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STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

**NOTICE TO CONTRACTORS
AND
SPECIAL PROVISIONS**

**FOR CONSTRUCTION ON STATE HIGHWAY IN
LOS ANGELES COUNTY IN LOS ANGELES FROM WILMINGTON BOULEVARD TO 0.2 KM EAST OF
BROAD AVENUE**

DISTRICT 07, ROUTE 1

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

CONTRACT NO. 07-4J6604

07-LA-1-16.1/17.5

Federal Aid Project

ACSTPHG-S001(501)E

**Bids Open: July 17, 2003
Dated: June 23, 2003**

IMPORTANT SPECIAL NOTICES

- DBEs must be certified by the California Unified Certification Program (CUCP). See Section 2, "Proposal Requirements and Conditions," of these special provisions for further details. The available sources for identifying certified DBEs have also been revised.
- The time allotted for the successful bidder to execute the contract and return it, together with the contract bonds, to the Department, has been revised. See Section 3, "Award and Execution of Contract," of these special provisions. Additional time will no longer be granted for return of the executed documents.

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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
A20A	Pavement Markers and Traffic Lines, Typical Details
A20B	Pavement Markers and Traffic Lines, Typical Details
A20C	Pavement Markers and Traffic Lines, Typical Details
A20D	Pavement Markers and Traffic Lines, Typical Details
A24A	Pavement Markings - Arrows
A24B	Pavement Markings - Arrows
A24C	Pavement Markings - Symbols and Numerals
A24D	Pavement Markings - Words
A24E	Pavement Markings - Words and Crosswalks
A62A	Excavation and Backfill - Miscellaneous Details
A73B	Markers
A87	Curbs, Dikes and Driveways
RS1	Roadside Signs, Typical Installation Details No. 1
RS2	Roadside Signs - Wood Post, Typical Installation Details No. 2
RS4	Roadside Signs, Typical Installation Details No. 4
ES-1A	Signal, Lighting and Electrical Systems - Symbols and Abbreviations
ES-1B	Signal, Lighting and Electrical Systems - Symbols and Abbreviations
ES-4A	Signal, Lighting and Electrical Systems - Signal Heads and Mountings
ES-4B	Signal, Lighting and Electrical Systems - Signal Heads and Mountings
ES-4C	Signal, Lighting and Electrical Systems - Signal Heads and Mountings
ES-4D	Signal, Lighting and Electrical Systems - Signal Heads and Mountings
ES-4E	Signal, Lighting and Electrical Systems - Signal Heads and Mountings
RSP ES-7D	Signal and Lighting Standards - Case 2 Arm Loading, Wind Velocity = 129 km/h, Arm Lengths 4.6 m to 9.1 m
ES-7F	Signal and Lighting Standards - Case 4 Arm Loading, Wind Velocity = 129 km/h, Arm Lengths 7.6 m to 13.7 m
ES-7M	Signal and Lighting Standards - Details No. 1
ES-7N	Signal and Lighting Standards - Details No. 2
ES-13A	Signal, Lighting and Electrical Systems - Splicing Details
ES-13B	Signal, Lighting and Electrical Systems - Wiring Details and Fuse Ratings
T1A	Temporary Crash Cushion, Sand Filled (Unidirectional)
T1B	Temporary Crash Cushion, Sand Filled (Bidirectional)
RPS T2	Temporary Crash Cushion, Sand Filled (Shoulder Installations)
T11	Traffic Control System for Lane Closure On Multilane Conventional Highways

DEPARTMENT OF TRANSPORTATION

NOTICE TO CONTRACTORS

CONTRACT NO. 07-4J6604

07-LA-1-16.1/17.5

Sealed proposals for the work shown on the plans entitled:

STATE OF CALIFORNIA; DEPARTMENT OF TRANSPORTATION; PROJECT PLANS FOR CONSTRUCTION ON STATE HIGHWAY IN LOS ANGELES COUNTY IN LOS ANGELES FROM WILMINGTON BOULEVARD TO 0.2 KM EAST OF BROAD AVENUE

will be received at the Department of Transportation, 3347 Michelson Drive, Suite 100, Irvine, CA 92612-1692, until 2 o'clock p.m. on July 17, 2003, at which time they will be publicly opened and read in Room C - 1116 at the same address.

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

STATE OF CALIFORNIA; DEPARTMENT OF TRANSPORTATION; PROPOSAL AND CONTRACT FOR CONSTRUCTION ON STATE HIGHWAY IN LOS ANGELES COUNTY IN LOS ANGELES FROM WILMINGTON BOULEVARD TO 0.2 KM EAST OF BROAD AVENUE

General work description: INSTALL SMART PED AND TRAFFIC SIGNALS

This project has a goal of 12 percent disadvantaged business enterprise (DBE) participation.

No prebid meeting is scheduled for this project.

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

Bids are required for the entire work described herein.

At the time this contract is awarded, the Contractor shall possess either a Class A license or one of the following Class C licenses: C-10.

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

Bidder inquiries may be submitted by one of the following methods:

1. Mail: District 7 Construction Duty Senior, 801 S. Grand Avenue, 4th Floor, Los Angeles, CA 90017.
2. Phone: (213) 897-0054.
3. Fax: (213) 897-0637.
4. E-mail: Duty_Senior_D7@dot.ca.gov.
5. Website at: <http://www.dot.ca.gov/dist07/construction/bir/>

To expedite processing, the preferred method of bidder inquiries is via "Bidder's Inquiry & Response Website."

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 not available.

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

The Department of Transportation hereby notifies all bidders that it will affirmatively ensure that in any contract entered into pursuant to this advertisement, disadvantaged business enterprises will be afforded full opportunity to submit bids in response to this invitation.

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

Pursuant to Section 1773 of the Labor Code, the general prevailing wage rates in the county, or counties, in which the work is to be done have been determined by the Director of the California Department of Industrial Relations. These wages are set forth in the General Prevailing Wage Rates for this project, available at the Labor Compliance Office at the offices of the District Director of Transportation for the district in which the work is situated, and available from the California Department of Industrial Relations' internet web site at: <http://www.dir.ca.gov>. The Federal minimum wage rates for this project as predetermined by the United States Secretary of Labor are available through the California Department of Transportation's Electronic Project Document Distribution Site on the internet at <http://hqidoc1.dot.ca.gov/>. Addenda to modify the Federal minimum wage rates, if necessary, will be issued to holders of "Proposal and Contract" books. Future effective general prevailing wage rates which have been predetermined and are on file with the California Department of Industrial Relations are referenced but not printed in the general prevailing wage rates.

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

DEPARTMENT OF TRANSPORTATION

Deputy Director Transportation Engineering

Dated June 23, 2003

D07KKT

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

07-4J6604

Item	Item Code	Item	Unit of Measure	Estimated Quantity
1	074017	PREPARE WATER POLLUTION CONTROL PROGRAM	LS	LUMP SUM
2	074020	WATER POLLUTION CONTROL	LS	LUMP SUM
3	120090	CONSTRUCTION AREA SIGNS	LS	LUMP SUM
4 (S)	120100	TRAFFIC CONTROL SYSTEM	LS	LUMP SUM
5	150704	REMOVE YELLOW THERMOPLASTIC TRAFFIC STRIPE	M	440
6	150710	REMOVE TRAFFIC STRIPE	M	2210
7	150713	REMOVE PAVEMENT MARKING	M2	80
8	150722	REMOVE PAVEMENT MARKER	EA	130
9	150742	REMOVE ROADSIDE SIGN	EA	13
10	150769	REMOVE ASPHALT CONCRETE	M2	180
11	150846	REMOVE CONCRETE PAVEMENT	M3	3
12	190101	ROADWAY EXCAVATION	M3	180
13	190110	LEAD COMPLIANCE PLAN	LS	LUMP SUM
14	260201	CLASS 2 AGGREGATE BASE	M3	20
15	390155	ASPHALT CONCRETE (TYPE A)	TONN	19
16	394002	PLACE ASPHALT CONCRETE (MISCELLANEOUS AREA)	M2	53
17	566011	ROADSIDE SIGN - ONE POST	EA	10
18	731501	MINOR CONCRETE (CURB)	M3	10
19	731519	MINOR CONCRETE (STAMPED CONCRETE)	M2	130
20 (S)	840515	THERMOPLASTIC PAVEMENT MARKING	M2	30

Item	Item Code	Item	Unit of Measure	Estimated Quantity
21 (S)	840561	100 MM THERMOPLASTIC TRAFFIC STRIPE	M	2050
22	840563	200 MM THERMOPLASTIC TRAFFIC STRIPE	M	160
23 (S)	850111	PAVEMENT MARKER (RETROREFLECTIVE)	EA	130
24 (S)	850112	PAVEMENT MARKER (RETROREFLECTIVE-SPECIAL TYPE G)	EA	89
25 (S)	850113	PAVEMENT MARKER (RETROREFLECTIVE-SPECIAL TYPE H)	EA	18
26	860201	SIGNAL AND LIGHTING	LS	LUMP SUM
27	031505	SMART PEDESTRIAN SYSTEM (ROUTE 1 AT RONAN AVENUE)	LS	LUMP SUM
28	031506	SMART PEDESTRIAN SYSTEM (ROUTE 1 AT BROAD AVENUE)	LS	LUMP SUM
29	999990	MOBILIZATION	LS	LUMP SUM

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISIONS

Annexed to Contract No. 07-4J6604

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.

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

**AMENDMENTS TO JULY 1999 STANDARD
SPECIFICATIONS**

UPDATED MAY 16, 2003

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

SECTION 2: PROPOSAL REQUIREMENTS AND CONDITIONS

Issue Date: June 6, 2002

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

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

- The bidder shall examine carefully the site of the work contemplated, the plans and specifications, and the proposal and contract forms therefor. The submission of a bid shall be conclusive evidence that the bidder has investigated and is satisfied as to the general and local conditions to be encountered, as to the character, quality and scope of work to be performed, the quantities of materials to be furnished and as to the requirements of the proposal, plans, specifications and the contract.
- The submission of a bid shall also be conclusive evidence that the bidder is satisfied that the character, quality and quantity of surface and subsurface materials or obstacles to be encountered insofar as this information was reasonably ascertainable from an inspection of the site and the records of exploratory work done by the Department as shown in the bid documents, as well as from the plans and specifications made a part of the contract.
- Where the Department has made investigations of site conditions including subsurface conditions in areas where work is to be performed under the contract, or in other areas, some of which may constitute possible local material sources,

bidders or contractors may, upon written request, inspect the records of the Department as to those investigations subject to and upon the conditions hereinafter set forth.

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

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

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

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

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

- When cross sections are included with the contract plans, it is expressly understood and agreed that the cross sections do not constitute part of the contract, do not necessarily represent actual site conditions or show location, character, dimensions and details of work to be performed, and are included in the plans only for the convenience of bidders and their use is subject to the conditions and limitations set forth in this Section 2-1.03.

- When contour maps were used in the design of the project, the bidders may inspect those maps, and if available, they may obtain copies for their use.

- The availability or use of information described in this Section 2-1.03 is not to be construed in any way as a waiver of the provisions of the first paragraph in this Section 2-1.03 and bidders and contractors are cautioned to make independent investigations and examinations as they deem necessary to be satisfied as to conditions to be encountered in the performance of the work and, with respect to possible local material sources, the quality and quantity of material available from the property and the type and extent of processing that may be required in order to produce material conforming to the requirements of the specifications.

- The Department assumes no responsibility for conclusions or interpretations made by a bidder or contractor based on the information or data made available by the Department. The Department does not assume responsibility for representation made by its officers or agents before the execution of the contract concerning surface or subsurface conditions, unless that representation is expressly stated in the contract.

- No conclusions or interpretations made by a bidder or contractor from the information and data made available by the Department will relieve a bidder or contractor from properly fulfilling the terms of the contract.

SECTION 5: CONTROL OF WORK

Issue Date: December 31, 2001

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

5-1.02A Excavation Safety Plans

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

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

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

- If the detailed plan includes designs of protective systems developed only from the allowable configurations and slopes, or Appendices, contained in the Construction Safety Orders, the plan shall be submitted at least 5 days before the Contractor intends to begin excavation. If the detailed plan includes designs of protective systems developed from tabulated data, or designs for which design by a registered professional engineer is required, the plan shall be submitted at least 3 weeks before the Contractor intends to begin excavation.
- Attention is directed to Section 7-1.01E, "Trench Safety."

SECTION 9: MEASUREMENT AND PAYMENT

Issue Date: November 18, 2002

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

9-1.04 NOTICE OF POTENTIAL CLAIM

- It is the intention of this section that disputes between the parties arising under and by virtue of the contract be brought to the attention of the Engineer at the earliest possible time in order that the matters may be resolved, if possible, or other appropriate action promptly taken.
- Disputes will not be considered unless the Contractor has first complied with specified notice or protest requirements, including Section 4-1.03, "Changes," Section 5-1.116, "Differing Site Conditions," Section 8-1.06, "Time of Completion," Section 8-1.07, "Liquidated Damages," and Section 8-1.10, "Utility and Non-Highway Facilities."
- For disputes arising under and by virtue of the contract, including an act or failure to act by the Engineer, the Contractor shall provide a signed written initial notice of potential claim to the Engineer within 5 days from the date the dispute first arose. The initial notice of potential claim shall provide the nature and circumstances involved in the dispute which shall remain consistent through the dispute. The initial notice of potential claim shall be submitted on Form CEM-6201A furnished by the Department and shall be certified with reference to the California False Claims Act, Government Code Sections 12650-12655. The Contractor shall assign an exclusive identification number for each dispute, determined by chronological sequencing, based on the date of the dispute.
 - The exclusive identification number for each dispute shall be used on the following corresponding documents:
 - A. Initial notice of potential claim.
 - B. Supplemental notice of potential claim.
 - C. Full and final documentation of potential claim.
 - D. Corresponding claim included in the Contractor's written statement of claims.
- The Contractor shall provide the Engineer the opportunity to examine the site of work within 5 days from the date of the initial notice of potential claim. The Contractor shall proceed with the performance of contract work unless otherwise specified or directed by the Engineer.
 - Throughout the disputed work, the Contractor shall maintain records that provide a clear distinction between the incurred direct costs of disputed work and that of undisputed work. The Contractor shall allow the Engineer access to the Contractor's project records deemed necessary by the Engineer to evaluate the potential claim within 20 days of the date of the Engineer's written request.
 - Within 15 days of submitting the initial notice of potential claim, the Contractor shall provide a signed supplemental notice of potential claim to the Engineer that provides the following information:
 - A. The complete nature and circumstances of the dispute which caused the potential claim.
 - B. The contract provisions that provide the basis of claim.
 - C. The estimated cost of the potential claim, including an itemized breakdown of individual costs and how the estimate was determined.
 - D. A time impact analysis of the project schedule that illustrates the effect on the scheduled completion date due to schedule changes or disruptions where a request for adjustment of contract time is made.
- The information provided in items A and B above shall provide the Contractor's complete reasoning for additional compensation or adjustments.
 - The supplemental notice of potential claim shall be submitted on Form CEM-6201B furnished by the Department and shall be certified with reference to the California False Claims Act, Government Code Sections 12650-12655. The Engineer will evaluate the information presented in the supplemental notice of potential claim and provide a written response to the Contractor within 20 days of its receipt. If the estimated cost or effect on the scheduled completion date changes, the

Contractor shall update information in items C and D above as soon as the change is recognized and submit this information to the Engineer.

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

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

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

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

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

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

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

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

- The Engineer will evaluate the information presented in the full and final documentation of potential claim and provide a written response to the Contractor within 30 days of its receipt unless otherwise specified. The Engineer's receipt of the full and final documentation of potential claim shall be evidenced by postal receipt or the Engineer's written receipt if delivered by hand. If the full and final documentation of potential claim is submitted by the Contractor after acceptance of the work by the Director, the Engineer need not provide a written response.

- Provisions in this section shall not apply to those claims for overhead costs and administrative disputes that occur after issuance of the proposed final estimate. Administrative disputes are disputes of administrative deductions or retentions, contract item quantities, contract item adjustments, interest payments, protests of contract change orders as provided in Section 4-1.03A, "Procedure and Protest," and protests of the weekly statement of working days as provided in Section 8-1.06, "Time of Completion." Administrative disputes that occur prior to issuance of the proposed final estimate shall follow applicable requirements of this section. Information listed in the supplemental notice and full and final documentation of potential claim that is not applicable to the administrative dispute may be exempted as determined by the Engineer.

- Unless otherwise specified in the special provisions, the Contractor may pursue the administrative claim process pursuant to Section 9-1.07B, "Final Payment and Claims," for any potential claim found by the Engineer to be without merit.
- Failure of the Contractor to conform to specified dispute procedures shall constitute a failure to pursue diligently and exhaust the administrative procedures in the contract, and is deemed as the Contractor's waiver of the potential claim and a waiver of the right to a corresponding claim for the disputed work in the administrative claim process in conformance with Section 9-1.07B, "Final Payment of Claims," and shall operate as a bar to arbitration pursuant to Section 10240.2 of the California Public Contract Code.

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

9-1.07B Final Payment and Claims

- After acceptance by the Director, the Engineer will make a proposed final estimate in writing of the total amount payable to the Contractor, including an itemization of the total amount, segregated by contract item quantities, extra work and other bases for payment, and shall also show each deduction made or to be made for prior payments and amounts to be kept or retained under the provisions of the contract. Prior estimates and payments shall be subject to correction in the proposed final estimate. The Contractor shall submit written approval of the proposed final estimate or a written statement of claims arising under or by virtue of the contract so that the Engineer receives the written approval or statement of claims no later than close of business of the thirtieth day after receiving the proposed final estimate. If the thirtieth day falls on a Saturday, Sunday or legal holiday, then receipt of the written approval or statement of claims by the Engineer shall not be later than close of business of the next business day. The Contractor's receipt of the proposed final estimate shall be evidenced by postal receipt. The Engineer's receipt of the Contractor's written approval or statement of claims shall be evidenced by postal receipt or the Engineer's written receipt if delivered by hand.

- On the Contractor's approval, or if the Contractor files no claim within the specified period of 30 days, the Engineer will issue a final estimate in writing in conformance with the proposed final estimate submitted to the Contractor, and within 30 days thereafter the State will pay the entire sum so found to be due. That final estimate and payment thereon shall be conclusive and binding against both parties to the contract on all questions relating to the amount of work done and the compensation payable therefor, except as otherwise provided in Sections 9-1.03C, "Records," and 9-1.09, "Clerical Errors."

- If the Contractor within the specified period of 30 days files claims, the Engineer will issue a semifinal estimate in conformance with the proposed final estimate submitted to the Contractor and within 30 days thereafter the State will pay the sum found to be due. The semifinal estimate and corresponding payment shall be conclusive and binding against both parties to the contract on each question relating to the amount of work done and the compensation payable therefor, except insofar as affected by the claims filed within the time and in the manner required hereunder and except as otherwise provided in Sections 9-1.03C, "Records," and 9-1.09, "Clerical Errors."

- Except for claims for overhead costs and administrative disputes that occur after issuance of the proposed final estimate, the Contractor shall only provide the following two items of information for each claim:

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

- If the final amount of requested additional compensation is different than the amount of requested compensation included in the full and final documentation of potential claim, the Contractor shall provide in the written statement of claims the reasons for the changed amount, the specific provisions of the contract which support the changed amount, and a statement of the reasons the provisions support and provide a basis for the changed amount. If the Contractor's claim fails to provide an exclusive identification number or if there is a disparity in the provided exclusive identification number, the Engineer will notify the Contractor of the omission or disparity. The Contractor shall have 15 days after receiving notification from the Engineer to correct the omission or disparity. If after the 15 days has elapsed, there is still an omission or disparity of the exclusive identification number assigned to the claim, the Engineer will assign the number. No claim will be considered that has any of the following deficiencies:

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

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

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

(name) _____ of

(title) _____

(company)

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

Dated _____

/s/ _____

Subscribed and sworn before me this _____ day

of _____

(Notary Public)
 My Commission
 Expires _____

- Failure to submit the notarized certificate will be sufficient cause for denying the claim.
- Claims for overhead type expenses or costs, in addition to being certified as stated above, shall be supported and accompanied by an audit report of an independent Certified Public Accountant. Omission of a supporting audit report of an independent Certified Public Accountant shall result in denial of the claim and shall operate as a bar to arbitration, as to the claim, in conformance with the requirements in Section 10240.2 of the California Public Contract Code. Claims for overhead type expenses or costs shall be subject to audit by the State at its discretion. The costs of performing an audit examination and submitting the report shall be borne by the Contractor. The Certified Public Accountant's audit examination shall be performed in conformance with the requirements of the American Institute of Certified Public Accountants Attestation Standards. The audit examination and report shall depict the Contractor's project and company-wide financial records and shall specify the actual overall average daily rates for both field and home office overhead for the entire duration of the project, and whether the costs have been properly allocated. The rates of field and home office overhead shall exclude unallowable costs as determined in Title 48 of the Federal Acquisition Regulations, Chapter 1, Part 31. The audit examination and report shall determine if the rates of field and home office overhead are:

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

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

- If the Contractor files a timely written statement of claims in response to the proposed final estimate, the District that administers the contract will submit a claim position letter to the Contractor by hand delivery or deposit in the U.S. mail within 135 days of acceptance of the contract. The claim position letter will delineate the District's position on the Contractor's claims. If the Contractor disagrees with the claim position letter, the Contractor shall submit a written notification of its disagreement and a written request to meet with the board of review, to be received by the District not later than 15 days after the Contractor's receipt of the claim position letter. The written notification of disagreement shall set forth the basis for the Contractor's disagreement and be submitted to the office designated in the claim position letter. The Contractor's failure to provide a timely written notification of disagreement or timely written request to meet with the board of review shall constitute the Contractor's acceptance and agreement with the determinations provided in the claim position letter and with final payment pursuant to the claim position letter.

- If the Contractor files a timely notification of disagreement with the District claim position letter and a timely request to meet with the board of review, then the board of review, designated by the District Director to review claims that remain in dispute, will meet with the Contractor within 45 days after receipt by the District of the notification of disagreement.

- If the District fails to submit a claim position letter to the Contractor within 135 days after the acceptance of the contract and the Contractor has claims that remain in dispute, the Contractor may request a meeting with the board of review designated by the District Director to review claims that remain in dispute. The Contractor's request for a meeting shall identify the claims that remain in dispute. If the Contractor files a request for a meeting, the board of review will meet with the Contractor within 45 days after the District receives the request for the meeting.

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

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

SECTION 19: EARTHWORK

Issue Date: December 31, 2001

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

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

SECTION 42: GROOVE AND GRIND PAVEMENT

Issue Date: December 31, 2001

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

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

SECTION 49: PILING

Issue Date: April 30, 2003

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

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

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

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

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

- Indicator compression pile load testing shall conform to the requirements in ASTM Designation: D 1143. The pile shall sustain the first compression test load applied which is equal to the nominal resistance in compression, as shown on the plans, with no more than 13 mm total vertical movement at the top of the pile measured relative to the top of the pile prior to the start of compression load testing.
- Indicator tension pile load testing shall conform to the requirements in ASTM Designation: D 3689. The loading apparatus described as "Load Applied to Pile by Hydraulic Jack(s) Acting at One End of Test Beam(s) Anchored to the Pile" shall not be used. The pile shall sustain the first tension test load applied which is equal to the nominal resistance in tension, as shown on the plans, with no more than 13 mm total vertical movement at the top of the pile measured relative to the top of the pile prior to the start of tension load testing.

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

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

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

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

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

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

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

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

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

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

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

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

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

49-1.08 PILE DRIVING ACCEPTANCE CRITERIA

- Except for piles to be load tested, driven piles shall be driven to a value of not less than the nominal resistance shown on the plans unless otherwise specified in the special provisions or permitted in writing by the Engineer. In addition, when a pile tip elevation is specified, driven piles shall penetrate at least to the specified tip elevation, unless otherwise permitted in writing by the Engineer. Piles to be load tested shall be driven to the specified tip elevation.
 - When the pile nominal resistance is omitted from the plans or the special provisions, timber piles shall be driven to a nominal resistance of 800 kN, and steel and concrete piles shall be driven to a nominal resistance of 1250 kN.
 - The nominal resistance for driven piles shall be determined from the following formula in which " R_u " is the nominal resistance in kilonewtons, " E_r " is the manufacturer's rating for joules of energy developed by the hammer at the observed field drop height, and " N " is the number of hammer blows in the last 300 millimeters. (maximum value to be used for N is 100):

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

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

The sixth paragraph in Section 49-4.01, "Description," of the Standard Specifications is amended to read:

- Lifting anchors used in precast prestressed concrete piles without a class designation ending in "C" (corrosion resistant) shall be removed, and the holes filled in conformance with the provisions in Section 51-1.18A, "Ordinary Surface Finish."

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

- Cast-in-place concrete piles shall consist of one of the following:
 - A. Steel shells driven permanently to the required nominal resistance and penetration and filled with concrete.
 - B. Steel casings installed permanently to the required penetration and filled with concrete.
 - C. Drilled holes filled with concrete.
 - D. Rock sockets filled with concrete.
- The drilling of holes shall conform to the provisions in these specifications. Concrete filling for cast-in-place concrete piles is designated by compressive strength and shall have a minimum 28-day compressive strength of 25 MPa. At the option of the Contractor, the combined aggregate grading for the concrete shall be either the 25-mm maximum grading, the 12.5-mm maximum grading, or the 9.5-mm maximum grading. Concrete shall conform to the provisions in Section 90, "Portland Cement Concrete," and Section 51, "Concrete Structures." Reinforcement shall conform to the provisions in Section 52, "Reinforcement."

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

SECTION 50: PRESTRESSING CONCRETE

Issue Date: November 18, 2002

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

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

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

- Prestressing steel shall be high-tensile wire conforming to the requirements in ASTM Designation: A 421, including Supplement I; high-tensile seven-wire strand conforming to the requirements in ASTM Designation: A 416; or uncoated high-strength steel bars conforming to the requirements in ASTM Designation: A 722, including all supplementary requirements. The maximum mass requirement of ASTM Designation: A 722 will not apply.

- In addition to the requirements of ASTM Designation: A 722, for deformed bars, the reduction of area shall be determined from a bar from which the deformations have been removed. The bar shall be machined no more than necessary to remove the deformations over a length of 300 mm, and reduction will be based on the area of the machined portion.

- In addition to the requirements specified herein, epoxy-coated seven-wire prestressing steel strand shall be grit impregnated and filled in conformance with the requirements in ASTM Designation: A 882/A 882M, including Supplement I, and the following:

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

- All bars in any individual member shall be of the same grade, unless otherwise permitted by the Engineer.

- When bars are to be extended by the use of couplers, the assembled units shall have a tensile strength of not less than the manufacturer's minimum guaranteed ultimate tensile strength of the bars. Failure of any one sample to meet this requirement will be cause for rejection of the heat of bars and lot of couplers. The location of couplers in the member shall be subject to approval by the Engineer.

- Wires shall be straightened if necessary to produce equal stress in all wires or wire groups or parallel lay cables that are to be stressed simultaneously or when necessary to ensure proper positioning in the ducts.

- Where wires are to be button-headed, the buttons shall be cold formed symmetrically about the axes of the wires. The buttons shall develop the minimum guaranteed ultimate tensile strength of the wire. No cold forming process shall be used that causes indentations in the wire. Buttonheads shall not contain wide open splits, more than 2 splits per head, or splits not parallel with the axis of the wire.

- Prestressing steel shall be protected against physical damage and rust or other results of corrosion at all times from manufacture to grouting or encasing in concrete. Prestressing steel that has sustained physical damage at any time shall be rejected. The development of visible rust or other results of corrosion shall be cause for rejection, when ordered by the Engineer.

- Epoxy-coated prestressing steel strand shall be covered with an opaque polyethylene sheeting or other suitable protective material to protect the strand from exposure to sunlight, salt spray, and weather. For stacked coils, the protective covering shall be draped around the perimeter of the stack. The covering shall be adequately secured; however, it should allow for air circulation around the strand to prevent condensation under the covering. Epoxy-coated strand shall not be stored within 300 m of ocean or tidal water for more than 2 months.

- Prestressing steel shall be packaged in containers or shipping forms for the protection of the steel against physical damage and corrosion during shipping and storage. Except for epoxy-coated strand, a corrosion inhibitor which prevents rust or other results of corrosion, shall be placed in the package or form, or shall be incorporated in a corrosion inhibitor carrier type packaging material, or when permitted by the Engineer, may be applied directly to the steel. The corrosion inhibitor shall have no deleterious effect on the steel or concrete or bond strength of steel to concrete. Packaging or forms damaged from any cause shall be immediately replaced or restored to original condition.

- The shipping package or form shall be clearly marked with a statement that the package contains high-strength prestressing steel, and the type of corrosion inhibitor used, including the date packaged.

- Prestressing steel for post-tensioning which is installed in members prior to placing and curing of the concrete, and which is not epoxy-coated, shall be continuously protected against rust or other results of corrosion, until grouted, by means of a corrosion inhibitor placed in the ducts or applied to the steel in the duct. The corrosion inhibitor shall conform to the provisions specified herein.

- When steam curing is used, prestressing steel for post-tensioning shall not be installed until the steam curing is completed.

- Water used for flushing ducts shall contain either quick lime (calcium oxide) or slaked lime (calcium hydroxide) in the amount of 0.01-kg/L. Compressed air used to blow out ducts shall be oil free.

- When prestressing steel for post-tensioning is installed in the ducts after completion of concrete curing, and if stressing and grouting are completed within 10 days after the installation of the prestressing steel, rust which may form during those 10 days will not be cause for rejection of the steel. Prestressing steel installed, tensioned, and grouted in this manner, all within 10 days, will not require the use of a corrosion inhibitor in the duct following installation of the prestressing steel. Prestressing steel installed as above but not grouted within 10 days shall be subject to all the requirements in this section pertaining to corrosion protection and rejection because of rust. The requirements in this section pertaining to tensioning and grouting within 10 days shall not apply to epoxy-coated prestressing steel strand.

- Any time prestressing steel for pretensioning is placed in the stressing bed and is exposed to the elements for more than 36 hours prior to encasement in concrete, adequate measures shall be taken by the Contractor, as approved by the Engineer, to protect the steel from contamination or corrosion.

- After final fabrication of the seven-wire prestressing steel strand, no electric welding of any form shall be performed on the prestressing steel. Whenever electric welding is performed on or near members containing prestressing steel, the welding ground shall be attached directly to the steel being welded.

- Pretensioned prestressing steel shall be cut off flush with the end of the member. For epoxy-coated prestressing steel, only abrasive saws shall be used to cut the steel. The exposed ends of the prestressing steel and a 25-mm strip of adjoining concrete shall be cleaned and painted. Cleaning shall be by wire brushing or abrasive blast cleaning to remove all dirt and residue on the metal or concrete surfaces. Immediately after cleaning, the surfaces shall be covered with one application of unthinned zinc-rich primer (organic vehicle type) conforming to the provisions in Section 91, "Paint," except that 2 applications shall be applied to surfaces which will not be covered by concrete or mortar. Aerosol cans shall not be used. The paint shall be thoroughly mixed at the time of application and shall be worked into any voids in the prestressing tendons.

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

- Prestressing steel in pretensioned members shall not be cut or released until the concrete in the member has attained a compressive strength of not less than the value shown on the plans or 28 MPa, whichever is greater. In addition to these concrete strength requirements, when epoxy-coated prestressing steel strand is used, the steel shall not be cut or released until the temperature of the concrete surrounding the strand is less than 65°C, and falling.

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

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

- A. For wire or bars, one 2-m long sample and for strand, one 1.5-m long sample, of each size shall be furnished for each heat or reel.

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

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

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

SECTION 51: CONCRETE STRUCTURES

Issue Date: April 16, 2003

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

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

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

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

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

- If structural composite lumber is proposed for use, the falsework drawings shall clearly identify the structural composite lumber members by grade (E value), species, and type. The Contractor shall provide technical data from the manufacturer showing the tabulated working stress values of the composite lumber. The Contractor shall furnish a certificate of compliance as specified in Section 6-1.07, "Certificates of Compliance," for each delivery of structural composite lumber to the project site.
- For falsework piles with a calculated loading capacity greater than 900 kN, the falsework piles shall be designed by an engineer who is registered as either a Civil Engineer or a Geotechnical Engineer in the State of California, and the calculations shall be submitted to the Engineer.

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

- The design load for falsework shall consist of the sum of dead and live vertical loads, and an assumed horizontal load. The minimum total design load for any falsework, including members that support walkways, shall be not less than 4800 N/m² for the combined live and dead load regardless of slab thickness.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

SECTION 52: REINFORCEMENT

Issue Date: December 31, 2001

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

- A Certificate of Compliance conforming to the provisions in Section 6-1.07, "Certificates of Compliance," shall also be furnished for each shipment of epoxy-coated bar reinforcement or wire reinforcement certifying that the coated reinforcement conforms to the requirements in ASTM Designation: A 775/A 775M or A 884/A 884M, respectively, and the provisions in Section 52-1.02B, "Epoxy-coated Reinforcement." The Certificate of Compliance shall include all of the certifications specified in ASTM Designation: A 775/A 775M or A 884/A 884M respectively, and a statement that the coating material has been prequalified by acceptance testing performed by the Valley Forge Laboratories, Inc., Devon, Pennsylvania.

The third paragraph in Section 52-1.08C, "Mechanical Butt Splices," of the Standard Specifications is amended to read:

- The total slip of the reinforcing bars within the splice sleeve after loading in tension to 200 MPa and relaxing to 20 MPa shall not exceed the values listed in the following table. The slip shall be measured between gage points that are clear of the splice sleeve.

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

The first paragraph in Section 52-1.08C(5), "Sleeve-Lockshear Bolt Mechanical Butt Splices," of the Standard Specifications is amended to read:

- The sleeve-lockshear bolt type of mechanical butt splices shall consist of a seamless steel sleeve, center hole with centering pin, and bolts that are tightened until the bolt heads shear off with the bolt ends left embedded in the reinforcing bars. The seamless steel sleeve shall be either formed into a V configuration or shall have 2 serrated steel strips welded to the inside of the sleeve.

Section 52-1.08F, "Nondestructive Splice Tests," of the Standard Specifications is amended by deleting the seventh paragraph.

SECTION 55: STEEL STRUCTURES

Issue Date: December 31, 2001

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

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

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

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

SECTION 56: SIGNS

Issue Date: December 31, 2001

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

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

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

SECTION 59: PAINTING

Issue Date: December 31, 2001

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

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

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

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

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

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

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

The fourth paragraph of Section 59-2.12, "Painting," of the Standard Specifications is amended to read:

- The dry film thickness of the paint will be measured in place with a calibrated Type 2 magnetic film thickness gage in conformance with the requirements of specification SSPC-PA2 of the "SSPC: The Society for Protective Coatings."

SECTION 75: MISCELLANEOUS METAL

Issue Date: December 31, 2001

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

Material	Specification
Steel bars, plates and shapes	ASTM Designation: A 36/A 36M or A 575, A 576 (AISI or M Grades 1016 through 1030 except Grade 1017)
Steel fastener components for general applications:	
Bolts and studs	ASTM Designation: A 307
Headed anchor bolts	ASTM Designation: A 307, Grade B, including S1 supplementary requirements
Nonheaded anchor bolts	ASTM Designation: A 307, Grade C, including S1 supplementary requirements and S1.6 of AASHTO Designation: M 314 supplementary requirements or AASHTO Designation: M 314, Grade 36 or 55, including S1 supplementary requirements
High-strength bolts and studs, threaded rods, and nonheaded anchor bolts	ASTM Designation: A 449, Type 1
Nuts	ASTM Designation: A 563, including Appendix X1*
Washers	ASTM Designation: F 844
Components of high-strength steel fastener assemblies for use in structural steel joints:	
Bolts	ASTM Designation: A 325, Type 1
Tension control bolts	ASTM Designation: F 1852, Type 1
Nuts	ASTM Designation: A 563, including Appendix X1*
Hardened washers	ASTM Designation: F 436, Type 1, Circular, including S1 supplementary requirements
Direct tension indicators	ASTM Designation: F 959, Type 325, zinc-coated
Stainless steel fasteners (Alloys 304 & 316) for general applications:	
Bolts, screws, studs, threaded rods, and nonheaded anchor bolts	ASTM Designation: F 593 or F 738M
Nuts	ASTM Designation: F 594 or F 836M
Washers	ASTM Designation: A 240/A 240M and ANSI B 18.22M
Carbon-steel castings	ASTM Designation: A 27/A 27M, Grade 65-35 [450-240], Class 1
Malleable iron castings	ASTM Designation: A 47, Grade 32510 or A 47M, Grade 22010
Gray iron castings	ASTM Designation: A 48, Class 30B
Ductile iron castings	ASTM Designation: A 536, Grade 65-45-12
Cast iron pipe	Commercial quality
Steel pipe	Commercial quality, welded or extruded
Other parts for general applications	Commercial quality

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

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

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

* Maximum stud diameter permitted for mechanical expansion anchors.

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

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

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

Installation Torque Values, (newton meters)

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

SECTION 83: RAILINGS AND BARRIERS

Issue Date: June 13, 2002

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

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

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

- Wood posts and blocks shall be pressure treated after fabrication in conformance with the provisions in Section 58, "Preservative Treatment of Lumber, Timber and Piling," of the Standard Specifications with creosote, creosote coal tar solution, creosote petroleum solution (50-50), pentachlorophenol in hydrocarbon solvent, copper naphthenate, ammoniacal copper arsenate, or ammoniacal copper zinc arsenate. In addition to the preservatives listed above, Southern yellow pine may also be pressure treated with chromated copper arsenate. When other than one of the creosote processes is used, blocks shall have a minimum retention of 6.4 Kg/m³, and need not be incised.

