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**STATE OF CALIFORNIA**

**DEPARTMENT OF TRANSPORTATION**

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**NOTICE TO CONTRACTORS  
AND  
SPECIAL PROVISIONS**

**FOR BUILDING CONSTRUCTION  
ADJACENT TO STATE HIGHWAY IN  
SIERRA COUNTY 3.2 km EAST OF DOWNIEVILLE AT  
THE DOWNIEVILLE MAINTENANCE STATION**

**DISTRICT 03, ROUTE 5706**

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

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**CONTRACT NO. 03-449514**

**03-Sic-5706**

**Bids Open: May 22, 2001**  
**Dated: April 23, 2001**

**OSD**

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# IMPORTANT SPECIAL NOTICES

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- Attention is directed to the Notice to Contractor and Section 1, "Plans and Specifications," of the special provisions regarding references to the District and District Director's Office. The Office of the District Director for the Northern Region is located at Marysville.
- **Payment Bonds**  
Attention is directed to Section 5 of the Special Provisions, regarding contract bonds. 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.

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## STANDARD PLANS LIST

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.

A10A	Abbreviations
A10B	Symbols
A62A	Excavation and Backfill - Miscellaneous Details
A62D	Excavation and Backfill - Concrete Pipe Culverts
RSP A62DA	Excavation and Backfill - Concrete Pipe Culverts
A62F	Excavation and Backfill - Metal and Plastic Culverts
A85	Chain Link Fence
A86	Barbed Wire and Wire Mesh Fences
D73	Drainage Inlets
D74C	Drainage Inlet Details
D75A	Pipe Inlets
D75B	Pipe Inlets
D75C	Pipe Inlets
D77A	Grate Details
D77B	Bicycle Proof Grate Details
D79	Precast Reinforced Concrete Pipe - Direct Design Method
D87A	Corrugated Metal Pipe Downdrain Details
D87B	Plastic Pipe Downdrain Details
D88	Construction Loads On Culverts
D94A	Metal and Plastic Flared End Sections
D94B	Concrete Flared End Sections
D97B	Corrugated Metal Pipe Coupling Details No. 2 - Hat Band Coupler and Flange Details
D97C	Corrugated Metal Pipe Coupling Details No. 3 - Helical and Universal Couplers
D97D	Corrugated Metal Pipe Coupling Details No. 4 - Hugger Coupling Bands
D97E	Corrugated Metal Pipe Coupling Details No. 5 - Standard Joint
D97F	Corrugated Metal Pipe Coupling Details No. 6 - Positive Joint
D97G	Corrugated Metal Pipe Coupling Details No. 7 - Positive Joints and Downdrains
D97H	Reinforced Concrete Pipe or Non-Reinforced Concrete Pipe - Standard and Positive Joints

**DEPARTMENT OF TRANSPORTATION**

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**NOTICE TO CONTRACTORS**

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**CONTRACT NO. 03-449514**

**03-Sie-5706-**

Sealed proposals for the work shown on the plans entitled:

**STATE OF CALIFORNIA; DEPARTMENT OF TRANSPORTATION; PROJECT PLANS FOR BUILDING CONSTRUCTION ADJACENT TO STATE HIGHWAY IN SIERRA COUNTY 3.2 km EAST OF DOWNIEVILLE AT THE DOWNIEVILLE MAINTENANCE STATION**

will be received at the Department of Transportation, 1120 N Street, Room 0200, MS #26, Sacramento, CA 95814, until 2 o'clock p.m. on May 22, 2001, at which time they will be publicly opened and read in Room 0100 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 BUILDING CONSTRUCTION ADJACENT TO STATE HIGHWAY IN SIERRA COUNTY 3.2 km EAST OF DOWNIEVILLE AT THE DOWNIEVILLE MAINTENANCE STATION**

General work description: Concrete masonry unit vehicle wash building to be constructed and water recycle system to be installed.

This project has a goal of 3 percent disabled veteran business enterprise (DVBE) participation.

No prebid meeting is scheduled for this project.

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 Class B license or a combination of Class C licenses which constitutes a majority of the work.

The Contractor must also be properly licensed at the time the bid is submitted, except that on a joint venture bid a joint venture license may be obtained by a combination of licenses after bid opening but before award in conformance with Business and Professions Code, Section 7029.1.

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

Preference will be granted to bidders properly certified as a "Small Business" as determined by the Department of General Services, Office of Small Business Certification and Resources at the time of bid opening in conformance with the provisions in Section 2-1.05, "Small Business Preference," of the special provisions, and Section 1896 et seq, Title 2, California Code of Regulations. A form for requesting a "Small Business" preference is included with the bid documents. Applications for status as a "Small Business" must be submitted to the Department of General Services, Office of Small Business Certification and Resources, 1531 "I" Street, Second Floor, Sacramento, CA 95814, Telephone No. (916) 322-5060.

A reciprocal preference will be granted to "California company" bidders in conformance with Section 6107 of the Public Contract Code. (See Sections 2 and 3 of the special provisions.) A form for indicating whether bidders are or are not a "California company" is included in the bid documents and is to be filled in and signed by all bidders.

The District in which the work for this project is located has been incorporated into the Department's Northern Region. References in the Standard Specifications or in the special provisions to the district shall be deemed to mean the Northern Region. The office of the District Director for the Northern Region is located at Marysville.

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.

Cross sections for this project are available at the office of the District Director of Transportation of the district in which the work is situated in paper or electronic copy format.

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

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>. Future effective general prevailing wage rates which have been predetermined and are on file with the Department of Industrial Relations are referenced but not printed in the general prevailing wage rates.

DEPARTMENT OF TRANSPORTATION

Deputy Director Transportation Engineering

Dated April 23, 2001

SW

**COPY OF ENGINEER'S ESTIMATE**  
**(NOT TO BE USED FOR BIDDING PURPOSES)**

**03-449514**

Item	Item Code	Item	Unit of Measure	Estimated Quantity
1	150604	REMOVE WOOD FENCE	M	67
2	150608	REMOVE CHAIN LINK FENCE	M	69
3	150801	REMOVE OVERSIDE DRAIN	M	5
4	150805	REMOVE CULVERT	M	38
5	150820	REMOVE INLET	EA	1
6	150821	REMOVE HEADWALL	EA	1
7	150855	REMOVE PAVEMENT	M3	80
8	152381	RELOCATE GATE	EA	1
9	152440	ADJUST MANHOLE TO GRADE	EA	1
10	160101	CLEARING AND GRUBBING	LS	LUMP SUM
11	160120	REMOVE TREE	EA	33
12	160121	REMOVE TREE STUMP	EA	33
13	190101	ROADWAY EXCAVATION	M3	3260
14	021180	STRUCTURAL EXCAVATION (CONTAMINATED)	M3	250
15	193001	STRUCTURE BACKFILL	M3	8
16	194001	DITCH EXCAVATION	M3	11
17	021181	GYPSUM	KG	270
18	203003	STRAW (EROSION CONTROL)	TONN	0.5
19	203014	FIBER (EROSION CONTROL)	KG	120
20	203024	COMPOST (EROSION CONTROL)	KG	480

Item	Item Code	Item	Unit of Measure	Estimated Quantity
21	203045	PURE LIVE SEED (EROSION CONTROL)	KG	3.4
22	203056	COMMERCIAL FERTILIZER (EROSION CONTROL)	KG	27
23	203061	STABILIZING EMULSION (EROSION CONTROL)	KG	41
24	260201	CLASS 2 AGGREGATE BASE	M3	340
25	390102	ASPHALT CONCRETE (TYPE A)	TONN	260
26	394002	PLACE ASPHALT CONCRETE (MISCELLANEOUS AREA)	M2	130
27 (F)	510502	MINOR CONCRETE (MINOR STRUCTURE)	M3	6.2
28	021179	DRAINAGE SAND TRAP TANK	EA	1
29	620909	450 MM ALTERNATIVE PIPE CULVERT	M	19
30	620913	600 MM ALTERNATIVE PIPE CULVERT	M	33
31	641134	450 MM PLASTIC PIPE	M	2
32	698091	300 MM ALTERNATIVE PIPE DOWNDRAIN	M	13
33	705334	300 MM ALTERNATIVE FLARED END SECTION	EA	1
34	705336	450 MM ALTERNATIVE FLARED END SECTION	EA	1
35	708058	900 MM ALTERNATIVE PIPE INLET	M	2.3
36	750007	FRAME AND GRATE	EA	3
37	800394	CHAIN LINK FENCE (TYPE CL-1.8, EXTENSION ARM)	M	89
38	021182	6.1 M CHAIN LINK GATE (TYPE CL-1.8, EXTENSION ARM)	EA	1
39	994650	BUILDING WORK	LS	LUMP SUM

**STATE OF CALIFORNIA**  
**DEPARTMENT OF TRANSPORTATION**

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**SPECIAL PROVISIONS**

**Annexed to Contract No. 03-449514**

**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 1999, of the Department of Transportation insofar as the same may apply, and these special provisions.

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 indented 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.

The District in which the work for this project is located has been incorporated into the Department's Northern Region. References in the Standard Specifications or in these special provisions to the district shall be deemed to mean the Northern Region. The office of the District Director for the Northern Region is located at Marysville.

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.

**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.

In addition to the subcontractors required to be listed in conformance with Section 2-1.054, "Required Listing of Proposed Subcontractors," of the Standard Specifications, each proposal shall have listed therein the name and address of each DVBE subcontractor to be used for credit in meeting the goal, and to whom the bidder proposes to directly subcontract portions of the work. The list of subcontractors shall also set forth the portion of work that will be performed by each subcontractor listed. A sheet for listing the subcontractors is included in the Proposal.

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.

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.

Submit request for substitution of an "or equal" item, and the data substantiating the request to the Department of Transportation, P.O. Box 911, Marysville, CA 95901, Attn: NRCO/Contract Administration Engineer, 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.

**2-1.02 DISABLED VETERAN BUSINESS ENTERPRISE (DVBE)**

Section 10115 of the Public Contract Code requires the Department to implement provisions to establish a goal for Disabled Veterans Business Enterprise (DVBE) in contracts.

It is the policy of the Department that Disabled Veteran Business Enterprise (DVBE) shall have the maximum opportunity to participate in the performance of contracts financed solely with state funds. The Contractor shall ensure that DVBEs have the maximum opportunity to participate in the performance of this contract and shall take all necessary and reasonable steps for this assurance. The Contractor shall not discriminate on the basis of race, color, national origin, or sex in

the award and performance of subcontracts. Failure to carry out the requirements of this paragraph shall constitute a breach of contract and may result in termination of this contract or other remedy the Department may deem appropriate.

Bidder's attention is directed to the following:

- A. "Disabled Veteran Business Enterprise" (DVBE) means a business concern certified as a DVBE by the Office of Small Business Certification and Resources, Department of General Services.
- B. A DVBE may participate as a prime contractor, subcontractor, joint venture partner with a prime or subcontractor, or vendor of material or supplies.
- C. Credit for DVBE prime contractors will be 100 percent.
- D. A DVBE joint venture partner must be responsible for specific contract items of work, or portions thereof. Responsibility means actually performing, managing and supervising the work with its own forces. The DVBE joint venture partner must share in the ownership, control, management responsibilities, risks and profits of the joint venture. The DVBE joint venturer must submit the joint venture agreement with the Caltrans Bidder DVBE Information form required in Section 2-1.04, "Submission of DVBE Information," elsewhere in these special provisions.
- E. A DVBE 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.
- F. Credit for DVBE vendors of materials or supplies is limited to 60 percent of the amount to be paid to the vendor for the material unless the vendor manufactures or substantially alters the goods.
- G. Credit for trucking by DVBEs will be as follows:
  - 1. One hundred percent of the amount to be paid when a DVBE trucker will perform the trucking with his/her own trucks, tractors and employees.
  - 2. Twenty percent of the amount to be paid to DVBE trucking brokers who do not have a "certified roster."
  - 3. One hundred percent of the amount to be paid to DVBE trucking brokers who have signed agreements that all trucking will be performed by DVBE truckers if credit is toward the DVBE goal, a "certified roster" showing that all trucks are owned by DVBEs, and a signed statement on the "certified roster" that indicates that 100 percent of revenue paid by the broker will be paid to the DVBEs listed on the "certified roster."
  - 4. Twenty percent of the amount to be paid to trucking brokers who are not a DVBE but who have signed agreements with DVBE truckers assuring that at least 20 percent of the trucking will be performed by DVBE truckers if credit is toward the DVBE goal, a "certified roster" showing that at least 20 percent of the number of trucks are owned by DVBE truckers, and a signed statement on the "certified roster" that indicates that at least 20 percent of the revenue paid by the broker will be paid to the DVBEs listed on the "certified roster."

The "certified roster" referred to herein shall conform to the requirements in Section 2-1.04, "Submission Of DVBE Information," elsewhere in these special provisions.

- H. DVBEs and DVBE joint venture partners must be certified DVBEs as determined by the Department of General Services, Office of Small Business Certification and Resources, 1531 "I" Street, Second Floor, Sacramento, CA 95814, on the date bids for the project are opened before credit may be allowed toward the DVBE goal. It is the Contractor's responsibility to verify that DVBEs are certified.
- I. Noncompliance by the Contractor with these requirements constitutes a breach of this contract and may result in termination of the contract or other appropriate remedy for a breach of this contract.

### **2-1.03 DVBE GOAL FOR THIS PROJECT**

The Department has established the following goal for Disabled Veteran Business Enterprise (DVBE) participation for this project:

Disabled Veteran Business Enterprise (DVBE): 3 percent.

It is the bidder's responsibility to make a sufficient portion of the work available to subcontractors and suppliers and to select those portions of the work or material needs consistent with the available DVBE subcontractors and suppliers, so as to assure meeting the goal for DVBE participation.

The Office of Small Business Certification and Resources, Department of General Services, may be contacted at (916) 322-5060 or visit their internet web site at <http://www.osmb.dgs.ca.gov/> for program information and certification status. The Department's Business Enterprise Program may also be contacted at (916) 227-9599 or the internet web site at <http://www.dot.ca.gov/hq/bep/>.

#### **2-1.04 SUBMISSION OF DVBE INFORMATION**

The required DVBE information shall be submitted on the "CALTRANS BIDDER - DVBE INFORMATION" form included in the Proposal. If this information is not submitted with the bid, the DVBE information forms shall be removed from the documents prior to submitting the bid.

It is the bidder's responsibility to make enough work available to DVBEs and to select those portions of the work or material needs consistent with the available DVBEs to meet the goal for DVBE participation or to provide information to establish that, prior to bidding, the bidder made adequate good faith efforts to do so.

If the DVBE information is not submitted with the bid, the apparent successful bidder (low bidder), the second low bidder and the third low bidder shall submit the DVBE information to the Department of Transportation, 1120 N Street, Room 0200, MS #26, Sacramento, California 95814 so the information is received by the Department no later than 4:00 p.m. on the fourth day, not including Saturdays, Sundays and legal holidays, following bid opening. DVBE information sent by U.S. Postal Service certified mail with return receipt and certificate of mailing and mailed on or before the third day, not including Saturdays, Sundays and legal holidays, following bid opening will be accepted even if it is received after the fourth day following bid opening. Failure to submit the required DVBE information by the time specified will be grounds for finding the bid or proposal nonresponsive. Other bidders need not submit DVBE information unless requested to do so by the Department.

The bidder's DVBE information shall establish that good faith efforts to meet the DVBE goal have been made. To establish good faith efforts, the bidder shall demonstrate that the goal will be met or that, prior to bidding, adequate good faith efforts to meet the goal were made.

Bidders are cautioned that even though their submittal indicates they will meet the stated DVBE goal, their submittal should also include their adequate good faith efforts information along with their DVBE goal information to protect their eligibility for award of the contract in the event the Department, in its review, finds that the goal has not been met.

The bidder's DVBE information shall include the names of DVBE firms that will participate, with a complete description of work or supplies to be provided by each, the dollar value of each DVBE transaction, and a written confirmation from the DVBE that it is participating in the contract. A copy of the DVBE's quote will serve as written confirmation that the DVBE is participating in the contract. When 100 percent of a contract item of work is not to be performed or furnished by a DVBE, a description of the exact portion of that work to be performed or furnished by that DVBE shall be included in the DVBE information, including the planned location of that work. The work that a DVBE prime contractor has committed to performing with its own forces as well as the work that it has committed to be performed by DVBE subcontractors, suppliers and trucking companies will count toward the goal.

If credit for trucking by a DVBE trucking broker is shown on the bidder's information as 100 percent of the revenue to be paid by the broker is to be paid to DVBE truckers, a "certified roster" of the broker's trucks to be used must be included. The "certified roster" must indicate that all the trucks are owned by certified DVBEs and must show the DVBE truck numbers, owner's name, Public Utilities Commission Cal-T numbers, and the DVBE certification numbers. The roster must indicate that all revenue paid by the broker will be paid to DVBEs listed on the "certified roster".

If credit for trucking by a trucking broker who is not a DVBE is shown in the bidder's information, a "certified roster" of the broker's trucks to be used must be included. The "certified roster" must indicate that at least 20 percent of the broker's trucks are owned by certified DVBEs and must show the DVBE truck numbers, owner's name, Public Utilities Commission Cal-T numbers, and the DVBE certification number. The roster must indicate that at least 20 percent of the revenue paid by the broker will be paid to DVBEs listed on the "certified roster".

A bidder shall be deemed to have made good faith efforts upon submittal, within time limits specified by the Department, of documentary evidence that all of the following actions were taken:

- A. Contact was made with the Office of Small Business Certification and Resources (OSBCR), Department of General Services or their web site at <http://www.osmb.dgs.ca.gov/> to identify Disabled Veteran Business Enterprises.
- B. Advertising was published in trade media and media focusing on Disabled Veteran Business Enterprises, unless time limits imposed by the Department do not permit that advertising.
- C. Invitations to bid were submitted to potential Disabled Veteran Business Enterprise contractors.
- D. Available Disabled Veteran Business Enterprises were considered.

#### **2-1.05 SMALL BUSINESS PREFERENCE**

Attention is directed to "Award and Execution of Contract" of these special provisions.

Attention is also directed to the Small Business Procurement and Contract Act, Government Code Section 14835, et seq and Title 2, California Code of Regulations, Section 1896, et seq.

Bidders who wish to be classified as a Small Business under the provisions of those laws and regulations, shall be certified as Small Business by the Department of General Services, Office of Small Business Certification and Resources, 1531 "I" Street, Second Floor, Sacramento, CA 95814.

To request Small Business Preference, bidders shall fill out and sign the Request for Small Business Preference form in the Proposal and shall attach a copy of their Office of Small Business Certification and Resources (OSBCR) small business certification letter to the form. The bidder's signature on the Request for Small Business Preference certifies, under penalty of perjury, that the bidder is certified as Small Business at the time of bid opening and further certifies, under penalty of perjury, that under the following conditions, at least 50 percent of the subcontractors to be utilized on the project are either certified Small Business or have applied for Small Business certification by bid opening date and are subsequently granted Small Business certification.

The conditions requiring the aforementioned 50 percent level of subcontracting by Small Business subcontractors apply if:

- A. The lowest responsible bid for the project exceeds \$100,000; and
- B. The project work to be performed requires a Class A or a Class B contractor's license; and
- C. Two or more subcontractors will be used.

If the above conditions apply and Small Business Preference is granted in the award of the contract, the 50 percent Small Business subcontractor utilization level shall be maintained throughout the life of the contract.

### **2-1.06 CALIFORNIA COMPANY PREFERENCE**

Attention is directed to "Award and Execution of Contract" of these special provisions.

In conformance with the requirements of Section 6107 of the Public Contract Code, a "California company" will be granted a reciprocal preference for bid comparison purposes as against a nonresident contractor from any state that gives or requires a preference to be given contractors from that state on its public entity construction contracts.

A "California company" means a sole proprietorship, partnership, joint venture, corporation, or other business entity that was a licensed California contractor on the date when bids for the public contract were opened and meets one of the following:

- A. Has its principal place of business in California.
- B. Has its principal place of business in a state in which there is no local contractor preference on construction contracts.
- C. Has its principal place of business in a state in which there is a local contractor construction preference and the contractor has paid not less than \$5000 in sales or use taxes to California for construction related activity for each of the five years immediately preceding the submission of the bid.

To carry out the "California company" reciprocal preference requirements of Section 6107 of the Public Contract Code, all bidders shall fill out and sign the California Company Preference form in the Proposal. The bidder's signature on the California Company Preference form certifies, under penalty of perjury, that the bidder is or is not a "California company" and if not, the amount of the preference applied by the state of the nonresident Contractor.

A nonresident Contractor shall disclose any and all bid preferences provided to the nonresident Contractor by the state or country in which the nonresident Contractor has its principal place of business.

Proposals without the California Company Preference form filled out and signed may be rejected.

### **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.

The award of the contract, if it be awarded, will be to the lowest responsible bidder whose proposal complies with all the requirements prescribed and who has met the goal for DVBE participation or has demonstrated, to the satisfaction of the Department, adequate good faith efforts to do so. Meeting the goal for DVBE participation or demonstrating, to the satisfaction of the Department, adequate good faith efforts to do so is a condition for being eligible for award of contract.

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 and contract bonds. 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 20 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.

Attention is also directed to "Small Business Preference" of these special provisions. Any bidder who is certified as a Small Business by the Department of General Services, Office of Small Business Certification and Resources will be allowed a preference in the award of this contract, if it be awarded, under the following conditions:

- A. The apparent low bidder is not certified as a Small Business, or has not filled out and signed the Request for Small Business Preference included with the bid documents and attached a copy of their Office of Small Business Certification and Resources (OSBCR) small business certification letter to the form; and
- B. The bidder filled out and signed the Request for Small Business Preference form included with the bid documents and attached a copy of their Office of Small Business Certification and Resources (OSBCR) small business certification letter to the form.

The small business preference will be a reduction in the bid submitted by the small business contractor, for bid comparison purposes, by an amount equal to 5 percent of the amount bid by the apparent low bidder, the amount not to exceed \$50,000. If this reduction results in the small business contractor becoming the low bidder, then the contract will be awarded to the small business contractor on the basis of the actual bid of the small business contractor notwithstanding the reduced bid price used for bid comparison purposes.

Attention is also directed to "California Company Preference" of these special provisions.

The amount of the California company reciprocal preference shall be equal to the amount of the preference applied by the state of the nonresident contractor with the lowest responsive bid, except where the "California company" is eligible for a California Small Business Preference, in which case the preference applied shall be the greater of the two, but not both.

If the bidder submitting the lowest responsive bid is not a "California company" and with the benefit of the reciprocal preference, a "California company's" responsive bid is equal to or less than the original lowest responsive bid, the "California company" will be awarded the contract at its submitted bid price except as provided below.

Small business bidders shall have precedence over nonsmall business bidders in that the application of the "California company" preference for which nonsmall business bidders may be eligible shall not result in the denial of the award to a small business bidder.

#### **SECTION 4. BEGINNING OF WORK, TIME OF COMPLETION AND LIQUIDATED DAMAGES**

Attention is directed to the provisions in Section 8-1.03, "Beginning of Work," in Section 8-1.06, "Time of Completion," and in Section 8-1.07, "Liquidated Damages," of the Standard Specifications and these special provisions.

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.

This work shall be diligently prosecuted to completion before the expiration of **135 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 \$375 per day, for each and every calendar day's delay in finishing the work in excess of the number of working days prescribed above.

#### **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.

###### **5-1.011 EXAMINATION OF PLANS, SPECIFICATIONS, CONTRACT, AND SITE OF WORK**

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

- 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.

Attention is directed to "Differing Site Conditions" of these special provisions regarding physical conditions at the site which may differ from those indicated in "Materials Information," log of test borings or other geotechnical information obtained by the Department's investigation of site conditions.

### **5-1.012 DIFFERING SITE CONDITIONS**

Attention is directed to Section 5-1.116, "Differing Site Conditions," of the Standard Specifications.

During the progress of the work, if subsurface or latent conditions are encountered at the site differing materially from those indicated in the "Materials Information," log of test borings, other geotechnical data obtained by the Department's investigation of subsurface conditions, or an examination of the conditions above ground at the site, the party discovering those conditions shall promptly notify the other party in writing of the specific differing conditions before they are disturbed and before the affected work is performed.

The Contractor will be allowed 15 days from the notification of the Engineer's determination of whether or not an adjustment of the contract is warranted, in which to file a notice of potential claim in conformance with the provisions of Section 9-1.04, "Notice of Potential Claim," of the Standard Specifications and as specified herein; otherwise the decision of the Engineer shall be deemed to have been accepted by the Contractor as correct. The notice of potential claim shall set forth in what respects the Contractor's position differs from the Engineer's determination and provide any additional information obtained by the Contractor, including but not limited to additional geotechnical data. The notice of potential claim shall be accompanied by the Contractor's certification that the following were made in preparation of the bid: a review of the contract, a review of the "Materials Information," a review of the log of test borings and other records of geotechnical data to the extent they were made available to bidders prior to the opening of bids, and an examination of the conditions above ground at the site. Supplementary information, obtained by the Contractor subsequent to the filing of the notice of potential claim, shall be submitted to the Engineer in an expeditious manner.

### **5-1.015 LABORATORY**

When a reference is made in the specifications to the "Laboratory," the reference shall mean the Division of Materials Engineering and Testing Services and the Division of Structural Foundations 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 the Division of Materials Engineering and Testing Services and the Division of Structural Foundations, located at 5900 Folsom Boulevard, Sacramento, CA 95819, Telephone (916) 227-7000.

### **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 EXCAVATION SAFETY PLANS**

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."

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.

#### **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 cost reduction proposal, the Contractor shall request a meeting with the Engineer to discuss the proposal in concept and to determine the merit of the cost reduction proposal. Items of discussion will also include permit issues, impact on other projects, impact on the project schedule, peer reviews, and review times required by the Department and other agencies.

