. No.6 pull box shall be Brooks Products No. 6; Christy Concrete Products No.36 or equal.

Traffic rated pull boxes shall be high density reinforced concrete box with steel cover with hold down bolts and bonding strap. Pull box and cover shall be designed for H20 loading. No. 5 pull box shall have inside dimensions of 335 mm by 610 mm. No. 6 pull box shall have inside dimensions of 430 mm by 760 mm.

RECEPTACLES AND SWITCHES.--

Ground fault circuit interrupter receptacles, (GFCI).--

Ground fault circuit interrupter receptacles shall 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 shall detect and trip at current leakage of 5 milliamperes and shall have front mounted test and reset buttons.

Duplex receptacles.--

Duplex receptacles shall be NEMA Type 5-20R, 3-wire, 20-ampere, 125-volt AC, safety grounding, ivory color, specification grade receptacle suitable for wiring with stranded conductors.

Fourplex receptacles.--

Fourplex receptacles shall be NEMA Type 5-20R, 3-wire, 20-ampere, 125-volt AC, safety grounding, ivory color, specification grade receptacle suitable for wiring with stranded conductors.

Management information system (MIS) receptacles.--

Management information system (MIS) receptacles shall be NEMA Type 5-20R, 3-wire, 20-ampere, 125-volt AC, isolated grounding, orange color, specification grade receptacle suitable for wiring with stranded conductors.

Sump pump receptacles.--

Sump pump receptacles shall be 3-wire, 20-ampere, 125-volt AC, grounding type, single, specification grade receptacle suitable for wiring with stranded conductors and shall match the plug of the sump pump unit furnished.

Multi-outlet assemblies.--

Multi-outlet assemblies shall be 3-wire, 15-ampere, 125-volt AC, 1600 mm long strip, grounding type receptacles spaced 300mm on center. The assembly shall be provided with the necessary entrance end fitting and blank end fitting.

Snap switches.--

Snap switches shall be 20-ampere, 120/277-volt AC, quiet type, specification grade, ivory color switch with silver cadmium alloy contacts. Switch shall be suitable for wiring with stranded conductors.

Occupancy sensor wall switches (single level).--

Occupancy sensor wall switches (single level) shall be wall-mounted, passive infrared (PIR) sensor switch with adjustable photocell override and time delay. Switch shall be rated at 800 W (minimum) incandescent or 1200 VA (minimum) fluorescent at 120 V (ac) and operate on 120/277 V (ac). The switch shall be capable of manual-on/automatic off mode. The sensor switch shall cover a minimum of 80 square meter of floor area, be suitable for installation in a single gang box, and shall have a field of view of not less than 180 degrees. The time delay off setting shall be adjustable from 30 seconds to 30 minutes, initially set at 10 minutes. Light level adjustment shall be adjustable from 30 lux to 2000 lux, initially set at 800 lux.

Occupancy sensor wall switches (Bi-level).--

Occupancy sensor wall switches (bi-level) shall be wall-mounted, passive infrared dual relay sensor switch with adjustable photocell override and time delay. Primary relay shall be rated at 800 W (minimum) incandescent or 1200 VA (minimum) fluorescent at 120 V (ac). Secondary relay shall be rated at 800 W (minimum) incandescent or 800 VA (minimum) fluorescent at 120 V. Switch shall operate on 120/277 V (ac). The relays in the sensor shall be capable of simultaneously controlling 2 different lighting loads or circuits. The second relay shall be independent allowing for two circuit control. The unit shall have dual manual override switches that can be used to toggle manual-on/automatic off mode for each lighting load. Sensor shall have audible alert to indicate impending light shut off. The sensor switch shall cover a minimum of 90 square meter of floor area, be suitable for installation in a single gang box, and shall have a field of view of not less than 180 degrees. The time delay off setting shall be adjustable from 30 seconds to 30 minutes, initially set at 10 minutes. Light level adjustment shall be adjustable from 30 lux to 2000 lux, initially set at 800 lux.

Occupancy sensor ceiling switches.—

Ceiling mounted occupancy sensor switches shall be a low voltage, dual technology, passive infrared (PIR) sensor switch. Switch shall have an adjustable photocell override or built-in light level sensor and time delay. Switch shall operate on 24 V (dc) and shall be provided with a power pack unit. The sensor switch shall cover a minimum of 110 square meter of floor area. Switch shall have a field of view of not less than 360 degrees, conical pattern. The time delay off setting shall be adjustable from 30 seconds to 30 minutes, initially set at 10 minutes. Light level adjustment shall be adjustable from 30 lux to 2000 lux, initially set at 800 lux. The sensor shall have LED indicator that remains active at all times in order to verify detection within the are to be controlled.

Three-way toggle switches.--

Three-way toggle switches shall be 20-ampere, 120/277-volt AC, quiet type, specification grade, ivory color switch with silver cadmium alloy contacts. Switch shall be suitable for wiring with stranded conductors.

Four-way toggle switches.--

Four-way switches shall be 20-ampere, 120/277-volt AC, quite type, specification grade, ivory color switch with silver cadmium alloy contacts. Switch shall be suitable for wiring with stranded conductors.

MISCELLANEOUS MATERIALS.--

Warning Tape.--

Warning tape shall be 100 mm wide and contain the printed warning "CAUTION ELECTRICAL CONDUIT" in bold 19 mm black letters at 760 mm intervals on bright orange or yellow background. The printed warning shall be non-erasable when submerged under water and resistant to insects, acids, alkali, and other corrosive elements in the soil. The tape shall have a tensile strength of not less than 70 kg per 100 mm wide strip and shall have a minimum elongation of 700 percent before breaking.

Pull ropes.--

Pull ropes shall be nylon or polypropylene with a minimum tensile strength of 225 kg.

Watertight conduit plugs.--

Watertight conduit plugs shall be a hollow or solid stem expansion plugs complete with inner and outer white polypropylene compression plates and red thermoplastic rubber seal. Seal material shall be non-stick type rubber resistant to oils, salt, and alkaline substances normally available at the construction sites.

Anchorage devices.--

Anchorage devices shall be corrosion resistant, toggle bolts, wood screws, bolts, machine screws, studs, expansion shields, and expansion anchors and inserts.

Electrical supporting devices.--

Electrical supporting devices shall be one hole conduit clamps with clamp backs, hot-dipped galvanized, malleable cast iron.

Construction channel shall be 41 mm x 41 mm, 2.66 mm (12-gage) galvanized steel channel with 13 mm diameter bolt holes, 40 mm on center in the base of the channel.

Ground rod(s).--

Ground rod(s) shall be a 19 mm (minimum) galvanized or copper clad steel rod, 3 meters long.

Telephone outlet boxes.--

Telephone outlet boxes shall be 102 mm square boxes and plates with modular type telephone outlet. Boxes on stud walls shall have plaster ring.

Plates for flush mounting outlets in finished room shall be Type 430 stainless steel, one mm thick with satin finish.

Radio system loud speaker outlet boxes and PA/Paging speaker outlet speaker outlet boxes shall be similar to telephone outlet boxes, except with blank cover plates for future speaker installation by others.

PART 3.- EXECUTION

INSTALLATION.--

Conduit, general.--Rigid steel conduit shall be used unless otherwise shown on the plans or specified in these special provisions.

Electrical metallic tubing may be used in furred spaces and for exposed work indoors above the switch height.

Unless otherwise specified or shown on the plans, flexible metal conduit shall be used to connect suspended lighting fixtures, motors, HVAC equipment, and other equipment subject to vibration in dry locations.

Unless otherwise specified or shown on the plans, liquid-tight flexible metal conduit shall be used to connect motors, HVAC equipment, and other equipment subject to vibration in wet locations.

Rigid non-metallic conduit shall be used at the locations shown on the plans for direct underground burial 762 mm below grade. All risers and elbows through building floors shall be rigid steel.

Conduit installation.--Conduit trade sizes are shown on the plans. No deviation from the conduit size shown on the plans will be permitted without written permission from the Engineer.

Conduit shall be concealed unless otherwise shown on the plans.

Conduits shall be tightly covered and well protected during construction using metallic bushings and bushing "pennies" to seal open ends.

Rigid non-metallic conduit bends of 30 degrees or greater shall be factory-made long radius sweeps. Bends less than 30 degrees shall be made using an approved heat box.

A pull rope shall be installed in all empty conduits. At least one meter of pull rope shall be doubled back into the conduit at each termination.

Locations of conduit runs shall be planned in advance of the installation and coordinated with the ductwork, plumbing, ceiling and wall construction in the same areas and shall not unnecessarily cross other conduits or pipe, nor prevent removal of ceiling tiles or panels, nor block access to mechanical or electrical equipment.

Where practical, conduits shall be installed in groups in parallel, vertical or horizontal runs and at elevations that avoid unnecessary offsets.

Exposed conduit shall be installed parallel and at right angles to the building lines.

Conduits shall not be placed closer than 300 mm from a parallel hot water or steam pipe or 75 mm from such lines crossing perpendicular to the runs.

All raceway systems shall be secured to the building structures using specified fasteners, clamps and hangers.

All metal conduits, metal conduit risers, and metal conduit elbows in contact with soil or concrete shall be wrapped with a double layer of 0.5 mm thick pipe wrapping tape. Each individual layer shall be overlapped a minimum of 50%.

Single conduit runs shall be supported by using one hole pipe clamps. Where run horizontally on walls in damp or wet locations, conduit shall be installed with "clamp backs" to space conduit off the surface.

Multiple conduit runs shall be supported with construction channel secured to the building structure. Conduits shall be fastened to construction channel with channel compatible pipe clamps.

Raceways of different types shall be joined using approved couplings or transition fittings.

Expansion couplings shall be installed where conduit crosses a building separation or expansion joint.

All floor and wall penetrations shall be sealed water-tight.

Conduit terminations.--Rigid steel conduits shall be securely fastened to cabinets, boxes and gutters using 2 locknuts and specified insulating metallic bushing. Electrical metallic tubing shall be securely fastened to cabinets, boxes and gutters

using specified connectors. Conduit terminations at exposed weatherproof enclosures and cast outlet boxes shall be made watertight using specified hubs.

Grounding bushings with bonding jumpers shall be installed on all type of conduits terminating at concentric knockouts and on all conduits containing service conductors, grounding electrode conductor, and conductors feeding separate buildings.

Rigid non-metallic conduits shall be terminated inside the underground pull boxes with an approved conduit bushings or fittings. All conduits shall enter the pull box at an angle of 45 degrees or more.

All future conduits terminated in underground pull boxes or exposed indoor and outdoor shall be provided with watertight conduit plugs.

Warning Tape.--Warning tape shall be placed over each conduit in a trench. Each warning tape shall be centered over the conduit and shall be placed over the 150 mm layer of sand covering the conduit as described elsewhere in these special provisions.

Conductor and cable installation.--Conductors shall not be installed in conduit until all work of any nature that may cause injury is completed. Care shall be taken in pulling conductors that insulation is not damaged. An approved non-petroleum base and insulating type pulling compound shall be used as needed.

All cables shall be installed and tested in accordance with manufacturer's recommendations.

Conductor splices and joints shall be insulated with insulation equivalent to that of the conductor. Conductors in underground pull boxes shall be spliced by the use of compression connectors and insulated by "Method B" as shown on the Standard Plans ES-13. Cables shall not be spliced.

Provide 155 mm of slack at each outlet and device connection. If the outlet or device is not at the end of a run of wire, connection shall be made with correctly colored pigtails tapped to the runs with splices as specified herein.

Branch circuit conductors in panelboards and load centers shall be neatly trained along a path from the breaker terminals to their exit point. The conductors shall have ample length to transverse the path without strain, but shall not be so long as to require coiling, doubling back, or cramming. The path shall transverse the panelboard gutter spaces without entering a gutter containing service conductors and, unless otherwise shown on the plans, without entering the gutter space of any panelboard feeder.

All pressure type connectors and lugs shall be retightened after the initial set.

Splices in underground pull boxes and similar locations shall be made watertight.

Junction boxes in furred or accessible ceiling spaces shall be identified with felt-tip pen denoting the circuits contained in the box.

Conductor and cables identification.--The neutral and equipment grounding conductors shall be identified as follows:

Neutral conductor shall have a white or natural gray insulation except that conductors No. 4 and larger may be identified by distinctive white marker such as paint or white tape at each termination.

Equipment grounding conductor shall be bare or insulated. If insulated, equipment grounding conductors shall have green or green with one or more yellow stripes insulation over its entire length except that conductors No. 4 and larger may be permanently identified by distinctive green markers such as paint or green tape over its entire exposed insulation.

Ungrounded feeder and branch circuit conductors shall 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 shall be as follows:

SYSTEM	COLOR CODE
120/208V-Three phase	Black, red, blue

Once an insulated circuit conductor, including grounded and ungrounded conductors, is identified with a specific color code, that color code shall be used for the entire length of the circuit.

Where more than one branch circuit enters or leaves a conduit, panel, gutter, or junction box, each conductor shall be identified by its panelboard and circuit number. All control conductors including control conductors of manufacturer supplied and field wired control devices shall be identified at each termination with the wire numbers shown on the plans, approved working drawings, and as directed by the Engineer where deemed necessary. Identification shall be made with one of the following:

Each set of cables (one Ethernet cable and Power cable), for radiation detection system shall be identified at their termination, at the sign bridge and inside the scale house, with the same identification number (1,2,3, or 4) of radiation detector control panel as shown on the plans. Identification shall be made with adhesive backed paper or cloth wrap-around markers with clear, heat shrinkable tubing sealed over either type of marker.

1. Adhesive backed paper or cloth wrap-around markers with clear, heat shrinkable tubing sealed over either type of marker.
2. Self-laminating wrap around type, printable, transparent, permanent heat bonding type thermoplastic film markers.
3. Pre-printed, white, heat-shrinkable tubing.

Each terminal block shall have a molded marking strip attached with screws. The identifying numbers of the terminating conductors, as shown on the plans or on the submittal drawings, shall be engraved in the marking strip.

Outlet, device and junction box installation.--Where exposed threaded steel conduits are connected to an outlet, device, or junction box below switch height, the box shall be a cast metal box. Unless otherwise shown on the plans or specified in these special provisions, all other boxes shall be sheet steel boxes. Weatherproof outlet, device and junction boxes shall have cast metal covers with gaskets. Unless otherwise shown on the plans or specified in these special provisions, all other boxes shall have standard galvanized covers.

All boxes shall finish flush with building walls, ceiling and floors except where exposed work is called for.

Raised device covers (plaster rings) shall be installed on all boxes concealed in concrete, masonry or stud walls.

No unused openings shall be left in any box. Knockout seals shall be installed as required to close openings.

Outlet, device, and junction boxes shall be installed at the locations and elevations shown on the plans or specified herein. Adjustments to locations may be made as required by structural conditions and to suit coordination requirements of other trades.

Boxes in stud walls and partitions shall not be mounted back to back. Through-wall boxes shall not be used.

Boxes installed in metal stud walls shall be equipped with brackets designed for attaching directly to the studs or shall 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 shall be mounted on 1.52 mm (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 shall be supported directly from the structures above.

Underground pull box installation.--Electrical pull box covers or lids shall be marked "ELECTRICAL." Telephone service pull box covers or lids shall have plain, unmarked covers.

The bottom of pull boxes shall be bedded in 155 mm of clean, crushed rock or gravel and shall be grouted with 40 mm thick grout prior to installation of conductors. Grout shall be sloped to a 25 mm PVC pipe drain hole. Conduit shall be sealed in place with grout.

Top of pull boxes shall 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 shall be set at plus 30 mm above surrounding grade. Pull boxes shown on the plans in the vicinity of curbs shall be placed adjacent to the back of curb. Pull boxes shown on the plans adjacent to lighting standards shall be placed on the side of foundation facing away from traffic.

Ground rod(s) installation.--The ground rod(s) shall be driven vertically until the top is 155 mm above the surrounding surface. When vertical penetration of the ground rod cannot be obtained, an equivalent horizontal grounding system, approved by the Engineer, shall be installed.

Anchorages.--Hangers, brackets, conduit straps, supports, and electrical equipment shall 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 shall be installed in accordance with the anchorage manufacturer's recommendations.

Mounting heights.--Electrical system components shall be mounted at the following mounting heights, unless otherwise shown on the plans. The mounting height dimensions shall be measured above the finished floor to the bottom of the device or component.

Thermostats	1.1 m maximum, office areas 1.25 m maximum, hallways
Wall switches	1.0 m maximum
Convenience outlets	510 mm minimum, office areas 1.25 m minimum, all other areas
Electric water cooler outlet	As recommended by the water cooler manufacturer.
Telephone and radio outlets	510 mm minimum

12-16.03 SERVICE AND DISTRIBUTION

PART 1.- GENERAL

SUMMARY.--

Scope.--This work shall consist of furnishing and installing service and distribution equipment in accordance with the requirements of the serving utilities, the details shown on the plans and these special provisions.

Attention is directed to "Utility Connection" in Section 12-1, "General Requirements," of these special provisions regarding arrangements, permits, licenses, charges, fees and costs for utility connections and extensions.

Related work.--Concrete and reinforcement for service pedestal shall conform to the requirements specified for minor work under “Cast-in-Place Concrete,” in Section 12-3, “Concrete and Reinforcement,” of these special provisions.

SUBMITTALS.--

Installation details.--The Contractor shall submit complete service installation details to the serving utilities for approval. Prior to submitting installation details to the serving utility, the Contractor shall have said drawings reviewed and stamped "APPROVED" by the Engineer. Submittals shall be approved by the serving utility prior to commencing work.

Product data.--A list of materials and equipment to be installed and the manufacturer's descriptive data shall be submitted for approval.. Any other data as requested by the Engineer shall also be submitted for approval.

Manufacturer's descriptive data shall 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 shall be included where applicable. All control and power conductors on the shop drawings shall be identified with wire numbers.

PART 2.- PRODUCTS

Main Service Switchboard.--

Main service switchboard shall contain a pull section, metering compartment and service disconnect switch for 208/120-volt, 400-ampere, 3-phase, 4-wire service. Main Service Switchboard shall also contain the Main Distribution Panel and Automatic Transfer Switch as shown on the plans. Interruptive capacity of circuit breakers shall be minimum 42,000 amperes (symmetrical) at 240 volts.

Enclosure.--

Enclosure shall be NEMA- 3R enclosure. Exterior shall be 2.66 mm (12-gage) and interior shall be 1.90 mm (14-gage) sheet steel. All screws, latches, hinge pins and similar hardware shall be stainless steel. Circuit breaker shall be operable with the exterior door open. Exterior door shall be lockable with a padlock. Enclosure finish shall be baked enamel or baked thermosetting polyester finish.

Utility Service disconnect switch.--

The utility service disconnect switch shall be 3-pole, 600-volt, 400-ampere frame, 400-ampere trip, molded case circuit breaker with AC magnetic trip adjusted to 2000-amperes. The interrupting capacity of the circuit breaker shall be 42,000 amperes (symmetrical) at 240-volt.

Branch Circuit Breakers. --

Branch circuit breakers to be installed in the Main Distribution Panel shall be molded case circuit breakers with trip rating as shown on the plans, and shall have interrupting capacity of 42,000 amperes (symmetrical) at 240-volts.

Automatic Transfer Switch. --

Automatic Transfer switch is specified under "Standby Generator" of these Special Provisions.

PART 3.- EXECUTION

Foundation for service pedestal shall be as shown on the plans.
Installation of Main service switchboard shall be in accordance with the requirements of the serving utilities.

12-16.04 ELECTRICAL EQUIPMENT

PART 1.- GENERAL

SUMMARY.--

Scope.--This work shall consist of furnishing and installing panelboards, starters, disconnect switches, transformers, and related accessories in accordance with the details shown on the plans and these special provisions.

Related work.--Anchorage devices shall be as specified under "Basic Materials and Methods" elsewhere in this Section 12-16.

SUBMITTALS.--

Product data.--A list of materials and equipment to be installed and the manufacturer's descriptive data shall be submitted for approval.. Any other data as requested by the Engineer shall also be submitted for approval.

Manufacturer's descriptive data shall 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 shall be included where applicable. All control and power conductors on the shop drawings shall be identified with wire numbers.

PART 2.- PRODUCTS

PANELBOARDS.—

Panelboard A.--

Panelboard A shall be indoor type, surface-mounted, factory assembled, 3-phase, 4-wire, 208/120-volt, AC panelboard at least 508 mm wide with 200-ampere main circuit breaker, electrolytically tin plated copper bus bars, insulated groundable neutral, hinged door and molded case branch circuit breakers as shown on the plans. Panel shall be Square D Company, General Electric, or equal.

Panelboard C.--

Panelboard C shall be indoor type, surface-mounted, factory assembled, 3-phase, 4-wire, 208/120-volt, AC panelboard at least 508 mm wide with 125-ampere main circuit breaker, electrolytically tin plated copper bus bars, insulated groundable neutral, hinged door and molded case branch circuit breakers as shown on the plans. Panels shall be Square D Company, General Electric, or equal.

Loadcenter L.--

Loadcenter L shall be indoor type, surface-mounted, factory assembled, 1-phase, 3-wire, 120/208-volt, AC loadcenter at least 508 mm wide with 60-ampere main circuit breaker, electrolytically tin plated copper bus bars, insulated groundable neutral, hinged door and molded case branch circuit breakers as shown on the plans. Loadcenter shall be Square D Company, General Electric, or equal.

STARTERS.—

Air compressor starter.--

Air compressor starter shall be combination 3-pole, 208-volt, NEMA Size 1, NEMA rated, line voltage starter and motor circuit protector in a NEMA-1 enclosure. Air compressor starter shall 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 shall be externally operable.

Exhaust fan controller cabinet.--

Exhaust fan controller cabinet shall be a NEMA-1 surface mounted enclosure with a hinged door and complete with main disconnect, fan starters (ST1 and ST2) and terminal blocks mounted inside the enclosure. The "Start-Stop" pushbuttons shall be externally operable. Exhaust fan motor starter ST1 and ST2 shall be 3-pole, 240-volt, NEMA rated line voltage starters, NEMA size 0, 120-volt coil with one auxiliary contact complete with 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.

SWITCHES.—

Air conditioner disconnect switch.--

Air Conditioner Disconnect switch shall be 3-pole, 240-volt, AC, 60-ampere, fused, general duty safety switch in a NEMA-3R enclosure. The fuses shall be sized to suit the air conditioning unit furnished.

Door operator disconnect switch.--

Door operator disconnect switch shall be 3-pole, 240-volt, AC, 30-ampere, non-fusible, general duty safety switch in a NEMA-1 enclosure with provision for padlocking in the "OFF" position.

Pit cover drive motor disconnect switch.--

Pit cover drive motor disconnect switch shall be 3-pole, 240-volt, AC, 30-ampere, non-fusible, heavy duty safety switch in a NEMA-3R enclosure with provision for padlocking in the "OFF" position.

Traffic signals disconnect switch.--

Traffic signals disconnect switch shall be single-pole, 20-ampere 120-volt, AC, specification grade snap switch in a two-gang cast metal box with cover.

Exhaust fans (EF-4 and EF-5) disconnect switch.--

Exhaust fan disconnect switch shall be 3-pole, 240-volt, 30-ampere, non-fusible, general duty safety switch in a NEMA-3R enclosure with provision for padlocking in the "OFF" position.