SECTION 85: PAVEMENT MARKERS

Issue Date: May 16, 2003

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

Sampling

- Twenty markers selected at random will constitute a representative sample for each lot of markers.
- The lot size shall not exceed 25000 markers.

Tolerances

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

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

85-1.04 Non-Reflective Pavement Markers

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

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

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

Testing

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

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

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

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

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

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

Testing

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

Test Description	Requirement		
Bond strength ^a	3.4 MPa, min.		
Compressive strength ^b	8900 N, min.		
Abrasion resistance, marker must meet the respective specific intensity minimum requirements after abrasion.	Pass		
Water Soak Resistance	No delamination of the body or lens system of the marker nor loss of reflectance		
Reflectance	Specific Intensity		
	Clear	Yellow	Red
0° Incidence Angle, min.	3.0	1.5	0.75
20° Incidence Angle, min.	1.2	0.60	0.30
After one year field evaluation	0.30	0.15	0.08
<p>a Failure of the marker body or filler material prior to reaching 3.4 MPa shall constitute a failing bond strength test.</p> <p>b Deformation of the marker of more than 3 mm at a load of less than 8900 N or delamination of the shell and the filler material of more than 3 mm regardless of the load required to break the marker shall be cause for rejection of the markers as specified in Section 85-1.03, "Sampling, Tolerances and Packaging."</p>			

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

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

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

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

SECTION 86: SIGNALS, LIGHTING AND ELECTRICAL SYSTEMS

Issue Date: February 28, 2002

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

- Forms shall be true to line and grade. Tops of foundations for posts and standards, except special foundations, shall be finished to curb or sidewalk grade or as directed by the Engineer. Forms shall be rigid and securely braced in place. Conduit ends and anchor bolts shall be placed in proper position and to proper height, and anchor bolts shall be held in place by means of rigid templates. Anchor bolts shall not be installed more than 1:40 from vertical.

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

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

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

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

SECTION 88: ENGINEERING FABRIC

Issue Date: January 15, 2002

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

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

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

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

SECTION 90: PORTLAND CEMENT CONCRETE

Issue Date: March 12, 2002

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

SECTION 90: PORTLAND CEMENT CONCRETE

90-1 GENERAL

90-1.01 DESCRIPTION

- Portland cement concrete shall be composed of cementitious material, fine aggregate, coarse aggregate, admixtures if used, and water, proportioned and mixed as specified in these specifications.
- The Contractor shall determine the mix proportions for all concrete except pavement concrete. The Engineer will determine the mix proportions for pavement 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.
- Unless otherwise specified, cementitious material shall be a combination of cement and mineral admixture. Cementitious material shall be either:
 1. "Type IP (MS) Modified" cement; or
 2. A combination of "Type II Modified" portland cement and mineral admixture; or
 3. A combination of Type V portland cement and mineral admixture.
- Type III portland cement shall be used only as allowed in the special provisions or with the approval of the Engineer.
 - Class 1 concrete shall contain not less than 400 kg of cementitious material per cubic meter.
 - Class 2 concrete shall contain not less than 350 kg of cementitious material per cubic meter.
 - Class 3 concrete shall contain not less than 300 kg of cementitious material per cubic meter.
 - Class 4 concrete shall contain not less than 250 kg of cementitious material per cubic meter.
 - Minor concrete shall contain not less than 325 kg of cementitious material per cubic meter unless otherwise specified in these specifications or the special provisions.
 - Unless otherwise designated on the plans or specified in these specifications or the special provisions, the amount of cementitious material used per cubic meter of concrete in structures or portions of structures shall conform to the following:

Use	Cementitious Material Content (kg/m ³)
Concrete designated by compressive strength:	
Deck slabs and slab spans of bridges	400 min., 475 max.
Roof sections of exposed top box culverts	400 min., 475 max.
Other portions of structures	350 min., 475 max.
Concrete not designated by compressive strength:	
Deck slabs and slab spans of bridges	400 min.
Roof sections of exposed top box culverts	400 min.
Prestressed members	400 min.
Seal courses	400 min.
Other portions of structures	350 min.
Concrete for precast members	350 min., 550 max.

- Whenever the 28-day compressive strength shown on the plans is greater than 25 MPa, the concrete shall be designated by compressive strength. If the plans show a 28-day compressive strength that is 28 MPa or greater, an additional 14 days will be allowed to obtain the specified strength. The 28-day compressive strengths shown on the plans that are 25 MPa or less are shown for design information only and are not a requirement for acceptance of the concrete.
- Concrete designated by compressive strength shall be proportioned such that the concrete will attain the strength shown on the plans or specified in the special provisions.
- Before using concrete for which the mix proportions have been determined by the Contractor, or in advance of revising those mix proportions, the Contractor shall submit in writing to the Engineer a copy of the mix design.

- Compliance with cementitious material content requirements will be verified in conformance with procedures described in California Test 518 for cement content. For testing purposes, mineral admixture shall be considered to be cement. Batch proportions shall be adjusted as necessary to produce concrete having the specified cementitious material content.
- If any concrete has a cementitious material, portland cement, or mineral admixture content that is less than the minimum required, the concrete shall be removed. However, if the Engineer determines that the concrete is structurally adequate, the concrete may remain in place and the Contractor shall pay to the State \$0.55 for each kilogram of cementitious material, portland cement, or mineral admixture that is less than the minimum required. The Department may deduct the amount from any moneys due, or that may become due, the Contractor under the contract. The deductions will not be made unless the difference between the contents required and those actually provided exceeds the batching tolerances permitted by Section 90-5, "Proportioning." No deductions will be made based on the results of California Test 518.
- The requirements of the preceding paragraph shall not apply to minor concrete or commercial quality concrete.

90-2 MATERIALS

90-2.01 CEMENT

- Unless otherwise specified, cement shall be either "Type IP (MS) Modified" cement, "Type II Modified" portland cement or Type V portland cement.
- "Type IP (MS) Modified" cement shall conform to the requirements for Type IP (MS) cement in ASTM Designation: C 595, and shall be comprised of an intimate and uniform blend of Type II cement and not more than 35 percent by mass of mineral admixture. The type and minimum amount of mineral admixture used in the manufacture of "Type IP (MS) Modified" cement shall be in conformance with the provisions in Section 90-4.08, "Required Use of Mineral Admixtures."
- "Type II Modified" portland cement shall conform to the requirements for Type II portland cement in ASTM Designation: C 150.
- 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 Na₂O plus 0.658 times the percentage of K₂O, when determined by either direct intensity flame photometry or by the atomic absorption method. The instrument and procedure used shall be qualified as to precision and accuracy in conformance with the requirements in ASTM Designation: C 114;
 - B. The autoclave expansion shall not exceed 0.50 percent; and
 - C. Mortar, containing the cement to be used and Ottawa sand, when tested in conformance with California Test 527, shall not expand in water more than 0.010 percent and shall not contract in air more than 0.048 percent, except that when cement is to be used for precast prestressed concrete piling, precast prestressed concrete members, or steam cured concrete products, the mortar shall not contract in air more than 0.053 percent.
- Type III and Type V portland cements shall conform to the requirements in ASTM Designation: C 150 and the additional requirements listed above for "Type II Modified" portland cement, except that when tested in conformance with California Test 527, mortar containing Type III portland cement shall not contract in air more than 0.075 percent.
 - Cement used in the manufacture of cast-in-place concrete for exposed surfaces of like elements of a structure shall be from the same cement mill.
 - Cement shall be protected from exposure to moisture until used. Sacked cement shall be piled to permit access for tally, inspection, and identification of each shipment.
 - Adequate facilities shall be provided to assure that cement meeting the provisions specified in this Section 90-2.01 shall be kept separate from other cement in order to prevent any but the specified cement from entering the work. Safe and suitable facilities for sampling cement shall be provided at the weigh hopper or in the feed line immediately in advance of the hopper, in conformance with California Test 125.
 - If cement is used prior to sampling and testing as provided in Section 6-1.07, "Certificates of Compliance," and the cement is delivered directly to the site of the work, the Certificate of Compliance shall be signed by the cement manufacturer or supplier of the cement. If the cement is used in ready-mixed concrete or in precast concrete products purchased as such by the Contractor, the Certificate of Compliance shall be signed by the manufacturer of the concrete or product.
 - Cement furnished without a Certificate of Compliance shall not be used in the work until the Engineer has had sufficient time to make appropriate tests and has approved the cement for use.

90-2.02 AGGREGATES

- Aggregates shall be free from deleterious coatings, clay balls, roots, bark, sticks, rags, and other extraneous material.
- Natural aggregates shall be thoroughly and uniformly washed before use.
- The Contractor, at the Contractor's expense, shall provide safe and suitable facilities, including necessary splitting devices for obtaining samples of aggregates, in conformance with California Test 125.
- Aggregates shall be of such character that it will be possible to produce workable concrete within the limits of water content provided in Section 90-6.06, "Amount of Water and Penetration."
- Aggregates shall have not more than 10 percent loss when tested for soundness in conformance with the requirements in California Test 214. The soundness requirement for fine aggregate will be waived, provided that the durability index, D_f , of the fine aggregate is 60, or greater, when tested for durability in conformance with California Test 229.
- If the results of any one or more of the Cleanness Value, Sand Equivalent, or aggregate grading tests do not meet the requirements specified for "Operating Range" but all meet the "Contract Compliance" requirements, the placement of concrete shall be suspended at the completion of the current pour until tests or other information indicate that the next material to be used in the work will comply with the requirements specified for "Operating Range."
- If the results of either or both the Cleanness Value and coarse aggregate grading tests do not meet the requirements specified for "Contract Compliance," the concrete that is represented by the tests shall be removed. However, if the Engineer determines that the concrete is structurally adequate, the concrete may remain in place, and the Contractor shall pay to the State \$4.60 per cubic meter for paving concrete and \$7.20 per cubic meter for all other concrete for the concrete represented by these tests and left in place. The Department may deduct the amount from any moneys due, or that may become due, the Contractor under the contract.
- If the results of either or both the Sand Equivalent and fine aggregate grading tests do not meet the requirements specified for "Contract Compliance," the concrete which is represented by the tests shall be removed. However, if the Engineer determines that the concrete is structurally adequate, the concrete may remain in place, and the Contractor shall pay to the State \$4.60 per cubic meter for paving concrete and \$7.20 per cubic meter for all other concrete for the concrete represented by these tests and left in place. The Department may deduct the amount from any moneys due, or that may become due, the Contractor under the contract.
- The 2 preceding paragraphs apply individually to the "Contract Compliance" requirements for coarse aggregate and fine aggregate. When both coarse aggregate and fine aggregate do not conform to the "Contract Compliance" requirements, both paragraphs shall apply. The payments specified in those paragraphs shall be in addition to any payments made in conformance with the provisions in Section 90-1.01, "Description."
- No single Cleanness Value, Sand Equivalent or aggregate grading test shall represent more than 250 m³ of concrete or one day's pour, whichever is smaller.
- Aggregates specified for freeze-thaw resistance shall pass the freezing and thawing test, California Test 528.
- The Contractor shall notify the Engineer of the proposed source of freeze-thaw resistant concrete aggregates at least 4 months before intended use. Should the Contractor later propose a different source of concrete aggregates, the Contractor shall again notify the Engineer at least 4 months before intended use. Blending of fine or coarse aggregates from untested sources with acceptable aggregates will not be permitted. Provisions for the time of submission of samples as provided in Section 40-1.015, "Cement Content," are superseded by the foregoing.
- Concurrently with notification of proposed sources of freeze-thaw resistant concrete aggregates, the Contractor shall furnish samples in the quantity ordered by the Engineer. The samples shall be secured under the direct supervision of the Engineer. Samples from existing stockpiles of processed aggregate shall be taken from washed materials and shall be visibly damp. Samples from materials in place in a material source shall be taken at depths from the existing surface that will ensure the presence of the full quantity of ground water. Excavations for the purpose of securing samples shall be made to the full depth of intended source operations. Samples shall be protected against loss of contained water until they are delivered to the Engineer.
- The Engineer will waive the above freeze-thaw test and the 4-month advance notice, required in this Section, provided aggregates are to be obtained from sources that have previously passed this test and test results are currently applicable.
- No extension of contract time will be allowed for the time required to perform the freezing and thawing test.
- When the source of an aggregate is changed, except for pavement concrete, the Contractor shall adjust the mix proportions and submit in writing to the Engineer a copy of the mix design before using the aggregates. When the source of an aggregate is changed for pavement concrete, the Engineer shall be allowed sufficient time to adjust the mix, and the aggregates shall not be used until necessary adjustments are made.

90-2.02A Coarse Aggregate

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

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

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

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

90-2.02B Fine Aggregate

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

- Fine aggregate shall conform to the following quality requirements:

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

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

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

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

90-2.03 WATER

• In conventionally reinforced concrete work, the water for curing, for washing aggregates, and for mixing shall be free from oil and shall not contain more than 1000 parts per million of chlorides as Cl, when tested in conformance with California Test 422, nor more than 1300 parts per million of sulfates as SO₄, when tested in conformance with California

Test 417. In prestressed concrete work, the water for curing, for washing aggregates, and for mixing shall be free from oil and shall not contain more than 650 parts per million of chlorides as Cl, when tested in conformance with California Test 422, nor more than 1300 parts per million of sulfates as SO₄, when tested in conformance with California Test 417. In no case shall the water contain an amount of impurities that will cause either: 1) a change in the setting time of cement of more than 25 percent when tested in conformance with the requirements in ASTM Designation: C 191 or ASTM Designation: C 266 or 2) a reduction in the compressive strength of mortar at 14 days of more than 5 percent, when tested in conformance with the requirements in ASTM Designation: C 109, when compared to the results obtained with distilled water or deionized water, tested in conformance with the requirements in ASTM Designation: C 109.

- In non-reinforced concrete work, the water for curing, for washing aggregates and for mixing shall be free from oil and shall not contain more than 2000 parts per million of chlorides as Cl, when tested in conformance with California Test 422, or more than 1500 parts per million of sulfates as SO₄, when tested in conformance with California Test 417.

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

- Water reclaimed from mixer wash-out operations may be used in mixing concrete. The water shall not contain coloring agents or more than 300 parts per million of alkalis (Na₂O + 0.658 K₂O) as determined on the filtrate. The specific gravity of the water shall not exceed 1.03 and shall not vary more than ±0.010 during a day's operations.

90-2.04 ADMIXTURE MATERIALS

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

A. Chemical Admixtures—ASTM Designation: C 494.

B. Air-entraining Admixtures—ASTM Designation: C 260.

C. Calcium Chloride—ASTM Designation: D 98.

D. Mineral Admixtures—Coal fly ash; raw or calcined natural pozzolan as specified in ASTM Designation: 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.

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

90-3 AGGREGATE GRADINGS

90-3.01 GENERAL

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

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

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

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

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

90-3.02 COARSE AGGREGATE GRADING

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

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

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

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

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

90-3.03 FINE AGGREGATE GRADING

- Fine aggregate shall be graded within the following limits:

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

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

In addition to the above required grading analysis, the distribution of the fine aggregate sizes shall be such that the difference between the total percentage passing the 1.18-mm sieve and the total percentage passing the 600-µm sieve shall be between 10 and 40, and the difference between the percentage passing the 600-µm and 300-µm sieves shall be between 10 and 40.

- Fine aggregate may be separated into 2 or more sizes and stored separately, provided that the combined material conforms to the grading requirements specified in this Section 90-3.03.

90-3.04 COMBINED AGGREGATE GRADINGS

- Combined aggregate grading limits shall be used only for the design of concrete mixes. Concrete mixes shall be designed so that aggregates are combined in proportions that shall produce a mixture within the grading limits for combined

aggregates as specified herein. Within these limitations, the relative proportions shall be as ordered by the Engineer, except as otherwise provided in Section 90-1.01, "Description."

- The combined aggregate grading used in portland cement concrete pavement shall be the 37.5-mm, maximum grading.
- The combined aggregate grading used in concrete for structures and other concrete items, except when specified otherwise in these specifications or the special provisions, shall be either the 37.5-mm, maximum grading, or the 25-mm, maximum grading, at the option of the Contractor.

Grading Limits of Combined Aggregates

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

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

90-4 ADMIXTURES

90-4.01 GENERAL

- Admixtures used in portland cement concrete shall conform to and be used in conformance with the provisions in this Section 90-4 and the special provisions. Admixtures shall be used when specified or ordered by the Engineer and may be used at the Contractor's option as provided herein.
- Chemical admixtures and air-entraining admixtures containing chlorides as Cl in excess of one percent by mass of admixture, as determined by California Test 415, shall not be used in prestressed or reinforced concrete.
- Calcium chloride shall not be used in concrete containing steel reinforcement or other embedded metals.
- Mineral admixture used in concrete for exposed surfaces of like elements of a structure shall be from the same source and of the same percentage.
- Admixtures shall be uniform in properties throughout their use in the work. Should it be found that an admixture as furnished is not uniform in properties, its use shall be discontinued.
- If more than one admixture is used, the admixtures shall be compatible with each other so that the desirable effects of all admixtures used will be realized.

90-4.02 MATERIALS

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

90-4.03 ADMIXTURE APPROVAL

- No admixture brand shall be used in the work unless it is on the Department's current list of approved brands for the type of admixture involved.
- Admixture brands will be considered for addition to the approved list if the manufacturer of the admixture submits to the Transportation Laboratory a sample of the admixture accompanied by certified test results demonstrating that the admixture complies with the requirements in the appropriate ASTM Designation and these specifications. The sample shall be sufficient to permit performance of all required tests. Approval of admixture brands will be dependent upon a determination as to compliance with the requirements, based on the certified test results submitted, together with tests the Department may elect to perform.

- When the Contractor proposes to use an admixture of a brand and type on the current list of approved admixture brands, the Contractor shall furnish a Certificate of Compliance from the manufacturer, as provided in Section 6-1.07, "Certificates of Compliance," certifying that the admixture furnished is the same as that previously approved. If a previously approved admixture is not accompanied by a Certificate of Compliance, the admixture shall not be used in the work until the Engineer has had sufficient time to make the appropriate tests and has approved the admixture for use. The Engineer may take samples for testing at any time, whether or not the admixture has been accompanied by a Certificate of Compliance.

- If a mineral admixture is delivered directly to the site of the work, the Certificate of Compliance shall be signed by the manufacturer or supplier of the mineral admixture. If the mineral admixture is used in ready-mix concrete or in precast concrete products purchased as such by the Contractor, the Certificate of Compliance shall be signed by the manufacturer of the concrete or product.

90-4.04 REQUIRED USE OF CHEMICAL ADMIXTURES AND CALCIUM CHLORIDE

- When the use of a chemical admixture or calcium chloride is specified or ordered by the Engineer, the admixture shall be used at the dosage specified or ordered, except that if no dosage is specified or ordered, the admixture shall be used at the dosage normally recommended by the manufacturer of the admixture.

- Calcium chloride shall be dispensed in liquid, flake, or pellet form. Calcium chloride dispensed in liquid form shall conform to the provisions for dispensing liquid admixtures in Section 90-4.10, "Proportioning and Dispensing Liquid Admixtures."

90-4.05 OPTIONAL USE OF CHEMICAL ADMIXTURES

- The Contractor will be permitted to use Type A or F, water-reducing; Type B, retarding; or Type D or G, water-reducing and retarding admixtures as described in ASTM Designation: C 494 to conserve cementitious material or to facilitate any concrete construction application subject to the following conditions:

- A. When a water-reducing admixture or a water-reducing and retarding admixture is used, the cementitious material content specified or ordered may be reduced by a maximum of 5 percent by mass, except that the resultant cementitious material content shall be not less than 300 kilograms per cubic meter; and

- B. When a reduction in cementitious material content is made, the dosage of admixture used shall be the dosage used in determining approval of the admixture.

- Unless otherwise specified, a Type C accelerating chemical admixture conforming to the requirements in ASTM Designation: C 494, may be used in portland cement concrete. Inclusion in the mix design submitted for approval will not be required provided that the admixture is added to counteract changing conditions that contribute to delayed setting of the portland cement concrete, and the use or change in dosage of the admixture is approved in writing by the Engineer.

90-4.06 REQUIRED USE OF AIR-ENTRAINING ADMIXTURES

- When air-entrainment is specified or ordered by the Engineer, the air-entraining admixture shall be used in amounts to produce a concrete having the specified air content as determined by California Test 504.

90-4.07 OPTIONAL USE OF AIR-ENTRAINING ADMIXTURES

- When air-entrainment has not been specified or ordered by the Engineer, the Contractor will be permitted to use an air-entraining admixture to facilitate the use of any construction procedure or equipment provided that the average air content, as determined by California Test 504, of 3 successive tests does not exceed 4 percent, and no single test value exceeds 5.5 percent. If the Contractor elects to use an air-entraining admixture in concrete for pavement, the Contractor shall so indicate at the time the Contractor designates the source of aggregate as provided in Section 40-1.015, "Cement Content."

90-4.08 REQUIRED USE OF MINERAL ADMIXTURES

- Unless otherwise specified, mineral admixture shall be combined with cement to make cementitious material.

- The calcium oxide content 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: C 618.

- The amounts of cement and mineral admixture used in cementitious material shall be sufficient to satisfy the minimum cementitious material content requirements specified in Section 90-1.01, "Description," or Section 90-4.05, "Optional Use of Chemical Admixtures," and shall conform to the following:

- A. The minimum amount of cement shall not be less than 75 percent by mass of the specified minimum cementitious material content;
- B. The minimum amount of mineral admixture to be combined with cement shall be determined using one of the following criteria:
 1. When the calcium oxide content of a mineral admixture is equal to or less than 2 percent by mass, the amount of mineral admixture shall not be less than 15 percent by mass of the total amount of cementitious material to be used in the mix;
 2. When the calcium oxide content of a mineral admixture is greater than 2 percent, the amount of mineral admixture shall not be less than 25 percent by mass of the total amount of cementitious material to be used in the mix;
 3. When a mineral admixture that conforms to the provisions for silica fume in Section 90-2.04, "Admixture Materials," is used, the amount of mineral admixture shall not be less than 10 percent by mass of the total amount of cementitious material to be used in the mix
- C. The total amount of mineral admixture shall not exceed 35 percent by mass of the total amount of cementitious material to be used in the mix. Where Section 90-1.01, "Description," specifies a maximum cementitious content in kilograms per cubic meter, the total mass of cement and mineral admixture per cubic meter shall not exceed the specified maximum cementitious material content.

90-4.09 BLANK

90-4.10 PROPORTIONING AND DISPENSING LIQUID ADMIXTURES

- Chemical admixtures and air-entraining admixtures shall be dispensed in liquid form. Dispensers for liquid admixtures shall have sufficient capacity to measure at one time the prescribed quantity required for each batch of concrete. Each dispenser shall include a graduated measuring unit into which liquid admixtures are measured to within ± 5 percent of the prescribed quantity for each batch. Dispensers shall be located and maintained so that the graduations can be accurately read from the point at which proportioning operations are controlled to permit a visual check of batching accuracy prior to discharge. Each measuring unit shall be clearly marked for the type and quantity of admixture.

- Each liquid admixture dispensing system shall be equipped with a sampling device consisting of a valve located in a safe and readily accessible position such that a sample of the admixture may be withdrawn slowly by the Engineer.

- If more than one liquid admixture is used in the concrete mix, each liquid admixture shall have a separate measuring unit and shall be dispensed by injecting equipment located in such a manner that the admixtures are not mixed at high concentrations and do not interfere with the effectiveness of each other. When air-entraining admixtures are used in conjunction with other liquid admixtures, the air-entraining admixture shall be the first to be incorporated into the mix.

- When automatic proportioning devices are required for concrete pavement, dispensers for liquid admixtures shall operate automatically with the batching control equipment. The dispensers shall be equipped with an automatic warning system in good operating condition that will provide a visible or audible signal at the point at which proportioning operations are controlled when the quantity of admixture measured for each batch of concrete varies from the preselected dosage by more than 5 percent, or when the entire contents of the measuring unit are not emptied from the dispenser into each batch of concrete.

- Unless liquid admixtures are added to premeasured water for the batch, their discharge into the batch shall be arranged to flow into the stream of water so that the admixtures are well dispersed throughout the batch, except that air-entraining admixtures may be dispensed directly into moist sand in the batching bins provided that adequate control of the air content of the concrete can be maintained.

- Liquid admixtures requiring dosages greater than 2.5 L/m^3 shall be considered to be water when determining the total amount of free water as specified in Section 90-6.06, "Amount of Water and Penetration."

- Special admixtures, such as "high range" water reducers that may contribute to a high rate of slump loss, shall be measured and dispensed as recommended by the admixture manufacturer and as approved by the Engineer.

90-4.11 STORAGE, PROPORTIONING, AND DISPENSING OF MINERAL ADMIXTURES

- Mineral admixtures shall be protected from exposure to moisture until used. Sacked material shall be piled to permit access for tally, inspection and identification for each shipment.

- Adequate facilities shall be provided to assure that mineral admixtures meeting the specified requirements are kept separate from other mineral admixtures in order to prevent any but the specified mineral admixtures from entering the work. Safe and suitable facilities for sampling mineral admixtures shall be provided at the weigh hopper or in the feed line immediately in advance of the hopper.

- Mineral admixtures shall be incorporated into concrete using equipment conforming to the requirements for cement weigh hoppers, and charging and discharging mechanisms in ASTM Designation: C 94, in Section 90-5.03, "Proportioning," and in this Section 90-4.11.

- When concrete is completely mixed in stationary paving mixers, the mineral admixture shall be weighed in a separate weigh hopper conforming to the provisions for cement weigh hoppers and charging and discharging mechanisms in Section 90-5.03A, "Proportioning for Pavement," and the mineral admixture and cement shall be introduced simultaneously into the mixer proportionately with the aggregate. If the mineral admixture is not weighed in a separate weigh hopper, the Contractor shall provide certification that the stationary mixer is capable of mixing the cement, admixture, aggregates and water uniformly prior to discharge. Certification shall contain the following:

- A. Test results for 2 compressive strength test cylinders of concrete taken within the first one-third and 2 compressive strength test cylinders of concrete taken within the last one-third of the concrete discharged from a single batch from the stationary paving mixer. Strength tests and cylinder preparation will be in conformance with the provisions of Section 90-9, "Compressive Strength;"
- B. Calculations demonstrating that the difference in the averages of 2 compressive strengths taken in the first one-third is no greater than 7.5 percent different than the averages of 2 compressive strengths taken in the last one-third of the concrete discharged from a single batch from the stationary paving mixer. Strength tests and cylinder preparation will be in conformance with the provisions of Section 90-9, "Compressive Strength;" and
- C. The mixer rotation speed and time of mixing prior to discharge that are required to produce a mix that meets the requirements above.

90-5 PROPORTIONING

90-5.01 STORAGE OF AGGREGATES

- Aggregates shall be stored or stockpiled in such a manner that separation of coarse and fine particles of each size shall be avoided and also that the various sizes shall not become intermixed before proportioning.

- Aggregates shall be stored or stockpiled and handled in a manner that shall prevent contamination by foreign materials. In addition, storage of aggregates at batching or mixing facilities that are erected subsequent to the award of the contract and that furnish concrete to the project shall conform to the following:

- A. Intermingling of the different sizes of aggregates shall be positively prevented. The Contractor shall take the necessary measures to prevent intermingling. The preventive measures may include, but are not necessarily limited to, physical separation of stockpiles or construction of bulkheads of adequate length and height; and
- B. Contamination of aggregates by contact with the ground shall be positively prevented. The Contractor shall take the necessary measures to prevent contamination. The preventive measures shall include, but are not necessarily limited to, placing aggregates on wooden platforms or on hardened surfaces consisting of portland cement concrete, asphalt concrete, or cement treated material.

- In placing aggregates in storage or in moving the aggregates from storage to the weigh hopper of the batching plant, any method that may cause segregation, degradation, or the combining of materials of different gradings that will result in any size of aggregate at the weigh hopper failing to meet the grading requirements, shall be discontinued. Any method of handling aggregates that results in excessive breakage of particles shall be discontinued. The use of suitable devices to reduce impact of falling aggregates may be required by the Engineer.

90-5.02 PROPORTIONING DEVICES

- Weighing, measuring, or metering devices used for proportioning materials shall conform to the requirements in Section 9-1.01, "Measurement of Quantities," and this Section 90-5.02. In addition, automatic weighing systems shall comply with the requirements for automatic proportioning devices in Section 90-5.03A, "Proportioning for Pavement." Automatic devices shall be automatic to the extent that the only manual operation required for proportioning the aggregates, cement, and mineral admixture for one batch of concrete is a single operation of a switch or starter.

- Proportioning devices shall be tested at the expense of the Contractor as frequently as the Engineer may deem necessary to ensure their accuracy.

- Weighing equipment shall be insulated against vibration or movement of other operating equipment in the plant. When the plant is in operation, the mass of each batch of material shall not vary from the mass designated by the Engineer by more than the tolerances specified herein.

- Equipment for cumulative weighing of aggregate shall have a zero tolerance of ± 0.5 percent of the designated total batch mass of the aggregate. For systems with individual weigh hoppers for the various sizes of aggregate, the zero tolerance

shall be ± 0.5 percent of the individual batch mass designated for each size of aggregate. Equipment for cumulative weighing of cement and mineral admixtures shall have a zero tolerance of ± 0.5 percent of the designated total batch mass of the cement and mineral admixture. Equipment for weighing cement or mineral admixture separately shall have a zero tolerance of ± 0.5 percent of their designated individual batch masses. Equipment for measuring water shall have a zero tolerance of ± 0.5 percent of its designated mass or volume.

- The mass indicated for any batch of material shall not vary from the preselected scale setting by more than the following:

- A. Aggregate weighed cumulatively shall be within 1.0 percent of the designated total batch mass of the aggregate. Aggregates weighed individually shall be within 1.5 percent of their respective designated batch masses; and
- B. Cement shall be within 1.0 percent of its designated batch mass. When weighed individually, mineral admixture shall be within 1.0 percent of its designated batch mass. When mineral admixture and cement are permitted to be weighed cumulatively, cement shall be weighed first to within 1.0 percent of its designated batch mass, and the total for cement and mineral admixture shall be within 1.0 percent of the sum of their designated batch masses; and
- C. Water shall be within 1.5 percent of its designated mass or volume.

- Each scale graduation shall be approximately 0.001 of the total capacity of the scale. The capacity of scales for weighing cement, mineral admixture, or cement plus mineral admixture and aggregates shall not exceed that of commercially available scales having single graduations indicating a mass not exceeding the maximum permissible mass variation above, except that no scale shall be required having a capacity of less than 500 kg, with 0.5-kg graduations.

90-5.03 PROPORTIONING

- Proportioning shall consist of dividing the aggregates into the specified sizes, each stored in a separate bin, and combining them with cement, mineral admixture, and water as provided in these specifications. Aggregates shall be proportioned by mass.

- At the time of batching, aggregates shall have been dried or drained sufficiently to result in a stable moisture content such that no visible separation of water from aggregate will take place during transportation from the proportioning plant to the point of mixing. In no event shall the free moisture content of the fine aggregate at the time of batching exceed 8 percent of its saturated, surface-dry mass.

- Should separate supplies of aggregate material of the same size group, but of different moisture content or specific gravity or surface characteristics affecting workability, be available at the proportioning plant, withdrawals shall be made from one supply exclusively and the materials therein completely exhausted before starting upon another.

- Bulk "Type IP (MS) Modified" cement shall be weighed in an individual hopper and shall be kept separate from the aggregates until the ingredients are released for discharge into the mixer.

- Bulk cement and mineral admixture may be weighed in separate, individual weigh hoppers or may be weighed in the same weigh hopper and shall be kept separate from the aggregates until the ingredients are released for discharge into the mixer. If the cement and mineral admixture are weighed cumulatively, the cement shall be weighed first.

- When cement and mineral admixtures are weighed in separate weigh hoppers, the weigh systems for the proportioning of the aggregate, the cement, and the mineral admixture shall be individual and distinct from all other weigh systems. Each weigh system shall be equipped with a hopper, a lever system, and an indicator to constitute an individual and independent material weighing device. The cement and the mineral admixture shall be discharged into the mixer simultaneously with the aggregate.

- The scales and weigh hoppers for bulk weighing cement, mineral admixture, or cement plus mineral admixture shall be separate and distinct from the aggregate weighing equipment.

- For batches with a volume of one cubic meter or more, the batching equipment shall conform to one of the following combinations:

- A. Separate boxes and separate scale and indicator for weighing each size of aggregate.
- B. Single box and scale indicator for all aggregates.
- C. Single box or separate boxes and automatic weighing mechanism for all aggregates.

- In order to check the accuracy of batch masses, the gross mass and tare mass of batch trucks, truck mixers, truck agitators, and non-agitating hauling equipment shall be determined when ordered by the Engineer. The equipment shall be weighed at the Contractor's expense on scales designated by the Engineer.

90-5.03A Proportioning for Pavement

- Aggregates and bulk cement, mineral admixture, and cement plus mineral admixture for use in pavement shall be proportioned by mass by means of automatic proportioning devices of approved type conforming to these specifications.
- The Contractor shall install and maintain in operating condition an electronically actuated moisture meter that will indicate, on a readily visible scale, changes in the moisture content of the fine aggregate as it is batched within a sensitivity of 0.5 percent by mass of the fine aggregate.
- The batching of cement, mineral admixture, or cement plus mineral admixture and aggregate shall be interlocked so that a new batch cannot be started until all weigh hoppers are empty, the proportioning devices are within zero tolerance, and the discharge gates are closed. The interlock shall permit no part of the batch to be discharged until all aggregate hoppers and the cement and mineral admixture hoppers or the cement plus mineral admixture hopper are charged with masses that are within the tolerances specified in Section 90-5.02, "Proportioning Devices."
- When interlocks are required for cement and mineral admixture charging mechanisms and cement and mineral admixtures are weighed cumulatively, their charging mechanisms shall be interlocked to prevent the introduction of mineral admixture until the mass of cement in the cement weigh hopper is within the tolerances specified in Section 90-5.02, "Proportioning Devices."
- The discharge gate on the cement and mineral admixture hoppers or the cement plus mineral admixture hopper shall be designed to permit regulating the flow of cement, mineral admixture, or cement plus mineral admixture into the aggregate as directed by the Engineer.
- When separate weigh boxes are used for each size of aggregate, the discharge gates shall permit regulating the flow of each size of aggregate as directed by the Engineer.
- Material discharged from the several bins shall be controlled by gates or by mechanical conveyors. The means of withdrawal from the several bins, and of discharge from the weigh box, shall be interlocked so that not more than one bin can discharge at a time, and so that the weigh box cannot be tripped until the required quantity from each of the several bins has been deposited therein. Should a separate weigh box be used for each size of aggregate, all may be operated and discharged simultaneously.
- When the discharge from the several bins is controlled by gates, each gate shall be actuated automatically so that the required mass is discharged into the weigh box, after which the gate shall automatically close and lock.
- The automatic weighing system shall be designed so that all proportions required may be set on the weighing controller at the same time.

90-6 MIXING AND TRANSPORTING

90-6.01 GENERAL

- Concrete shall be mixed in mechanically operated mixers, except that when permitted by the Engineer, batches not exceeding 0.25 m³ may be mixed by hand methods in conformance with the provisions in Section 90-6.05, "Hand-Mixing."
- Equipment having components made of aluminum or magnesium alloys that would have contact with plastic concrete during mixing, transporting, or pumping of portland cement concrete shall not be used.
- Concrete shall be homogeneous and thoroughly mixed, and there shall be no lumps or evidence of undispersed cement, mineral admixture, or cement plus mineral admixture.
- Uniformity of concrete mixtures will be determined by differences in penetration as determined by California Test 533, or slump as determined by ASTM Designation: C 143, and by variations in the proportion of coarse aggregate as determined by California Test 529.
- When the mix design specifies a penetration value, the difference in penetration, determined by comparing penetration tests on 2 samples of mixed concrete from the same batch or truck mixer load, shall not exceed 10 mm. When the mix design specifies a slump value, the difference in slump, determined by comparing slump tests on 2 samples of mixed concrete from the same batch or truck mixer load, shall not exceed the values given in the table below. Variation in the proportion of coarse aggregate will be determined by comparing the results of tests of 2 samples of mixed concrete from the same batch or truck mixer load and the difference between the 2 results shall not exceed 100 kg per cubic meter of concrete.

Average Slump	Maximum Permissible Difference
Less than 100-mm	25-mm
100-mm to 150-mm	38-mm
Greater than 150-mm to 225-mm	50-mm

- The Contractor, at the Contractor's expense, shall furnish samples of the freshly mixed concrete and provide satisfactory facilities for obtaining the samples.