#### **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.

#### **5-1.03 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.

#### **5-1.031 FINAL PAYMENT AND CLAIMS**

Attention is directed to Section 9-1.07B, "Final Payment and Claims," of the Standard Specifications.

The District that administers the contract shall submit a claim position letter to the Contractor within 135 days after acceptance of the contract. After receipt of the claim position letter from the District, or 135 days after acceptance of the contract, whichever occurs first, the Contractor may request a meeting with the person or board designated by the District Director to review claims that remain in dispute. If the Contractor requests a meeting, the review person or board shall meet with the Contractor within 45 days after the request is received.

**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.

Temporary railing (Type K) shall conform to the provisions in Section 12-3.08, "Temporary Railing (Type K)," of the Standard Specifications. Temporary railing (Type K), conforming to the details shown on 1999 Standard Plan T3, may be used. Temporary railing (Type K) fabricated prior to January 1, 1993, and conforming to 1988 Standard Plan B11-30 may be used, provided the fabrication date is printed on the required Certificate of Compliance.

Temporary crash cushion modules shall conform to the provisions in "Temporary Crash Cushion Module" of these special provisions.

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 SURFACE MINING AND RECLAMATION ACT**

Attention is directed to the Surface Mining and Reclamation Act of 1975, commencing in Public Resources Code, Mining and Geology, Section 2710, which establishes regulations pertinent to surface mining operations, and to California Public Contract Code Section 10295.5.

Material from mining operations furnished for this project shall only come from permitted sites in compliance with California Public Contract Code Section 10295.5.

The requirements of this section shall apply to materials furnished for the project, except for acquisition of materials in conformance with the provisions in Section 4-1.05, "Use of Materials Found on the Work," of the Standard Specifications.

#### **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.

#### **5-1.07 YEAR 2000 COMPLIANCE**

This contract is subject to Year 2000 Compliance for automated devices in the State of California.

Year 2000 compliance for automated devices in the State of California is achieved when embedded functions have or create no logical or mathematical inconsistencies when dealing with dates prior to and beyond 1999. The year 2000 is recognized and processed as a leap year. The product shall operate accurately in the manner in which the product was intended for date operation without requiring manual intervention.

The Contractor shall provide the Engineer a Certificate of Compliance from the manufacturer in conformance with the provisions in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications for all automated devices furnished for the project.

#### **5-1.08 SUBCONTRACTOR AND DVBE RECORDS**

The Contractor shall maintain records of all subcontracts entered into with certified DVBE subcontractors and records of materials purchased from certified DVBE suppliers. The records shall show the name and business address of each DVBE subcontractor or vendor and the total dollar amount actually paid each DVBE subcontractor or vendor.

Upon completion of the contract, a summary of these records shall be prepared on Form CEM-2402 (S) and certified correct by the Contractor or the Contractor's authorized representative, and shall be furnished to the Engineer.

#### **5-1.086 PERFORMANCE OF DVBE SUBCONTRACTORS AND SUPPLIERS**

The DVBEs listed by the Contractor in response to the provisions in Section 2-1.04, "Submission of DVBE Information," and Section 3, "Award and Execution of Contract," of these special provisions, which are determined by the Department to be certified DVBEs, 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.

Authorization to utilize other forces or sources of materials may be requested for the following reasons:

- A. The listed DVBE, after having had a reasonable opportunity to do so, fails or refuses to execute a written contract, when the written contract, based upon the general terms, conditions, plans and specifications for the project, or on the terms of the subcontractor's or supplier's written bid, is presented by the Contractor.
- B. The listed DVBE becomes bankrupt or insolvent.
- C. The listed DVBE fails or refuses to perform the subcontract or furnish the listed materials.

- D. The Contractor stipulated that a bond was a condition of executing a subcontract and the listed DVBE subcontractor fails or refuses to meet the bond requirements of the Contractor.
- E. The work performed by the listed subcontractor is substantially unsatisfactory and is not in substantial conformance with the plans and specifications or the subcontractor is substantially delaying or disrupting the progress of the work.
- F. The listed DVBE subcontractor is not licensed pursuant to the Contractor's License Law.
- G. It would be in the best interest of the State.

The Contractor shall not be entitled to payment for the work or material unless it is performed or supplied by the listed DVBE or by other forces (including those of the Contractor) pursuant to prior written authorization of the Engineer.

### **5-1.09 SUBCONTRACTING**

Attention is directed to the provisions in Section 8-1.01, "Subcontracting," of the Standard Specifications, Section 2, "Proposal Requirements and Conditions," Section 2-1.04, "Submission of DVBE Information," and Section 3, "Award and Execution of Contract," of these special provisions and these special provisions.

Pursuant to the provisions in 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>.

The third paragraph of Section 8-1.01 of the Standard Specifications shall not apply to this contract.

The DVBE information furnished under Section 2-1.04, "Submission of DVBE Information," of these special provisions is in addition to the subcontractor information required to be furnished in Section 8-1.01, "Subcontracting," and Section 2-1.054, "Required Listing of Proposed Subcontractors," of the Standard Specifications.

Section 10115 of the Public Contract Code requires the Department to implement provisions to establish a goal for Disabled Veteran Business Enterprise (DVBE) participation in highway contracts that are State funded. As a part of this requirement:

- A. No substitution of a DVBE subcontractor shall be made at any time without the written consent of the Department, and
- B. If a DVBE subcontractor is unable to perform successfully and is to be replaced, the Contractor shall make good faith efforts to replace the original DVBE subcontractor with another DVBE subcontractor.

The provisions in Section 2-1.02, "Disabled Veteran Business Enterprise (DVBE)," of these special provisions that DVBEs shall be certified on the date bids are opened does not apply to DVBE substitutions after award of the contract.

### **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 and Section 7108.5 of the Business and Professions Code concerning prompt payment to subcontractors.

### **5-1.11 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. 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.

The Contractor shall remove equipment, materials, and rubbish from the work areas and other State-owned property which the Contractor occupies. The Contractor shall leave the areas in a presentable condition in conformance with the provisions in Section 4-1.02, "Final Cleaning Up," of the Standard Specifications.

### **5-1.12 RELATIONS WITH TAHOE NATIONAL FOREST**

This project is located within the jurisdiction of the California Department of Tahoe National Forest. An agreement regarding work within the Tahoe National Forest has been entered into by the Department of Transportation and the United States Forest Service. The Contractor shall be fully informed of the requirements of this agreement as well as rules, regulations, and conditions that may govern the Contractor's operations in these areas and shall conduct the work accordingly.

Copies of the agreement may be obtained at the Department of Transportation, Plans and Bid Documents Section, MS 26, 1120 N Street, Room 200, Sacramento, CA 95814, Telephone (916) 654-4490, and are available for inspection at the office of the District Director of Transportation at the Northern Region Construction Office at 379-A Colusa Highway, Yuba City, California 95991.

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 Contractor's attention is directed to the Special Use Permit which is among the conditions established by the United States Forest Service in their permit for this project.

Modifications to the agreement between the Department of Transportation and the United States Forest Service which are proposed by the Contractor shall be submitted in writing to the Engineer for transmittal to the United States Forest Service for their consideration.

When the Contractor is notified by the Engineer that a modification to the agreement is under consideration, no work shall be performed which is inconsistent with the original agreement or proposed modification until the Departments take action on the proposed modifications. Compensation for delay will be determined in conformance with the provisions in Section 8-1.09, "Right of Way Delays," of the Standard Specifications.

The provisions of this section shall be made a part of every subcontract executed pursuant to this contract.

Modifications to any agreement between the Department of Transportation and the United States Forest Service will be fully binding on the Contractor. The provisions of this section shall be made a part of every subcontract executed pursuant to this contract.

### **5-1.13 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.

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. Culvert Pipe
- B. Miscellaneous Drainage Facilities
- C. Miscellaneous Iron and Steel
- D. Fences and Gates

### **5-1.14 OPEN BURNING OF WASTE MATERIAL**

Open burning of waste material shall conform to the provisions in Section 7-1.01F, "Air Pollution Control," of the Standard Specifications and these special provisions.

Material to be disposed of shall not be burned unless the Contractor has obtained a permit to burn combustible material resulting from clearing and grubbing operations from an air pollution control officer of the local or regional authority and the United States Forest Service. A copy of the permit shall be filed with the Engineer before beginning burning. Burning shall be conducted in strict conformance with the provisions stipulated in the permit and at times and in such a manner as to prevent the fire from spreading to areas adjoining the right of way.

**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 SIZES OF HIGH STRENGTH STEEL FASTENERS**  
ASTM Designation: A 325M

<b>METRIC SIZE SHOWN ON THE PLANS</b> mm x thread pitch	<b>SIZE TO BE SUBSTITUTED</b> 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 PLAIN WIRE REINFORCEMENT**

ASTM Designation: A 82

METRIC SIZE SHOWN ON THE PLANS mm <sup>2</sup>	SIZE TO BE SUBSTITUTED inch <sup>2</sup> 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 <sup>1</sup> SHOWN ON THE PLANS	BAR DESIGNATION NUMBER <sup>2</sup> TO BE SUBSTITUTED
13	4
16	5
19	6
22	7
25	8
29	9
32	10
36	11
43	14
57	18

<sup>1</sup>Bar designation numbers approximate the number of millimeters of the nominal diameter of the bars.

<sup>2</sup>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 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

**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 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 in 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 in 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**

- A. Apex, Model 921 (100 mm x 100 mm)
- B. Ray-O-Lite, Models SS (100 mm x 100 mm), RS (100 mm x 100 mm) and AA (100 mm x 100 mm)
- C. Stimsonite, Models 88 (100 mm x 100 mm), 911 (100 mm x 100 mm), 953 (70 mm x 114 mm)
- D. 3M Series 290 (89 mm x 100 mm)

### **Retroreflective With Abrasion Resistant Surface (ARS)**

- A. Apex, Model 921AR (100 mm x 100 mm)
- B. Ray-O-Lite "AA" ARS (100 mm x 100 mm)
- C. Stimsonite, Models 911 (100 mm x 100 mm), 953 (70 mm x 114 mm)
- D. 3M Series 290 (89 mm x 100 mm)

### **Retroreflective With Abrasion Resistant Surface (ARS)**

(Used for recessed applications)

- A. Stimsonite, Model 948 (58 mm x 119 mm)
  - B. Ray-O-Lite, Model 2002 (58 mm x 117 mm)
  - C. Stimsonite, Model 944SB (51 mm x 100 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 For Use With Epoxy Adhesive, 100 mm Round**

- A. Apex Universal (Ceramic)
- B. Highway Ceramics, Inc. (Ceramic)

### **Non-Reflective For Use With Bitumen Adhesive, 100 mm Round**

- A. Alpine Products, "D-Dot" and "ANR" (ABS)
- B. Apex Universal (Ceramic)
- C. Apex Universal, Model 929 (ABS)
- D. Elgin Molded Plastics, "Empco-Lite" Model 900 (ABS)
- E. Highway Ceramics, Inc. (Ceramic)
- F. Hi-Way Safety, Inc., Models P20-2000W and 2001Y (ABS)
- G. Interstate Sales, "Diamond Back" (ABS) and (Polypropylene)
- H. Novabrite Models Adot-w (White) Adot-y (Yellow), (ABS)
- I. Road Creations, Model RCB4NR (Acrylic)
- J. Zumar Industries, "Titan TM40A" (ABS)

## **PAVEMENT MARKERS, TEMPORARY TYPE**

### **Temporary Markers For Long Term Day/Night Use (6 months or less)**

- A. Apex Universal, Model 924 (100 mm x 100 mm)
- B. Elgin Molded Plastics, "Empco-Lite" Model 901 (100 mm x 100 mm)
- C. Road Creations, Model R41C (100 mm x 100 mm)
- D. 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. Davidson Plastics, Models T.O.M., T.R.P.M., and "HH" (High Heat)
- C. Hi-Way Safety, Inc., Model 1280/1281

## **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. P.B. Laminations, Aztec, Grade 102
- D. Swarco Industries, "Director-2"
- E. 3M, "Stamark," Series 620
- F. 3M Series A145 Removable Black Line Mask  
(Black Tape: For use only on Asphalt Concrete Surfaces)
- G. Advanced Traffic Marking Black "Hide-A-Line"  
(Black Tape: For use only on Asphalt Concrete Surfaces)
- H. Brite-Line "BTR" Black Removable Tape  
(Black Tape: For use only on Asphalt Concrete Surfaces)

**Preformed Thermoplastic (Heated in place)**

- A. Flint Trading, "Premark" and "Premark 20/20 Flex"
- B. Pavemark, "Hotape"

**Removable Traffic Paint**

- A. Belpro, Series 250/252 and No. 93 Remover

**Ceramic Surfacing Laminate, 150 mm x 150 mm**

- A. Safeline Industries/Highway Ceramics, Inc.

**CLASS 1 DELINEATORS**

**One Piece Driveable Flexible Type, 1700 mm**

- A. Carsonite, Curve-Flex CFRM-400
- B. Carsonite, Roadmarker CRM-375
- C. Davidson Plastics, "Flexi-Guide Models 400 and 566"
- D. FlexStake, Model 654 TM
- E. GreenLine Models HWD1-66 and CGD1-66
- F. J. Miller Industries, Model JMI-375 (with soil anchor)

**Special Use Flexible Type, 1700 mm**

- A. Carsonite, "Survivor" (with 450 mm U-Channel base)
- B. FlexStake, Model 604
- C. GreenLine Models HWD and CGD (with 450 mm U-Channel base)
- D. Safe-Hit with 200 mm pavement anchor (SH248-GP1)
- E. Safe-Hit with 380 mm soil anchor (SH248-GP2) and with 450 mm soil anchor (SH248-GP3)

**Surface Mount Flexible 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

**CHANNELIZERS**

**Surface Mount Type, 900 mm**

- A. Bent Manufacturing Company, Masterflex Models MF-360-36 (Round) and MF-180-36 (Flat)
- B. Carsonite, "Super Duck" (Flat SDF-436, Round SDR-336)
- C. Carsonite, "Super Duck II" Model SDCF203601MB "The Channelizer"
- D. Davidson Plastics, Flex-Guide Models FG300LD and FG300UR
- 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. The Line Connection, "Dura-Post" Model DP36-3 (Permanent)
- I. The Line Connection, "Dura-Post" Model DP36-3C (Temporary)
- J. Repo, Models 300 and 400
- K. Safe-Hit, Guide Post, Model SH236SMA

### **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. Roadmaker Company "Stacker"
- D. Traffix Devices "Grabber"

### **OBJECT MARKERS**

#### **Type "K", 450 mm**

- A. Carsonite, Model SMD-615
- B. FlexStake, Model 701 KM
- C. Repo, Models 300 and 400
- D. Safe-Hit, Model SH718SMA
- E. The Line Connection, Model DP21-4K

#### **Type "K-4" / "Q" Object Markers, 600 mm**

- A. Bent Manufacturing "Masterflex" Model MF-360-24
- B. Carsonite, Super Duck II
- C. FlexStake, Model 701KM
- D. Repo, Models 300 and 400
- E. Safe-Hit, Models SH8 24SMA\_WA and SH8 24GP3\_WA
- F. The Line Connection, Model DP21-4Q

### **TEMPORARY RAILING (TYPE K) REFLECTORS AND CONCRETE BARRIER MARKERS**

#### **Impactable Type**

- A. ARTUK, "FB"
- B. Davidson Plastics, Model PCBM-12
- C. Duraflex Corp., "Flexx 2020" and "Electriflexx"
- D. Hi-Way Safety, Inc., Model GMKRM100

#### **Non-Impactable Type**

- A. ARTUK, JD Series
- B. Stimsonite, Model 967 (with 83 mm Acrylic cube corner reflector)
- C. Stimsonite, Model 967LS
- D. Vega Molded Products, Models GBM and JD

### **THREE BEAM BARRIER MARKERS**

(For use to the left of traffic)

- A. Duraflex Corp., "Railrider"
- B. Davidson Plastics, "Mini" (75 mm x 254 mm)

### **CONCRETE BARRIER DELINEATORS, 400 mm**

(For use to the right of traffic. When mounted on top of barrier, places top of reflective element at 1200 mm)

- A. Davidson Plastics, Model PCBM T-16
- B. Safe-Hit, Model SH216RBM
- C. Sun-Lab Technology, "Safety Guide Light, Model TM," 130 mm x 130 mm x 80 mm

### **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. Davidson Plastics, PCBM S-36
- B. Sun-Lab Technology, "Safety Guide Light, Model SM12," 130 mm x 130 mm x 80 mm

## **GUARD RAILING DELINEATOR**

(Top of reflective element at 1200 mm above plane of roadway)

### **Wood Post Type, 686 mm**

- A. Carsonite, Model 427
- B. Davidson Plastics FG 427 and FG 527
- C. FlexStake, Model 102 GR
- D. GreenLine GRD 27
- E. J. Miller Model JMI-375G
- F. Safe-Hit, Model SH227GRD

### **Steel Post Type**

- A. Carsonite, Model CFGR-327 with CFGRBK300 Mounting Bracket

## **RETROREFLECTIVE SHEETING**

### **Channelizers, Barrier Markers, and Delineators**

- A. 3M, High Intensity
- B. Reflexite, PC-1000 Metalized Polycarbonate
- C. Reflexite, AC-1000 Acrylic
- D. Reflexite, AP-1000 Metalized Polyester
- E. Reflexite, AR-1000 Abrasion Resistant Coating
- F. Avery Dennison T-6500 Series (Formerly Stimsonite, Series 6200) (For rigid substrate devices only)

### **Traffic Cones, 330 mm Sleeves**

- A. Reflexite SB (Polyester), Vinyl or "TR" (Semi-transparent)

### **Traffic Cones, 100 mm and 150 mm Sleeves**

- A. 3M Series 3840
- B. Reflexite Vinyl, "TR" (Semi-transparent) or "Conformalite"

### **Barrels and Drums**

- A. Reflexite, "Super High Intensity" or "High Impact Drum Sheeting"
- B. 3M Series 3810

### **Barricades: Type I, Engineer Grade**

- A. American Decal, Adcolite
- B. Avery Dennison, T-1500 and T-1600
- C. 3M, Scotchlite, Series CW

### **Barricades: Type II, Super Engineer Grade**

- A. Avery Dennison, T-2500 Series
- B. Kiwalite Type II
- C. Nikkalite 1800 Series

### **Signs: Type II, Super Engineer Grade**

- A. Avery Dennison, T-2500 Series
- B. Kiwalite, Type II
- C. Nikkalite 1800 Series

**Signs: Type III, High-Intensity Grade**

- A. 3M Series 3800
- B. Nippon Carbide, Nikkalite Brand Ultralite Grade II

**Signs: Type IV, High-Intensity Prismatic Grade**

- A. Avery Dennison T-6500 (Formerly Stimsonite Series 6200)

**Signs: Type VII, High-Intensity Prismatic Grade**

- A. 3M Series 3900

**Signs: Type VI, Roll-Up Signs**

- A. Reflexite, Vinyl (Orange)
- B. Reflexite "SuperBright" (Fluorescent orange)
- C. Reflexite "Marathon" (Fluorescent orange)
- D. 3M Series RS34 (Orange) and RS20 (Fluorescent orange)

**SPECIALTY SIGN (All Plastic)**

- A. All Sign Products, STOP Sign, 750 mm

**SIGN SUBSTRATE FOR CONSTRUCTION AREA SIGNS**

**Aluminum**

**Fiberglass Reinforced Plastic (FRP)**

- A. Sequentia, "Polyplate"
- B. Fiber-Brite

**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.

Unless the use of a mineral admixture is prohibited, whenever the word "cement" is used in the Standard Specifications or the special provisions, it shall be understood to mean "cementitious material" when both of the following conditions are met:

- A. The cement content of portland cement concrete is specified, and
- B. Section 90, "Portland Cement Concrete," of the Standard Specifications is referenced.

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 for precast steam cured concrete members.

Section 90-1.01, "Description," of the Standard Specifications is amended to read:

**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.
- Unless otherwise specified, cementitious material to be used in portland cement concrete shall conform to the provisions for cement and mineral admixtures in Section 90-2, "Materials," and shall be either: 1) "Type IP (MS) Modified" cement or 2) a combination of "Type II Modified" portland cement and mineral admixture.
- Concrete for each portion of the work shall comply with the provisions for the Class, cementitious material content in kilograms per cubic meter, 28-day compressive strength, minor concrete or commercial quality concrete, as shown on the plans or specified in these specifications or the special provisions.
  - 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/m <sup>3</sup> )
Concrete which is 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 considered to be designated by compressive strength. If the plans show a 28-day compressive strength which is 31 MPa or greater, an additional 7 days will be allowed to obtain the specified strength. The 28-day compressive strengths shown on the plans which are 25 MPa or less are shown for design information only and are not to be considered a requirement for acceptance of the concrete.
  - Concrete designated by compressive strength shall be proportioned such that the concrete will conform to the strength shown on the plans or specified in the special provisions.
  - The Contractor shall determine the mix proportions for all concrete except pavement concrete. The Engineer will determine the mix proportions for pavement concrete.
  - 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 used in the work has a cementitious material content, consisting of cement, mineral admixture, or cement plus mineral admixture, which is less than the minimum required for the work, 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 cement, mineral admixture, or cement plus mineral admixture which is less than the minimum required for the work. The Department may deduct the amount from 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 for cementitious material content 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.
    - Concrete for which the mix proportions are determined either by the Contractor or the Engineer shall conform to the requirements of this Section 90.

The first paragraph in Section 90-2.01, "Portland Cement," of the Standard Specifications is amended to read:

**90-2.01 PORTLAND CEMENT**

- Unless otherwise specified, portland cement shall be either "Type IP (MS) Modified" cement or "Type II Modified" portland cement.
  - "Type IP (MS) Modified" cement shall conform to the specifications for Type IP (MS) cement in ASTM Designation: C 595, and shall be comprised of an intimate mixture of Type II cement and not more than 25 percent of a 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.

- 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 alkalis, calculated as the percentage of Na<sub>2</sub>O plus 0.658 times the percentage of K<sub>2</sub>O, 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.
- 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.

The second paragraph in Section 90-2.01, "Portland Cement," of the Standard Specifications is amended to read:

- Type III and Type V portland cements shall conform to the requirements in ASTM Designation: C 150, 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.

The third paragraph in Section 90-2.01, "Portland Cement," of the Standard Specifications is deleted.

The twelfth paragraph in Section 90-2.02, "Aggregates," of the Standard Specifications is deleted.

The first paragraph in Section 90-2.03, "Water," of the Standard Specifications is amended to read:.

### **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 1,000 parts per million of chlorides as Cl, nor more than 1,300 parts per million of sulfates as SO<sub>4</sub>. 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, nor more than 1,300 parts per million of sulfates as SO<sub>4</sub>. 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.

The following section is added to Section 90-2, "Materials," of the Standard Specifications:

### **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: C618. Silica fume conforming to the requirements in ASTM Designation: C1240, with reduction of mortar expansion of 80 percent, minimum, using the cement from the proposed mix design.

- Mineral admixtures shall be used in conformance with the provisions in Section 90-4.08, "Required Use of Mineral Admixtures."

The first paragraph in Section 90-3.03, "Fine Aggregate Grading," is amended to read:

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

Section 90-4.02, "Materials," of the Standard Specifications is amended to read:

**90-4.02 MATERIALS**

- Admixture materials shall conform to the provisions in Section 90-2.04, "Admixture Materials."

Section 90-4.05, "Optional Use of Chemical Admixtures," of the Standard Specifications is amended to read:

**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 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.
  - 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.

Section 90-4.07, "Optional Use of Air-entraining Admixtures," of the Standard Specifications is amended to read:

**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."

Section 90-4.08, "Required Use of Mineral Admixtures," of the Standard Specifications is amended to read:

**90-4.08 REQUIRED USE OF MINERAL ADMIXTURES**

- Unless otherwise specified, mineral admixture shall be combined with cement to make cementitious material for use in portland cement concrete.
  - The calcium oxide content of mineral admixtures shall not exceed 10 percent and the available alkali, as sodium oxide equivalent, shall not exceed 1.5 percent when determined in conformance with the requirements in ASTM Designation: C618.
  - The amounts of cement and mineral admixture used in cementitious material for portland cement concrete 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, as determined in conformance with the requirements in ASTM Designation: C618 and the provisions in Section 90-2.04, "Admixture Materials," 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, as determined in conformance with the requirements in ASTM Designation: C618 and the provisions in Section 90-2.04, "Admixture Materials," 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 is used, which conforms to the provisions for silica fume in Section 90-2.04, "Admixture Materials," 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. If more than the required amount of cementitious material is used, the additional cementitious material in the mix may be either cement, a mineral admixture conforming to the provisions in Section 90-2.04, "Admixture Materials," or a combination of both; however, the maximum 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.

Section 90-4.09, "Optional Use of Mineral Admixtures," of the Standard Specifications is deleted.

Section 90-4.11, "Storage, Proportioning, and Dispensing of Mineral Admixtures," of the Standard Specifications is amended to read:

#### **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 interlocks are required for cement and mineral admixture charging mechanisms by Section 90-5.03A, "Proportioning for Pavement," 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."
- 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.

Section 90-5.02, "Proportioning Devices," of the Standard Specifications is amended to read:

#### **90-5.02 PROPORTIONING DEVICES**

- Weighing, measuring or metering devices used for proportioning materials shall conform to the provisions in Section 9-1.01, "Measurement of Quantities," and this Section 90-5.02. In addition, automatic weighing systems used shall comply with the provisions for automatic proportioning devices in Section 90-5.03A, "Proportioning for Pavement." These 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 insure 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  $\pm 0.5$  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  $\pm 0.5$  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  $\pm 0.5$  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  $\pm 0.5$

percent of their designated individual batch masses. Equipment for measuring water shall have a zero tolerance of  $\pm 0.5$  percent of its designated mass or volume.

- The mass indicated for a 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.
- 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.
- 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.