MISCELLANEOUS MATERIALS.--

Air Resource Board Pedestal Enclosure.--

Air resources board pedestal enclosure shall be single exterior hinged door, dust tight NEMA Type 3R enclosure containing and electrical mounting panel. The enclosure shall be made of 14-gauge steel minimum with all seams continuously welded. A rolled lip shall be provided around three sides of the hinged door and around all sides of the opening. The door shall be provided with a neoprene gasket that is attached with an oil-resistant adhesive. The door shall be maintained closed with door clamps. Security shall be provided by a hasp and staple for padlocking. The following equipment shall be provided at the interior mounting panel of the enclosure.

ARB power outlet.--

ARB power outlet shall be a 30-ampere, 2-pole, 3-wire, grounding type, 125-volt, AC, outlet conforming to the configuration, suitable for use with recreational vehicle as shown in figure 551-46(c) of the National Electrical Code Handbook.

ARB telephone outlet.--

ARB telephone outlet shall be installed in a two gang cast metal box with lugs suitable for 2 telephone jacks.

Nameplates.--

Nameplates shall be laminated phenolic plastic with white core and black front and back. Nameplate inscription shall be in capitals letters etched through the outer layer of the nameplate material.

Warning plates.--

Warning plates shall be laminated phenolic plastic with white core and red front and back. Warning plates inscription shall be in capitals letters etched through the outer layer of the nameplate material.

Plywood backing board.--

Plywood backing board for mounting electrical or telephone equipment shall be 19 mm, APA plywood panels, C-D PLUGGED and touch-sanded, Exposure 1.

Uninterruptible power supply, UPS.--

Uninterruptible power supply shall be 1 kVA, 120/208-volt, AC input line voltage, output voltage of 120 ± 3.5 volts, at 60 Hz sine wave. Total harmonic distortion shall not exceed 7 percent. Power transfer from power line to UPS shall occur at approximately 102 volts, and restoring power to line supply shall occur at 110 volts. Transfer time shall not be more than 10 milliseconds. UPS shall be equipped with maintenance free battery that requires no more than 16 hours to recharge and provides 12 minutes (minimum) of backup time at full load, or 30 minutes at half load. UPS shall have 6 NEMA Type 5-15R output receptacles or a built-in distribution box for 6 circuits minimum. UPS shall be capable of operating at 40° C. ambient temperature and 95 percent non-condensing humidity.

PART 3.- EXECUTION

INSTALLATION.--

Plywood backing board.--Plywood backing board shall be securely fastened to walls or other vertical framing.

Surface to be coated shall be cleaned of all dirt, excess materials, of filler by hand cleaning.

Plywood backing board exposed surfaces shall receive the following paint system: one prime coat, alkyd, interior wood primer and 2 finish coats, acrylic, interior enamel, semi-gloss. Color shall match surrounding surfaces, or shall be as directed by the Engineer.

Coatings shall be applied in accordance with the manufacturer's instructions. Each coat shall be applied to a uniform finish, free of skips, brush marks, laps or other imperfections.

Panelboard installation.--Set cabinets plumb and symmetrical with building lines. Train interior wiring as specified under "Conductor and Cable Installation" in "Basic Materials and Methods" of these special provisions. 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 which may impede ready access, security or integrity.

Mounting height shall be 1.67 meters to the highest circuit breaker handle, measured above the finished floor.

Where "Future" or "Space" is indicated on the plans, branch connectors, mounting brackets, and other hardware shall be furnished and installed for future breaker.

A typewritten directory under transparent protective cover shall be provided and set in metal frame inside each cabinet door. Directory panel designation for each circuit breaker shall include complete information concerning equipment controlled, including room number or area designated on the plans.

Equipment identification.--Equipment shall be identified with nameplates fastened with self-tapping, cadmium-plated screws or nickel-plated bolts.

Nameplate inscriptions shall read as follows:

Item	Letter height, mm	Inscription
Panel A	6	PANEL A 208/120V, 3PH ,4W
Panel C	6	PANEL C 208/120V, 3PH ,4W
Loadcenter L	6	LOADCENTER L 120/208V, 1PH ,3W
Outside Lighting Control Stations	6	OUTSIDE LIGHTS
Overhead Door Disconnect Switch	6	DOOR OPERATOR
Exhaust Fans Controller	6	EXHAUST FANS

Warning plates.--Warning plates shall be attached to designated equipment with self-tapping cadmium-plated screws or nickel-plated bolts.

12-16.05 LIGHTING

GENERAL.--This work shall consist of furnishing, installing and connecting all lighting equipment in accordance with the details shown on the plans and these special provisions.

SUBMITTALS.--Manufacturer's descriptive information, photometric curves, catalog cuts, and installation instructions shall be submitted for approval.

PRODUCTS.--

Lighting fixture lamps.--

Lighting fixture lamps shall be type and size as shown on the plans. Lamps shall be General Electric, Phillips, Sylvania, or equal. Fluorescent lamps, unless otherwise noted, shall be super T8, 4100K tri-phosphor with a CRI of 75 or greater.

Ballasts.--

All fixtures shall be equipped with high power factor ballasts suitable for the line voltage and for the type, size and number of lamps required by the fixture. Fluorescent ballasts shall be UL Listed, Class P and ETL Certified ballasts with sound rating A. Fluorescent ballasts shall be high-frequency electronic ballasts with power factor greater then 0.95, nominal ballast factor of 0.88 unless specified otherwise, total harmonic distortion less than 20 percent, crest factor less than or equal to 1.7, complying with ANSI C 62.41 Category A for surge protection, and FCC Part 18 for interference. Dimming ballasts shall be high frequency ballasts as specified above and shall be capable of dimming the light output from 100 percent to 20 percent of the rated light output.

Lighting fixtures.--

Lighting fixtures shall be as shown on the plans and as specified herein. Outdoor luminaires shall be listed and labeled "Fixture Suitable For Wet Locations."

F1.--

Ceiling-mounted fluorescent fixture with two 32-watt T8 lamps, electronic ballast and one-piece, clear acrylic, wrap-around diffuser. The fixture shall be Day Brite, Lithonia, or equal.

F2.--

Lay-in 600 mm x 1200 mm lensed troffer fluorescent fixture with two 32-watt T8 lamps, electronic ballast. The fixture shall be Lithonia Series SP8; Day-Brite, Series DP; or equal.

F4.--

Recessed, compact, downlight, lensed chrome baffle downlight fluorescent fixture with two vertically mounted 26 watt tri-tube (TRT) lamp, electronic dimming ballast and aluminum lampholder housing. Fixture shall have concave holophane lens. Ceiling opening shall be minimum 203 mm. The fixture shall be Prescolite, Compact Fluorescent Series; Capri, PL Series; or equal.

F5.—

Heavy duty, 2400 mm long, stainless steel wet location fixture with double-body construction, 0.3 mm virgin acrylic internally-ribbed lens, permanently closed-cell neoprene gasket, wall mounted, modified with two 32-watt T8 lamps, mounted in the upper lamp holder, the lower lamp holders removed, an internal reflector installed to deliver 50 percent of rated lamp output upward in the 20 to 70 degree zone.

F6--

Surface mounted low profile round fluorescent fixture, with white acrylic diffuser, and rated 26 watt, compact fluorescent lamp and integral ballast. The fixture shall be Lithonia; Halo; or equal

F7.--

Stem mounted or bracket mounted, industrial, fluorescent fixture with two 60-watt T8 lamps, electronic ballast and white baked enamel ribbed reflector, complete with end plates. The fixture shall be Lithonia, AF Series; Columbia, Dynamo KL Series; or equal.

F8.--

Ceiling mounted fixture, suitable for damp location with clear polycarbonate lens and two- 13-watt twin tube lamps. The fixture shall be Lithonia, Halo or equal.

MH1.--

Pole-mounted luminaire with 400-watt, 208-volt, type II distribution, metal halide lamp cut-off luminaire with integral ballasts. MH1 shall be enclosed type with wide drop glass refractor. Each luminaire shall consist of a housing, a reflector, a refractor, a lamp socket, an integral ballast, a terminal block and a lamp. The housing shall conform to Section 86-6.01, "High Pressure Luminaires," of the Standard Specifications. All external hardware shall be corrosion resistant. The fitter shall be built-in and accommodate a standard size 53C tenon or equivalent pole top. The terminal block shall be located inside the fitter. The fixture door shall contain all ballast components and be hinged for fast tool-free removal and replacement. Refractor shall be wide drop borosilicate glass. Socket shall be pulse rated, nickel-plated and lamp grip porcelain enclosed. Ballast shall be regulator type. Pole type and arm mast arm length shall be as shown on the plans. Pole shall conform to Section 86-2.04, "Standards, Steel Pedestals and Posts," of the Standard Specification.

MH2.--

MH2 shall be similar to MH1 except MH2 shall have two 400-watt, 208-volt, Type II distribution, metal halide lamps.

MH3.--

Outdoor, surface mounted, 100-watt, 120-volt, metal halide luminaire with integral ballast. The fixture shall be Holophane, Wallpack Series; Lithonia, TWH Series; or equal.

MH4.—

Outdoor, surface mounted, 70-watt, 120-volt, metal halide luminaire with integral ballast. The fixture shall be Holophane, Wallpack Series; Lithonia, TWH Series; or equal.

MH5.--

Outdoor, surface mounted, 175-watt, 120-volt, metal halide luminaire with integral ballast. The fixture shall be Holophane, Wallpack Series; Lithonia, TWH Series; or equal.

MH6.--

Outdoor floodlight, 175-watt, metal halide luminaire with integral ballast. Luminaire shall have heavy duty die-cast aluminum housing, electrocoat paint finish, enclosed and gasketed charcoal filter, heat and shock resistant tempered glass lens, corrosion resistant external hardware, adjustable aiming, with photometrics as shown on the plans. The luminaire shall be General Electric, Series PF-154; Lithonia, Series TFL; or equal. Fixtures shall be enclosed in a floodlight housing as specified below and as shown on the plans.

The floodlight housing shall be a low profile NEMA 3R enclosure with dimensions as shown on the plans, to protect the floodlights when not in service. Housing shall be galvanized 2.66 mm (12 gauge) steel continuous welded to form a seamless exterior, reinforced to form a rigid box. The door shall have a high quality two-point locking mechanism to allow easy opening and closing with one hand. The lock shall be recessed and the door face shall be smooth except for three 13-mm thick rubber bumpers mounted neat the lock and two latches. The door interlock shall be a 10-ampere, 120-volt, NEMA 4 limit switch mounted on a flange welded to the housing, adjusted to open the circuit when the door is four inches from fully closed. The duplex weatherproof receptacle shall be mounted on a flange welded to the housing.

Finish shall be polyester dry powder electrostatically applied and baked on at 150ºC. Color shall be black interior and exterior shall match the cement plaster color. The painting process shall include five stages of metal preparation using dip tanks as follows: 1) alkaline cleaner, 2) clear water rinse, 3) zinc phosphate application, 4) clear water rinse and 5) inhibitor rinse to seal phosphated surfaces.

Fused splices.--

Fused splices shall be Buss, Elastimold, or equal; with standard midget, ferrule, 5-ampere, 240-volt, slow blowing fuses.

Photoelectric unit, PEC.--

Photoelectric unit shall be cadmium sulfide photoelectric control with capacity of 1000-watt incandescent or 1800-watt inductive or fluorescent load, mounting adapter, and EEI-NEMA twist lock receptacle; Fisher-Pierce, Ripley, or equal.

Outside lighting control station, OLCS1.--

Outside lighting control station shall consist of a lighting contactors, selector switch, timer switch, terminal block and pilot light in a surface mounted NEMA-12 enclosure with a hinged door.

Lighting contactors, LC1, LC2 ,LC3,LC4.--

Lighting contactor shall be electrically held, lighting contactor with 120-volt AC coil and 30-ampere, double-break, silver alloy contacts; Square D Company, I.T.E., Westinghouse, or equal. Number of poles per contactor shall be as shown on the plans.

Selector switch, SS.--

Selector switch shall be rotary action, double-pole, 2-position, 10-ampere, 120-volt switch. Switch contacts shall 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 shall have legend plate marked MANUAL-AUTO.

Pilot light, PL.--

Pilot light shall be panel mounted, heavy duty, oil tight indicating light with 120-volt, AC, LED lamp with red domed cap.

Time clock, TC.—

Time clock shall be a 120-volt, AC, solid state programmable timer with power on-off and manual override. Time clock shall be able to program for a minimum of 3 independent schedules for any days of the week, in addition to being able to skip selected days. Time clock shall have two single-pole, double-throw output contact rated at not less than 10-ampere, 120-volt, AC.

Timer switch, TS.--

Timer switch shall be a commercial type, automatic shut-off, spring wound 2-hour minute time switch, SPST, rated 20-amperes, 120-volt, 60 Hz. Faceplate shall be brushed aluminum 120 minute time dial with black knob. Intermatic Series FF, or equal.

Terminal block, TB.--

Terminal block shall be 30-ampere, 300-volt, molded plastic with two or more mounting holes and two or more terminals in each cast block. The molded plastic shall have a high resistance to heat, moisture, mechanical shock, and electrical potential and shall have a smooth even finish. Each block shall have a molded marking strip attached with screws. Terminal blocks shall have tubular, high pressure clamp connectors.

Concrete.--

Concrete shall be as specified under "Cast-In-Place Concrete" in Section 12-3, "Concrete and Reinforcement," of these special provisions. The concrete shall be commercial quality portland cement concrete containing not less than 337 kilograms of cement per cubic meter.

FABRICATION.--

Component mounting.--The following electrical components shall be mounted on the back panel of the outside light control station enclosure, OLCS:

Terminal Block, TB
Lighting contactors Time clock

The following electrical components shall be mounted on the hinged door of the outside light control station enclosure, OLCS:

Selector switch
Pilot light
Timer switch

A wiring diagram encased between two heat-fused laminated plastic sheets shall be provided with brass mounting eyelets and attached to the inside of the outside lighting control station enclosures.

EXECUTION.--

LIGHTING FIXTURES.--Lighting fixtures shall be mounted securely in accordance with the manufacturer's recommendations. Mounting methods shall be suitable for the particular type of ceiling or support at each location.

The Contractor shall provide all supports, hangers, spacers, channels, fasteners and other hardware necessary to support the fixtures. All pendant mounted or cable mounted fixtures shall be provided with ball sockets, escutcheon plates and all necessary hardware to support the fixture.

Fixtures shall be set at the mounting heights shown on the plans, except heights shown shall be adjusted to meet conditions.

BALLASTS.--All fluorescent fixtures shall be equipped with high power factor ballasts suitable for the line voltage and for the type, size and number of lamps required by fixture. The Contractor has the option to install low voltage dimming control provided that the Contractor submit plans and specifications with appropriate revisions for the low voltage dimming control to the Engineers for approval prior to installation.

All ballasts used in unheated areas inside the building shall be -20°C ballasts or less.

POLE MOUNTED LUMINAIRES.--In the pull box adjacent to each pole for luminaire, MH1 and MH2, a fused splice connector shall be installed in each ungrounded conductor between the line and the ballast. The connector shall be readily accessible in the pull box and shall be insulated and made waterproof in accordance with the splice connector manufacturer's recommendations.

Concrete foundations shall be as shown on the plans. Anchor bolts or devices shall be accurately located and positioned to match the holes in the pole base plates. Pole and luminaire orientation shall be as indicated on the plans.

The poles for pole mounted type fixtures shall be mounted rigidly and securely on the foundations as recommended by the fixture and pole manufacturer.

The adjustable component (refractor or reflector) controlling the orientation of the light distribution of asymmetrical luminaires shall be rotatable 360 degrees around a vertical axis.

12-16.06 VEHICLE MONITORING AND SIGNAL SYSTEM

GENERAL.--This work shall consist of furnishing, installing and connecting the vehicle monitoring and signal system (VMSS) in accordance with the details shown on the plans and these special provisions.

The vehicle monitoring and signal system shall consist of the control console, truck overheight detector system, truck length detector system, signal, length and height control cabinet, truck traffic signal system, public address system and closed circuit television system.

The poles and posts of the vehicle monitoring and signal system shall be as shown on the plans and shall conform to the requirements of Section 10-3.03, “Standards and Posts,” of the Standard Specifications.

SUBMITTALS.--Manufacturer's descriptive information, photometric curves, catalog cuts, and installation instructions shall be submitted for approval. Any other data as requested by the Engineer shall also be submitted for approval.

CONTROL CONSOLE.--

GENERAL.--The control console shall be an oil-tight console designed to house electrical components as shown on the plans. The console shall be made from minimum 1.9 mm (14-gage) steel, and shall contain continuously welded seams with no holes or knockouts. The cover shall contain a continuous hinge, a gasket, and captive screws for securing.

The selector switches, pilot lights, counters and name plates shall be mounted on the cover of the control console as shown on the plans. Terminal blocks shall be mounted inside the console. Terminal blocks shall contain a separate, one terminal connector for each conductor entering and leaving the control console.

PRODUCTS AND EXECUTION.--

The electrical control components shall conform to the following:

Selector switches (SS1, SS2 and SS5).--

Selector switches SS1, SS2 and SS5 shall be rotary action, double-pole, 2-position, 10-ampere, 120-volt switch. Switch contacts shall 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 shall have legend plate marked ON- OFF.

Selector switches (SS3 and SS4).--

Selector switches SS3 and SS4 shall be rotary action, double-pole, 3-position, 10-ampere, 120-volt switch. Switch contacts shall 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 shall have legend plate marked STOP-GO-TURN.

Pilot Lights (PL1 thru PL7).--

30.5 mm, NEMA Type 4, panel mounted, 120 V, (ac), high visibility light emitting diode (LED) type lamp with colored plastic lens and screw cap.

Counters .--_

The Counters shall be as specified under "Signals, Length and Height Control Cabinet" in these special provisions.

Push Button PB1.--

Push button PB1 for overheight reset, shall be heavy duty, general purpose, 30.5 mm push button with one normally open, momentary contact. Contact shall have an inductive pilot duty rating of 60 A (make), 6 A (break) and 10 A (continuous) at 120 V and 35 percent power factor.

Terminal block.—

Terminal block, TB, shall contain at least the number of terminal connections shown on the plans or specified in these special provisions. Terminal blocks shall be 300-volt, 20-ampere, molded plastic with 2 or more mounting holes and 2 or more terminals in each cast block. The molded plastic shall have a high resistance to heat, moisture, mechanical shock and electrical potential, and shall have a smooth even finish. Each block shall have a molded marking strip attached with screws. The identifying numbers of the terminating wires, as shown on the working drawings, shall be engraved in the marking strip. Terminal blocks shall have tubular, high-pressure clamp connectors.

TRUCK OVERHEIGHT DETECTOR SYSTEM.--

GENERAL.--Truck overheight indicator shall be an automatic overheight indicator system consisting of infrared energy transmitting devices, infrared energy receiving devices, and suitable control units for detecting overheight vehicles.

Transmitter and receiver shall have NEMA Type 4 enclosure. The height gage transmitter and receiver shall be 120-volt, AC, 60 Hz and shall operate with minimum excess gain of 600 at a separation of 7.62 m. Operating temperature shall be –28ºC to 51ºC. Each height gage receiver shall contain either a single-pole, single-throw (SPST) solid-state isolated output switch rated 0.25-ampere at 30 volts, DC with OFF-state leakage current not to exceed one microampere or a relay with 2-pole double throw (DPDT), 5-ampere, 120-volt AC contacts. The receiver shall be immune to of sunlight.

TRUCK LENGTH DETECTOR SYSTEM.--

GENERAL.--Each of the two lanes shall have an inductive loop detector installed in the pavement at location as shown on the plans for signaling the presence of a vehicle. Each loop shall be 18 meter Type 1 A installed in accordance with Section 86-5.01A(5), "Installation Details," of the Standard Specifications and sheet ES-5A, "Detectors" of the Standard Plans.

Lead-in cables shall conform to the requirements of Section 86-5.01A(4), "Construction Materials," of the Standard Specification for Type C lead-in-cable.

SIGNALS, LENGTH AND HEIGHT CONTROL CABINET.--

GENERAL.--The signals, length and height control cabinet enclosure shall be a NEMA 12 enclosure conforming to the Joint Industrial Conference Standards, with interior mounting panel, clamp door and continues hinge sized to fit all components and to fit space under the counter to be installed. The control relays, fuse, transformer, buzzer, bell and terminal blocks shall be mounted on the panel in the enclosure.

PRODUCTS AND EXECUTION.--

The electrical control components shall conform to the following:

Counters.--

Seven digit, electrical reset, 120V(ac) input, 51 mm LCD digital display with 3 V lithium battery that allows the counter to operate with no external power supply. The battery life shall not be less than 6 years.

Fuses.--

Shall be 250-volt, one-ampere, dual-element glass fuse with fuse holder.

Transformer, T1.--

Transformers shall be double-wound, 50 VA, 60 Hz dry type transformer with 120-volt primary and 24-volt secondary.

Control Relays (CR1 thru CR10).--

120 V(ac), general purpose relay with 3-pole, double-throw, 10 A contacts. Relay shall be enclosed in a clear plastic with 11-pin plug base. Socket for the relay shall be barrier type, 11-contacts relay socket with 10 A contacts and screw terminals.

Time Delay Relay (TDR).--

The time delay relay shall be an electronic type with a range of 1 second to 60 seconds. Relay shall be double-pole, double-throw, double break contacts having a capacity of 10 A at 120-V(ac). Delay relay shall have an initial setting of 10 seconds.

Buzzer and Bell.--

24 V(ac), with insulated binding posts with adjustable tone and volume.

Teminal Block.--

Terminal blocks shall be as specified under Control Console in these special provisions.

Loop detector.--

Each of the truck lanes shall have loop detectors installed in the pavement for signaling the presence of a vehicle. The loop detectors shall consist of 1.8 m loops, detector card rack, power supply card, conduits, conductors and cables installed in accordance with the provisions in Section 86-5, "Detectors," of the Standard Specifications and these special provisions.

Loop detector sensor units will be State-furnished as provided for under "State-Furnished Materials," elsewhere in these special provisions.
Slots shall be filled with elastomeric sealant or hot-melt rubberized asphalt sealant.

The loop installation shall be in accordance with Section 86-5.01A(5), "Installation Details," of the Standard Specifications and "Type 1 Installation," Sheet ES-5A of the Standard Plans.

TRUCK TRAFFIC SIGNALS SYSTEM.--

GENERAL.--The traffic in each of the traveling lanes shall be controlled by traffic signal mounted on the signal and weight display support.

The traffic near the exit shall be controlled by a one-section traffic signal head mounted on the exit signal and speaker pole.

The traffic at the entrance and exit of each inspection bay shall be controlled by two-section traffic signal heads mounted on the overhead door wall. The traffic signals shall conform to the requirements of Section 86-4, "Traffic Signal Faces and Fittings," of the Standard Specifications and these special provisions.

Each traffic signal head mounted on the signal and weight display support shall be the programmed visibility type conforming to the requirements of Section 86-4.05, "Programmed Visibility Vehicle Signal Faces," of the Standard Specifications except for the inspection bays and overhead doors shall be non programmed visibility type. Each traffic lane traffic signal shall contain 3 sections arranged vertically with red-top, green arrow-center and green bottom. The green arrow shall be arranged to show right turn.

The traffic signal section for the exit-stop signal shall be non-programmable 305 mm signal head with backplate. The exit signal lens shall be red.

The traffic signal section for entrance and exit of the inspection bay overhead doors shall be non-programmable with two 203 mm signal face sections arranged vertically with red color lens at the top and the green color lens at the bottom without backplate.

PUBLIC ADDRESS SYSTEM.--

GENERAL.--The public address system shall include control panel, speakers, amplifiers, desk stand type microphone with built-in speaker control and interconnecting cables.