90-6.02 MACHINE MIXING

- Concrete mixers may be of the revolving drum or the revolving blade type, and the mixing drum or blades shall be operated uniformly at the mixing speed recommended by the manufacturer. Mixers and agitators that have an accumulation of hard concrete or mortar shall not be used.
- The temperature of mixed concrete, immediately before placing, shall be not less than 10°C or more than 32°C. Aggregates and water shall be heated or cooled as necessary to produce concrete within these temperature limits. Neither aggregates nor mixing water shall be heated to exceed 65°C. If ice is used to cool the concrete, discharge of the mixer will not be permitted until all ice is melted.
- The batch shall be so charged into the mixer that some water will enter in advance of cementitious materials and aggregates. All water shall be in the drum by the end of the first one - fourth of the specified mixing time.
- Cementitious materials shall be batched and charged into the mixer by means that will not result either in loss of cementitious materials due to the effect of wind, in accumulation of cementitious materials on surfaces of conveyors or hoppers, or in other conditions that reduce or vary the required quantity of cementitious material in the concrete mixture.
- Paving and stationary mixers shall be operated with an automatic timing device. The timing device and discharge mechanism shall be interlocked so that during normal operation no part of the batch will be discharged until the specified mixing time has elapsed.
 - The total elapsed time between the intermingling of damp aggregates and all cementitious materials and the start of mixing shall not exceed 30 minutes.
 - The size of batch shall not exceed the manufacturer's guaranteed capacity.
 - When producing concrete for pavement or base, suitable batch counters shall be installed and maintained in good operating condition at jobsite batching plants and stationary mixers. The batch counters shall indicate the exact number of batches proportioned and mixed.
 - Concrete shall be mixed and delivered to the jobsite by means of one of the following combinations of operations:
 - A. Mixed completely in a stationary mixer and the mixed concrete transported to the point of delivery in truck agitators or in non-agitating hauling equipment (central-mixed concrete).
 - B. Mixed partially in a stationary mixer, and the mixing completed in a truck mixer (shrink-mixed concrete).
 - C. Mixed completely in a truck mixer (transit-mixed concrete).
 - D. Mixed completely in a paving mixer.
- Agitators may be truck mixers operating at agitating speed or truck agitators. Each mixer and agitator shall have attached thereto in a prominent place a metal plate or plates on which is plainly marked the various uses for which the equipment is designed, the manufacturer's guaranteed capacity of the drum or container in terms of the volume of mixed concrete and the speed of rotation of the mixing drum or blades.
 - Truck mixers shall be equipped with electrically or mechanically actuated revolution counters by which the number of revolutions of the drum or blades may readily be verified.
 - When shrink-mixed concrete is furnished, concrete that has been partially mixed at a central plant shall be transferred to a truck mixer and all requirements for transit-mixed concrete shall apply. No credit in the number of revolutions at mixing speed shall be allowed for partial mixing in a central plant.

90-6.03 TRANSPORTING MIXED CONCRETE

- Mixed concrete may be transported to the delivery point in truck agitators or truck mixers operating at the speed designated by the manufacturer of the equipment as agitating speed, or in non-agitating hauling equipment, provided the consistency and workability of the mixed concrete upon discharge at the delivery point is suitable for adequate placement and consolidation in place, and provided the mixed concrete after hauling to the delivery point conforms to the provisions in Section 90-6.01, "General."
 - Truck agitators shall be loaded not to exceed the manufacturer's guaranteed capacity and shall maintain the mixed concrete in a thoroughly mixed and uniform mass during hauling.
 - Bodies of non-agitating hauling equipment shall be constructed so that leakage of the concrete mix, or any part thereof, will not occur at any time.
 - Concrete hauled in open-top vehicles shall be protected during hauling against rain or against exposure to the sun for more than 20 minutes when the ambient temperature exceeds 24°C.
 - No additional mixing water shall be incorporated into the concrete during hauling or after arrival at the delivery point, unless authorized by the Engineer. If the Engineer authorizes additional water to be incorporated into the concrete, the drum shall be revolved not less than 30 revolutions at mixing speed after the water is added and before discharge is commenced.

- The rate of discharge of mixed concrete from truck mixer-agitators shall be controlled by the speed of rotation of the drum in the discharge direction with the discharge gate fully open.
- When a truck mixer or agitator is used for transporting concrete to the delivery point, discharge shall be completed within 1.5 hours or before 250 revolutions of the drum or blades, whichever occurs first, after the introduction of the cement to the aggregates. Under conditions contributing to quick stiffening of the concrete, or when the temperature of the concrete is 30°C or above, the time allowed may be less than 1.5 hours.
- When non-agitating hauling equipment is used for transporting concrete to the delivery point, discharge shall be completed within one hour after the addition of the cement to the aggregates. Under conditions contributing to quick stiffening of the concrete, or when the temperature of the concrete is 30°C or above, the time between the introduction of cement to the aggregates and discharge shall not exceed 45 minutes.
- Each load of concrete delivered at the jobsite shall be accompanied by a weighmaster certificate showing the mix identification number, non-repeating load number, date and time at which the materials were batched, the total amount of water added to the load, and for transit-mixed concrete, the reading of the revolution counter at the time the truck mixer is charged with cement. This weighmaster certificate shall also show the actual scale masses (kilograms) for the ingredients batched. Theoretical or target batch masses shall not be used as a substitute for actual scale masses.
- Weighmaster certificates shall be provided in printed form, or if approved by the Engineer, the data may be submitted in electronic media. Electronic media shall be presented in a tab-delimited format on a 90 mm diskette with a capacity of at least 1.4 megabytes. Captured data, for the ingredients represented by each batch shall be "line feed, carriage return" (LFCR) and "one line, separate record" with allowances for sufficient fields to satisfy the amount of data required by these specifications.
- The Contractor may furnish a weighmaster certificate accompanied by a separate certificate that lists the actual batch masses or measurements for a load of concrete provided that both certificates are imprinted with the same non-repeating load number that is unique to the contract and delivered to the jobsite with the load.
- Weighmaster certificates furnished by the Contractor shall conform to the provisions in Section 9-1.01, "Measurement of Quantities."

90-6.04 TIME OR AMOUNT OF MIXING

- Mixing of concrete in paving or stationary mixers shall continue for the required mixing time after all ingredients, except water and admixture, if added with the water, are in the mixing compartment of the mixer before any part of the batch is released. Transfer time in multiple drum mixers shall not be counted as part of the required mixing time.
- The required mixing time, in paving or stationary mixers, of concrete used for concrete structures, except minor structures, shall be not less than 90 seconds or more than 5 minutes, except that when directed by the Engineer in writing, the requirements of the following paragraph shall apply.
- The required mixing time, in paving or stationary mixers, except as provided in the preceding paragraph, shall be not less than 50 seconds or more than 5 minutes.
- The minimum required revolutions at the mixing speed for transit-mixed concrete shall not be less than that recommended by the mixer manufacturer, but in no case shall the number of revolutions be less than that required to consistently produce concrete conforming to the provisions for uniformity in Section 90-6.01, "General."

90-6.05 HAND-MIXING

- Hand-mixed concrete shall be made in batches of not more than 0.25 m³ and shall be mixed on a watertight, level platform. The proper amount of coarse aggregate shall be measured in measuring boxes and spread on the platform and the fine aggregate shall be spread on this layer, the 2 layers being not more than 0.3 meters in total depth. On this mixture shall be spread the dry cement and mineral admixture and the whole mass turned no fewer than 2 times dry; then sufficient clean water shall be added, evenly distributed, and the whole mass again turned no fewer than 3 times, not including placing in the carriers or forms.

90-6.06 AMOUNT OF WATER AND PENETRATION

- The amount of water used in concrete mixes shall be regulated so that the penetration of the concrete as determined by California Test 533 or the slump of the concrete as determined by ASTM Designation: C 143 is within the "Nominal" values shown in the following table. When the penetration or slump of the concrete is found to exceed the nominal values listed, the mixture of subsequent batches shall be adjusted to reduce the penetration or slump to a value within the nominal range shown. Batches of concrete with a penetration or slump exceeding the maximum values listed shall not be used in the work. When Type F or Type G chemical admixtures are added to the mix, the penetration requirements shall not apply and the slump shall not exceed 225 mm after the chemical admixtures are added.

Type of Work	Nominal		Maximum	
	Penetration (mm)	Slump (mm)	Penetration (mm)	Slump (mm)
Concrete Pavement	0-25	—	40	—
Non-reinforced concrete facilities	0-35	—	50	—
Reinforced concrete structures				
Sections over 300-mm thick	0-35	—	65	—
Sections 300-mm thick or less	0-50	—	75	—
Concrete placed under water	—	150-200	—	225
Cast-in-place concrete piles	65-90	130-180	100	200

- The amount of free water used in concrete shall not exceed 183 kg/m^3 , plus 20 kg for each required 100 kg of cementitious material in excess of 325 kg/m^3 .
- The term free water is defined as the total water in the mixture minus the water absorbed by the aggregates in reaching a saturated surface-dry condition.
- Where there are adverse or difficult conditions that affect the placing of concrete, the above specified penetration and free water content limitations may be exceeded providing the Contractor is granted permission by the Engineer in writing to increase the cementitious material content per cubic meter of concrete. The increase in water and cementitious material shall be at a ratio not to exceed 30 kg of water per added 100 kg of cementitious material per cubic meter. The cost of additional cementitious material and water added under these conditions shall be at the Contractor's expense and no additional compensation will be allowed therefor.
- The equipment for supplying water to the mixer shall be constructed and arranged so that the amount of water added can be measured accurately. Any method of discharging water into the mixer for a batch shall be accurate within 1.5 percent of the quantity of water required to be added to the mix for any position of the mixer. Tanks used to measure water shall be designed so that water cannot enter while water is being discharged into the mixer and discharge into the mixer shall be made rapidly in one operation without dribbling. All equipment shall be arranged so as to permit checking the amount of water delivered by discharging into measured containers.

90-7 CURING CONCRETE

90-7.01 METHODS OF CURING

- Newly placed concrete shall be cured by the methods specified in this Section 90-7.01 and the special provisions.

90-7.01A Water Method

- The concrete shall be kept continuously wet by the application of water for a minimum curing period of 7 days after the concrete has been placed.
 - When a curing medium consisting of cotton mats, rugs, carpets, or earth or sand blankets is to be used to retain the moisture, the entire surface of the concrete shall be kept damp by applying water with a nozzle that so atomizes the flow that a mist and not a spray is formed, until the surface of the concrete is covered with the curing medium. The moisture from the nozzle shall not be applied under pressure directly upon the concrete and shall not be allowed to accumulate on the concrete in a quantity sufficient to cause a flow or wash the surface. At the expiration of the curing period, the concrete surfaces shall be cleared of all curing mediums.
 - When concrete bridge decks and flat slabs are to be cured without the use of a curing medium, the entire surface of the bridge deck or slab shall be kept damp by the application of water with an atomizing nozzle as specified in the preceding paragraph, until the concrete has set, after which the entire surface of the concrete shall be sprinkled continuously with water for a period of not less than 7 days.

90-7.01B Curing Compound Method

- Surfaces of the concrete that are exposed to the air shall be sprayed uniformly with a curing compound.
- Curing compounds to be used shall be as follows:
 1. Pigmented curing compound conforming to the requirements in ASTM Designation: C 309, Type 2, Class B, except the resin type shall be poly-alpha-methylstyrene.
 2. Pigmented curing compound conforming to the requirements in ASTM Designation: C 309, Type 2, Class B.
 3. Pigmented curing compound conforming to the requirements in ASTM Designation: C 309, Type 2, Class A.
 4. Non-pigmented curing compound conforming to the requirements in ASTM Designation: C 309, Type 1, Class B.

5. Non-pigmented curing compound conforming to the requirements in ASTM Designation: C 309, Type 1, Class A.
6. Non-pigmented curing compound with fugitive dye conforming to the requirements in ASTM Designation: C 309, Type 1-D, Class A.

- The infrared scan for the dried vehicle from curing compound (1) shall match the infrared scan on file at the Transportation Laboratory.

- The loss of water for each type of curing compound, when tested in conformance with the requirements in California Test 534, shall not be more than 0.15-kg/m² in 24 hours or more than 0.45-kg/m² in 72 hours.

- The curing compound to be used will be specified elsewhere in these specifications or in the special provisions.

- When the use of curing compound is required or permitted elsewhere in these specifications or in the special provisions and no specific kind is specified, any of the curing compounds listed above may be used.

- Curing compound shall be applied at a nominal rate of 3.7 m²/L, unless otherwise specified.

- At any point, the application rate shall be within ± 1.2 m²/L of the nominal rate specified, and the average application rate shall be within ± 0.5 m²/L of the nominal rate specified when tested in conformance with the requirements in California Test 535. Runs, sags, thin areas, skips, or holidays in the applied curing compound shall be evidence that the application is not satisfactory.

- Curing compounds shall be applied using power operated spray equipment. The power operated spraying equipment shall be equipped with an operational pressure gage and a means of controlling the pressure. Hand spraying of small and irregular areas that are not reasonably accessible to mechanical spraying equipment, in the opinion of the Engineer, may be permitted.

- The curing compound shall be applied to the concrete following the surface finishing operation, immediately before the moisture sheen disappears from the surface, but before any drying shrinkage or craze cracks begin to appear. In the event of any drying or cracking of the surface, application of water with an atomizing nozzle as specified in Section 90-7.01A, "Water Method," shall be started immediately and shall be continued until application of the compound is resumed or started; however, the compound shall not be applied over any resulting freestanding water. Should the film of compound be damaged from any cause before the expiration of 7 days after the concrete is placed in the case of structures and 72 hours in the case of pavement, the damaged portion shall be repaired immediately with additional compound.

- At the time of use, compounds containing pigments shall be in a thoroughly mixed condition with the pigment uniformly dispersed throughout the vehicle. A paddle shall be used to loosen all settled pigment from the bottom of the container, and a power driven agitator shall be used to disperse the pigment uniformly throughout the vehicle.

- Agitation shall not introduce air or other foreign substance into the curing compound.

- The manufacturer shall include in the curing compound the necessary additives for control of sagging, pigment settling, leveling, de-emulsification, or other requisite qualities of a satisfactory working material. Pigmented curing compounds shall be manufactured so that the pigment does not settle badly, does not cake or thicken in the container, and does not become granular or curdled. Settlement of pigment shall be a thoroughly wetted, soft, mushy mass permitting the complete and easy vertical penetration of a paddle. Settled pigment shall be easily redispersed, with minimum resistance to the sideways manual motion of the paddle across the bottom of the container, to form a smooth uniform product of the proper consistency.

- Curing compounds shall remain sprayable at temperatures above 4°C and shall not be diluted or altered after manufacture.

- The curing compound shall be packaged in clean 210-L barrels or round 19-L containers or shall be supplied from a suitable storage tank located at the jobsite. The containers shall comply with "Title 49, Code of Federal Regulations, Hazardous Materials Regulations." The 210-L barrels shall have removable lids and airtight fasteners. The 19-L containers shall be round and have standard full open head and bail. Lids with bungholes shall not be permitted. On-site storage tanks shall be kept clean and free of contaminants. Each tank shall have a permanent system designed to completely redisperse settled material without introducing air or other foreign substances.

- Steel containers and lids shall be lined with a coating that will prevent destructive action by the compound or chemical agents in the air space above the compound. The coating shall not come off the container or lid as skins. Containers shall be filled in a manner that will prevent skinning. Plastic containers shall not react with the compound.

- Each container shall be labeled with the manufacturer's name, kind of curing compound, batch number, volume, date of manufacture, and volatile organic compound (VOC) content. The label shall also warn that the curing compound containing pigment shall be well stirred before use. Precautions concerning the handling and the application of curing compound shall be shown on the label of the curing compound containers in conformance with the Construction Safety Orders and General Industry Safety Orders of the State of California.

- Containers of curing compound shall be labeled to indicate that the contents fully comply with the rules and regulations concerning air pollution control in the State of California.

- When the curing compound is shipped in tanks or tank trucks, a shipping invoice shall accompany each load. The invoice shall contain the same information as that required herein for container labels.

- Curing compound will be sampled by the Engineer at the source of supply or at the jobsite or at both locations.
- Curing compound shall be formulated so as to maintain the specified properties for a minimum of one year. The Engineer may require additional testing before use to determine compliance with these specifications if the compound has not been used within one year or whenever the Engineer has reason to believe the compound is no longer satisfactory.
- Tests will be conducted in conformance with the latest ASTM test methods and methods in use by the Transportation Laboratory.

90-7.01C Waterproof Membrane Method

- The exposed finished surfaces of concrete shall be sprayed with water, using a nozzle that so atomizes the flow that a mist and not a spray is formed, until the concrete has set, after which the curing membrane shall be placed. The curing membrane shall remain in place for a period of not less than 72 hours.
- Sheeting material for curing concrete shall conform to the requirements in AASHTO Designation: M 171 for white reflective materials.
- The sheeting material shall be fabricated into sheets of such width as to provide a complete cover for the entire concrete surface. Joints in the sheets shall be securely cemented together in such a manner as to provide a waterproof joint. The joint seams shall have a minimum lap of 100 mm.
- The sheets shall be securely weighted down by placing a bank of earth on the edges of the sheets or by other means satisfactory to the Engineer.
- Should any portion of the sheets be broken or damaged before the expiration of 72 hours after being placed, the broken or damaged portions shall be immediately repaired with new sheets properly cemented into place.
- Sections of membrane that have lost their waterproof qualities or have been damaged to such an extent as to render them unfit for curing the concrete shall not be used.

90-7.01D Forms-In-Place Method

- Formed surfaces of concrete may be cured by retaining the forms in place. The forms shall remain in place for a minimum period of 7 days after the concrete has been placed, except that for members over 0.5-m in least dimension the forms shall remain in place for a minimum period of 5 days.
- Joints in the forms and the joints between the end of forms and concrete shall be kept moisture tight during the curing period. Cracks in the forms and cracks between the forms and the concrete shall be resealed by methods subject to the approval of the Engineer.

90-7.02 CURING PAVEMENT

- The entire exposed area of the pavement, including edges, shall be cured by the waterproof membrane method, or curing compound method using curing compound (1) or (2) as the Contractor may elect. Should the side forms be removed before the expiration of 72 hours following the start of curing, the exposed pavement edges shall also be cured. If the pavement is cured by means of the curing compound method, the sawcut and all portions of the curing compound that have been disturbed by sawing operations shall be restored by spraying with additional curing compound.
- Curing shall commence as soon as the finishing process provided in Section 40-1.10, "Final Finishing," has been completed. The method selected shall conform to the provisions in Section 90-7.01, "Methods of Curing."
- When the curing compound method is used, the compound shall be applied to the entire pavement surface by mechanical sprayers. Spraying equipment shall be of the fully atomizing type equipped with a tank agitator that provides for continual agitation of the curing compound during the time of application. The spray shall be adequately protected against wind, and the nozzles shall be so oriented or moved mechanically transversely as to result in the minimum specified rate of coverage being applied uniformly on exposed faces. Hand spraying of small and irregular areas, and areas inaccessible to mechanical spraying equipment, in the opinion of the Engineer, will be permitted. When the ambient air temperature is above 15°C, the Contractor shall fog the surface of the concrete with a fine spray of water as specified in Section 90-7.01A, "Water Method." The surface of the pavement shall be kept moist between the hours of 10:00 a.m. and 4:30 p.m. on the day the concrete is placed. However, the fogging done after the curing compound has been applied shall not begin until the compound has set sufficiently to prevent displacement. Fogging shall be discontinued if ordered in writing by the Engineer.

90-7.03 CURING STRUCTURES

- Newly placed concrete for cast-in-place structures, other than highway bridge decks, shall be cured by the water method, the forms-in-place method, or, as permitted herein, by the curing compound method, in conformance with the provisions in Section 90-7.01, "Methods of Curing."
- The curing compound method using a pigmented curing compound may be used on concrete surfaces of construction joints, surfaces that are to be buried underground, and surfaces where only Ordinary Surface Finish is to be

applied and on which a uniform color is not required and that will not be visible from a public traveled way. If the Contractor elects to use the curing compound method on the bottom slab of box girder spans, the curing compound shall be curing compound (1).

- The top surface of highway bridge decks shall be cured by both the curing compound method and the water method. The curing compound shall be curing compound (1).
- Concrete surfaces of minor structures, as defined in Section 51-1.02, "Minor Structures," shall be cured by the water method, the forms-in-place method or the curing compound method.
- When deemed necessary by the Engineer during periods of hot weather, water shall be applied to concrete surfaces being cured by the curing compound method or by the forms-in-place method, until the Engineer determines that a cooling effect is no longer required. Application of water for this purpose will be paid for as extra work as provided in Section 4-1.03D, "Extra Work."

90-7.04 CURING PRECAST CONCRETE MEMBERS

• Precast concrete members shall be cured in conformance with any of the methods specified in Section 90-7.01, "Methods of Curing." Curing shall be provided for the minimum time specified for each method or until the concrete reaches its design strength, whichever is less. Steam curing may also be used for precast members and shall conform to the following provisions:

- A. After placement of the concrete, members shall be held for a minimum 4-hour presteaming period. If the ambient air temperature is below 10°C, steam shall be applied during the presteaming period to hold the air surrounding the member at a temperature between 10°C and 32°C.
- B. To prevent moisture loss on exposed surfaces during the presteaming period, members shall be covered as soon as possible after casting or the exposed surfaces shall be kept wet by fog spray or wet blankets.
- C. Enclosures for steam curing shall allow free circulation of steam about the member and shall be constructed to contain the live steam with a minimum moisture loss. The use of tarpaulins or similar flexible covers will be permitted, provided they are kept in good repair and secured in such a manner as to prevent the loss of steam and moisture.
- D. Steam at the jets shall be at low pressure and in a saturated condition. Steam jets shall not impinge directly on the concrete, test cylinders, or forms. During application of the steam, the temperature rise within the enclosure shall not exceed 22°C per hour. The curing temperature throughout the enclosure shall not exceed 65°C and shall be maintained at a constant level for a sufficient time necessary to develop the required transfer strength. Control cylinders shall be covered to prevent moisture loss and shall be placed in a location where temperature is representative of the average temperature of the enclosure.
- E. Temperature recording devices that will provide an accurate, continuous, permanent record of the curing temperature shall be provided. A minimum of one temperature recording device per 60 m of continuous bed length will be required for checking temperature.
- F. Members in pretension beds shall be detensioned immediately after the termination of steam curing while the concrete and forms are still warm, or the temperature under the enclosure shall be maintained above 15°C until the stress is transferred to the concrete.
- G. Curing of precast concrete will be considered completed after termination of the steam curing cycle.

90-7.05 CURING PRECAST PRESTRESSED CONCRETE PILES

• Newly placed concrete for precast prestressed concrete piles shall be cured in conformance with the provisions in Section 90-7.04, "Curing Precast Concrete Members," except that piles with a class designation ending in C (corrosion resistant) shall be cured as follows:

- A. Piles shall be either steam cured or water cured. If water curing is used, the piles shall be kept continuously wet by the application of water in conformance with the provisions in Section 90-7.01A, "Water Method."
- B. If steam curing is used, the steam curing provisions in Section 90-7.04, "Curing Precast Concrete Members," shall apply except that the piles shall be kept continuously wet for their entire length for a period of not less than 3 days, including the holding and steam curing periods.

90-7.06 CURING SLOPE PROTECTION

• Concrete slope protection shall be cured in conformance with any of the methods specified in Section 90-7.01, "Methods of Curing."

- Concreted-rock slope protection shall be cured in conformance with any of the methods specified in Section 90-7.01, "Methods of Curing," or with a blanket of earth kept wet for 72 hours, or by sprinkling with a fine spray of water every 2 hours during the daytime for a period of 3 days.

90-7.07 CURING MISCELLANEOUS CONCRETE WORK

- Exposed surfaces of curbs shall be cured by pigmented curing compounds as specified in Section 90-7.01B, "Curing Compound Method."
- Concrete sidewalks, gutter depressions, island paving, curb ramps, driveways, and other miscellaneous concrete areas shall be cured in conformance with any of the methods specified in Section 90-7.01, "Methods of Curing."
- Shotcrete shall be cured for at least 72 hours by spraying with water, or by a moist earth blanket, or by any of the methods provided in Section 90-7.01, "Methods of Curing."
- Mortar and grout shall be cured by keeping the surface damp for 3 days.
- After placing, the exposed surfaces of sign structure foundations, including pedestal portions, if constructed, shall be cured for at least 72 hours by spraying with water, or by a moist earth blanket, or by any of the methods provided in Section 90-7.01, "Methods of Curing."

90-8 PROTECTING CONCRETE

90-8.01 GENERAL

- In addition to the provisions in Section 7-1.16, "Contractor's Responsibility for the Work and Materials," the Contractor shall protect concrete as provided in this Section 90-8.
- Concrete shall not be placed on frozen or ice-coated ground or subgrade nor on ice-coated forms, reinforcing steel, structural steel, conduits, precast members, or construction joints.
- Under rainy conditions, placing of concrete shall be stopped before the quantity of surface water is sufficient to damage surface mortar or cause a flow or wash of the concrete surface, unless the Contractor provides adequate protection against damage.
- Concrete that has been frozen or damaged by other causes, as determined by the Engineer, shall be removed and replaced by the Contractor at the Contractor's expense.

90-8.02 PROTECTING CONCRETE STRUCTURES

- Structure concrete and shotcrete used as structure concrete shall be maintained at a temperature of not less than 7°C for 72 hours after placing and at not less than 4°C for an additional 4 days. When required by the Engineer, the Contractor shall submit a written outline of the proposed methods for protecting the concrete.

90-8.03 PROTECTING CONCRETE PAVEMENT

- Pavement concrete shall be maintained at a temperature of not less than 4°C for 72 hours. When required by the Engineer, the Contractor shall submit a written outline of the proposed methods for protecting the concrete.
- Except as provided in Section 7-1.08, "Public Convenience," the Contractor shall protect concrete pavement against construction and other activities that abrade, scar, discolor, reduce texture depth, lower coefficient of friction, or otherwise damage the surface. Stockpiling, drifting, or excessive spillage of soil, gravel, petroleum products, and concrete or asphalt mixes on the surface of concrete pavement is prohibited unless otherwise specified in these specifications, the special provisions or permitted by the Engineer.
- When ordered by the Engineer or shown on the plans or specified in the special provisions, pavement crossings shall be constructed for the convenience of public traffic. The material and work necessary for the construction of the crossings, and their subsequent removal and disposal, will be paid for at the contract unit prices for the items of work involved and if there are no contract items for the work involved, payment for pavement crossings will be made by extra work as provided in Section 4-1.03D, "Extra Work.". Where public traffic will be required to cross over the new pavement, Type III portland cement may be used in concrete, if permitted in writing by the Engineer. The pavement may be opened to traffic as soon as the concrete has developed a modulus of rupture of 3.8 MPa. The modulus of rupture will be determined by California Test 523.
- No traffic or Contractor's equipment, except as hereinafter provided, will be permitted on the pavement before a period of 10 days has elapsed after the concrete has been placed, nor before the concrete has developed a modulus of rupture of at least 3.8 MPa. Concrete that fails to attain a modulus of rupture of 3.8 MPa within 10 days shall not be opened to traffic until directed by the Engineer.
- Equipment for sawing weakened plane joints will be permitted on the pavement as specified in Section 40-1.08B, "Weakened Plane Joints."

- When requested in writing by the Contractor, the tracks on one side of paving equipment will be permitted on the pavement after a modulus of rupture of 2.4 MPa has been attained, provided that:
 - A. Unit pressure exerted on the pavement by the paver shall not exceed 135 kPa;
 - B. Tracks with cleats, grousers, or similar protuberances shall be modified or shall travel on planks or equivalent protective material, so that the pavement is not damaged; and
 - C. No part of the track shall be closer than 0.3-m from the edge of pavement.
- In case of visible cracking of, or other damage to the pavement, operation of the paving equipment on the pavement shall be immediately discontinued.
- Damage to the pavement resulting from early use of pavement by the Contractor's equipment as provided above shall be repaired by the Contractor at the Contractor's expense.
- The State will furnish the molds and machines for testing the concrete for modulus of rupture, and the Contractor, at the Contractor's expense, shall furnish the material and whatever labor the Engineer may require.

90-9 COMPRESSIVE STRENGTH

90-9.01 GENERAL

- Concrete compressive strength requirements consist of a minimum strength that shall be attained before various loads or stresses are applied to the concrete and, for concrete designated by strength, a minimum strength at the age of 28 days or at the age otherwise allowed in Section 90-1.01, "Description." The various strengths required are specified in these specifications or the special provisions or are shown on the plans.
- The compressive strength of concrete will be determined from test cylinders that have been fabricated from concrete sampled in conformance with the requirements of California Test 539. Test cylinders will be molded and initially field cured in conformance with California Test 540. Test cylinders will be cured and tested after receipt at the testing laboratory in conformance with the requirements of California Test 521. A strength test shall consist of the average strength of 2 cylinders fabricated from material taken from a single load of concrete, except that, if any cylinder should show evidence of improper sampling, molding, or testing, that cylinder shall be discarded and the strength test shall consist of the strength of the remaining cylinder.
- When concrete compressive strength is specified as a prerequisite to applying loads or stresses to a concrete structure or member, test cylinders for other than steam cured concrete will be cured in conformance with Method 1 of California Test 540. The compressive strength of concrete determined for these purposes will be evaluated on the basis of individual tests.
- When concrete is designated by 28-day compressive strength rather than by cementitious material content, the concrete strength to be used as a basis for acceptance of other than steam cured concrete will be determined from cylinders cured in conformance with Method 1 of California Test 540. If the result of a single compressive strength test at the maximum age specified or allowed is below the specified strength but is 95 percent or more of the specified strength, the Contractor shall, at the Contractor's expense, make corrective changes, subject to approval of the Engineer, in the mix proportions or in the concrete fabrication procedures, before placing additional concrete, and shall pay to the State \$14 for each in-place cubic meter of concrete represented by the deficient test. If the result of a single compressive strength test at the maximum age specified or allowed is below 95 percent of the specified strength, but is 85 percent or more of the specified strength, the Contractor shall make the corrective changes specified above, and shall pay to the State \$20 for each in place cubic meter of concrete represented by the deficient test. In addition, such corrective changes shall be made when the compressive strength of concrete tested at 7 days indicates, in the judgment of the Engineer, that the concrete will not attain the required compressive strength at the maximum age specified or allowed. Concrete represented by a single test that indicates a compressive strength of less than 85 percent of the specified 28-day compressive strength will be rejected in conformance with the provisions in Section 6-1.04, "Defective Materials."
- If the test result indicates that the compressive strength at the maximum curing age specified or allowed is below the specified strength, but is 85 percent or more of the specified strength, payments to the State as required above shall be made, unless the Contractor, at the Contractor's expense, obtains and submits evidence acceptable to the Engineer that the strength of the concrete placed in the work meets or exceeds the specified 28-day compressive strength. If the test result indicates a compressive strength at the maximum curing age specified or allowed below 85 percent, the concrete represented by that test will be rejected, unless the Contractor, at the Contractor's expense, obtains and submits evidence acceptable to the Engineer that the strength and quality of the concrete placed in the work are acceptable. If the evidence consists of tests made on cores taken from the work, the cores shall be obtained and tested in conformance with the requirements in ASTM Designation: C 42.
- No single compressive strength test shall represent more than 250 m³.

- When a precast concrete member is steam cured, the compressive strength of the concrete will be determined from test cylinders that have been handled and stored in conformance with Method 3 of California Test 540. The compressive strength of steam cured concrete will be evaluated on the basis of individual tests representing specific portions of production. When the concrete is designated by 28-day compressive strength rather than by cementitious material content, the concrete shall be considered to be acceptable whenever its compressive strength reaches the specified 28-day compressive strength provided that strength is reached in not more than the maximum number of days specified or allowed after the member is cast.

- When concrete is specified by compressive strength, prequalification of materials, mix proportions, mixing equipment, and procedures proposed for use will be required prior to placement of the concrete. Prequalification shall be accomplished by the submission of acceptable certified test data or trial batch reports by the Contractor. Prequalification data shall be based on the use of materials, mix proportions, mixing equipment, procedures, and size of batch proposed for use in the work.

- Certified test data, in order to be acceptable, shall indicate that not less than 90 percent of at least 20 consecutive tests exceed the specified strength at the maximum number of cure days specified or allowed, and none of those tests are less than 95 percent of specified strength. Strength tests included in the data shall be the most recent tests made on concrete of the proposed mix design and all shall have been made within one year of the proposed use of the concrete.

- Trial batch test reports, in order to be acceptable, shall indicate that the average compressive strength of 5 consecutive concrete cylinders, taken from a single batch, at not more than 28 days (or the maximum age allowed) after molding shall be at least 4 MPa greater than the specified 28-day compressive strength, and no individual cylinder shall have a strength less than the specified strength at the maximum age specified or allowed. Data contained in the report shall be from trial batches that were produced within one year of the proposed use of specified strength concrete in the project. Whenever air-entrainment is required, the air content of trial batches shall be equal to or greater than the air content specified for the concrete without reduction due to tolerances.

- Tests shall be performed in conformance with either the appropriate California Test methods or the comparable ASTM test methods. Equipment employed in testing shall be in good condition and shall be properly calibrated. If the tests are performed during the life of the contract, the Engineer shall be notified sufficiently in advance of performing the tests in order to witness the test procedures.

- The certified test data and trial batch test reports shall include the following information:

- A. Date of mixing.
- B. Mixing equipment and procedures used.
- C. The size of batch in cubic meters and the mass, type, and source of all ingredients used.
- D. Penetration of the concrete.
- E. The air content of the concrete if an air-entraining admixture is used.
- F. The age at time of testing and strength of all concrete cylinders tested.

- Certified test data and trial batch test reports shall be signed by an official of the firm that performed the tests.

- When approved by the Engineer, concrete from trial batches may be used in the work at locations where concrete of a lower quality is required and the concrete will be paid for as the type or class of concrete required at that location.

- After materials, mix proportions, mixing equipment, and procedures for concrete have been prequalified for use, additional prequalification by testing of trial batches will be required prior to making changes that, in the judgment of the Engineer, could result in a strength of concrete below that specified.

- The Contractor's attention is directed to the time required to test trial batches and the Contractor shall be responsible for production of trial batches at a sufficiently early date so that the progress of the work is not delayed.

- When precast concrete members are manufactured at the plant of an established manufacturer of precast concrete members, the mix proportions of the concrete shall be determined by the Contractor, and a trial batch and prequalification of the materials, mix proportions, mixing equipment, and procedures will not be required.

90-10 MINOR CONCRETE

90-10.01 GENERAL

- Concrete for minor structures, slope paving, curbs, sidewalks and other concrete work, when designated as minor concrete on the plans, in the specifications, or in the contract item, shall conform to the provisions specified herein.

- The Engineer, at the Engineer's discretion, will inspect and test the facilities, materials and methods for producing the concrete to ensure that minor concrete of the quality suitable for use in the work is obtained.

90-10.02 MATERIALS

- Minor concrete shall conform to the following requirements:

90-10.02A Cementitious Material

- Cementitious material shall conform to the provisions in Section 90-1.01, "Description."

90-10.02B Aggregate

- Aggregate shall be clean and free from deleterious coatings, clay balls, roots, and other extraneous materials.
- The Contractor shall submit to the Engineer for approval, a grading of the combined aggregate proposed for use in the minor concrete. After acceptance of the grading, aggregate furnished for minor concrete shall conform to that grading, unless a change is authorized in writing by the Engineer.
 - The Engineer may require the Contractor to furnish periodic test reports of the aggregate grading furnished. The maximum size of aggregate used shall be at the option of the Contractor, but in no case shall the maximum size be larger than 37.5 mm or smaller than 19 mm.
 - The Engineer may waive, in writing, the gradation requirements in this Section 90-10.02B, if, in the Engineer's opinion, the furnishing of the gradation is not necessary for the type or amount of concrete work to be constructed.

90-10.02C Water

- Water used for washing, mixing, and curing shall be free from oil, salts, and other impurities that would discolor or etch the surface or have an adverse affect on the quality of the concrete.

90-10.02D Admixtures

- The use of admixtures shall conform to the provisions in Section 90-4, "Admixtures."

90-10.03 PRODUCTION

- Cementitious material, water, aggregate, and admixtures shall be stored, proportioned, mixed, transported, and discharged in conformance with recognized standards of good practice that will result in concrete that is thoroughly and uniformly mixed, that is suitable for the use intended, and that conforms to requirements specified herein. Recognized standards of good practice are outlined in various industry publications such as are issued by American Concrete Institute, AASHTO, or the Department.
 - The cementitious material content of minor concrete shall conform to the provisions in Section 90-1.01, "Description."
 - The amount of water used shall result in a consistency of concrete conforming to the provisions in Section 90-6.06, "Amount of Water and Penetration." Additional mixing water shall not be incorporated into the concrete during hauling or after arrival at the delivery point, unless authorized by the Engineer.
 - Discharge of ready-mixed concrete from the transporting vehicle shall be made while the concrete is still plastic and before stiffening occurs. An elapsed time of 1.5 hours (one hour in non-agitating hauling equipment), or more than 250 revolutions of the drum or blades, after the introduction of the cementitious material to the aggregates, or a temperature of concrete of more than 32°C will be considered conditions contributing to the quick stiffening of concrete. The Contractor shall take whatever action is necessary to eliminate quick stiffening, except that the addition of water will not be permitted.
 - The required mixing time in stationary mixers shall be not less than 50 seconds or more than 5 minutes.
 - The minimum required revolutions at mixing speed for transit-mixed concrete shall be not less than that recommended by the mixer manufacturer, and shall be increased, if necessary, to produce thoroughly and uniformly mixed concrete.
 - Each load of ready-mixed concrete shall be accompanied by a weighmaster certificate that shall be delivered to the Engineer at the discharge location of the concrete, unless otherwise directed by the Engineer. The weighmaster certificate shall be clearly marked with the date and time of day when the load left the batching plant and, if hauled in truck mixers or agitators, the time the mixing cycle started.
 - A Certificate of Compliance conforming to the provisions in Section 6-1.07, "Certificates of Compliance," shall be furnished to the Engineer, prior to placing minor concrete from a source not previously used on the contract, stating that minor concrete to be furnished meets contract requirements, including minimum cementitious material content specified.

90-10.04 CURING MINOR CONCRETE

- Curing minor concrete shall conform to the provisions in Section 90-7, "Curing Concrete."

90-10.05 PROTECTING MINOR CONCRETE

- Protecting minor concrete shall conform to the provisions in Section 90-8, "Protecting Concrete," except the concrete shall be maintained at a temperature of not less than 4°C for 72 hours after placing.

90-10.06 MEASUREMENT AND PAYMENT

- Minor concrete will be measured and paid for in conformance with the provisions specified in the various sections of these specifications covering concrete construction when minor concrete is specified in the specifications, shown on the plans, or indicated by contract item in the Engineer's Estimate.