Section 90-5.03, "Proportioning," excluding Section 90-5.03A, "Proportioning for Pavement," of the Standard Specifications is amended to read:

### **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 that conforms to the provisions in Section 90-2.01, "Portland 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 to be blended with mineral admixture for use in portland cement concrete for pavement and structures may be weighed in separate, individual weigh hoppers or may be weighed in the same weigh hopper with mineral admixture 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 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 scale and weigh hopper for bulk weighing cement, mineral admixture, and cement plus mineral admixture shall be separate and distinct from the aggregate weighing equipment.

- When the source of an aggregate is changed for concrete structures, the Contractor shall adjust the mix proportions and submit in writing to the Engineer a copy of the mix design before using such aggregates. When the source of an aggregate is changed for other concrete, the Engineer shall be allowed sufficient time to adjust the mix and such aggregates shall not be used until necessary adjustments are made.

- 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.

Section 90-5.03A, "Proportioning for Pavement," of the Standard Specifications is amended to read:

#### **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 the provisions in this Section 90-5.03A.
  - The Contractor shall install and maintain in operating condition an electrically 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 which are 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 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.

The third paragraph in Section 90-6.01, "General," of the Standard Specifications is amended to read:

- Concrete shall be homogeneous and thoroughly mixed. There shall be no lumps or evidence of undispersed cement, mineral admixture, or cement plus mineral admixture.

The third and fourth paragraphs in Section 90-6.02, "Machine Mixing," of the Standard Specifications are amended to read:

- 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, or in accumulation of cementitious materials on surfaces of conveyors or hoppers, or in other conditions which reduce or vary the required quantity of cementitious material in the concrete mixture.

The sixth paragraph in Section 90-6.02, "Machine Mixing," of the Standard Specifications is amended to read:

- 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 seventh through tenth paragraphs in Section 90-6.03, "Transporting Mixed Concrete," of the Standard Specifications are amended to read:

- 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 comes 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, a time less than 1.5 hours may be required.
- 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 job site shall be accompanied by a weight 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 weight 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.
- Weight 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 90 mm diskette with a capacity of at least 1.4 megabytes. Captured data, for the ingredients represented by each batch shall be LFCR (one line, separate record) with allowances for sufficient fields to satisfy the amount of data required by these specifications.
- The Contractor may furnish a weight certificate that is accompanied by a separate certificate which lists the actual batch masses or measurements for a load of concrete provided that both certificates are 1) imprinted with the same non-repeating load number that is unique to the contract and 2) delivered to the job site with the load.
- Weight certificates furnished by the Contractor shall conform to the provisions in Section 9-1.01, "Measurement of Quantities," of the Standard Specifications.

Section 90-6.05, "Hand-Mixing," of the Standard Specifications is amended to read:

**90-6.05 HAND-MIXING**

- Hand-mixed concrete shall be made in batches not more than one-fourth cubic meter 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.

The table in the first paragraph in Section 90-6.06, "Amount of Water and Penetration," of the Standard Specifications is replaced with the following table:

Type of Work	Nominal Penetration (mm)	Maximum Penetration (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	75-100	115
Cast-in-place concrete piles	65-90	100

The first paragraph following the table of penetration ranges in Section 90-6.06, "Amount of Water and Penetration," of the Standard Specifications is amended to read:

- The amount of free water used in concrete shall not exceed 183 kg/m<sup>3</sup>, plus 20 kg for each required 100 kg of cementitious material in excess of 325 kg/m<sup>3</sup>.

The fourth paragraph in Section 90-6.06, "Amount of Water and Penetration," of the Standard Specifications is amended to read:

- Where there are adverse or difficult conditions which 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.

Section 90-9.01, "General," of the Standard Specifications is amended to read:

#### **90-9.01 GENERAL**

- Concrete compressive strength requirements consist of a minimum strength which must 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 are shown on the plans.

- The compressive strength of concrete will be determined from test cylinders which have been fabricated from concrete sampled in conformance with California Test 539. Test cylinders will be molded and initial field cured in conformance with California Test 540. Test cylinders will be cured and tested after receipt at the testing laboratory in conformance with 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 by 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 which 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 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 cubic meters.

- When a precast concrete member is steam cured, the compressive strength of the concrete will be determined from test cylinders which 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.

- If concrete is specified by compressive strength, then materials, mix proportions, mixing equipment, and procedures proposed for use shall be prequalified 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, must 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, must 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 which 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 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 concrete cylinders tested.

- Certified test data and trial batch test reports shall be signed by an official of the firm which 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 which, in the judgment of the Engineer, could result in a lowering of the strength of the concrete below that specified.

- The Contractor's attention is directed to the time required to test trial batches. 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.

Section 90-10.02A, "Portland Cement," of the Standard Specifications is renamed "Cementitious Material" and is amended to read:

#### **90-10.02A CEMENTITIOUS MATERIAL**

- Cementitious material shall conform to the provisions in Section 90-1.01, "Description." Compressive strength requirements consist of a minimum strength which must 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 are shown on the plans.

The fifth paragraph in Section 90-10.02B, "Aggregate," of the Standard Specifications is deleted.

Section 90-10.03, "Production," of the Standard Specifications is amended to read:

#### **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, which will result in concrete that is thoroughly and uniformly mixed, which is suitable for the use intended, and which conforms to provisions specified herein. Recognized

standards of good practice are outlined in various industry publications such as those issued by American Concrete Institute, AASHTO, or California Department of Transportation.

- 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 as 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 weight certificate which shall be delivered to the Engineer at the discharge location of the concrete, unless otherwise directed by the Engineer. The weight 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.

The third and fourth paragraphs in Section 90-11.02, "Payment," of the Standard Specifications are amended to read:

- Should the Engineer order the Contractor to incorporate admixtures into 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.

- 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 in the concrete at the Contractor's expense and no additional compensation will be allowed therefor.

## **8-2.02 FREEZE-THAW REQUIREMENTS**

Paragraphs 13 through 17 of Section 90-2.02, "Aggregates," of the Standard Specifications, shall not apply.

The mortar strength of fine aggregate relative to the mortar strength of Ottawa sand shall be 100 percent, minimum, as determined by California Test 515.

Unless a higher cement content is otherwise required, the minimum cement content for all portland cement concrete and for all precast portland cement concrete products shall be 350 kilograms per cubic meter.

An air-entraining admixture conforming to the provisions in Section 90-4, "Admixtures," of the Standard Specifications shall be added to the concrete at the rate required to result in an air content of  $6 \pm 1.5$  percent in the freshly mixed concrete, unless a different air content is specified in these special provisions.

## **SECTION 8-3. (BLANK)**

## **SECTION 9. (BLANK)**

## **SECTION 10. CONSTRUCTION DETAILS**

### **SECTION 10-1. GENERAL**

#### **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.

Work shall be performed in such a manner that maintenance forces are able to park trucks and equipment in the yard at all times and the shop building is operational, unless otherwise approved in writing by the Engineer.

Attention is directed to "Remove Chain Link Fence" of these special provisions regarding constructing temporary fence for security purposes.

Attention is directed to "Utility Connection" of these special provisions.

The Contractor shall coordinate with PG&E in relocate 12kV overhead electrical line prior to beginning the building site work.

The 12kV Underground Electrical Conduit will be surveyed by State forces after it has been installed and before backfilling the trench. The Contractor shall provide the Engineer 5 working days notice prior beginning construction of the 12kV Underground Electrical Conduit to allow for surveying. If in the opinion of the Engineer, the Contractor's operations are delayed or interfered with by reason of the State forces surveying the 12kV Underground Electrical Conduit, 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.

Within 20 days after the contract has been approved, 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.

### **10-1.02 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.

Water pollution control work shall conform to the requirements in the Construction Contractor's Guide and Specifications of the Caltrans Storm Water Quality Handbooks, dated November 2000, and addenda thereto issued up to and including the date of advertisement of the project, hereafter referred to as the "Handbook." Copies of the Handbook 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.

Copies of the Handbook are also available for review at the North Region Construction Office at 379-A Colusa Highway, Yuba City, California 95991.

The Contractor shall know and fully comply with the applicable provisions of the Handbook and Federal, State, and local regulations that govern the Contractor's operations and storm water discharges from both the project site and areas of disturbance outside the project limits during construction.

Unless arrangements for disturbance of areas outside the project limits are made by the Department and made part of the contract, it is expressly agreed that the Department assumes no responsibility whatsoever to the Contractor or property owner with respect to any arrangements made between the Contractor and property owner to allow disturbance of areas outside the project limits.

The Contractor shall be responsible for the costs and for liabilities imposed by law as a result of the Contractor's failure to comply with the requirements set forth in this section "Water Pollution Control" including, but not limited to, compliance with the applicable provisions of the Handbook and Federal, State, and local regulations. For the purposes of this paragraph, costs and liabilities include, but are not limited to, fines, penalties, and damages whether assessed against the State or the Contractor, including those levied under the Federal Clean Water Act and the State Porter Cologne Water Quality Act.

In addition to the remedies authorized by law, an amount of the money due the Contractor under the contract, as determined by the Department, may be retained by the State of California until disposition has been made of the costs and liabilities.

The retention of money due the Contractor shall be 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 costs and liabilities in connection with the matter for which the retention was made, the Department shall be liable for interest on the amount retained at the legal rate of interest for the period of the retention.

Conformance with the provisions in this section "Water Pollution Control" shall not relieve the Contractor from the Contractor's responsibilities as provided in Section 7, "Legal Relations and Responsibilities," of the Standard Specifications.

## **WATER POLLUTION CONTROL PROGRAM PREPARATION, APPROVAL AND UPDATES**

As part of the water pollution control work, a Water Pollution Control Program, hereafter referred to as the "WPCP," is required for this contract. The WPCP shall conform to the provisions in Section 7-1.01G, "Water Pollution," of the Standard Specifications, the requirements in the Handbook, and these special provisions.

No work having potential to cause water pollution, as determined by the Engineer, shall be performed until the WPCP has been approved by the Engineer.

Within 7 days after the approval of the contract, the Contractor shall submit 3 copies of the WPCP to the Engineer. The Engineer will have 3 days to review the WPCP. If revisions are required, as determined by the Engineer, the Contractor shall revise and resubmit the WPCP within 7 days of receipt of the Engineer's comments. The Engineer will have 3 days to review the revisions. Upon the Engineer's approval of the WPCP, 3 additional copies of the WPCP 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 WPCP. In order to allow construction activities to proceed, the Engineer may conditionally approve the WPCP while minor revisions or amendments are being completed.

The WPCP shall identify pollution sources that may adversely affect the quality of storm water discharges associated with the project and shall identify water pollution control measures, hereafter referred to as control measures, to be constructed, implemented, and maintained in order to reduce to the extent feasible pollutants in storm water discharges from the construction site during construction under this contract.

The WPCP shall incorporate control measures in the following categories:

- A. Soil stabilization practices;
- B. Sediment control practices;
- C. Sediment tracking control practices;
- D. Wind erosion control practices; and
- E. Nonstorm water management and waste management and disposal control practices.

Specific objectives and minimum requirements for each category of control measures are contained in the Handbook.

The Contractor shall consider the objectives and minimum requirements presented in the Handbook for each of the above categories. When minimum requirements are listed for any category, the Contractor shall incorporate into the WPCP and implement on the project, one or more of the listed minimum controls required in order to meet the pollution control objectives for the category. In addition, the Contractor shall consider other control measures presented in the Handbook and shall incorporate into the WPCP and implement on the project the control measures necessary to meet the objectives of the WPCP. The Contractor shall document the selection process in conformance with the procedure specified in the Handbook.

The WPCP shall include, but not be limited to, the following items as described in the Handbook:

- A. Project description and Contractor's certification;
- B. Project information;
- C. Pollution sources, control measures, and water pollution control drawings; and
- D. Amendments, if any.

The Contractor shall amend the WPCP, graphically and in narrative form, whenever there is a change in construction activities or operations which may affect the discharge of significant quantities of pollutants to surface waters, ground waters, municipal storm drain systems or when deemed necessary by the Engineer. The WPCP shall be amended if the WPCP has not achieved the objective of reducing pollutants in storm water discharges. Amendments shall show additional control measures or revised operations, including those in areas not shown in the initially approved WPCP, which are required on the project to control water pollution effectively. Amendments to the WPCP shall be submitted for review and approval by the Engineer in the same manner specified for the initially approved WPCP. Amendments shall be dated and attached to the on-site WPCP document.

The Contractor shall keep a copy of the WPCP, together with updates, revisions and amendments at the project site.

## **WPCP IMPLEMENTATION**

Upon approval of the WPCP, the Contractor shall be responsible throughout the duration of the project for installing, constructing, inspecting, and maintaining the control measures included in the WPCP and any amendments thereto and for removing and disposing of temporary control measures. Unless otherwise directed by the Engineer or specified in these special provisions, the Contractor's responsibility for WPCP implementation shall continue throughout any temporary suspension 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 control measures are specified in the Handbook and these special provisions.

Soil stabilization practices and sediment control measures, including minimum requirements, shall be provided throughout the winter season, defined as between October 15 and April 15.

Implementation of soil stabilization practices and sediment control measures for soil-disturbed areas on the project site shall be completed, except as provided for below, not later than 20 days prior to the beginning of the winter season or upon start of applicable construction activities for projects which begin either during or within 20 days of the winter season.

Throughout the winter season, the active, soil-disturbed area of the project site shall be not more than 1.9 hectares. The Engineer may approve, on a case-by-case basis, expansions of the active, soil-disturbed area limit. The Contractor shall demonstrate the ability and preparedness to fully deploy soil stabilization practices and sediment control measures to protect soil-disturbed areas on the project site before the onset of precipitation. A quantity of soil stabilization and sediment control materials shall be maintained on site equal to 100 percent of that sufficient to protect unprotected, soil-disturbed areas on the project site. A detailed plan for the mobilization of sufficient labor and equipment shall be maintained to fully deploy control measures required to protect unprotected, soil-disturbed areas on the project site prior to the onset of precipitation. A current inventory of control measure materials and the detailed mobilization plan shall be included as part of the WPCP.

Throughout the winter season, soil-disturbed areas on the project site shall be considered to be nonactive whenever soil disturbing activities are expected to be discontinued for a period of 20 or more days and the areas are fully protected. Areas that will become nonactive either during the winter season or within 20 days thereof shall be fully protected with soil stabilization practices and sediment control measures within 10 days of the discontinuance of soil disturbing activities or prior to the onset of precipitation, whichever is first to occur.

Throughout the winter season, active soil-disturbed areas of the project site shall be fully protected at the end of each day with soil stabilization practices and sediment control measures unless fair weather is predicted through the following work day. The weather forecast shall be monitored by the Contractor on a daily basis. The National Weather Service forecast shall be used. An alternative weather forecast proposed by the Contractor may be used if approved by the Engineer. If precipitation is predicted prior to the end of the following work day, construction scheduling shall be modified, as required, and functioning control measures shall be deployed prior to the onset of the precipitation.

The Contractor shall implement, year-round and throughout the duration of the project, control measures included in the WPCP for sediment tracking, wind erosion, nonstorm water management, and waste management and disposal.

The Engineer may order the suspension of construction operations which create water pollution if the Contractor fails to conform to the provisions in this section "Water Pollution Control" as determined by the Engineer.

## **MAINTENANCE**

To ensure the proper implementation and functioning of control measures, the Contractor shall regularly inspect and maintain the construction site for the control measures identified in the WPCP. The Contractor shall identify corrective actions and time needed to address any deficient measures or reinstate any measures that have been discontinued.

The construction site inspection checklist provided in the Handbook shall be used to ensure that the necessary measures are being properly implemented, and to ensure that the control measures are functioning adequately. One copy of each site inspection record shall be submitted to the Engineer.

During the winter season, inspections of the construction site shall be conducted by the Contractor to identify deficient measures, as follows:

- A. Prior to a forecast storm;
- B. After all precipitation which causes runoff capable of carrying sediment from the construction site;
- C. At 24-hour intervals during extended precipitation events; and
- D. Routinely, at a minimum of once every 2 weeks.

If the Contractor or the Engineer identifies a deficiency in the deployment or functioning of an identified control measure, the deficiency shall be corrected immediately. The deficiency may be corrected at a later date and time if requested by the Contractor and approved by the Engineer in writing, but not later than the onset of subsequent precipitation events. The correction of deficiencies shall be at no additional cost to the State.

## **PAYMENT**

Full compensation for conforming to the provisions in 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.

The Engineer will retain an amount equal to 25 percent of the estimated value of the contract work performed during estimate periods in which the Contractor fails to conform to the provisions in this section "Water Pollution Control" as determined by the Engineer.

Retentions for failure to conform to the provisions in this section "Water Pollution Control" shall be in addition to the other retentions provided for in the contract. The amounts retained for failure of the Contractor to conform to the provisions in this section will be released for payment on the next monthly estimate for partial payment following the date that a WPCP has been implemented and maintained and water pollution is adequately controlled, as determined by the Engineer.

### **10-1.03 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 ground cover plants shall be from flats and shall be planted 300 mm on center. 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 7-1.13 of the Standard Specifications.

Replacement planting of injured or damaged trees, shrubs and other plants shall be completed not less than 20 working days prior to acceptance of the contract. Replacement plants shall be watered as necessary to maintain the plants in a healthy condition.

### **10-1.04 COOPERATION**

Attention is directed to Section 7-1.14, "Cooperation," and Section 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 of the State concerning the Downieville Maintenance Station.

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 after consultation with and for such time periods as directed by the Engineer.

### **10-1.05 PROGRESS SCHEDULE**

Progress schedules are required for this contract and shall be submitted in conformance with the provisions in Section 8-1.04, "Progress Schedule," of the Standard Specifications.

### **10-1.06 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. 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

Installation of the following utility facilities will require coordination with the Contractor's operations. Four weeks prior to starting the utility work 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, to the Engineer. The schedule of work shall provide not less than the following number of working days, as defined in Section 8-1.06, "Time of Completion," of the Standard Specifications for the utility company to complete their work: Attention is directed to Section 12-1.12, "Utility Connection," of these special provisions, regarding the installation of the Pacific Gas and Electric Company concentrically grounded conduit, trench and backfill, transformer pad, and substructures.

Utility	Location	Working Days
PG&E will Replace existing OH 12kV Electrical Lines with Aerial Guy Wire  PG&E Overhead 12kV Electrical Line conversion to Underground Facility. PG&E will pull primary wires and make connections.	From JP 14.228 LT "A" 0+19.639 to JP 43.887 RT "A" 0+61.704  From JP 14.228 LT "A" 0+19.639 to 6.835 LT "A" 0+02.880; From 6.835 LT "A" 0+02.880 to 5.813 RT "A" 0+08.606; From 5.813 RT "A" 0+08.606 to BC 50.216 RT "A" 0+50.739; From BC 50.216 RT "A" 0+50.739 to EC 71.916 RT "A" 0+56.949 (along 40 m radius curve); From EC 71.916 RT "A" 0+56.949 to 79.672 RT "A" 0+57.705; From 79.672 RT "A" 0+57.705 to JP 67.586 RT "A" 0+58.358.  Aforementioned Underground Facility depicted as "U" Line on Utility Plan U-1.	15

In the event that the utility facilities mentioned above are not removed or relocated 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 utility facilities not being removed or relocated 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, and not otherwise, except as provided in Section 8-1.10, "Utility and Non-Highway Facilities," of the Standard Specifications.

**10-1.07 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.

**REMOVE WOOD FENCE**

Existing wood fence, at the locations shown on the plans, shall be removed and disposed of.

Full compensation for removing and disposing of wood fence shall be considered as included in the contract price paid per meter for remove wood fence and no separate payment will be made therefor.

**REMOVE CHAIN LINK FENCE**

Existing chain link fence, where shown on the plans to be removed, shall be removed and disposed of.

Existing concrete shall be removed to a depth of not less than 0.3-m below subgrade or 0.3-m below finished grade, whichever is greater in depth. Full compensation for removing concrete shall be considered as included in the contract price paid per meter for remove chain link fence and no separate payment will be made therefor.

Once the existing fence has been removed and until the new chain link fence has been constructed, the Contractor shall provide temporary fencing to provide security for the facility and State equipment. At the Contractor's option, rather than provide temporary fencing, personnel may be employed to patrol the facility and yard during non-working hours.

Full compensation for furnishing, constructing, maintaining, and removing temporary fence or for providing personnel to patrol facility shall be considered as included in the contract price paid per meter for remove chain link fence and no separate payment will be made therefor.

### **REMOVE DRAINAGE FACILITY**

Existing culverts, overside drains, inlets, headwalls and endwalls, 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 PAVEMENT**

Existing bituminous surfacing shown on the plans to be removed, shall be removed completely. Resulting holes and depressions shall be backfilled with Class 2 aggregate base and compacted to the lines and grade established by the Engineer.

The material removed shall be disposed of outside the highway right of way in conformance with the provisions in Section 15-2.03, "Disposal," of the Standard Specifications.

Removing pavement will be measured by the cubic meter in the same manner specified for roadway excavation in conformance with the provisions in Section 19, "Earthwork," of the Standard Specifications and will be paid for at the contract price per cubic meter for remove pavement.

Full compensation for Class 2 aggregate base and compaction used in the resulting holes and depressions shall be considered as included in the contract price paid per cubic meter for remove pavement and no separate payment will be made therefor.

### **RELOCATE GATE**

Existing gate shall be removed and relocated to the new locations shown on the plans.

The Contractor shall take all necessary measures to prevent the gate from being damaged. If, in the opinion of the Engineer, the gate is damaged during relocation, the Contractor shall replace the gate in kind, at his own expense.

The relocated gate shall be attached to the supports in its new location, using hardware from the existing gate.

A gate that is replaced 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. Gate supports and foundations at the existing location shall be removed and disposed of. Resulting holes shall be backfilled in conformance with the provisions in the second paragraph of Section 15-1.02, "Preservation of Property," of the Standard Specifications.

The contract unit price paid for relocate gate shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in relocating gate, complete in place, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

### **ADJUST FRAME AND COVER TO GRADE**

Frames and covers of existing manholes shall be adjusted to grade in conformance with the provisions in Section 15-2.05, "Reconstruction," of the Standard Specifications.

### **10-1.08 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 structure, clearing and grubbing of vegetation shall be limited to 1.5 m outside the physical limits of the 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.

## **REMOVE TREE**

Existing trees, at those locations shown on the plans to be removed, shall be removed and disposed of.

Remove tree shall conform to Section 20-4.025, "Roadside Clearing," and Section 15-1.02, "Preservation of Property," of the Standard Specifications.

Remove trees 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.

In locations where one or more trees to be removed originate from the same stump, the quantity of trees to be removed shall be measured as the actual number of trees at that tree stump prior to removal.

The contract unit price paid for remove tree and shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in removing trees, complete in place, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

## **REMOVE TREE STUMP**

Existing tree stumps, at those locations shown on the plans to be removed, shall be removed and disposed of.

Remove tree stump shall conform to Section 20-4.025, "Roadside Clearing," and Section 15-1.02 "Preservation of Property," of the Standard Specifications.

Remove tree stumps 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.

In locations where one or more trees originate from the same stump, the item shall be measured as tree stump.

The contract unit price paid for remove tree stump shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in removing tree stumps, complete in place, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

## **10-1.09 EARTHWORK**

Earthwork shall conform to the provisions in Section 19, "Earthwork," of the Standard Specifications and these special provisions.

Full compensation for removing water service and electrical service as shown on the plans and arrangement for disconnecting these services shall be considered as included in the contract unit price paid per cubic meter for roadway excavation and no separate payment will be made therefor.

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.

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.

### **10.1.10 STRUCTURE EXCAVATION (CONTAMINATED)**

**Scope--**Structure Excavation (Contaminated) shall conform to the provisions in Section 19, Earthwork, of the Standard Specifications.

Soil with diesel and motor oil will be encountered during the excavation necessary for construction of this project. Diesel and motor oil contaminated soil has been identified in the top 0.15 m of soil adjacent to the wash rack and equipment storage building. Motor oil contaminated soil has been identified in the top 1.52 m of soil in the area of the ditch outfall. Concentrations of up to 161 mg/kg TPH-Diesel and 386 mg/kg TPH-Motor Oil have been found in the soil adjacent to the wash rack and equipment storage building at the maintenance station. Concentrations of up to 232 mg/kg of motor oil have been detected in the area of the ditch outfall. TPH-Gasoline, Benzene, Toluene, Ethylbenzene, Xylenes, and Ethylene Glycol were not reported in any of the test samples analyzed.

When excavated, this material will become classified as designated waste. Excavated soil material that is designated waste shall be disposed of at an appropriately permitted facility. Attention is directed to "Earthwork for Building Work" elsewhere in these special provisions.

A Site Investigation Report has been completed and copies of the report may be obtained at the Department of Transportation, Plans and Bid Documents, Room 0200, Transportation Building, 1120 N Street, P.O. Box 942874, Sacramento, California 94274-001, Telephone No. (916) 654-4490, and are available for inspection at the office of the District Director of Transportation at 703 B Street, Marysville, California. The applicable report is entitled, Site Investigation Report - Various Caltrans Maintenance Stations – Nevada City, Downieville, Sierraville, Whitmore and

Kyburz, California, prepared by GEOCON - Geotechnical & Environmental Consultants, under Task Order No. 03-911175-37, GEOCON Project No. S8130-06-103, dated January 1999.