PRODUCTS AND EXECUTION.--

Public address (PA) system control panel.--

The PA system control panel shall be a surface mounted NEMA Type 12 control panel enclosure conforming to the Joint Industrial Conference Standards. The enclosure shall be made of 1.9 mm (14 gauge) steel minimum with all seams continuously welded. The enclosure shall contain an electrical mounting panel and a hinged door with flush latch handle. The control relays, attenuators, fuse, power supply, duplex plug receptacle and terminal blocks shall be mounted on the panel in the enclosure.

Control relays.--

Control relays, CR1 through CR3 shall be 24-volt, DC relay with 24-volt coil and 2-pole, double throw contacts. Coil of the relay shall have a diode suppressor.

Power supply .--

Power supply shall be 120-volt AC fused input and 24-volt DC, 2-ampere output. The unit shall have less than 2.5 per cent ripple at full load.

Attenuators .--

Attenuators shall be autotransformer type and shall meet the following requirements:

Power rating:	30 watts
Positions:	eleven (10-off)
Attenuations/step:	3 dB

Duplex plug receptacle, DP.--

Duplex plug receptacle shall be as specified elsewhere in these special provisions.

Fuse.--

Fuse shall be 30-volt DC, 2-ampere complete with fuse holders.

Terminal blocks.--

Terminal blocks shall be as specified under "Control Console" in these special provisions.

Amplifier.--

The amplifier shall be of completely solid-stated circuitry and shall have an integral power supply. The amplifier shall be designed for shelf mounting and shall be housed in metal cabinets. Each amplifier shall meet or exceed the following requirements:

Power output:	120 watts (RMS)
Distortion:	Less than 2 per cent at 60 watts (RMS)
Frequency response:	50 Hz to 10 kHz + 2 dB
Noise level:	58 dB below rated output (Microphone input)
Sensitivity:	Full output with 0.3 millivolt input from microphone
Output impedance:	4, 8, 16 ohms and 70 volts (constant voltage)
Primary voltage:	120 V (ac), 60 Hz
Protection:	Amplifier shall have built-in protection against shorted or open speaker lines and shall have an adequate AC input line fuse.
Controls:	2 microphone gain, one auxiliary gain, bass and treble control
Inputs:	2 microphone, low impedance 150 to 250 ohm, one auxiliary.

Microphone.--

The microphone shall be the dynamic or moving coil type and shall be furnished with a desk stand providing four 3-position switches for lane speakers control with center-off. Microphone case and desk stand shall be of metal construction.

The microphone shall be provided with a 8-conductors cable with 2-conductos shielded. The microphone shall meet or exceed the following requirements.

Output level:	Minus 59 dB/1 mW/10
Frequency response:	60 Hz to 10 kHz
Impedance	150-250 ohms
Polar pattern	Semi-directional

Speakers.--

Each speaker furnished and installed for the public address system shall be the weatherproof, metal horn type and shall be furnished with adjustable swivel mounting brackets. Each speaker shall meet or exceed the following requirements:

Power rating:	30 watts
Impedance:	8 ohms
Frequency response:	250 Hz to 10 kHz
Dispersion:	120 degrees
Sound pressure level:	120 dB @ 1.2 m @ 1kHz on axis at rated output

A weatherpoof, 70-volt, constant voltage transformer shall be installed at speakers for level setting. Transformers shall have multi-primary taps to permit various power settings up to 30 watts.

Speaker cables.--

Speaker cables shall be 2-conductor, stranded, No. 14 spiral copper shielded foil with copper drain and plastic suitable for underground use.

CLOSED CIRCUIT TELEVISION SYSTEM (CCTV).--

GENERAL.--Closed circuit television (CCTV) system shall be color type consisting of cameras, zoom lenses, camera enclosures, monitors, switchers, pan tilt units, remote control receivers, remote control transmitters, camera and pan and tilt assemblies, video coaxial cables, and such other equipment required by the CCTV manufacturer to install a complete system without any extra charge to the State. The number of closed circuit television systems and components shall be as shown on the plans.

PRODUCTS AND EXECUTION.--

Camera.--

The camera assemblies shall be assembled and tested in accordance with these specifications prior to delivery to the jobsite. Factory testing documentation shall be furnished to the Engineer. Camera assemblies shall be delivered to the jobsite as a complete unit.

The camera shall meet or exceed the following specifications:

a. High resolution, solid state, 8.5 mm solid-state CCD (charged coupled device) color camera
b. Signal format shall be compatible with all applicable National Television Standards Committee, NTSC, and have 525 lines per frame, interlaced 2:1 per EIA-170 A standard.
c. Color balance shall be of the through-the-lens type, with less than 10 IRE units unbalance from 2850 to 5800°K.
d. Imaging system shall have Charged Coupled Device (CCD) solid-state image sensor. The minimum number of picture elements (NTSC) shall be 768(H) by 494(V) pixels.
e. Video output signal shall be Standards NTSC (RS-170 or RS 170A). Video output level shall be 1.0 V p-p (75 ohm composite).
f. Minimum video sensitivity of 0.1 lux.
g. Camera resolution (NTSC) shall be a minimum of 460 horizontal television lines and a minimum of 350 vertical television lines when measured from the camera video output.
h. Signal-to-noise ratio shall be better than 48 dB at 1.0 V p-p (with Standard Automatic Gain Control off and 15 lux).
i. Gamma shall be 0.45.
j. Camera shall operate on 115 V, AC, 60 Hz.
k. Camera shall be equipped with a standard "C" type lens mount and shall be designed to operate and interconnect with industry standard auto iris lenses.
l. Power consumption with heater off shall be less than 10 watts. Power consumption with heater on shall be less than 20 watts.
m. Camera shall be capable of integrating multiple frames for increased sensitivity.

The camera shall be specifically designed to operate under low light conditions and shall function satisfactorily over a wide range of dynamic lighting conditions ranging from low light to full sunlight.

The cameras shall have a built-in programmable electronic circuit character generator capable of superimposing a written camera identification message over the video display. The identification shall be programmable up to two lines of 24 characters per line. Text characters shall be white with a black border 28 horizontal TV lines in height. The camera identification shall be input via an RS-422 connector to the camera housing programmable from a computer or a dumb terminal. The character generator shall also superimpose a message indicating that the camera pressure is low if the pressure in the enclosure drops to 1400 kg per m^2 and below.

Camera lens.--

The camera lenses shall be motorized with automatic iris and manual override. The iris shall be controlled directly by the camera in automatic mode and from the control receiver in manual mode. Each lens shall incorporate an intra-spot neutral density filter and shall meet the following requirements:

Standard "C" type mount, 8.5 mm format.
Focal length of 8 to 48 mm providing a 6:1 power zoom ratio.
Maximum aperture of no less than F1.2.
All lens motors shall be slipclutch protected to prevent damage due to overload.

Camera enclosure.--

Camera enclosure shall be environmental type and shall be a sealed and pressurized cylindrical enclosure with outside dimension of approximately 560 mm (L) x 115 mm (Diameter) maximum. The enclosure shall be provided with a mounting for attachment to the pan and tilt unit. The enclosure shall be fabricated from corrosion resistant aluminum and finished in a beige or neutral color of weather resistant enamel. The front of the enclosure shall be tempered glass. The enclosure shall be purged of air and pressurized with dry nitrogen to 34 ± 6 kPA. A standard Schrader valve shall be located on the back plane of the environmental enclosure for pressurizing and purging. A decal shall be affixed permanently to the rear housing plate stating that the unit is pressurized and that safety precautions must be observed. A pressure relief valve, preset to 138 ± 34 kPA shall be located on the back plate of the environmental enclosure. A safety pressure release bolt shall be incorporated such that the enclosure may not be opened without first releasing the internal pressure. Each housing shall have one package of desiccant placed in the enclosure. The camera connector for the environmental housing shall mount on the rear plate and seal to the plate with an O-Ring.

The complete camera assembly shall meet or exceed the following environmental specifications:

Temperature	-40 to +60°C
Humidity	100% relative humidity
Vibration	Swept 5-60 Hz, 2 mm amplitude: (15 G's at 60 Hz) Random 60-1000 Hz 5 G's RMS
Shock	Up to 30 G's, any axis under nonoperating conditions. MIL-E-5400T, para 3.2.24.6
Sand & Dust	MIL-E-5400T, para 3.2.24.7
Fungus Salt	MIL-E-5400T, para 3.2.24.8
Atmosphere	MIL-E-5400T, para 3.2.24.9
Explosion	MIL-E-5400T, para 3.2.24.10
EMI	FCC Rules, part 15, subpart J, for Class A devices
Acoustic Noise	+150 dB

A sunshield shall be supplied and installed on all the cameras to protect the camera from direct sunlight. It shall be constructed in such a way as to allow the free passage of air between the housing and the shield, but shall not form a "sail" to place an excessive load on the pan/tilt unit in high winds.

Pan and tilt unit.--

The contractor shall furnish and install an environmental pan and tilt unit which integrates a pan and tilt and a receiver/driver into one package at each camera site where shown on the plans. The integrated receiver/driver, contained within the pan/tilt unit, communicates with multiprocessor control units. All camera and pan/tilt functions are operable via RS-422 serial communications.

The pan and tilt unit shall be designed for use in all outdoor weather conditions. The pan and tilt unit shall be compatible with the transmitter/receiver control box, camera enclosures and the camera and lens assemblies provided under this contract.

The pan and tilt drive shall be a medium-duty, counterbalanced unit designed for operation with loads up to 16 kg. It shall include drive motors with factory lubricated, hardened-steel gear trains that require no field lubrication, and quad ring seals with Teflon wear surfaces for protection in severe conditions. Operational stability with minimum shall be provided by self energizing brakes integral with the drive moors, or by solenoid-operated brakes.

The pan and tilt unit shall meet the following specifications:

1. The travel angle of the pan and tilt drive unit shall be 350 degrees minimum in the horizontal plane and ± 90 degrees in the vertical plane. Position of camera stops shall be approved by the Engineer.
2. The pan and tilt unit shall provide positional feedback through an internal potentiometer to accommodate preset positions, controlled from the multiprocessor control units and transmitter/receiver control box.
3. The pan and tilt unit shall pan at a nominal speed of 5 to 10 degrees per second, and a nominal tilt of 2 to 4 degrees per second.
4. The pan and tilt unit shall have instantaneous reverse motor action. Dynamic braking shall also be incorporated to prevent drift.
5. Heavy duty roller bearings shall be used on all rotating surfaces. All rotor gears shall be made from hardened steel and low temperature lubricant shall be used. Gasket seals shall be incorporated to ensure all-weather protection. All internal parts shall be corrosion protected.
6. Provision shall be made for mounting the weatherproof outdoor enclosure with the camera assembly to the Pan and Tilt unit at the correct pivot point.
7. The Pan and Tilt unit shall be capable of supporting a maximum load of 18.1 kg at 127mm from tilt table surface to the center of gravity.
8. The Pan and Tilt unit shall be of the adjustable worm gear final drive type, to prevent drift and minimize backlash.
9. The Pan and Tilt unit shall be powered and controlled from the transmitter/receiver control box.
10. Input voltage shall be provided by the remote control receiver. Input shall be 115 V(ac). Input power shall be 21 VA pan, 21 VA tilt.

The size of the unit shall be approximately 280 mm high, 230 mm wide with a base of approximately 152 mm^2.

All parts shall be corrosion-protected steel or aluminum. Finish shall be off-white baked enamel. Pan bearings shall be heavy duty ball bearings. Tilt bearings shall be oil tight bronze bushing. Gears shall be hardened steel. Seals shall be quad ring and gasket seals for all weather environmental protection. Ambient temperature range shall be -23°C to +49°C. Overload protection shall be motor thermal on tilt, motor clutch protection on pan.

Any mounting adapter, necessary cables, brackets, connectors, potting sleeves, potting materials, and auxiliary materials required to install the pan and tilt unit shall be provided to suit the units furnished.

CCTV receiver.--

CCTV receiver control box shall be the equipment required to interface with the pan and tilt unit, camera, camera lens, environmental enclosure and switcher. Remote control command shall be sent by the remote control transmitter over cables as shown on the plans.

The receiver assembly shall have the following features:

SIGNAL INPUT/OUTPUT: 1.00 V p-p composite video.
LENS OUTPUTS: 12 V (dc) switched on command from the remote transmitter so as to allow the zoom and focus lens functions to operate over their entire range at the command of the operator.
CONNECTORS: For pan/tilt unit and camera - 37 pin AMP type. For video - BNC type.
SUPPLY VOLTAGE: 115 V(ac), 60 Hz (±10%).
CAMERA POWER: 115 V(ac).
CONSTRUCTION: Weatherproof NEMA Type 4 enclosure.

CCTV transmitter.--

The CCTV transmitter shall be connected by coaxial cable to the CCTV receiver for control of pan, tilt, zoom lens, and auxiliary functions of the CCTV camera. The transmitter shall be connected to the sequential switcher via coaxial cable to allow control to be switched to any one of the cameras.

The pan and tilt control shall consist of a joystick to move the camera to the left, right, up or down positions. The zoom lens control shall have the following: Zoom-Tele/Wide; Focus-Near/Far; Iris-Open/ Close. Lens speed shall be controlled from slow to fast with a rotary knob. The power On/Off switch shall be a rocker type switch.

Sequential switcher.--

The sequential switcher shall have 4 inputs, terminating type, with manual and automatic switching capability to two monitors. Front panel of the switcher shall have three-position switches to manually view a camera, view a camera during auto-sequencing, and to lock-out a camera during auto-sequencing. The switcher shall have the following:

Video inputs - 4
Maximum signal level - 2.0 Volt peak to peak
Video output - two
Termination - 75 ohms internal termination
Gain - unity
Frequency response - Flat with one Hz to 10 MHz
Adjustable dwell - 5 to 60 seconds
Supply voltage - 120-volt, AC, 60 Hz

Monitor.--

The monitors shall be 380 mm thin film transfer (TFT) minimum, liquid crystal display (LCD) and depth of 76 mm or less. The monitor shall have characteristics as follows:

Color System:	NTSC
Input voltage :	100-240 V(ac), 60 Hz
Input/output signal	1 Vp-p composite signal
Video input/output	RCA, S-VHS connectors
Contrast Ratio	300:1 or better
Brightness	350 cd/m²
Native Resolution	1024 x 768
Operating temperature	50° to 104° F

The monitor shall be compatible with the signal from the sequential switcher, bracket shall be provided for monitor mounting on column at location as shown on the plans.

Cables, connectors and harnesses.—

Units or assemblies which require 120-volt AC power for operation shall be furnished with a 1 meter long, 3-conductor power cable permanently affixed to its chassis or enclosure at one end in a manner so that it is fully protected from contact with metal edges. The chassis or the enclosure shall have a strain relief device to prevent strain on each internal connection to the power cable.

Coaxial cable shall be type RG59/U for cameras located up to 228 m maximum away from the monitor. Type RG6/U shall be used for cameras located up to 457 m away from the monitor. Coaxial cable used for making video connections between devices shall be of the RG-59 type with nominal impedance of 73 to 75 ohms. All coaxial cables shall have a polyethylene dielectric with copper braid shield having a minimum of 95 percent shield coverage and not greater than 3.4 dB attenuation per 31 m at 100 MHz.

The camera control cable assembly from the camera housing and the pan and tilt mechanism to the CCTV receiver shall be of the type recommended by the camera manufacturer and all connections shall be done using Y connectors .

All external connections shall be made by means of connectors. The connectors shall be keyed to preclude improper hookups. All wires to and from the connectors shall be color coded and/or appropriately marked. In order to assure compatibility and performance compliance, the cables from the camera and pan and tilt unit shall be assembled by the camera manufacturer.

Connecting harnesses of appropriate length and terminated with matching connectors shall be provided for interconnection with the communications system equipment.

All pins and mating connectors shall be plated to provide good electrical connection and resist corrosion. Connectors utilizing solder type connections shall have each soldered connection covered by a piece of heat shrink tubing securely shrunk to insure that it protects the connection.

All connectors shall be provided and installed which are compatible with the communications equipment interface. Connectors shall be used for connections at the camera/lens enclosure and pan/tilt positioning system. All connector pins and mating connectors shall be plated to ensure good electrical connection and resist corrosion. Pressure tight multi-conductor ms-type cable connectors shall be used for camera connections.

INSTALLATION.--

CCTV system shall be installed as shown on the plans. Cameras and monitors shall be adjusted for both day and night operations. The Contractor shall submit the installation and mounting details of the cameras. The system shall be installed at locations shown on the plans and by methods recommended by the manufacturers. The Contractor shall provide all supports, fasteners and other hardware necessary to support the units.

TRAINING

The Contractor shall provide one hour of on-site training on the use, operation, and maintenance of the system for not more than 8 designated State employees. The Contractor shall notify the Engineer in writing not less than 10 days in advance of proposed training class.

TESTING AND DOCUMENTATION

Prior to conducting any tests the Contractor shall provide the Engineer detailed test procedures for review and approval. Documentation of all test results shall be provided to the Engineer for review and approval. System Documentation shall incorporate test results for ongoing maintenance and performance measurements.

CCTV system location tests.-- In the presence of the Engineer, the Contractor, after installation of each camera location with pan and tilt drive, shall verify the correct operation of the camera, lens, pan and tilt drive unit, and the weatherproof outdoor enclosure accessories from the cabinet location. These tests shall include:

1. Viewing video images as the lens focal lengths and apertures of the lens is varied. The Contractor shall verify that the camera is focused after each change.
2. Verifying the correct operation of the auto iris, power zoom and imager protection features.
3. Verifying the correct operation of the pan and tilt unit. The pan and tilt stops shall be such that the camera viewing coverage of the freeway is optimized as directed by the Engineer.

Camera control location tests.-- In the presence of the Engineer, the Contractor, after installation of the CCTV, shall verify the correct operation of the camera and pan and tilt drive units. These tests shall include:

1. Viewing video images as the lens focal lengths and apertures of the lens is varied from the multiprocessor camera control, master and remote locations. The Contractor shall verify that the camera is focused after each change.
2. Verifying the correct operation of the auto iris, power zoom and imager protection features from the multiprocessor camera control, master and remote locations.
3. Verifying the correct operation of the pan and tilt unit from the multiprocessor camera control, master and remote locations.
4. Verifying the correct operation of the switcher. The switcher shall switch any of the chosen composite video input signals to any one of the chosen composite video outputs without blocking other users.

The Contractor shall have a representative present during all phases of testing, who is capable of troubleshooting Contractor installed equipment. The representative shall troubleshoot Contractor installed equipment as the need arises. All of the work described herein shall be considered paid as part of the CCTV installation.

Final systems test.--In the presence of the Engineer, the Contractor shall conduct a final test of the CCTV system to verify the system is complete and fully operational. The Contractor shall conduct end to end performance tests on the CCTV system. These tests shall confirm the functional operation of all elements of the system and shall include measurements of the system performance.

Each camera shall be tested to measure the video signal received using a NTSC waveform monitor. The testing shall confirm video levels and signal to noise ratio specification compliance for daytime and nighttime operation at each of the camera locations. The pan and tilt shall be functionally tested over 350 degrees in the horizontal plane and ± 90 degrees in the vertical plane. Functional testing shall also confirm specification compliance for the lens operation, the auto and manual iris control, and the camera controller receiver and transmitter.

12-16.07 TRUCK WEIGHING ELECTRICAL SYSTEM

GENERAL.--This work shall consist of furnishing and installing a truck static electronic weighing system and a Truck Screening Weighing System in accordance with the details shown on the plans and these special provisions.

TRUCK STATIC WEIGHING ELECTRICAL SYSTEM

GENERAL.-- The truck scale static electronic weighing equipment shall include the scale, a weightmeter, printer, remote weight display, load cells and load cell summation box. The system shall be complete with interconnecting cables.

PRODUCTS.--

Scale.--

The static weighing system scale shall be as specified under "Truck Static Weighing System" in Section 12-10, "Specialties," in these special provisions.

Weightmeter.--

The weightmeter shall incorporate filtering against effects of radio frequency and electromagnetic interferences such as those generated by electromechanical equipment, power lines, portable hand-held radio transmitters and citizen band transmitters. The weighmeter shall display accurate axle weights of vehicle moving over the scale platform at a speed of 4.8 km/h (3 mph) or slower. The weighmeter shall provide, on command to printer, the following information:

1. Individual axle weight.
2. Time and date.
3. Total of all axle weights.
4. Truncated weight information in 20-pound (9 kg) increments.

Operator control of the weighmeter shall include the following:

1. Time and date setting.
2. ON-OFF selector switch for remote weight display.
3. Axle weight "Print" pushbutton actuator.
4. Tot
5. ON-OFF switch for an internal overload alarm.

The weighmeter shall also meet or exceed the following requirements:

Power requirements	120-volt AC, 60 Hz
Operating temperature	0ºC to 49ºC (32˚F to 120˚F).
Full scale range	99980 pounds (45350 kg)
Counting increments	20 pounds (9 kg)
Polarity indication	Auto minus shall illuminate when reading is below one increment or more.
Overload audio alarm	Presettable overload indication for internal audio alarm. Alarm shall come on when the weight on the scale platform exceeds the preset weight.
Pounds for kilograms	Direct arithmetic conversion by front panel pushbutton switch.
Pushbutton zero	Automatically zeros weighmeter display interlocked with motion detector.
Auto-zero tracking	Automatically tracks zero to ensure a stable zero. Tracking range shall be internally selectable.
Numeric keyboard	Provide manual entry of all functional data.
Function key	Appropriate number of preassigned function keys for special control functions.
Status key	Display weighmeter status mode, center zero, and motion.

Load cell excitation	Power up to 4 load cells at 15 volts AC or DC.
Dead load	Field adjustable from 0 to 74 percent
Back up battery	Retain data memory during power failure
Auxiliary output	Shall interface with the following: a. Remote weight display. b. Printer c. Presetting an overload capacity on scale, when the truck reaches this preset point, an alarm will sound
Auxiliary input	Shall interface with following command devices from auxiliary equipment; a. Mode, zero, net. gross pushbuttons. b. Remote display ON/OFF selector switch. c. Axle weight "Print" pushbutton. d. Total of axle weights "Print" pushbutton.
Display	Light emitting diode main and auxiliary display. Main display shall be 12. 7 mm (0.5 inch) or more in height with 6 digits. Auxiliary display shall be 5 mm (0.2 inch) or more in height, with alpha-numeric characters.
Enclosure	Countertop, all metal NEMA 1 enclosure with front enclosure of 63 mm (2.5 inches) maximum, a back enclosure height of 133 mm (5.25 inches) maximum, and a depth of 292 mm (11.5 inches) maximum with front control panel sloped at 60 degrees to the countertop.

The weight of each axle and the total accumulated weight of all previous axles shall be displayed on the weighmeter. When the "TOTAL" command is entered, all preceding axle weights shall be displayed on the auxiliary display for an additional two seconds after which the accumulator shall automatically reset to zero.

The weighmeter, including the enclosure, shall be standard manufacturer catalog item with the required modification specified above.