90-11 MEASUREMENT AND PAYMENT

90-11.01 MEASUREMENT

- Portland cement concrete will be measured in conformance with the provisions specified in the various sections of these specifications covering construction requiring concrete.
- When it is provided that concrete will be measured at the mixer, the volume in cubic meters shall be computed as the total mass of the batch in kilograms divided by the density of the concrete in kilograms per cubic meter. The total mass of the batch shall be calculated as the sum of all materials, including water, entering the batch. The density of the concrete will be determined in conformance with the requirements in California Test 518.

90-11.02 PAYMENT

- Portland cement concrete will be paid for in conformance with the provisions specified in the various sections of these specifications covering construction requiring concrete.
- Full compensation for furnishing and incorporating admixtures required by these specifications or the special provisions will be considered as included in the contract prices paid for the concrete involved and no additional compensation will be allowed therefor.
- Should the Engineer order the Contractor to incorporate any admixtures in the concrete when their use is not required by these specifications or the special provisions, furnishing the admixtures and adding them to the concrete will be paid for as extra work as provided in Section 4-1.03D, "Extra Work."
- Should the Contractor use admixtures in conformance with the provisions in Section 90-4.05, "Optional Use of Chemical Admixtures," or Section 90-4.07, "Optional Use of Air-entraining Admixtures," or should the Contractor request and obtain permission to use other admixtures for the Contractor's benefit, the Contractor shall furnish those admixtures and incorporate them into the concrete at the Contractor's expense and no additional compensation will be allowed therefor.

END OF AMENDMENTS

SECTION 2. PROPOSAL REQUIREMENTS AND CONDITIONS

2-1.01 GENERAL

The bidder's attention is directed to the provisions in Section 2, "Proposal Requirements and Conditions," of the Standard Specifications and these special provisions for the requirements and conditions which the bidder must observe in the preparation of the Proposal form and the submission of the bid.

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 portion of work that will be performed by each subcontractor listed.

The Bidder's Bond form mentioned in the last paragraph in Section 2-1.07, "Proposal Guaranty," of the Standard Specifications will be found following the signature page of the Proposal.

Submit request for substitution of an "or equal" item, and the data substantiating the request to the Department of Transportation, Construction Division Chief, 801 South Grand Avenue, 4th Floor, Los Angeles, CA 90017, so that the request is received by the Department by close of business on the fourth day, not including Saturdays, Sundays and legal holidays, following bid opening.

In conformance with Public Contract Code Section 7106, a Noncollusion Affidavit is included in the Proposal. Signing the Proposal shall also constitute signature of the Noncollusion Affidavit.

The contractor, sub recipient or subcontractor shall not discriminate on the basis of race, color, national origin, or sex in the performance of this contract. The contractor shall carry out applicable requirements of 49 CFR part 26 in the award and administration of DOT-assisted contracts. Failure by the contractor to carry out these requirements is a material breach of

this contract, which may result in the termination of this contract or such other remedy as the recipient deems appropriate. Each subcontract signed by the bidder must include this assurance.

2-1.015 FEDERAL LOBBYING RESTRICTIONS

Section 1352, Title 31, United States Code prohibits Federal funds from being expended by the recipient or any lower tier subrecipient of a Federal-aid contract to pay for any person for influencing or attempting to influence a Federal agency or Congress in connection with the awarding of any Federal-aid contract, the making of any Federal grant or loan, or the entering into of any cooperative agreement.

If any funds other than Federal funds have been paid for the same purposes in connection with this Federal-aid contract, the recipient shall submit an executed certification and, if required, submit a completed disclosure form as part of the bid documents.

A certification for Federal-aid contracts regarding payment of funds to lobby Congress or a Federal agency is included in the Proposal. Standard Form - LLL, "Disclosure of Lobbying Activities," with instructions for completion of the Standard Form is also included in the Proposal. Signing the Proposal shall constitute signature of the Certification.

The above-referenced certification and disclosure of lobbying activities shall be included in each subcontract and any lower-tier contracts exceeding \$100,000. All disclosure forms, but not certifications, shall be forwarded from tier to tier until received by the Engineer.

The Contractor, subcontractors and any lower-tier contractors shall file a disclosure form at the end of each calendar quarter in which there occurs any event that requires disclosure or that materially affects the accuracy of the information contained in any disclosure form previously filed by the Contractor, subcontractors and any lower-tier contractors. An event that materially affects the accuracy of the information reported includes:

- A. A cumulative increase of \$25,000 or more in the amount paid or expected to be paid for influencing or attempting to influence a covered Federal action; or
- B. A change in the person(s) or individual(s) influencing or attempting to influence a covered Federal action; or,
- C. A change in the officer(s), employee(s), or Member(s) contacted to influence or attempt to influence a covered Federal action.

2-1.02 DISADVANTAGED BUSINESS ENTERPRISE (DBE)

This project is subject to Part 26, Title 49, Code of Federal Regulations entitled "Participation by Disadvantaged Business Enterprises in Department of Transportation Financial Assistance Programs." The Regulations in their entirety are incorporated herein by this reference.

Bidders shall be fully informed respecting the requirements of the Regulations and the Department's Disadvantaged Business Enterprise (DBE) program developed pursuant to the Regulations; particular attention is directed to the following matters:

- A. A DBE must be a small business concern as defined pursuant to Section 3 of U.S. Small Business Act and relevant regulations promulgated pursuant thereto.
- B. A DBE may participate as a prime contractor, subcontractor, joint venture partner with a prime or subcontractor, vendor of material or supplies, or as a trucking company.
- C. A DBE bidder, not bidding as a joint venture with a non-DBE, will be required to document one or a combination of the following:
 - 1. The bidder will meet the goal by performing work with its own forces.
 - 2. The bidder will meet the goal through work performed by DBE subcontractors, suppliers or trucking companies.
 - 3. The bidder, prior to bidding, made adequate good faith efforts to meet the goal.
- D. A DBE 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 DBE joint venture partner must share in the capital contribution, control, management, risks and profits of the joint venture. The DBE joint venturer must submit the joint venture agreement with the proposal or the DBE Information form required in the Section entitled "Submission of DBE Information" of these special provisions.
- E. A DBE must perform a commercially useful function, i.e., must be responsible for the execution of a distinct element of the work and must carry out its responsibility by actually performing, managing and supervising the work.

- F. DBEs must be certified by the California Unified Certification Program (CUCP). It is the contractor's responsibility to confirm that the firm is DBE certified as of the date of bid opening. Listings of DBEs certified by the CUCP are available from the following sources:
1. The Department's DBE Directory, which is published quarterly. This Directory may be obtained from the Department of Transportation, Materiel Operations Branch, Publication Distribution Unit, 1900 Royal Oaks Drive, Sacramento, California 95815, Telephone: (916) 445-3520.
 2. The Department's web site at <http://www.dot.ca.gov/hq/bep>.
 3. The organizations listed in the Section entitled "DBE Goal for this Project" of these special provisions.
- G. Credit for materials or supplies purchased from DBEs will be as follows:
1. If the materials or supplies are obtained from a DBE manufacturer, 100 percent of the cost of the materials or supplies will count toward the DBE goal. A DBE manufacturer is a firm that operates or maintains a factory or establishment that produces, on the premises, the materials, supplies, articles, or equipment required under the contract and of the general character described by the specifications.
 2. If the materials or supplies are purchased from a DBE regular dealer, 60 percent of the cost of the materials or supplies will count toward the DBE goal. A DBE regular dealer is a firm that owns, operates, or maintains a store, warehouse, or other establishment in which the materials, supplies, articles or equipment of the general character described by the specifications and required under the contract are bought, kept in stock, and regularly sold or leased to the public in the usual course of business. To be a DBE regular dealer, the firm must be an established, regular business that engages, as its principal business and under its own name, in the purchase and sale or lease of the products in question. A person may be a DBE regular dealer in such bulk items as petroleum products, steel, cement, gravel, stone, or asphalt without owning, operating, or maintaining a place of business as provided in this paragraph G.2. if the person both owns and operates distribution equipment for the products. Any supplementing of regular dealers' own distribution equipment shall be by a long-term lease agreement and not on an ad hoc or contract-by-contract basis. Packagers, brokers, manufacturers' representatives, or other persons who arrange or expedite transactions are not DBE regular dealers within the meaning of this paragraph G.2.
 3. Credit for materials or supplies purchased from a DBE which is neither a manufacturer nor a regular dealer will be limited to the entire amount of fees or commissions charged for assistance in the procurement of the materials and supplies, or fees or transportation charges for the delivery of materials or supplies required on a job site, provided the fees are reasonable and not excessive as compared with fees charged for similar services.
- H. Credit for DBE trucking companies will be as follows:
1. The DBE must be responsible for the management and supervision of the entire trucking operation for which it is responsible on a particular contract, and there cannot be a contrived arrangement for the purpose of meeting the DBE goal.
 2. The DBE must itself own and operate at least one fully licensed, insured, and operational truck used on the contract.
 3. The DBE receives credit for the total value of the transportation services it provides on the contract using trucks its owns, insures, and operates using drivers it employs.
 4. The DBE may lease trucks from another DBE firm, including an owner-operator who is certified as a DBE. The DBE who leases trucks from another DBE receives credit for the total value of the transportation services the lessee DBE provides on the contract.
 5. The DBE may also lease trucks from a non-DBE firm, including an owner-operator. The DBE who leases trucks from a non-DBE is entitled to credit only for the fee or commission it receives as a result of the lease arrangement. The DBE does not receive credit for the total value of the transportation services provided by the lessee, since these services are not provided by a DBE.
 6. For the purposes of this paragraph H, a lease must indicate that the DBE has exclusive use of and control over the truck. This does not preclude the leased truck from working for others during the term of the lease with the consent of the DBE, so long as the lease gives the DBE absolute priority for use of the leased truck. Leased trucks must display the name and identification number of the DBE.
- I. Noncompliance by the Contractor with the requirements of the regulations constitutes a breach of this contract and may result in termination of the contract or other appropriate remedy for a breach of this contract.
- J. Bidders are encouraged to use services offered by financial institutions owned and controlled by DBEs.

2-1.02A DBE GOAL FOR THIS PROJECT

The Department has established the following goal for Disadvantaged Business Enterprise (DBE) participation for this project:

Disadvantaged Business Enterprise (DBE): 12 percent

Bidders may use the services of the following firms to contact interested DBEs. These firms are available to assist DBEs in preparing bids for subcontracting or supplying materials.

The following firms may be contacted for projects in the following locations:

<p>Districts 04, 05 (except San Luis Obispo and Santa Barbara Counties), 06 (except Kern County) and 10:</p> <p>Triaxial Management Services, Inc. - Oakland</p> <p>1545 Willow Street, 1st Floor Oakland, CA 94607 Telephone: (510) 286-1313 FAX No.: (510) 286-6792</p>	<p>Districts 08 and 11:</p> <p>Padilla & Associates - San Diego</p> <p>2725 Congress Street, Suite 1D San Diego, CA 92110 Telephone: (619) 725-0843 FAX No.: (619) 725-0854</p>
<p>Districts 07, 08, and 12; in San Luis Obispo and Santa Barbara Counties in District 05; and in Kern County in District 06:</p> <p>Padilla & Associates - Los Angeles</p> <p>5675 East Telegraph Rd., Suite A-260 Los Angeles, CA 90040 Telephone: (323) 728-8847 FAX No.: (323) 728-8867</p>	<p>Districts 01, 02, 03 and 09:</p> <p>Triaxial Management Services, Inc. - Sacramento</p> <p>930 Alhambra Blvd., #205 Sacramento, CA 95816 Telephone: (916) 553-4172 FAX No.: (916) 553-4173</p>

2-1.02B SUBMISSION OF DBE INFORMATION

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

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

If DBE information is not submitted with the bid, the apparent successful bidder (low bidder), the second low bidder and the third low bidder shall submit DBE 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. DBE 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 DBE information by the time specified will be grounds for finding the bid or proposal nonresponsive. Other bidders need not submit DBE information unless requested to do so by the Department.

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

The information necessary to establish the bidder's adequate good faith efforts to meet the DBE goal should include:

- A. The names and dates of each publication in which a request for DBE participation for this project was placed by the bidder.
- B. The names and dates of written notices sent to certified DBEs soliciting bids for this project and the dates and methods used for following up initial solicitations to determine with certainty whether the DBEs were interested.
- C. The items of work which the bidder made available to DBE firms, including, where appropriate, any breaking down of the contract work items (including those items normally performed by the bidder with its own forces) into economically feasible units to facilitate DBE participation. It is the bidder's responsibility to demonstrate that sufficient work to meet the DBE goal was made available to DBE firms.
- D. The names, addresses and phone numbers of rejected DBE firms, the firms selected for that work, and the reasons for the bidder's choice.
- E. Efforts made to assist interested DBEs in obtaining bonding, lines of credit or insurance, and any technical assistance or information related to the plans, specifications and requirements for the work which was provided to DBEs.
- F. Efforts made to assist interested DBEs in obtaining necessary equipment, supplies, materials, or related assistance or services, excluding supplies and equipment the DBE subcontractor purchases or leases from the prime contractor or its affiliate.
- G. The names of agencies contacted to provide assistance in contacting, recruiting and using DBE firms.
- H. Any additional data to support a demonstration of good faith efforts.

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 DBE participation or has demonstrated, to the satisfaction of the Department, adequate good faith efforts to do so. Meeting the goal for DBE 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.

The contract shall be executed by the successful bidder and shall be returned, together with the contract bonds, to the Department so that it is received within 10 days, not including Saturdays, Sundays and legal holidays, after the bidder has received the contract for execution. Failure to do so shall be just cause for forfeiture of the proposal guaranty. The executed contract documents shall be delivered to the following address: Department of Transportation MS 43, Attn: Office Engineer, 1727 30th Street, Sacramento, CA 95816.

A "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 31 percent of payments due the contractor and penalties of up to \$20,000. This retention of payments for failure to complete the "Payee Data Record" form is in addition to any other retention of payments due the Contractor.

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

Attention is directed to the provisions in 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 5 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 **60 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 \$1300 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

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.

5-1.013 LINES AND GRADES

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

Stakes or marks will be set by the Engineer in conformance with the requirements in Chapter 12, "Construction Surveys," of the Department's Surveys Manual.

5-1.015 LABORATORY

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

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.

5-1.019 COST REDUCTION INCENTIVE

Attention is directed to Section 5-1.14, "Cost Reduction Incentive," of the Standard Specifications.

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

If a cost reduction proposal submitted by the Contractor, and subsequently approved by the Engineer, provides for a reduction in contract time, 50 percent of that contract time reduction shall be credited to the State by reducing the contract working days, not including plant establishment. Attention is directed to "Beginning of Work, Time of Completion and Liquidated Damages" of these special provisions regarding the working days.

If a cost reduction proposal submitted by the Contractor, and subsequently approved by the Engineer, provides for a reduction in traffic congestion or avoids traffic congestion during construction, 60 percent of the estimated net savings in construction costs attributable to the cost reduction proposal will be paid to the Contractor. In addition to the requirements in Section 5-1.14, "Cost Reduction Incentive," of the Standard Specifications, the Contractor shall provide detailed comparisons of the traffic handling between the existing contract and the proposed change, and estimates of the traffic volumes and congestion.

5-1.02 LABOR NONDISCRIMINATION

Attention is directed to the following Notice that is required by Chapter 5 of Division 4 of Title 2, California Code of Regulations.

NOTICE OF REQUIREMENT FOR NONDISCRIMINATION PROGRAM

(GOV. CODE, SECTION 12990)

Your attention is called to the "Nondiscrimination Clause", set forth in Section 7-1.01A(4), "Labor Nondiscrimination," of the Standard Specifications, which is applicable to all nonexempt State contracts and subcontracts, and to the "Standard California Nondiscrimination Construction Contract Specifications" set forth therein. The specifications are applicable to all nonexempt State construction contracts and subcontracts of \$5000 or more.

5-1.022 PAYMENT OF WITHHELD FUNDS

Payment of withheld funds shall conform to Section 9-1.065, "Payment of Withheld Funds," of the Standard Specifications and these special provisions.

Funds withheld from progress payments to ensure performance of the contract that are eligible for payment into escrow or to an escrow agent pursuant to Section 10263 of the California Public Contract Code do not include funds withheld or deducted from payment due to failure of the Contractor to fulfill a contract requirement.

5-1.03 INTEREST ON PAYMENTS

Interest shall be payable on progress payments, payments after acceptance, final payments, extra work payments, and claim payments as follows:

- A. Unpaid progress payments, payment after acceptance, and final payments shall begin to accrue interest 30 days after the Engineer prepares the payment estimate.
- B. Unpaid extra work bills shall begin to accrue interest 30 days after preparation of the first pay estimate following receipt of a properly submitted and undisputed extra work bill. To be properly submitted, the bill must be submitted within 7 days of the performance of the extra work and in conformance with the provisions in Section 9-1.03C, "Records," and Section 9-1.06, "Partial Payments," of the Standard Specifications. An undisputed extra work bill not submitted within 7 days of performance of the extra work will begin to accrue interest 30 days after the preparation of the second pay estimate following submittal of the bill.
- C. The rate of interest payable for unpaid progress payments, payments after acceptance, final payments, and extra work payments shall be 10 percent per annum.
- D. The rate of interest payable on a claim, protest or dispute ultimately allowed under this contract shall be 6 percent per annum. Interest shall begin to accrue 61 days after the Contractor submits to the Engineer information in sufficient detail to enable the Engineer to ascertain the basis and amount of said claim, protest or dispute.

The rate of interest payable on any award in arbitration shall be 6 percent per annum if allowed under the provisions of Civil Code Section 3289.

5-1.04 PUBLIC SAFETY

The Contractor shall provide for the safety of traffic and the public in conformance with the provisions in Section 7-1.09, "Public Safety," of the Standard Specifications and these special provisions.

The Contractor shall install temporary railing (Type K) between a lane open to public traffic and an excavation, obstacle or storage area when the following conditions exist:

- A. Excavations.—The near edge of the excavation is 3.6 m or less from the edge of the lane, except:
 - 1. Excavations covered with sheet steel or concrete covers of adequate thickness to prevent accidental entry by traffic or the public.
 - 2. Excavations less than 0.3-m deep.
 - 3. Trenches less than 0.3-m wide for irrigation pipe or electrical conduit, or excavations less than 0.3-m in diameter.
 - 4. Excavations parallel to the lane for the purpose of pavement widening or reconstruction.
 - 5. Excavations in side slopes, where the slope is steeper than 1:4 (vertical:horizontal).
 - 6. Excavations protected by existing barrier or railing.
- B. Temporarily Unprotected Permanent Obstacles.—The work includes the installation of a fixed obstacle together with a protective system, such as a sign structure together with protective railing, and the Contractor elects to install the obstacle prior to installing the protective system; or the Contractor, for the Contractor's convenience and with permission of the Engineer, removes a portion of an existing protective railing at an obstacle and does not replace such railing complete in place during the same day.
- C. Storage Areas.—Material or equipment is stored within 3.6 m of the lane and the storage is not otherwise prohibited by the provisions of the Standard Specifications and these special provisions.

The approach end of temporary railing (Type K), installed in conformance with the provisions in this section "Public Safety" and in Section 7-1.09, "Public Safety," of the Standard Specifications, shall be offset a minimum of 4.6 m from the edge of the traffic lane open to public traffic. The temporary railing shall be installed on a skew toward the edge of the traffic lane of not more than 0.3-m transversely to 3 m longitudinally with respect to the edge of the traffic lane. If the 4.6-m minimum offset cannot be achieved, the temporary railing shall be installed on the 10 to 1 skew to obtain the maximum available offset between the approach end of the railing and the edge of the traffic lane, and an array of temporary crash cushion modules shall be installed at the approach end of the temporary railing.

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 TESTING

Testing of materials and work shall conform to the provisions in Section 6-3, "Testing," of the Standard Specifications and these special provisions.

Whenever the provisions of Section 6-3.01, "General," of the Standard Specifications refer to tests or testing, it shall mean tests to assure the quality and to determine the acceptability of the materials and work.

The Engineer will deduct the costs for testing of materials and work found to be unacceptable, as determined by the tests performed by the Department, and the costs for testing of material sources identified by the Contractor which are not used for the work, from moneys due or to become due to the Contractor. The amount deducted will be determined by the Engineer.

5-1.06 REMOVAL OF ASBESTOS AND HAZARDOUS SUBSTANCES

When the presence of asbestos or hazardous substances are not shown on the plans or indicated in the specifications and the Contractor encounters materials which the Contractor reasonably believes to be asbestos or a hazardous substance as defined in Section 25914.1 of the Health and Safety Code, and the asbestos or hazardous substance has not been rendered harmless, the Contractor may continue work in unaffected areas reasonably believed to be safe. The Contractor shall immediately cease work in the affected area and report the condition to the Engineer in writing.

In conformance with Section 25914.1 of the Health and Safety Code, removal of asbestos or hazardous substances including exploratory work to identify and determine the extent of the asbestos or hazardous substance will be performed by separate contract.

If delay of work in the area delays the current controlling operation, the delay will be considered a right of way delay and the Contractor will be compensated for the delay in conformance with the provisions in Section 8-1.09, "Right of Way Delays," of the Standard Specifications.

5-1.07 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.

5-1.075 BUY AMERICA REQUIREMENTS

Attention is directed to the "Buy America" requirements of the Surface Transportation Assistance Act of 1982 (Section 165) and the Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA) Sections 1041(a) and 1048(a), and the regulations adopted pursuant thereto. In conformance with the law and regulations, all manufacturing processes for steel and iron materials furnished for incorporation into the work on this project shall occur in the United States; with the exception that pig iron and processed, pelletized and reduced iron ore manufactured outside of the United States may be used in the domestic manufacturing process for such steel and iron materials. The application of coatings, such as epoxy coating, galvanizing, painting, and other coatings that protect or enhance the value of steel or iron materials shall be considered a manufacturing process subject to the "Buy America" requirements.

A Certificate of Compliance conforming to the provisions in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications shall be furnished for steel and iron materials. The certificates, in addition to certifying that the materials comply with the specifications, shall specifically certify that all manufacturing processes for the materials occurred in the United States, except for the above exceptions.

The requirements imposed by the law and regulations do not prevent a minimal use of foreign steel and iron materials if the total combined cost of the materials used does not exceed one-tenth of one percent (0.1 percent) of the total contract cost

or \$2500, whichever is greater. The Contractor shall furnish the Engineer acceptable documentation of the quantity and value of the foreign steel and iron prior to incorporating the materials into the work.

5-1.08 SUBCONTRACTOR AND DBE RECORDS

The Contractor shall maintain records showing the name and business address of each first-tier subcontractor. The records shall also show the name and business address of every DBE subcontractor, DBE vendor of materials and DBE trucking company, regardless of tier. The records shall show the date of payment and the total dollar figure paid to all of these firms. DBE prime contractors shall also show the date of work performed by their own forces along with the corresponding dollar value of the work.

Upon completion of the contract, a summary of these records shall be prepared on Form CEM-2402 (F) and certified correct by the Contractor or the Contractor's authorized representative, and shall be furnished to the Engineer. The form shall be furnished to the Engineer within 90 days from the date of contract acceptance. \$10,000 will be withheld from payment until the Form CEM-2402 (F) is submitted. The amount will be returned to the Contractor when a satisfactory Form CEM-2402 (F) is submitted.

Prior to the fifteenth of each month, the Contractor shall submit documentation to the Engineer showing the amount paid to DBE trucking companies listed in the Contractor's DBE information. This monthly documentation shall indicate the portion of the revenue paid to DBE trucking companies which is claimed toward DBE participation. The Contractor shall also obtain and submit documentation to the Engineer showing the amount paid by DBE trucking companies to all firms, including owner-operators, for the leasing of trucks. The DBE who leases trucks from a non-DBE is entitled to credit only for the fee or commission it receives as a result of the lease arrangement. The records must confirm that the amount of credit claimed toward DBE participation conforms with Section 2-1.02, "Disadvantaged Business Enterprise," of these special provisions.

The Contractor shall also obtain and submit documentation to the Engineer showing the truck number, owner's name, California Highway Patrol CA number, and if applicable, the DBE certification number of the owner of the truck for all trucks used during that month for which DBE participation will be claimed. This documentation shall be submitted on Form CEM-2404 (F).

5-1.083 DBE CERTIFICATION STATUS

If a DBE subcontractor is decertified during the life of the project, the decertified subcontractor shall notify the Contractor in writing with the date of decertification. If a subcontractor becomes a certified DBE during the life of the project, the subcontractor shall notify the Contractor in writing with the date of certification. The Contractor shall furnish the written documentation to the Engineer.

Upon completion of the contract, Form CEM-2403 (F) indicating the DBE's existing certification status shall be signed and certified correct by the Contractor. The certified form shall be furnished to the Engineer within 90 days from the date of contract acceptance.

5-1.086 PERFORMANCE OF DBE SUBCONTRACTORS AND SUPPLIERS

The DBEs listed by the Contractor in response to the provisions in Section 2-1.02B, "Submission of DBE Information," and Section 3, "Award and Execution of Contract," of these special provisions, which are determined by the Department to be certified DBEs, 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 use other forces or sources of materials may be requested for the following reasons:

- A. The listed DBE, after having had a reasonable opportunity to do so, fails or refuses to execute a written contract, when such written contract, based upon the general terms, conditions, plans and specifications for the project, or on the terms of such subcontractor's or supplier's written bid, is presented by the Contractor.
- B. The listed DBE becomes bankrupt or insolvent.
- C. The listed DBE 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 DBE 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. It would be in the best interest of the State.

The Contractor shall not be entitled to any payment for such work or material unless it is performed or supplied by the listed DBE 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, and Section 2, "Proposal Requirements and Conditions," and Section 3, "Award and Execution of Contract," of these special provisions.

Pursuant to the provisions of Section 1777.1 of the Labor Code, the Labor Commissioner publishes and distributes a list of contractors ineligible to perform work as a subcontractor on a public works project. This list of debarred contractors is available from the Department of Industrial Relations web site at:

<http://www.dir.ca.gov/DLSE/Debar.html>.

The provisions in the third paragraph of Section 8-1.01, "Subcontracting," of the Standard Specifications, that the Contractor shall perform with the Contractor's own organization contract work amounting to not less than 50 percent of the original contract price, is not changed by the Federal Aid requirement specified under "Required Contract Provisions Federal-Aid Construction Contracts" in Section 14 of these special provisions that the Contractor perform not less than 30 percent of the original contract work with the Contractor's own organization.

Each subcontract and any lower tier subcontract that may in turn be made shall include the "Required Contract Provisions Federal-Aid Construction Contracts" in Section 14 of these special provisions. This requirement shall be enforced as follows:

- A. Noncompliance shall be corrected. Payment for subcontracted work involved will be withheld from progress payments due, or to become due, until correction is made. Failure to comply may result in termination of the contract.

In conformance with the Federal DBE regulations Sections 26.53(f)(1) and 26.53(f)(2) Part 26, Title 49 CFR:

- A. The Contractor shall not terminate for convenience a DBE subcontractor listed in response to Section 2-1.02B, "Submission of DBE Information," and then perform that work with its own forces, or those of an affiliate without the written consent of the Department, and
- B. If a DBE subcontractor is terminated or fails to complete its work for any reason, the Contractor will be required to make good faith efforts to substitute another DBE subcontractor for the original DBE subcontractor, to the extent needed to meet the contract goal.

The requirement in Section 2-1.02, "Disadvantaged Business Enterprise (DBE)," of these special provisions that DBEs must be certified on the date bids are opened does not apply to DBE 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.

5-1.102 PROMPT PAYMENT OF WITHHELD FUNDS TO SUBCONTRACTORS

The Contractor shall return all moneys withheld in retention from the subcontractor within 30 days after receiving payment for work satisfactorily completed, even if the other contract work is not completed and has not been accepted in conformance with Section 7-1.17, "Acceptance of Contract," of the Standard Specifications. This requirement shall not be construed to limit or impair any contractual, administrative, or judicial remedies otherwise available to the Contractor or subcontractor in the event of a dispute involving late payment or nonpayment by the Contractor or deficient subcontract performance or noncompliance by a subcontractor.

5-1.103 RECORDS

The Contractor shall maintain cost accounting records for the contract pertaining to, and in such a manner as to provide a clear distinction between, the following six categories of costs of work during the life of the contract:

- A. Direct costs of contract item work.
- B. Direct costs of changes in character in conformance with Section 4-1.03C, "Changes in Character of Work," of the Standard Specifications.
- C. Direct costs of extra work in conformance with Section 4-1.03D, "Extra Work," of the Standard Specifications.
- D. Direct costs of work not required by the contract and performed for others.

- E. Direct costs of work performed under a notice of potential claim in conformance with the provisions in Section 9-1.04, "Notice of Potential Claim," of the Standard Specifications.
- F. Indirect costs of overhead.

Cost accounting records shall include the information specified for daily extra work reports in Section 9-1.03C, "Records," of the Standard Specifications. The requirements for furnishing the Engineer completed daily extra work reports shall only apply to work paid for on a force account basis.

The cost accounting records for the contract shall be maintained separately from other contracts, during the life of the contract, and for a period of not less than 3 years after the date of acceptance of the contract. If the Contractor intends to file claims against the Department, the Contractor shall keep the cost accounting records specified above until complete resolution of all claims has been reached.

5-1.11 DAMAGE CLAIMS

Attention is directed to Section 7, "Legal Relations and Responsibility," of the Standard Specifications.

Provided the Contractor's operations and work comply with the plans and specifications, the Contractor's responsibility for payment of claims for physical damages caused by screenings or bituminous binder will be limited to no more than 10 percent of the total contract bid price.

For each seal coat location within the project, only those claims for physical damages caused by screenings or bituminous binder that occurred within the period extending from the first day screenings were applied to the binder to 4 days following the last day screenings were applied to the binder, shall be considered for resolution.

Claims reported or submitted by the public directly to the Contractor within 30 days from the last spreading of screenings on the project shall be processed and resolved by the Contractor in conformance with the following:

- A. Within 3 working days after receipt of a claim from the public, the Contractor shall submit to the Department a copy of the claim together with a determination of whether or not the claim will be paid. If the claim is to be rejected, the Contractor shall explain in writing the basis for rejecting the claim.
- B. If the claimant becomes dissatisfied with the Contractor's handling of their claim, the Contractor shall immediately refer the dissatisfied claimant to the local District Claims Office for assistance in resolving the claim.
- C. Within 30 days from the last spreading of screenings on the project, the Contractor shall submit evidence to the Department of those claims paid by the Contractor.

Claims presented by the public directly to the Department or State Board of Control, as set forth in Government Code Section 900, et seq., will be processed and resolved by the Department in conformance with the following:

- A. These claims will be processed as formal government claims against the State, subject to all applicable statutes, regulations, and departmental policies. The Department reserves the right to adjust and settle any formal government claim directly with the claimant, or it may refer the claim to the Contractor for investigation and disposition.
- B. If the Department or State Board of Control approves settlement of a formal government claim or the Department is ordered to pay the claim pursuant to a court order, the claim will be paid by the Department from the funds retained.
- C. Within 3 working days of determination by the local District Claims Office that the Contractor is responsible for resolving the formal government claim, the local District Claims Office will either send a copy of the claim to the Contractor for handling and disposition, or notify the Contractor of the Department's decision to settle and pay the claim directly with the claimant.

Funds in an amount not to exceed 5 percent of the total contract bid price will be retained from the Contractor's payments. This retention by the Department will be for a maximum period of 60 days after the last spreading of screenings on the project to allow the Department sufficient time to settle claims that remain unresolved by the Contractor. At the end of this 60 day period, funds remaining in the retention, that are not allocated by the Department to pay unsettled claims, will be returned to the Contractor. This 5 percent retention shall be in addition to any retention provided for in Section 7-1.12A, "Indemnification," of the Standard Specifications, or any other deduction or retention specified elsewhere in the specifications.

If no retained funds remain, or if the retention has been returned to the Contractor, the Department may elect to pay a formal government claim from public funds. If the Department determines the Contractor is responsible for the claim, the Department will then seek reimbursement from the Contractor for any public funds used to pay the claim, subject to the 10 percent limitation. The Department may use any legal remedy available to obtain reimbursement from the Contractor including administration of an offset as provided for in Section 12419.5 of the Government Code.

Except for the limitation of responsibility for damage claims specified above, nothing in this section shall be construed as decreasing the Contractor's obligation to defend and indemnify the State from all claims in conformance with the provisions of Section 7, "Legal Relations and Responsibility," of the Standard Specifications.

5-1.12 AREAS FOR CONTRACTOR'S USE

Attention is directed to the provisions in Section 7-1.19, "Rights in Land and Improvements," of the Standard Specifications and these special provisions.

The highway right of way shall be used only for purposes that are necessary to perform the required work. The Contractor shall not occupy the right of way, or allow others to occupy the right of way, for purposes which are not necessary to perform the required work.

No State-owned parcels adjacent to the right of way are available for the exclusive use of the Contractor within the contract limits. The Contractor shall secure, at the Contractor's own expense, areas required for plant sites, storage of equipment or materials, or for other purposes.

No area is available within the contract limits for the exclusive use of the Contractor. However, temporary storage of equipment and materials on State property may be arranged with the Engineer, subject to the prior demands of State maintenance forces and to other contract requirements. Use of the Contractor's work areas and other State-owned property shall be at the Contractor's own risk, and the State shall not be held liable for damage to or loss of materials or equipment located within such areas.

5-1.13 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.

For the purpose of making partial payments pursuant to Section 9-1.06, "Partial Payments," of the Standard Specifications, the amount set forth for the contract items of work hereinafter listed shall be deemed to be the maximum value of the contract item of work which will be recognized for progress payment purposes:

- A. Lead Compliance Plan \$5 000.00

After acceptance of the contract pursuant to the provisions in Section 7-1.17, "Acceptance of Contract," of the Standard Specifications, the amount, if any, payable for a contract item of work in excess of the maximum value for progress payment purposes hereinabove listed for the item, will be included for payment in the first estimate made after acceptance of the contract.

No partial payment will be made for any materials on hand which are furnished but not incorporated in the work.

5-1.14 SOUND CONTROL REQUIREMENTS

Sound control shall conform to the provisions in Section 7-1.01I, "Sound Control Requirements," of the Standard Specifications and these special provisions.

The noise level from the Contractor's operations, between the hours of 9:00 p.m. and 7:00 a.m., shall not exceed 86 dBa at a distance of 15 m. This requirement shall not relieve the Contractor from responsibility for complying with local ordinances regulating noise level.

The noise level requirement shall apply to the equipment on the job or related to the job, including but not limited to trucks, transit mixers or transient equipment that may or may not be owned by the Contractor. The use of loud sound signals shall be avoided in favor of light warnings except those required by safety laws for the protection of personnel.

Full compensation for conforming to the requirements of this section shall be considered as included in the prices paid for the various contract items of work involved and no additional compensation will be allowed therefor.

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

METRIC SIZE SHOWN ON THE PLANS mm x thread pitch	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 PLAIN WIRE REINFORCEMENT

ASTM Designation: A 82

METRIC SIZE SHOWN ON THE PLANS mm ²	SIZE TO BE SUBSTITUTED inch ² x 100
MW9	W1.4
MW10	W1.6
MW13	W2.0
MW15	W2.3
MW19	W2.9
MW20	W3.1
MW22	W3.5
MW25	W3.9, except W3.5 in piles only
MW26	W4.0
MW30	W4.7
MW32	W5.0
MW35	W5.4
MW40	W6.2
MW45	W6.5
MW50	W7.8
MW55	W8.5, except W8.0 in piles only
MW60	W9.3
MW70	W10.9, except W11.0 in piles only
MW80	W12.4
MW90	W14.0
MW100	W15.5

SUBSTITUTION TABLE FOR BAR REINFORCEMENT

METRIC BAR DESIGNATION NUMBER ¹ SHOWN ON THE PLANS	BAR DESIGNATION NUMBER ² TO BE SUBSTITUTED
10	3
13	4
16	5
19	6
22	7
25	8
29	9
32	10
36	11
43	14
57	18

¹Bar designation numbers approximate the number of millimeters of the nominal diameter of the bars.

²Bar 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 on the list of Prequalified and Tested Signing and Delineation Materials, only those products shown within the listing may be used in the work. Other categories of products, not included on the list of Prequalified and Tested Signing and Delineation Materials, may be used in the work provided they conform to the requirements of the Standard Specifications.

Materials and products may be added to the list of Prequalified and Tested Signing and Delineation Materials if the manufacturer submits a New Product Information Form to the New Product Coordinator at the Transportation Laboratory. Upon a Departmental request for samples, sufficient samples shall be submitted to permit performance of required tests. Approval of materials or products will depend upon compliance with the specifications and tests the Department may elect to perform.