**Applicable rules and regulations.**— Excavation, transport and disposal of hazardous waste material and designated waste material shall be in accordance with the rules and regulations of the following agencies:

- Department of Toxic Substance Control (DTSC)
- Integrated Waste Management Board
- Regional Water Quality Control Board (RWQCB)
- State Air Resources Board
- United States Department of Transportation (USDOT)
- United States Environmental Protection Agency (USEPA)
- California Environmental Protection Agency (CAL-EPA):
- California Division of Occupational Safety and Health Administration (CAL-OSHA)
- Sierra County Department of Environmental Health

**Permits and licenses.**—The Contractor shall procure all permits and licenses, pay all charges and fees, and give all notices necessary and incident to the due and lawful prosecution of the work, including registration as appropriate for transporting vehicles carrying the designated waste. The California Environmental Quality Act (CEQA) of 1970 (Chapter 1433, States. 1970), as amended, may be applicable to permits, licenses and authorizations which the Contractor shall obtain from all agencies in connection with performing the work of the contract. The Contractor shall comply with the provisions of said statutes in obtaining such permits, licenses and other authorizations.

**Health, safety and work plan.**—The Contractor shall also prepare a detailed Health, Safety and Work Plan for site personnel. The Health, Safety and Work Plan shall include mandatory personal protective equipment, training, equipment decontamination procedures, spill plan, site clean up procedures, and physical barrier requirements in accordance with California Code of Regulations (CCR), Title 8. The Health, Safety and Work plan shall also include a description of the order of work, material handling, material segregation, stockpile locations, sampling protocols, transportation and disposal sites for petroleum hydrocarbon materials and shall be submitted for review and acceptance by the Engineer at least 15 working days prior to beginning any excavation work. If the plan is unacceptable it shall be returned, within 15 working days of submittal to the Contractor for revision. The Engineer shall have 5 working days to review and accept or reject the revised plan from the date the revised plan is received from the Contractor. No work shall proceed until the plan is accepted by the Engineer. Prior to submittal, the Contractor shall have the Health, Safety and Work Plan for all excavation work approved by a Certified Industrial Hygienist. Water from decontamination procedures shall be collected and disposed of at an appropriate disposal site by the Contractor. Non-reusable protective equipment, once used by any personnel, including State personnel, shall be collected and disposed of at an appropriate disposal site by the Contractor.

**Safety training.**—Prior to performing any excavation work, all personnel working on the project, including State Personnel, shall complete required training specified in the Contractor's compliance program covering the potential hazards as identified. Any required training shall be provided by the Contractor who shall provide a certification of the completion of the Safety Training Program for all personnel. Personal protective equipment required by the Contractor's Health, Safety and Work for personnel working on the project will also be supplied to State personnel by the Contractor. The number of State personnel requiring the above mentioned safety training program and personal protective equipment will be two (2). Full compensation for safety training shall be considered as included in the contract price paid for Structure Excavation (Contaminated) and no additional compensation will be allowed therefor.

**Segregation of designated waste.**—All excavated material shall be stockpiled in a fenced area on two layers of 10-mil thick (minimum) black polyethylene. A perimeter berm for the stockpile shall be constructed by wrapping the edges of the plastic over hay bales, or equivalent, to prevent contaminated water runoff and infiltration. The stockpiles shall be covered with one layer of 10-mil (minimum) black polyethylene at all times. The plastic shall be sufficiently weighted with sandbags to prevent wind damage to the plastic. Stockpiled petroleum impacted material shall be tested and disposed of within 30 days of completion of excavation work.

**Sampling and analysis requirements.**—The Contractor shall test soil. If any of this material is found through testing to contain concentrations above 1.0 mg/kg of either TPH-Motor Oil, TPH-Diesel, or TPH-Gasoline; or concentrations above 5.0 µg/kg of either Benzene, Toluene, Ethylbenzene, or Xylene, the material shall be disposed of at an appropriately permitted facility. The material shall become the property of the Contractor if testing shows contaminant concentrations below those mentioned above. Contractor's sampling and testing analysis shall be performed using the sampling and testing analysis

procedure required by the regulatory agencies in the locality of the job and any acceptance requirements put forth by a disposal facility. At a minimum, a sample shall be collected for every 25 cubic meters of stockpiled soil. A minimum of Five (5) samples shall be taken from stockpile soil.

The laboratory used shall be certified by the California Department of Health Services for the required analyses.

Samples shall be analyzed for Motor Oil (TPH-MO) by Test Method Modified EPA 8015 and Total Petroleum Hydrocarbons Diesel (TPH-D) and Gasoline (TPH-G) by Test Method Modified EPA 8015 and BTEX by EPA Method 8021.

If additional Structural Excavation (Contaminated) is required at the direction of the Engineer, such extra excavation will be paid for as extra work in conformance with Section 4-1.03D, "Extra Work", of the Standard Specifications.

Estimated quantities of designated waste material is 250 cubic meters.

No water (except groundwater) shall be allowed to enter excavated area. In the case such water does enter this area, such water shall be tested prior to discharge. No disposal of such water by pumping or other means shall be performed until the results of such testing have been submitted to the Engineer for review and approval. If the results of such testing indicate that the level of petroleum hydrocarbon products exceed levels considered allowable by the applicable regulatory agencies, the water shall be handled in accordance with all applicable laws and regulations. Should testing of water be required as a result of the failure of the Contractor's measures to prevent uncontrolled water from entering the excavated area, this testing and disposal shall be performed at the Contractor's expense and no additional compensation will be allowed therefor. Should testing of water be required as a result of groundwater entering the excavated area, testing groundwater will be paid for as extra work in conformance with Section 4-1.03D, "Extra Work," of the Standard Specifications. Disposal of contaminated groundwater will be paid for as extra work in conformance with Section 4-1.03D, "Extra Work," of the Standard Specifications.

**Payment.--** The contract price paid per cubic meter for Structure Excavation (Contaminated) shall include full compensation for furnishing all labor, training, materials, tools, equipment, and incidentals, and for doing all the work involved in excavation of designated waste material, complete in place, including sampling, testing, transporting, constructing containment facility and stockpiling, sorting the material into its appropriate classification, loading from stockpiles, transporting and disposing, including disposal fees, as specified in these special provisions, and as directed by the Engineer.

#### **10-1.11 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.

Erosion control (Type D) work shall consist of applying erosion control materials to embankment and excavation slopes up to 20% and other areas disturbed by construction activities which are less than a 20% slope. Erosion control (Type D) shall be applied during the period starting July 1 and ending October 10; or, if the slope on which the erosion control is to be placed is finished during the winter season as specified in "Water Pollution Control" of these special provisions, the erosion control shall be applied immediately; or, if the slope on which the erosion control is to be placed is finished outside both specified periods and the contract work will be completed before July 1, the erosion control shall be applied as a last item of work.

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)
*Lotus purshianus var. purshianus (Spanish Clover)	40	3.0

\*California native seed source

**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)
*Bromus carinatus (plumas) (California Brome)	50	8.0
Elymus multisetus (Big Squirreltail)	40	5.0
Elymus glaucus plumas (Plumas Blue Wildrye)	40	5.0
*Festuca idahoensis Native Idaho Fescue	50	5.0

\*California native seed source

**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 within 2 percent of 20 percent nitrogen, 11 percent phosphoric acid and 12 percent water soluble potash.

**Straw**

Straw shall conform to the provisions in Section 20-2.06, "Straw," of the Standard Specifications and these special provisions.

Straw shall be derived from rice.

**Compost**

Compost shall be derived from green material consisting of chipped, shredded or ground vegetation or clean processed recycled wood products or a Class A, exceptional quality biosolids composts, as required by the United States Environmental Protection Agency (EPA), 40 CFR, Part 503c regulations or a combination of green material and biosolids compost. The compost shall be processed or completed to reduce weed seeds, pathogens and deleterious material, and shall not contain paint, petroleum products, herbicides, fungicides or other chemical residues that would be harmful to plant or animal life. Other deleterious material, plastic, glass, metal or rocks shall not exceed 0.1 percent by weight or volume. A minimum internal temperature of 57°C shall be maintained for at least 15 continuous days during the composting process. The compost shall be thoroughly turned a minimum of 5 times during the composting process and shall go through a minimum 90-day curing period after the 15-day thermophilic compost process has been completed. Compost shall be screened through a maximum 9.5-mm screen. The moisture content of the compost shall not exceed 35 percent. Moisture content shall be determined by California Test 226. Compost products with a higher moisture content may be used provided the weight of the

compost is increased to equal the compost with a moisture content of 35 percent. Compost will be tested for maturity and stability with a solvita test kit. The compost shall measure a minimum of 6 on the maturity and stability scale.

**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 nonflammable and shall have an effective life of at least one year.

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 3 separate applications in the following sequence:

- A. The following mixture in the proportions 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)
Fiber	400
Non-Legume Seed	23
Legume Seed	3
Compost	1200

- B. Straw shall be applied at the rate of 3.5 tonnes per hectare based on slope measurements. Incorporation of straw will not be required.
- C. The following mixture in the proportions indicated shall be applied with hydro-seeding equipment:

Material	Kilograms Per Hectare (Slope Measurement)
Fiber	600
Compost	1800
Commercial Fertilizer	200
Stabilizing Emulsion	300

- D. The ratio of total water to total stabilizing emulsion in the mixture shall be as recommended by the manufacturer.

Once straw work is started in an area, stabilizing emulsion applications shall be completed in that area on the same working day.

The proportions of erosion control materials may be changed by the Engineer to meet field conditions.

**MEASUREMENT AND PAYMENT**

The contract price paid per kilogram 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.

**10-1.12 EROSION CONTROL (GYPSUM MATTE)**

Erosion control (Gypsum Matte) shall conform to the provisions in Section 20-3, "Erosion Control," of the Standard Specifications and these special provisions.

Erosion control (Gypsum Matte) work shall consist of applying erosion control materials to embankment and excavation slopes greater than 20% and other areas disturbed by construction activities with slopes greater than 20%. Erosion control (Gypsum Matte) shall be applied during the period starting July 1 and ending October 10; or, if the slope on which the erosion control is to be placed is finished during the winter season as specified in "Water Pollution Control" of these special provisions, the erosion control shall be applied immediately; or, if the slope on which the erosion control is to be placed is finished outside both specified periods and the contract work will be completed before July 1, the erosion control shall be applied as a last item of work.

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)
*Lotus purshianus var. purshianus (Spanish Clover)	40	3.0

\*California native seed source

**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)
*Bromus carinatus (plumas) (California Brome)	50	8.0
Elymus elymoides (Big Squirreltail)	40	4.0
Elymus glaucus (plumas) (Plumas Blue Wildrye)	40	5.0
*Festuca idahoensis Native Idaho Fescue	50	5.0

\*California native seed source

**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 within 2 percent of 20 percent nitrogen, 11 percent phosphoric acid and 12 percent water soluble potash.

**Straw**

Straw shall conform to the provisions in Section 20-2.06, "Straw," of the Standard Specifications and these special provisions.

Straw shall be derived from rice.

**Compost**

Compost shall be derived from green material consisting of chipped, shredded or ground vegetation or clean processed recycled wood products or a Class A, exceptional quality biosolids composts, as required by the United States Environmental Protection Agency (EPA), 40 CFR, Part 503c regulations or a combination of green material and biosolids compost. The compost shall be processed or completed to reduce weed seeds, pathogens and deleterious material, and shall not contain paint, petroleum products, herbicides, fungicides or other chemical residues that would be harmful to plant or animal life. Other deleterious material, plastic, glass, metal or rocks shall not exceed 0.1 percent by weight or volume. A minimum internal temperature of 57°C shall be maintained for at least 15 continuous days during the composting process. The compost shall be thoroughly turned a minimum of 5 times during the composting process and shall go through a minimum 90-day curing period after the 15-day thermophilic compost process has been completed. Compost shall be screened through a maximum 9.5-mm screen. The moisture content of the compost shall not exceed 35 percent. Moisture content shall be determined by California Test 226. Compost products with a higher moisture content may be used provided the weight of the compost is increased to equal the compost with a moisture content of 35 percent. Compost will be tested for maturity and stability with a solvita test kit. The compost shall measure a minimum of 6 on the maturity and stability scale.

**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 nonflammable and shall have an effective life of at least one year.

Stabilizing emulsion shall be in a dry powder form, may be reemulsifiable, and shall be a processed organic adhesive used as a soil tackifier.

**Gypsum**

Gypsum shall consist of a naturally occurring high purity processed gypsum and necessary additives, such as retarders and accelerators and water to formulate a cementitious binder that will produce a protective crust like barrier within 4 to 8 hours after application. Gypsum shall be produced from a quarried or mined source and shall be processed to be composed of a crushed, dry calcium sulfate hemihydrate (CA SO4.1/2 H2O) having a purity of not less than 88%. Gypsum which has become partially air set, lumpy or caked prior to use will be rejected.

**APPLICATION**

Erosion control materials shall be applied in 3 separate applications in the following sequence:

- A. The following mixture in the proportions 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)
Fiber	190
Non-Legume Seed	22
Legume Seed	3
Compost	1200
Gypsum	1000

- B. Straw shall be applied at the rate of 3.5 tonnes per hectare based on slope measurements. Incorporation of straw will not be required.
- C. The following mixture in the proportions indicated shall be applied with hydro-seeding equipment:

Material	Kilograms Per Hectare (Slope Measurement)
Fiber	600
Compost	2500
Gypsum	1500
Commercial Fertilizer	200
Stabilizing Emulsion	300

D. The ratio of total water to total stabilizing emulsion in the mixture shall be as recommended by the manufacturer.

Once straw work is started in an area, stabilizing emulsion applications shall be completed in that area on the same working day.

The proportions of erosion control materials may be changed by the Engineer to meet field conditions.

### MEASUREMENT AND PAYMENT

The contract price paid per kilogram 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.

The contract price paid per kilogram for gypsum (erosion control) shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in applying gypsum 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.

### 10-1.13 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.

### 10-1.14 ASPHALT CONCRETE

Asphalt concrete 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 shall be AR4000.

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 listed in Section 39, "Asphalt Concrete," of the Standard Specifications, the asphalt concrete shall conform to the following quality requirement when mixed with the asphalt used on the job in the amount determined to be optimum by California Test 367:

Test	California Test	Requirement
Surface Abrasion	360	Loss not to exceed 0.4g/cm <sup>2</sup>

### 10-1.15 CONCRETE STRUCTURES

Portland cement concrete structures shall conform to the provisions in Section 51, "Concrete Structures," of the Standard Specifications and these special provisions.

Portland cement concrete shall conform to the provisions in "Freeze-Thaw Requirements" of these special provisions.

**Modified inlets.**--Weep holes shall be constructed in inlet walls and stainless steel mesh screen and sacked pervious backfill material shall be furnished and placed as shown on the plans. Full compensation for furnishing and placing stainless steel mesh screen, and sacked pervious backfill material shall be considered as included in the contract price paid per cubic meter for minor concrete (minor structure) and no additional compensation will be allowed therefor.

## 10-1.16 DRAINAGE SAND TRAP TANK

**Description.--**This work shall consist of furnishing and installing a precast concrete drainage sand trap in accordance with the details shown on the plans and these special provisions.

The drainage sand trap tank shall function to separate sand and other pollutants from parking lot drainage water prior to introduction of such drainage to storm drain system.

Pipes, fittings, devices, aprons, appurtenances, and other items or details, not mentioned, which are required for the construction and proper operation of the sand trap shall be furnished, placed, constructed, or installed as required.

**Materials list.--**Material list for material to be used shall be submitted for approval and shall include the name of the manufacturer and the source, model number, description, and standards of manufacturer.

Manufacturer's descriptive data and catalog cuts for manhole frames and covers, traffic frames and covers, and traffic frames and grates shall be submitted for approval.

**Working drawings.--**Working drawings and design calculations for the precast concrete tank used in the work shall be submitted for approval. The drawings and calculations shall be stamped and signed by an engineer who is registered as a Civil or Structural Engineer in the State of California. Bedding, assembly, installation and backfilling instructions for the precast tank shall be submitted for approval.

**Certificates of Compliance.--**Certificates of compliance shall be furnished for manhole covers and frames, traffic covers and frames and traffic grates and frames in accordance with the requirements specified in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications.

### **Precast tank .--**

Precast concrete tank shall be precast, reinforced concrete tank by Nottingham, Cook Concrete Products (Redding), Bakersfield Precast Concrete, or equal. The design and details shall comply with the minimum requirements of the American Concrete Institute (ACI) 318 Code. Minimum concrete compressive strength (f'c) shall be 21 MPa. Tanks shall be designed for all loads and pressures resulting from the vertical and lateral earth loadings listed below:

1. Minimum earth cover over the tanks as shown on the plans.
2. Earth density: 1922 kilograms per cubic meter.
3. Equivalent fluid pressure for lateral pressure due to earth: 1436 Pa.

### **Cast-in-place concrete and reinforcement.--**

Cast-in-place concrete and reinforcement for collars shall conform to the requirements for minor work specified in Section 12-3, "Cast-In-Place Concrete" elsewhere in these special provisions.

### **Cement mortar.--**

Cement mortar shall consist of one part cement to 2 to 3 parts clean plaster or concrete sand mixed with just enough water for suitable consistency.

### **Epoxy mortar.--**

Epoxy mortar shall be commercial quality, low viscosity paste polysulfide extended epoxy formulated primarily for use in bonding new portland cement concrete to old portland cement concrete.

### **Pea gravel backfill.--**

Pea gravel for precast concrete tank backfill shall be clean aggregate, free from clay or organic material and graded such that 90 percent to 100 percent passes the No. 4 sieve size.

### **Backfill.--**

Backfill, unless otherwise shown on the plans, shall be native material, free of rocks greater than 50 mm in greatest dimension, vegetable matter, trash or other deleterious material. The thickness of each layer of backfill before compaction shall not exceed 150 mm.

### **Sealant.--**

Sealant for precast concrete tank shall be closed cell expanded neoprene conforming to ASTM Designation: D 1056, Grade RE 41.

**Manholes.--**

Manholes shall be precast, reinforced concrete manhole sections, conforming to ASTM Designation: C 478; or nonreinforced concrete pipe conforming to ASTM Designation: C 14; or precast reinforced concrete pipe conforming to ASTM Designation: C 76.

**Manhole frames and covers.--**

Manhole frames and covers shall be gray cast iron, conforming to ASTM Designation: A 48, Class 30 or greater (traffic type). Cover shall be no bolt, gas tight, closed pick hole, and shall be marked "SS," "SEWER," or "SANITARY SEWER." The side or bottom of the cover shall be machine 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. The machine groove may be omitted and a flat gasket may be used, provided that the gasket is molded to the frame seat with contact cement.

**General.--**Manufactured precast sand trap tank, manhole frames and covers, and other appurtenances shall be installed in accordance with the manufacturer's recommendations and the approved working drawings.

**Testing.--**The drainage sand trap 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.

**Measurement and payment.--**Drainage sand trap tank will be measured and paid for as units. The contract unit prices paid for drainage sand trap tank shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in furnishing and installing drainage sand trap tank, complete in place, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

**10-1.17 REINFORCEMENT**

Reinforcement shall conform to the provisions in Section 52, "Reinforcement," of the Standard Specifications and these special provisions.

A Certificate of Compliance conforming to the provisions in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications 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 Bar Reinforcement," of the Standard Specifications. The Certificate of Compliance shall include all the certifications specified in ASTM Designation: A 775/A 775M or A 884/A 884M, respectively, and a statement that the coating material has been prequalified by acceptance testing performed by the Valley Forge Laboratories, Inc., Devon, Pennsylvania.

**10-1.18 ALTERNATIVE PIPE**

Alternative pipe culverts shall conform to the provisions in Section 62, "Alternative Culverts," of the Standard Specifications and these special provisions.

**SPIRAL RIB PIPE**

Spiral rib pipe shall conform to the provisions in "Corrugated Metal Pipe" of these special provisions, except for profile and fabrication requirements.

Spiral rib pipe shall, at the option of the Contractor, consist of either (1) three rectangular ribs spaced midway between seams with ribs 19 mm wide by 19 mm high at a maximum rib pitch of 191 mm, (2) two rectangular ribs and one half-circle rib equally spaced between seams with ribs 19 mm wide by 25 mm high at a maximum rib pitch of 292 mm. The half-circle rib diameter shall be spaced midway between the rectangular ribs or (3) two rectangular ribs equally spaced between seams with ribs 19 mm wide by 25 mm high at a maximum rib pitch of 213 mm. Rib pitch measured at right angles to the direction of the ribs may vary  $\pm 13$  mm.

Corrugated steel spiral rib pipe shall be fabricated by a continuous helical lock seam fabricated in conformance with the provisions in Section 66-3.03C(1), "Fabrication by Continuous Lock Seam," of the Standard Specifications.

Corrugated aluminum spiral rib pipe shall be fabricated by a continuous helical lock seam fabricated in conformance with the provisions in Section 66-2.03B, "Fabrication by Continuous Helical Lock Seam," of the Standard Specifications.

Coupling bands for spiral rib pipe shall conform to the provisions in Section 66-1.07, "Coupling Bands," of the Standard Specifications. A coupling band shown on the plans or approved by the Engineer in conformance with the provisions in Section 61-1.02, "Performance Requirements for Culvert and Drainage Pipe Joints," of the Standard Specifications, for use on a pipe corrugation of 68 mm x 13 mm for corrugated metal pipe may be used on spiral rib pipe having 68 mm x 13 mm rerolled annular ends. The width of band (W) for hat bands for pipe sizes larger than 1200 mm in diameter shall be 95 mm.

### **10-1.19 PLASTIC PIPE**

Plastic pipe shall conform to the provisions in Section 64, "Plastic Pipe," of the Standard Specifications.

### **10-1.20 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 Revised 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 Revised Standard Plan A62DA shall not be compacted prior to placement of the pipe.

### **10-1.21 CORRUGATED METAL PIPE**

Corrugated metal pipe culverts shall conform to the provisions in Section 66, "Corrugated Metal Pipe," of the Standard Specifications and these special provisions.

Asphaltic mastic coating or polymeric sheet coating substituted for bituminous coating shall be placed on the outside and inside surfaces of the pipe.

### **10-1.22 PERMEABLE MATERIAL**

Permeable material shall conform with the details shown on the plans, and to the provisions in Section 68-1, "Underdrains," of the Standard Specifications, and these special provisions.

Full compensation for Class 1 permeable material shall be considered as included in the contract price paid per cubic meter for minor concrete (minor structures) and no separate payment compensation will be made therefor.

### **10-1.23 ANCHOR ASSEMBLY**

Anchor assemblies for pipe downdrains shall be installed as shown on the plans and in conformance with the provisions in Section 69-1.02C, "Anchor Assemblies," of the Standard Specifications and these special provisions.

Full compensation for anchorage assemblies shall be considered as included in the contract price paid per meter for the size and type of pipe downdrain involved and no separate payment will be made therefor.

### **10-1.24 OVERSIDE DRAIN**

Alternative pipe downdrains shall conform to the provisions in Section 69, "Overside Drains," of the Standard Specifications for the kind of alternative pipe downdrain installed and these special provisions.

Plastic pipe for overside drains shall be Type S corrugated high density polyethylene or ribbed polyvinyl chloride pipe conforming to the provisions in Section 64, "Plastic Pipe," of the Standard Specification.

Plastic pipe joints shall conform to the provisions in Section 61-1.02, "Performance Requirements for Culvert and Drainage Pipe Joints," of the Standard Specifications for downdrain joints, except that the alternatives selected for plastic pipe joint restrainer assemblies shown on the plans shall serve in lieu of the tensile strength requirements. The joint overlap requirements for integral joints shall conform to the requirements for positive joints.

Plastic pipe joint restrainer assembly, Alternative A, when used shall be installed immediately below the pipe bell.

Polyvinyl chloride pipe shall not be used unless the overside drain is covered for the entire length of the overside drain.

Plastic pipe overside drains shall be installed with the bell end of the pipe facing uphill.

### **10-1.25 MISCELLANEOUS FACILITIES**

Alternative flared end section and alternative pipe inlet shall conform to the provisions in Section 70, "Miscellaneous Facilities," of the Standard Specifications.

### **10-1.26 MISCELLANEOUS IRON AND STEEL**

Frames and grates shall conform to the provisions in Section 75, "Miscellaneous Metal," of the Standard Specifications.

### **10-1.27 CHAIN LINK FENCE AND CHAIN LINK GATE**

Chain link fence and chain link gate shall be Type CL-1.8 with extension arms and shall conform to the provisions in Section 80, "Fences," of the Standard Specifications and these special provisions..

Barbed wire supporting arms (extension arms) shall extend upwards from the tops of the fence posts at an approximate angle of 45 degrees and shall be fitted with clips or other suitable means for attaching 3 lines of barbed wire. The top outside wire shall be attached to the extension arm at a point approximately 300 mm above the top of the chain link fabric and 300 mm out from the fence line. The other wires shall be attached to the arm uniformly between the top of the fence and the top outside wire.

Barbed wire shall conform to the provisions in Section 80-3.01C, "Barbed Wire," of the Standard Specifications.

## **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 constructing a concrete masonry unit vehicle wash building with metal roof decking and pre-engineered I beam joists; clarifier and lift station; installing water recycle system; mechanical and electrical 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
CEC	California Electrical Code
CMC	California Mechanical Code
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
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
UL	Underwriters Laboratories, Inc.
WCLIB	West Coast Lumber Inspection Bureau (stamped WCLB)
WCLB	Grade stamp for WCLIB
WIC	Woodwork Institute of California
WWPA	Western Wood Products' Association

When reference is made to the Uniform Building Code (UBC) on the plans or in the special provisions, it shall be the 1997 Uniform Building Code as amended by the 1998 Title 24 California Building Standards Code.

### **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 the contract, or a portion thereof, in the sum equal to one-half the 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 of the State concerning the Downieville Maintenance Station.

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, 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 2 copies of a Schedule of Values covering each lump sum item for building work. The Schedule of Values, showing the value of each kind of work, shall be acceptable to 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, profit, bond premium, temporary construction facilities, and plant shall not be listed.

### **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, "Indemnification and Insurance," 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, "Indemnification and Insurance," 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.

The Contractor shall be required to provide and install Transformer Pad, Substructures, Concentrically Grounded Conduit, Trench, and Backfill in accordance with Pacific Gas & Electric Company requirements for the 12KV Overhead conversion to Underground 12KV Concentrically Grounded facility. The Concentrically Grounded Conduit location is depicted as "U" Line on Utility Plan U-1.