Printer.--

Printer shall be fully microprocessor controlled printer with dot matrix print head and alpha-numeric characters. The printer shall be under the manual control of the weighmeter with pushbuttons for "PRINT" and "TOTAL" commands during each weighing, either static or dynamic. When the "PRINT" command is entered, whatever weight is displayed on the weighmeter at that time shall be printed. When the "TOTAL" command is entered, all preceding axle weights and the date and time shall be printed on each weight ticket. The printer shall not interfere with the normal weighing and indicating mechanisms of the scale. The printer shall meet or exceed the following requirements:

Power requirements	120-volt AC, 60 Hz
Control	ON-OFF switch
Character height	2.7 mm (0.105-inch), minimum
Print speed	One or more lines per second
Line spacing	6 lines per 25 mm (inch)
Roll paper width	Standard office supply paper
Paper thickness	One or two ply 0.07 mm to 0.18 mm (0.003-inch to 0.007-inch)
Roll paper diameter	83 mm (3.25-inch)
Data input	Compatible with data output of weighmeter
Operating temperature	–1ºC to 48ºC (Plus 30ºFto plus 120ºF)
Axle sequence number	Automatically reset to zero for each vehicle

Load cells.--

Load cells shall be the tension or compression type load cell with mounting assembly and shall meet or exceed the requirements contained in the National Bureau of Standards Handbook 44, "Specifications and Tolerances." Load cells shall be temperature compensated for thermal changes to assure accurate zero and span output, environmentally sealed against dust and moisture, and barometrically insensitive to barometric changes. Load cells shall be of high strength alloy steel construction and shall meet or exceed the following requirements:

Capacity	25 Tons (22 680 kg)
Safe overload	150 percent
Zero balance	±1 percent of full scale
Maximum excitation	15-volts AC or DC
Non-linearity	0.05 percent of full scale
Hysterisis	0.30 percent of full scale
Non-repeatability	0.02 percent of full scale

Remote weight display.--

Remote weight display shall be an outdoor, electromechanical display with six numerals. The sixth digit at the right shall be a fixed zero. Numerals shall be 228 mm (9 inches high), yellow fluorescent digits with internal flourescent light fixture controlled by photoelectric unit. Numerals shall show against a flat background. The enclosure shall be NEMA Type 4X, fully gasketed and watertight. The external digital weight display shall precisely track the weighmeter display and operate on standard 120-volt, 60 Hz, AC power. The unit shall operate satisfactorily in a temperature range between 0ºC and 49ºC (32ºF and 120ºF and shall have a 2-pole, single throw selector switch to turn on and off the power.

Interconnection cables.--

All interconnection cables between the scale electronic equipment shall be of the type recommended by the equipment manufacturer.

Load Cell Summation Box.—

Load cell summation box shall be a NEMA 4 enclosure with equipment to suit load cell furnished**.**

TRUCK SCREENING WEIGHING ELECTRICAL SYSTEM

GENERAL.—The work shall consist of furnishing and installing a fully electronic truck screening weighing system for Empty Lane in accordance with the details shown on the plans, as specified in these special provisions and as recommended by the system manufacturer.

The truck screening weighing system shall include weighpad, a weightmeter and interconnecting cables. The weightmeter shall display each axle weight for trucks passing over the weighpad at speeds up to 24 km/h (15 mph) with accuracy specified elsewhere. The bending plate for the weighpad shall be of proven design and successfully in use for not less than three years in at least three similar installations in the United States of America.

WARRANTY.--The warranty shall cover material and labor for five years for the strain gages and load cells of the weighpad and one year for all other parts.

PRODUCTS.--

Weighpad.--

The weighpad shall be of the bending plate type with strain gages or shall be of the load cell type. The weighpad shall be installed in asphalt concrete pavement as shown on the plans and as recommended by the weighpad manufacturer.

The weighpad shall meet or exceed the following requirements:

Minimum width.--
1.75 meter

Minimum load.--
Not more than 453 kg (1,000 pounds)

Wheel load.--
11340 kg (25,000 pounds) min.
Accuracy.--
95% accuracy compared to the value given by Static Scale.

Temperature range.--
-28.8˚C (-20° F) to 65.5˚C (150°F).

Weightmeter.—
The weightmeter shall incorporate filtering against effects of radio frequency and electromagnetic interference such as those generated by electro-mechanical equipment, power lines portable hand-held radio transmitters and citizen band transmitters. The weightmeter shall display accurate axle weights of vehicles moving over the weighpad at a speed of 24 km/h (15 mph) or slower. The weightmeter shall meet or exceed the following:

Power requirements.--
120-volt AC, 60 Hz

Operating temperature.--
4˚ C (40°F) to 48.8˚ C (120°F).

Full scale range.--
45314 kg (99900 pounds)

Counting increments.--
45.3 kg (100 pounds)

Polarity indication.--
Auto minus shall illuminate when reading is below one increment or more.

Pushbutton zero.--
Zero weightmeter display

Display.--
Digital (LED or LCD with backlit) with a minimum character height of 12.7 mm. The axle weight (double the wheel weight) shall be displayed until the next axle passes over the weighpad.

Alarm.--
Excess of an adjustable weight threshold shall activate a pilot light in the weightmeter, a buzzer in the weightmeter and a silicon current rectifier (SCR) output to control an external light. The buzzer shall be turned off via separate

toggle switch. The alarm shall be reset either by a pushbutton or after adjustable time (1 to 15 seconds) whichever comes first.

Setting.--
Setting threshold and other setups shall be accomplished with accessible DIP switches.

Calibration.--
Calibration shall be accomplished through terminal or PC.

Enclosure.—NEMA 12 enclosure

12-16.08 LIGHT EMITTING DIODE SIGNAL MODULE

Traffic signal faces with 300-mm sections, 200-mm sections or arrow sections shall use light emitting diode (LED) signal modules as the light source in conformance with these special provisions.

GENERAL

Type 1 LED signal modules shall be installed in the doorframes of standard traffic signal housings. Lamp sockets, reflectors, reflector holders and lenses used with incandescent lamps shall not be used when Type 1 LED signal modules are installed.

LED signal modules, including green, yellow, red, circular balls and arrow indications shall be from the same manufacturer, and each size shall be the same model.

Type 1 LED signal modules shall be sealed units with two color-coded conductors for power connection, a printed circuit board, a power supply, a lens and a gasket. LED signal modules shall be weatherproof after installation and connection. Circuit boards and power supplies shall be contained inside Type 1 LED signal modules. Circuit boards shall conform to the requirements in Chapter 1, Section 6 of the "Transportation Electrical Equipment Specifications," (TEES) published by the Department.

Conductors for Type 1 LED signal modules shall be one meter in length with quick disconnect terminals attached, and shall conform to the provisions in Section 86-4.01C, "Electrical Components," of the Standard Specifications.

Lenses of Type 1 LED signal modules shall be integral to the units, shall be convex with a smooth outer surface and shall be made of ultraviolet (UV) stabilized plastic or glass. The lenses shall be capable of withstanding ultraviolet exposure from direct sunlight for a minimum period of 36 months without exhibiting evidence of deterioration.

Type 1 LED signal modules shall be sealed in doorframes with one-piece ethylene propylene rubber (EPDM) gaskets.

LEDs used in signal modules shall be of Aluminum Indium Gallium Phosphide (AlInGaP) technology for red and yellow indications and of Gallium Nitride (GaN) technology for green indications. LEDs shall be the ultra bright type rated for 100,000 hours of continuous operation from -40°C to +74°C.

Individual LEDs shall be wired so that a total failure of one LED will result in the loss of not more than 5 percent of the signal module light output. Failure of an individual LED in a string shall not result in the loss of the entire string or any other indication.

Maximum power consumption requirements for LED signal modules shall be as follows:

LED Signal Module	Power Consumption in Watts					
	Red		Yellow		Green	
	25°C	74°C	25°C	74°C	25°C	74°C
300 mm circular	11	17	22	25	12	12
200 mm circular	8	13	13	16	10	10
300 mm arrow	9	12	10	12	13	13

PHYSICAL AND MECHANICAL REQUIREMENTS

For existing traffic signals, LED signal modules shall be designed as retrofit replacements for existing optical units of standard traffic signal sections and shall not require special tools for installation. LED signal modules shall fit into existing traffic signal section housings built in conformance with the requirements in the Institute of Transportation Engineers (ITE) without any modification to the housing.

Installation of LED signal modules shall only require the removal of the optical unit components such as the lens, lamp module, gaskets and reflector. LED signal modules shall be weather tight, fit securely to the housing and connect directly to electrical wiring.

Arrow modules shall conform to the requirements in Section 9.01 of the Institute of Transportation Engineers (ITE) Publication: Equipment and Materials Standards, "Vehicle Traffic Control Signal Heads" for arrow indications. LEDs shall be spread evenly across the illuminated portion of the arrow area.

LED Signal Module Lens

The LED signal module shall be capable of replacing the optical unit. The lens may be tinted or may use transparent film or materials with similar characteristics to enhance "ON/OFF" contrasts. The use of tinting or other materials to enhance "ON/OFF" contrast shall not affect chromaticity and shall be uniform across the face of the lens.

If a polymeric lens is used, a surface coating or chemical surface treatment shall be used to provide front surface abrasion resistance.

Environmental Requirements

LED signal modules shall be rated for use in the operating temperature range of -40°C to +74°C.

LED signal modules shall be protected against dust and moisture intrusion in conformance with the requirements in NEMA Standard 250-1991 for Type 4 enclosures to protect internal components.

Construction

LED signal modules shall be single, self-contained devices, not requiring on-site assembly for installation into existing traffic signal housings. The power supply for LED signal modules shall be integral to the module.

Assembly and manufacturing processes for LED signal modules shall be designed to assure all internal components will be adequately supported to withstand mechanical shock and vibration from high winds and other sources.

Materials

Materials used for lenses and LED signal modules shall conform to the requirements in ASTM Specifications for the materials.

Enclosures containing the power supply or electronic components of LED signal modules shall be made of UL94VO flame-retardant materials. Lenses of LED signal modules are excluded from this requirement.

Module Identification

LED signal modules shall have the manufacturer's name, trademark, model number, serial number, lot number, month and year of manufacture, and required operating characteristics permanently marked on the back of the module. Required operating characteristics shall include rated voltage, power consumption and volt-ampere (VA).

Type 1 LED signal modules shall have prominent and permanent vertical markings for correct indexing and orientation within the signal housings. Markings shall consist of an up arrow or the word "UP" or "TOP."

PHOTOMETRIC REQUIREMENTS

Initial luminous intensity values for LED signal modules, operating at 25°C, shall meet or exceed the following minimum values:

Circular Indications (in cd)

	200 mm			300 mm		
Angle (v,h)	Red	Yellow	Green	Red	Yellow	Green
2.5, ±2.5	157	314	314	399	798	798
2.5, ±7.5	114	228	228	295	589	589
2.5, ±12.5	67	133	133	166	333	333
2.5, ±17.5	29	57	57	90	181	181
7.5, ±2.5	119	238	238	266	532	532
7.5, ±7.5	105	209	209	238	475	475
7.5, ±12.5	76	152	152	171	342	342
7.5, ±17.5	48	95	95	105	209	209
7.5, ±22.5	21	43	43	45	90	90
7.5, ±27.5	12	24	24	19	38	38
12.5, ±2.5	43	86	86	59	119	119
12.5, ±7.5	38	76	76	57	114	114
12.5, ±12.5	33	67	67	52	105	105
12.5, ±17.5	24	48	48	40	81	81
12.5, ±22.5	14	29	29	26	52	52
12.5, ±27.5	10	19	19	19	38	38
17.5, ±2.5	19	38	38	26	52	52
17.5, ±7.5	17	33	33	26	52	52
17.5, ±12.5	12	24	24	26	52	52
17.5, ±17.5	10	19	19	26	52	52
17.5, ±22.5	7	14	14	24	48	48
17.5, ±27.5	5	10	10	19	38	38

Arrow Indications (in cd/m^2)

	Red	Yellow	Green
Arrow Indication	5500	11 000	11 000

LED signal modules shall meet or exceed the following minimum illumination values for a minimum period of 36 months, based on normal use in traffic signal operation over an operating temperature range of -40°C to +74°C. In addition, yellow LED signal modules shall meet or exceed the following minimum illumination values for a minimum period of 36 months, based on normal use in traffic signal operation at 25°C:

Circular Indications (in cd)

	200 mm			300 mm		
Angle (v,h)	Red	Yellow	Green	Red	Yellow	Green
2.5, ±2.5	133	267	267	339	678	678
2.5, ±7.5	97	194	194	251	501	501
2.5, ±12.5	57	113	113	141	283	283
2.5, ±17.5	25	48	48	77	154	154
7.5, ±2.5	101	202	202	226	452	452
7.5, ±7.5	89	178	178	202	404	404
7.5, ±12.5	65	129	129	145	291	291
7.5, ±17.5	41	81	81	89	178	178
7.5, ±22.5	18	37	37	38	77	77
7.5, ±27.5	10	20	20	16	32	32
12.5, ±2.5	37	73	73	50	101	101
12.5, ±7.5	32	65	65	48	97	97
12.5, ±12.5	28	57	57	44	89	89
12.5, ±17.5	20	41	41	34	69	69
12.5, ±22.5	12	25	25	22	44	44
12.5, ±27.5	9	16	16	16	32	32
17.5, ±2.5	16	32	32	22	44	44
17.5, ±7.5	14	28	28	22	44	44
17.5, ±12.5	10	20	20	22	44	44
17.5, ±17.5	9	16	16	22	44	44
17.5, ±22.5	6	12	12	20	41	41
17.5, ±27.5	4	9	9	16	32	32

Arrow Indications (in cd/m^2)

	Red	Yellow	Green
Arrow Indication	5 500	11 000	11 000

Measured chromaticity coordinates of LED signal modules shall conform to the chromaticity requirements of the following table, for a minimum period of 36 months, over an operating temperature range of -40°C to +74°C.

Chromaticity Standards

Red	Y: not greater than 0.308, or less than 0.998 -x
Yellow	Y: not less than 0.411, nor less than 0.995 - x, nor less than 0.452
Green	Y: not less than 0.506 - 0.519x, nor less than 0.150 + 1.068x, nor more than 0.730 - x

LED signal modules tested or submitted for testing shall be representative of typical production units. Circular LED modules shall be tested in conformance with California Test 604. Optical testing shall be performed with LED signal modules mounted in standard traffic signal sections without visors or hoods attached to the signal sections.

LEDs for arrow indications shall be spread evenly across the illuminated portion of the arrow area. Arrow LED signal modules shall be tested in conformance with California Test 3001. Optical testing shall be performed with LED signal modules mounted in standard traffic signal sections without visors or hoods attached to the signal sections. LED arrow signal section indication shall provide minimum initial luminous intensity as listed herein. Measurements shall be performed at the rated operating voltage of 120 V (ac).

ELECTRICAL

Maximum power consumption requirements for LED signal modules shall not exceed those listed in "General." LED signal modules shall operate at a frequency of 60 Hz ± 3 Hz over a voltage range from 95 V (ac) to 135 V (ac) without perceptible flicker. Fluctuations of line voltage shall have no visible effect on luminous intensity of the indications. Rated voltage for all measurements shall be 120 V (ac).

Wiring and terminal blocks shall conform to the requirements of Section 13.02 of the ITE Publication: Equipment and Material Standards, (Vehicle Traffic Control Signal Heads). Two secured, color coded, 1 meter long, 600 V, 20 AWG minimum, jacketed wires, conforming to the National Electronic Code, rated for service at +105°C, shall be provided for electrical connection for each Type 1 LED signal module.

LED signal module on-board circuitry shall include voltage surge protection to withstand high repetition noise transients in conformance with the requirements in Section 2.1.6 of NEMA Standard TS2-1992.

LED signal modules shall be operationally compatible with currently used controller assemblies including solid state load switches, flashers and conflict monitors. When a current of 20 milliamperes (ac) or less is applied to the unit, the voltage read across the two leads shall be 15 V (ac) or less.

LED signal modules and associated on-board circuitry shall conform to the requirements in Federal Communications Commission (FCC) Title 47, SubPart B, Section 15 regulations concerning the emission of electronic noise.

LED signal modules shall provide a power factor of 0.90 or greater.

Total harmonic distortion from current and voltage induced into an alternating current power line by LED signal modules shall not exceed 20 percent at an operating temperature of 25°C.

QUALITY CONTROL PROGRAM

LED signal modules shall be manufactured in conformance with a vendor quality control (QC) program. The QC program shall include two types of testing: (1) design qualification and (2) production quality. Production quality testing shall include statistically controlled routine tests to ensure minimum performance levels of LED signal modules built to meet these specifications.

Documentation of the QC process and test results shall be kept on file for a minimum period of seven years.

LED signal module designs not satisfying design qualification testing and the production quality testing performance requirements specified herein shall not be labeled, advertised or sold as conforming to these specifications.

Identification of components and subassemblies of LED signal modules, which may affect reliability and performance, shall be traceable to the original manufacturers.

Design Qualification Testing

Design qualification testing (DQT) shall be performed by the manufacturer or an independent testing lab hired by the manufacturer on new LED signal module designs, and on existing designs when a major design change has been implemented. Failure to conform to the requirements of any design qualification test shall be cause for rejection.

A major design change is defined as a design change, electrical or physical, which changes any of the performance characteristics of the LED signal module, results in a different circuit configuration for the power supply, or changes the layout of the individual LEDs in the signal module.

Two LED modules for each design shall be used for DQT. The two LED signal modules shall be selected at random. These signal modules shall be submitted to the Transportation Laboratory after the DQT is complete. Testing data shall be submitted with the modules to the Transportation Laboratory for verification of DQT data.

LED signal modules shall be energized for a minimum of 24 hours, at 100 percent on-time duty cycle, at a temperature of 74°C before performing any DQT.

After burn-in, LED signal modules shall be tested for rated initial luminous intensity in conformance with the provisions in "Photometric Requirements." Before measurement, LED signal modules shall be energized at rated voltage, with 100 percent on-time duty cycle, for a time period of 30 minutes. Photometrics, luminous intensity and color measurements for yellow LED signal modules shall be taken immediately after the modules are energized. The ambient temperature for these measurements shall be 25°C. Test results for this testing shall record the current, voltage, total harmonic distortion (THD) and power factor (PF) associated with each measurement.

LED signal modules shall be tested by measuring for chromaticity (color) in conformance with the provisions in "Photometric Requirements." A spectra radiometer shall be used for this measurement. The ambient temperature for this measurement shall be 25°C.

LED signal modules shall be tested by measuring the current flow in amperes. The measured current values shall be used for quality comparison of production quality assurance on production modules.

LED signal modules shall be tested by measuring the power factor. A commercially available power factor meter may be used to perform this measurement.

LED signal modules shall be tested by measuring the total harmonic distortion. A commercially available total harmonic distortion meter may be used to perform this measurement.

LED signal modules shall be tested in conformance with the provisions in "Electrical," with reference to Class A emission limits referenced in Federal Communications Commission (FCC) Title 47, SubPart B, Section 15.

LED signal modules shall be tested for compatibility with the controller unit, conflict monitor and load switch. Each signal module shall be connected to the output of a standard load switch connected to an alternating current voltage supply

between the values of 95 and 135 V (ac) with the input to the load switch in the "OFF" position. The alternating current voltage developed across each LED signal module so connected shall not exceed 15 V rms as the input alternating current voltage is varied from 95 V (ac) rms to 135 V (ac) rms.

LED signal modules shall be tested for transient immunity in conformance with the provisions in "Electrical," and conforming to the procedure described in NEMA Standard TS2-1992.

Mechanical vibration testing shall be performed on LED signal modules in conformance with the requirements in MIL-STD-883, Test Method 2007, using three 4-minute cycles along each x, y, and z axis, at a force of 2.5 Gs, with a frequency sweep from 2 Hz to 120 Hz. The loosening of the lens, internal components, or other physical damage shall be cause for rejection.

Temperature cycling shall be performed on LED signal modules in conformance with the requirements of MIL-STD-883, Test Method 1010. The temperature range shall conform to the provisions in "Environmental Requirements." A minimum of 20 cycles shall be performed with a 30 minute transfer time between temperature extremes and a 30 minute dwell time at each temperature. LED signal module under test shall be non-operating. Failure of LED signal modules to function properly or evidence of cracking of LED signal module lenses or housings after temperature cycling shall be cause for rejection.

Moisture resistance testing shall be performed on LED signal modules in conformance with the requirements in NEMA Standard 250-1991 for Type 4 enclosures. Evidence of internal moisture after testing shall be cause for rejection.

Production Quality Testing

Production quality testing shall be performed on each LED signal module prior to shipment. Failure to conform to the requirements of any production quality test shall be cause for rejection. The manufacturer shall retain test results for seven years for warranty purposes.

LED signal modules shall be tested for rated initial intensity after burn-in. The burn-in period shall consist of signal modules being energized at rated voltage for a 30 minute stabilization period before the measurements are made. A single point measurement with a correlation to the minimum initial luminous intensity requirements of "Photometric Requirements" for circular modules may be used. The ambient temperature for this measurement shall be +25°C.

LED signal modules shall be tested for luminous intensity requirements in "Photometric Requirements."

LED signal modules shall be tested for required power factor after burn-in.

LED signal modules shall be tested by measuring current flow in amperes after burn-in. The measured current values shall be compared against current values resulting from design qualification measurements under "Design Qualification Testing." The current flow shall not exceed the rated value. The measured ampere values with rated voltage shall be recorded as volt-ampere (VA) on the product labels.

LED signal modules shall be visually inspected for any exterior physical damage or assembly anomalies. The surface of the lens shall be free of scratches, abrasions, cracks, chips, discoloration, or other defects. Any such defects shall be cause for rejection.

CERTIFICATE OF COMPLIANCE

The Contractor shall provide the Engineer a Certificate of Compliance from the manufacturer, in conformance with the provisions of Section 6-1.07, "Certificates of Compliance," of the Standard Specifications. The certificate shall certify that the LED signal modules comply with the requirements of these specifications. The certificate shall also include a copy of all applicable test reports on the LED signal modules.

QUALITY ASSURANCE TESTING (RANDOM SAMPLE TESTING)

The State may perform random sample testing on all shipments. Random sample testing will be completed within 30 days after delivery to the Transportation Laboratory. Circular LED signal modules shall be tested in conformance with California Test 604 and these special provisions. Arrow signal modules shall be tested in conformance with California Test 3001 and these special provisions. Optical testing shall be performed with the module mounted in a standard traffic signal section, but without a visor or hood attached to the section or housing. The number of modules tested shall be determined by the quantity of each model in the shipment. The sample size shall conform to ANSI/ASQC Z1.4. The Transportation Laboratory shall determine the sampling parameters to be used for the random sample testing. All parameters of the specification may be tested on the modules. Acceptance or rejection of the shipment shall conform to ANSI/ASQC Z1.4 for random sampled shipments.

WARRANTY

The manufacturer shall provide a written warranty against defects in materials and workmanship for LED signal modules for a period of 36 months after installation of LED signal modules. Replacement LED signal modules shall be provided within 5 days after receipt of failed LED signal modules at no cost to the State, except the cost of shipping the failed

modules. All warranty documentation shall be given to the Engineer prior to installation. Replacement LED signal modules shall be delivered to the resident engineer.

12-16.09 STANDBY GENERATOR

GENERAL.--This work shall consist of furnishing and installing a standby generator in accordance with the details shown on the plans and these special provisions.

The standby generator shall include engine, generator, automatic transfer switch, circuit breakers, starting batteries, engine-generator control panel, battery charger, protective housing, top-mounted exhaust silencer, base mounted diesel fuel tank, drip pan, warning sign, battery hydrometer with storage container, battery filler, distilled water, anchoring devices, vibration isolators, and such other miscellaneous accessories, not mentioned, which are required for the complete installation and proper operation of the standby generator.

The standby generator assembly shall be factory assembled and mounted on a steel base with vibration isolators.

SUBMITTAL.--

Product data.--A list of materials and equipment to be installed and the manufacturer's descriptive data shall be submitted for approval. Any other data as requested by the Engineer shall also be submitted for approval.