PAVEMENT MARKERS, PERMANENT TYPE

Retroreflective With Abrasion Resistant Surface (ARS)

- A. Apex, Model 921AR (100 mm x 100 mm)
- B. Avery Dennison (formerly Stimsonite), Models C88 (100 mm x 100 mm), 911 (100 mm x 100 mm) and 953 (70 mm x 114 mm)
- C. Ray-O-Lite, Model "AA" ARS (100 mm x 100 mm)
- D. 3M Series 290 (89 mm x 100 mm)
- E. 3M Series 290 PSA, with pressure sensitive adhesive pad (89 mm x 100 mm)

Retroreflective With Abrasion Resistant Surface (ARS)

(for recessed applications only)

- A. Avery Dennison (formerly Stimsonite), Model 948 (58 mm x 119 mm)
- B. Avery Dennison (formerly Stimsonite), Model 944SB (51 mm x 100 mm)*
- C. Ray-O-Lite, Model 2002 (58 mm x 117 mm)
- D. Ray-O-Lite, Model 2004 ARS (51 mm x 100 mm)*

*For use only in 114 mm wide (older) recessed slots

Non-Reflective, 100 mm Round

- A. Alpine Products, "D-Dot" and "ANR" (ABS)
- B. Apex Universal (Ceramic)
- C. Apex Universal, Models 929 (ABS) and 929PP (Polypropylene)
- D. Elgin Molded Plastics, "Empco-Lite" Model 900 (ABS)
- E. Hi-Way Safety, Inc., Models P20-2000W and 2001Y (ABS)
- F. Interstate Sales, "Diamond Back" (ABS) and (Polypropylene)
- G. Novabrite Models Cdot (White) Cdot-y (Yellow), Ceramic
- H. Novabrite Models Adot-w (White) Adot-y (Yellow), (ABS)
- I. Novabrite Models Pdot-w (White) Pdot-y (Yellow), Polypropylene
- J. Road Creations, Model RCB4NR (Acrylic)
- K. Three D Traffic Works TD10000 (ABS), TD10500 (Polypropylene)
- L. 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. Bunzl Extrusion, 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. Garlock Rubber Technologies, Series 2000
- D. P.B. Laminations, Aztec, Grade 102
- E. Swarco Industries, "Director-2"
- F. Trelleborg Industri, R140 Series
- G. 3M, Series 620 "CR", and Series A750
- H. 3M, Series A145, Removable Black Line Mask
(Black Tape: for use only on Asphalt Concrete Surfaces)
- I. Advanced Traffic Marking Black "Hide-A-Line"
(Black Tape: for use only on Asphalt Concrete Surfaces)
- J. Brite-Line "BTR" Black Removable Tape
(Black Tape: for use only on Asphalt Concrete Surfaces)
- K. Trelleborg Industri, RB-140
(Black Tape: for use only on Asphalt Concrete Surfaces)

Preformed Thermoplastic (Heated in place)

- A. Avery Dennison, "Hotape"
- B. Flint Trading, "Premark," "Premark 20/20 Flex," and "Premark 20/20 Flex Plus"

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

Special Use Type, 1700 mm

- A. Bunzl Extrusion, Model FG 560 (with 450 mm U-Channel base)
- B. Carsonite, "Survivor" (with 450 mm U-Channel base)
- C. Carsonite, Roadmarker CRM-375 (with 450 mm U-Channel base)
- D. FlexStake, Model 604
- E. GreenLine Models HWDU and CGD (with 450 mm U-Channel base)
- F. Impact Recovery Model D36, with #105 Driveable Base
- G. Safe-Hit with 200 mm pavement anchor (SH248-GP1)
- H. Safe-Hit with 380 mm soil anchor (SH248-GP2) and with 450 mm soil anchor (SH248-GP3)

Surface Mount Type, 1200 mm

- A. Bent Manufacturing Company, Masterflex Model MF-180EX-48
- B. Carsonite, "Super Duck II"
- C. FlexStake, Surface Mount, Models 704 and 754 TM
- D. Impact Recovery Model D48, with #101 Fixed (Surface-Mount) Base
- E. Three D Traffic Works "Channelflex" Part No. 522248W

CHANNELIZERS

Surface Mount Type, 900 mm

- A. Bent Manufacturing Company, Masterflex Models MF-360-36 (Round) and MF-180-36 (Flat)
- B. Bunzl Extrusion, Flexi-Guide Models FG300LD and FG300UR
- C. Carsonite, "Super Duck" (Flat SDF-436, Round SDR-336)
- D. Carsonite, "Super Duck II" Model SDCF203601MB "The Channelizer"
- E. FlexStake, Surface Mount, Models 703 and 753 TM
- F. GreenLine, Model SMD-36

- G. Hi-Way Safety, Inc. "Channel Guide Channelizer" Model CGC36
- H. Impact Recovery Model D36, with #101 Fixed (Surface-Mount) Base
- I. Repo, Models 300 and 400
- J. Safe-Hit, Guide Post, Model SH236SMA
- K. The Line Connection, "Dura-Post" Model DP36-3 (Permanent)
- L. The Line Connection, "Dura-Post" Model DP36-3C (Temporary)
- M. Three D Traffic Works "Channelflex" Part No. 522053W

Lane Separation System

- A. Bunzl "Flexi-Guide (FG) 300 Curb System"
- B. Qwick Kurb, "Klemmfix Guide System"
- C. Recycled Technology, Inc. "Safe-Lane System"

CONICAL DELINEATORS, 1070 mm

(For 700 mm Traffic Cones, see Standard Specifications)

- A. Bent Manufacturing Company "T-Top"
- B. Plastic Safety Systems "Navigator-42"
- C. Radiator Specialty Company "Enforcer"
- D. Roadmaker Company "Stacker"
- E. Traffix Devices "Grabber"

OBJECT MARKERS

Type "K", 450 mm

- A. Bunzl, Model FG318PE
- B. Carsonite, Model SMD 615
- C. FlexStake, Model 701 KM
- D. Repo, Models 300 and 400
- E. Safe-Hit, Model SH718SMA
- F. The Line Connection, Model DP21-4K

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

- A. Bent Manufacturing "Masterflex" Model MF-360-24
- B. Bunzl Extrusion, Model FG324PE
- C. Carsonite, Super Duck II
- D. FlexStake, Model 701KM
- E. Repo, Models 300 and 400
- F. Safe-Hit, Models SH8 24SMA_WA and SH8 24GP3_WA
- G. The Line Connection, Model DP21-4Q
- H. Three D Traffic Works "Q" Marker, Part No. 531702W

CONCRETE BARRIER MARKERS AND TEMPORARY RAILING (TYPE K) REFLECTORS

Impactable Type

- A. ARTUK, "FB"
- B. Bunzl Extrusion, Models PCBM-12 and PCBM-T12
- C. Duraflex Corp., "Flexx 2020" and "Electriflexx"
- D. Hi-Way Safety, Inc., Model GMKRM100
- E. Plastic Safety Systems "BAM" Models OM-BARR and OM-BWAR
- F. Sun-Lab Technology, "Safety Guide Light Model TM-5"
- G. Three D Traffic Works "Roadguide" TD9000 Series

Non-Impactable Type

- A. ARTUK, JD Series
- B. Plastic Safety Systems "BAM" Models OM-BITARW and OM-BITARA
- C. Vega Molded Products, Models GBM and JD

THREE BEAM BARRIER MARKERS

(For use to the left of traffic)

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

CONCRETE BARRIER DELINEATORS, 400 mm

(For use to the right of traffic)

- A. Bunzl Extrusion, Model PCBM T-16
- B. Safe-Hit, Model SH216RBM
- C. Sun-Lab Technology, "Safety Guide Light, Model TM16," (75 mm x 300 mm)
- D. Three D Traffic Works "Roadguide" TD9416 Series

CONCRETE BARRIER-MOUNTED MINI-DRUM (260 mm x 360 mm x 570 mm)

- A. Stinson Equipment Company "SaddleMarker"

SOUND WALL DELINEATOR

(Applied vertically. Place top of 75 mm x 300 mm reflective element at 1200 mm above roadway)

- A. Bunzl Extrusion, PCBM S-36
- B. Sun-Lab Technology, "Safety Guide Light, Model SM12," (75 mm x 300 mm)

GUARD RAILING DELINEATOR

(Place top of reflective element at 1200 mm above plane of roadway)

Wood Post Type, 686 mm

- A. Bunzl Extrusion, FG 427 and FG 527
- B. Carsonite, Model 427
- C. FlexStake, Model 102 GR
- D. GreenLine GRD 27
- E. J. Miller Model JMI-375G
- F. Safe-Hit, Model SH227GRD
- G. Three D Traffic Works "Guardflex" TD5100 Series

Steel Post Type

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

RETROREFLECTIVE SHEETING

Channelizers, Barrier Markers, and Delineators

- A. Avery Dennison T-6500 Series (Formerly Stimsonite, Series 6200) (For rigid substrate devices only)
- B. Avery Dennison WR-6100 Series
- C. Nippon Carbide, Flexible Ultralite Grade (ULG) II
- D. Reflexite, PC-1000 Metalized Polycarbonate
- E. Reflexite, AC-1000 Acrylic
- F. Reflexite, AP-1000 Metalized Polyester
- G. Reflexite, Conformalight, AR-1000 Abrasion Resistant Coating
- H. 3M, High Intensity

Traffic Cones, 330 mm Sleeves

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

Traffic Cones, 100 mm and 150 mm Sleeves

- A. Nippon Carbide, Flexible Ultralite Grade (ULG) II
- B. Reflexite, Vinyl, "TR" (Semi-transparent) or "Conformalight"
- C. 3M Series 3840

Barrels and Drums

- A. Avery Dennison WR-6100
- B. Nippon Carbide, Flexible Ultralite Grade (ULG) II

- C. Reflexite, "Conformalight", "Super High Intensity" or "High Impact Drum Sheeting"
- D. 3M Series 3810

Barricades: Type I, Medium-Intensity (Typically Enclosed Lens, Glass-Bead Element)

- A. American Decal, Adcolite
- B. Avery Dennison, T-1500 and T-1600 series
- C. 3M Engineer Grade, Series 3170

Barricades: Type II, Medium-High-Intensity (Typically Enclosed Lens, Glass-Bead Element)

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

Signs: Type II, Medium-High-Intensity (Typically Enclosed Lens, Glass-Bead Element)

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

Signs: Type III, High-Intensity (Typically Encapsulated Glass-Bead Element)

- A. Avery Dennison, T-5500 Series
- B. Nippon Carbide, Nikkalite Brand Ultralite Grade II
- C. 3M Series 3870

Signs: Type IV, High-Intensity (Typically Unmetallized Microprismatic Element)

- A. Avery Dennison, T-6500 Series (Formerly Stimsonite Series 6200)
- B. Nippon Carbide, Crystal Grade, 94000 Series

Signs: Type VI, Elastomeric (Roll-Up) High-Intensity, without Adhesive

- A. Avery Dennison, WU-6014 (Fluorescent orange)
- B. Novabrite LLC, "Econobrite"
- B. Reflexite "Vinyl" (Orange)
- C. Reflexite "SuperBright" (Fluorescent orange)
- D. Reflexite "Marathon" (Fluorescent orange)
- E. 3M Series RS34 (Orange) and RS20 (Fluorescent orange)

Signs: Type VII, Super-High-Intensity (Typically Unmetallized Microprismatic Element)

- A. 3M LDP Series 3970

Signs: Type VIII, Super-High-Intensity (Typically Unmetallized Microprismatic Element)

- A. Avery Dennison, T-7500 Series

Signs: Type IX, Very-High-Intensity (Typically Unmetallized Microprismatic Element)

- A. 3M VIP Series 3990 Diamond Grade

SPECIALTY SIGNS

- A. All Sign Products, STOP Sign (All Plastic), 750 mm
- B. Reflexite "Endurance" Work Zone Sign (with Semi-Rigid Plastic Substrate)

SIGN SUBSTRATE

Fiberglass Reinforced Plastic (FRP)

- A. Fiber-Brite
- B. Sequentia, "Polyplate"
- C. Inteplast Group "InteCel" (13 mm for Post-Mounted CZ Signs, 1200 mm or less)

Aluminum Composite

- A. Alcan Composites "Dibond Material, 2 mm"

- B. Mitsubishi Chemical America, Alpolic 350

8-1.03 STATE-FURNISHED MATERIALS

Attention is directed to Section 6-1.02, "State-Furnished Materials," of the Standard Specifications and these special provisions.

The following materials will be furnished to the Contractor:

- A. Sign panels for roadside signs and hardware for mounting on traffic signal mast arms and mounting on cantilever flashing beacon standards.
- B. Light emitting diode modules for vehicular traffic signal units, Type A pedestrian signals, and flashing beacon units.

The following State-furnished material shall be picked up by the Contractor at City Of Los Angeles, Department of Transportation (LADOT), Piper Technical Center, 555 Ramirez Street, telephone 213-580-5350, Los Angeles, California 90012-2601:

- A. Non-illuminated street name signs
- B. Light emitting diode modules for the flashing beacon units.

The following State-furnished material shall be picked up by the Contractor at City of Los Angeles, Department of Water and Power (DWP), Street Lighting Maintenance Headquarters, 611 North Hoover Street, telephone 213-367-9966, Los Angeles, California 90012-2601:

- A. Photoelectric controls
- B. 60A fuse and the in-line waterproof fuse holder for the service

The Contractor shall notify the Engineer not less than 15 working days before State-furnished material is to be picked up by the Contractor. A full description of the material and the time the material will be picked up shall be provided.

8-1.04 SLAG AGGREGATE

Aggregate produced from slag resulting from any steel-making process or from air-cooled iron blast furnace slag shall not be used on this project.

SECTION 8-2. CONCRETE

8-2.01 PORTLAND CEMENT CONCRETE

Portland cement concrete shall conform to the provisions in Section 90, "Portland Cement Concrete," of the Standard Specifications and these special provisions.

References to Section 90-2.01, "Portland Cement," of the Standard Specifications shall mean Section 90-2.01, "Cement," of the Standard Specifications.

Mineral admixture shall be combined with cement in conformance with the provisions in Section 90-4.08, "Required Use of Mineral Admixtures," of the Standard Specifications for the concrete materials specified in Section 56-2, "Roadside Signs," of the Standard Specifications.

The requirements of Section 90-4.08, "Required Use of Mineral Admixture," of the Standard Specifications shall not apply to Section 19-3.025C, "Soil Cement Bedding," of the Standard Specifications.

The Department maintains a list of sources of fine and coarse aggregate that have been approved for use with a reduced amount of mineral admixture in the total amount of cementitious material to be used. A source of aggregate will be considered for addition to the approved list if the producer of the aggregate submits to the Transportation Laboratory certified test results from a qualified testing laboratory that verify the aggregate complies with the requirements. Prior to starting the testing, the aggregate test shall be registered with the Department. A registration number can be obtained by calling (916) 227-7228. The registration number shall be used as the identification for the aggregate sample in correspondence with the Department. Upon request, a split of the tested sample shall be provided to the Department. Approval of aggregate will depend upon compliance with the specifications, based on the certified test results submitted, together with any replicate testing the Department may elect to perform. Approval will expire 3 years from the date the most recent registered and evaluated sample was collected from the aggregate source.

Qualified testing laboratories shall conform to the following requirements:

- A. Laboratories performing ASTM Designation: C 1293 shall participate in the Cement and Concrete Reference Laboratory (CCRL) Concrete Proficiency Sample Program and shall have received a score of 3 or better on all tests of the previous 2 sets of concrete samples.
- B. Laboratories performing ASTM Designation: C 1260 shall participate in the Cement and Concrete Reference Laboratory (CCRL) Pozzolan Proficiency Sample Program and shall have received a score of 3 or better on the shrinkage and soundness tests of the previous 2 sets of pozzolan samples.

Aggregates on the list shall conform to one of the following requirements:

- A. When the aggregate is tested in conformance with the requirements in California Test 554 and ASTM Designation: C 1293, the average expansion at one year shall be less than or equal to 0.040 percent; or
- B. When the aggregate is tested in conformance with the requirements in California Test 554 and ASTM Designation: C 1260, the average of the expansion at 16 days shall be less than or equal to 0.15 percent.

The amounts of cement and mineral admixture used in cementitious material shall be sufficient to satisfy the minimum cementitious material content requirements specified in Section 90-1.01, "Description," or Section 90-4.05, "Optional Use of Chemical Admixtures," of the Standard Specifications and shall conform to the following:

- A. The minimum amount of cement shall not be less than 75 percent by mass of the specified minimum cementitious material content.
- B. The minimum amount of mineral admixture to be combined with cement shall be determined using one of the following criteria:
 - 1. When the calcium oxide content of a mineral admixture is equal to or less than 2 percent by mass, the amount of mineral admixture shall not be less than 15 percent by mass of the total amount of cementitious material to be used in the mix.
 - 2. When the calcium oxide content of a mineral admixture is greater than 2 percent by mass, and any of the aggregates used are not listed on the approved list as specified in these special provisions, then the amount of mineral admixture shall not be less than 25 percent by mass of the total amount of cementitious material to be used in the mix.
 - 3. When the calcium oxide content of a mineral admixture is greater than 2 percent by mass and the fine and coarse aggregates are listed on the approved list as specified in these special provisions, then the amount of mineral admixture shall not be less than 15 percent by mass of the total amount of cementitious material to be used in the mix.
 - 4. When a mineral admixture that conforms to the provisions for silica fume in Section 90-2.04, "Admixture Materials," of the Standard Specifications is used, the amount of mineral admixture shall not be less than 10 percent by mass of the total amount of cementitious material to be used in the mix.
 - 5. When a mineral admixture that conforms to the provisions for silica fume in Section 90-2.04, "Admixture Materials," of the Standard Specifications is used and the fine and coarse aggregates are listed on the approved list as specified in these special provisions, then the amount of mineral admixture shall not be less than 7 percent by mass of the total amount of cementitious material to be used in the mix.
- C. The total amount of mineral admixture shall not exceed 35 percent by mass of the total amount of cementitious material to be used in the mix. Where Section 90-1.01, "Description," of the Standard Specifications specifies a maximum cementitious content in kilograms per cubic meter, the total mass of cement and mineral admixture per cubic meter shall not exceed the specified maximum cementitious material content.

SECTION 8-3. WELDING

8-3.01 WELDING

GENERAL

Flux core welding electrodes conforming to the requirements of AWS A5.20 E6XT-4 or E7XT-4 shall not be used to perform welding for this project.

Wherever reference is made to the following AWS welding codes in the Standard Specifications, on the plans, or in these special provisions, the year of adoption for these codes shall be as listed:

AWS Code	Year of Adoption
D1.1	2000
D1.4	1998
D1.5	1995
D1.5 (metric only)	1996

Requirements of the AWS welding codes shall apply unless specified otherwise in the Standard Specifications, on the plans, or in these special provisions. Wherever the abbreviation AWS is used, it shall be equivalent to the abbreviations ANSI/AWS or ANSI/AASHTO/AWS.

Sections 6.1.2 through 6.1.4.3 of AWS D 1.1, Sections 7.1.1 and 7.1.2 of AWS D 1.4, and Sections 6.1.1.1 through 6.1.3.3 of AWS D 1.5 are replaced with the following:

Quality Control (QC) shall be the responsibility of the Contractor. As a minimum, the Contractor shall perform inspection and testing of each weld joint prior to welding, during welding, and after welding as specified in this section and as necessary to ensure that materials and workmanship conform to the requirements of the contract documents.

The QC Inspector shall be the duly designated person who acts for and on behalf of the Contractor for inspection, testing, and quality related matters for all welding.

Quality Assurance (QA) is the prerogative of the Engineer. The QA Inspector is the duly designated person who acts for and on behalf of the Engineer.

The QC Inspector shall be responsible for quality control acceptance or rejection of materials and workmanship, and shall be currently certified as an AWS Certified Welding Inspector (CWI) in conformance with the requirements in AWS QC1, "Standard and Guide for Qualification of Welding Inspectors."

The QC Inspector may be assisted by an Assistant QC Inspector provided that this individual is currently certified as an AWS Certified Associate Welding Inspector (CAWI) in conformance with the requirements in AWS QC1, "Standard and Guide for Qualification of Welding Inspectors," or has equivalent qualifications. The QC Inspector shall monitor the Assistant QC Inspector's work, and shall be responsible for signing all reports.

When the term "Inspector" is used without further qualification, it shall refer to the QC Inspector.

Section 6.14.6, "Personnel Qualification," of AWS D 1.1, Section 7.7.6, "Personnel Qualification," of AWS D 1.4, and Section 6.1.3.4, "Personnel Qualification," of AWS D 1.5 are replaced with the following:

Personnel performing nondestructive testing (NDT) shall be qualified and certified in conformance with the requirements of the American Society for Nondestructive Testing (ASNT) Recommended Practice No. SNT-TC-1A and the Written Practice of the NDT firm. The Written Practice of the NDT firm shall meet or exceed the guidelines of the ASNT Recommended Practice No. SNT-TC-1A. Only individuals who are 1) certified as an NDT Level II, or 2) Level III technicians who hold a current ASNT Level III certificate in that discipline and are authorized and certified to perform the work of Level II technicians, shall perform NDT, review the results, and prepare the written reports.

Section 6.5.4, "Scope of Examination," of AWS D 1.1 and Section 7.5.4 of AWS D 1.4 are replaced with the following:

The QC Inspector shall inspect and approve each joint preparation, assembly practice, welding technique, and the performance of each welder, welding operator, and tack welder to make certain that the applicable requirements of this code and the approved welding procedure specification (WPS) are met.

Section 6.5.4 of AWS D 1.5 is replaced with the following:

The QC Inspector shall inspect and approve each joint preparation, assembly practice, welding technique, and the performance of each welder, welding operator, and tack welder to make certain that the applicable requirements of this code and the approved WPS are met. The QC Inspector shall examine the work to make certain that it meets the requirements of Sections 3 and 9.21. The size and contour of all welds shall be measured using suitable gages. Visual inspection for cracks in welds and base metal, and for other discontinuities should be aided by strong light magnifiers, or such other devices as may be helpful. Acceptance criteria different from those specified in this code may be used when approved by the Engineer.

Section 6.6.5, "Nonspecified Nondestructive Testing Other Than Visual," of AWS D 1.1, Section 6.6.5 of AWS D 1.4 and Section 6.6.5 of AWS D 1.5 shall not apply.

For any welding, the Engineer may direct the Contractor to perform NDT that is in addition to the visual inspection or NDT specified in the AWS welding codes, in the Standard Specifications, or in these special provisions. Additional NDT

required by the Engineer, will be paid for as extra work as provided in Section 4-1.03D, "Extra Work," of the Standard Specifications. Should any welding deficiencies be discovered by this additional NDT, the cost of the testing will not be paid for as extra work but shall be at the Contractor's expense.

Required repair work to correct welding deficiencies, whether discovered by the required visual inspection or NDT, or by additional NDT directed by the Engineer, and any associated delays or expenses caused to the Contractor by performing these repairs, shall be at the Contractor's expense.

The Engineer shall have the authority to verify the qualifications or certifications of any welder, QC Inspector, or NDT personnel to specified levels by retests or other means.

A sufficient number of QC Inspectors shall be provided to ensure continuous inspection when any welding is being performed. Continuous inspection, as a minimum, shall include (1) having QC Inspectors continually present on the shop floor or project site when any welding operation is being performed, and (2) having a QC Inspector within such close proximity of all welding operations so that inspections by the QC Inspector of each operation, at each welding location, shall not lapse for a period exceeding 30 minutes.

Inspection and approval of all joint preparations, assembly practices, welding techniques, and the performance of each welder, welding operator, and tack welder shall be documented by the QC Inspector on a daily basis for each day that welding is performed. The QC Inspector shall confirm and document compliance with the requirements of the AWS code criteria and the requirements of these special provisions on all weld joints before welding, during welding, and after the completion of each weld.

When joint details that are not prequalified by the applicable AWS codes are proposed for use in the work, welders using these details shall perform a qualification test plate using the approved WPS variables and the joint detail to be used in production. The test plate shall be the maximum thickness to be used in production. The test plate shall be mechanically or radiographically tested as directed by the Engineer. Mechanical and radiographic testing and acceptance criteria shall be as specified in the applicable AWS codes.

The period of effectiveness for a welder's or welding operator's qualification shall be a maximum of 3 years for the same weld process, welding position, and weld type. A valid qualification at the beginning of work on a contract will be acceptable for the entire period of the contract, as long as the welder's work remains satisfactory.

PAYMENT

Full compensation for conforming to the requirements of this section shall be considered as included in the contract prices paid for the various items of work involved and no additional compensation will be allowed therefor.

SECTION 9. (BLANK)

SECTION 10. CONSTRUCTION DETAILS

SECTION 10-1. GENERAL

10-1.01 ORDER OF WORK

Order of work shall conform to the provisions in Section 5-1.05, "Order of Work," of the Standard Specifications and these special provisions.

Attention is directed to "Water Pollution Control" of these special provisions regarding the submittal and approval of the Water Pollution Control Program prior to performing work having potential to cause water pollution.

The first order of work shall be to place the order for the traffic signal and smart pedestrian system equipment. Broad Avenue construction shall be the first order of work.

Equipment shall be installed no later than 2 working days after delivery.

Prior to commencement of the traffic signal functional test at any location, all items of work related to signal control shall be completed and all roadside signs, pavement delineation, and pavement markings shall be in place at that location.

Prior to applying slurry seal, the Contractor shall cover all manholes, valve and monument covers, grates, or other exposed facilities located within the area of application, using a plastic or oil resistant construction paper secured to the facility being covered by tape or adhesive. The covered facilities shall be referenced by the Contractor, with a sufficient number of control points to relocate the facilities after the slurry seal has been placed. After completion of the slurry seal operation, all covers shall be removed and disposed of in a manner satisfactory to the Engineer. Full compensation for covering manholes, valve and monument covers, grates, or other exposed facilities, referencing, and removing temporary cover shall be considered as included in the contract price paid per square meter for remove pavement marking, and no additional compensation will be allowed therefor.

At the end of each working day if a difference in excess of 0.045-meter exists between the elevation of the existing pavement and the elevation of excavations within 1.5 m of the traveled way, material shall be placed and compacted against the vertical cuts adjacent to the traveled way. During excavation operations, native material may be used for this purpose; however, once placing of the structural section commences, structural material shall be used. The material shall be placed to the level of the elevation of the top of existing pavement and tapered at a slope of 1:4 (vertical:horizontal) or flatter to the bottom of the excavation. Full compensation for placing the material on a 1:4 slope, regardless of the number of times the material is required, and subsequent removing or reshaping of the material to the lines and grades shown on the plans shall be considered as included in the contract price paid for the materials involved and no additional compensation will be allowed therefor. No payment will be made for material placed in excess of that required for the structural section.

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 "Storm Water Pollution Prevention Plan (SWPPP) and Water Pollution Control Program (WPCP) Preparation Manual" and the "Construction Site Best Management Practices (BMPs) Manual," and addenda thereto issued up to, and including, the date of advertisement of the project. These manuals are hereinafter referred to respectively as the "Preparation Manual" and the "Construction Site BMPs Manual," and collectively, as the "Manuals." Copies of the Manuals may be obtained from the Department of Transportation, Material Operations Branch, Publication Distribution Unit, 1900 Royal Oaks Drive, Sacramento, California 95815, Telephone: (916) 445-3520, and may also be obtained from the Department's Internet website at: <http://www.dot.ca.gov/hq/construc/stormwater.html>.

The Contractor shall know and fully comply with applicable provisions of the Manuals, and Federal, State, and local regulations and requirements that govern the Contractor's operations and storm water and non-storm water discharges from both the project site and areas of disturbance outside the project limits during construction. Attention is directed to Sections 7-1.01, "Laws to be Observed," and 7-1.12, "Indemnification and Insurance," of the Standard Specifications.

Water pollution control requirements shall apply to storm water and non-storm water discharges from areas outside the project site which are directly related to construction activities for this contract including, but not limited to, asphalt batch plants, material borrow areas, concrete plants, staging areas, storage yards and access roads. The Contractor shall comply with the Manuals for those areas and shall implement, inspect and maintain the required water pollution control practices. Installing, inspecting and maintaining water pollution control practices on areas outside the highway right of way not specifically arranged and provided for by the Department for the execution of this contract, will not be paid for.

The Contractor shall be responsible for penalties assessed or levied on the Contractor or the Department as a result of the Contractor's failure to comply with the provisions in this section "Water Pollution Control" including, but not limited to, compliance with the applicable provisions of the Manuals, and Federal, State and local regulations and requirements as set forth therein.

Penalties as used in this section shall include fines, penalties and damages, whether proposed, assessed, or levied against the Department or the Contractor, including those levied under the Federal Clean Water Act and the State Porter-Cologne Water Quality Control Act, by governmental agencies or as a result of citizen suits. Penalties shall also include payments made or costs incurred in settlement for alleged violations of the Manuals, or applicable laws, regulations, or requirements. Costs incurred could include sums spent instead of penalties, in mitigation or to remediate or correct violations.

RETENTION OF FUNDS

Notwithstanding any other remedies authorized by law, the Department may retain money due the Contractor under the contract, in an amount determined by the Department, up to and including the entire amount of Penalties proposed, assessed, or levied as a result of the Contractor's violation of the Manuals, or Federal or State law, regulations or requirements. Funds may be retained by the Department until final disposition has been made as to the Penalties. The Contractor shall remain liable for the full amount of Penalties until such time as they are finally resolved with the entity seeking the Penalties.

Retention of funds for failure to conform to the provisions in this section, "Water Pollution Control," shall be in addition to the other retention amounts required by the contract. The amounts retained for the Contractor's failure to conform to provisions in this section will be released for payment on the next monthly estimate for partial payment following the date when an approved WPCP has been implemented and maintained, and when water pollution has been adequately controlled, as determined by the Engineer.

When a regulatory agency identifies a failure to comply with the Manuals, or other Federal, State or local requirements, the Department may retain money due the Contractor, subject to the following:

- A. The Department will give the Contractor 30 days notice of the Department's intention to retain funds from partial payments which may become due to the Contractor prior to acceptance of the contract. Retention of funds from payments made after acceptance of the contract may be made without prior notice to the Contractor.
- B. No retention of additional amounts out of partial payments will be made if the amount to be retained does not exceed the amount being withheld from partial payments pursuant to Section 9-1.06, "Partial Payments," of the Standard Specifications.
- C. If the Department has retained funds, and it is subsequently determined that the State is not subject to the entire amount of the Costs and Liabilities assessed or proposed in connection with the matter for which the retention was made, the Department shall be liable for interest on the amount retained for the period of the retention. The interest rate payable shall be 6 percent per annum.

During the first estimate period that the Contractor fails to conform to the provisions in this section, "Water Pollution Control," the Department may retain an amount equal to 25 percent of the estimated value of the contract work performed.

The Contractor shall notify the Engineer immediately upon request from the regulatory agencies to enter, inspect, sample, monitor, or otherwise access the project site or the Contractor's records pertaining to water pollution control work. The Contractor and the Department shall provide copies of correspondence, notices of violations, enforcement actions or proposed fines by regulatory agencies to the requesting regulatory agency.

WATER POLLUTION CONTROL PROGRAM PREPARATION, APPROVAL AND AMENDMENTS

As part of the water pollution control work, a Water Pollution Control Program (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 Manuals, and these special provisions. Upon the Engineer's approval of the WPCP, the WPCP shall be considered to fulfill the provisions in Section 7-1.01G, "Water Pollution," of the Standard Specifications for development and submittal of a Water Pollution Control Program.

No work having potential to cause water pollution, shall be performed until the WPCP has been approved by the Engineer. Approval shall not constitute a finding that the WPCP complies with applicable requirements of the Manuals and applicable Federal, State and local laws, regulations, and requirements.

The Contractor shall designate a Water Pollution Control Manager. The Water Pollution Control Manager shall be responsible for the preparation of the WPCP and required modifications or amendments, and shall be responsible for the implementation and adequate functioning of the various water pollution control practices employed. The Contractor may designate different Water Pollution Control Managers to prepare the WPCP and to implement the water pollution control practices. The Water Pollution Control Managers shall serve as the primary contact for issues related to the WPCP or its implementation. The Contractor shall assure that the Water Pollution Managers have adequate training and qualifications necessary to prepare the WPCP, implement and maintain water pollution control practices.

Within 10 working days after the approval of the contract, the Contractor shall submit 3 copies of the draft WPCP to the Engineer. The Engineer will have 10 working days to review the WPCP. If revisions are required, as determined by the Engineer, the Contractor shall revise and resubmit the WPCP within 10 working days of receipt of the Engineer's comments. The Engineer will have 5 working days to review the revisions. Upon the Engineer's approval of the WPCP, 4 approved copies of the WPCP, incorporating the required changes, shall be submitted to the Engineer. In order to allow construction activities to proceed, the Engineer may conditionally approve the WPCP while minor revisions are being completed. In the event the Engineer fails to complete the review within the time allowed, and if, in the opinion of the Engineer, completion of the work is delayed or interfered with by reason of the Engineer's delay in completing the review, the Contractor will be compensated for resulting losses, and an extension of time will be granted, in the same manner as provided for in Section 8-1.09, "Right of Way Delays," of the Standard Specifications.

The WPCP shall incorporate water pollution control practices in the following categories:

- A. Soil stabilization.
- B. Sediment control.
- C. Wind erosion control.
- D. Tracking control.
- E. Non-storm water management.
- F. Waste management and materials pollution control.

The Contractor shall develop a Water Pollution Control Schedule that describes the timing of grading or other work activities that could affect water pollution. The Water Pollution Control Schedule shall be updated by the Contractor to reflect changes in the Contractor's operations that would affect the necessary implementation of water pollution control practices.

The Contractor shall complete the BMP checklists for each of the six categories presented in Section 3 of the Preparation Manual and shall incorporate the completed checklists and water pollution control practices into Sections 30.1, 30.2, and 30.3 of the WPCP. Water pollution control practices include the "Minimum Requirements" and other Contractor-selected water pollution control practices from the BMP checklists and "Project-Specific Minimum Requirements" identified in the Water Pollution Control Cost Break-Down of this section.

The following contract items of work, as shown on the project plans or as specified elsewhere in these special provisions, shall be identified in the WPCP as permanent water pollution control practices: minor concrete (stamped concrete). The Contractor shall maintain and protect the permanent water pollution control practices throughout the duration of the project and shall restore these controls to the lines, grades and condition shown on the plans prior to acceptance of the contract.

The WPCP shall include, but not be limited to, the items described in the Manuals and related information contained in the contract documents.

The Contractor shall prepare an amendment to the WPCP when there is a change in construction activities or operations which may affect the discharge of pollutants to surface waters, ground waters, municipal storm drain systems, or when the Contractor's activities or operations violate Federal, State or local regulations, or when directed by the Engineer. Amendments shall identify additional water pollution control practices or revised operations, including those areas or operations not identified in the initially approved WPCP. Amendments to the WPCP shall be prepared and submitted for review and approval within a time approved by the Engineer, but in no case longer than the time specified for the initial submittal and review of the WPCP.

The Contractor shall keep one copy of the approved WPCP and approved amendments at the project site. The WPCP shall be made available upon request by a representative of the Regional Water Quality Control Board, State Water Resources Control Board, United States Environmental Protection Agency, or the local storm water management agency. Requests by the public shall be directed to the Engineer.

COST BREAK-DOWN

The Contractor shall include a Water Pollution Control Cost Break-Down in the WPCP which itemizes the contract lump sum for water pollution control work. The Contractor shall use the Water Pollution Control Cost Break-Down provided in this section as the basis for the cost break-down submitted with the WPCP. The Contractor shall use the Water Pollution Control Cost Break-Down to identify items, quantities and values for water pollution control work, excluding Temporary Water Pollution Control Practices for which there is a separate bid item. The Contractor shall be responsible for the accuracy of the quantities and values used in the cost break-down submitted with the WPCP. Partial payment for the item of water pollution control will not be made until the Water Pollution Control Cost Break-Down is approved by the Engineer.

Line items indicated in the Water Pollution Control Cost Break-Down in this section with a specified Estimated Quantity shall be considered a "Project-Specific Minimum Requirement." The Contractor shall incorporate the items with Contractor-designated quantities and values into the Water Pollution Control Cost Break-Down submitted with the WPCP.

Line items indicated in the Water Pollution Control Cost Break-Down in this section without a specified Estimated Quantity shall be considered by the Contractor for selection to meet the applicable "Minimum Requirements" as defined in the Manuals, or for other water pollution control work as identified in the BMP checklists presented in Section 3 of the Preparation Manual. In the Water Pollution Control Cost Break-Down submitted with the WPCP, the Contractor shall list only those water pollution control practices selected for the project, including quantities and values required to complete the work for those items.

The sum of the amounts for the items of work listed in the Water Pollution Control Cost Break-Down shall be equal to the contract lump sum price bid for water pollution control. Overhead and profit shall be included in each individual item listed in the cost break-down.

WATER POLLUTION CONTROL COST BREAK-DOWN

Contract No. 07-4J6604

ITEM	ITEM DESCRIPTION	UNIT	ESTIMATED QUANTITY	VALUE	AMOUNT
SS-1	Scheduling	LS			
SS-2	Preservation of Existing Vegetation	LS			
SS-3	Hydraulic Mulch	M2			
SS-4	Hydroseeding	M2			
SS-5	Soil Binders	M2			
SS-6	Straw Mulch	M2			
SS-7	Geotextiles, Plastic Covers & Erosion Control Blankets/Mats	M2			
SS-8	Wood Mulching	M2			
SS-9	Earth Dikes/Drainage Swales & Lined Ditches	M			
SS-10	Outlet Protection/Velocity Dissipation Devices	EA			
SS-11	Slope Drains	EA			
SC-1	Silt Fence	M			
SC-2	Desilting Basin	EA			
SC-3	Sediment Trap	EA			
SC-4	Check Dam	EA			
SC-5	Fiber Rolls	M			
SC-6	Gravel Bag Berm	M			
SC-7	Street Sweeping and Vacuuming	LS			
SC-8	Sandbag Barrier	M			
SC-9	Straw Bale Barrier	M			
SC-10	Storm Drain Inlet Protection	EA			
WE-1	Wind Erosion Control	LS			
TC-1	Stabilized Construction Entrance/Exit	EA			
TC-2	Stabilized Construction Roadway	EA			
TC-3	Entrance/Outlet Tire Wash	EA			
NS-1	Water Conservation Practices	LS			
NS-2	Dewatering Operations	EA			
NS-3	Paving and Grinding Operations	LS			

Contract No. 07-4J6604

ITEM	ITEM DESCRIPTION	UNIT	ESTIMATED QUANTITY	VALUE	AMOUNT
NS-4	Temporary Stream Crossing	EA			
NS-5	Clear Water Diversion	EA			
NS-6	Illicit Connection/Illegal Discharge Detection and Reporting	LS			
NS-7	Potable Water/Irrigation	LS			
NS-8	Vehicle and Equipment Cleaning	LS			
NS-9	Vehicle and Equipment Fueling	LS			
NS-10	Vehicle and Equipment Maintenance	LS			
WM-1	Material Delivery and Storage	LS			
WM-2	Material Use	LS			
WM-3	Stockpile Management	LS			
WM-4	Spill Prevention and Control	LS			
WM-5	Solid Waste Management	LS			
WM-6	Hazardous Waste Management	LS			
WM-7	Contaminated Soil Management	LS			
WM-8	Concrete Waste Management	LS			
WM-9	Sanitary/Septic Waste Management	LS			
WM-10	Liquid Waste Management	LS			

TOTAL _____

Adjustments in the items of work and quantities listed in the approved cost break-down shall be made when required to address amendments to the WPCP, except when the adjusted items are paid for as extra work.