Attention is directed to the Information Handout regarding the installation of the Pacific Gas and Electric Company concentrically grounded conduit, trench and backfill, transformer pad, and substructures.

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**

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.

#### **12-1.15 REFERENCES**

When reference is made to the Uniform Building Code (UBC) on the plans or in the special provisions, it shall be the 1997 Uniform Building Code as amended by the 1998 Title 24 California Building Standards Code.

#### **12-1.16 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.

#### **12-1.17 FIELD ENGINEERING**

This section specifies administrative and procedural requirements for field engineering services to be performed by the Contractor.

**Lines and grades.**--Attention is directed to Section 5-1.07 "Lines and Grades," of the Standard Specifications.

Such stakes or marks will be set by the Engineer as he determines to be necessary to establish the lines and grades required for the completion of the work shown on the plans and as specified in these special provisions. In general, these will consist of the primary vertical and horizontal control points.

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

All other stakes or marks required to establish the lines and grades required for the completion of the work shall be the responsibility of the Contractor.

**Existing utilities and equipment.**--The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, the Contractor shall investigate and verify the existence and location of underground utilities and other construction.

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

**Surveys for layout and performance.**--The Contractor shall perform all surveys for layout and performance, reduce field notes, and make all necessary calculations and drawings necessary to carry out the work.

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

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

**Survey accuracy and tolerances.**--The tolerances generally applicable in setting survey stakes for foundations, slabs, and underground work shall not exceed the following:

Survey Stakes or Markers	Tolerance
Rough grading or excavation	30 mm
Trimming or preparation of subgrade for roadways	15 mm
Roadway surfacing, steel or concrete pipe	6 mm
Structures or building construction	3 mm

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

#### **12-1.18 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 <sup>2</sup> 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 THICKNESS SHOWN ON THE PLANS mm	EQUIVALENT US STANDARD GAGE inch	METRIC THICKNESS SHOWN ON THE PLANS mm	EQUIVALENT GALVANIZED 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	EQUIVALENT USA STEEL WIRE THICKNESS	GAGE NO.
mm	inch	
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		ENGLISH	
	mm		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	EQUIVALENT NOMINAL SURFACE DRY U S SIZE
mm	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 (m <sup>2</sup> K/W)	ENGLISH (HR FT <sup>2</sup> 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
0.10	5
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 REMOVING PORTIONS OF EXISTING FACILITIES

#### PART 1.- GENERAL

**Scope.--**This work shall consist of removing portions of the existing facilities, including removal of existing work to gain access to or for new work, in accordance with the details shown on the plans and these special provisions.

#### PART 2.- PRODUCTS (Not applicable)

#### PART 3.- EXECUTION

##### PREPARATION.--

**General.--**The limits of removal shall be located and identified. Items to be removed and the interface of items to be removed and items to remain intact shall be identified and marked.

Prior to removing concrete or masonry, a saw cut approximately 25 mm deep shall be made along the limits of removal on all faces that will be visible in the completed work.

##### REMOVAL.--

**General.--**Removal shall be to the limits shown on the plans. Removal shall be done carefully to minimize damage to the portions to remain. Remaining portions that are damaged by the Contractor's operation shall be restored to original condition at the Contractor's expense.

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

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

Piping and conduits to be abandoned shall be capped or plugged.

Surfaces that are exposed to view at the limits of removal work shall be patched, bumps shall be removed and depressions filled, and the surface shall be finished to match the existing surrounding surfaces. Depressions in concrete less than 25 mm deep shall be deepened to 25 mm minimum depth before filling with cement mortar.

Anchor bolts and reinforcement shall be removed at least 25 mm below the surrounding surfaces, and the resulting hole shall be patched with cement mortar.

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

##### DISPOSAL.--

**General.--**Materials that are to be removed, shall become the property of the Contractor and shall be disposed of outside the highway right of way in accordance with the requirements in Section 7-1.13, "Disposal of Material Outside of the Highway Right of Way," of the Standard Specifications.

##### SALVAGE.--

**General.--**Materials or equipment shown on the plans to be salvaged shall remain the property of the State and shall be removed, cleaned and stockpiled at a location at the project site designated by the Engineer.

## 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 requirements of "Field Engineering" in Section 12-1, "General Requirements," of these special provisions.

#### 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 areas.--**Existing surfaced 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.

##### 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<sup>3</sup>, 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<sup>3</sup>, 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  $\pm 12$  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.

Unless approved in writing by the Engineer, compaction of structure or select backfill by jetting or ponding will not be permitted.

**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<sup>3</sup> 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.

**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.

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 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 AGGREGATE BASE**

**PART 1.-GENERAL**

**SUMMARY.--**

**Scope.**--This work shall consist of furnishing, spreading and compacting aggregate base in accordance with the details shown on the plans and these special provisions.

**PART 2.-PRODUCTS**

**Aggregate base.--**

Aggregate base shall be commercial quality aggregates consisting of broken stone; crushed gravel; natural, clean, rough-surfaced gravel and sand; or a combination thereof.

Aggregate base shall conform to the following grading as determined by California Test 202:

Sieve or Screen Size	Percentage Passing
25 mm	100
19 mm	90 - 100
4.75 mm	35 - 60
600 µm	10 - 30
75 µm	2 - 9

Aggregate base shall also conform to the following quality requirements:

Tests	California Test No.	Test Requirements
Durability Index	229	35 Min.
Resistance (R-Value)	301	78 Min.
Sand Equivalent	217	22 Min.

**PART 3.-EXECUTION**

**SPREADING AND COMPACTING.--**

**Spreading.--**Aggregate base shall be placed and compacted to the lines and grades shown on the plans.

Spreading and compacting shall be performed by methods that will produce a uniform base, free from pockets of coarse or fine material.

**Compaction.--**Relative compaction of each layer of compacted base material shall be not less than 95 percent, as determined by California Test 216 or 231.

**12-2.04 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.

**12-2.05 ASPHALT CONCRETE**

**PART 1.- GENERAL**

**SUMMARY.--**

**Scope.--**This work shall consist of furnishing, spreading, placing and compacting asphalt concrete for asphalt concrete surfacing, applying asphaltic emulsion paint binder and fog seal coat, in accordance with the details shown on the plans and these special provisions.

Asphalt concrete shall be commercial quality, produced at a central mixing plant, 13 mm maximum, medium grade, as specified herein.

Areas to be surfaced with asphalt concrete shall include those locations where existing bituminous surfacing has been removed to facilitate the required work.

**QUALITY ASSURANCE.--**

**Certificates of Compliance.--**Certificates of Compliance shall be furnished for asphalt concrete and asphaltic emulsion in accordance with the requirements specified in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications.

**PART 2.- PRODUCTS**

**MATERIALS.--**

**Asphalts.--**

Asphalt binder for asphalt concrete shall be steam-refined paving asphalt Grade AR-4000 (asphalt graded by viscosity), conforming to the requirements in AASHTO Designation: M 226.

Asphalt emulsion for paint binder and fog seal coat shall be asphaltic emulsion Grade SS1h conforming to the requirements in AASHTO Designation: M 140.

**Aggregates.--**

Aggregate for asphalt concrete shall be commercial quality asphalt concrete aggregate, and shall have a Sand Equivalent value of 30 minimum, when determined by California Test 217.

The combined aggregate gradings for the respective asphalt concrete mixture shall conform to the following gradations when determined by California Test 202:

13 mm Maximum Grading	
Sieve Sizes	Percentage Passing
19 mm	100
13 mm	95 - 100
4.75 mm	55 - 72
600 µm	18 - 33
75 µm	4 - 8

**MIXING.--**

**General.--**Asphalt binder to be mixed with the aggregate shall be between 5 percent and 8 percent by weight of the dry aggregate as determined by the Engineer.

**PART 3.- EXECUTION**

**PREPARATION.--**

**Subgrade.--**Immediately prior to placing asphalt concrete thereon, the surface of the grading plane shall not vary more than 0.015 meter above or below the grade established by the Engineer.

At the time of placing the asphalt concrete material thereon, the moisture content of the subgrade shall not be more than 3 percent above or below the optimum moisture content of the subgrade material as determined by California Test 216.

**Paint binder.--**Paint binder shall be furnished and applied to all existing surfacing upon which asphalt concrete is to be placed, vertical surfaces against which additional asphalt concrete material is to be placed and other surfaces designated by the Engineer.

## **SPREADING AND COMPACTING.--**

**Spreading.--**The mixture shall be spread at a temperature of not less than 121°C. Spreading shall be performed by methods that will produce an asphalt concrete surfacing of uniform smoothness and texture. Asphalt concrete shall be placed only when the atmospheric temperature is above 10°C.

Asphalt concrete for surfacing more than 1.5 meters in width shall be spread in one operation with an approved spreader and be ready for compaction without further shaping.

**Compacting.--**Asphalt concrete shall be placed in one or more layers of 0.04 meter or less in compacted thickness to match the thickness as shown on the plans. The first coverage of initial or breakdown compaction shall be performed when the temperature of the mixture is not less than 121°C, and all breakdown compaction shall be completed before the temperature of the mixture drops below 93°C.

Asphalt concrete shall be thoroughly compacted with a self-propelled tandem roller, weighing not less than 7260 kg. At locations where asphalt concrete is to be placed and which are inaccessible to rolling equipment, compaction shall be obtained by hand rollers, vibrating plates, impactors or other methods approved by the Engineer.

## **12-2.06 WASH WATER SYSTEM**

### **PART 1.- GENERAL**

#### **SUMMARY.--**

**Scope.--**This work shall consist of furnishing, installing and constructing a wash water system and modifying portions of existing water systems in accordance with the details shown on the plans and these special provisions.

Wash water system shall include piping, valves, cleanouts and other fittings and appurtenances, not mentioned, which are required for the complete installation and proper operation of the system.

Earthwork for installation of pipes, valves, cleanouts and other appurtenances shall be as specified under "Earthwork for Building Work" in this Section 12-2 of these special provisions.

Concrete and reinforcement shall conform to the requirements specified under "Cast-in-place Concrete" in Section 12-3, "Concrete and Reinforcement," of these special provisions.

**Order of work.--**Work which will curtail the use of the existing sewage system shall not be done until the facilities utilizing the system are closed and are no longer required.

#### **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 to be submitted for approval are as follows:

- Bituminous coatings
- Clarifier tank
- Cleanout to grade
- Dielectric waterway
- Flexible coupling
- Flexible discharge pipe
- Flexible waterproofing membrane
- Hose faucet
- Insulating unions
- Manhole
- Manhole frame and cover
- Sewer pipe
- Drain pipe
- Water pipe
- Force main pipe
- Pressure washer pipe

Pipe hanger  
Pipe supports  
Pipe wrapping and primer  
Underground tracer tape  
Ball valve  
True union ball valve  
Solenoid valve  
Valve box and covers

## **QUALITY ASSURANCE.--**

**Codes and standards.--** Work shall conform to the applicable portions of the current approved Uniform Plumbing Code as amended by the applicable portions of current approved Title 24 California Building Standards Code, pertaining to the selection and installation of recycle wash water system materials and products.

**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 permanent, bright colored, continuous printed plastic tape with copper wire or aluminum foil intended for direct burial service; not less than 50 mm wide x 0.1 mm thick; lettering shall read "CAUTION SEWER/WATER BURIED BELOW."

### **PIPES AND PIPE FITTINGS.--**

**General.--** Provide pipes of one of the following materials, of weight and class indicated. Provide pipe fittings and accessories of same material and weight and class as pipes, with joining method as indicated.

#### **Sewer pipe and fittings.--**

Sewer 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.

#### **Drain pipe and fittings.--**

Drain pipe and fittings, below ground, shall be 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 NPS 3 and smaller, plain end pipe with solvent welded fittings conforming to ASTM Designation: D 2241, may be used.

Drain pipe, below ground risers and above 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.

#### **Water pipe and fittings.--**

Water 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.

Water pipe aboveground and below ground risers 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 shall be threaded and/or slip pipe as shown on the plans.

**Pressure washer pipe and fittings.--**

Pressure washer pipe and fittings shall be as recommended by the high pressure washer manufacturer.

**Union.--**

Unions (for steel pipe) shall be 1730 kPa, threaded malleable iron, ground joint, brass to iron seat, galvanized or black to match piping.

**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.

**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).

**CONCRETE TANKS.--**

**Clarifier tank with sampling box.--**

Clarifier tank with sampling box shall be precast, reinforced concrete tank of the size shown on the plan. The design and details shall comply with the minimum requirements of the American Concrete Institute (ACI) 318 Code. Minimum concrete compressive strength (f<sub>c</sub>) shall be 21 MPa. Tanks shall be designed for all loads and pressures resulting from the vertical and lateral earth loadings listed below:

1. Minimum earth cover over the tanks as shown on the plans.
2. Earth density: 1922 kilograms per cubic meter.
3. Equivalent fluid pressure for lateral pressure due to earth: 1436 Pa.

Clarifier tank with sampling box shall be Nottingham, Cook Concrete Products (Redding), Bakersfield Precast Concrete, or equal.

**MANHOLES AND COVERS.--**

**Manhole.--**

Manhole 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, gas tight, closed pick hole and shall be factory marked "SS," "SEWER," or "SANITARY SEWER." The bearing surfaces of frames and covers shall be machined, and the cover shall seat firmly into the frame without rocking or sliding. Gray iron castings shall be true to pattern in form, dimensions and thickness; shall be free of surface defects; and shall be free from visible, x-ray, and machine operation defects which would affect the service value of the castings. Castings shall be matched sets in appearance, and lettering and sizing as shown on the plans.

## **VALVE BOX.--**

### **Valve box.--**

Valve box and cover shall be traffic rated, precast concrete meter box and cast iron cover with no holes. Cover shall be factory marked "SEWER," "SS," or "SANITARY SEWER", or "WATER", as required. Valve box and cover shall be Cook Concrete Products, Christy Concrete Products, Bes Concrete products, or equal with extensions as required. Nominal inside dimension 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.

### **True union ball valve .--**

True union ball valve shall be minimum 1550 kPa, polyvinyl chloride (PVC) body ball and components, fluorocarbon rubber o-rings, polytetrafluoroethylene (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.

### **Solenoid valve.--**

Solenoid valves shall be Type 1, General Purpose, 120-volt, 60-hertz, seal and discs of PTFE, CSA certified, UL listed. The water operating pressure differential shall be 0 to 2070 kPa. Solenoid valve shall be continuous duty cycle rated.

## **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.

## **HYDRANTS.--**

### **Hose faucet.--**

Hose faucet shall be compression type, angle pattern, wall flange at exterior locations, tee handle, NPS 3/4 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.

## **COATINGS.--**

### **Bituminous coating.--**

Bituminous coating shall conform to ASTM Designation: D 41.

### **Flexible waterproofing membrane.--**

Flexible waterproofing membrane shall be a liquid, cold applied, seamless, single component, flexible, bitumen modified polyurethane formulated for hand application by roller or airless spraying.

Properties shall be as follows:

Property	Value	Test Designation
Wet film thickness	2.5 mm, min	Wet film thickness gage
Shore A hardness	10 min	ASTM D 2240
Elongation, %	350 min	ASTM D 412
Tensile strength (kPa)	550 min	ASTM D 412
Application rate, approximate	3 liters per square meter	Inspection, wet mil thickness

Waterproofing membrane shall be Rexnord Chemical Products, HLM 5000; Polycoat Products, Aquaseal-1; Select Products Company, Select Poly-Kote LM; or equal.

**MISCELLANEOUS MATERIALS.--**

**Cement mortar.--**

Cement mortar shall consist of one part cement to 2 to 3 parts clean plaster or concrete sand mixed with just enough water for suitable consistency.

**Epoxy mortar.--**

Epoxy mortar shall be commercial quality, low viscosity paste polysulfide extended epoxy formulated primarily for use in bonding new portland cement concrete to old portland cement concrete.

**Sealant.--**

Sealant for precast concrete tank shall be closed cell expanded neoprene conforming to ASTM Designation: D 1056, Grade RE 41.

**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.

**Pipe supports.--**

Pipe supports shall consist of non-metallic or metallic construction channel framing system. Supports shall meet the requirements of Federal Specification: WW-H-171 for pipe hangers and supports. The maximum rated loads for supports shall have a minimum safety factor of 5 or the allowable stress values as set forth in Manufacturer's Standardization Society Standards MSS SP-58. Non-metallic channel framing products shall have a flame spread rating of 25 or less when tested per ASTM Designation: E-84 and be rated Class 1.

**Pipe hanger (for piping supported from overhead).--**

Pipe hanger (for piping supported from overhead) shall be Grinnell, Model N0. 269; Super Struct, Model No. C711; or equal.

**Water hose.--**

Water hose shall be 18 mm diameter x 30 m length commercial duty rubber hose, industrial 2-layer tire cord reinforcing, resistant to oil, chemicals, abrasion, and weather, with heavy duty brass couplings and octagon head for wrench or hand use.

**Water nozzle.--**

Water nozzle shall be straight nozzle, solid brass with barrel that moves freely from full open to full closed. Barrel shall be removable for use as full flow plain hose nozzle.

**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, sewer and water pipes.

**INSTALLATION OF PIPE AND FITTINGS.--**

**General.--**Pipe shall be installed upgrade unless otherwise permitted by the Engineer. Pipe slopes shall be as shown on the plans. Galvanized steel pipe for above ground air vents shall be installed vertical terminating at grades and mounted in accordance with the details shown on the plans and these special provisions.

**Pipe and fittings.--**Pipe and fittings shall be installed in accordance with the plans and specifications. Lines between manholes shall be flushed as necessary to remove collected 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.

**Flushing completed systems.--**All completed systems shall be flushed and blown out.

**Chlorination.--**All potable source water piping and facilities shall be flushed and chlorinated by disinfecting solutions as specified in the current edition of the California Plumbing Code.

**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.

**Wall, footing and slab penetrations.--**Pipes passing through existing walls, footings and slabs penetrations shall consist of cored holes.

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.

**Securing pipe.--**Pipe in the buildings shall be held in place by pipe hangers or construction channel. Material 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. Plastic pipe shall have hangers or supports every 1.5 m. 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.

**Wrapping and coating steel pipe.--**Steel pipe buried in the ground shall be wrapped 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. Field joints, fittings and valves for wrapped steel pipe shall be covered to provide continuous protection by putting 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.

**Dielectric waterway.--**Dielectric waterway shall be provided between metal pipes of different material, and between brass or bronze valves and steel piping.

**Sewers near water pipes.--**Sewers near water pipe shall be installed below, (with vertical separation of not less than 305 mm), water pipe in the same trench, in parallel trenches less than 3 m apart, or at any crossing as specified in the current edition of the California Plumbing Code.

When water pipes cross above a sewer pipe, a vertical separation of not less than 305 mm shall be maintained between the top of the sewer pipe and the bottom of the water pipe.

When water pipes cross under a sewer pipe, a vertical separation of not less than 455 mm shall be maintained between the top of the water pipe and the bottom of the sewer pipe. No sewer pipe joint shall be within 1.5 m of the water pipe.

**Joint adapters.--**Joints between different types of pipes shall be made only with approved standard manufactured adapters and fittings intended for that purpose as specified in these special provisions. Adapter couplings requiring polyethylene encasement shall be as shown on the plans and these special provisions.

**Interior inspection.--**Interiors of pipes shall be inspected to determine displacement or damage during installation or backfilling.

Damaged pipe shall be replaced.

Misaligned pipe shall be corrected prior to use.

#### **INSTALLATION OF CONCRETE TANKS.--**

**General.--**Manufactured precast 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.

#### **INSTALLATION OF MISCELLANEOUS ITEMS.--**

**Installing pipe supports.--**Vent drain galvanized steel pipe supports shall be attached to equipment building walls with pipe supports.

#### **INSTALLATION OF MANHOLES AND VALVE BOXES.--**

**General.--**Manufactured manholes, riser sections, concentric/eccentric cones, grade rings, valve boxes 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 and valve boxes shall be sealed watertight, inside and outside, with epoxy mortar.

Fiberglass manholes shall be bolted watertight with gaskets, stainless steel nuts, bolts and washers in conformance with the manufacturers recommendations and these specifications.

A reinforced concrete collar or slab shall be formed and cast in place around each manhole or valve box in accordance with the details shown on the plans.

Reinforcement shall be placed with a minimum 50 mm clearance on all sides. Slabs and collars shall be broom surface finished. Slabs and collars shall match existing/finished grade. Compaction prior to form work shall be as specified elsewhere in these special provisions.

Box penetrations shall be cored.

Where sewer manholes, valve, access or meter boxes or cleanouts 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 immediate area.

The watertight access box shall be coated with a flexible membrane.

### **INSTALLING THRUST BLOCKS.--**

**General.--**Cast-in-place concrete thrust blocks shall be installed at PVC pipe fittings in accordance with the details as shown on the plans and in conformance to applicable codes and standards.

### **INSTALLATION OF CLEANOUTS.--**

**General.--**Cleanouts shall be installed 90 degrees to finished grade and shall terminate in a valve box as shown on the plans. A concrete pad, 455 mm long and 100 mm thick, shall be provided full width of the trench under the wye/two way cleanout tee branch. A reinforced concrete collar shall be formed and cast-in-place around each cleanout box in conformance to the details shown on the plans.

Cleanouts to grade shall be a combination of fittings as shown on the plans. Piping and fittings for NPS 4 pipe shall be sewer pipe and for NPS 3 and smaller shall be drain pipe. Cleanout piping shall terminate below grade in a valve box.

Slabs and collars shall be broom surface finished. Slabs and collars shall match existing/finished grade. Compaction prior to form work shall be as specified elsewhere in these special provisions.

Where cleanouts 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.

### **APPLICATION OF COATINGS.--**

**General.--**The edge and bottom of manhole cover seat areas shall be coated with a uniform application of heavy duty, waterproof automotive or industrial grease.

The flexible waterproofing membrane coatings shall be applied in accordance with the coating manufacturer's recommendations. Flexible membrane coating shall be applied without runs, holidays, sags, misses, pinholes, or other imperfections.

### **TAP CONNECTION.--**

**General.--**Connections to existing systems shall be as shown on the plans and subject to approvals by the local agency and Engineer.

### **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 sewer) 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 sewer pipe may be tested in sections with the test water progressively passed down the pipes if feasible. Water shall be released at a rate which will not create water hammer or surge in the plugged section of pipe.

Water pipes shall be tested for leakage for a minimum period of 4 hours by filling pipes with water to a pressure of 860 kPa. Provisions shall be made for release of air. Systems shall show no loss in pressure or visible leaks. The Contractor shall repair any leaks or irregularities.

Pressure washer pipe shall be tested for leakage for a minimum period of 4 hours by filling pipes with water to a pressure of 14 000 kPa. Provisions shall be made for release of air. Systems shall show no loss in pressure or visible leaks. The Contractor shall repair any leaks or irregularities.

In lieu of hydrostatic test with water, the air test method, as outlined in the Uniform Plumbing Code (UPC), "Low Pressure Air Test for Building Sewers," 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.

The complete wash water system shall be tested for operational use, a minimum of 2 hours per day for 3 consecutive days. The system shall operate as intended by design and as approved by the Engineer. Repairs, if necessary, shall be made at the Contractor's expense.

## 12-2.07 CORE CONCRETE

**GENERAL.**--This work shall consist of coring holes through existing concrete surfaces in accordance with the details shown on the plans and these special provisions.

### EXECUTION.--

Holes shall be cored by methods that will not shatter or damage the concrete adjacent to the holes.

Water for the core drilling operations shall be from the domestic water supply and shall not contain more than 1,000 parts per million of chlorides as Cl, nor more than 1,300 parts per million of sulfates as SO<sub>4</sub>, nor shall it contain any impurities in a sufficient amount to cause discoloration or etching of the surface.

Water from the core drilling operations shall not be permitted to flow into sewers or other drainage facilities.

## 12-2.08 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

#### Steel posts.--

Steel posts for guard posts shall be standard weight, galvanized steel pipe conforming to the details shown on the plans.

#### 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.**--The length and diameter of the guard posts shall conform to the details shown on the plans.

Guard posts shall be placed in holes excavated to the depth and cross section shown on the plans, and shall be installed plumb.

Guard posts shall be backfilled with concrete as 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.

## 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, admixtures, freeze-thaw aggregates and epoxy products 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).--**

Commercial quality concrete shall be proportioned to provide a workable mix suitable for the intended use; shall have not less than 350 kg/m<sup>3</sup> of cement; 0 to 50 mm penetration, inclusive, as determined by California Test 533.

The air content of the freshly mixed concrete shall be  $6 \pm 1 \frac{1}{2}$  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<sup>3</sup> 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.

The air content of the freshly mixed concrete shall be  $6 \pm 1 \frac{1}{2}$  percent, as determined by California Test 504.

### **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.

#### **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.

#### **Coloring for concrete.--**

Coloring for portland cement concrete shall be chemically inert, fade resistant mineral oxide or synthetic type.

### **FORM MATERIALS.--**

#### **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.

**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  $\mu$ m sieve.

**RELATED MATERIALS.--****Anchor bolts, nuts, and washers.--**

Nonheaded anchor bolts shall conform to ASTM Designation: A 36/A 36M, with a minimum hook length of 6.2 diameters.

Headed anchor bolts shall conform to ASTM Designation: A 307.

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.

**Keyed construction joint forms.--**

Keyed construction joint forms shall be commercial quality, galvanized metal, 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 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.

**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<sup>3</sup>. 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.

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.

Anchorage and embedded items shall be placed and rigidly secured at their planned locations prior to placing concrete.

**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 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 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.

### **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.

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.

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.

### **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 moist 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<sup>2</sup> will not be permitted on the concrete within 10 calendar days after placing.