Manufacturer's descriptive data shall include complete description, performance data and installation instructions for the materials and equipment specified herein. Engine and generator control schematic diagrams, interconnection diagrams, and exact dimension drawings of the engine-generator set shall be submitted for approval. All control and power conductors on the diagrams shall be identified with wire numbers.

PRODUCTS.--

Engine.--

The engine shall be 4-cycle LPG fuel type with not less than 5880 cubic centimeters of piston displacement, liquid cooled, and designed for continuous operation. The engine shall deliver a minimum of 100 kilowatts at 1800 RPM.

The engine's continuous duty rated output shall be ample to drive the generator and connected normal accessories at the rated speed and unity power factor at 100 percent of the rated load with an ambient temperature of 35°C at 100 meters above sea level.

The engine shall operate satisfactorily on Liquid petroleum gas(LPG) fuel. The crankshaft shall be drilled for full pressure lubrication to all bearings. All crankshaft bearing surfaces shall be hardened. The crankshaft shall have one more main bearing than there are number of cylinders. The intake and exhaust valves and valve seats shall be heat resistant alloy steel. The exposed surfaces of the engine shall be finished with one coat of primer and 2 coats of an industrial paint suitable for the intended use.

The engine shall be equipped with the following accessories:

Oil Filter System.--The pressurized lubricating oil system shall have a full flow filter system, consisting of a strainer with openings not to exceed 0.64 mm in greatest dimension, and a separate, cleanable or replaceable filter capable of removing particles of 25 microns and larger.

Air Filter System.--The air intake shall be provided with a dry type air filter of adequate capacity to effectively remove dirt and abrasives from the combustion air. The dry type filter shall be designed to allow for easy removal and replacement of filter element. The filter shall be equipped with service indicators to indicate necessary replacement.

Engine Governor.--The governor shall be a gear driven mechanical type providing a 5 percent speed regulation from no load to full load and provide +0.5 percent steady state frequency regulation.

Engine Cooling.--The engine shall be equipped with an engine driven radiator cooling system. The radiator shall be capable of cooling the engine while operating at 100 percent rated continuous load in 52°C maximum ambient temperature. Fan shall be push type.

Engine Preheater.--The engine shall be equipped with a 120-volt, 1000-watt electric water jacket heater. The heater shall be thermostatically controlled to maintain engine coolant at the proper temperature to meet the start up requirement of NFPA-99 standard. The required circuitry for proper operation shall be provided. The thermostat shall be adjustable between 35°C and 50°C.

Engine Starter.--The engine shall be provided with a 12-volt heavy duty positive engagement solenoid shift starting motor. The drive mechanism for engaging the starting motor with the engine flywheel shall engage and release without binding.

Safety Controls.--The engine shall be provided with automatic controls that shut down engine operation when low lubricating oil pressure, high water temperature or overspeed conditions occur. The values at which the low lubricating oil pressure, high jacket water temperature and overspeed controls operate to shut down engine operation, shall be as recommended by the engine manufacturer.

Overcrank safety controls shall be provided as specified in these special provisions.

Engine Instrumentation.--Engine instruments shall be mounted in the engine-generator control panel. Engine instruments shall include the following:

a. Lubricating oil pressure gage.
b. Water temperature gage.
c. Engine hour meter (totalizing mechanism of 9,999 hours).

Exhaust system.--

The exhaust system shall consist of a muffler and flexible connection.

The muffler shall be a residential type, sized to meet or exceed the engine requirements. The muffler shall be provided with a drain, flange connection and companion flanges.

The flexible connection shall be bellows type, not less than 300 mm in length and installed between the engine exhaust and the Schedule 40 galvanized steel exhaust pipe. The flexible connection shall be constructed of Type 321 stainless steel and shall be provided with flanged ends for connection to the engine and galvanized steel exhaust pipe.

Starting batteries.--

Storage batteries for engine starting and other requirements shall be sufficient in number, and shall be 6-cell, heavy duty, lead-acid type. Total battery capacity shall be a minimum of 90 ampere-hours at the 20-hour rate. Batteries shall be mounted in corrosion resistant battery racks located within the skid base and shall be provided with battery cables of sufficient length to connect to the DC apparatus.

Battery charger.--

In addition to the integral battery charging circuit operable when the engine generator is running, an additional battery charger shall be of the dual rate type and shall be mounted in the engine-generator housing and operable with the input of 120-volt, when the generator is off. The battery charger shall be provided with the following features:

1. Dual fusing for AC input and DC output.
2. Automatic DC voltage regulation.
3. Automatic load regulation.
4. Compensation taps for setting the charger for average AC line and battery conditions.
5. DC cranking circuit disconnect relay.

Generator.--

The generator shall be a brushless type, single bearing, self-aligning, continuous duty, synchronous type, with a drip-proof enclosure. The insulation shall be NEMA Class F or better.

The generator shall be rated at 100 kW, 125 kVA, 0.8 power factor, 208/120 volts, 3-phase, 4-wire, 60 Hz, and 1880 RPM. The generator shall have the following capabilities:

1. Steady state voltage regulation at full rated load shall be within plus or minus one percent.
2. Voltage regulation shall be within plus or minus 2 percent of rated steady state voltage from no load to full load.
3. Voltage recovery shall be within 2 percent of nominal rated voltage within 5 seconds, after the rated load is applied or removed in one-step.

Engine generator control panel.--

A completely wired and assembled engine-generator control panel shall be mounted on the engine-generator unit. The panel and its components shall comply with all applicable NEMA standards for industrial type controls, and shall be fully enclosed and vibration isolated. The panel shall include the following switches and instruments exposed on the front of the control panel:

1. AC ammeter.
2. AC voltmeter.
3. Three-position combination ammeter-voltmeter-phase selector switch.
4. Frequency meter.
5. Manual reset generator exciter circuit breaker with thermal magnetic trips.
6. Battery charger DC ammeter.
7. Manual "START-STOP" switch.
8. Indicating lights to show cause of emergency shutdown.
9. Emergency "STOP" switch.
10. Voltage adjust rheostat.
11. Engine oil pressure gage.
12. Engine running time meter.
13. Engine water temperature gage.

Equipment or devices to be mounted within the engine-generator control panel shall include the following:

1. Battery charger.
2. Automatic voltage regulator.
3. Automatic starting controls.
4. Radio interference suppression
5. Transformers, relays and other equipment required for proper operation.

Equipment mounted in the control panel shall be arranged for easy service access.

Overcranking protection.--

Upon failure of primary power, the engine shall be automatically cranked for 20 seconds or until it starts, whichever is shorter. If the engine fails to start, within 20 seconds, further attempts to start shall be prevented by a manually reset lockout device. Overcranking default condition shall be indicated by a pilot light.

Automatic transfer switch.--

The automatic transfer switch shall be a 208/120-volt, 3-phase, 4-wire, electrically operated, mechanically held device utilizing two 3-pole contactors.

Contactors shall be rated at not less than 400 amperes continuous duty, and shall be electrically and mechanically interlocked to positively prevent simultaneous connection of both normal and standby power sources. Electrical operation shall not permit a neutral position between normal and standby power sources. The contacts shall be enclosed and shall be constructed of silver alloy. Coils shall be readily accessible for examination and replacement.

Voltage sensing relays shall monitor each phase of the normal power source, and shall initiate the sequence for transfer at the factory preset limit of 70 percent of the rated voltage on any phase. Retransfer to the normal power source shall be delayed for a period adjustable from 0 to 30 minutes, initially set at 5 minutes.

Momentary power outages shall be ignored by delaying cranking of the standby power plant for a period adjustable from 1 to 600 seconds, initially set at 300 seconds.

Connection of the standby load shall be prevented until the standby power plant reaches at least 90 percent of its operating voltage.

Retransfer from the stand-by power plant to the normal power source shall be delayed for a period adjustable from 0 to 30 minutes, initially set at 5 minutes.

Shutdown of the standby power plant after retransfer to the normal power source shall be delayed for a period adjustable from 2 to 10 minutes, initially set at 5 minutes.

In addition to the auxiliary contacts required for the engine-generator operation, additional SPDT auxiliary switch operated by the transfer switch shall be provided on each side of the transfer switch to operate future peripheral equipment. A programmable exerciser clock to exercise the engine-generator shall be provided. The clock shall be able to select day, time, and duration of the engine-generator exercise period. A two position selector switch with legend plate marked "WITH LOAD / WITHOUT LOAD" shall be provided to make a selection of either mode of operation.

The automatic transfer switch, including the special features specified herein, shall be mounted in a NEMA Type 12 control panel enclosure conforming to the Joint Industry Conference Standards, inside the Main Service Switchboards as shown on the plans. A 3-position "HAND-CRANK"-"OFF"-"AUTO" selector switch shall be mounted in the front panel.

The Contractor shall provide all accessory control cables from the generator control panel to the automatic transfer switch mounted in the Main Service Switchboard for proper operation of the transfer switch and the generator.

Miscellaneous accessories.--

A galvanized sheet metal duct shall be fabricated and installed between the radiator and the exhaust louvers. This radiator cooling air exhaust duct shall be installed with vibration isolators.

The generator main power disconnect shall be 600-volt, 3-pole, 400-ampere trip molded case, thermal-magnetic, circuit breaker and shall be mounted in a NEMA Type-1 enclosure on the side of the generator housing. The adjustable magnetic trip shall be set for 2000 amperes. The interrupting capacity of the circuit breaker shall be 42000 amperes at 240 volts AC.

A warning sign shall be mounted at a location on the engine generator set approved by the Engineer. The sign shall be sheet steel, not less than one mm thick (18-gage) with a baked enamel coating. The sign shall have a red background and white letters not less than 40 mm in height. The sign inscription shall read as follows:

DANGER
AUTOMATIC
MAY START AT ANY TIME

A commercial quality battery hydrometer with plastic type storage container, and a commercial quality 3.8 liter battery filler with filler hose and 3.8 liter of distilled water, shall be furnished and installed adjacent to the battery location. The body of the battery filler shall be clearly marked "DISTILLED WATER" in letters not less than 12 mm in height.

EXECUTION.--

The engine-generator set shall be installed on a concrete slab as shown on the plans.

Anchoring devices shall be as recommended by the engine-generator manufacturer and shall be installed to fasten the engine-generator set securely to the concrete slab.

Vibration isolators shall be installed between the engine base and the concrete slab. The type and size of the isolators shall be as recommended by the engine-generator manufacturer.

TESTING.--

The engine-generator power generating system, including transfer switch, shall be tested at completion of installation and adjustments.

All necessary materials, test equipment and recording instruments, and labor required for the tests shall be furnished. The Contractor shall notify the Engineer not less than 5 working days in advance of testing. Testing shall be performed in the presence of the Engineer.

The engine-generator power generating system shall be tested for compliance with the conditions shown on the plans and the requirements specified in these special provisions.

Tests shall utilize a resistive load bank. All transient requirements shall be demonstrated by means of recording instruments. All engine safety shutdown devices shall be demonstrated.

A battery and starter test shall consist of 30 seconds of continuous cold with out engine start, followed by immediately by a normal engine start without excessive starter laboring.

A 4-hour heat run shall be conducted at 100 percent of generator rated full load capacity at the specified rated voltage.

12-16.10 FIRE ALARM AND DETECTION SYSTEM

PART 1.- GENERAL

SUMMARY.--

Scope.--This work shall consist of furnishing and installing a complete and operational fire alarm and detection system in accordance with the details shown of the plans and these special provisions.

The system shall include all materials, whether mentioned or not, but are necessary for the complete and operational fire alarm and detection system.

SYSTEM DESCRIPTION.--

Design Requirements.--The fire alarm and detection system shall be a low voltage, direct current, zoned, closed circuit, electrically supervised, and Class A fire alarm and detection system. The system shall consist of fire alarm control panel, manual pull stations, smoke detectors, duct smoke detectors, heat detectors, end-of-line resistors, audio-visual devices, and all other necessary appurtenances.

The alarm system components shall be listed by U.L. or F.M. and the California State Fire Marshal.

SUBMITTALS.--

Product data.--Manufacturer's descriptive information and installation instructions shall be submitted for approval.

Installation instructions shall 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.

Working drawings.--Complete working drawings shall be submitted for approval.

State Fire Marshal approval.--Prior to the submittal of the working drawings, the Contractor shall have said drawings stamped "APPROVED" by the State Fire Marshal. Allow 12 weeks for State Fire Marshal review and approval.

PART 2.- PRODUCTS

Fire alarm control panel.--

Fire alarm control panel shall 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.

The control panel shall conform to the following requirements:

Compatible with Radionics 6000 or 6500 receiver or equivalent;
Minimum 8 zones (capable of expansion);
Digital dialer communicator;
Audible trouble signal, silencing switch and trouble pilot light;
Solid state, modular construction;
Fan shut down relays;
24-hour standby batteries, battery charger with automatic transfer on loss of utility company power and retransfer upon restitution of utility power;

Indicating lights for normal power failure, battery power failure, audible alarm, and silencing switch;
Low battery reporting.

Manual pull station.--

Manual pull station shall be single-action, non-coded, closed circuit, pull down type pull station mounted on a standard electrical outlet box. The manual pull station actuating contact shall function continuously until reset. The pull station shall have provisions for fire drill and testing and shall have integral LED light to indicate operation of the pull station.

Smoke detector.--

Smoke detector shall be ionization type detector with dual chamber with sensitivity control and plug-in detector head. One chamber shall be for detection and the other for changes in ambient parameters. The smoke detector shall have integral LED light to indicate operation of the smoke detector.

Duct-mounted smoke detector.--

Duct-mounted smoke detector shall be similar to the space smoke detector except it shall have the following additional features:

Sampling tube;
Uniform sensitivity between 150 meters to 940 meters per minute air velocity;
Test jack.

Heat detector.--

Heat detector for automatic detection of fire shall be of compact and rugged construction employing rate-of-rise and fixed temperature methods of detecting fires. The heat detectors shall have twist-and-lock type plug-in detector head, and low profile.

Audio-visual device.--

Audio-visual device shall be vibrating type horn with flashing light and adjustable volume control with maximum audible output of 90 dB at 3 meters from the horn. Frequency of audio visual flash shall be not less than one flash per second.

PART 3.- EXECUTION.--

INSTALLATION.--

General.--The fire alarm system shall be installed in accordance with the manufacturer's recommendations. No modification of the recommended alarm system type, components type, or replacement shall be made without prior written approval from the Engineer.

Fire alarm panel zoning.--Fire alarm panel zoning shall be as follows:

Zone 1:	Office Area pull stations;
Zone 2:	Office Area detectors (heat and smoke detectors);
Zone 3:	Office Area audio/visual devices;
Zone 4:	Inspection Bay Area pull stations;
Zone 5:	Inspection Bay Area detectors (heat and smoke detectors);
Zone 6:	Inspection Bay Area audio/visual devices;
Zone 7:	Sprinkler riser;
Zone 8:	Trouble.

Conduit and conductors.--Fire alarm system wiring shall be installed in conduits conforming to the requirements of "Basic Materials and Methods" elsewhere in these special provisions. Conduit size shall be as recommended by the fire alarm system manufacturers except that conduits shall be not less than 16 mm diameter, trade size. Within the office areas, conduits shall be concealed in ceiling or walls. All other conduits shall be exposed conduit.

Conductors and cables for the fire alarm system shall be as recommended by the fire alarm system manufacturer.

FIELD QUALITY CONTROL.--

Testing.--The operational test for the fire alarm system shall be performed by the Contractor in the presence of the Engineer. The operational tests shall 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. The Contractor shall notify the Engineer in writing not less than 10 days in advance of performing the operational tests.

Monitoring.--The Contractor shall provide monitoring services for the facility for one year after the acceptance of the contract. The services shall include a toll-free telephone line connecting to the 24-hour on call monitoring station. Monitoring station shall 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 State.

DEMONSTRATION.--

Training.--The Contractor shall provide one hour of on-site training on the use, operation, and, maintenance of the system for not more than 8 designated State employees. The Contractor shall notify the Engineer in writing not less than 10 days in advance of proposed training class.

12-16.11 INTRUSION ALARM SYSTEM

PART 1.- GENERAL

SUMMARY.--

Scope.--This work shall consist of furnishing and installing a complete and operational access control and intrusion reporting alarm system in accordance with the details shown on the plans and these special provisions at the Tecate CVEF Facility in southern California.

The system shall include all materials, whether mentioned or not, that are necessary for a complete and operational intrusion alarm system.

SYSTEM DESCRIPTION.--

Design requirements.--The intrusion alarm system shall be a low voltage, direct current, zoned alarm system, and shall consist of a master reporting control panel, in the electrical closet of the office building, magnetic contact switches, glass break discriminators, digital card readers and digital keypad stations for the buildings. Each zone shall be "supervised, Class B circuit." The end of line resistor shall be installed in the control panel.

The alarm system shall self-test and report status of individual zones every twenty-four (24) hours.

The alarm system shall provide an automatically rechargeable back-up power supply system, 24-hour minimum, in case of building power interruption.

The alarm system components shall be U.L. or F.M. Listed. The system proposed shall be approved by the Federal Communication Commission (FCC).

SUBMITTALS.--

Product data.--Manufacturer's descriptive information and installation instructions shall be submitted for approval.

Installation instructions shall 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 devices.

QUALITY ASSURANCE.--

Installer qualification.--The installer of the security alarm system shall be licensed by the State Department of Consumer Affairs, Bureau of Collection and Investigative Services. License numbers and expiration dates shall be included on all correspondence.

PART 2.- PRODUCTS

Control panel.--

The master control panel (Radionics 9412B) shall 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 shall meet the following requirements:

Control panel, will be UL Listed for Commercial Fire and Burglar reporting;
Minimum eight (8) zones (capable of zone expansion);
Digital dialer communicator;
12-volt auxiliary power supply (minimum 24 hours);
Rechargeable battery (24 hour minimum);
Battery charger;
Low battery reporting;
Silent alarm signaling;
System connected to RJ31X or RJ38X telephone jack or equivalent;
Line test every twenty-four (24) hours
120-volt, AC, input
Front accessible control and indication digital keypad.
UL listed for commercial use;
Remote control identification.

Magnetic contact switch.--

Magnetic door switch for pedestrian door shall be a 2-section, self-lock mounting type switch, and shall be compatible with the material of the door on which it is installed. The switch shall be epoxied in the switch housing. Magnetic contact switches shall be the type capable of being concealed on the top of the door frame.

Magnetic contact switches for the overhead vehicle doors shall be 2-section, extra heavy-duty, floor mounting type switch with stainless steel armored cable.

Switch shall be housed in a non-magnetic case.

Glass break discriminator.--

Glass break discriminator shall be an acoustic glass break detector with advanced technology for sensing and reporting simultaneous sound and shock wave activity. Detector shall respond to energy of breaking windows using piezo-electric crystal microphone. Sensor coverage pattern shall be directional, detecting breakage of uncovered glass in a 10.5 meters wide area at a distance of 3.5 meters minimum. The sensor shall be housed in a fire retardant ABS housing.

Digital keypad.--

Keypad shall be weatherproof 12-button keypad with 16 user codes capable of expansion to 120, surface-mounted, low voltage (12 V(dc)/24 V(dc)), vandal resistant device with programmable ability for user codes 1-6 digits. Keypad will have an EEPROM memory for backup of all codes, have a relock time delay adjustable time from 1-90 seconds or on/off and have a tamper switch to detect unauthorized access to the keypad working mechanism. The keypad will have incorporated four (4) on-board relays for electric door locks, alarm shunting, forced door monitoring and door ajar monitoring.

Combination detector (Microwave/passive infrared).--

Combination detectors shall be Ul listed for commercial use and compatible with the system and for the application recommended. Wiring is to be concealed in walls, EMT conduit or metal surface raceways.

Combination detector (Request–to-Exit).--

Combination detectors shall be Ul listed for commercial use, be single or double door use wall or ceiling mount, internal pointability, wraparound coverage pattern,12 or 24 AC or DC operation, selectable failsafe /fail secure, coverage 2.43 m x 3.04 m, and compatible with the system and for the application recommended. Wiring is to be concealed in walls, EMT conduit or metal surface raceways.

PART 3. EXECUTION.--

INSTALLATION.--

General.—The access control and intrusion reporting alarm system shall be installed in accordance with the manufacturer's recommendations and at the locations specified on the plans.

For pedestrian access doors the magnetic contact. The switch section without wires shall be recessed flush into the top edge of the door at the approximate center of the door, and the switch section with wires shall be recessed flush in the top section of the door frame. The two sections of the switch shall be mounted directly opposite each other to provide maximum sensitivity. The wiring from each magnetic switch shall be run to the control panel in the zone dedicated for the intrusion alarm circuit.

Magnetic contact switches for overhead doors shall be mounted as follows. The switch section mounted on the bottom edge of the overhead door shall be without wires. The switch section with wires shall be mounted on the floors directly below the switch part without wires. The wiring from each magnetic switch shall be run to the control panel in the zone dedicated for the intrusion alarm circuit.

The glass break discriminator shall be mounted on the ceiling at locations shown on the plans.

Access control devices to include digital key pad, electric door strikes, request-to –exit devices and magnetic contact switches are to be installed at locations specified in accordance with manufactures' specifications.

Intrusion alarm zoning.--Intrusion alarm panel zoning shall be as follows:

Control Panel to be installed in the Electrical Closet.

Zone 1: Pedestrian Access Door into Inspection Bay Storage Area to include: one(1) digital key pad (item #1); one(1) Magnetic Contact Switch-Pedestrian (item # 2) ; Zone 2: Pedestrian Access Door into Southeast Inspection Bay Area to include: one(1) digital key pad (item #4); and one(1) Magnetic Contact Switch-Pedestrian (item # 5).

Zone 3: Vehicle Access Door (west) into Inspection Bay Area to include: one(1) Magnetic Contact Switch-Vehicle (item # 3).

Zone 4: Vehicle Access Door (east) into Inspection Bay Area to include: one(1) Magnetic Contact Switch-Vehicle (item # 6).

Zone 5: Pedestrian Access Door into Break room include: one(1) digital key pad (item #8); and one(1) Magnetic Contact Switch-Pedestrian (item # 7).

Zone 6: Pedestrian Access Door into Hallway include: one(1) digital key pad (item #12); and one(1) Magnetic Contact Switch-Pedestrian (item # 13).

Zone 7: Pedestrian Access Door into Sacle observation area include: one(1) digital key pad (item #10); and one(1) Magnetic Contact Switch-Pedestrian (item # 9).

Zone 8: Pedestrian Access Door into Lobby area include: and one(1) Magnetic Contact Switch-Pedestrian (item # 11).

Zone 9: Glass Break Discriminator in Office Area (item #14).

Zone 10: Glass Break Discriminator in Scale observation room (item #16) and Glass Break Discriminator in Hallway (item #15).

Zone 11: Glass Break Discriminator in Office Areas (items #17and #18), Glass Break Discriminator in Break room (item #19) .

Conduit and conductors.--All access control intrusion reporting alarm system wiring shall be installed in conduit system conforming to the requirements under "Basic Materials and Methods" elsewhere in these special provisions. Conduit size shall be as recommended by the intrusion alarm manufacturer, except that conduits shall be not less than 16 mm diameter. Within the office building areas, conduits shall be concealed in ceiling or walls. All other conduit shall be exposed.

All conductors and cables for the intrusion alarm system wiring shall be as recommended by the intrusion alarm system manufacturer.

All points of protection must be specifically identified by zone when reporting to the intrusion alarm panel. All points of protection will be transmitted to the U.L. listed monitoring company.

FIELD QUALITY CONTROL.--

Testing.--The operational test for the intrusion alarm system shall be performed by the Contractor in the presence of the Engineer and a representative from California Department of Transportation Operation Security Branch. The operational tests shall 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. The Contractor shall notify the Engineer and Caltrans Operation Security Branch in writing not less than 10 days in advance of performing the operational tests.