No adjustment in compensation will be made to the contract lump sum price paid for water pollution control due to differences between the quantities shown in the approved cost break-down and the quantities required to complete the work as shown on the approved WPCP. No adjustment in compensation will be made for ordered changes to correct WPCP work resulting from the Contractor's own operations or from the Contractor's negligence.

The approved cost break-down will be used to determine partial payments during the progress of the work and as the basis for calculating the adjustment in compensation for the item of water pollution control due to increases or decreases of quantities ordered by the Engineer. When an ordered change increases or decreases the quantities of an approved cost break-down item, the adjustment in compensation will be determined in the same manner specified for increases and decreases in the quantity of a contract item of work in conformance with the provisions in Section 4-1.03B, "Increased or Decreased Quantities," of the Standard Specifications. If an ordered change requires a new item which is not on the approved cost break-down, the adjustment in compensation will be determined in the same manner specified for extra work in conformance with Section 4-1.03D, "Extra Work," of the Standard Specifications.

If requested by the Contractor and approved by the Engineer, changes to the water pollution control practices listed in the approved cost break-down, including addition of new water pollution control practices, will be allowed. Changes shall be included in the approved amendment of the WPCP. If the requested changes result in a net cost increase to the lump sum price for water pollution control, an adjustment in compensation will be made without change to the water pollution control item. The net cost increase to the water pollution control item will be paid for as extra work as provided in Section 4-1.03D, "Extra Work," of the Standard Specifications.

WPCP IMPLEMENTATION

Unless otherwise specified, upon approval of the WPCP, the Contractor shall be responsible throughout the duration of the project for installing, constructing, inspecting, maintaining, removing, and disposing of the water pollution control practices specified in the WPCP and in the amendments. Unless otherwise directed by the Engineer, 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 water pollution control practices shall conform to the requirements in the Manuals and these special provisions.

If the Contractor or the Engineer identifies a deficiency in the implementation of the approved WPCP or amendments, 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 shall be corrected prior to the onset of precipitation. If the Contractor fails to correct the identified deficiency by the date agreed or prior to the onset of precipitation, the project shall be in nonconformance with this section. Attention is directed to Section 5-1.01, "Authority of Engineer," of the Standard Specifications, and to "Retention of Funds" of this section for possible nonconformance penalties.

If the Contractor fails to conform to the provisions of this section, "Water Pollution Control," the Engineer may order the suspension of construction operations until the project complies with the requirements of this section.

Implementation of water pollution control practices may vary by season. The Construction Site BMPs Manual and these special provisions shall be followed for control practice selection of year-round, rainy season and non-rainy season water pollution control practices.

Year-Round Implementation Requirements

The Contractor shall have a year-round program for implementing, inspecting and maintaining water pollution control practices for wind erosion control, tracking control, non-storm water management, and waste management and materials pollution control.

The National Weather Service weather forecast shall be monitored and used by the Contractor on a daily basis. An alternative weather forecast proposed by the Contractor may be used if approved by the Engineer. If precipitation is predicted, the necessary water pollution control practices shall be deployed prior to the onset of the precipitation.

Disturbed soil areas shall be considered active whenever the soil disturbing activities have occurred, continue to occur or will occur during the ensuing 21 days. Nonactive areas shall be protected as prescribed in the Construction Site BMPs Manual within 14 days of cessation of soil disturbing activities or prior to the onset of precipitation, whichever occurs first.

Rainy Season Implementation Requirements

Soil stabilization and sediment control practices conforming to the requirements of these special provisions shall be provided throughout the rainy season, defined as between October 1 and May 1.

An implementation schedule of required soil stabilization and sediment control practices for disturbed soil areas shall be completed no later than 20 days prior to the beginning of each rainy season. The implementation schedule shall identify the soil stabilization and sediment control practices and the dates when the implementation will be 25 percent, 50 percent and 100 percent complete, respectively. For construction activities beginning during the rainy season, the Contractor shall implement applicable soil stabilization and sediment control practices.

Non-Rainy Season Implementation Requirements

The non-rainy season shall be defined as days outside the defined rainy season. The Contractor's attention is directed to the Construction Site BMPs Manual for soil stabilization and sediment control implementation requirements on disturbed soil areas during the non-rainy season. Disturbed soil areas within the project shall be protected in conformance with the requirements in the Construction Site BMPs Manual with an effective combination of soil stabilization and sediment control.

MAINTENANCE

To ensure the proper implementation and functioning of water pollution control practices, the Contractor shall regularly inspect and maintain the construction site for the water pollution control practices identified in the WPCP. The construction site shall be inspected by the Contractor as follows:

- A. Prior to a forecast storm.
- B. After a precipitation event which causes site runoff.
- C. At 24 hour intervals during extended precipitation events.
- D. Routinely, a minimum of once every two weeks outside of the defined rainy season.
- E. Routinely, a minimum of once every week during the defined rainy season.

The Contractor shall use the Storm Water Quality Construction Site Inspection Checklist provided in the Preparation Manual or an alternative inspection checklist provided by the Engineer. One copy of each site inspection record shall be submitted to the Engineer within 24 hours of completing the inspection.

REPORTING REQUIREMENTS

Report of Discharges, Notices or Orders

If the Contractor identifies discharges into surface waters or drainage systems in a manner causing, or potentially causing, a condition of pollution, or if the project receives a written notice or order from a regulatory agency, the Contractor shall immediately inform the Engineer. The Contractor shall submit a written report to the Engineer within 3 days of the discharge event, notice or order. The report shall include the following information:

- A. The date, time, location, nature of the operation, and type of discharge, including the cause or nature of the notice or order.
- B. The water pollution control practices deployed before the discharge event, or prior to receiving the notice or order.
- C. The date of deployment and type of water pollution control practices deployed after the discharge event, or after receiving the notice or order, including additional measures installed or planned to reduce or prevent reoccurrence.
- D. An implementation and maintenance schedule for affected water pollution control practices.

Report of First-Time Non-Storm Water Discharge

The Contractor shall notify the Engineer at least 7 days in advance of first-time non-storm water discharge events. The Contractor shall notify the Engineer of the operations causing non-storm water discharges and shall obtain field approval for first-time non-storm water discharges. Non-storm water discharges shall be monitored at first-time occurrences and routinely thereafter.

PAYMENT

The contract lump sum price paid for prepare water pollution control program shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals for doing all the work involved in developing, preparing, obtaining approval of, revising, and amending the WPCP, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

Attention is directed to Section 9-1.06, "Partial Payments," and Section 9-1.07, "Payment After Acceptance," of the Standard Specifications. Payments for Prepare Water Pollution Control Program will be made as follows:

- A. After the WPCP has been approved by the Engineer, 75 percent of the contract item price for Prepare Water Pollution Control Program will be included in the monthly partial payment estimate.
- B. After acceptance of the contract in conformance with the provisions in Section 7-1.17, "Acceptance of Contract," of the Standard Specifications, payment for the remaining 25 percent of the contract item price for Prepare Water Pollution Control Program will be made in conformance with the provisions in Section 9-1.07.

The contract lump sum price paid for water pollution control shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in installing, constructing, maintaining, removing, and disposing of water pollution control practices, including non-storm water management, and waste management and materials pollution water pollution control practices, except those for which there is a contract item of work as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

Water pollution control practices for which there is a contract item of work will be measured and paid for as that contract item of work.

10-1.03 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 injured or damaged by reason of the Contractor's operations, shall be replaced by the Contractor. The minimum size of tree replacement shall be No. 15 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.

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 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 and these special provisions, unless otherwise authorized in writing by the Engineer.

The second paragraph of Section 8-1.04, "Progress Schedule," of the Standard Specifications shall not apply.

10-1.05 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.

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

10-1.06 MOBILIZATION

Mobilization shall conform to the provisions in Section 11, "Mobilization," of the Standard Specifications.

10-1.07 CONSTRUCTION AREA TRAFFIC CONTROL DEVICES

Flagging, signs, and all other traffic control devices furnished, installed, maintained, and removed when no longer required shall conform to the provisions in Section 12, "Construction Area Traffic Control Devices," of the Standard Specifications and these special provisions.

Category 1 traffic control devices are defined as those devices that are small and lightweight (less than 45 kg), and have been in common use for many years. The devices shall be known to be crashworthy by crash testing, crash testing of similar devices, or years of demonstrable safe performance. Category 1 traffic control devices include traffic cones, plastic drums, portable delineators, and channelizers.

If requested by the Engineer, the Contractor shall provide written self-certification for crashworthiness of Category 1 traffic control devices. Self-certification shall be provided by the manufacturer or Contractor and shall include the following: date, Federal Aid number (if applicable), expenditure authorization, district, county, route and kilometer post of project limits; company name of certifying vendor, street address, city, state and zip code; printed name, signature and title of certifying person; and an indication of which Category 1 traffic control devices will be used on the project. The Contractor may obtain a standard form for self-certification from the Engineer.

Category 2 traffic control devices are defined as those items that are small and lightweight (less than 45 kg), that are not expected to produce significant vehicular velocity change, but may otherwise be potentially hazardous. Category 2 traffic control devices include: barricades and portable sign supports.

Category 2 devices purchased on or after October 1, 2000 shall be on the Federal Highway Administration (FHWA) Acceptable Crashworthy Category 2 Hardware for Work Zones list. This list is maintained by FHWA and can be located at the following internet address: <http://safety.fhwa.dot.gov/fourthlevel/hardware/listing.cfm?code=workzone>. The Department maintains a secondary list at the following internet address: <http://www.dot.ca.gov/hq/traffops/signtech/signdel/pdf.htm>.

Category 2 devices that have not received FHWA acceptance, and were purchased before October 1, 2000, may continue to be used until they complete their useful service life or until January 1, 2003, whichever comes first. Category 2 devices in use that have received FHWA acceptance shall be labeled with the FHWA acceptance letter number and the name of the manufacturer by the start of the project. The label shall be readable. After January 1, 2003, all Category 2 devices without a label shall not be used on the project.

If requested by the Engineer, the Contractor shall provide a written list of Category 2 devices to be used on the project at least 5 days prior to beginning any work using the devices. For each type of device, the list shall indicate the FHWA acceptance letter number and the name of the manufacturer.

Full compensation for providing self-certification for crashworthiness of Category 1 traffic control devices and for providing a list of Category 2 devices used on the project and labeling Category 2 devices as specified shall be considered as included in the prices paid for the various contract items of work requiring the use of the Category 1 or Category 2 traffic control devices and no additional compensation will be allowed therefor.

10-1.08 CONSTRUCTION AREA SIGNS

Construction area signs shall be furnished, installed, maintained, and removed when no longer required in conformance with the provisions in Section 12, "Construction Area Traffic Control Devices," of the Standard Specifications and these special provisions.

Five working days prior to traffic signal pole removal, the Engineer shall be notified regarding removal and reinstallation of pole mounted and mast arm mounted street name signs.

Attention is directed to the provisions in "Prequalified and Tested Signing and Delineation Materials" of these special provisions. Type II retroreflective sheeting shall not be used on construction area sign panels.

The Contractor shall notify the appropriate regional notification center for operators of subsurface installations at least 2 working days, but not more than 14 calendar days, prior to commencing excavation for construction area sign posts. The regional notification centers include, but are not limited to, the following:

Notification Center	Telephone Number
Underground Service Alert-Northern California (USA)	1-800-642-2444 1-800-227-2600
Underground Service Alert-Southern California (USA)	1-800-422-4133 1-800-227-2600

Excavations required to install construction area signs shall be performed by hand methods without the use of power equipment, except that power equipment may be used if it is determined there are no utility facilities in the area of the proposed post holes.

Sign substrates for stationary mounted construction area signs may be fabricated from fiberglass reinforced plastic as specified under "Prequalified and Tested Signing and Delineation Materials" of these special provisions.

The Contractor may be required to cover certain signs during the progress of the work. Signs that are no longer required or that convey inaccurate information to the public shall be immediately covered or removed, or the information shall be corrected. Covers for construction area signs shall be of sufficient size and density to completely block out the complete face of the signs. The retroreflective face of the covered signs shall not be visible either during the day or at night. Covers shall

be fastened securely so that the signs remain covered during inclement weather. Covers shall be replaced when they no longer cover the signs properly.

10-1.09 MAINTAINING TRAFFIC

Attention is directed to Sections 7-1.08, "Public Convenience," 7-1.09, "Public Safety," and 12, "Construction Area Traffic Control Devices," of the Standard Specifications and to the provisions in "Public Safety" of these special provisions and these special provisions. Nothing in these special provisions shall be construed as relieving the Contractor from the responsibilities specified in Section 7-1.09.

Lane closures shall conform to the provisions in section "Traffic Control System for Lane Closure" of these special provisions.

Personal vehicles of the Contractor's employees shall not be parked on the traveled way including any section closed to public traffic.

The Contractor shall notify local authorities of the Contractor's intent to begin work at least 5 days before work is begun. The Contractor shall cooperate with local authorities relative to handling traffic through the area and shall make arrangements relative to keeping the working area clear of parked vehicles.

Whenever vehicles or equipment are parked on the shoulder within 1.8 m of a traffic lane, the shoulder area shall be closed with fluorescent traffic cones or portable delineators placed on a taper in advance of the parked vehicles or equipment and along the edge of the pavement at 7.5 m intervals to a point not less than 7.5 m past the last vehicle or piece of equipment. A minimum of 9 cones or portable delineators shall be used for the taper. A C23 (Road Work Ahead) or C24 (Shoulder Work Ahead) sign shall be mounted on a portable sign stand with flags. The sign shall be placed where designated by the Engineer.

A minimum of two paved traffic lanes, not less than 3.0 m wide per lane, shall be open for use by public traffic in each direction of travel.

No work that interferes with public traffic shall be performed between 6:00 a.m. and 9:00 a.m. or between 3:00 p.m. and 7:00 p.m. except work required under Sections 7-1.08 and 7-1.09.

Lanes shall be closed only during the hours shown on the chart included in this section "Maintaining Traffic." Except work required under Sections 7-1.08 and 7-1.09, work that interferes with public traffic shall be performed only during the hours shown for lane closures.

Designated legal holidays are: January 1st, the third Monday in February, the last Monday in May, July 4th, the first Monday in September, November 11th, Thanksgiving Day, and December 25th. When a designated legal holiday falls on a Sunday, the following Monday shall be a designated legal holiday. When November 11th falls on a Saturday, the preceding Friday shall be a designated legal holiday.

Flashing, activation and deactivation of signals and interconnect may occur between 9:00 a.m. and 3:00 p.m. and between 7:00 p.m. and 6:00 a.m. on weekdays except legal holidays and shall be activated or deactivated by a LADOT traffic signal electrician. The LADOT traffic signal electrician will delay or cancel a scheduled signal deactivation due to unsafe working or weather conditions.

Chart No. 1																								
City Street Lane Requirements and Hours of Work																								
Location: 7-LA-1-KP 16.80/17.83 NB and SB Rte. 1 at Broad Ave., Island Ave., and Ronan Ave.																								
FROM HOUR TO HOUR	a.m.											p.m.												
	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11
Mondays through Thursdays	1	1	1	1	1	1				2	2	2	2	2	2					2	2	2	1	1
Fridays	1	1	1	1	1	1				2	2	2	2	2	2					2	2	2	1	1
Saturdays	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1	1
Sundays	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1	1
Legend:																								
1	Provide at least one city street lane open in direction of travel																							
C	Street lane may be closed.																							
	No work that interferes with public traffic will be allowed																							
REMARKS: Number of Through Traffic Lanes - 3 in Each Direction The full width of the traveled way shall be open for use by public traffic when construction operations are not actively in progress.																								

10-1.10 CLOSURE REQUIREMENTS AND CONDITIONS

Lane closures shall conform to the provisions in "Maintaining Traffic" of these special provisions and these special provisions.

The term closure, as used herein, is defined as the closure of a traffic lane or lanes within a single traffic control system.

CLOSURE SCHEDULE

By noon Monday, the Contractor shall submit a written schedule of planned closures for the following week period, defined as Friday noon through the following Friday noon.

The Closure Schedule shall show the locations and times when the proposed closures are to be in effect. The Contractor shall use the Closure Schedule request forms furnished by the Engineer. Closure Schedules submitted to the Engineer with incomplete, unintelligible or inaccurate information will be returned for correction and resubmittal. The Contractor will be notified of disapproved closures or closures that require coordination with other parties as a condition of approval.

Amendments to the Closure Schedule, including adding additional closures, shall be submitted to the Engineer, in writing, at least 3 working days in advance of a planned closure.

The Contractor shall confirm, in writing, all scheduled closures by no later than 8:00 a.m. 3 working days prior to the date on which the closure is to be made. Approval or denial of scheduled closures will be made no later than 4:00 p.m. 2 working days prior to the date on which the closure is to be made. Closures not confirmed or approved will not be allowed.

Confirmed closures that are cancelled due to unsuitable weather may be rescheduled at the discretion of the Engineer for the following working day.

CONTINGENCY PLAN

The Contractor shall prepare a contingency plan for reopening closures to public traffic. The Contractor shall submit the contingency plan for a given operation to the Engineer within one working day of the Engineer's request.

LATE REOPENING OF CLOSURES

If a closure is not reopened to public traffic by the specified time, work shall be suspended in conformance with the provisions in Section 8-1.05, "Temporary Suspension of Work," of the Standard Specifications. The Contractor shall not make any further closures until the Engineer has accepted a work plan, submitted by the Contractor, that will insure that future closures will be reopened to public traffic at the specified time. The Engineer will have 2 working days to accept or reject the Contractor's proposed work plan. The Contractor will not be entitled to any compensation for the suspension of work resulting from the late reopening of closures.

COMPENSATION

The Contractor shall notify the Engineer of any delay in the Contractor's operations due to the following conditions, and if, in the opinion of the Engineer, the Contractor's controlling operation is delayed or interfered with by reason of those conditions, and the Contractor's loss due to that delay could not have been avoided by rescheduling the affected closure or by judicious handling of forces, equipment and plant, the delay will be considered a right of way delay within the meaning of Section 8-1.09, "Right of Way Delays," and compensation for the delay will be determined in conformance with the provisions in Section 8-1.09:

- A. The Contractor's proposed Closure Schedule is denied and his planned closures are within the time frame allowed for closures in "Maintaining Traffic" of these special provisions, except that the Contractor will not be entitled to any compensation for amendments to the Closure Schedule that are not approved.
- B. The Contractor is denied a confirmed closure.

Should the Engineer direct the Contractor to remove a closure prior to the time designated in the approved Closure Schedule, any delay to the Contractor's schedule due to removal of the closure will be considered a right of way delay within the meaning of Section 8-1.09, "Right of Way Delays," and compensation for the delay will be determined in conformance with the provisions in Section 8-1.09.

10-1.11 TRAFFIC CONTROL SYSTEM FOR LANE CLOSURE

A traffic control system shall consist of closing traffic lanes in conformance with the details shown on the plans, the provisions in Section 12, "Construction Area Traffic Control Devices," of the Standard Specifications, the provisions under "Maintaining Traffic" and "Construction Area Signs" of these special provisions, and these special provisions.

The provisions in this section will not relieve the Contractor from the responsibility to provide additional devices or take measures as may be necessary to comply with the provisions in Section 7-1.09, "Public Safety," of the Standard Specifications.

Each vehicle used to place, maintain and remove components of a traffic control system on multilane highways shall be equipped with a Type II flashing arrow sign which shall be in operation when the vehicle is being used for placing, maintaining or removing components. Vehicles equipped with Type II flashing arrow sign not involved in placing, maintaining or removing components when operated within a stationary lane closure shall only display the caution display mode. The sign shall be controllable by the operator of the vehicle while the vehicle is in motion. The flashing arrow sign shown on the plans shall not be used on vehicles which are being used to place, maintain and remove components of a traffic control system and shall be in place before a lane closure requiring its use is completed.

If components in the traffic control system are displaced or cease to operate or function as specified, from any cause, during the progress of the work, the Contractor shall immediately repair the components to the original condition or replace the components and shall restore the components to the original location.

When lane closures are made for work periods only, at the end of each work period, components of the traffic control system, except portable delineators placed along open trenches or excavation adjacent to the traveled way, shall be removed from the traveled way and shoulder. If the Contractor so elects, the components may be stored at selected central locations designated by the Engineer within the limits of the highway right of way.

The contract lump sum price paid for traffic control system shall include full compensation for furnishing all labor, materials (including signs), tools, equipment, and incidentals, and for doing all the work involved in placing, removing, storing, maintaining, moving to new locations, replacing, and disposing of the components of the traffic control system shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

The adjustment provisions in Section 4-1.03, "Changes," of the Standard Specifications shall not apply to the item of traffic control system. Adjustments in compensation for traffic control system will be made only for increased or decreased traffic control system required by changes ordered by the Engineer and will be made on the basis of the cost of the increased or decreased traffic control necessary. The adjustment will be made on a force account basis as provided in Section 9-1.03, "Force Account Payment," of the Standard Specifications for increased work and estimated on the same basis in the case of decreased work.

Traffic control system required by work which is classed as extra work, as provided in Section 4-1.03D of the Standard Specifications, will be paid for as a part of the extra work.

10-1.12 TEMPORARY CRASH CUSHION MODULE

This work shall consist of furnishing, installing, and maintaining sand filled temporary crash cushion modules in groupings or arrays as specified in these special provisions or where designated by the Engineer. The grouping or array of sand filled modules shall form a complete sand filled temporary crash cushion in conformance with these special provisions.

Attention is directed to "Public Safety" of these special provisions.

Whenever the work or the Contractor's operations establishes a fixed obstacle, the exposed fixed obstacle shall be protected with a sand filled temporary crash cushion. The sand filled temporary crash cushion shall be in place prior to opening the lanes adjacent to the fixed obstacle to public traffic.

Sand filled temporary crash cushions shall be maintained in place at each location, including times when work is not actively in progress. Sand filled temporary crash cushions may be removed during a work period for access to the work provided that the exposed fixed obstacle is 4.6 m or more from a lane carrying public traffic and the temporary crash cushion is reset to protect the obstacle prior to the end of the work period in which the fixed obstacle was exposed. When no longer required, as determined by the Engineer, sand filled temporary crash cushions shall be removed from the site of the work.

At the Contractor's option, the modules for use in sand filled temporary crash cushions shall be either Energite III Inertial Modules, Fitch Inertial Modules or Traffix Sand Barrels manufactured after March 31, 1997, or equal:

- A. Energite III and Fitch Inertial Modules, manufactured by Energy Absorption Systems, Inc., One East Wacker Drive, Chicago, IL 60601-2076. Telephone 1-312-467-6750, FAX 1-800-770-6755
 - 1. Distributor (North): Traffic Control Service, Inc., 8585 Thys Court, Sacramento, CA 95828. Telephone 1-800-884-8274, FAX 1-916-387-9734
 - 2. Distributor (South): Traffic Control Service, Inc., 1881 Betmor Lane, Anaheim, CA 92805. Telephone 1-800-222-8274, FAX 1-714-937-1070

- B. Traffix Sand Barrels, manufactured by Traffix Devices, Inc., 220 Calle Pintoresco, San Clemente, CA 92672. Telephone 1-949 361-5663, FAX 1-949 361-9205
 - 1. Distributor (North): United Rentals, Inc., 1533 Berger Drive, San Jose, CA 95112. Telephone 1-408 287-4303, FAX 1-408 287-1929
 - 2. Distributor (South): Statewide Safety & Sign, Inc., P.O. Box 1440, Pismo Beach, CA 93448. Telephone 1-800-559-7080, FAX 1-805 929-5786

Modules contained in each temporary crash cushion shall be of the same type at each location. The color of the modules shall be the standard yellow color, as furnished by the vendor, with black lids. The modules shall exhibit good workmanship free from structural flaws and objectionable surface defects. The modules need not be new. Good used undamaged modules conforming to color and quality of the types specified herein may be utilized. If used Fitch modules requiring a seal are furnished, the top edge of the seal shall be securely fastened to the wall of the module by a continuous strip of heavy duty tape.

Modules shall be filled with sand in conformance with the manufacturer's directions, and to the sand capacity in kilograms for each module shown on the plans. Sand for filling the modules shall be clean washed concrete sand of commercial quality. At the time of placing in the modules, the sand shall contain not more than 7 percent water as determined by California Test 226.

Modules damaged due to the Contractor's operations shall be repaired immediately by the Contractor at the Contractor's expense. Modules damaged beyond repair, as determined by the Engineer, due to the Contractor's operations shall be removed and replaced by the Contractor at the Contractor's expense.

Temporary crash cushion modules shall be placed on movable pallets or frames conforming to the dimensions shown on the plans. The pallets or frames shall provide a full bearing base beneath the modules. The modules and supporting pallets or frames shall not be moved by sliding or skidding along the pavement or bridge deck.

A Type R or P marker panel shall be attached to the front of the crash cushion as shown on the plans, when the closest point of the crash cushion array is within 3.6 m of the traveled way. The marker panel, when required, shall be firmly fastened to the crash cushion with commercial quality hardware or by other methods determined by the Engineer.

At the completion of the project, temporary crash cushion modules, sand filling, pallets or frames, and marker panels shall become the property of the Contractor and shall be removed from the site of the work. Temporary crash cushion modules shall not be installed in the permanent work.

Temporary crash cushion modules placed in conformance with the provisions in "Public Safety" of these special provisions will not be measured nor paid for.

10-1.13 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 PAVEMENT MARKER

Existing pavement markers, including underlying adhesive, when no longer required for traffic lane delineation as determined by the Engineer, shall be removed and disposed of.

REMOVE TRAFFIC STRIPE AND PAVEMENT MARKING

Traffic stripe and pavement marking shall be removed at the locations shown on the plans and as directed by the Engineer.

Attention is directed to "Water Pollution Control" of these special provisions.

Waste from removal of yellow thermoplastic traffic stripe contains lead chromate in average concentrations greater than or equal to 5 mg/L Soluble Lead or 1000 mg/kg Total Lead. Residue produced from when yellow thermoplastic is removed may contain heavy metals in concentrations that exceed thresholds established by the California Health and Safety Code and may produce toxic fumes when heated.

The removed yellow thermoplastic shall be disposed of at a Class 1 disposal facility or a Class 2 disposal facility permitted by the Regional Water Quality Control Board in conformance with the requirements of the disposal facility operator within 20 days after accumulating 100 kg of residue and dust. The Contractor shall make necessary arrangements with the operator of the disposal facility to test the yellow thermoplastic residue as required by the facility and these special provisions. Testing shall include, at a minimum, (1) Total Lead and Chromium by EPA Method 7000 series and (2) Soluble Lead and Chromium by California Waste Extraction Test. From the first 3360 L of waste or portion thereof, if less than 3360 L of waste are produced, a minimum of four randomly selected samples shall be taken and analyzed. From each additional 840 L of waste or portion thereof, if less than 840 L are produced, a minimum of one additional random sample shall be taken and analyzed. The Contractor shall submit the name and location of the disposal facility and analytical laboratory along with the testing requirements to the Engineer not less than 5 days prior to the start of removal of yellow thermoplastic traffic stripe. The analytical laboratory shall be certified by the Department of Health Services Environmental Laboratory Accreditation Program. Test results shall be provided to the Engineer for review prior to signing a waste profile as requested by the disposal facility, prior to issuing an EPA identification number, and prior to allowing removal of the waste from the site.

The Contractor shall prepare a project specific Lead Compliance Plan to prevent or minimize worker exposure to lead while handling removed yellow thermoplastic residue. Attention is directed to Title 8, California Code of Regulations, Section 1532.1, "Lead," for specific Cal-OSHA requirements when working with lead.

The Lead Compliance Plan shall contain the elements listed in Title 8, California Code of Regulations, Section 1532.1(e)(2)(B). Before submission to the Engineer, the Lead Compliance Plan shall be approved by an Industrial Hygienist certified in Comprehensive Practice by the American Board of Industrial Hygiene. The Plan shall be submitted to the Engineer at least 7 days prior to beginning removal of yellow thermoplastic and yellow paint.

Prior to removing yellow thermoplastic traffic stripe, personnel who have no prior training, including State personnel, shall complete a safety training program provided by the Contractor that meets the requirements of Title 8, California Code of Regulations, Section 1532.1, "Lead," and the Contractor's Lead Compliance Program.

Personal protective equipment, training, and washing facilities required by the Contractor's Lead Compliance Plan shall be supplied to State personnel by the Contractor. The number of State personnel will be 2.

Where grinding or other methods approved by the Engineer are used to remove yellow thermoplastic and yellow painted traffic stripe and pavement marking, the removed residue, including dust, shall be contained and collected immediately. Sweeping equipment shall not be used. Collection shall be by a high efficiency particulate air (HEPA) filter equipped vacuum attachment operated concurrently with the removal operations or other equally effective methods approved by the Engineer. The Contractor shall submit a written work plan for the removal, storage, and disposal of yellow thermoplastic and yellow painted traffic stripe and pavement marking to the Engineer for approval not less than 7 days prior to the start of the removal operations. Removal operations shall not be started until the Engineer has approved the work plan.

The removed yellow thermoplastic traffic stripe residue shall be stored and labeled in covered containers. Labels shall conform to the provisions of Title 22, California Code of Regulations, Sections 66262.31 and 66262.32. Labels shall be marked with date when the waste is generated, the words "Hazardous Waste", composition and physical state of the waste (for example, asphalt grindings with thermoplastic or paint), the word "Toxic", the name and address of the Engineer, the Engineer's telephone number, contract number, and Contractor or subcontractor. The containers shall be a type approved by the United States Department of Transportation for the transportation and temporary storage of the removed residue. The containers shall be handled so that no spillage will occur. The containers shall be stored in a secured enclosure at a location within the project limits until disposal, as approved by the Engineer.

If the yellow thermoplastic traffic stripe residue is transported to a Class 1 disposal facility, a manifest shall be used, and the transporter shall be registered with the California Department of Toxic Substance Control. The Engineer will obtain the United States Environmental Protection Agency Identification Number and sign all manifests as the generator within 2 working days of receiving sample test results and approving the test methods.

Nothing in these special provisions shall relieve the Contractor of the Contractor's responsibilities as specified in Section 7-1.09, "Public Safety," of the Standard Specifications.

The contract lump sum price paid for Lead Compliance Plan shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals and for doing all the work involved in preparing the Lead Compliance Plan, including paying the Certified Industrial Hygienist, and for providing personnel protective equipment, training, air monitoring, and medical surveillance, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

Full compensation for providing a written work plan for the removal, storage, and disposal of yellow thermoplastic traffic stripe shall be considered as included in the contract prices paid per meter for remove yellow thermoplastic traffic stripe and no separate payment will be made therefor.

Areas where pavement markings have been removed shall be slurry sealed conforming to the provisions of "Slurry Seal," of these special provisions.

REMOVE ROADSIDE SIGN

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

Existing roadside signs shall not be removed until replacement signs have been installed or until the existing signs are no longer required for the direction of public traffic, unless otherwise directed by the Engineer.

REMOVE PORTLAND CEMENT CONCRETE PAVEMENT

Removing portland cement concrete pavement shall conform to the provisions in Section 15-3, "Removing Concrete," of the Standard Specifications.

Where no joint exists in the pavement on the line at which concrete is to be removed, a straight, neat cut with a power driven saw shall be made along the line to a minimum depth of 50 mm before removing the concrete.

The quantities of portland cement concrete pavement removed will be measured and paid for by the cubic meter.

No deduction will be made from any excavation quantities for the quantity of portland cement concrete pavement removed.

Full compensation for removing bituminous or other overlying material and sawing joints at removal lines, as required, shall be considered as included in the contract price paid cubic meter for remove concrete pavement and no additional compensation will be allowed therefor.

10-1.14 EARTHWORK

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

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.

Reinforcement or metal attached to reinforced concrete rubble placed in embankments shall not protrude above the grading plane. Prior to placement within 0.6-m below the grading plane of embankments, reinforcement or metal shall be trimmed to no greater than 20 mm from the face of reinforced concrete rubble. Full compensation for trimming reinforcement or metal shall be considered as included in the contract prices paid per cubic meter for roadway excavation shown in the Engineer's estimate, or the contract prices paid for furnishing and placing imported borrow or embankment material, as the case may be, and no additional compensation will be allowed therefor.

10-1.15 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.

10-1.16 SLURRY SEAL

Slurry seal shall conform to the provisions in Section 37-2, "Slurry Seal," of the Standard Specifications and these special provisions.

The aggregate for slurry seal shall be Type II .

Polymer modified asphaltic emulsion shall be composed of a bituminous material uniformly emulsified with water and an emulsifying or stabilization agent and shall contain a polymer.

The polymer used in the manufacture of polymer modified asphaltic emulsions shall be at the option of the Contractor, either neoprene, or a copolymer of butadiene and styrene. The polymer used in the polymer modified asphaltic emulsion shall be homogenous and shall be milled into the product at the colloid mill.

The polymer modified asphalt emulsion shall be grade PMCQS1h and shall conform to the following requirements:

Type	Cationic	
Grade	PMCQS1h	
Properties	Min.	Max
Tests on Emulsion:		
Viscosity SSF @ 25°C, sec AASHTO Designation T-59	15	90
Sieve Test, % AASHTO Designation T-539	—	0.30
Storage Stability, 1 day, % AASHTO Designation T-59	—	1
Residue by Evaporation, % California Test 331	57	—
Particle Charge AASHTO Designation T-59	Positive	
Tests on Residue from Evaporation Test		
Penetration, 25°C AASHTO Designation: T 49	40	90
Ductility, 25°C, mm AASHTO Designation: T 51	400	—
Torsional Recovery, % California Test 332	18	—
or		
Polymer Content, % California Test 401	2.5	—

Note:

When the test for polymer content of polymer modified asphaltic emulsion is used, see sampling requirements in Section 94-1.03, "Sampling" of the Standard Specifications.

Full compensation for slurry seal shall be considered as included in the contract price paid per square meter for remove pavement marking and no separate payment will be made therefor.

10-1.17 ASPHALT CONCRETE

Asphalt concrete shall be Type B and shall conform to the provisions in Section 39, "Asphalt Concrete," of the Standard Specifications and these special provisions.

Paint binder (tack coat) shall be applied to existing surfaces to be surfaced and between layers of asphalt concrete, except when eliminated by the Engineer.

Paint binder (tack coat) shall be, at the option of the Contractor, either slow-setting type asphaltic emulsion, rapid setting asphaltic emulsion or paving asphalt. Slow-setting type asphaltic emulsion and rapid setting asphaltic emulsion shall conform to the provisions in Section 39-4.02, "Prime Coat and Paint Binder (Tack Coat)," and the provisions in Section 94, "Asphaltic Emulsions," of the Standard Specifications. When paving asphalt is used for paint binder, the grade will be determined by the Engineer. Paving asphalt shall conform to the provisions in Section 39-4.02, "Prime Coat and Paint Binder (Tack Coat)," and the provisions in Section 92, "Asphalts," of the Standard Specifications.

Paint binder (tack coat) shall be applied in the liter per square meter range limits specified for the surfaces to receive asphalt concrete in the tables below. The exact application rate within the range will be determined by the Engineer.

Application Rates for Asphaltic Emulsion Paint Binder (Tack Coat) for Asphalt Concrete (except Open Graded) and on Portland Cement Concrete Pavement		
Type of surface to receive paint binder (tack coat)	Slow-Setting Asphaltic Emulsion L/m ² (Note A)	Rapid-Setting Asphaltic Emulsion L/m ² (Note B)
Dense, compact surfaces, between layers, and on PCCP	0.20 – 0.35	0.10 – 0.20
Open textured, or dry, aged surfaces	0.35 – 0.90	0.20 – 0.40

Note A: Slow-setting asphaltic emulsion is asphaltic emulsion diluted with additional water. Water shall be added and mixed with the asphaltic emulsion (containing up to 43 percent water) so the resulting mixture contains one part asphaltic emulsion and not more than one part added water. The water shall be added by the emulsion producer or at a facility that has the capability to mix or agitate the combined blend.

Note B: Undiluted rapid-setting asphaltic emulsion.

When asphaltic emulsion is used as paint binder (tack coat), asphalt concrete shall not be placed until the applied asphaltic emulsion has completely changed color from brown to black.

The miscellaneous areas to be paid for at the contract price per square meter for place asphalt concrete (miscellaneous area), in addition to the prices paid for the materials involved, shall be limited to the areas listed on the plans.

10-1.18 PILING

GENERAL

Piling shall conform to the provisions in Section 49, "Piling," of the Standard Specifications, and these special provisions.

Unless otherwise specified, welding of any work performed in conformance with the provisions in Section 49, "Piling," of the Standard Specifications, shall be in conformance with the requirements in AWS D1.1.

Attention is directed to "Welding" of these special provisions.

Difficult pile installation is anticipated due to the presence underground utilities, overhead utilities, sound control, and traffic control.