#### **SPECIAL TREATMENTS.--**

**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 CONCRETE MASONRY UNITS**

##### **PART 1.- GENERAL**

##### **SUMMARY.--**

**Scope.--**This work shall consist of constructing reinforced hollow concrete masonry units in accordance with the details shown on the plans and these special provisions.

**Related work.--**Water repellent coating shall be applied in accordance with the requirements specified under "Water Repellent Coating" in Section 12-7, "Thermal and Moisture Protection," of these special provisions.

##### **PERFORMANCE REQUIREMENTS.--**

**Unit Strength.--**Provide masonry units that develop the following installed compressive strengths (f'm) at 28 days:

Based on net area f'm = 10.34 MPa

##### **SUBMITTALS.--**

**Product data.--**Manufacturer's descriptive data for each type of masonry unit, accessory, and other manufactured products shall be submitted for approval.

**Samples.--**Two samples of masonry units of each color and architectural finish shall be submitted for approval.

#### **QUALITY ASSURANCE.--**

**Masonry preconstruction testing service.--**The Contractor shall employ and pay all costs for the services of a testing laboratory acceptable to the Engineer and experienced in performing preconstruction masonry tests. The testing laboratory shall comply with the requirements of ASTM Designation: E 329.

Preconstruction tests shall be performed on the following materials by the Unit Test Method as defined by Section 2105, "Quality Assurance," of the Uniform Building Code:

Concrete masonry units shall be tested in accordance with ASTM Designation: C 140.

Grout shall be tested in accordance with ASTM Designation: C 1019.

In addition:

Mortar shall be tested in accordance with Uniform Building Code Standard: 21-16.

Test results shall be reported in writing to the Engineer and the Contractor on the same day the tests are made.

**Single source responsibility.--**Exposed masonry units of uniform color and texture shall be obtained from one manufacturer for each different product required for each continuous surface or visually related surfaces.

Mortar ingredients of uniform quality, including color for exposed masonry, shall be obtained from one manufacturer for each cementitious component and from one source and producer for each aggregate.

**Certificates of Compliance.--**Certificate of Compliance shall be furnished for masonry units, aggregate for grout and transit mixed grout in accordance with the requirements specified in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications.

#### **DELIVERY, HANDLING AND STORAGE.--**

**Delivery.--**Masonry materials shall be delivered to the project in an undamaged condition.

**Storage and handling.--**Masonry units shall be stored and handled in order to prevent deterioration or damage due to moisture, temperature changes, contamination, corrosion or other causes.

### **PART 2.- PRODUCTS**

#### **CONCRETE MASONRY UNITS.--**

##### **Concrete masonry units.--**

Concrete masonry units shall be nominal size, color and architectural finish as shown on plans; hollow load bearing, medium weight, Grade N, Type II, conforming to ASTM Designation: C 90; standard or open ended masonry units.

Special shapes shall be provided where required for lintels, corners, jambs, sash, control joints, headers, bonding and other special conditions.

#### **MORTAR AND GROUT MATERIALS.--**

##### **Cement.--**

Cement for mortar shall be Type II, low alkali portland cement conforming to ASTM Designation: C 150; or masonry cement conforming to ASTM Designation: C 91.

Cement for grout shall be Type II portland cement conforming to ASTM Designation: C 150 with maximum 15 percent Class N, F, or C mineral admixture conforming to ASTM Designation: C 618 except that the loss on ignition shall not exceed 4 percent; or Type IP(MS) blended hydraulic cement conforming to ASTM Designation: C 595.

**Aggregate.--**

Aggregate for mortar shall conform to ASTM Designation: C 144, except not more than 10 percent shall pass the No. 100 sieve.

Aggregate for grout shall conform to ASTM Designation: C 404, except 100 percent of the coarse aggregate shall pass the 9.5 mm sieve. Soundness loss shall not exceed 10 percent as determined by California Test 214.

**Coloring for mortar.--**

Coloring for mortar shall be chemically inert, fade resistant mineral oxide or synthetic type.

**Lime.--**

Lime shall conform to ASTM Designation: C 207, Type S.

**Premixed mortar or grout.--**

A premixed packaged blend of cement, lime, and sand, with or without color, that requires only water to prepare for use as masonry mortar or grout may be furnished. Packages of premix shall bear the manufacturer's name, brand, contents, weight, and color identification.

**Transit mixed grout.--**

Transit mixed grout shall conform to ASTM Designation: C 94, except aggregate shall be as specified herein for aggregate for grout. The minimum compressive strength shall be 17236 kPa at 28 days when tested in accordance with ASTM Designation: C 39. Admixtures, if used, shall conform to ASTM Designation: C 494, Types A, E or F and shall not contain chlorides.

**REINFORCEMENT, TIES AND ANCHORING DEVICES.--****Bar reinforcement.--**

Bar reinforcement shall conform to ASTM Designation: A 615/A 615 M, Grade 60 [420], or ASTM Designation: A 706/A 706 M.

**Anchor bolts.--**

Anchor bolts shall conform to ASTM Designation: A 307, and shall be 12 mm diameter unless otherwise shown on the plans.

**Anchors, ties, angles, and metal lath.--**

Anchors, ties, angles, and metal lath shall be commercial quality, and shall be galvanized.

**Dry pack.--**

Dry pack to set items into masonry shall be one part portland cement to not over 3 parts of clean sand and with a minimum amount of water for hydration and packing.

**PROPORTIONING MORTAR AND GROUT.--**

**General.--**Mortar shall be proportioned by loose volume and shall have one part cement, one quarter part of hydrated lime and 2 1/4 to 3 parts aggregate. Mortar shall be tinted with coloring to match the masonry units.

Grout, except transit mixed and packaged premix grout, shall be proportioned by loose volume and shall have one part cement, not more than 1/10 part hydrated lime, 2 1/4 to 3 parts sand aggregate, and not more than 2 parts gravel aggregate.

Aggregate shall be measured in a damp loose condition.

Grout shall be mixed with sufficient water to produce a mix consistency suitable for pumping without segregation. Slump shall not exceed 229 mm.

## **PART 3.- EXECUTION**

### **CONSTRUCTION.--**

**General.--**Masonry units shall be laid in running bond, except as otherwise shown on the plans.

Surfaces of metal, glass, wood, completed masonry, and other such materials exposed to view shall be protected from spillage, splatters and other deposits of cementitious materials from masonry construction. All such deposits shall be removed without damage to the materials or exposed surfaces.

Construction will comply with Section 2104 Construction of the Uniform Building Code. Tolerances specified in Section 2104 shall be in affect unless otherwise shown on the plans.

Where fresh masonry joins concrete or masonry, the contact surfaces of existing material shall be roughened, cleaned and lightly wetted. The roughened surface shall be no smoother than a wood troweled surface. Cleaning shall remove laitance, curing compounds, debris, dirt and any substance which decreases bond to the fresh masonry.

Masonry shall not be erected when the ambient air temperature is below 5°C.

Surfaces of masonry erected when the ambient air temperature exceeds 38°C shall be kept moist with water for a period of not less than 24 hours. Water shall be uniformly applied with a fog spray at the intervals required to keep the surfaces moist but not to exceed 3 hours unless otherwise approved by the Engineer.

All anchors, bolts, dowels, reglets and other miscellaneous items to be cast into the wall, shall be firmly secured in place before grout is poured.

Shoring for concrete masonry lintels shall remain in place a minimum of 15 days after the wall has been completed.

**Laying masonry units.--**Concrete masonry units shall be laid dry.

During laying of units all cells shall be kept dry in inclement weather by suitably covering incomplete walls. Wooden boards and planks shall not be used as covering materials. The covering shall extend down each side of masonry walls approximately 600 mm.

Chases shall be kept free from debris and mortar.

Bond beam units with an opening at each cross web shall be used at all horizontal reinforcing bars.

Where masonry unit cutting is necessary, all cuts shall be made with a masonry saw to neat and true lines. Blocks with excessive cracking or chipping of the finished surfaces exposed to view will not be acceptable.

**Lintels.--**Masonry lintels shall be as shown on the plans. Lintels shall be formed using U-shaped lintel units with reinforcing bars placed as shown on the plans. Formed-in-place lintels shall be temporarily supported.

**Bar reinforcement.--**Bar reinforcement shall be accurately positioned in the center of the cell and securely held in position with either wire ties or spacing devices near the ends of bars and at intervals not exceeding 192 bar diameters. Wire shall be 16-gage or heavier. Wooden, aluminum, or plastic spacing devices shall not be used. Tolerances for the placement of vertical reinforcement in walls and flexural elements shall be  $\pm 12$  mm. Tolerance for longitudinal reinforcement in walls shall be  $\pm 50$  mm.

The minimum spacing for splices in vertical reinforcement for masonry walls shall be 1220 mm plus lap.

Bar reinforcement shall not be placed in the plane of mortar joints.

**Mortar.--**Mortar joints shall be approximately 9.5 mm wide. Units shall be laid with all head and bed joints filled solidly with mortar for the full width of masonry unit shell. Head joints shall be shoved tight. Exposed joints shall be concave, tooled smooth, unless otherwise shown on the plans.

Mortar that has been mixed more than one hour shall not be retempered.

Mortar placed in joints shall preserve the unobstructed vertical continuity of the concrete filling. Any overhanging mortar projecting more than 12 mm, or other obstruction or debris shall be removed from the inside of such cells.

### **GROUTING.--**

**General.--**All cells shall be filled solidly with grout. All grout in the cells shall be consolidated at the time of placement by vibrating and reconsolidated after excess moisture has been absorbed but before plasticity is lost. Slicing with a trowel is not acceptable.

Masonry units may be placed full height of the masonry work before grouting, or they may be placed in increments for individual grout pours.

Cleanouts shall be provided for all grout pours over 1524 mm in height. Such cleanouts shall be provided in the bottom course at every cell containing vertical reinforcement. After cell inspection, the cleanouts shall be sealed before filling with grout.

Masonry units shall be placed full height of the grout pour. Grout shall be placed in a continuous pour in grout lifts not exceeding 1828 mm. The interruption between placing successive lifts of grout shall be not more than one hour.

Between grout pours, a horizontal construction joint shall be formed by stopping the grout a minimum of 38 mm below the top of the last course, except if the joint is at a bond beam, it shall be 12 mm below the top of the bond beam unit, or at the top of the wall.

#### **CLEANING AND PROTECTING MASONRY.--**

**General.--**Splashes, stains or spots on the faces of the masonry exposed to view shall be removed. Completed masonry shall be protected from freezing for a period of at least 5 days.

#### **FIELD QUALITY CONTROL.--**

**General.--** The Contractor shall employ, at his own expense, a special inspector and testing laboratory to perform structural tests and inspections of masonry to verify that the construction conforms to the Uniform Building Code in accordance with the requirements in Section 1701, "Special Inspections," and Section 2105, "Quality Assurance," of the Uniform Building Code. The contractor shall submit a written Field Quality Control Plan that identifies the inspector, the lab, and the procedures used. The Field Quality Control Plan shall conform to these specifications and the 1997 Uniform Building Code. The Contractor's Field Quality Control Plan shall be submitted to the Engineer for approval. The Engineer shall have three weeks to approve the plan.

The Contractor shall designate in the Field Quality Control Plan a masonry Quality Control Manager (QCM). The QCM shall be responsible directly to the Contractor for the quality of masonry, including materials and workmanship, performed by the Contractor and all subcontractors.

The QCM shall be the sole individual responsible to the Contractor for submitting, receiving, and approving all correspondence, required submittals, and reports 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.

Masonry special inspection personnel or testing 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:

**Special Inspector.--**The special inspector shall be, as a minimum, an International Conference of Building Officials (ICBO) certified Special Masonry Inspector. The special masonry inspector shall perform the inspections required under Section 1701.5.7., "Structural masonry" of the Uniform Building Code. The special inspector shall prepare a "Daily Field Report" providing information regarding the specific operations witnessed, including placing of masonry units and bar reinforcing, grouting, fabrication of test specimens, and other observations of importance to the work. A "Daily Field Report" is required for each day that the Special Inspector is on the jobsite. A copy of these reports shall be delivered to the Engineer on the day following the preparation. The special inspector shall submit a final signed report to the Engineer and Contractor stating whether the work requiring special inspection was, to the best of the inspector's knowledge, in conformance with the approved plans, specifications, and the applicable workmanship provisions of these specifications and the Uniform Building Code.

**Testing.--**The testing laboratory shall comply with the requirements of ASTM Designation: E 329. Test results shall be reported in writing to the Engineer and the Contractor on the same day the tests are made. Testing shall be done in accordance with Section 2105.3,"Compliance with f'm" of the UBC. The Contractor can establish f'm by either sections 2105.3.2, 2105.3.3, or 2105.3.3. A set of tests shall be done for each 465 m<sup>2</sup> of wall area, but not less than one test per project. Tests shall be performed on the following materials by the Unit Test Method as defined:

Concrete masonry units shall be tested in accordance with ASTM Designation: C 140.  
Grout shall be tested in accordance with ASTM Designation: C 1019.

In addition:

Mortar shall be tested in accordance with Uniform Building Code Standard: 21-16.

Any work not meeting the requirements of Section 2105 shall be redone and retested. Sampling, inspecting, reworking and retesting of material will be done at the contractor's expense.

## SECTION 12-5. METALS

### 12-5.01 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:

door track and guides,  
grate and frame

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 36/A 36M.

##### Grate and frame.--

Grate and frame shall be traffic rated. Grate and frame shall be Neenah, R4990CX with Type A grate; AFC, A2422; or equal.

##### 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.

**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.

**PART 3.- EXECUTION****GENERAL.--**

**Anchorage.--**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.

**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.

**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.

## 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.

##### 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.

**PLYWOODPANELS.--**

**General.**—Plywoodpanels 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 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 backing panels.--**

Plywood backing panels for mounting electrical or telephone equipment shall be 19 mm plywood panels APA C-D PLUGGED, Exposure 1, touch-sanded.

**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 naphthenate, 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 naphthenate.

### **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.

Roof 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.

### **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 California Building Code (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.

## 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 INSULATION

#### PART 1.- GENERAL

##### SUMMARY.--

**Scope.--**This work shall consist of furnishing and installing batt insulation in accordance with the details shown on the plans and these special provisions.

Batt insulation shall include faced batts in ceilings.

## **QUALITY ASSURANCE.--**

**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.

#### **Ceiling insulation.--**

Ceiling insulation shall be R-5.3  $K \cdot m^2/W$  fiberglass batts with paper-laminate vapor-retarder membrane on one face. Insulation shall conform to ASTM Designation: C 665, Type II, Class C.

### **VAPOR-RETARDERS.--**

#### **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.

### **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.

### **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 THROUGH-PENETRATION FIRESTOPPING

### PART 1.- GENERAL

#### SUMMARY.--

**Scope.--**This work shall consist of furnishing and installing firestopping materials at penetrations in fire-rated walls, floors, and ceilings in accordance with the details shown on the plans and these special provisions.

#### SUBMITTALS.--

**Product data.--**A list of materials, manufacturer's descriptive data, and location schedule shall be submitted for approval.

Descriptive data shall include trade names, manufacturers' names, complete information on the materials to be applied, the material thickness for the required fire resistance ratings, and the manufacturer's printed instructions for installation. Manufacturer's assembly shall be California State Fire Marshal approved.

#### QUALITY ASSURANCE.--

**Certificates of Compliance.--**Certificates of Compliance shall be furnished with each shipment of firestopping materials in accordance with Section 6-1.07, "Certificates of Compliance," of the Standard Specifications.

#### DELIVERY, STORAGE AND HANDLING.--

**Delivery.--**Materials to be applied shall be delivered in original unopened packages. Packages shall be identified by the manufacturer's label and shall bear proper labels for fire resistance classification.

**Storage.--**Materials shall be stored above ground, under cover, and in a dry location until ready for use. Packages which have been exposed to moisture before use shall be discarded.

### PART 2.- PRODUCTS

#### Fire-rated caulk.--

Fire-rated caulk shall conform to ASTM Designation: E 814 and shall be rated for use in 2 and 3-hour fire-rated assemblies. Fire-rated caulk shall be 3M Brand, Fire Barrier Caulk; Dow Corning, Fire Stop Sealant; Standard Oil, Fyre Putty; or equal.

#### Wrap strip.--

Wrap strip shall be nominal 6 mm thick intumescent elastomeric material in 50 mm wide strips, faced one side with aluminum foil, and rated for use in 1-hour and 2-hour fire-rated systems.

#### Packing material.--

Packing material shall be polyethylene backer rod or nominal one inch thickness of tightly packed ceramic (alumina silica) fiber blanket, mineral-wool batt or glass fiber insulation material.

#### Fire-rated mortar.--

Fire-rated mortar shall be non-asbestos, 753 to 913 kilograms per cubic meter air dried density portland cement fly ash through-penetration firestopping mortar. Fire-rated mortar shall conform to ASTM Designation: E 814 and shall be rated for use in 3-hour fire-rated systems at 75 mm minimum thickness.

#### Fire safing insulation.--

Fire safing insulation shall be inorganic 56 kilograms per cubic meter minimum density, non-combustible fiber insulation conforming to Federal Specifications HH-1-521F, when tested in accordance with ASTM Designation: E 119 and ASTM Designation: E 136 for 3 hour fire resistance.

### **PART 3.-EXECUTION.--**

**Installation.--**Firestopping materials shall be installed to conform to the requirements of the California State Fire Marshal Listing and the manufacturer's recommendations.

#### **12-7.04 METAL ROOFING**

##### **PART 1.- GENERAL**

###### **SUMMARY.--**

**Scope.--**This work shall consist of furnishing and installing preformed metal roofing in accordance with the details shown on the plans and these special provisions.

Metal roofing system shall consist of underlayment, prefinished metal roof panels, concealed fasteners, sealants, and other accessories and components, not mentioned, which are required for a complete, securely fastened and weathertight installation.

###### **SYSTEM DESCRIPTION.--**

**Design Requirements.--**The roofing system shall conform to the wind design requirements for uplift in Chapter 16 of the California Building Code 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 roofing 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 roofing system.

**Samples.--**Material samples shall include a 305 mm x 305 mm sample of the roofing panel for each color to be installed and a sample of each anchor clip and fastening device.

**Working Drawings.--**Working drawings showing the layout and details of the metal roofing 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.

###### **QUALITY ASSURANCE.--**

**Certificates of Compliance.--**Certificates of compliance shall be furnished for the metal roofing 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.--**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.--**

##### **Base metal.--**

Base metal shall be cold formed, 0.71 mm (24-gage), galvanized sheet steel with G90 coating, conforming to ASTM Designation: A 446, Grade A except where a higher strength is required for performance, extra smooth, or cold formed aluminum-zinc alloy-coated, commercial quality, sheet steel with AZ55 coating conforming to ASTM Designation: A 792, Grade 40, extra smooth.

##### **Configuration.--**

Metal roofing system shall be a standing seam system with standing rib a minimum of 45 mm high and spaced not less than 305 mm nor more than 460 mm on center.

#### **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 Architect 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.--**

Flashings shall be formed from the same material, gage and in the same finish as the roofing panels.

##### **Perforated soffit.--**

Perforated soffit shall be formed from the same material, gage and in the same finish as the roof panels.

#### **MISCELLANEOUS MATERIALS--**

##### **Fastener clips.--**

Fastener clips shall be noncorrosive ferrous metal fasteners as recommended by the metal roofing system manufacturer to resist the design loads.

##### **Fasteners.--**

Fasteners shall be as recommended by the metal roofing system manufacturer. Sheet metal screws shall not be used except to fasten trim and flashings.

##### **Underlayment.--**

Underlayment shall be as recommended by the metal roofing system manufacturer, but not less than 7 kilograms minimum asphalt impregnated fiber glass mat roofing felt.

##### **Sealant and sealant tape.--**

Sealant and sealant tape shall be as recommended by the roofing 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 eave, except such length shall not exceed the manufacturer's maximum production length. Flashings shall be fabricated in the longest practical lengths.

Roofing panels shall be factory formed. Field formed panels are not acceptable.

### **PART 3.- EXECUTION.--**

#### **INSTALLATION.--**

**Underlayment.--**The roof and fascia 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 panels.--**The roof system 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.

Roof 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.

Gaskets, joint fillers, sealants and sealing tape shall be installed where indicated on the approved drawings or as required for weatherproof performance of panel systems.

Fasteners shall not be driven through roof panels or batten covers.

**Miscellaneous metal shapes.--**Trim, fascia, flashings, and other prefinished metal work shall be positioned to the correct alignment for each detailed condition. Metal work shall be securely attached to backing 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.

Roof panels, trim, 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 roofing 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 roofing 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.

## 12-7.05 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, gravel stops, reglets, roof jacks, and screen type vents.

#### 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 "Standard Practice in Architectural Sheet Metal Work."

### PART 2.- PRODUCTS

#### MATERIALS.--

##### Galvanized sheet steel.--

Galvanized sheet steel shall conform to ASTM Designation: A 361, 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 lead.--

Sheet lead shall be not less than 1.6 mm thick, made from chemical lead, conforming to ASTM Designation: B 29.

##### 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.

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.

## **12-7.06 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 as shown on the plans.

**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.

## 12-7.07 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.

#### **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.

#### **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.

**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 POWER OPERATED ROLL-UP STEEL DOOR**

**GENERAL.**--This work shall consist of furnishing and installing electric motor operated, insulated roll-up door in accordance with the details shown on the plans and these special provisions.

**SUBMITTALS.**--Manufacturer's descriptive data, materials list, working drawings and installation instructions shall be submitted for approval.

Manufacturer's descriptive data shall show manufacturer's name and conformance to these special provisions for door panel construction and material thickness, curtain guide size and material thickness, counterbalance spring service life, and motor operator specifications.

Materials list shall contain all items proposed to be furnished and installed under this section of these special provisions.

### **PRODUCT.--**

#### **Curtain.--**

Curtain shall be interlocking flat faced sheet steel slats; sectional dimensions shall be 38 mm to 76 mm in height and 13 mm to 22 mm in depth. Sheet steel shall be galvanized and not less than 0.91 mm (20 gage) thickness. Both ends of alternate slats shall be fitted with endlocks. The bottom of the curtain shall be reinforced with two steel angles and provided with a pressure sensitive bottom edge. Angles shall be not less than 3.175 mm thick.

#### **Curtain guides.--**

Curtain guides shall be fabricated from channels and angles of galvanized steel bolted together with 10 mm diameter bolts at 762 mm maximum spacing. All mounting holes in wall angle shall be slotted to allow for heat expansion.

#### **Brackets.--**

Bracket shall be constructed of heavy steel plate and reinforced to carry full door weight, roller shaft, hood, curtain and the motorized operator. Sealed ball bearings shall be furnished at all rotating support points. Bracket shall be attached to guide wall angle with a minimum of three 13 mm diameter bolts.

#### **Roller shaft.--**

Steel pipe or welded type with internal counterbalancing spring and sized to prevent distortion of the slats and deflection greater than 0.762 mm per 0.3048 m of span. Journal shall be fitted with self-lubricating bronze bearings of permanently lubricated shielded or sealed ball bearings.

#### **Counterbalancing spring.--**

Oil-tempered, helical torsion springs spring sized to provide sufficient torque for easy operation of curtain from any position. Spring tension shall be adjustable from outside without removing the hood or skirting. Spring shall be rated for a minimum of 10,000 cycle service life.

#### **Manual curtain operator.--**

Manually operated, continuous chain driven mechanism with machine cut gears. Galvanized chain shall extend to within approximately 610 mm of floor and be provided with a hand-chain keeper.

#### **Hood.--**

Hood shall be fabricated of galvanized sheet steel formed to fit the contour of the brackets and shall be not less than 0.76 mm (22-gage) nominal thickness, reinforced to prevent bending or sagging and to provide a rigid, quiet and vibrationless installation.

#### **Motor.--**

Instantly reversing type, single-phase, 240-volt minimum 0.37 kilowatt induction motor of size and type recommended by the door manufacturer to adequately power the unit for proper operation of the door. Motor shall be equipped with a nonfusible, combination reversible type line voltage starter in a NEMA type I enclosure. Starter shall have double break silver contacts and one bi-metallic thermal overloads unless protection is provided in the motor.

**Reversing door edge.--**

A safety device extending across the full width at the bottom of the door which will cause the door to stop automatically and return to open position upon contact with any obstruction.

**Controls.--**

Limit switches, remote control panel (3-button) control, and solenoid operated brake.

**EXECUTION.--**

The power operated roll-up steel door and accessories shall be installed in accordance with the manufacturer's instructions and shall operate freely without binding.

Curtain guides shall be secured, reinforced, braced and supported as necessary to prevent swaying and vibration of the door. Door control panel shall be located approximately 1219 mm above the floor at a convenient location on the interior wall adjacent to the roll-up door as shown on the plans. Conduit and wiring of adequate size shall be installed between the door control panel and the associated overhead door junction box.

Door shall be locked with an automatic brake and a hand-chain keeper. Locking device shall be installed on the inside of the door.

**FINISH.--**

Door curtain shall have one coat of factory applied baked on polyester primer and all other galvanized parts of the door shall have one coat of factory applied rust inhibitive primer. Final finish shall be field applied in accordance with the requirements specified under "Painting," in Section 12-9, of these special provisions.

**12-8.03 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.

**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 26D metal plated finish.

**KEYING INSTRUCTIONS.—**

New locks shall be compatible with the master key system of the existing facility and shall be keyed to the existing lock system in use.

Locks and cylinders shall be provided with seven pin "O" cylinders and blank keys. Cylinders and blank keys shall be delivered to the Engineer for combining of cylinders and cutting of keys.

The Contractor shall provide cylinders for use during construction. Construction cylinders shall remain in place until permanent cylinders are installed. Construction cylinders shall remain the property of the Contractor.

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.	

**Mortise locksets, latchsets and privacy sets.--**

Mortise locksets, latchsets and privacy sets shall be steel case with 32 mm x 203 mm face plate and 70 mm backset. Door and frame preparation for mortise locksets, latchset and privacy sets shall conform to ANSI A115.1.