Monitoring.--The contractor shall provide UL Listed monitoring services for the facility for one year after the acceptance of the contract. The services shall include a toll-free telephone line connecting to the 24-hour on call monitoring station. Monitoring station shall 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.

DEMONSTRATION.--

Training.--The Contractor shall provide two hour of on-site training on the use, operation, and maintenance of the system for not more than 3 designated employees. The Contractor shall notify the Engineer in writing not less than 10 days in advance of proposed training class.

12-16.12 WELL PUMP CONTROL STATIONS

PART 1.- GENERAL

SUMMARY.--

Scope.--This work shall consist of furnishing and installing well pump control stations in accordance with the details shown on the plans and these special provisions.

SUBMITTALS.--

Product data.--A list of materials and equipment to be installed and the manufacturer's descriptive data shall be submitted for approval.. Any other data as requested by the Engineer shall also be submitted for approval.

Manufacturer's descriptive data shall 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 shall be included where applicable. All control and power conductors on the working drawings shall be identified with wire numbers.

PART 2.- PRODUCTS

Well pump control enclosure, WPC.--

Well pump control panel enclosure shall be single exterior hinged door, dust tight NEMA Type 3R enclosure, containing an electrical mounting panel and hinged interior deadfront door. The enclosure shall be made of 1.90 mm (14-gage) steel minimum with all seams continuously welded. A rolled up lip shall be provided around three sides of the hinged door and around all sides of the enclosure opening. The door shall be provided with a

neoprene gasket that is attached with an oil-resistant adhesive. The door shall be maintained closed with door clamps. Security shall be provided by a hasp and staple for padlocking.

The enclosure shall be factory prewired in conformance with NEMA Class IIC wiring. All wires entering the enclosure shall terminate on terminal blocks. All interior control wires shall be 19-strand No. 14 MTW. Wires shall be neatly trained and bundled, and wiring troughs shall be provided in the enclosure as necessary. Wiring shall 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 encased between two heat-fused laminated plastic sheets shall be provided with brass mounting eyelets and attached to the inside of the enclosure.

Well pump main breaker, WMB.--

Well pump main breaker shall be 3-pole, 240-volt, AC, molded case circuit breaker with 100-ampere frame, 70-ampere trip, and interrupting capacity of 10,000 amperes (symmetrical) at 240 volts. Breaker shall be Square D Company, I.T.E., or equal.

Circuit breakers CD and PD, and AVCD.--

Circuit breakers CD and PD, and AVCD shall have interrupting capacity of 10,000 amperes (symmetrical) at 240 volts with trip rating as shown on the plans.

Starter, ST.--

Starter shall be NEMA Size 1, NEMA rated, 3-pole, 240-volt, contactor with 120-volt coil, and non-adjustable overload relay. Overload relay shall be resettable by an externally operable pushbutton on the hinged interior deadfront panel. Overload relay shall have three thermal overload elements and shall trip between 115 and 125 percent of full load motor current, as quoted on the nameplate by the motor manufacturer.

Control relays, CR1, CR2, CR3.--

Control relays CR1, CR2, CR3 shall be 120-volt, AC, general purpose relay with 3-pole, double-throw, 10-ampere, 120-volt, AC, contacts. Relay shall be enclosed in clear plastic with 11-pin tube type plug base. Sockets for relay shall be barrier type, 11-contact relay socket with 10-ampere contacts and screw terminals. Relay shall be Square D Company, Struthers-Dunn, Eagle Signal, or equal.

Neutral bar, BAR.--

Neutral bar shall be 60-ampere copper neutral bar with circuit taps.

Time meter, TM.--

Time meter shall be 120-volt, 60 Hz running time meter with 0 to 99,999.9 hours range without a reset.

Pilot light, PL1.--

Pilot light, PL1 shall be panel mounting light with colored lens with screw cap and a direct incandescent replacement LED, 120-volt lamp with candelabra screw base. Light shall be mounted on the hinged deadfront door. Color of lens shall be as shown on the plans.

Terminal block, TB.--

Terminal block shall be 30-ampere, 300-volt, molded plastic with two or more mounting holes and two or more terminals in each cast block. The molded plastic shall have a high resistance to heat, moisture, mechanical shock, and electric potential and shall have a smooth even finish. Each block shall have a molded marking strip attached with screws. Terminal blocks shall have tubular, high pressure clamp connectors.

Selector switch, SS.--

Selector switch shall be rotary action, single-pole, 3-position, 10-ampere, 120-volt switch. Switch contacts shall 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 shall have legend plate marked HAND-OFF-AUTO.

Alarm light, AL.--

Alarm light shall be fluorescent, weatherproof light fixture for use with threaded rigid conduit. Light fixture shall have guard and red globe. Lamp shall be 5-watt, 120-volt compact fluorescent lamp, complete with ballast and screw-on type base.

Motor Saver, MS.--

Motor saver, MS, shall be a pump protector used for 3- phase motor. Motor saver shall protect the pump from under voltage, over voltage, running dry or overloading. Also the motor saver shall protect the pump from current unbalance and rapid cycling. The motor saver shall be furnished with current transformers built in the unit. The motor saver shall have one normally open and one normally closed contacts rated 240VA at 120 volts.

Reset pushbutton, PB1.—

Reset pushbuttons PB1 shall be heavy duty oil-tight and momentary pushbutton with one normally closed contact. The contact shall have an inductive pilot duty rating amperes (make), 6 amperes (break) and 10 amperes (continuous) at 120 volts and 35 percent power factor.

FABRICATION.--

Component mounting.--The following electrical components shall be mounted on the mounting panel of Well Pump Control panel Enclosure: Well pump main breaker, WMB; Starter, ST; Motor saver, MS; Control relays, CR1, CR2, CR3; Pump disconnect, PD; Pump starting control; Control disconnect, CD; Air volume controller disconnect, AVCD; Neutral bar, Terminal block, TB; and Time meter, TM. Spacers shall be installed with all breakers (WMB, PD, CD and AVCD) so that they are externally operable with the hinged door closed.

The following electrical components shall be mounted on the interior door of Well Pump Control Enclosure: Selector switch, SS; Time meter, TM; Pilot light, PL1 and Reset pushbuttons, PB1.

PART 3.- EXECUTION

INSTALLATION.--

General.--The well pump control station shall be installed on a concrete pad and oriented as shown on the plans.

All bolts and fasteners shall be galvanized.

All concrete around conduit penetrations shall be finished smooth and sloped in a way to avoid standing water around the conduit.

12-16.13 . BOOSTER PUMP ELECTRICAL SYSTEM

Booster pump electrical system includes booster pump control equipment as shown on the plans and as specified in these special provisions. The Contractor's attention is directed to "Booster Pumps Systems" of these special provisions, regarding the equipment to be operated and serviced by the booster pump electrical systems.

MATERIALS LIST AND DRAWINGS

A list of materials which the Contractor proposes to install for the booster pump electrical systems together with the drawings and other data shall be submitted to the Engineer in conformance with the provisions in Section 86-1.04, "Equipment List and Drawings," of the Standard Specifications.

The working drawings shall include a wiring diagram for the booster pump systems showing pump control details.

Before the completion of the contract, one set of the approved wiring diagrams for each booster pump system shall be covered separately on each side with clear, self-adhesive plastic and placed in a heavy-duty plastic envelope. The envelope shall be attached securely to the inside of the electrical equipment enclosure exterior door or at a convenient location designated by the Engineer.

The Contractor shall be responsible for the compatibility and adjustment of components as necessary for the successful operation of the completed installation.

MATERIALS

Booster Pump Control Enclosure

Booster pump control enclosures shall be fabricated in conformance with the provisions in Section 86-3.04A, "Cabinet Construction," of the Standard Specifications. The electrical equipment enclosure shall be fabricated of stainless steel. Booster pump control enclosure shall have a single exterior door, a hinged interior door and an interior mounting panel. Dimension of the electrical equipment enclosure shall be suitable for the equipment to be installed as shown on the plans and as specified in these special provisions.

Circuit breakers, overload reset button and switches shall be externally operable after the exterior door is opened. The hinged interior door shall have a sign indicating that the interior door is not to be opened unless the main breaker is in the "off" position.

The enclosure shall be factory pre-wired in conformance with NEMA Class IIC wiring. Wires entering or leaving the enclosure shall terminate on terminal blocks. Natural gray or dark gray colored wiring shall not be used in the electrical equipment enclosure.

The wiring shall be arranged so that any piece of equipment may be removed without disconnecting any wiring except the leads to that piece of equipment.

The following equipment shall be furnished and installed in the Booster pump control enclosure:

Main Disconnect, MD; Pump Disconnect, PD; Control Disconnect, CD; Irrigation Controller Disconnect, ICD; Motor Starter, ST; Time Meter, TM; Selector Switch, SS; Control Relay, CR; Neutral Bar, NB; Ground bar, GB; Terminal blocks, TB.

Main Disconnect

Booster pump main disconnect shall be a 3-pole, 240-V(ac), 30-A, molded case circuit breaker with adjustable magnetic trip. The interrupting capacity of the main disconnect shall be 10,000 A (symmetrical) at 240 V(ac).

Pump Disconnect

Pump disconnects shall be a 3-pole, 240-V(ac), 20-A, molded case circuit breaker. The interrupting capacity of the pump disconnect shall be 10,000 A (symmetrical) at 240V(ac).

Motor Starter (ST)

Booster pump motor starter shall be 3-pole, 240-volt NEMA size 1 NEMA rated line voltage combination starter and motor circuit protector with 120-V(ac) coils, double break silver contacts, and 3 bimetallic, manual reset thermal overloads set to trip between 115 and 125 percent of full load motor current as shown on the nameplate.

Selector Switch (SS)

Selector switch shall be a rotary action, single pole, 3-position, 10 A, 120-V(ac) switch. Switch contacts shall have an inductive pilot duty rating of 60 A (make), 6 A (break), and 10 A (continuous) at 120 V(ac) and 35 percent power factor. The selector switch shall have legend plate marked HAND-AUTO.

Control Disconnect (CD)

Control disconnects shall be single pole, 120-V(ac), 15-A trip, molded case circuit breakers. Control disconnects shall have an interrupting capacity of 10 000 A (symmetrical) at 120 V(ac).

Irrigation Controller Disconnect (ICD)

Irrigation controller disconnects shall be single pole, 120-V(ac), 15-A trip, molded case circuit breakers. Irrigation controller disconnects shall have an interrupting capacity of 10 000 A (symmetrical) at 120 V (ac).

Neutral Bar (NB)

Neutral bars shall be 100-A copper neutral bars with circuit taps.

Ground Bar (GB)

Ground bars shall be 100-A copper ground bars with circuit taps.

Control Relay (CR)

Control relays shall be 120-V(ac), 10-A, 2-pole, double-throw, 24-V(ac) coil, general purpose type with an enclosed clear plastic cover and 8-pin plug base. Sockets for relays shall be the barrier type, 8-contact relay sockets with 10-A contacts and screw terminals.

Terminal Blocks

Terminal blocks shall be 30-A molded plastic with 2 or more mounting holes and 2 or more terminals in each cast block. The molded plastic shall have high resistance to heat, electrical potential, moisture, and mechanical shock and shall have a smooth even finish. Each block shall have a molded marking strip attached with screws. The identifying numbers of the terminating wires as shown on the Contractor's working drawings shall be engraved in the marking strip. Terminal blocks shall have tubular, high pressure clamp connectors.

Time Meter

Time meters shall be 240-V (ac), 60 Hz, 65-mm, panel mounted, elapsed-time meters with a range of 0 to 99 999.9 hours. Time meters shall be completely enclosed for dust protection and shall have the terminals on the back of the enclosure.

Identification Of Units

Units shall be identified in conformance with the provisions in Section 74-3.09, "Identification of Units and Conductors," of the Standard Specifications and these special provisions. Inscriptions on nameplates for devices and switches shall be as shown on the plans.

12-16.14 COMMUNICATION TOWER

PART 1.- GENERAL.--

SUMMARY.--

Scope.--This work shall consist of designing, fabricating, furnishing and installing a steel communication antenna tower, including support footings, in accordance with the details shown on the plans and these special provisions.

The communication tower shall be designed, constructed assembled and installed in accordance with applicable requirements of the Electronic Industries Association (EIA).

SUBMITTALS.--

Project data.--Manufacturer's descriptive data, design calculations and working drawings shall be submitted for approval. Design calculations shall show the size of concrete foundation pad, governing codes, design criteria, stress level, displacement and drift. Submittals shall be approved prior to the start of fabrication.

If design calculations consist of computerized or tabulated calculations for a series of manufactured products, the portions and values pertaining to this project shall be identified, described and indexed.

Submittals shall be prepared, stamped and signed by an engineer who is registered as a civil or Structural Engineer in the State of California.

QUALITY CONTROL SUBMITTALS.--

Certificates of compliance.--Certificates of compliance shall be furnished for the communication tower in accordance with the requirements specified in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications.

Certificates of compliance shall certify that the materials and fabrication comply with these special provisions and the details shown on the approved working drawings.

PART 2.- PRODUCTS.--

Tower.--

The communication tower shall be a 24.4 meter in height, self-supporting, steel tower with an OSHA approved access ladder. The tower shall be supported on concrete footings and the access ladder shall be complete with base section.

The tower and footings shall be designed to support the following antenna:

1. One 11.4-kilograms, omni antenna located at the 24.4-meter level and extending 4.5 meter above the tower top.
2. One 11.4-kilograms, monitor antenna located at the 21.4-meter level and side mounted approximately 1.2-meter from the tower leg.
3. One 11.4-kilograms, television antenna located at the 18.3-meter level and offset 1.2-meter from the tower leg.
4. One additional 11.4-kilograms, antenna located at the 18.3-meter level and offset 1.2-meter from the tower leg.

The tower shall be designed to conform to the EIA requirements for drift, sway and twist at a frequency of 6 gigahertz, under a no-ice condition and wind load of 195-kilograms per square meter.

The communication tower framing members, brackets, fasteners, accessories, appurtenances, and supplementary parts shall be hot-dip, galvanized after fabrication.

Concrete and reinforcement.--

Concrete and reinforcement shall conform to the requirements specified under "Cast-In-Place Concrete" in Section 12-3, "Concrete and Reinforcement," in these special provisions, unless otherwise modified by the approved submittals.

PART 3.- EXECUTION.--

The communication tower shall be assembled, erected and installed by the tower manufacturer or by an authorized representative of the manufacturer, using qualified workmen skilled in the installation of such towers. Assembly, erection and installation work shall be performed in accordance with the manufacturer's recommendations, the EIA recommended procedures, and the approved working drawings.

Grounding shall be in accordance with the tower manufacturer's recommendations and as shown on the plans.

SECTION 13. (BLANK)

SECTION 14 FEDERAL REQUIREMENTS FOR FEDERAL-AID CONSTRUCTION PROJECTS

GENERAL.—The work herein proposed will be financed in whole or in part with Federal funds, and therefore all of the statutes, rules and regulations promulgated by the Federal Government and applicable to work financed in whole or in part with Federal funds will apply to such work. The "Required Contract Provisions, Federal-Aid Construction Contracts, "Form FHWA 1273, are included in this Section 14. Whenever in said required contract provisions references are made to "SHA contracting officer," "SHA resident engineer," or "authorized representative of the SHA," such references shall be construed to mean "Engineer" as defined in Section 1-1.18 of the Standard Specifications.

PERFORMANCE OF PREVIOUS CONTRACT.—In addition to the provisions in Section II, "Nondiscrimination," and Section VII, "Subletting or Assigning the Contract," of the required contract provisions, the Contractor shall comply with the following:

The bidder shall execute the CERTIFICATION WITH REGARD TO THE PERFORMANCE OF PREVIOUS CONTRACTS OR SUBCONTRACTS SUBJECT TO THE EQUAL OPPORTUNITY CLAUSE AND THE FILING OF REQUIRED REPORTS located in the proposal. No request for subletting or assigning any portion of the contract in excess of $10,000 will be considered under the provisions of Section VII of the required contract provisions unless such request is accompanied by the CERTIFICATION referred to above, executed by the proposed subcontractor.

NON-COLLUSION PROVISION.—The provisions in this section are applicable to all contracts except contracts for Federal Aid Secondary projects.

Title 23, United States Code, Section 112, requires as a condition precedent to approval by the Federal Highway Administrator of the contract for this work that each bidder file a sworn statement executed by, or on behalf of, the person, firm, association, or corporation to whom such contract is to be awarded, certifying that such person, firm, association, or corporation has not, either directly or indirectly, entered into any agreement, participated in any collusion, or otherwise taken any action in restraint of free competitive bidding in connection with the submitted bid. A form to make the non-collusion affidavit statement required by Section 112 as a certification under penalty of perjury rather than as a sworn statement as permitted by 28, USC, Sec. 1746, is included in the proposal.

PARTICIPATION BY MINORITY BUSINESS ENTERPRISES IN SUBCONTRACTING.—Part 23, Title 49, Code of Federal Regulations applies to this Federal-aid project. Pertinent sections of said Code are incorporated in part or in its entirety within other sections of these special provisions.

Schedule B—Information for Determining Joint Venture Eligibility

(This form need not be filled in if all joint venture firms are minority owned.)

1. Name of joint venture _____
2. Address of joint venture _____
3. Phone number of joint venture _____
4. Identify the firms which comprise the joint venture. (The MBE partner must complete Schedule A.) _____
   _____

   a. Describe the role of the MBE firm in the joint venture. _____
      _____
   b. Describe very briefly the experience and business qualifications of each non-MBE joint venturer: _____
      _____

5. Nature of the joint venture's business _____
   _____
6. Provide a copy of the joint venture agreement.
7. What is the claimed percentage of MBE ownership? _____
8. Ownership of joint venture: (This need not be filled in if described in the joint venture agreement, provided by question 6.).

   a. Profit and loss sharing.
   b. Capital contributions, including equipment.
   c. Other applicable ownership interests.

9. Control of and participation in this contract. Identify by name, race, sex, and "firm" those individuals (and their titles) who are responsible for day-to-day management and policy decision making, including, but not limited to, those with prime responsibility for:

   a. Financial decisions _____
   b. Management decisions, such as:

      (1) Estimating _____
      (2) Marketing and sales _____
      (3) Hiring and firing of management personnel _____
      _____
      (4) Purchasing of major items or supplies _____
      _____

   c. Supervision of field operations _____

Note.—If, after filing this Schedule B and before the completion of the joint venture's work on the contract covered by this regulation, there is any significant change in the information submitted, the joint venture must inform the grantee, either directly or through the prime contractor if the joint venture is a subcontractor.

Affidavit

"The undersigned swear that the foregoing statements are correct and include all material information necessary to identify and explain the terms and operation of our joint venture and the intended participation by each joint venturer in the undertaking. Further, the undersigned covenant and agree to provide to grantee current, complete and accurate information regarding actual joint venture work and the payment therefor and any proposed changes in any of the joint venture arrangements and to permit the audit and examination of the books, records and files of the joint venture, or those of each joint venturer relevant to the joint venture, by authorized representatives of the grantee or the Federal funding agency. Any material misrepresentation will be grounds for terminating any contract which may be awarded and for initiating action under Federal or State laws concerning false statements."

Name of Firm	Name of Firm
Signature	Signature
Name	Name
Title	Title
Date	Date

Date _____

State of _____

County of _____

On this ____ day of _____, 20___, before me appeared (Name) _____, to me personally known, who, being duly sworn, did execute the foregoing affidavit, and did state that he or she was properly authorized by (Name of firm) _____ to execute the affidavit and did so as his or her free act and deed.

Notary Public _____

Commission expires _____

[Seal]

Date _____

State of _____

County of _____

On this ___ day of _____, 20___, before me appeared (Name) _____ to me personally known, who, being duly sworn, did execute the foregoing affidavit, and did state that he or she was properly authorized by (Name of firm) _____ to execute the affidavit and did so as his or her free act and deed.

Notary Public _____

Commission expires _____

[Seal]

REQUIRED CONTRACT PROVISIONS
FEDERAL-AID CONSTRUCTION CONTRACTS

I. GENERAL

1. These contract provisions shall apply to all work performed on the contract by the contractor's own organization and with the assistance of workers under the contractor's immediate superintendence and to all work performed on the contract by piecework, station work, or by subcontract.

2. Except as otherwise provided for in each section, the contractor shall insert in each subcontract all of the stipulations contained in these Required Contract Provisions, and further require their inclusion in any lower tier subcontract or purchase order that may in turn be made. The Required Contract Provisions shall not be incorporated by reference in any case. The prime contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with these Required Contract Provisions.

3. A breach of any of the stipulations contained in these Required Contract Provisions shall be sufficient grounds for termination of the contract.

4. A breach of the following clauses of the Required Contract Provisions may also be grounds for debarment as provided in 29 CFR 5.12:

   Section I, paragraph 2;
   Section IV, paragraphs 1, 2, 3, 4, and 7;
   Section V, paragraphs 1 and 2a through 2g.

5. Disputes arising out of the labor standards provisions of Section IV (except paragraph 5) and Section V of these Required Contract Provisions shall not be subject to the general disputes clause of this contract. Such disputes shall be resolved in accordance with the procedures of the U.S. Department of Labor (DOL) as set forth in 29 CFR 5, 6, and 7. Disputes within the meaning of this clause include disputes between the contractor (or any of its subcontractors) and the contracting agency, the DOL, or the contractor's employees or their representatives.

6. Selection of Labor - During the performance of this contract, the contractor shall not:

   a. discriminate against labor from any other State, possession, or territory of the United States (except for employment preference for Appalachian contracts, when applicable, as specified in Attachment A), or

   b. employ convict labor for any purpose within the limits of the project unless it is labor performed by convicts who are on parole, supervised release, or probation.

II. NONDISCRIMINATION

(Applicable to all Federal-aid construction contracts and to all related subcontracts of $10,000 or more.)

1. **Equal Employment Opportunity:** Equal employment opportunity (EEO) requirements not to discriminate and to take affirmative action to assure equal opportunity as set forth under laws, executive orders, rules, regulations (28 CFR 35, 29 CFR 1630, and 41 CFR 60) and orders of the Secretary of Labor as modified by the provisions prescribed herein, and imposed pursuant to 23 U.S.C. 140 shall constitute the EEO and specific affirmative action standards for the contractor's project activities under this contract. The Equal Opportunity Construction Contract Specifications set forth under 41 CFR 60-4.3 and the provisions of the American Disabilities Act of 1990 (42 U.S.C. 12101 et seq.) set forth under 28 CFR 35 and 29 CFR 1630 are incorporated by reference in this contract. In the execution of this contract, the contractor agrees to comply with the following minimum specific requirement activities of EEO:

   a. The contractor will work with the State highway agency (SHA) and the Federal Government in carrying out EEO obligations and in their review of his/her activities under the contract.

   b. The contractor will accept as his operating policy the following statement:

      "It is the policy of this Company to assure that applicants are employed, and that employees are treated during employment, without regard to their race, religion, sex, color, national origin, age or disability. Such action

shall include: employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship, preapprenticeship, and/or on-the-job training."

2. **EEO Officer:** The contractor will designate and make known to the SHA contracting officers an EEO Officer who will have the responsibility for and must be capable of effectively administering and promoting an active contractor program of EEO and who must be assigned adequate authority and responsibility to do so.