CAST-IN-DRILLED-HOLE CONCRETE PILES

Cast-in-drilled-hole concrete piling shall conform to the provisions in Section 49-4, "Cast-In-Place Concrete Piles," of the Standard Specifications and these special provisions.

Cast-in-drilled-hole concrete piles 600 mm in diameter or larger may be constructed by excavation and depositing concrete under slurry.

Materials

Concrete deposited under slurry shall have a nominal penetration equal to or greater than 90 mm. Concrete shall be proportioned to prevent excessive bleed water and segregation.

Concrete deposited under slurry shall contain not less than 400 kg of cementitious material per cubic meter.

The combined aggregate grading used in concrete for cast-in-drilled-hole concrete piling shall be either the 25-mm maximum grading, the 12.5-mm maximum grading, or the 9.5-mm maximum grading and shall conform to the requirements in Section 90-3 "Aggregate Gradings," of the Standard Specifications.

Mineral Slurry

Mineral slurry shall be mixed and thoroughly hydrated in slurry tanks, and slurry shall be sampled from the slurry tanks and tested before placement in the drilled hole.

Slurry shall be recirculated or continuously agitated in the drilled hole to maintain the specified properties.

Recirculation shall include removal of drill cuttings from the slurry before discharging the slurry back into the drilled hole. When recirculation is used, the slurry shall be sampled and tested at least every 2 hours after beginning its use until tests show that the samples taken from the slurry tank and from near the bottom of the hole have consistent specified properties. Subsequently, slurry shall be sampled at least twice per shift as long as the specified properties remain consistent.

Slurry that is not recirculated in the drilled hole shall be sampled and tested at least every 2 hours after beginning its use. The slurry shall be sampled midheight and near the bottom of the hole. Slurry shall be recirculated when tests show that the samples taken from midheight and near the bottom of the hole do not have consistent specified properties.

Slurry shall also be sampled and tested prior to final cleaning of the bottom of the hole and again just prior to placing concrete. Samples shall be taken from midheight and near the bottom of the hole. Cleaning of the bottom of the hole and placement of the concrete shall not start until tests show that the samples taken from midheight and near the bottom of the hole have consistent specified properties.

Mineral slurry shall be tested for conformance to the requirements shown in the following table:

MINERAL SLURRY		
PROPERTY	REQUIREMENT	TEST
Density (kg/m ³) - before placement in the drilled hole - during drilling - prior to final cleaning - immediately prior to placing concrete	1030* to 1110* 1030* to 1200*	Mud Weight (Density) API 13B-1 Section 1
Viscosity (seconds/liter) bentonite attapulgate	 29 to 53 29 to 42	Marsh Funnel and Cup API 13B-1 Section 2.2
pH	8 to 10.5	Glass Electrode pH Meter or pH Paper
Sand Content (percent) - prior to final cleaning - immediately prior to placing concrete	 less than or equal to 4.0	Sand API 13B-1 Section 5
*When approved by the Engineer, slurry may be used in salt water, and the allowable densities may be increased up to 32 kg/m ³ . Slurry temperature shall be at least 4 degrees Celsius when tested.		

Any caked slurry on the sides or bottom of hole shall be removed before placing reinforcement. If concrete is not placed immediately after placing reinforcement, the reinforcement shall be removed and cleaned of slurry, the sides of the drilled hole cleaned of caked slurry, and the reinforcement again placed in the hole for concrete placement.

Synthetic Slurry

Synthetic slurries shall be used in conformance with the manufacturer’s recommendations and these special provisions. The following synthetic slurries may be used:

PRODUCT	MANUFACTURER
SlurryPro EXL	KB Technologies Ltd. 3648 FM 1960 West Suite 107 Houston, TX 77068 (800) 525-5237
Super Mud	PDS Company c/o Champion Equipment Company 8140 East Rosecrans Ave. Paramount, CA 90723 (562) 634-8180
Shore Pac GCV	CETCO Drilling Products Group 1350 West Shure Drive Arlington Heights, IL 60004 (847) 392-5800

Inclusion of a synthetic slurry on the above list may be obtained by meeting the Department's requirements for synthetic slurries. The requirements can be obtained from the Office of Structure Design, P.O. Box 942874, Sacramento, CA 94274-0001.

Synthetic slurries listed may not be appropriate for a given site.

Synthetic slurries shall not be used in holes drilled in primarily soft or very soft cohesive soils as determined by the Engineer.

A manufacturer's representative, as approved by the Engineer, shall provide technical assistance for the use of their product, shall be at the site prior to introduction of the synthetic slurry into a drilled hole, and shall remain at the site until released by the Engineer.

Synthetic slurries shall be sampled and tested at both mid-height and near the bottom of the drilled hole. Samples shall be taken and tested during drilling as necessary to verify the control of the properties of the slurry. Samples shall be taken and tested when drilling is complete, but prior to final cleaning of the bottom of the hole. When samples are in conformance with the requirements shown in the following tables for each slurry product, the bottom of the hole shall be cleaned and any loose or settled material removed. Samples shall be obtained and tested after final cleaning and immediately prior to placing concrete.

SlurryPro CDP synthetic slurries shall be tested for conformance to the requirements shown in the following table:

SLURRYPRO CDP KB Technologies Ltd.		
PROPERTY	REQUIREMENT	TEST
Density (kg/m ³) - during drilling - prior to final cleaning - just prior to placing concrete	less than or equal to 1075* less than or equal to 1025*	Mud Weight (Density) API 13B-1 Section 1
Viscosity (seconds/liter) - during drilling -prior to final cleaning - just prior to placing concrete	53 to 127 less than or equal to 74	Marsh Funnel and Cup API 13B-1 Section 2.2
pH	6 to 11.5	Glass Electrode pH Meter or pH Paper
Sand Content (percent) - prior to final cleaning - just prior to placing concrete	less than or equal to 0.5	Sand API 13B-1 Section 5
*When approved by the Engineer, slurry may be used in salt water, and the allowable densities may be increased up to 32 kg/m ³ . Slurry temperature shall be at least 4 degrees Celsius when tested.		

Super Mud synthetic slurries shall be tested for conformance to the requirements shown in the following table:

SUPER MUD PDS Company		
PROPERTY	REQUIREMENT	TEST
Density (kg/m ³) - prior to final cleaning - just prior to placing concrete	less than or equal to 1025*	Mud Weight (Density) API 13B-1 Section 1
Viscosity (seconds/liter) - during drilling - prior to final cleaning - just prior to placing concrete	34 to 64 less than or equal to 64	Marsh Funnel and Cup API 13B-1 Section 2.2
pH	8 to 10.0	Glass Electrode pH Meter or pH Paper
Sand Content (percent) - prior to final cleaning -just prior to placing concrete	less than or equal to 0.5	Sand API 13B-1 Section 5
*When approved by the Engineer, slurry may be used in salt water, and the allowable densities may be increased up to 32 kg/m ³ . Slurry temperature shall be at least 4 degrees Celsius when tested.		

Shore Pac GCV synthetic slurries shall be tested for conformance to the requirements shown in the following table:

Shore Pac GCV CETCO Drilling Products Group		
PROPERTY	REQUIREMENT	TEST
Density (kg/m ³) - prior to final cleaning - just prior to placing concrete	less than or equal to 1025*	Mud Weight (Density) API 13B-1 Section 1
Viscosity (seconds/liter) - during drilling - prior to final cleaning - just prior to placing concrete	35 to 78 less than or equal to 60	Marsh Funnel and Cup API 13B-1 Section 2.2
pH	8.0 to 11.0	Glass Electrode pH Meter or pH Paper
Sand Content (percent) - prior to final cleaning -just prior to placing concrete	less than or equal to 0.5	Sand API 13B-1 Section 5
*When approved by the Engineer, slurry may be used in salt water, and the allowable densities may be increased up to 32 kg/m ³ . Slurry temperature shall be at least 4 degrees Celsius when tested.		

Water Slurry

At the option of the Contractor water may be used as slurry when casing is used for the entire length of the drilled hole. Water slurry shall be tested for conformance to the requirements shown in the following table:

WATER SLURRY		
PROPERTY	REQUIREMENT	TEST
Density (kg/m ³) - prior to final cleaning - just prior to placing concrete	1017 *	Mud Weight (Density) API 13B-1 Section 1
Sand Content (percent) - prior to final cleaning -just prior to placing concrete	less than or equal to 0.5	Sand API 13B-1 Section 5
*When approved by the Engineer, salt water slurry may be used.		

and the allowable densities may be increased up to 32 kg/m³.

Construction

The Contractor shall submit a placing plan to the Engineer for approval prior to producing the test batch for cast-in-drilled-hole concrete piling and at least 10 working days prior to constructing piling. The plan shall include complete descriptions, details, and supporting calculations as listed below:

- A. Requirements for all cast-in-drilled hole concrete piling:
 - 1. Concrete mix design, certified test data, and trial batch reports.
 - 2. Drilling or coring methods and equipment.
 - 3. Proposed method for casing installation and removal when necessary.
 - 4. Plan view drawing of pile showing reinforcement and inspection pipes, if required.
 - 5. Methods for placing, positioning, and supporting bar reinforcement.
 - 6. Methods and equipment for accurately determining the depth of concrete and actual and theoretical volume placed, including effects on volume of concrete when any casings are withdrawn.
 - 7. Methods and equipment for verifying that the bottom of the drilled hole is clean prior to placing concrete.
 - 8. Methods and equipment for preventing upward movement of reinforcement, including the Contractor's means of detecting and measuring upward movement during concrete placement operations.

- B. Additional requirements when concrete is placed under slurry:
 - 1. Concrete batching, delivery, and placing systems, including time schedules and capacities therefor. Time schedules shall include the time required for each concrete placing operation at each pile.
 - 2. Concrete placing rate calculations. When requested by the Engineer, calculations shall be based on the initial pump pressures or static head on the concrete and losses throughout the placing system, including anticipated head of slurry and concrete to be displaced.
 - 3. Suppliers' test reports on the physical and chemical properties of the slurry and any proposed slurry chemical additives, including Material Safety Data Sheet.
 - 4. Slurry testing equipment and procedures.
 - 5. Methods of removal and disposal of excavation, slurry, and contaminated concrete, including removal rates.
 - 6. Methods and equipment for slurry agitating, recirculating, and cleaning.

In addition to compressive strength requirements, the consistency of the concrete to be deposited under slurry shall be verified before use by producing a test batch. The test batch shall be produced and delivered to the project under conditions and in time periods similar to those expected during the placement of concrete in the piles. Concrete for the test batch shall be placed in an excavated hole or suitable container of adequate size to allow for testing as specified herein. Depositing of test batch concrete under slurry will not be required. In addition to meeting the specified nominal penetration, the test batch shall meet the following requirements:

- A. For piles where the time required for each concrete placing operation, as submitted in the placing plan, will be 2 hours or less, the test batch shall demonstrate that the proposed concrete mix design achieves either a penetration of at least 50 mm or a slump of at least 125 mm after twice that time has elapsed.
- B. For piles where the time required for each concrete placing operation, as submitted in the placing plan, will be more than 2 hours, the test batch shall demonstrate that the proposed concrete mix design achieves either a penetration of at least 50 mm or a slump of at least 125 mm after that time plus 2 hours has elapsed.

The time period shall begin at the start of placement. The concrete shall not be vibrated or agitated during the test period. Penetration tests shall be performed in conformance with the requirements in California Test 533. Slump tests shall be performed in conformance with the requirements in ASTM Designation: C 143. Upon completion of testing, the concrete shall be disposed of in conformance with the provisions in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications.

The concrete deposited under slurry shall be carefully placed in a compact, monolithic mass and by a method that will prevent washing of the concrete. Concrete deposited under slurry need not be vibrated. Placing concrete shall be a continuous operation lasting not more than the time required for each concrete placing operation at each pile, as submitted in the placing plan, unless otherwise approved in writing by the Engineer. The concrete shall be placed with concrete pumps

and delivery tube system of adequate number and size to complete the placing of concrete in the time specified. The delivery tube system shall consist of one of the following:

- A. A tremie tube or tubes, each of which are at least 250 mm in diameter, fed by one or more concrete pumps.
- B. One or more concrete pump tubes, each fed by a single concrete pump.

The delivery tube system shall consist of watertight tubes with sufficient rigidity to keep the ends always in the mass of concrete placed. If only one delivery tube is utilized to place the concrete, the tube shall be placed near the center of the drilled hole. Multiple tubes shall be uniformly spaced in the hole. Internal bracing for the steel reinforcing cage shall accommodate the delivery tube system. Tremies shall not be used for piles without space for a 250-mm tube.

Spillage of concrete into the slurry during concrete placing operations shall not be allowed. Delivery tubes shall be capped with a watertight cap, or plugged above the slurry level with a good quality, tight fitting, moving plug that will expel the slurry from the tube as the tube is charged with concrete. The cap or plug shall be designed to be released as the tube is charged. The pump discharge or tremie tube shall extend to the bottom of the hole before charging the tube with concrete. After charging the delivery tube system with concrete, the flow of concrete through a tube shall be induced by slightly raising the discharge end. During concrete placement, the tip of the delivery tube shall be maintained as follows to prevent reentry of the slurry into the tube. Until at least 3 m of concrete has been placed, the tip of the delivery tube shall be within 150 mm of the bottom of the drilled hole, and then the embedment of the tip shall be maintained at least 3 m below the top surface of the concrete. Rapid raising or lowering of the delivery tube shall not be permitted. If the seal is lost or the delivery tube becomes plugged and must be removed, the tube shall be withdrawn, the tube cleaned, the tip of the tube capped to prevent entrance of the slurry, and the operation restarted by pushing the capped tube 3 m into the concrete and then reinitiating the flow of concrete.

When slurry is used, a fully operational standby concrete pump, adequate to complete the work in the time specified, shall be provided at the site during concrete placement. The slurry level shall be maintained within 300 mm of the top of the drilled hole.

A log of concrete placement for each drilled hole shall be maintained by the Contractor when concrete is deposited under slurry. The log shall show the pile location, tip elevation, dates of excavation and concrete placement, total quantity of concrete deposited, length and tip elevation of any casing, and details of any hole stabilization method and materials used. The log shall include a 215 mm x 280 mm sized graph of the concrete placed versus depth of hole filled. The graph shall be plotted continuously throughout placing of concrete. The depth of drilled hole filled shall be plotted vertically with the pile tip oriented at the bottom and the quantity of concrete shall be plotted horizontally. Readings shall be made at least at each 1.5 m of pile depth, and the time of the reading shall be indicated. The graph shall be labeled with the pile location, tip elevation, cutoff elevation, and the dates of excavation and concrete placement. The log shall be delivered to the Engineer within one working day of completion of placing concrete in the pile.

After placing reinforcement and prior to placing concrete in the drilled hole, if drill cuttings settle out of the slurry, the bottom of the drilled hole shall be cleaned. The Contractor shall verify that the bottom of the drilled hole is clean.

If temporary casing is used, concrete placed under slurry shall be maintained at a level at least 1.5 m above the bottom of the casing. The withdrawal of casings shall not cause contamination of the concrete with slurry.

Material resulting from using slurry shall be disposed of in conformance with the provisions in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications.

Acceptance Testing and Mitigation

Vertical inspection pipes for acceptance testing shall be provided in all cast-in-drilled-hole concrete piles that are 600 mm in diameter or larger, except when the holes are dry or when the holes are dewatered without the use of temporary casing to control ground water.

Inspection pipes shall be Schedule 40 polyvinyl chloride pipes with a nominal inside diameter of 50 mm. Each inspection pipe shall be capped top and bottom and shall have watertight couplers to provide a clean, dry and unobstructed 50-mm diameter clear opening from 1.0 m above the pile cutoff down to the bottom of the reinforcing cage.

Inspection pipes shall be placed around the pile, inside the outermost spiral or hoop reinforcement, and 75 mm clear of the vertical reinforcement, at a uniform spacing not exceeding 840 mm measured along the circle passing through the centers of inspection pipes. A minimum of 2 inspection pipes per pile shall be used. When the vertical reinforcement is not bundled and each bar is not more than 26 mm in diameter, inspection pipes may be placed 50 mm clear of the vertical reinforcement. The inspection pipes shall be placed to provide the maximum diameter circle that passes through the centers of the inspection pipes while maintaining the clear spacing required herein. The pipes shall be installed in straight alignment, parallel to the main reinforcement, and securely fastened in place to prevent misalignment during installation of the reinforcement and placing of concrete in the hole.

The Contractor shall log the location of the inspection pipe couplers with respect to the plane of pile cut off, and these logs shall be delivered to the Engineer upon completion of the placement of concrete in the drilled hole.

After placing concrete and before requesting acceptance tests, each inspection pipe shall be tested by the Contractor in the presence of the Engineer by passing a 48.3-mm diameter rigid cylinder 610 mm long through the complete length of pipe. If the 48.3-mm diameter rigid cylinder fails to pass any of the inspection pipes, the Contractor shall attempt to pass a 32.0-mm diameter rigid cylinder 1.375 m long through the complete length of those pipes in the presence of the Engineer. If an inspection pipe fails to pass the 32.0-mm diameter cylinder, the Contractor shall immediately fill all inspection pipes in the pile with water.

The Contractor shall replace each inspection pipe that does not pass the 32.0-mm diameter cylinder with a 50.8-mm diameter hole cored through the concrete for the entire length of the pile. Cored holes shall be located as close as possible to the inspection pipes they are replacing and shall be no more than 150 mm inside the reinforcement. Coring shall not damage the pile reinforcement. Cored holes shall be made with a double wall core barrel system utilizing a split tube type inner barrel. Coring with a solid type inner barrel will not be allowed. Coring methods and equipment shall provide intact cores for the entire length of the pile concrete. The coring operation shall be logged by an Engineering Geologist or Civil Engineer licensed in the State of California and experienced in core logging. Coring logs shall include complete descriptions of inclusions and voids encountered during coring, and shall be delivered to the Engineer upon completion. Concrete cores shall be preserved, identified with the exact location the core was recovered from within the pile, and made available for inspection by the Engineer.

Acceptance tests of the concrete will be made by the Engineer, without cost to the Contractor. Acceptance tests will evaluate the homogeneity of the placed concrete. Tests will include gamma-gamma logging. Tests may also include crosshole sonic logging and other means of inspection selected by the Engineer. The Contractor shall not conduct operations within 8.0 m of the gamma-gamma logging operations. The Contractor shall separate reinforcing steel as necessary to allow the Engineer access to the inspection pipes to perform gamma-gamma logging or other acceptance testing. After requesting acceptance tests and providing access to the piling, the Contractor shall allow 3 weeks for the Engineer to conduct these tests and make determination of acceptance if the 48.3-mm diameter cylinder passed all inspection pipes, and 4 weeks if only the 32.0-mm diameter cylinder passed all inspection pipes. Should the Engineer fail to complete these tests within the time allowance, and if in the opinion of the Engineer, the Contractor's controlling operation is delayed or interfered with by reason of the delay in inspection, the delay will be considered a right of way delay as specified in Section 8-1.09, "Right of Way Delays," of the Standard Specifications.

All inspection pipes and cored holes in a pile shall be dewatered and filled with grout after notification by the Engineer that the pile is acceptable. Placement and removal of water in the inspection pipes shall be at the Contractor's expense. Grout shall conform to the provisions in Section 50-1.09, "Bonding and Grouting," of the Standard Specifications. The inspection pipes and holes shall be filled using grout tubes that extend to the bottom of the pipe or hole or into the grout already placed.

If acceptance testing performed by the Engineer determines that a pile does not meet the requirements of the specifications, then that pile will be rejected and all depositing of concrete under slurry or concrete placed using temporary casing for the purpose of controlling groundwater shall be suspended until written changes to the methods of pile construction are approved in writing by the Engineer.

The Contractor shall submit to the Engineer for approval a mitigation plan for repair, supplementation, or replacement for each rejected cast-in-drilled-hole concrete pile, and this plan shall conform to the provisions in Section 5-1.02, "Plans and Working Drawings," of the Standard Specifications. Prior to submitting this mitigation plan, the Engineer will hold a repair feasibility meeting with the Contractor to discuss the feasibility of repairing rejected piling. The Engineer will consider the size of the defect, the location of the defect, and the design information and corrosion protection considerations for the pile. This information will be made available to the Contractor, if appropriate, for the development of the mitigation plan. If the Engineer determines that it is not feasible to repair the rejected pile, the Contractor shall not include repair as a means of mitigation and shall proceed with the submittal of a mitigation plan for replacement or supplementation of the rejected pile.

If the Engineer determines that a rejected pile does not require mitigation due to structural, geotechnical, or corrosion concerns, the Contractor may elect to 1) repair the pile per the approved mitigation plan, or 2) not repair anomalies found during acceptance testing of that pile. For such unrepaired piles, the Contractor shall pay to the State, \$400 per cubic meter for the portion of the pile affected by the anomalies. The volume, in cubic meters, of the portion of the pile affected by the anomalies, shall be calculated as the area of the cross-section of the pile affected by each anomaly, in square meters, as determined by the Engineer, multiplied by the distance, in meters, from the top of each anomaly to the specified tip of the pile. If the volume calculated for one anomaly overlaps the volume calculated for additional anomalies within the pile, the calculated volume for the overlap shall only be counted once. In no case shall the amount of the payment to the State for any such pile be less than \$400. The Department may deduct the amount from any moneys due, or that may become due the Contractor under the contract.

Pile mitigation plans shall include the following:

- A. The designation and location of the pile addressed by the mitigation plan.
- B. A review of the structural, geotechnical, and corrosion design requirements of the rejected pile.
- C. A step by step description of the mitigation work to be performed, including drawings if necessary.
- D. An assessment of how the proposed mitigation work will address the structural, geotechnical, and corrosion design requirements of the rejected pile.
- E. Methods for preservation or restoration of existing earthen materials.
- F. A list of affected facilities, if any, with methods and equipment for protection of these facilities during mitigation.
- G. The State assigned contract number, bridge number, full name of the structure as shown on the contract plans, District-County-Route-Kilometer Post, and the Contractor's (and Subcontractor's if applicable) name on each sheet.
- H. A list of materials, with quantity estimates, and personnel, with qualifications, to be used to perform the mitigation work.
- I. The seal and signature of an engineer who is licensed as a Civil Engineer by the State of California.

For rejected piles to be repaired, the Contractor shall submit a pile mitigation plan that contains the following additional information:

- A. An assessment of the nature and size of the anomalies in the rejected pile.
- B. Provisions for access for additional pile testing if required by the Engineer.

For rejected piles to be replaced or supplemented, the Contractor shall submit a pile mitigation plan that contains the following additional information:

- A. The proposed location and size of additional piling.
- B. Structural details and calculations for any modification to the structure to accommodate the replacement or supplemental piling.

All provisions for cast-in-drilled-hole concrete piling shall apply to replacement piling.

The Contractor shall allow the Engineer 3 weeks to review the mitigation plan after a complete submittal has been received.

Should the Engineer fail to review the complete pile mitigation submittal within the time specified, and if, in the opinion of the Engineer, the Contractor's controlling operation is delayed or interfered with by reason of the delay in reviewing the pile mitigation plan, an extension of time commensurate with the delay in completion of the work thus caused will be granted in conformance with the provisions in Section 8-1.09, "Right of Way Delays," of the Standard Specifications.

When repairs are performed, the Contractor shall submit a mitigation report to the Engineer within 10 days of completion of the repair. This report shall state exactly what repair work was performed and quantify the success of the repairs relative to the submitted mitigation plan. The mitigation report shall be stamped and signed by an engineer that is licensed as a Civil Engineer by the State of California. The mitigation report shall show the State assigned contract number, bridge number, full name of the structure as shown on the contract plans, District-County-Route-Kilometer Post, and the Contractor (and Subcontractor if applicable) name on each sheet. The Engineer will be the sole judge as to whether a mitigation proposal is acceptable, the mitigation efforts are successful, and to whether additional repairs, removal and replacement, or construction of a supplemental foundation is required.

MEASUREMENT AND PAYMENT (PILING)

Measurement and payment for the various types and classes of piles shall conform to the provisions in Sections 49-6.01, "Measurement," and 49-6.02, "Payment," of the Standard Specifications and these special provisions.

Full compensation for piling shall be considered as included in the contract price paid for signal and lighting and no separate payment will be made therefor.

10-1.19 ROADSIDE SIGNS

Roadside signs shall be installed at the locations shown on the plans or where designated by the Engineer and in conformance with the provisions in Section 56-2, "Roadside Signs," of the Standard Specifications and these special provisions.

Wood posts shall be pressure treated after fabrication in conformance with the provisions in Section 58, "Preservative Treatment of Lumber, Timber and Piling," of the Standard Specifications with creosote, creosote coal tar solution, creosote petroleum solution (50-50), pentachlorophenol in hydrocarbon solvent, copper naphthenate, ammoniacal copper arsenate, or ammoniacal copper zinc arsenate. In addition to the preservatives listed above, Southern yellow pine may also be pressure

treated with chromated copper arsenate. When other than one of the creosote processes is used, blocks shall have a minimum retention of 6.4 kg/m^3 , and need not be incised.

10-1.20 MISCELLANEOUS CONCRETE CONSTRUCTION

Minor concrete (curb) and minor concrete (stamped concrete) shall conform to the provisions in Section 73, "Concrete Curbs and Sidewalks," of the Standard Specifications and these special provisions.

Aggregate for minor concrete (stamped concrete) and minor concrete (curb) shall conform to the grading specified for fine aggregate in Section 90-3.03, "Fine Aggregate Grading," of the Standard

A sample of the colors specified for stamped concrete is available for review by prospective bidders at the Office of Landscape Architecture of the Department of Transportation District 7, 120 South Spring Street, 4th floor, Los Angeles, California. Portland cement concrete closely conforming to the color specified for stamped concrete is available through commercial concrete sources. A sample of sufficient size, of the type and color of the stamped concrete, to demonstrate the stamped concrete, including color hardener, curing and finishing compounds, shall be submitted to the Engineer for written approval.

Stamped concrete shall not be placed on the project prior to approval by the Engineer of the samples prepared and submitted by the Contractor. In the event more than one sample of stamped concrete to be placed is required by the Engineer, each additional sample will be paid for as extra work as provided in Section 4-1.03D of the Standard Specifications.

Welded wire fabric, of the size and type shown on the plans and conforming to the provisions in Section 52, "Reinforcement," of the Standard Specifications, shall be placed in the stamped paving areas as shown on the plans.

The respective pattern type and color of concrete for stamped concrete shall be an architectural cobblestone texture simulating the appearance of cobblestones placed at the locations shown on the plans, struck off and compacted until a layer of mortar is brought to the surface. The concrete shall be screeded to the required grade and cross section and floated to a uniform surface. Stamped concrete shall not have secondary patterns imparted by shadows or repetitive surfaces. The stamped concrete shall simulate a cobblestone relief constructed to the dimensions and shapes shown on the plans.

Floor color hardener shall be applied to the plastic surface of the concrete by the "dry-shake" method using a minimum of 30 kg of hardener per 10 m^2 . Hardener shall be applied in 2 applications, shall be wood-floated after each application, and shall be trowelled only after the final floating. The resultant color of the floor hardener shall closely conform to the colors specified on the plans for the respective areas.

The forming tools for the stamped concrete shall be applied to form the patterned surfaces while the concrete is still in the plastic stage of set.

Stamped concrete areas shall be cured by the curing compound method. The curing compound shall be curing compound (6) conforming to the provisions in Section 90-7.01B, "Curing Compound Method," of the Standard Specifications.

For payment purposes, the area in square meters of minor concrete (stamped concrete) will be determined from horizontal measurements of the finished stamped concrete.

The contract price paid per square meter for minor concrete (stamped concrete) shall include full compensation for furnishing all labor, materials (including welded wire fabric, where required), tools, equipment, and incidentals, and for doing all the work involved in minor concrete (stamped concrete) with cobblestone texture complete in place, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

10-1.21 THERMOPLASTIC TRAFFIC STRIPE AND PAVEMENT MARKING

Thermoplastic traffic stripes (traffic lines) and pavement markings shall be applied in conformance with the provisions in Section 84, "Traffic Stripes and Pavement Markings," of the Standard Specifications and these special provisions.

Thermoplastic material shall be free of lead and chromium, and shall conform to the requirements in State Specification PTH-02ALKYD.

Retroreflectivity of the thermoplastic traffic stripes and pavement markings shall conform to the requirements in ASTM Designation: D 6359-99. White thermoplastic traffic stripes and pavement markings shall have a minimum initial retroreflectivity of $250 \text{ mcd}\cdot\text{m}^{-2}\cdot\text{lx}^{-1}$. Yellow thermoplastic traffic stripes and pavement markings shall have a minimum initial retroreflectivity of $150 \text{ mcd}\cdot\text{m}^{-2}\cdot\text{lx}^{-1}$.

Where striping joins existing striping, as shown on the plans, the Contractor shall begin and end the transition from the existing striping pattern into or from the new striping pattern a sufficient distance to ensure continuity of the striping pattern.

Thermoplastic traffic stripes shall be applied at the minimum thickness and application rate as specified below. The minimum application rate is based on a solid stripe of 100 mm in width.

Minimum Stripe Thickness (mm)	Minimum Application Rate (kg/m)
2.0	0.4

Thermoplastic traffic stripes and pavement markings shall be free of runs, bubbles, craters, drag marks, stretch marks, and debris.

At the option of the Contractor, permanent traffic striping and pavement marking tape conforming to the provisions in "Prequalified and Tested Signing and Delineation Materials" of these special provisions may be placed instead of the thermoplastic traffic stripes and pavement markings specified herein. Permanent tape, if used, shall be installed in conformance with the manufacturer's specifications.

If permanent tape is placed instead of thermoplastic traffic stripes and pavement markings, the tape will be measured and paid for by the meter as thermoplastic traffic stripe and by the square meter as thermoplastic pavement marking.

10-1.22 PAVEMENT MARKERS

Pavement markers shall be placed in conformance with the provisions in Section 85, "Pavement Markers," of the Standard Specifications and these special provisions.

The Contractor shall furnish the Engineer certificates of compliance for the pavement markers in conformance with the provisions in Section 6-1.07, "Certificates of Compliance" of the Standard Specifications.

Retroreflective pavement markers shall be marked as abrasion resistant on the body of the markers.

SECTION 10-2. (BLANK)

SECTION 10-3. SIGNALS, LIGHTING AND ELECTRICAL SYSTEMS

10-3.01 DESCRIPTION

Traffic signals, flashing beacons, lighting and smart pedestrian systems shall conform to the provisions in Section 86, "Signals, Lighting and Electrical Systems," of the Standard Specifications and these special provisions.

Smart pedestrian system work shall be performed at the following locations:

- A. Route 1 at Ronan Avenue
- B. Route 1 at Broad Avenue

10-3.02 COST BREAK-DOWN

Cost break-downs shall conform to the provisions in Section 86-1.03, "Cost Break-Down," of the Standard Specifications and these special provisions.

The Engineer shall be furnished a cost break-down for each contract lump sum item of work described in this Section 10-3.

The cost break-down shall be submitted to the Engineer for approval within 15 days after the contract has been approved. The cost break-down shall be approved, in writing, by the Engineer before any partial payment for the items of electrical work will be made.

10-3.03 EQUIPMENT LIST AND DRAWINGS

A maintenance manual shall be furnished for all installed controller units, video detection cameras, video image processor and auxiliary equipment. The maintenance manual and operation manual may be combined into one manual. The maintenance manual or combined maintenance and operation manual shall be submitted at the time the controllers are delivered for testing or, if ordered by the Engineer, prior to purchase. The maintenance manual shall include, but need not be limited to, the following items:

- A. Specifications
- B. Design characteristics
- C. General operation theory
- D. Function of all controls
- E. Trouble shooting procedure (diagnostic routine)
- F. Block circuit diagram
- G. Geographical layout of components

- H. Schematic diagrams
- H. List of replaceable component parts with stock numbers

FIELD CABINETS

Each field cabinet which is connected to the smart pedestrian system shall be supplied with the following documentation, as it relates to this project, stored in a re-sealable water resistant folder mounted on the inside of the field cabinet door:

VIDEO DETECTION CAMERA

- A copy of the video channel assignment table
- A copy of the video cable assignment tables
- A copy of the system schematic diagrams
- A copy of the element reference table

10-3.04 MAINTAINING EXISTING AND TEMPORARY ELECTRICAL SYSTEMS

The Contractor shall obtain written approval from the Engineer, 72 hours prior to any testing or disruption of service from the existing lighting system.

10-3.05 FOUNDATIONS

Reinforced cast-in-drilled-hole concrete pile foundations for traffic signal and lighting standards shall conform to the provisions in "Piling" of these special provisions.

Copper Ground Rods shall be installed in all controller foundations and all service pull boxes. For a post-top mounted controller cabinet on existing or new F-8 foundation, a 2.44 m by 12.7 mm diameter ground rod shall be installed in the controller pull box. For a Model 170 or Model 2070 controller in a Type 332 cabinet on F-332 foundation, a 2.44 m by 12.7 mm diameter ground rod shall be installed in the foundation.

10-3.06 STANDARDS, STEEL PEDESTALS AND POSTS

Standards, steel pedestals and posts for traffic signal and lighting standards shall conform to the provisions in "Steel Structures" of these special provisions.

Where the plans refer to the side tenon detail at the end of the signal mast arm, the applicable tip tenon detail may be substituted.

The sign mounting hardware shall be installed at the locations shown on the plans.

The sign panels will be State-furnished in conformance with the provisions in "Materials" of these special provisions.

Mast arm mounted street name signs shall be installed on signal mast arms at the locations shown on the plans. The street name signs and mounting hardware (except straps, seals and saddle brackets) will be State-furnished in conformance with the provisions in "Materials" of these special provisions. The State-furnished hanger assembly will be similar to that shown for internally illuminated street name signs. The mounting hardware and sign shall be assembled. The assembly shall be attached to the mast arm using a 19 mm x 0.53 mm stainless steel strap in a manner similar to the strap and saddle bracket method shown on the plans. The band shall be wrapped at least twice around the mast arm, tightened, and secured with a stainless strap seal in the same manner shown for strap and saddle bracket sign mounting. Straps, seals and saddle brackets shall be furnished by the Contractor. The sign panel shall be leveled and hardware securely tightened.

Type 1 standards shall conform to the requirements in LADOT Standard Drawing No. S-51.1.3A as shown on the plan.

All ferrous metal parts of tubular sign structures shall be galvanized and shall not be painted.

10-3.07 CONDUIT

All conduit to be installed underground shall be Type 1.

When a standard coupling cannot be used for joining Type 1 conduit, a UL listed threaded union coupling conforming to the provisions in Section 86-2.05C, "Installation," of the Standard Specifications shall be used.

After conductors have been installed, the ends of conduits terminating in pull boxes, service equipment enclosures, and controller cabinets shall be sealed with an approved type of sealing compound.

At those locations where conduit is required to be installed under pavement and existing underground facilities require special precautions in conformance with the provisions in "Obstructions" of these special provisions, conduit shall be placed by the "Trenching in Pavement Method" in conformance with the provisions in Section 86-2.05C, "Installation," of the Standard Specifications.

The Contractor shall verify horizontal and vertical alignments of existing utilities prior to installation of conduits.

Traffic signal conduits shall be separated from street lighting conduits. New conduit runs shall be of the same size and material throughout the run. Empty conduit (conduit only) shall include a 6.35 mm diameter polyethylene pull rope.

All cross street conduit runs and all interconnect conduit runs between intersections- shall be 78 mm in diameter. 78 mm conduit shall be used between an F-8 foundation and the adjacent PB-3 pull box. Two 78 mm conduits are required between an F-332 foundation and the adjacent PB-3 pull box. 41 mm conduit shall be used between an F-7 foundation and the adjacent pull box. All other new conduit runs shall be 53 mm in diameter, unless otherwise specified on the plan.

10-3.08 PULL BOXES

Pull boxes shall be Type PB-2 and Type PB-3 as shown on the plan.

The tops of pull boxes installed in sidewalk areas shall be flush with the surrounding grade or the top of the adjacent curb. Where practical, pull boxes adjacent to standards shall be placed at a clearance of 0.9 m from the side of foundations. Pull boxes shall not be placed in curb ramp areas or driveways. Pull boxes shall be located beyond the door opening paths of traffic signal controllers. Unless physically impractical, pull boxes shall be installed at least 12.7 mm from any substructure or back of curb. This is to allow for rock under and cement around the pull box.

Type PB-3 pull boxes shall be used for:

- a. Interconnect runs
- b. Power service conduits
- c. Controllers
- d. Junctions with 4 or more conduits
- e. Junctions with 3 conduits, 2 of which are 78 mm in diameter

Type PB-2 pull boxes shall be installed at all other locations as shown on the plans.

Existing pull boxes are considered to be an integral part of the surrounding concrete sidewalk. Where the surrounding sidewalk surface is composed of a special material, pull boxes with covers of compatible material shall be used to obtain a homogeneous appearance of the sidewalk area. The Contractor shall be required to replace the pull box when modifying or replacing the surrounding concrete. Replacement of pull boxes shall conform to the requirements in the LADOT Standard Drawing No. S-78.5.1, or S-78.8 as shown on the plan. All pull boxes shall be new.

10-3.09 CONDUCTORS AND WIRING

Splices shall be insulated by "Method B".

Material

Conductors shall be solid copper of the gage shown on the plans, unless otherwise specified.

A 28-conductor (27 - No. 14 wires and 1 - No. 10 common wire) cable shall be installed in new cross street runs unless otherwise specified on the plans.

Conductor Splicing and Termination

All spliced solid field wires shall be twisted together and secured using vinyl, watertight, spring tensioned, silicone filled, direct burial, wire connectors. One meter of surplus signal wires shall be neatly coiled in a clockwise direction within each pull box.

All stranded wires shall be terminated with a terminal connector and properly compressed for minimum resistance at the attachment.