Lever operated lockset shall be:

Best	35H 6FW 15H
Falcon	LM521 DG
Schlage	L9453P x 06
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	85001
Dorma	7800
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	37
Quality	48
Trimco	6000
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.	

**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. Door pulls shall be centered 1118 mm from the finished floor. Locksets 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 3.9 kg maximum for exterior doors and 2.7 kg 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 6.8 kg maximum.

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 lever operated mortise lockset  
1 each door closer  
1 each kick plate  
1 each frame with weatherstripping  
1 each wall mounted door stop  
1 each door bottom with aluminum drip  
1 each threshold

## **SECTION 12-9. FINISHES**

### **12-9.01 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.

**WOOD.**--Oil and grease shall be removed by solvent wash. Mildew shall be removed by mildew wash. Surfaces to be coated shall be cleaned of all dirt, excess material, or filler by hand cleaning. Smooth surfaced wood shall be sanded lightly.

A sealer composed of equal parts of shellac and alcohol shall be spot applied to knots, sap, pitch, tar, creosote, and other bleeding substances.

After the application of the prime coat, all nail holes, cracks, open joints, dents, scars, and surface irregularities shall be filled, hand cleaned, and spot primed to provide smooth surfaces for the application of finish coats.

Irregularities in wood surfaces to receive a transparent stain finish shall be filled and hand cleaned after the first coat of stain has been applied. The color of the filler shall match the color of the stained wood.

Irregularities in wood surfaces to receive a clear finish shall be filled and hand cleaned before the application of coatings. The color of the filler shall match the color of the coated wood.

**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.

**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.

**CONCRETE UNIT MASONRY.**--New material shall be cured a minimum of 14 days before coating. Surface dirt and dust shall be removed by brooming, air blast, or vacuum cleaner. Oil and grease shall be removed by steam cleaning. Form release agents, weak concrete, surface laitance, dirt, and other deleterious material shall be removed by sandblasting. Cracks and voids shall be filled with cement mortar patching material.

### **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.

**ABRASIVE BLASTING.**--Removal of oil, grease, form release agents, paint, dirt, rust, mill scale, efflorescence, weak concrete, or laitance, by the use of airborne abrasives, and removal of loose particles, dust, and abrasives by blasting with clean air.

Abrasives shall be limited to clean dry sand, mineral grit, steel grit, or steel shot, and shall be graded to produce satisfactory results. Unwashed beach sand containing salt or silt shall not be used.

Abrasive blasting shall conform to the requirements of SSPC-SP6-85, Commercial Blast Cleaning, as defined in the Steel Structures Painting Council Manual.

Light abrasive blasting shall conform to the requirements of SSPC-SP7-85, Brush-Off Blast Cleaning, as defined in the Steel Structures Painting Council Manual.

**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.

**TSP WASH.--**Removal of oil, grease, dirt, paint gloss, and other foreign matter by scrubbing with a solution of trisodium phosphate and warm water, and removal of all solution and residues with clean water.

**WATER BLASTING.--**High pressure, low volume water stream for removing dirt, light scale, chalking or peeling paint. Water blasting equipment shall produce not less than a 13 800 MPa minimum output pressure when used. Heated water shall not exceed 66°C. If a detergent solution is used, it shall be biodegradable and shall be removed from all surfaces 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- SHOP PRIMED STEEL.--**

1 prime coat : red oxide ferrous metal primer  
2 finish coats: alkyd, exterior enamel, semi-gloss

**SYSTEM 4- STEEL AND OTHER FERROUS METALS.--**

2 prime coats: red oxide ferrous metal primer  
2 finish coats: alkyd, exterior enamel, semi-gloss

**SYSTEM 5- CONCRETE UNIT MASONRY.--**

1 pretreat coat: block filler  
1 prime coat: concrete and masonry primer  
2 finish coats: acrylic, exterior enamel, semi-gloss

**SYSTEM 6- WOOD, PAINTED.--**

1 prime coat: alkyd, exterior wood primer  
2 finish coats: acrylic, exterior enamel, semi-gloss

**COLOR SCHEDULE.--**Colors shall be as shown on the plans.

**SECTION 12-10. SPECIAL CONSTRUCTION**

**12-10.01 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.

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.

## **12-10.02 METAL SIGNS**

**GENERAL.--**This work shall consist of furnishing and installing metal signs in accordance with the details shown on the plans and these special provisions.

**SUBMITTALS.--**Manufacturer's descriptive data, colors, graphics and fastening details shall be submitted for approval.

### **PRODUCTS.--**

#### **Signs.--**

Signs shall be sheet steel, not less than 1.22 mm thick (18-gage) with a baked-on enamel coating.

#### **Fasteners.--**

Fasteners shall be as recommended by the sign manufacturer.

**EXECUTION.--**Sign inscriptions shall read as shown on the plans.

Each sign shall be located as shown on the plans and shall be fastened in place with a minimum of 4 fasteners for each sign.

## **SECTION 12-11. EQUIPMENT**

### **12-11.01 HIGH PRESSURE WASHER (STATIONARY)**

#### **PART 1.- GENERAL**

##### **SUMMARY.--**

**Scope.--**This work shall consist of furnishing and installing a stationary high pressure washer and accessories in accordance with the details shown on the plans and these special provisions.

LPG gas piping and water piping shall be furnished and installed in accordance with the requirements specified under "Pipe, Fittings and Valves" in Section 12-15, "Mechanical," of these special provisions.

##### **SUBMITTALS.--**

**Product data.--**Manufacturer's descriptive data for high pressure washer 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**

### **MANUFACTURERS.--**

**Acceptable manufacturers.--**Subject to compliance with the requirements, products shall be Epps; Whitco; or equal.

### **MANUFACTURED UNITS.--**

#### **High pressure washer.--**

High pressure washer shall be stationary type, electric motor driven (208/220 volt AC, 3 phase), LPG, minimum 80 percent efficient, automatic operating type washer designed for continuous operation. The washer shall have a capacity of 38 liters per minute of hot water solution heated to 27°C at 13 800 kPa. Unit shall be rated for not less than 11 kilowatt. The washer burner shall be natural draft, with automatic electric ignition and flame monitoring system. Heater unit shall be factor preset to operate between 15.5°C and 27°C. The heating coil shall have an inside diameter of not less than 12 mm. The unit shall be completely housed in a steel cabinet with parts shielded from spray or splash.

Washer unit shall be equipped with a remote on/off pump motor and washer heater switch control panel. All controls including remote operator shall be 24-volt AC. Unit shall have a timer automatic shutdown system preset for two minutes.

The control panel shall display temperature and pressure gauges and shall mount the motor starter and the power disconnect breaker.

The unit shall be equipped with safety controls, safety valve, vent stack and the following accessories: 864 mm heavy duty dual lance wand with trigger control; 12.7 mm diameter by 15 meters in length, high pressure hose with 2 swivel ends rated for 24 100 kPa at 121°C; spray nozzles to allow flat, round and wide angle spray patterns at full flow at 13 800 kPa and full flow at 6 900 kPa (total 6); and a wall mounted hose reel and gun rack.

### **ACCESSORIES.--**

#### **Drum dolly.--**

Drum dolly shall have welded steel construction with a cross braced bottom and a 50 mm continuous perimeter lip, 4 ball bearing casters with steel or semi-steel wheels. Drum dolly shall be sized to match the liquid detergent drum with a minimum capacity of 450 kg.

#### **Vent stack.--**

Vent stack shall be listed Class B. Vent stack shall include back draft diverter, fire stop spacer, ventilating thimble with drip cap and listed vent cap.

#### **Hose and gun reel.--**

Hose and gun reel shall be heavy duty assembly of steel construction with connecting hose, locking automatic ratchet, guide rollers and heavy duty spring activated hose pickup. Hose and gun reel shall have bushings, swivels, ball stops, and sized for a 15 m delivery hose. The reel shall have a baked enamel finish. Manufacturers reel mounting brackets shall be supplied with reel.

#### **Soap/water mixing meter.--**

The soap/water mixing meter shall be wall mounted, have a blend center consisting of; siphon breaker; kick-off spring; stainless steel enclosure; vinyl tubing; proportioner; ceramic weight; pipe plug; magnetic housing; push button; spring; spacer; plunger valve body; pipe to garden hose adapter; foot valve; inlet screen; and meter tip kit.

#### **Non-emulsifying soap.--**

Non-emulsifying soap shall be a commercially formulated, concentrated liquid that removes surface dirt, road film, and bug residue from vehicle exteriors with minimal brushing when used in conjunction with a high pressure washer. The soap shall contain no solvents, caustics, acids or phosphates. It shall work with hot or cold water, rinse easily and leave no unsightly soap film or streaks. A drum containing 208 liters of the product shall be supplied by,

or approved by the manufacturer of the recycle process unitsystem specified elsewhere in these special provisions. Product shall conform to the following:

Boiling point	>100°C
Specific Gravity	1.102
Solubility in water	100%
Evaporation rate	>1
pH	11-12

**Expansion anchors.--**

Expansion anchors shall be ICBO approved, integral stud type or internally threaded type with independent stud complete with hex nut and cut washer.

**PART 3.- EXECUTION**

**INSTALLATION.--**

**General.--**The high pressure washer shall be installed in accordance with the manufacturer's recommendations.

Hose and gun brackets shall be installed on the wall to hold both the hot water hose and the gun with extension. Location shall be approved by the Engineer. Hose brackets shall be attached to the wall with lag screws or expansion anchors.

Hose and gun reel assembly shall be attached to the wall with 6 mm (minimum) stud type expansion anchors. If hose and gun reel does not include brackets for the gun nozzle, wall brackets shall be installed at the Contractor's expense.

Factory fittings for mixing meter shall be installed on the 208 liter drum of non-emulsified soap and placed on the drum dolly. Soap and dolly shall be ready for use and placed in the equipment building or other location as designated by the Engineer.

**FIELD QUALITY CONTROL.--**

**Testing.--**Testing of the high pressure washer 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.

**12-11.02 RECYCLE PROCESS UNIT**

**PART 1.-GENERAL**

**SUMMARY**

**Scope.--**This work shall consist of furnishing and installing a wash water recycle process unit (RPU) and appurtenances in accordance with the details shown on the plans and these special provisions.

Recycle process unit and appurtenances shall include products and other fittings and appurtenances, not mentioned, which are required for the complete installation and proper operation of the system.

Earthwork for installation of pipes, manholes, cleanouts and other appurtenances shall be as specified under "Earthwork for Building Work," in Section 12-2, "Sitework," of these special provisions.

Concrete and reinforcement shall conform to the requirements specified under "Cast-in-place Concrete," in Section 12-3, "Concrete and Reinforcement," of these special provisions.

Recycle process unit and appurtenances which are required for the complete installation and proper operation of the system shall conform to the requirements specified under "Wash Water System," in Section 12-2, "Sitework," of these special provisions.

**SUBMITTALS.—**

**Working drawings and seismic design.--**Working drawing and seismic design calculations for the recycle process unit and the water storage tank shall be submitted for approval. Working drawings for the storage tank shall include location and type of penetration fittings installed by the tank manufacturer. The drawing and 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.

Control panel component layout, catalogue cuts of all the components to be incorporated in the control panel, schematic diagram, and wiring diagram shall be submitted for approval prior to fabrication of the control panel. All control and power conductors shall be identified with wire numbers on the submittals.

**Product data.**--Materials list for the recycle process unit and all components 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.

The required data and catalog cuts shall be submitted for the following:

Recycle Process Unit and Components

#### **OPERATION AND MAINTENANCE MANUALS.—**

**Operation and maintenance manuals.**--Prior to the completion of the contract, 3 identical 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 instruction 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.

#### **WARRANTIES AND GUARANTEES.—**

**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. Manufacturer's warranties and guarantees shall be a minimum of one year from start up and shall be in a bound manual form.

#### **QUALITY ASSURANCE.--**

**Codes and standards.**--Work shall conform to the applicable portions of the current approved Uniform Plumbing Code as amended by the applicable portions of current approved Title 24 California Building Standards Code, pertaining to the selection and installation of recycle process unit system materials and products.

In addition, all electrical work shall conform to the requirement specified in Section 12-16, "Electrical," of these special provisions.

**Certificates of Compliance.**--Certificates of compliance shall be furnished for process unit in accordance with the requirements specified in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications.

### **PART 2.- PRODUCTS**

#### **Recycle Process Unit, (RPU)**

The RPU shall be a pre-assembled, skid mounted, packaged system. The RPU shall be closed-loop, zero discharge, recycle system and process wash water at a minimum rate of 57 liters per minute on a continuous basis.

The RPU shall remove: free floating oils, not chemically emulsified; dissolved and settle-able solids from oil water mixtures; free oil droplets, 10 microns and greater; and total petroleum hydrocarbons-diesel (TPH-D) down to an effluent concentration not to exceed 0.5 milligrams per liter, when tested in accordance with EPA Test Method TPH-D with inlet conditions of: 57 liters per minute TPH-D concentration of greater than or equal to 10.0 milligrams per liter.

The RPU's oil water separating, coalescing, settling and filter bag tanks shall be constructed of Type 316 stainless steel or thermo-welded polypropylene (minimum 12 mm thickness) with stainless steel hinges, nuts, bolts, and fasteners. Interior and exterior steel surfaces, including frame assembly, shall be sandblasted prior to application of one coat epoxy primer and two topcoats of epoxy coating.

The RPU shall operate on an automatic basis, including processing wash water, backflushing filters, fresh water make-up, low water shut off and pressurization of the recycled water for use at the outlets and pressure washer.

The RPU shall include:

1. Lift pump with piping and components. The lift station pump shall be submersible type and shall be suitable for Class 1, Division 1 locations and shall be constructed of 316 stainless steel, a 316 stainless steel shaft, with Viton o-rings and mechanical seal and polyamide impeller. Pump shall be capable of pumping 40-mm solids. The oil-filled motor shall have built in thermal protection. All piping and accessories shall be included as shown on the plans.
2. Oil-water-solids separation chamber. Chamber shall be a V-bottom tank area with a minimum of three cells operating by gravity flow. Oil separation chamber shall contain a minimum of 74 square meters (equivalent surface area) of non-corrosive removable, oleophilic, incline plate coalescer packs or oil coalescing biospheres and an adjustable height oil skimmer. Each cell and oil skimmer shall have a drain ball valve discharging through separate bag filters as shown on the plans. One set of replacement bag filters shall be supplied.
3. Filtration system. The filtration system shall consist of a multimedia filter and an ion charged filter. Filter housings shall be manufactured of polyglass with a pressure rating of 1035 kPa at 49 degrees Celsius. Size shall be as shown on the plans.

Multimedia material shall consist of four layers of filtration material, one of gravel bed material and three layers of garnet of different mesh size.

Ion material shall consist of a mixture of active absorbent material and anthracite media.

Both filters shall be controlled by separate flow controllers, specially designed for commercial applications and shall allow flow rates of up to 100 liters per minute. An adjustable 24-hour timer shall automatically initiate the backflush cycle.

Transfer pump shall be a close-coupled bronze fitted, single stage horizontal centrifugal pump with mechanical seal and all or roller bearings. Pump case shall be close-grained, high strength, cast iron with bronze wear rings. Pump shaft shall be stainless steel. Impellers shall be bronze.

A flow regulator shall be installed to restrict flows through the filters to 57 liters per minute.

Pump shall be capable of pumping water as required by the RPU system and shall not load motor beyond the nameplate rating. Kilowatt rating, voltage, phase and RPM shall be as shown on the plans.

4. Storage tank. Storage tank shall be constructed of polyethylene with a fiberglass casing. Size shall be as shown on the plans. Tank shall be equipped with the following: seismic tie down anchors; removable lid; clear PVC site gauge, connected to the tank with unions and ball valves; and two float switches.
5. Ozone system. The ozone system shall include an ozone generator, ozone pump and adjustable timer. The ozone generator shall produce a minimum of one (1) gram of ozone per hour. Ozone pump shall be similar to "Transfer Pump" specified in "Filtration System" above. Timer shall be a 24-hour adjustable (15-minute minimum incremental) timer.

Ozone system shall circulate water from the storage tank to the first cell of the oil-water-separation chamber.

6. Pressurization system. Pressurization system shall include a booster pump, pressure tank and pressure switch. Booster pump shall be similar to "Transfer Pump" specified in "Filtration System" above. The pressure tank shall be a minimum 53-liter pre-charged bladder tank. The pressure switch shall be preset to energize the booster pump when the pressure drops to 210 kPa and de-energize the pump when the a pressure of 345 kPa is reached.
7. Control panel. The control panel shall contain the appropriate controls for all RPU functions. Control panel shall utilize power relays, general purpose relays, time delay relays, timers, main breaker, lift pump circuit breaker, control circuit breaker, and other circuit breakers where required, hand/auto switches for all RPU components, run light with direct incandescent replacement LED lamp, and hour meter for each pump and shall be housed in a NEMA 3 enclosure. All control and power wiring shall be properly labeled and numbered.

Control panel shall incorporate intrinsically safe circuitry (suitable for Class 1, Division 1 locations) for detecting water level in the lift pump sump. Intrinsically safe circuitry shall be housed in a separate compartment with metal barriers to separate low voltage from high voltages within the control panel. Metal barriers shall extend all the way from back mounting panel to the interior hinged door.

The enclosure shall be factory pre-wired in conformance with NEMA Class IIC wiring. All wiring entering or leaving the enclosure shall terminate on terminal blocks. All interior control wiring shall be 19-strand No. 14 type MTW. Wiring shall be neatly trained and bundled, and wiring trough shall be provided in the enclosure. 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 minimum of 150 mm empty space shall be provided at the bottom of the panel for bundling field conductors and terminating field conduits. A wiring diagram encased between heat-fused laminated plastic sheets shall be provided with brass mounting bolts and attached to the inside of the panel.

8. Make up water and low level cutoff systems. Make up water system shall include the float switch as specified under "Storage tank" above and a solenoid valve. The make-up water system shall be designed to maintain the water level in the storage tank at the levels shown on the plans. The low-level cutoff system shall be able to shut off the RPU when the water level in the tank drops to the level shown on the plans. The system shall reenergize when the low level float switch is de-energized. In addition, an alarm light on the exterior of the building shall be energized only when the cutoff system is engaged. The make up water and low level alarm systems shall work independently.
9. Miscellaneous equipment. The following miscellaneous equipment shall be furnished and installed with the RPU: all valve seals shall be Viton material; all solenoid valves shall be continuous duty cycle rated; all piping shall be PVC Schedule 80 conforming to ASTM Designation: D1785; all pressure gauges shall be glycerin filled with a 63.5 mm dial face and rated from 0 to 690 kPa; and all equipment and components shall be identified with names plates.

#### **Float switches.--**

Float switches shall be wide-angle float switches. Float switches shall have one double-pole, double throw (DPDT) contact rated 120-volt, 10-ampere minimum. The contact shall be in an inert synthetic casing with external weight complete with cable fasteners and PVC jacketed cable of sufficient length.

#### **Sight gauge tubing and fittings**

Sight gauge tubing and fittings shall be transparent in color polyvinyl chloride (PVC), superior resistance to fuel, oils and solvents and pressure rated to 515 kPa. Sight gauge tubing and fittings shall be supplied watertight from the manufacturer.

#### **Nameplates.--**

Nameplates shall be phenolic, plastic, or similar material, black background; with white lettering, letter height shall be 9± mm minimum. Other Color and lettering style shall be submitted to the Engineer for approval.

### **PART 3.- EXECUTION**

#### **INSTALLATION OF RECYCLE PROCESS UNIT.--**

**General.--**Manufactured recycle process unit system and appurtenances shall be installed in accordance with the plans, these specifications, codes and standards and the manufacturer's recommendations where applicable, as approved by the Engineer. Piping from recycle process unit and appurtenances shall be installed watertight.

All components, including valves, electrical equipment and piping, shall be identified with nameplates. Nameplates shall be attached to the mounting surface with self tapping cadmium plated screws.

#### **INSTALLATION OF CONTROL PANEL.--**

**General.--**Recycle process unit control panel shall be mounted on the RPU with proper working clearances in front of and around the electrical equipment. Only the low voltage conduit with float switch conductors shall be terminated in the intrinsically safe compartment. All other conduits shall be terminated elsewhere in the control panel as required.

All control devices/ appurtenances shall be identified with nameplates. Nameplates shall be attached to the mounting surface with self tapping cadmium plated screws.

#### **INSTALLATION OF WASH WATER STORAGE TANK.--**

**General.--**The wash water storage tank shall be installed in accordance with the plans, the manufacturer's recommendations where applicable and the most recent Uniform Building Code. Penetrations of the water tank for connection of piping or fittings shall be watertight.

#### **INSTALLATION OF SIGHT GAUGE TUBING AND FITTINGS.--**

**General.--**The sight gauge shall be installed on the wash water storage tank in accordance with the plans, these specifications, the tank manufacturer's recommendation and sight gauge manufacturer's recommendations where applicable. The connections to the wash water storage tank and the sight gauge tubing and fittings shall be watertight.

#### **FIELD QUALITY CONTROL.--**

**Testing.--**The recycle process unit shall be tested for leakage by filling the tank and the oil-water-solids separation chamber with water to the level of the outflow line for a period of 24 hours. All seams and joints shall be left exposed for inspection purposes. The tank shall remain watertight. Repairs, if necessary, shall be made at the Contractor's expense.

The recycle process unit system, including lift station, shall be operated continuously for 8 hours on 3 consecutive days. Water shall be introduced onto the wash rack at approximately 35 Liters per minute for 30 minutes of each hour. System shall show no signs of leakage or backup. . Repairs, if necessary, shall be made at the Contractor's expense.

**Training.--** A two hour operational and maintenance demonstration shall be conducted by the RPU manufacturer's representative. The Engineer shall be given a 5-day notice prior to the demonstration.

### **SECTION 12-12. THROUGH 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, 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:

- LPG pressure regulator
- Motorized damper
- Exhaust fan
- Emergency shower and eyewash
- Thermostat
- LPG valve
- Pumps
- Heat exchange
- Expansion tank
- Tempering valve
- Air separator
- Hydronic heating tubing
- Chemical feeder
- Pressure gages
- Thermometers
- Flow meters

#### **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:

- Fan
- Pumps
- Thermostat
- Tempering valve
- Chemical feeder

#### **QUALITY ASSURANCE.--**

**Codes and standards.--**Mechanical work, including equipment, materials and installation, shall conform to the California Building Standards Code, Title 24, 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.

#### **SYSTEM IDENTIFICATION.--**

**Piping, ducts, valves and equipment.--**Identification of piping, ducts, valves and equipment shall be as shown on the plans or these special provisions:

**Above ground piping and ducts.--**Markers shall be provided on lines which are either exposed or concealed in accessible spaces. For piping systems, except drain and vent lines, indicate the fluid conveyed or its abbreviation; either by preprinted markers or stenciled markings, and include arrows to show the direction of flow. Colors shall comply with ANSI Standard: A13.1. Locate markers at ends of lines, near major branches and other interruptions including equipment in the line, where lines pass through penetrations in floors, walls or ceilings or otherwise pass into inaccessible spaces, and at 50-foot maximum intervals along exposed portions of the lines. Marking of short branches and repetitive branches for equipment connections is not required.

**Equipment.**--All equipment shall be identified with a plastic laminated, engraved nameplate which bears the unit mark number as indicated on the drawings (for example, AC-4). Provide 1/2 inch high lettering, white on black background. Nameplates shall be permanently secured to the unit.

## **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 latest edition of the Uniform Plumbing Code, the manufacturer's recommendations and the requirements specified herein.

### **PART 2.- PRODUCTS**

#### **MATERIALS.--**

#### **PIPE AND FITTINGS --**

<b>Class</b>	<b>Description</b>
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##### **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.

##### **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.

##### **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.

##### **P7.--**

Cross-linked Polyethylene tube (PEX) with oxygen barrier, conforming to ASTM Designation: F876/F877 and International Standard 9001. Tubing shall be flexible thermoplastic type rated for 690 kPa working pressure at 82°C. Tube shall have a 25 year warranty.

**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.

**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.

**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 (40 mm and smaller).--**

Check valve (40 mm and smaller) shall be silent spring loaded type, threaded bronze body, nylon or teflon disc, beryllium or stainless steel helical spring and shaft, Class 125 and same size as pipe in which installed. Check valve shall be Nibco/Scott, T-480; CPV, 36; Kitz, 26; 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.

**MISCELLANEOUS ITEMS.--****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.

**Wye strainer.--**

Wye strainer shall be wye pattern, cast iron body and Type 304 stainless steel or monel strainer screen. The strainer screen shall have an open area equal to at least 3 times the cross sectional area of the pipe in which it is installed and shall be woven wire fabric with 20 mesh or perforated sheet with 850 micron maximum diameter holes.

**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 clamps shall be installed with insulation to allow for thermal expansion.

**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.

**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 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 for each head, 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, 8300; Speakman, SE-607; Western, 9221; or equal.

**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 underground within 1.5 m of the building	A1 or H2
Hydronic piping (except in slab)	H2
Hydronic floor tubing in slab	P7
Liquefied petroleum gas (LPG), 860 kPa or less, above ground	A1 or B2
LPG, 860 kPa or less, underground	B2 (plastic coated)

**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.

Warehouse rooms, equipment bays, and loft areas 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.

Piping and tubing for hydronic heating shall be installed in accordance with the requirements specified under "Hydronic Heating System," elsewhere in this Section 12-15.

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. Underground piping shall be buried 900 mm minimum depth.

Gas piping shall be pitched to equipment or to low point and provided with a 200 mm minimum dirt leg.

**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.

**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. 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

**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.

**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.

**Insulating union and insulating connection.--**Insulating union and insulating connection shall be provided where shown and at the following locations:

1. In metallic water and gas 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 and gas service connections in ground at point where new metallic pipes connect to existing metallic pipes. Install valve box above insulating connection.