3. **Dissemination of Policy:** All members of the contractor's staff who are authorized to hire, supervise, promote, and discharge employees, or who recommend such action, or who are substantially involved in such action, will be made fully cognizant of, and will implement, the contractor's EEO policy and contractual responsibilities to provide EEO in each grade and classification of employment. To ensure that the above agreement will be met, the following actions will be taken as a minimum:

   a. Periodic meetings of supervisory and personnel office employees will be conducted before the start of work and then not less often than once every six months, at which time the contractor's EEO policy and its implementation will be reviewed and explained. The meetings will be conducted by the EEO Officer.

   b. All new supervisory or personnel office employees will be given a thorough indoctrination by the EEO Officer, covering all major aspects of the contractor's EEO obligations within thirty days following their reporting for duty with the contractor.

   c. All personnel who are engaged in direct recruitment for the project will be instructed by the EEO Officer in the contractor's procedures for locating and hiring minority group employees.

   d. Notices and posters setting forth the contractor's EEO policy will be placed in areas readily accessible to employees, applicants for employment and potential employees.

   e. The contractor's EEO policy and the procedures to implement such policy will be brought to the attention of employees by means of meetings, employee handbooks, or other appropriate means.

4. **Recruitment:** When advertising for employees, the contractor will include in all advertisements for employees the notation: "An Equal Opportunity Employer." All such advertisements will be placed in publications having a large circulation among minority groups in the area from which the project work force would normally be derived.

   a. The contractor will, unless precluded by a valid bargaining agreement, conduct systematic and direct recruitment through public and private employee referral sources likely to yield qualified minority group applicants. To meet this requirement, the contractor will identify sources of potential minority group employees, and establish with such identified sources procedures whereby minority group applicants may be referred to the contractor for employment consideration.

   b. In the event the contractor has a valid bargaining agreement providing for exclusive hiring hall referrals, he is expected to observe the provisions of that agreement to the extent that the system permits the contractor's compliance with EEO contract provisions. (The DOL has held that where implementation of such agreements have the effect of discriminating against minorities or women, or obligates the contractor to do the same, such implementation violates Executive Order 11246, as amended.)

   c. The contractor will encourage his present employees to refer minority group applicants for employment. Information and procedures with regard to referring minority group applicants will be discussed with employees.

5. **Personnel Actions:** Wages, working conditions, and employee benefits shall be established and administered, and personnel actions of every type, including hiring, upgrading, promotion, transfer, demotion, layoff, and termination, shall be taken without regard to race, color, religion, sex, national origin, age or disability. The following procedures shall be followed:

   a. The contractor will conduct periodic inspections of project sites to insure that working conditions and employee facilities do not indicate discriminatory treatment of project site personnel.

b. The contractor will periodically evaluate the spread of wages paid within each classification to determine any evidence of discriminatory wage practices.

c. The contractor will periodically review selected personnel actions in depth to determine whether there is evidence of discrimination. Where evidence is found, the contractor will promptly take corrective action. If the review indicates that the discrimination may extend beyond the actions reviewed, such corrective action shall include all affected persons.

d. The contractor will promptly investigate all complaints of alleged discrimination made to the contractor in connection with his obligations under this contract, will attempt to resolve such complaints, and will take appropriate corrective action within a reasonable time. If the investigation indicates that the discrimination may affect persons other than the complainant, such corrective action shall include such other persons. Upon completion of each investigation, the contractor will inform every complainant of all of his avenues of appeal.

6. **Training and Promotion:**

a. The contractor will assist in locating, qualifying, and increasing the skills of minority group and women employees, and applicants for employment.

b. Consistent with the contractor's work force requirements and as permissible under Federal and State regulations, the contractor shall make full use of training programs, i.e., apprenticeship, and on-the-job training programs for the geographical area of contract performance. Where feasible, 25 percent of apprentices or trainees in each occupation shall be in their first year of apprenticeship or training. In the event a special provision for training is provided under this contract, this subparagraph will be superseded as indicated in the special provision.

c. The contractor will advise employees and applicants for employment of available training programs and entrance requirements for each.

d. The contractor will periodically review the training and promotion potential of minority group and women employees and will encourage eligible employees to apply for such training and promotion.

7. **Unions:** If the contractor relies in whole or in part upon unions as a source of employees, the contractor will use his/her best efforts to obtain the cooperation of such unions to increase opportunities for minority groups and women within the unions, and to effect referrals by such unions of minority and female employees. Actions by the contractor either directly or through a contractor's association acting as agent will include the procedures set forth below:

a. The contractor will use best efforts to develop, in cooperation with the unions, joint training programs aimed toward qualifying more minority group members and women for membership in the unions and increasing the skills of minority group employees and women so that they may qualify for higher paying employment.

b. The contractor will use best efforts to incorporate an EEO clause into each union agreement to the end that such union will be contractually bound to refer applicants without regard to their race, color, religion, sex, national origin, age or disability.

c. The contractor is to obtain information as to the referral practices and policies of the labor union except that to the extent such information is within the exclusive possession of the labor union and such labor union refuses to furnish such information to the contractor, the contractor shall so certify to the SHA and shall set forth what efforts have been made to obtain such information.

d. In the event the union is unable to provide the contractor with a reasonable flow of minority and women referrals within the time limit set forth in the collective bargaining agreement, the contractor will, through independent recruitment efforts, fill the employment vacancies without regard to race, color, religion, sex, national origin, age or disability; making full efforts to obtain qualified and/or qualifiable minority group persons and women. (The DOL has held that it shall be no excuse that the union with which the contractor has a collective bargaining agreement providing for exclusive referral failed to refer minority employees.) In the event the union referral practice prevents the contractor from meeting the obligations pursuant to Executive Order 11246, as amended, and these special provisions, such contractor shall immediately notify the SHA.

8. **Selection of Subcontractors, Procurement of Materials and Leasing of Equipment:** The contractor shall not discriminate on the grounds of race, color, religion, sex, national origin, age or disability in the selection and retention of subcontractors, including procurement of materials and leases of equipment.

   a. The contractor shall notify all potential subcontractors and suppliers of his/her EEO obligations under this contract.

   b. Disadvantaged business enterprises (DBE), as defined in 49 CFR 23, shall have equal opportunity to compete for and perform subcontracts which the contractor enters into pursuant to this contract. The contractor will use his best efforts to solicit bids from and to utilize DBE subcontractors or subcontractors with meaningful minority group and female representation among their employees. Contractors shall obtain lists of DBE construction firms from SHA personnel.

   c. The contractor will use his best efforts to ensure subcontractor compliance with their EEO obligations.

9. **Records and Reports:** The contractor shall keep such records as necessary to document compliance with the EEO requirements. Such records shall be retained for a period of three years following completion of the contract work and shall be available at reasonable times and places for inspection by authorized representatives of the SHA and the FHWA.

   a. The records kept by the contractor shall document the following:

      (1) The number of minority and non-minority group members and women employed in each work classification on the project;

      (2) The progress and efforts being made in cooperation with unions, when applicable, to increase employment opportunities for minorities and women;

      (3) The progress and efforts being made in locating, hiring, training, qualifying, and upgrading minority and female employees; and

      (4) The progress and efforts being made in securing the services of DBE subcontractors or subcontractors with meaningful minority and female representation among their employees.

   b. The contractors will submit an annual report to the SHA each July for the duration of the project, indicating the number of minority, women, and non-minority group employees currently engaged in each work classification required by the contract work. This information is to be reported on Form FHWA-1391. If on-the-job training is being required by special provision, the contractor will be required to collect and report training data.

III. NONSEGREGATED FACILITIES

(Applicable to all Federal-aid construction contracts and to all related subcontracts of $10,000 or more.)

a. By submission of this bid, the execution of this contract or subcontract, or the consummation of this material supply agreement or purchase order, as appropriate, the bidder, Federal-aid construction contractor, subcontractor, material supplier, or vendor, as appropriate, certifies that the firm does not maintain or provide for its employees any segregated facilities at any of its establishments, and that the firm does not permit its employees to perform their services at any location, under its control, where segregated facilities are maintained. The firm agrees that a breach of this certification is a violation of the EEO provisions of this contract. The firm further certifies that no employee will be denied access to adequate facilities on the basis of sex or disability.

b. As used in this certification, the term "segregated facilities" means any waiting rooms, work areas, restrooms and washrooms, restaurants and other eating areas, time clocks, locker rooms, and other storage or dressing areas, parking lots, drinking fountains, recreation or entertainment areas, transportation, and housing facilities provided for employees which are segregated by explicit directive, or are, in fact, segregated on the basis of race, color, religion, national origin, age or disability, because of habit, local custom, or otherwise. The only exception will be for the disabled when the demands for accessibility override (e.g. disabled parking).

c. The contractor agrees that it has obtained or will obtain identical certification from proposed subcontractors or material suppliers prior to award of subcontracts or consummation of material supply agreements of $10,000 or more and that it will retain such certifications in its files.

IV. PAYMENT OF PREDETERMINED MINIMUM WAGE

(Applicable to all Federal-aid construction contracts exceeding $2,000 and to all related subcontracts, except for projects located on roadways classified as local roads or rural minor collectors, which are exempt.)

1. **General:**

a. All mechanics and laborers employed or working upon the site of the work will be paid unconditionally and not less often than once a week and without subsequent deduction or rebate on any account [except such payroll deductions as are permitted by regulations (29 CFR 3)] issued by the Secretary of Labor under the Copeland Act (40 U.S.C. 276c) the full amounts of wages and bona fide fringe benefits (or cash equivalents thereof) due at time of payment. The payment shall be computed at wage rates not less than those contained in the wage determination of the Secretary of Labor (hereinafter "the wage determination") which is attached hereto and made a part hereof, regardless of any contractual relationship which may be alleged to exist between the contractor or its subcontractors and such laborers and mechanics. The wage determination (including any additional classifications and wage rates conformed under paragraph 2 of this Section IV and the DOL poster (WH-1321) or Form FHWA-1495) shall be posted at all times by the contractor and its subcontractors at the site of the work in a prominent and accessible place where it can be easily seen by the workers. For the purpose of this Section, contributions made or costs reasonably anticipated for bona fide fringe benefits under Section 1(b)(2) of the Davis-Bacon Act (40 U.S.C. 276a) on behalf of laborers or mechanics are considered wages paid to such laborers or mechanics, subject to the provisions of Section IV, paragraph 3b, hereof. Also, for the purpose of this Section, regular contributions made or costs incurred for more than a weekly period (but not less often than quarterly) under plans, funds, or programs, which cover the particular weekly period, are deemed to be constructively made or incurred during such weekly period. Such laborers and mechanics shall be paid the appropriate wage rate and fringe benefits on the wage determination for the classification of work actually performed, without regard to skill, except as provided in paragraphs 4 and 5 of this Section IV.

b. Laborers or mechanics performing work in more than one classification may be compensated at the rate specified for each classification for the time actually worked therein, provided, that the employer's payroll records accurately set forth the time spent in each classification in which work is performed.

c. All rulings and interpretations of the Davis-Bacon Act and related acts contained in 29 CFR 1, 3, and 5 are herein incorporated by reference in this contract.

2. **Classification:**

a. The SHA contracting officer shall require that any class of laborers or mechanics employed under the contract, which is not listed in the wage determination, shall be classified in conformance with the wage determination.

b. The contracting officer shall approve an additional classification, wage rate and fringe benefits only when the following criteria have been met:

(1) the work to be performed by the additional classification requested is not performed by a classification in the wage determination;

(2) the additional classification is utilized in the area by the construction industry;

(3) the proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination; and

(4) with respect to helpers, when such a classification prevails in the area in which the work is performed.

c. If the contractor or subcontractors, as appropriate, the laborers and mechanics (if known) to be employed in the additional classification or their representatives, and the contracting officer agree on the classification and wage rate (including the amount designated for fringe benefits where appropriate), a report of the action taken shall be

sent by the contracting officer to the DOL, Administrator of the Wage and Hour Division, Employment Standards Administration, Washington, D.C. 20210. The Wage and Hour Administrator, or an authorized representative, will approve, modify, or disapprove every additional classification action within 30 days of receipt and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary.

d. In the event the contractor or subcontractors, as appropriate, the laborers or mechanics to be employed in the additional classification or their representatives, and the contracting officer do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits, where appropriate), the contracting officer shall refer the questions, including the views of all interested parties and the recommendation of the contracting officer, to the Wage and Hour Administrator for determination. Said Administrator, or an authorized representative, will issue a determination within 30 days of receipt and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary

e. The wage rate (including fringe benefits where appropriate) determined pursuant to paragraph 2c or 2d of this Section IV shall be paid to all workers performing work in the additional classification from the first day on which work is performed in the classification.

3. **Payment of Fringe Benefits:**

a. Whenever the minimum wage rate prescribed in the contract for a class of laborers or mechanics includes a fringe benefit which is not expressed as an hourly rate, the contractor or subcontractors, as appropriate, shall either pay the benefit as stated in the wage determination or shall pay another bona fide fringe benefit or an hourly case equivalent thereof.

b. If the contractor or subcontractor, as appropriate, does not make payments to a trustee or other third person, he/she may consider as a part of the wages of any laborer or mechanic the amount of any costs reasonably anticipated in providing bona fide fringe benefits under a plan or program, provided, that the Secretary of Labor has found, upon the written request of the contractor, that the applicable standards of the Davis-Bacon Act have been met. The Secretary of Labor may require the contractor to set aside in a separate account assets for the meeting of obligations under the plan or program.

4. **Apprentices and Trainees (Programs of the U.S. DOL) and Helpers:**

a. Apprentices:

(1) Apprentices will be permitted to work at less than the predetermined rate for the work they performed when they are employed pursuant to and individually registered in a bona fide apprenticeship program registered with the DOL, Employment and Training Administration, Bureau of Apprenticeship and Training, or with a State apprenticeship agency recognized by the Bureau, or if a person is employed in his/her first 90 days of probationary employment as an apprentice in such an apprenticeship program, who is not individually registered in the program, but who has been certified by the Bureau of Apprenticeship and Training or a State apprenticeship agency (where appropriate) to be eligible for probationary employment as an apprentice.

(2) The allowable ratio of apprentices to journeyman-level employees on the job site in any craft classification shall not be greater than the ratio permitted to the contractor as to the entire work force under the registered program. Any employee listed on a payroll at an apprentice wage rate, who is not registered or otherwise employed as stated above, shall be paid not less than the applicable wage rate listed in the wage determination for the classification of work actually performed. In addition, any apprentice performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. Where a contractor or subcontractor is performing construction on a project in a locality other than that in which its program is registered, the ratios and wage rates (expressed in percentages of the journeyman-level hourly rate) specified in the contractor's or subcontractor's registered program shall be observed.

(3) Every apprentice must be paid at not less than the rate specified in the registered program for the apprentice's level of progress, expressed as a percentage of the journeyman-level hourly rate specified in

the applicable wage determination. Apprentices shall be paid fringe benefits in accordance with the provisions of the apprenticeship program. If the apprenticeship program does not specify fringe benefits, apprentices must be paid the full amount of fringe benefits listed on the wage determination for the applicable classification. If the Administrator for the Wage and Hour Division determines that a different practice prevails for the applicable apprentice classification, fringes shall be paid in accordance with that determination.

(4) In the event the Bureau of Apprenticeship and Training, or a State apprenticeship agency recognized by the Bureau, withdraws approval of an apprenticeship program, the contractor or subcontractor will no longer be permitted to utilize apprentices at less than the applicable predetermined rate for the comparable work performed by regular employees until an acceptable program is approved.

b. Trainees:

(1) Except as provided in 29 CFR 5.16, trainees will not be permitted to work at less than the predetermined rate for the work performed unless they are employed pursuant to and individually registered in a program which has received prior approval, evidenced by formal certification by the DOL, Employment and Training Administration.

(2) The ratio of trainees to journeyman-level employees on the job site shall not be greater than permitted under the plan approved by the Employment and Training Administration. Any employee listed on the payroll at a trainee rate who is not registered and participating in a training plan approved by the Employment and Training Administration shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any trainee performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed.

(3) Every trainee must be paid at not less than the rate specified in the approved program for his/her level of progress, expressed as a percentage of the journeyman-level hourly rate specified in the applicable wage determination. Trainees shall be paid fringe benefits in accordance with the provisions of the trainee program. If the trainee program does not mention fringe benefits, trainees shall be paid the full amount of fringe benefits listed on the wage determination unless the Administrator of the Wage and Hour Division determines that there is an apprenticeship program associated with the corresponding journeyman-level wage rate on the wage determination which provides for less than full fringe benefits for apprentices, in which case such trainees shall receive the same fringe benefits as apprentices.

(4) In the event the Employment and Training Administration withdraws approval of a training program, the contractor or subcontractor will no longer be permitted to utilize trainees at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

c**.** Helpers**:**

Helpers will be permitted to work on a project if the helper classification is specified and defined on the applicable wage determination or is approved pursuant to the conformance procedure set forth in Section IV.2. Any worker listed on a payroll at a helper wage rate, who is not a helper under an approved definition, shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed.

5. **Apprentices and Trainees (Programs of the U.S. DOT):**
Apprentices and trainees working under apprenticeship and skill training programs which have been certified by the Secretary of Transportation as promoting EEO in connection with Federal-aid highway construction programs are not subject to the requirements of paragraph 4 of this Section IV. The straight time hourly wage rates for apprentices and trainees under such programs will be established by the particular programs. The ratio of apprentices and trainees to journeymen shall not be greater than permitted by the terms of the particular program.

6. **Withholding:**
The SHA shall upon its own action or upon written request of an authorized representative of the DOL withhold, or cause to be withheld, from the contractor or subcontractor under this contract or any other Federal contract with the same prime contractor, or any other Federally-assisted contract subject to Davis-Bacon prevailing wage

requirements which is held by the same prime contractor, as much of the accrued payments or advances as may be considered necessary to pay laborers and mechanics, including apprentices, trainees, and helpers, employed by the contractor or any subcontractor the full amount of wages required by the contract. In the event of failure to pay any laborer or mechanic, including any apprentice, trainee, or helper, employed or working on the site of the work, all or part of the wages required by the contract, the SHA contracting officer may, after written notice to the contractor, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds until such violations have ceased.

7. **Overtime Requirements:**
No contractor or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers, mechanics, watchmen, or guards (including apprentices, trainees, and helpers described in paragraphs 4 and 5 above) shall require or permit any laborer, mechanic, watchman, or guard in any workweek in which he/she is employed on such work, to work in excess of 40 hours in such workweek unless such laborer, mechanic, watchman, or guard receives compensation at a rate not less than one-and-one-half times his/her basic rate of pay for all hours worked in excess of 40 hours in such workweek.

8. **Violation:**
Liability for Unpaid Wages; Liquidated Damages: In the event of any violation of the clause set forth in paragraph 7 above, the contractor and any subcontractor responsible thereof shall be liable to the affected employee for his/her unpaid wages. In addition, such contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory) for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer, mechanic, watchman, or guard employed in violation of the clause set forth in paragraph 7, in the sum of $10 for each calendar day on which such employee was required or permitted to work in excess of the standard work week of 40 hours without payment of the overtime wages required by the clause set forth in paragraph 7.

9. **Withholding for Unpaid Wages and Liquidated Damages:**
The SHA shall upon its own action or upon written request of any authorized representative of the DOL withhold, or cause to be withheld, from any monies payable on account of work performed by the contractor or subcontractor under any such contract or any other Federal contract with the same prime contractor, or any other Federally-assisted contract subject to the Contract Work Hours and Safety Standards Act, which is held by the same prime contractor, such sums as may be determined to be necessary to satisfy any liabilities of such contractor or subcontractor for unpaid wages and liquidated damages as provided in the clause set forth in paragraph 8 above.

V. STATEMENTS AND PAYROLLS

(Applicable to all Federal-aid construction contracts exceeding $2,000 and to all related subcontracts, except for projects located on roadways classified as local roads or rural collectors, which are exempt.)

1. **Compliance with Copeland Regulations (29 CFR 3):**

The contractor shall comply with the Copeland Regulations of the Secretary of Labor which are herein incorporated by reference.

2. **Payrolls and Payroll Records:**

a. Payrolls and basic records relating thereto shall be maintained by the contractor and each subcontractor during the course of the work and preserved for a period of 3 years from the date of completion of the contract for all laborers, mechanics, apprentices, trainees, watchmen, helpers, and guards working at the site of the work.

b. The payroll records shall contain the name, social security number, and address of each such employee; his or her correct classification; hourly rates of wages paid (including rates of contributions or costs anticipated for bona fide fringe benefits or cash equivalent thereof the types described in Section 1(b)(2)(B) of the Davis Bacon Act); daily and weekly number of hours worked; deductions made; and actual wages paid. In addition, for Appalachian contracts, the payroll records shall contain a notation indicating whether the employee does, or does not, normally reside in the labor area as defined in Attachment A, paragraph 1. Whenever the Secretary of Labor, pursuant to Section IV, paragraph 3b, has found that the wages of any laborer or mechanic include the amount of any costs reasonably anticipated in providing benefits under a plan or program described in Section 1(b)(2)(B) of the Davis Bacon Act, the contractor and each subcontractor shall maintain records which show

that the commitment to provide such benefits is enforceable, that the plan or program is financially responsible, that the plan or program has been communicated in writing to the laborers or mechanics affected, and show the cost anticipated or the actual cost incurred in providing benefits. Contractors or subcontractors employing apprentices or trainees under approved programs shall maintain written evidence of the registration of apprentices and trainees, and ratios and wage rates prescribed in the applicable programs.

c. Each contractor and subcontractor shall furnish, each week in which any contract work is performed, to the SHA resident engineer a payroll of wages paid each of its employees (including apprentices, trainees, and helpers, described in Section IV, paragraphs 4 and 5, and watchmen and guards engaged on work during the preceding weekly payroll period). The payroll submitted shall set out accurately and completely all of the information required to be maintained under paragraph 2b of this Section V. This information may be submitted in any form desired. Optional Form WH-347 is available for this purpose and may be purchased from the Superintendent of Documents (Federal stock number 029-005-0014-1), U.S. Government Printing Office, Washington, D.C. 20402. The prime contractor is responsible for the submission of copies of payrolls by all subcontractors.

d. Each payroll submitted shall be accompanied by a "Statement of Compliance," signed by the contractor or subcontractor or his/her agent who pays or supervises the payment of the persons employed under the contract and shall certify the following:

(1) that the payroll for the payroll period contains the information required to be maintained under paragraph 2b of this Section V and that such information is correct and complete;

(2) that such laborer or mechanic (including each helper, apprentice, and trainee) employed on the contract during the payroll period has been paid the full weekly wages earned, without rebate, either directly or indirectly, and that no deductions have been made either directly or indirectly from the full wages earned, other than permissible deductions as set forth in the Regulations, 29 CFR 3;

(3) that each laborer or mechanic has been paid not less that the applicable wage rate and fringe benefits or cash equivalent for the classification of worked performed, as specified in the applicable wage determination incorporated into the contract.

e. The weekly submission of a properly executed certification set forth on the reverse side of Optional Form WH-347 shall satisfy the requirement for submission of the "Statement of Compliance" required by paragraph 2d of this Section V.

f. The falsification of any of the above certifications may subject the contractor to civil or criminal prosecution under 18 U.S.C. 1001 and 31 U.S.C. 231.

g. The contractor or subcontractor shall make the records required under paragraph 2b of this Section V available for inspection, copying, or transcription by authorized representatives of the SHA, the FHWA, or the DOL, and shall permit such representatives to interview employees during working hours on the job. If the contractor or subcontractor fails to submit the required records or to make them available, the SHA, the FHWA, the DOL, or all may, after written notice to the contractor, sponsor, applicant, or owner, take such actions as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds. Furthermore, failure to submit the required records upon request or to make such records available may be grounds for debarment action pursuant to 29 CFR 5.12.