**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 National Electrical Code. Bonding shall all be coordinated with electrical work.

#### **INSTALLATION OF VALVES.--**

**Pressure reducing valve.--**A capped tee connection and strainer shall be installed ahead of the pressure reducing valve.

**Exterior valves.--**Exterior valves located underground shall be installed in valve boxes.

#### **INSTALLATION OF MISCELLANEOUS ITEMS.--**

**Gas appliance connection.--**Gas valve and flexible connector shall be provided for gas piping at each appliance. 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.

**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.

**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
Water	860 kPa	Water
Gas	690 kPa	Air

During testing of water systems, valves shall be closed and pipeline filled with water. Provisions shall be made for release of air.

**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 hydronic supply and return piping, above and below grade unless shown otherwise on the plans.

**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.

## **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.

### **Domestic water and interior hydronic piping insulation.--**

Piping insulation shall be glass fiber molded pipe insulation with factory applied jacket suitable for service temperatures up to 175°C. Covering jacket shall have pressure sealing lap adhesive joints. Pipe insulation shall have a minimum thermal resistance of  $R-0.5 \text{ K}\cdot\text{m}^2/\text{W}$ . Insulation and jackets shall be Owens-Corning, Fiberglass 25 with ASJ/SSL All Service Jacket; Manville, Micro-Lok 650ML with AP-T All Purpose Jacket; or equal.

### **Piping insulation cement.--**

Insulation cement shall be Fenco, All Purpose Cement; Manville, JM375; or equal.

### **Exterior and in ground hydronic 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.

## **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. 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.

## 12-15.04 HEATING, VENTILATING AND AIR CONDITIONING EQUIPMENT AND SYSTEMS

### PART 1.- GENERAL

**Scope.--**This work shall consist of furnishing, installing and testing heating, ventilating equipment and systems in accordance with the details shown on the plans and these special provisions.

The performance rating and electric service of the ventilating equipment shall be as shown on the plans.

**Temperature controls.--**Thermostats, relays, 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

#### FANS AND VENTILATORS.--

##### Exhaust fan (wall mounted)--

Exhaust fan shall be wall mounted, AMCA certified and shall be equipped with grille, metal housing, backdraft damper, centrifugal fan wheel and bird screen. Fan motor and fan assembly shall be isolated from base with rubber vibration isolators. Fan shall be completely weatherproof and shall have a disconnect means under the hood and fan motor shall have integral thermal overload protection. Wall exhaust fan shall be Jenn-Air; Carnes; EWDA; Penn; or equal.

#### HVAC CONTROLS.--

##### Hydronic heating thermostat.--

Hydronic heating thermostat shall be low voltage type, single set point range internally adjustable from 4°C to 27C. Thermostat shall be insulated from outside wall.

#### 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.

##### Duct supports.--

Duct supports shall be hot-dip galvanized steel.

##### Motorized damper.--

Motorized damper shall be low leakage, parallel blade type with 1.52 mm (16-gage) minimum galvanized steel frame, heavy dual wall extruded aluminum blades and 115-volt electric motor. The damper shall open when the motor is energized, and spring-close when the motor is de-energized..

## **PART 3.- EXECUTION**

### **INSTALLATION.--**

#### **Ducts.--**

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 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.

All standing seams and transverse joints of ducts shall be sealed with sealant and taped.

### **FIELD QUALITY CONTROL.--**

**Pre-test requirements.--**Before starting or operating systems, equipment shall be cleaned and checked for proper installation, lubrication and servicing.

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.

**Project completion tests.--**The Engineer shall be notified at least 3 working days in advance of starting project completion tests.

Upon completion of mechanical work and pre-test requirements, or at such time prior to completion as determined by the Engineer, the Contractor shall operate and test installed mechanical systems for at least 3 consecutive 8-hour days to demonstrate satisfactory overall operation.

## **12-15.05 HYDRONIC HEATING SYSTEM**

### **PART 1.- GENERAL**

#### **SUMMARY.--**

**Scope.--**This work shall consist of furnishing, installing and testing a hydronic heating system in accordance with details shown on the plans and these special provisions.

Piping and tubing for hydronic heating shall conform to the requirements in "Pipe, Fittings, and Valves," elsewhere in this Section 12-15.

Thermostats, relays, time 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.

#### **QUALITY ASSURANCE.--**

**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.

## **PART 2.- PRODUCTS**

### **COMPONENTS.-**

#### **Pumps.--**

Pumps shall be close coupled type with non-overloading characteristics. Pumps shall not overload the motor above its horsepower rating under any operating conditions with the ratings based on continuous operation. Motor sizes shown are estimated minimum requirements and larger motors shall be furnished if necessary to meet non-overloading requirements. Motors shall have built-in overcurrent protection.

Pump material shall be compatible with the working fluid, and shall be sized to meet the operating requirements specified.

Pumps shall not be connected to the piping before the piping is thoroughly flushed and cleaned of dirt and grit. After the connections have been made, the system shall be filled before starting the pumps. Pumps shall not be run dry under any circumstances.

Piping shall be supported from the building structure to prevent strain on the pump casings. A final check for alignment of the piping connections shall be made after the pump has been secured.

Pumps shall be Grundfos, Bell and Gosset, or equal. Pumps shall be designed especially for these type of installations. Each pump shall have a cast iron case, bronze impeller, mechanical seal, flexible coupling and flanged connections to permit easy removal of the complete unit from the piping system.

#### **Chemical feeder.--**

Chemical feeder shall be bypass feeder, pot type with 3.79 L minimum capacity. Feeder shall be provided with union and ball valve on both the supply and return lines, configured as recommended by the manufacturer.

#### **Heat exchanger.--**

Heat exchanger shall be counterflow, plate type with channel, cover plates and connection fittings constructed of Type 316 stainless steel. The heat exchanger shall be rated for a working pressure 550 kPa and rated for a temperature of at least 150°C.

#### **Expansion tank.--**

Expansion tank shall be of welded steel construction and shall be ASME inspected and stamped for 860 kPa working pressure. The tank shall be equipped with drain valve, air charging valve, and gauge glass. Expansion tank shall have the capacity shown on the plans.

#### **Gauge glass.--**

Gauge glass shall be 12 mm in size and of adequate length to indicate the entire contents of the tank. The gauge shall be an automatic type with drain cock and shall be valved top and bottom to allow changing the glass without draining the tank.

#### **Air separator.--**

Air separator shall be furnished and installed as shown on the plans and shall be rated for 70 liters per minute. Air separator shall be constructed for 860 kPa working pressure and comply with ASME boiler and pressure vessel code. Air separator shall be Amtrol, Bell & Gossett, or equal.

#### **Balance valves.--**

Balance valves shall be as specified for "ball valve" elsewhere in these special provisions. Valves shall have removable handles.

#### **Flow meter.--**

Flow meter shall be in-line, direct reading, see-through type, rated for 82°C temperature and 860 kPa working pressure with accuracy to within 2 percent of full scale reading.

Flow meter on pump discharge shall have a maximum scale range of 70 liters per minute (LPM).

Flow meter shall be Blue-White Industries, Hedland Products, Letro Thermometer Incorporated; or equal.

**Tempering valve.--**

Tempering valve shall be self-actuated, rated at 860 kPa working pressure at 93°C with wrench operated adjustable temperature range set for an outlet temperature as shown on the plans, rough bronze construction and bronze trim with union angle strainer and check stops on inlet. Pressure drop across the valve shall be a maximum of 10 kPa at 76 LPM. Valve shall be both temperature and pressure compensating.

**Thermometer.--**

Thermometer shall be liquid dial type, minimum 125 mm diameter, with 1°C graduations and a temperature range that includes 0°C and 80°C.

Accuracy shall be within  $\pm$  one percent.

Thermometer shall be provided with extension neck or stem such that the thermometer face is above the surface of insulation or other materials.

Liquid thermometer shall be designed for and be installed in a thermowell which projects into the flow stream and is completely immersed in liquid. The thermowell shall prevent system fluid loss when the thermometer is removed. Pipe size shall be increased at the thermowell where necessary to allow for full flow without excessive resistance.

**Pressure gage.--**

Pressure gage shall be ANSI Standard: B40.1, Grade A, 110 mm minimum diameter dial, liquid filled with cover, plain case, reset screw, 7 mm bottom inlet. Gage shall read from 0 kPa to 210 kPa. Each pressure gage shall be equipped with a gage cock.

**Gage cock.--**

Gage cock shall be 7 mm, brass or bronze, 1040 kPa rated with female and male threaded ends, and tee handle. Gage cock shall be installed at each pressure gauge.

**Air vent valve.--**

Air vent valve shall consist of ball valves and copper tubing connected to the top of all high points in the hot water system. Tubing shall be 7 mm and shall extend down to easily accessible 7 mm globe valves mounted approximately 1.5 m above the floor. The 7 mm tubing shall discharge to the building floor and shall terminate 150 mm above finish floor.

**Radiant heating manifold.--**

Radiant heating manifold shall be bronze construction, complete with throttling valves and tubing connections.

**PART 3.- EXECUTION**

**INSTALLATION.--**

**Installation of pipe and tubing.--**Installation of all heating water supply and return pipe and tubing shall conform to the requirements for cutting, cleaning, closing, securing and insulating of water piping as specified under "Pipe, Fittings, and Valves," and "Mechanical Insulation," elsewhere in this Section 12-15.

Heating water floor coil layout shall conform to the detail shown on the plans. The spacing between tubing runs shall be 229 mm on center. Vertical clearance from the surface of the slab to the tubing shall be as shown on the plans. The minimum radius for tubing bends shall be 160 mm.

Floor coil tubing shall be laid in continuous lengths with no splicing. Tubing shall be secured directly to the bar reinforcement using nylon ties located at 3 m intervals along straight runs, at the mid-point of each radius on bends and at other locations as directed by the Engineer.

The piping system in the floor slab shall be tested prior to placing concrete. The compressor, pump, gauges and other materials or equipment required for testing the piping systems shall be furnished and installed by the Contractor.

The piping shall be visually leak tested with water at 690 kPa for a minimum of 4 hours prior to the placement of the slab concrete. At the conclusion of the water testing, the floor slab concrete shall be placed. The water pressure shall be maintained in the piping system during the concrete placement operation. Leaks that develop shall be repaired immediately. The water pressure shall be released 2 hours after completion of the concrete placement and repressurization shall not take place until the concrete has attained sufficient strength to resist the piping expansion as determined by the Engineer.

The ends of the in-slab pipe risers shall remain capped and protected from damage. After the above slab portion of the supply and return piping has been installed and tested, both systems shall be flushed with clean, potable water and then connected.

The completed above and below slab systems shall be pressure tested with water at 690 kPa for 8 hours. The system shall show no loss in pressure. At the conclusion of the pressure test, the system shall be filled with a 50-50 solution of glycol and water.

The contractor shall be responsible for freeze protecting all piping prior to the completion of the hydronic system.

### **FIELD QUALITY CONTROL.--**

**Pre-test requirements.--**Before starting or operating systems, equipment and controls shall be cleaned and checked for proper installation and operation.

The pumping rate for each pump shall be adjusted to the value shown on the plans.

Balancing of the hydronic system shall be performed using throttling valves only. The return temperature at each manifold shall not vary by more than 3 degrees Celsius. A contact thermometer shall be used at each hydronic tube to show that the range from the hottest to the coldest individual tube does not exceed 3 degrees Celsius.

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 system shall be set and adjusted to deliver the required performance at temperatures specified by the Engineer. All control work shall be done in collaboration with the control manufacturer's representative.

**Acceptance testing.--**Prior to completion of hydronic system installation, and before permitting use of the system, the Contractor shall fire the boiler and demonstrate all operating and safety controls in the presence of the Engineer.

The Contractor shall notify the Engineer at least 3 working days in advance of the dates and times tests are to be performed.

Upon completion of mechanical work and pre-test requirements, or at such time prior to contract acceptance as determined by the Engineer, the Contractor shall operate and test the complete hydronic heating system for at least 5 consecutive 8-hour days to demonstrate satisfactory overall operation.

### **INSTRUCTION AND MAINTENANCE.--**

**Instruction.--**The Contractor shall instruct State personnel in the proper use, operations and daily maintenance of the hydronic heating system.

Immediately prior to substantial completion, the Contractor shall conduct a final inspection with State personnel present to determine that control systems and operating devices are operating properly.

**Project completion tests.--**The Engineer shall be notified at least 3 working days in advance of starting project completion tests.

During the test period the following data shall be measured and recorded twice a day:

1. Ambient temperature and conditions.
2. Circulating fluid flow through each pump.
3. Slab and air temperature in the Vehicle Wash Building.

The measurements shall be taken prior to 8:00 a.m. each morning and after 1:00 p.m. each afternoon.

The data shall be tabulated and submitted to the Engineer at the jobsite for approval.

## 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 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 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.

##### 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

##### QUALITY ASSURANCE.--

**Codes and standards.--**All work performed and materials installed shall be in accordance with the National Electrical Code; the California Building Standards Code, Title 24, Part 3, "California Electrical Code," and the California Code of Regulations, Title 8, Chapter 4, "Electrical Safety Orders," and all State ordinances.

**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 installation work has been completed, the electrical system 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.

### 12-16.02 BASIC MATERIALS AND METHODS

#### PART 1.- GENERAL

##### SUMMARY.--

**Scope.--**This work shall consist of furnishing and installing conduits, conductors, 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 wall, 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, 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 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.

#### **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.--**

#### **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 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.--**

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.

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.

**RECEPTACLES AND SWITCHES.--**

**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.

**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.

**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.

**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.

**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.

### **PART 3.- EXECUTION**

#### **INSTALLATION.--**

**Conduit, general.--**Rigid steel conduit shall be used unless otherwise shown on the plans or specified in these special provisions.

Unless otherwise specified or shown on the plans, liquid-tight flexible metal conduit shall be used to connect motors, , 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 outside the building foundation.

**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.

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.

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 watertight.

**Conduit terminations.--**Rigid steel conduits shall be securely fastened to cabinets, boxes and gutters using 2 locknuts and specified insulating metallic bushing. 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.

**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.

Splices and joints shall be insulated with insulation equivalent to that of the conductor.

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 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 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.

Feeder and branch circuit ungrounded 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
120/240V-Three phase	Black, orange, blue

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 shop drawings, and as directed by the Engineer where deemed necessary. Identification shall be made with one of the following:

1. Adhesive backed paper or cloth wrap-around markers with clear, heat shrinkable tubing sealed over either type of marker.
2. 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 one or more threaded steel conduits are required to connect to an outlet, device, or junction box, the box shall be a cast metal box with threaded hubs. Weatherproof outlet, device and junction boxes shall have cast metal covers with gaskets. 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 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.

**Anchorage.**--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	1.25 m minimum, all other areas

## 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 main switchboard 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, 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, 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 Switchboard, MSB.--

Main switchboard, MSB, shall have four sections as follow:

- Pull section
- Main disconnect and metering section
- Automatic transfer switch (ATS) section
- Distribution section

#### Main disconnect and metering section.—

Main disconnect and metering section shall contain metering compartment and main disconnect compartment for 120/240-volt, 400-ampere, three-phase, four-wire service.

Main disconnect shall be 3-pole, 120/240-volt, 400-ampere frame, 400-ampere trip, molded case circuit breaker with AC magnetic trip adjusted to 2800 amperes. The interrupting capacity of the circuit breaker shall be 42000 amperes (symmetrical) at 240-volt.

#### Automatic Transfer Switch Section

Automatic transfer switch section shall contain an automatic transfer switch as described under Standby Generator in these special provisions.

**Distribution section.--**

Distribution section shall contain a distribution panel with circuit breaker ratings as shown on the plans. Circuit breakers shall be molded case circuit breakers with minimum interrupting capacity of 42000 amperes (symmetrical) at 240-volt.

**Main switchboard enclosure.--**

Main switchboard 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.

**Concrete.--**

Concrete for main switchboard shall be commercial quality concrete, proportioned to provide a workable mix for the intended use; shall contain not less than 285 kilograms of cement per cubic meter.

**PART 3.- EXECUTION**

Installation of main switchboard shall be in accordance with the requirements of the serving utilities as shown on the approved installation details.

**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, 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, 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 R.--**

Panelboard R shall be outdoor type, surface-mounted, factory assembled, 3-phase, 4-wire, 120/240-volt, AC panelboard at least 508 mm wide with 100-ampere frame, 100-ampere trip main circuit breaker, insulated groundable neutral, hinged door and molded case branch circuit breakers as shown on the plans. Panel shall be Square D Company, type NQOD; General Electric, Type AL; or equal. Panelboard R shall be suitable as service entrance equipment.

**SWITCHES.--****High Pressure Washer disconnect switch**

High pressure washer 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 washer unit furnished.

**Overhead door operator disconnect switch.--**

Overhead door operator disconnect switch shall be 2-pole, 240-volt, AC, 30-ampere, non-fusible, general duty safety switch in a NEMA-3R enclosure with provision for padlocking in the "OFF" position.

**Exhaust fan disconnect switch.--**

Exhaust fan disconnect switch shall be 1-pole, 120-volt, 10-ampere, specification grade, AC switch in a cast metal box with weatherproof cover.

**Remote on/off switch for high pressure washer.—**

Remote on/off switch for high pressure washer shall be the same as exhaust fan disconnect switch.

**Circulating Pumps disconnect switch.**

Circulating pump disconnect switch shall be the same as exhaust fan disconnect switch.

**Thermostat disconnect switch.**

Thermostat disconnect switch shall be the same as exhaust fan disconnect switch.

**Thermostat.**

The thermostat shall have a rain-tight enclosure with a plain copper bulb sensing capillary. The thermostat shall have a temperature range between -17°C and +65°C. The capillary shall be 1 meter long.

**MISCELLANEOUS MATERIALS.--****Alarm sign**

Alarm sign shall be sheet steel, not less than 1.2 mm thick (18-gage) with a baked enamel coating and shall have red letters, 50 mm in height, on a white background.

**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 panels.--**

Plywood backing panels for mounting electrical or telephone equipment shall be 19 mm, APA plywood panels, C-D PLUGGED and touch-sanded, Exposure 1.

**Paint.--**

Plywood backing panels shall receive the following paint system: one prime coat, alkyd, interior wood primer and 2 finish coats, acrylic, interior enamel, semi-gloss.

**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.

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.

**Existing panelboards.**--Provide new circuit breakers, where required to match existing type unless otherwise shown on the plans. Provide mounting hardware, bus straps, and related materials for proper circuit breaker installation. Provide new panelboard identification nameplate with designation as shown for each panelboard. Remove existing nameplates where applicable. Provide new typewritten circuit directory reflecting changes made under the Contract.

**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 1.4 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 R	6.35	PANEL R, 120/240V, 3-PHASE, 4-WIRE

**Alarm sign.**--

Alarm sign with the message ""LIFT PUMP" 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 4100K tri-phosphor with a CRI of 70 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. All ballasts except 800 milliampere ballasts shall have sound rating A. Fluorescent ballasts except for 800 milliampere ballasts shall be high-frequency electronic ballasts with power factor greater than 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.

**Lighting fixtures.**--

Lighting fixtures shall be as shown on the plans and as specified herein. Lighting fixtures shall be listed and labeled "Fixture Suitable For Wet Locations."

**F1.--**

Bracket mounted 120-volt fluorescent fixture with two 96 watt T 12 HO lamps, 800mA ballast and one-piece, clear high impact acrylic, diffuser. The fixture shall have heavy duty steel housing with baked enamel finish and shall be fully gasketed. All fasteners shall be corrosion resistant.

**F2.--**

Fixture shall be the same as F1 fixture, except it shall be stem mounted.

**H1.--**

Outdoor, wall mounted, 100-watt, 120-volt high pressure sodium luminaire with integral ballast and photoelectric cell for automatic operation. Rear housing shall be rugged, corrosion-resistant, die-cast aluminum finished in white thermoset polyester powder. Front housing and refractor shall be one injection-molded piece.

**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.

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.

**12-16.06 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, weather 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, manufacturer's descriptive data, prototype test certification, 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. 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 diesel No.2 fuel type with not less than 6.4 liters of piston displacement, liquid cooled, and designed for continuous operation. The engine shall deliver a minimum of 125 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 152 meters above sea level.

The engine shall operate satisfactorily on commercial grade No. 2-D diesel 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:

**Diesel Fuel Filter System.**--The diesel fuel filter system shall consist of a primary fuel filter capable of removing particles of 50 microns and larger, and a secondary filter capable of removing particles of 25 microns and larger. Each filter shall be a spin-on, replaceable unit, designed for diesel fuel filtration and water separation. Filters shall be located for easy service access.

**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.

**Diesel fuel tank.--**

The engine shall be equipped with a double wall diesel fuel tank of not less than 744 liters capacity. The fuel tank shall be base mounted, and shall be complete with fuel level indicator, flexible fuel lines, vent, and fill devices.

**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.--**

The battery charger shall be of the dual rate type and shall be mounted in the engine-generator control panel. The battery charger shall be provided with the following features:

1. DC ammeter.
2. Dual fusing for AC input and DC output.
3. Automatic DC voltage regulation.
4. Automatic load regulation.
5. Compensation taps for setting the charger for average AC line and battery conditions.
6. 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 125 kW, 156 kVA, 0.8 power factor, 120/240 volts, 3-phase, 4-wire, 60 Hz, and 1800 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 120/240-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 0.2 to 120 seconds, initially set at 20 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 1 control panel enclosure conforming to the Joint Industry Conference Standards. A 3-position "HAND-CRANK"- "OFF"- "AUTO" selector switch shall be mounted in the front panel.

### **Miscellaneous accessories.--**

A drip pan fabricated of not less than one mm thick (20-gage) galvanized sheet steel with turned up edges rolled over wire, sized to catch all oil or grease which may drop from the engine, shall be provided under the engine-generator set.

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 240-volt, 3-pole, 400-ampere trip molded case, thermal-magnetic, circuit breaker and shall be mounted in a NEMA Type 3 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.

The automatic transfer switch shall be installed in the automatic transfer switch section of the main switchboard.

### **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.

## 12-16.07 RECYCLE SYSTEM CONTROL

### PART 1.- GENERAL

#### SUMMARY.--

**Scope.--**This work shall consist of furnishing and installing the recycle system control panel with the details shown on the plans and these special provisions.

Attention is directed to the requirements specified under "Recycle Process Unit System" elsewhere in these special provisions, regarding equipment connected to the recycle system control panel.

#### 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, 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

#### Recycle system control panel.--

Recycle system control panel shall be single exterior hinged door, NEMA Type 4 enclosure, containing an electrical mounting panel and hinged interior deadfront door. The panel 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 panel shall be factory prewired in conformance with NEMA Class IIC wiring (Use of natural gray or dark gray wires for wiring the control panel is prohibited). All wires entering the panel 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.

#### Main breaker, MB.--

Main breaker shall be 2-pole, 240-volt, AC, molded case circuit breaker with 100-ampere frame, 30-ampere trip, and interrupting capacity of not less than 10000 amperes (symmetrical) at 120/240 volts.

#### Lift pump disconnect, CB1 .--

Lift pump disconnect shall be single-pole, 120-volt, AC, molded case circuit breaker with 100-ampere frame, 20-ampere trip, and interrupting capacity of not less than 10,000 amperes (symmetrical) at 120 volts.

#### Control disconnect, CD.--

Control disconnect shall be single-pole, 120-volt, AC, molded case circuit breaker with 100-ampere frame, 15-ampere trip, and interrupting capacity of not less than 10,000 amperes (symmetrical) at 120 volts.

#### Control relay, CR2.--

Control relay shall be 120-volt, AC, general purpose relay with 3-pole, double-throw (3PDT), 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.

**Control relay, CR1.--**

Control relay, CR1, shall be 120-volt, AC, kilowatt rated relay with 120-volt AC coil and double pole, double throw (DPDT), 120-volt, AC, 30-ampere contacts. Relay shall have the capacity to switch up to 1.2 kW motor at 120-volt AC. Relay shall have screw terminals for connection.

**Intrinsically safe relays, ISR1 and ISR2.--**

Intrinsically safe relay shall be latching type and completely self-contained solid-state relay approved for use with sensors in Class 1, Division 1 locations. Relay shall be suitable for supply voltage of 120 volts, AC, with 0.3 ampere, 120-volt rated single-pole, double throw contact relay shall have maximum turn-on time of 5 milliseconds, and maximum output current of 100 microamperes at 28 volts, DC.

**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.

**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.

**Test switches, TSW1 and TSW2.--**

Test switch shall be rotary type, heavy duty oil-tight switch with contacts as required. The switch contact 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.

**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 two 9-watt, 120-volt standard service fluorescent lamp, complete with ballast and screw-on type base.

**Indicating lights, IL1 and IL2.--**

Indicating light shall be panel-mounted, type LED, 120-volt lamp with candelabra screw base. IL1 shall have amber lens and IL2 shall have green lens.

**FABRICATION.--**

**Component mounting.--**The following electrical components shall be mounted on the mounting panel of the recycle system control panel: Main breaker, MB; disconnects CB1 and CD; control relays CR1 and CR2; neutral bar, NB; terminal block, TB; metal barrier; and intrinsically safe relays ISR1 and ISR2.

The following electrical components shall be mounted on the hinged interior door of the recycle system control panel: indicating lights, IL1 and IL2; time meter, TM; and test switches, TSW1 and TSW2.

Intrinsically safe relays shall be installed inside the recycle system control panel within the metal barrier so that all the high voltage components are isolated from the low voltage wiring. A metal barrier extending all the way from the backpanel to the front door shall be installed as shown on the plans.

**PART 3.- EXECUTION****INSTALLATION.--**

**General.--**The recycle system control panel shall be installed as shown on the plans. All bolts and fasteners shall be galvanized.

**OPERATION.--**

The recycle system control panel shall monitor water level in storage tank and clarifier sump, control flow of make up water into the recycle system. The operation of individual control items shall be as shown in the plans.