VI. RECORD OF MATERIALS, SUPPLIES, AND LABOR

1. On all Federal-aid contracts on the National Highway System, except those which provide solely for the installation of protective devices at railroad grade crossings, those which are constructed on a force account or direct labor basis, highway beautification contracts, and contracts for which the total final construction cost for roadway and bridge is less than $1,000,000 (23 CFR 635) the contractor shall:

a. Become familiar with the list of specific materials and supplies contained in Form FHWA-47, "Statement of Materials and Labor Used by Contractor of Highway Construction Involving Federal Funds," prior to the commencement of work under this contract.

b. Maintain a record of the total cost of all materials and supplies purchased for and incorporated in the work, and also of the quantities of those specific materials and supplies listed on Form FHWA-47, and in the units shown on Form FHWA-47.

c. Furnish, upon the completion of the contract, to the SHA resident engineer on Form FHWA-47 together with the data required in paragraph 1b relative to materials and supplies, a final labor summary of all contract work indicating the total hours worked and the total amount earned.

2. At the prime contractor's option, either a single report covering all contract work or separate reports for the contractor and for each subcontract shall be submitted.

VII. SUBLETTING OR ASSIGNING THE CONTRACT

1. The contractor shall perform with its own organization contract work amounting to not less than 30 percent (or a greater percentage if specified elsewhere in the contract) of the total original contract price, excluding any specialty items designated by the State. Specialty items may be performed by subcontract and the amount of any such specialty items performed may be deducted from the total original contract price before computing the amount of work required to be performed by the contractor's own organization (23 CFR 635).

   a. "Its own organization" shall be construed to include only workers employed and paid directly by the prime contractor and equipment owned or rented by the prime contractor, with or without operators. Such term does not include employees or equipment of a subcontractor, assignee, or agent of the prime contractor.

   b. "Specialty Items" shall be construed to be limited to work that requires highly specialized knowledge, abilities, or equipment not ordinarily available in the type of contracting organizations qualified and expected to bid on the contract as a whole and in general are to be limited to minor components of the overall contract.

2. The contract amount upon which the requirements set forth in paragraph 1 of Section VII is computed includes the cost of material and manufactured products which are to be purchased or produced by the contractor under the contract provisions.

3. The contractor shall furnish (a) a competent superintendent or supervisor who is employed by the firm, has full authority to direct performance of the work in accordance with the contract requirements, and is in charge of all construction operations (regardless of who performs the work) and (b) such other of its own organizational resources (supervision, management, and engineering services) as the SHA contracting officer determines is necessary to assure the performance of the contract.

4. No portion of the contract shall be sublet, assigned or otherwise disposed of except with the written consent of the SHA contracting officer, or authorized representative, and such consent when given shall not be construed to relieve the contractor of any responsibility for the fulfillment of the contract. Written consent will be given only after the SHA has assured that each subcontract is evidenced in writing and that it contains all pertinent provisions and requirements of the prime contract.

VIII. SAFETY - ACCIDENT PREVENTION

1. In the performance of this contract the contractor shall comply with all applicable Federal, State, and local laws governing safety, health, and sanitation (23 CFR 635). The contractor shall provide all safeguards, safety devices and protective equipment and take any other needed actions as it determines, or as the SHA contracting officer may determine, to be reasonably necessary to protect the life and health of employees on the job and the safety of the public and to protect property in connection with the performance of the work covered by the contract.

2. It is a condition of this contract, and shall be made a condition of each subcontract, which the contractor enters into pursuant to this contract, that the contractor and any subcontractor shall not permit any employee, in performance of the contract, to work in surroundings or under conditions which are unsanitary, hazardous or dangerous to his/her health or safety, as determined under construction safety and health standards (29 CFR 1926) promulgated by the Secretary of Labor, in accordance with Section 107 of the Contract Work Hours and Safety Standards Act (40 U.S.C. 333).

3. Pursuant to 29 CFR 1926.3, it is a condition of this contract that the Secretary of Labor or authorized representative thereof, shall have right of entry to any site of contract performance to inspect or investigate the matter of

compliance with the construction safety and health standards and to carry out the duties of the Secretary under Section 107 of the Contract Work Hours and Safety Standards Act (40 U.S.C. 333).

IX. FALSE STATEMENTS CONCERNING HIGHWAY PROJECTS

In order to assure high quality and durable construction in conformity with approved plans and specifications and a high degree of reliability on statements and representations made by engineers, contractors, suppliers, and workers on Federal-aid highway projects, it is essential that all persons concerned with the project perform their functions as carefully, thoroughly, and honestly as possible. Willful falsification, distortion, or misrepresentation with respect to any facts related to the project is a violation of Federal law. To prevent any misunderstanding regarding the seriousness of these and similar acts, the following notice shall be posted on each Federal-aid highway project (23 CFR 635) in one or more places where it is readily available to all persons concerned with the project:

Notice To All Personnel Engaged On Federal-Aid Highway Projects

18 U.S.C. 1020 READS AS FOLLOWS:

"Whoever being an officer, agent, or employee of the United States, or any State or Territory, or whoever, whether a person, association, firm, or corporation, knowingly makes any false statement, false representation, or false report as to the character, quality, quantity, or cost of the material used or to be used, or the quantity or quality of the work performed or to be performed, or the cost thereof in connection with the submission of plans, maps, specifications, contracts, or costs of construction on any highway or related project submitted for approval to the Secretary of Transportation; or

Whoever knowingly makes any false statement, false representation, false report or false claim with respect to the character, quality, quantity, or cost of any work performed or to be performed, or materials furnished or to be furnished, in connection with the construction of any highway or related project approved by the Secretary of Transportation; or

Whoever knowingly makes any false statement or false representation as to material fact in any statement, certificate, or report submitted pursuant to provisions of the Federal-aid Roads Act approved July 1, 1916, (39 Stat. 355), as amended and supplemented;

Shall be fined not more that $10,000 or imprisoned not more than 5 years or both."

X. IMPLEMENTATION OF CLEAN AIR ACT AND FEDERAL WATER POLLUTION CONTROL ACT

(Applicable to all Federal-aid construction contracts and to all related subcontracts of $100,000 or more.)

By submission of this bid or the execution of this contract, or subcontract, as appropriate, the bidder, Federal-aid construction contractor, or subcontractor, as appropriate, will be deemed to have stipulated as follows:

1. That any facility that is or will be utilized in the performance of this contract, unless such contract is exempt under the Clean Air Act, as amended (42 U.S.C. 1857 et seq., as amended by Pub.L. 91-604), and under the Federal Water Pollution Control Act, as amended (33 U.S.C. 1251 et seq., as amended by Pub.L. 92-500), Executive Order 11738, and regulations in implementation thereof (40 CFR 15) is not listed, on the date of contract award, on the U.S. Environmental Protection Agency (EPA) List of Violating Facilities pursuant to 40 CFR 15.20.

2. That the firm agrees to comply and remain in compliance with all the requirements of Section 114 of the Clean Air Act and Section 308 of the Federal Water Pollution Control Act and all regulations and guidelines listed thereunder.

3. That the firm shall promptly notify the SHA of the receipt of any communication from the Director, Office of Federal Activities, EPA, indicating that a facility that is or will be utilized for the contract is under consideration to be listed on the EPA List of Violating Facilities.

4. That the firm agrees to include or cause to be included the requirements of paragraph 1 through 4 of this Section X in every nonexempt subcontract, and further agrees to take such action as the government may direct as a means of enforcing such requirements.

XI. CERTIFICATION REGARDING DEBARMENT, SUSPENSION, INELIGIBILITY AND VOLUNTARY EXCLUSION

1. **Instructions for Certification - Primary Covered Transactions:**
(Applicable to all Federal-aid contracts - 49 CFR 29)

a. By signing and submitting this proposal, the prospective primary participant is providing the certification set out below.

b. The inability of a person to provide the certification set out below will not necessarily result in denial of participation in this covered transaction. The prospective participant shall submit an explanation of why it cannot provide the certification set out below. The certification or explanation will be considered in connection with the department or agency's determination whether to enter into this transaction. However, failure of the prospective primary participant to furnish a certification or an explanation shall disqualify such a person from participation in this transaction.

c. The certification in this clause is a material representation of fact upon which reliance was placed when the department or agency determined to enter into this transaction. If it is later determined that the prospective primary participant knowingly rendered an erroneous certification, in addition to other remedies available to the Federal Government, the department or agency may terminate this transaction for cause of default.

d. The prospective primary participant shall provide immediate written notice to the department or agency to whom this proposal is submitted if any time the prospective primary participant learns that its certification was erroneous when submitted or has become erroneous by reason of changed circumstances.

e. The terms "covered transaction," "debarred," "suspended," "ineligible," "lower tier covered transaction," "participant," "person," "primary covered transaction," "principal," "proposal," and "voluntarily excluded," as used in this clause, have the meanings set out in the Definitions and Coverage sections of rules implementing Executive Order 12549. You may contact the department or agency to which this proposal is submitted for assistance in obtaining a copy of those regulations.

f. The prospective primary participant agrees by submitting this proposal that, should the proposed covered transaction be entered into, it shall not knowingly enter into any lower tier covered transaction with a person who is debarred, suspended, declared ineligible, or voluntarily excluded from participation in this covered transaction, unless authorized by the department or agency entering into this transaction.

g. The prospective primary participant further agrees by submitting this proposal that it will include the clause titled "Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion-Lower Tier Covered Transaction," provided by the department or agency entering into this covered transaction, without modification, in all lower tier covered transactions and in all solicitations for lower tier covered transactions.

h. A participant in a covered transaction may rely upon a certification of a prospective participant in a lower tier covered transaction that is not debarred, suspended, ineligible, or voluntarily excluded from the covered transaction, unless it knows that the certification is erroneous. A participant may decide the method and frequency by which it determines the eligibility of its principals. Each participant may, but is not required to, check the nonprocurement portion of the "Lists of Parties Excluded From Federal Procurement or Nonprocurement Programs" (Nonprocurement List) which is compiled by the General Services Administration.

i. Nothing contained in the foregoing shall be construed to require establishment of a system of records in order to render in good faith the certification required by this clause. The knowledge and information of participant is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.

j. Except for transactions authorized under paragraph f of these instructions, if a participant in a covered transaction knowingly enters into a lower tier covered transaction with a person who is suspended, debarred, ineligible, or voluntarily excluded from participation in this transaction, in addition to other remedies available to the Federal Government, the department or agency may terminate this transaction for cause or default.

2. **Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion — Primary Covered Transactions:**

a. The prospective primary participant certifies to the best of its knowledge and belief, that it and its principals:

(1) Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from covered transactions by any Federal department or agency;

(2) Have not within a 3-year period preceding this proposal been convicted of or had a civil judgement rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, State or local) transaction or contract under a public transaction; violation of Federal or State antitrust statutes or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property;

(3) Are not presently indicted for or otherwise criminally or civilly charged by a governmental entity (Federal, State or local) with commission of any of the offenses enumerated in paragraph 1b of this certification; and

(4) Have not within a 3-year period preceding this application/proposal had one or more public transactions (Federal, State or local) terminated for cause or default.

b. Where the prospective primary participant is unable to certify to any of the statements in this certification, such prospective participant shall attach an explanation to this proposal.

3. **Instructions for Certification - Lower Tier Covered Transactions:**
(Applicable to all subcontracts, purchase orders and other lower tier transactions of $25,000 or more - 49 CFR 29)

a. By signing and submitting this proposal, the prospective lower tier is providing the certification set out below.

b. The certification in this clause is a material representation of fact upon which reliance was placed when this transaction was entered into. If it is later determined that the prospective lower tier participant knowingly rendered an erroneous certification, in addition to other remedies available to the Federal Government, the department or agency with which this transaction originated may pursue available remedies, including suspension and/or debarment.

c. The prospective lower tier participant shall provide immediate written notice to the person to which this proposal is submitted if at any time the prospective lower tier participant learns that its certification was erroneous by reason of changed circumstances.

d. The terms "covered transaction," "debarred," "suspended," "ineligible," "primary covered transaction," "participant," "person," "principal," "proposal," and "voluntarily excluded," as used in this clause, have the meanings set out in the Definitions and Coverage sections of rules implementing Executive Order 12549. You may contact the person to which this proposal is submitted for assistance in obtaining a copy of those regulations.

e. The prospective lower tier participant agrees by submitting this proposal that, should the proposed covered transaction be entered into, it shall not knowingly enter into any lower tier covered transaction with a person who is debarred, suspended, declared ineligible, or voluntarily excluded from participation in this covered transaction, unless authorized by the department or agency with which this transaction originated.

f. The prospective lower tier participant further agrees by submitting this proposal that it will include this clause titled "Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion-Lower Tier Covered Transaction," without modification, in all lower tier covered transactions and in all solicitations for lower tier covered transactions.

g. A participant in a covered transaction may rely upon a certification of a prospective participant in a lower tier covered transaction that is not debarred, suspended, ineligible, or voluntarily excluded from the covered transaction, unless it knows that the certification is erroneous. A participant may decide the method and frequency by which it determines the eligibility of its principals. Each participant may, but is not required to, check the Nonprocurement List.

h. Nothing contained in the foregoing shall be construed to require establishment of a system of records in order to render in good faith the certification required by this clause. The knowledge and information of participant is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.

i. Except for transactions authorized under paragraph e of these instructions, if a participant in a covered transaction knowingly enters into a lower tier covered transaction with a person who is suspended, debarred, ineligible, or voluntarily excluded from participation in this transaction, in addition to other remedies available to the Federal Government, the department or agency with which this transaction originated may pursue available remedies, including suspension and/or debarment.

4. **Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion — Lower Tier Covered Transactions:**

a. The prospective lower tier participant certifies, by submission of this proposal, that neither it nor its principals is presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participation in this transaction by any Federal department or agency.

b. Where the prospective lower tier participant is unable to certify to any of the statements in this certification, such prospective participant shall attach an explanation to this proposal.

XII. CERTIFICATION REGARDING USE OF CONTRACT FUNDS FOR LOBBYING

(Applicable to all Federal-aid construction contracts and to all related subcontracts which exceed $100,000 - 49 CFR 20)

1. The prospective participant certifies, by signing and submitting this bid or proposal, to the best of his or her knowledge and belief, that:

a. No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of any Federal agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.

b. If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any Federal agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form-LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions.

2. This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by 31 U.S.C. 1352. Any person who fails to file the required certification shall be subject to a civil penalty of not less than $10,000 and not more than $100,000 for each such failure.

3. The prospective participant also agrees by submitting his or her bid or proposal that he or she shall require that the language of this certification be included in all lower tier subcontracts, which exceed $100,000 and that all such recipients shall certify and disclose accordingly.

FEDERAL-AID FEMALE AND MINORITY GOALS

In accordance with Section II, "Nondiscrimination," of "Required Contract Provisions Federal-aid Construction Contracts" the following are the goals for female utilization:

Goal for Women (applies nationwide).....(percent) 6.9

The following are goals for minority utilization:

CALIFORNIA ECONOMIC AREA

		Goal (Percent)
174	**Redding, CA:**	
	Non-SMSA Counties	6.8
	CA Lassen; CA Modoc;CA Plumas;CA Shasta; CA Siskiyou; CA Tehama.	
175	**Eureka, CA**	
	Non-SMSA Counties	6.6
	CA Del Norte; CA Humboldt; CA Trinity.	
176	**San Francisco-Oakland-San Jose, CA:**	
	SMSA Counties:	
	7120 Salinas-Seaside-Monterey, CA	28.9
	CA Monterey.	
	7360 San Francisco-Oakland	25.6
	CA Alameda; CA Contra Costa; CA Marin; CA San Francisco; CA San Mateo.	
	7400 San Jose, CA	19.6
	CA Santa Clara.	
	7485 Santa Cruz, CA.	14.9
	CA Santa Cruz.	
	7500 Santa Rosa, CA	9.1
	CA Sonoma.	
	8720 Vallejo-Fairfield- Napa, CA	17.1
	CA Napa; CA Solano	
	Non-SMSA Counties	23.2
	CA Lake; CA Mendocino; CA San Benito	
177	**Sacramento, CA**:	
	SMSA Counties:	
	6920 Sacramento, CA	16.1
	CA Placer; CA Sacramento; CA Yolo.	
	Non-SMSA Counties	14.3
	CA Butte; CA Colusa; CA El Dorado; CA Glenn; CA Nevada; CA Sierra; CA Sutter; CA Yuba.	
178	**Stockton-Modesto, CA:**	
	SMSA Counties:	
	5170 Modesto, CA	12.3
	CA Stanislaus.	
	8120 Stockton, CA	24.3
	CA San Joaquin.	
	Non-SMSA Counties	19.8
	CA Alpine; CA Amador; CA Calaveras; CA Mariposa;CA Merced; CA Tuolumne.	

		Goal (Percent)
179	**Fresno-Bakersfield, CA**	
	SMSA Counties:	
	0680 Bakersfield, CA	19.1
	CA Kern.	
	2840 Fresno, CA	26.1
	CA Fresno.	
	Non-SMSA Counties	23.6
	CA Kings; CA Madera; CA Tulare.	
180	**Los Angeles, CA:**	
	SMSA Counties:	
	0360 Anaheim-Santa Ana-Garden Grove, CA	11.9
	CA Orange.	
	4480 Los Angeles-Long Beach, CA	28.3
	CA Los Angeles.	
	6000 Oxnard-Simi Valley-Ventura, CA	21.5
	CA Ventura.	
	6780 Riverside-San Bernardino-Ontario, CA.	19.0
	CA Riverside; CA San Bernardino.	
	7480 Santa Barbara-Santa Maria-Lompoc, CA	19.7
	CA Santa Barbara.	
	Non-SMSA Counties	24.6
	CA Inyo; CA Mono; CA San Luis Obispo.	
181	**San Diego, CA:**	
	SMSA Counties	
	7320 San Diego, CA.	16.9
	CA San Diego.	
	Non-SMSA Counties	18.2
	CA Imperial.	

In addition to the reporting requirements set forth elsewhere in this contract the Contractor and subcontractors holding subcontracts, not including material suppliers, of $10,000 or more, shall submit for every month of July during which work is performed, employment data as contained under Form FHWA PR-1391 (Appendix C to 23 CFR, Part 230), and in accordance with the instructions included thereon.

FEDERAL REQUIREMENT TRAINING SPECIAL PROVISIONS

As part of the Contractor's equal employment opportunity affirmative action program, training shall be provided as follows:

The Contractor shall provide on-the-job training to develop full journeymen in the types of trades or job classification involved.

The goal for the number of trainees or apprentices to be trained under the requirements of this special provision will be 10.

In the event the Contractor subcontracts a portion of the contract work, he shall determine how many, if any, of the trainees or apprentices are to be trained by the subcontractor, provided however, that the Contractor shall retain the primary responsibility for meeting the training requirements imposed by this special provision. The Contractor shall also insure that this Training Special Provision is made applicable to such subcontract. Where feasible, 25 percent of trainees or apprentices in each occupation shall be in their first year of apprenticeship or training.

The number of trainees or apprentices shall be distributed among the work classifications on the basis of the Contractor's needs and the availability of journeymen in the various classifications within a reasonable area of recruitment. Prior to commencing work, the Contractor shall submit to the Department for approval the number of trainees or apprentices to be trained in each selected classification and training program to be used. Furthermore, the Contractor shall specify the starting time for training in each of the classifications. The Contractor will be credited for each trainee or apprentice employed by him on the contract work who is currently enrolled or becomes enrolled in an approved program and will be reimbursed for such trainees or apprentices as provided hereinafter.

Training and upgrading of minorities and women toward journeymen status is a primary objective of this Training Special Provision. Accordingly, the Contractor shall make every effort to enroll minority and women trainees or apprentices (e.g., by conducting systematic and direct recruitment through public and private sources likely to yield minority and women trainees or apprentices) to the extent such persons are available within a reasonable area of recruitment. The Contractor will be responsible for demonstrating the steps that he has taken in pursuance thereof, prior to a determination as to whether the Contractor is in compliance with this Training Special Provision. This training commitment is not intended, and shall not be used, to discriminate against any applicant for training, whether a member of a minority group or not.

No employee shall be employed as a trainee or apprentice in any classification in which he has successfully completed a training course leading to journeyman status or in which he has been employed as a journeyman. The Contractor should satisfy this requirement by including appropriate questions in the employee application or by other suitable means. Regardless of the method used the Contractor's records should document the findings in each case.

The minimum length and type of training for each classification will be as established in the training program selected by the Contractor and approved by both the Department and the Federal Highway Administration. The Department and the Federal Highway Administration will approve a program if it is reasonably calculated to meet the equal employment opportunity obligations of the Contractor and to qualify the average trainee or apprentice for journeyman status in the classification concerned by the end of the training period. Furthermore, apprenticeship programs registered with the U.S. Department of Labor, Bureau of Apprenticeship and Training, or with the State of California, Department of Industrial Relations, Division of Apprenticeship Standards recognized by the Bureau and training programs approved but not necessarily sponsored by the U.S. Department of Labor, Manpower Administration, Bureau of Apprenticeship and Training shall also be considered acceptable provided it is being administered in a manner consistent with the equal employment obligations of Federal-aid highway construction contracts. Approval or acceptance of a training program shall be obtained from the State prior to commencing work on the classification covered by the program. It is the intention of these provisions that training is to be provided in the construction crafts rather than clerk-typists or secretarial-type positions. Training is permissible in lower level management positions such as office engineers, estimators, timekeepers, etc., where the training is oriented toward construction applications. Training in the laborer classification may be permitted provided that significant and meaningful training is provided and approved by the division office. Some offsite training is permissible as long as the training is an integral part of an approved training program and does not comprise a significant part of the overall training.

Except as otherwise noted below, the Contractor will be reimbursed 80 cents per hour of training given an employee on this contract in accordance with an approved training program. As approved by the Engineer, reimbursement will be made for training of persons in excess of the number specified herein. This reimbursement will be made even though the Contractor receives additional training program funds from other sources, provided such other source does not specifically prohibit the Contractor from receiving other reimbursement. Reimbursement for offsite training indicated above may only be made to the Contractor where he does one or more of the following and the trainees or apprentices are concurrently employed on a Federal-aid project; contributes to the cost of the training, provides the instruction to the trainee or apprentice or pays the trainee's or apprentice's wages during the offsite training period.

No payment shall be made to the Contractor if either the failure to provide the required training, or the failure to hire the trainee or apprentice as a journeyman, is caused by the Contractor and evidences a lack of good faith on the part of the Contractor in meeting the requirements of this Training Special Provision. It is normally expected that a trainee or apprentice

will begin his training on the project as soon as feasible after start of work utilizing the skill involved and remain on the project as long as training opportunities exist in his work classification or until he has completed his training program. It is not required that all trainees or apprentices be on board for the entire length of the contract. A Contractor will have fulfilled his responsibilities under this Training Special Provision if he has provided acceptable training to the number of trainees or apprentices specified. The number trained shall be determined on the basis of the total number enrolled on the contract for a significant period.

Only trainees or apprentices registered in a program approved by the State of California's State Administrator of Apprenticeship may be employed on the project and said trainees or apprentices shall be paid the standard wage specified under the regulations of the craft or trade at which they are employed.

The Contractor shall furnish the trainee or apprentice a copy of the program he will follow in providing the training. The Contractor shall provide each trainee or apprentice with a certification showing the type and length of training satisfactorily completed.

The Contractor will provide for the maintenance of records and furnish periodic reports documenting his performance under this Training Special Provision.