Where optimum operation of circuits requires minimum resistance, the connections and terminals shall be soldered.

The minimum insulation thickness, at any point, for Type USE, RHH or RHW wire shall be 1.0 mm for conductor sizes No. 14 to No. 10, inclusive, and 1.3 mm for No. 8 to No. 2, inclusive. The minimum insulation thickness, at any point, for Type THW and TW wires shall be 0.69 mm for conductor sizes No. 14 to No. 10, inclusive, 1.02 mm for No. 8, and 1.37 mm for No. 6 to No. 2, inclusive.

Identification

Each cable shall be identified in all communication cabinets by an aluminum tag 25 mm by 102 mm in size, stamped with the cable run identification characters in 12.7 mm letters and secured to the cable with two nylon tie-wrap devices.

Each cable shall be identified in all controller cabinets by a plastic tag 12.7 mm by 51 mm in size, stamped with the cable run identification characters in 6.35 mm letters and secured to the cable with two nylon tie-wrap devices.

Each conductor shall have clear, distinctive and permanent markings for identification and shall conform to the latest edition of Standard Specifications.

SIGNAL INTERCONNECT CABLE.

Signal Interconnect Cable (SIC) shall be the 12-pair type.

The signal interconnect cable with 12 pair No. 22 wires shall be run continuously from controller to controller without splices, unless splices are specifically authorized by the Engineer. Where splices are authorized by the Engineer. Splices shall be soldered and shall be secured using vinyl, water-tight, spring tensioned, silicone filled, direct burial wire connectors.

Multi-Pair Interconnect Cable

Filled telephone type cable shall consist of paired No. 22 AWG solid annealed copper conductors. The cable shall be polyethylene insulated and aluminum shielded, conforming to the construction requirements and environmental, mechanical, and electrical tests of the Rural Electrification Administration (R.E.A.) Specification PE-39 for filled telephone cable. The cable sizes shall be 12, 25, 50, and 75 pair. Cable splices can only be made at a communication cabinet or controller.

Telephone and Fire Alarm

Interconnect cable using telephone lines or former fire alarm lines shall be No. 14 AWG stranded twisted pair copper wire having 600-volt insulation and overall shield and jacket.

10-3.10 SMART PEDESTRIAN SYSTEM

DESCRIPTION

The smart pedestrian system is a video pedestrian detection system (VPDS), to detect the presence and movement of pedestrians in preset optical detection zones, which are superimposed on a standard EIA video image. The system shall interface with the traffic signal equipment, which shall act on the signal actuations.

The smart pedestrian system is activated by a pedestrian waiting in the video detection zone adjacent to the pedestrian crosswalk after which the beacons flash for a set period of time after the pedestrian leaves the detection area before automatically turning off. The smart pedestrian detector shall have a delay time of 5 seconds.

The minimum pedestrian crossing time shall be based on a walking rate of 1.22 meters per second.

GENERAL

The video pedestrian detection system shall consist of video detection cameras, video image processor in the traffic signal controller input file, all the necessary connectors and associated cables as shown on the plans and as specified in these special provisions.

Prototype equipment is not acceptable. All equipment shall be current standard production units and shall have been in production for a minimum of 6 months. Rebuilt or reconditioned equipment will not be allowed.

All equipment and instrumentation for installation of the smart pedestrian detection system will be from the Manufacture/Supplier and shall be installed in accordance with the Manufacture/Supplier's recommendations and instructions.

The Contractor shall arrange to have a technician, qualified to work on the smart pedestrian detection system equipment, from the Manufacture/Supplier, or his representative, present at the time the equipment is installed.

Special wiring in the Model 2070 controller assemblies with all necessary hardwares for the video detection system will be installed by the City of Los Angeles, Department of Transportation (LADOT). The Contractor shall cooperate with other support personnel for ongoing system work that may be in progress in the field during the term of this contract. The Engineer will advise the City of Los Angeles, Department of Transportation (LADOT) of the Contractor's scheduled work.

Arrangements have been made with the City of Los Angeles, Department of Transportation (LADOT), the video pedestrian detection system shall conform to the special provisions and requirements in the City of Los Angeles Purchase Specification No. 92-087-01, Revision 02, August 2001, a copy will be available to any prospective bidders at the City of Los Angeles, Department of Transportation (LADOT), Material Control located at 221 North Figueroa Street, Suite 500, Figueroa Plaza, telephone 213-580-5477, Los Angeles, California 90012-2601, to assist any prospective bidders to locate the Manufacturer/Supplier of video pedestrian detection system and to obtain the Manufacturer/Supplier of video pedestrian detection system, equipment fact sheets and price quotes.

VIDEO PEDESTRIAN DETECTOR

General

The VPDS shall consist of a video image processor that shall reside in the signal controller cabinet input file, two (2) remote cameras (one at each end of the crosswalk) with mounting hardware, all the necessary connectors and 150 meters of video/power cable. A remote keypad or device that shall interface with the video image processor to program detector parameters shall be provided with each system with a maximum number of six, dependent on the purchase order.

All video detection programming and processing shall reside in the video image processor. The video image processor input shall be compatible with any NTSC composite video camera signal (refer to video image processor section below).

Cameras

The cameras shall be NTSC, black and white composite video compliant. The video output level shall be 1 V p-p into 75 ohms, unbalanced output. The image pick-up element shall be a 12.7 mm format interline transfer CCD image sensor.

The lens shall have a focal length of 3.6 mm at F1.6 and be of the auto iris type. The camera sensitivity shall be 0.1 Lux to 60,000 Lux.

The cameras shall be of one-piece construction with an integral sun shield. The sun shield shall prevent the direct rays of the sun from heating the camera body and reduce the incidents of lens flare caused by bright sources of light.

The camera body shall be weatherproof and dust tight. The body shall incorporate an optical glass view port and UV filter. The view port shall be resistant to crazing and be scratch proof.

All electrical cables shall be made of weatherproof and UV stabilized material. Their connections to all components of the VPDS shall be weather and dust tight.

A galvanized steel pedestrian camera utility enclosure shall be available with each image sensor for installation on the lighting standard where shown in the plans. The nominal dimensions of the pedestrian camera utility enclosure shall be 254 mm (H) x 114 mm (W) x 76 mm (D).

The pedestrian camera utility enclosure shall be securely mounted on the lighting standard using stainless steel straps. The mounting hardware or method shall not impede the operation of the door. The connections shall be weather tight grommets. The pedestrian camera utility enclosure shall be mounted on the side of the pole away from freeway traffic.

Video Image Processor

The system software shall be able to detect the presence and the crossing of pedestrians over programmed optical detection zones, which are superimposed upon a standard EIA video image. The video image processor shall install in a standard Model 332-/337 traffic signal controller input file and shall not occupy more than two adjacent input slots.

The video image processor back plane shall interface to the input file and derive its input power (24 VDC), receive the two video camera input signals and provide two optically isolated call output signals to the traffic signal controller.

The video image processor front panel shall provide input and output status indicators, switches and I/O connections to monitor the video signals and to provide keypad and/or laptop communication interface.

The user shall be able to define a minimum of seven detection zones per each camera video image, on screen by use of an external monitor in conjunction with a programming keypad or laptop. The zones, their logic features and characteristics shall be configured internally in the video image processor through software and not using external relays or matrix circuitry. Each zone can be programmed with the following characteristics:

- Size and shape
- Direction sensitivity
- Presence or pulse
- Time delay.

Each zone in an image can be combined with the other zone outputs to form an AND, OR, or NOT OR logic output.

Each detection zone shall have an auto adaptive sensitivity system and no adjustments are needed. Each detection zone shall be able to detect the presence of pedestrians during day and night periods. Based on proper camera position and sensitivity, the minimum accuracy during normal conditions shall be 98 percent and 96 percent during adverse (fog, rain, snow, sleet, etc.) conditions.

Programming and Software

A front panel service port (DB9-RS232) shall be provided to link the video image processor to accomplish all programming and setup with a keypad and optionally but not exclusively with a laptop computer.

The program shall be menu driven and the detection configuration parameters stored in nonvolatile memory. It shall be possible to upload and download these parameters via laptop for archiving and for printing hard copies. Batteries shall not be used for maintaining program information in memory.

Software updates shall be made available subsequent to purchase at no extra cost.

Electrical

The video image processor shall derive its power from the cabinet input file 24 VDC supply. The video image processor shall operate at 24 VDC nominal \pm 4 VDC and tolerate 500 Mv ripple.

The video camera shall operate at 12 VDC \pm 10 percent. Power and video signals must be isolated in the connection system. It shall be possible to connect a standard NTSC monitor of 500 lines or greater to the system without risk of damage from the power supply voltage.

The VPDS shall include voltage surge protection to withstand high-repetition, high-energy transients and low-repetition, high-energy transients as stated in NEMA (National Electrical Manufacturers Association) Section 2.1.6, Standard TS-2, 1992.

Environmental

The VPDS shall be operate reliably between a temperature range of -40°C and +74°C at 0 percent to 95 percent relative humidity, non-condensing. The VPDS shall be designed to operate reliably in the adverse environment and be protected from moisture and dust incursion.

Hardware

All mounting hardware and enclosures shall be rust and corrosion resistant. Bolts, screws, pins, lugs, clips, etc., shall be made of type 302, 304 or 305 stainless steel.

Identification

The VPDS shall be marked with the manufacturers model, revision and serial numbers.

The VPDS shall be marked with the nominal operating voltage and power rating.

FCC Compliance

The VPDS shall meet Federal Communications Commission (FCC) Title 47, Subpart B, Section 15 regulations concerning the emission of electronic noise interference.

Documentation

Three sets of VPDS operation manuals including specifications, theory of operation, programming instructions, schematics and block diagrams shall be provided with each- contract.

Warranty

The manufacturer shall warrant the VPDS including associated hardware, to be free from defects and failure for a minimum of (2) two years from the date of installation.

Shipping expenses as part of the warranty shall be the responsibility of the manufacturer or supplier.

Samples

All bidders shall submit for approval by the Department of Transportation one VPDS as specified at the time of the bid opening and before a bid can be awarded.

SYSTEM TESTING

The system testing shall cover pre-installation testing, functional testing, sub-system testing, video detection testing, physical inspection, performance testing and final acceptance testing that is required to validate the operational performance of the video pedestrian detection system and described elsewhere in these special provisions. Records of all tests shall be delivered to the Engineer.

Test plan

The Contractor shall develop and submit within 20 working days to the Engineer an installation and test plan for approval, which details the method of installation and all testing for all material, equipment, and cables and the associated schedule of activities, based on these special provisions, plans, the manufacturer's recommended test procedures, and

industry standard practices. Three copies of the test plan shall be submitted to the Engineer for approval. The Engineer will review then approve or disapprove the plan within four weeks. If the Engineer rejects the test plan the Contractor shall submit a revised test plan within 10 working days for review and approval by the Engineer. No testing shall be performed until the Contractor's test plan has been approved by the Engineer. The tests shall demonstrate that the design and production of material and equipment meet the requirements of these special provisions and plans. All test results, including results of failed test or re-tests, shall be submitted and delivered to the Engineer and a copy placed with the equipment at the site. The Contractor shall provide or arrange all test equipment, labor and ancillary items required to perform the system testing.

The test plan shall include the following major test and acceptance categories. The Contractor shall notify the Engineer of his intent to proceed with functional and sub-system testing 48 hours prior to commencement of each test. Full environmental conditions shall be tested as part of the functional tests for field equipment. Sub-system testing and inspections shall include visual inspection for damaged in correct installation, adjustments and alignment, and measurement of parameters and operating conditions.

Pre-Installation Testing

Pre-installation testing shall include testing of all material, equipment and cable prior to delivery to the site. The tests shall either be conducted at the equipment manufacturer's premises or at a laboratory arranged by the Contractor.

All material, except test equipment and special tools, shall be bench tested in accordance with the following paragraphs, which include those items described elsewhere requiring pre-installation testing for each individual item where applicable.

All active equipment shall be connected to normal operating power, energized and subjected to normal operating conditions for a continuous period of time of not less than 48 hours.

Functional testing

Functional testing shall be performed by the manufacturer on all material prior to delivery to the site. The functional tests shall be performed in accordance with the approved test plan. All system function shall be tested to demonstrate that all circuits, cameras, and all equipment satisfies the functional requirements of these special provisions. This testing shall include subjective testing of the camera image. The Contractor shall provide all documents of all functional test results.

Any material or equipment which fails to meet the requirements of the contract shall be repaired or replaced and the test shall be repeated until satisfactory. All functional test results, including results of failed tests or re-tests, shall be submitted and delivered with all material and equipment delivered to the site.

Sub-system Testing

Sub-system testing shall encompass the testing of all material, equipment and cable after installation, but prior to final acceptance tests. These tests shall be done in accordance with the performance testing called elsewhere and under various individual items in these special provisions.

Equipment and hardware shall be installed in accordance with the plans and special provisions. All material, equipment and cable shall be tested after installation at the site. Sub-system testing and inspections shall include visual inspection for damaged or incorrect installation, adjustments and alignment, and measurement of parameters and operating conditions. The Contractor shall notify the Engineer of his intent to proceed with sub-system testing 48 hours prior to commencement of each test.

Installation documentation and test results shall be provided for all material, equipment and cable prior to commencement of acceptance tests. Installation documentation shall be in accordance with these special provisions and shall include the following as appropriate:

- Model, part number and serial number for all material and equipment.
- Test equipment model number, serial number, settings, and date of last calibration.
- All strap and switch settings.
- Record of all adjustments and levels.
- Alignment measurements.
- Identification of interconnections.
- All factory, laboratory and site test results.

Video Detection Testing

The video detection testing shall be conducted after the Contractor submits a test plan and receives approval from the Engineer, based on these special provisions, plans and the manufacture's recommended test procedures for the equipment involved. The video test set shall be approved by the Engineer.

A video detection shall include programmed optical detection zone. Video detection performance tests shall be performed only after the associated camera has been installed and tested. The Contractor shall perform all level adjustments and alignments required on the video imaging detection in order for it to operate in accordance with these special provisions. If any video imaging detection fails to meet the performance requirements, the Contractor shall take all steps necessary to restore the failed video imaging detection to the required performance.

Each video imaging detection in the system shall be tested for qualitative performance with its associated camera turned on and connected to a Model 2070 controller.

Physical inspection

The Contractor shall provide the document to prove delivery of all material, equipment, cable and documentation. If any material or documentation is outstanding or has been replaced under pre-acceptance warranty, a physical inspection and documentation shall be provided for the material. The physical inspection shall consist of inspecting installed material to ensure workmanship satisfies the specified requirements.

Full performance test

The full performance test shall be performed in accordance with a test plan developed by the Contractor and approved by the Engineer and shall be performed by the Manufacture/Supplier or by the Contractor on at least one unit of material selected at random.

Acceptance testing

The acceptance testing shall be conducted in accordance with the approved test plan. The acceptance testing shall include conducting acceptance tests and subsequent re-tests, and documentation of the test results. All material, equipment, and cable shall be installed, adjusted, and aligned. The Contractor shall notify the Engineer of his intent to proceed with the testing 48 hours prior to the commencement of each test. In the event that any aspect of the acceptance tests are determined by the Engineer to have failed, the Contractor shall cease all acceptance testing, determine the cause of the failure and make repairs to the satisfaction of the Engineer.

All acceptance test results shall be fully documented and such documentation provided as a condition of acceptance.

10-3.11 BONDING AND GROUNDING

Bonding and grounding shall conform to the provisions in Section 86-2.10, "Bonding and Grounding," of the Standard Specifications and these special provisions.

Bonding jumpers in standards with handholes and traffic pull box lid covers shall be attached by a UL listed lug using 4.5-mm diameter or larger brass or bronze bolts and shall run to the conduit or bonding wire in the adjacent pull box. The grounding jumper shall be visible after the standard has been installed and the mortar pad and cap have been placed on the foundation.

Standards without handholes shall have bonding accomplished by jumpers attached to UL listed ground clamps on each anchor bolt.

For slip base standards or slip base inserts, bonding shall be accomplished by jumpers attached to UL listed ground clamps on each anchor bolt, or a UL listed lug attached to the bottom slip base plate with a 4.5-mm diameter or larger brass or bronze bolt.

Equipment bonding and grounding conductors are required in conduits, except when the conduits contain combinations of loop lead-in cable, fiber optic cable, or signal interconnect cable. A No. 8 minimum, bare copper wire shall run continuously in circuits, except for series lighting circuits, where No. 6 bare copper wire shall run continuously. The bonding wire size shall be increased to match the circuit breaker size in conformance with the Code, or shall be as shown on the plans. Conduits to be installed for future conductors, may omit the copper wire.

Bonding of metallic conduits in metal pull boxes shall be by means of bonding bushings and bonding jumpers connected to the bonding wire running in the conduit system.

10-3.12 SERVICE

Service checks shall be made by measuring the service voltage at the live AC terminal before the main circuit breaker in the controller assembly.

The Contractor shall notify the Engineer if the voltage is measuring less than 110V(ac) and the resistance measuring more than 4 ohm.

A resistance measurement shall be made between the service neutral terminal and the chassis ground terminal.

60A fuse and the in-line waterproof fuse holder will be State-furnished in conformance with the provisions in "Materials" of these special provisions.

10-3.13 MODEL 2070 -CONTROLLER ASSEMBLIES

Model 2070 –controller assemblies shall conform to the requirements in Transportation Electrical Equipment Specifications (TEES) November 1999, shall be furnished by the Contractor.

The Engineer shall be notified when each Model 2070 controller is ready for the functional test. The functional test will be conducted by City of Los Angeles, Department of Transportation (LADOT). The completely assembled controller with cabinet and auxiliary equipment shall be delivered to the LADOT Traffic Signal Shop, Piper Technical Center, at 555 Ramirez Street, Los Angeles, CA 90012, telephone number (213) 847-2944, at least thirty (30) working days prior to being available to the Contractor. The traffic signal program for the Model 2070 controller will be supplied, assembled and tested by LADOT. Upon successful completion of the testing, the Contractor shall pick up the traffic signal controller assemblies within fifteen (15) working days after notification for the installation at the job site.

The Contractor shall arrange to have a signal technician, qualified to work on the controller unit and employed by the controller unit manufacturer, or the manufacturer's representative, present at the time the equipment is turned on.

(1) Purchase requisition is for Model 2070 Controllers with a unit version of “2070 UNIT” including:

Unit Chassis,
Model 2070-1A
Model 2070-2A
Model 2070-3A
Model 2070-4A
Model 2070-5A
Model 2070-6A (or configurable to either 2070-6A or 2070-6B), and
Model 2070-7A (isolation of signals and ground not required).

(2) A permanent label, “CITY OF LOS ANGELES,” shall be stenciled or embossed on the front of Model 2070 controller unit, centered directly about the LCD.

(3) A manufacturer's unit serial number shall be placed on the chassis to the right side of the power supply, in front of the back plane of VME cage, as viewed from the front.

(4) Section 9.2.5.2.3: This section is optional at the vendor's choice (internal timers).

(5) Page 9-7-13 Notes addition: Termination identification labels for the connection pins of PS1 and PS2 harnesses shall be stenciled at both ends of harnesses on the PS, MB, and VME.

(6) Page 9-7-12 Changes: The display support of Reverse Video and Underline by the FPA is optional at vendor's choice.

(7) Page 9-7-5 Note 4 Addition: Signal pins SP1-TXD+, SP1-RXD+, SP1-RTS+, SP1-CTS+, SP1-DCD+, SP1-TXC(O)+, and SP1-RXC+ in the “A2”, “A3,” and “A4” connectors shall be assigned respectively to MC68360's SCC1-TXD1, SCC1-RXD1, SCC1-RTS1, SCC1-CTS1, SCC1-CD1, SCC1-TCLK1, and SCC1-RCLK1, when SP1 of a Model 2070 is used as an Ethernet port.

(8) Section 10.1.6 Addition: An on-board DIP switch shall be provided on each modem to enable/disable the anti-streaming function. The anti-streaming function shall limit the modem's transmitter to be on for not more than 7 seconds. However, the 7 second timeout counter shall be reset and the transmitter shall be turned on when either the RTS line is asserted or new transmit data (with RTS is still on) from the CPU are received.

(9) The winning vendor shall provide two (2) fully functional units within TEN (10) days after bid opening for the City's compliance testing. The City will provide a compliance test report within thirty (30) days after the delivery of the two test units. If the test units do not comply with all specification requirements as determined by the City, then the City reserved the rights to reject the bid and select the next available vendor.

(10) Warranties and Guaranties: It is the responsibility of the winning vendor to ensure that all equipment provided has been thoroughly tested prior to shipment, and that each shipment conforms to these specifications. The minimum warranty for any equipment and materials shall be for a period of two (2) years from the date of the test acceptance by the Department of Transportation, City of Los Angeles. The warranty shall cover all manufacturer's defects, parts, labor, and shipping costs. The warranty for each unit of equipment that requires repair by the winning vendor shall be extended by the length of time that the limit is out of service for repair.

(11) Spare Modules: The manufacturer shall provide one complete set of replacement modules for every 100-controller-units purchased on a contract. One set of complete replacement modules is listed as following:

Model 2070-1A
Model 2070-2A
Model 2070-3A

Model 2070-4A
Model 2070-5A
Model 2070-6A (or configurable to either 2070-6A or 2070-6B), and
Model 2070-7A (isolation of signals and ground not required).

(12) Test Documentation: The manufacturer shall provide one (1) set ten (10) sets of manuals and schematics per unit purchase contract. The manuals and schematics shall reflect the latest board revisions and changes.

(13) Test Hardware: The manufacturer shall provide one set five (5) sets of wraparound harnesses, special test jigs, and extender boards for performing diagnostic or repairs. These shall be provided with the first shipment of any new contract on a one-time basis.

10-3.14 CONTROLLER CABINETS

The Model 332 and PMT 337 cabinets shall conform the provisions in Section 86-3.03, "Model 170 and Model 2070 Controller Assemblies," of the Standard Specifications and these special provisions.

Prior to shipping to the project site, each Model 332 and PTM 337 cabinet shall be submitted to the City of Los Angeles, Department of Transportation (LADOT), Traffic Signal Shop, Piper Technical Center, at 555 Ramirez Street, Quad 1, Space 100, Los Angeles, CA 90012, telephone number (213) 847-2944 for acceptance testing. The costs of transportation to and from the LADOT Traffic Signal Shop at Piper Technical Center shall be at the Contractor's expense.

The Engineer shall be notified when each Model 332 and PTM 337 cabinet is ready for the functional test. The functional test will be conducted by City of Los Angeles, Department of Transportation (LADOT), Traffic Signal Shop at Piper Technical Center, 555 Ramirez Street, Quad 1, Space 100, Los Angeles, CA 90012, telephone number (213) 847-2944, at least 30 working days prior to being available to the Contractor. Upon successful completion of the testing, the Contractor shall pick up the Model 332 and PTM 337 cabinet within 15 working days after notification for the installation at the job site.

SCOPE

All items supplied shall be new and unused.

SPECIFICATION COMPLIANCE

All controller assemblies and associated hardware shall be inspected and evaluated for compliance with the following specifications:

UNDERWRITERS LABORATORIES INC.
ELECTRONIC INDUSTRIES ASSOC. (EIA)
NATIONAL ELECTRICAL CODE (NEC)
AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)
AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)
NATIONAL ELECTRICAL MANUFACTURERS ASSOC. (NEMA)

GENERAL SPECIFICATIONS FOR TRAFFIC SIGNAL CONTROL EQUIPMENT

GLOSSARY SECTION

Wherever the following terms or abbreviations are used, the intent and meaning shall be interpreted as follows:

AC Alternating Current.
AC+ 120 Volts AC, 60 Hertz ungrounded power source.
AC-120 Volts AC, 60 Hertz grounded return to the power source.
ACIA Asynchronous Communications Interface Adaptor Device, Motorola MC6850 or equivalent.
ANSI American National Standards Institute.
Assembly A complete structure, unit or device that was manufactured by fitting together parts and/or modules.
ASTM American Society for Testing and Materials.
ATSAC Los Angeles Automated Traffic Surveillance and Control System
AWG American Wire Gage.
C Celsius
Cabinet An outdoor enclosure for housing the controller unit and associated equipment.

Certificate of Compliance A certificate signed by the manufacturer of the material or the manufacturer of assembled materials stating that the materials involved comply in all respects with the requirements of the specifications.

Channel An information path from a discrete input to a discrete output.

City The City of Los Angeles

CMOS Complimentary Metal Oxide Semiconductor.

Component A component shall be defined as any electrical or electronic device.

Controller Unit The component device within the controller assembly devoted to the operational control of the traffic signals.

CPU Central Processing Unit

CR ACIA Control Register

Db Decibel

DBa Decibels above reference noise, adjusted

DC Direct Current

EG Equipment Ground

EIAThe Electronic Industries Association

EPROM Ultraviolet Erasable Programmable Read Only Memory Device.

Equal Connectors Complying to physical dimensions, contact/pin material, plating and method of connection.

Equal Devices Conforming to function, pin out, electrical, and operating parameters of the specified device. Interpretation shall be in the judgement of the Engineer.

ETL Electrical Testing Laboratories, Inc.

HEX Hexadecimal.

Hz Hertz.

I.D. Identification.

Jumper A means of connecting/disconnecting two (2) or more conductive points by soldering/desoldering a conductive wire jumper.

LADOTCity of Los Angeles Department of Transportation

LED Light Emitting Diode.

MA Milliamperere.

Module A functional unit that plugs into an assembly.

Motherboard A printed circuit connector interface board with no active or passive components.

MOS Metal Oxide Semiconductor.

Ms Millisecond.

Mw Milliwatt.

NA Presently not assigned. Cannot be used by the contractor for other purposes.

NEMA National Electrical Manufacturer's Association.

NETA National Electrical Testing Association, Inc.

N.C. Normally closed contact.

N.O. Normally open contact.

Ns Nanosecond.

PAL/PLA Programmable Array Logic Device.

PCB Printed Circuit Board.

Ppm Parts per million.

RAM Random Access Memory Device.

RDR ACIA Receiver Data Register.

ROM Read Only Memory Device.

RTS Request To Send.

SCISerial Communications Interface.

Second Sourced Produced by more than one (1) manufacturer.

SRAM Static Random Access Memory Device.

STATE State of California.

SW switch.

Thumb Screw Device A 8-32 retractable screw fastener with projecting stainless steel screw, spring and natural aluminum knob finish

TTL Transistor-Transistor Logic.

Ua Microampere.

UL Underwriter's Laboratories, Inc.

Us Microsecond.

Vac Voltage Alternating Current.

VDC Voltage Direct Current.

VMA Valid Memory Address.

Watchdog Timer (WDT) A monitoring circuit, internal to the Conflict Monitor which senses the Controller Unit Watchdog output Line.

XX Manufacturer's option

GENERAL SECTION

All equipment furnished under these specifications shall be of solid state design. Use of electro-mechanical devices within the equipment is not acceptable unless otherwise indicated.

CODE REQUIREMENTS

Traffic controls, parts, and accessories shall meet the following codes wherever applicable:

Radio Manufacturer's Association

National Electrical Code

Manual of Uniform Traffic Control Devices

ANSI Code

NEMA

ASTM

ASA

Federal

State of California

LADOT

Each manual shall include the following:

General description

General characteristics

Installation

Adjustments

Theory of operation

Systems description (Include block diagram)

Detailed description of circuit operation

Maintenance:

- " Preventive maintenance
- " Trouble analysis
- " Trouble shooting sequence chart.
- " Wave forms
- " Voltage measurements
- " Alignment procedures

Technical Information

Technical information in the form of Manufacturer's published data sheets for medium and large scale integrated circuits.

Parts List

Parts List (shall include circuit and board designation, part type and class, power rating and component manufacturer, and original manufacturer's part number).

Electrical Interconnection Drawing

Schematic and Logic Diagram

Drawings and Diagrams

Assembly drawings and a pictorial diagram showing physical locations and identification of each component.

Serial and Revision Numbers

Serial numbers and revision numbers of equipment covered by manuals shall be printed on the front cover of the manuals.

A cabinet wiring diagram for the model 332 and 337 cabinets shown complete on a single plan sheet.

Manuals for the Models 332, and 337 cabinets shall be furnished with each unit.

Rejection of the Sample Unit

Rejection of the sample unit during acceptance testing will be grounds for rejection of the bid, and the Contractor shall be responsible for removal of rejected equipment from the LADOT testing facility.

The Engineer will reject equipment that fails to meet testing requirements or specifications. The Contractor shall rectify discrepancies and re-submit sample units, as required, for acceptance testing.

The Engineer may return all defective equipment, including Stock equipment, to the Contractor for exchange for newly acceptance tested units.

Any and all expenses incurred, as a result of equipment being rejected during the term of the contract, shall be born by the Contractor, including any penalties resulting from project delays.

CONTROLLER ASSEMBLY UNIT

Standard controller assembly units per these specifications, shall consist of the following equipment lists shown below.

Model 332 Controller Cabinet Assembly Unit

Cabinet assembly unit, Model 332, one each.

Traffic controller unit (Optional), one each.

Conflict monitor, Model 2010, one each with red monitor cable

Vehicle detector, Model 222, 8 each.

Two channel DC isolator, Model 242, 3 each.

Two channel AC isolator, Model 252, one each.

Solid state switch pack, Model 200, 12 each.

Flasher, Model 204, 3 each.

Model 337 Controller Cabinet Assembly Unit

Cabinet assembly unit Model 337, one each.

Traffic controller unit (Optional),one each.

Conflict monitor, Model 2010, one each with red monitor cable

Vehicle detector Model 222, 2 each.

Two (2) channel DC isolator Model 242, 2 each.

Two (2) channel AC isolator Model 252, oneeach.

Solid state switch pack Model 200, 4 each.

Flasher, Model 204, 2 each.

Controller Cabinet, Empty

An empty controller cabinet Model 332 or 337 shall be delivered unwired, without a rack, harnesses or terminal blocks except for the following items:

A fan and thermostat shall be wired and installed with harness. Standard light fixture shall be included for each empty controller cabinet delivered.

The Model 337 cabinet shall have wired and installed the "Cabinet Connection and Outlet Panel" with controller receptacle and ground fault interrupter.

Door switches, wired and installed shall conform to the requirements of these special provisions.

Cabinet vent and filter shall conform to the requirements of these special provisions.

Door locks and tumblers shall conform to the requirements of these special provisions.

Delivery

A unit shall consist of the controller unit (if called for in the contract), cabinet, and the number of peripherals that the bid designates for each complete controller assembly. Additional shipments will be predicated on the acceptance of the previous delivery.

Each shipment shall be accompanied by a standard shipping invoice and a packing list in a database format compatible with Microsoft ACCESS 97 or EXCEL 97. The medium shall be a "90 mm" floppy disk or a ZIP disk unless arrangements are made with the Engineer to forward the list by electronic medium. The list shall be organized by cabinet assembly unit and contain the following information, each item in its own field: Manufacturer, model, revision, and quantity of items. The cabinet, the controller unit and the Model 2010 conflict monitor shall have the corresponding serial numbers included in the database.

Each shipment shall be delivered to:

Piper Technical Center
555 Ramirez Street
Quad 1, Space 100
Los Angeles, California 90012

A minimum of 72 hours advance notice to the Engineer shall be given prior to each delivery. All deliveries shall be made during the hours of 8:00 AM and 2:00 PM on any working day, Monday - Thursday.

Warranties and Guarantees

The Contractor shall ensure that all equipment provided has been thoroughly tested prior to shipment, and that each shipment conforms to these specifications.

The minimum warranty for any equipment and materials shall be for a period of 2 years from the date of test acceptance by the Department of Transportation. The warranty shall cover all manufacturer's defects, parts, labor, and shipping costs. The warranty for each unit of equipment that requires repair shall be extended by the length of time that the unit is out of service for repair.

The supplier shall furnish the Engineer with a contact name and telephone number for the person to notify of any alleged defects.

INTERCHANGEABILITY

The following assemblies and their respective associated devices shall electrically and mechanically intermate and be compatible with each other:

ASSEMBLIES

Output File No. 1 & No. 2

Input File

Power Distribution Assembly

No.1 & No.2

ASSOCIATED DEVICES

Switch Pack Model 200
Monitor Unit Model 2010

Relay:
Heavy Duty Model 430
Detectors Model 222
 222LRT

Isolators Model 242
 252
 255

Flasher Unit Model 204
Relay:
Heavy Duty Model 430

Cabinet Model 332
 337

INDICATORS and CHARACTER DISPLAYS

All indicators and character displays shall have a +45 degree cone of visibility with its axis perpendicular to the front panel. All indicators and character displays shall be readily visible at a radius of up to 1.2 meters within the cone of visibility when the indicator is subjected to 96,875 lux (9,000 footcandles) of white light with the light source at 45 (±2) degrees to the front panel. If characters are not self-luminous, illumination shall be provided for viewing in low levels of ambient light. Indicators supplied on equipment requiring handles shall be mounted such that a horizontal clearance of 15 degrees minimum shall be provided for Models 2010, 222, 242, 252, and 255 as well as a clearance of 30 degrees minimum for Models 200 and 204.

All indicators and character displays shall have a rated life of 100,000 hours minimum.

Liquid crystal displays (LCD) shall operate at temperatures of -20°C to 70°C without loss of visibility or bleeding.

CONNECTORS

General

All connectors shall be keyed to prevent improper insertion of the wrong connector or PCB.

The T Type 25 connector shall be a 25 contact AMP HDP – 20 connector or equal with gold on nickel plated contacts. The female mating connector with socket contacts is designated T Type 25S and the male mating connector with pin contacts is designated Type 25P. The T Type 25P connector shall be provided with lock spring clips for latching to its mating connector.

The T Type T connector shall be a single row, 10 position, feed through terminal block. The terminal block shall be a barrier type with 6-32 -by-6.35 mm, or longer, nickel plated brass binder head screws. Each terminal shall be permanently identified as to its function.

The mating connectors shall be designated as the connector number and male/female relationship such as C1P (plug or PCB edge connector) and C1S (socket).

Connectors C1, 2, 4, and C5

Pin and socket contacts for connectors C1, C2, C4 and C5 shall be beryllium copper construction subplated with 0.00127 mm nickel and plated with 0.00076 mm gold. Pin diameter shall be 1.57 mm. Connectors shall have the following number of contacts:

- C1 - 104 contacts
- C2 - 14 contacts
- C4 - 37 contacts
- C5 - 24 contacts

All pin and socket connectors of C1, C2, C4, and C5 shall use the AMP No. 601105-1 or No. 91002-1 contact insertion tool, and the AMP No. 305183 contact extraction tool.

Connector C1 and C2 blocks shall be constructed of phenolic or equal and shall have an Insulation resistance of 5000 megohms. The contacts shall be secured in the blocks with stainless steel springs.

Connector C1 and C2 corner guides shall be stainless steel. The guide pins shall be 27.86 mm in length and the guide sockets 15.8 mm in length.

Connector C4 and C5 shall be circular plastic type with quick connect/disconnect capability and thread assist, positive detent coupling. The connectors shall be UL listed Glass Filled Nylon, 94 V-1 Rated, heat stabilized, fire resistant.

PCB CONNECTORS

PCB edge connectors shall have bifurcated gold plated contacts.

The PCB connector shall meet or exceed the following:

- Operating voltage: 600 V(ac) (RMS) at sea level
- Current rating: 5A
- Insulation resistance: 5,000 megohms
- Contact material: Copper alloy
(plated with 0.00127 mm of nickel and 0.000381 mm of gold)
- Contact resistance: 0.006 Ω maximum

The PCB 22/44 connector shall have 22 independent contacts per side, dual-sided with 3.96 mm contact centers.

The PCB 28/56 connector shall have 28 independent contacts per side, dual-sided with 3.96 mm contact centers.

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The PCB 36/72 connector shall have 36 independent contacts per side, dual-sided with 2.54 mm contact centers. Connectors that are of the "Insulation displacement" type will not be permitted. All edge connectors shall use the "bifurcated bellow" type contact or equivalent.

PACKAGING

Each item delivered shall be individually packed in its own shipping container. When loose Styrofoam is used for packing the item, the item shall be sealed in a plastic bag to prevent direct contact with the Styrofoam. A 610 mm x 711 mm wooden pallet shall be used when shipping a 337 controller assembly, secured with 4 1/4-20 bolts. A 737 mm x 1016 mm wooden pallet shall be used when shipping a 332 controller assembly, secured with 4 1/4-20 bolts.

DELIVERY

Each item delivered for testing shall be complete, including manuals, and ready for testing.

METALS

Aluminum

Aluminum sheet shall be Type 5052-H32 ASTM designation B209.

Rod, bar and extruded shall be Type 6061-T6, or equal.

Stainless Steel sheet shall be annealed or one-quarter-hard complying with the ASTM Designation: A666 for Type 304, Grades A or B, stainless steel sheet.

Cold Rolled Steel

Sheet, rod, bar and extruded shall be Type 1018/1020.

Plating

All cold roll steel shall be plated. All plating shall be either cadmium plating meeting the requirements of Federal Specification QQ-P-416C, Type 2 Class 1 or zinc plating meeting the requirements of Federal Specification QQ-Z-325B, Type 2 Class 1.

All sharp edges and corners shall be rounded.

COMPONENTS SECTION

GENERAL

All components shall be second sourced and shall be of such design, fabrication, nomenclature, or other identification as to be purchased from a wholesale electronics distributor, or from the component manufacturer, except as follows:

Circuit design shall be such that all components of the same generic type, regardless of manufacturer, shall function equally in accordance with these special provisions.

Memory, MPU, MIC, and ACIA devices shall be the only socket mounted on the PCBs.

No component shall be operated above 80 percent of its maximum rated voltage, current or power ratings. Digital components shall not be operated more than 3 percent above their nominal voltage, current, or power ratings.

No component shall be provided where the manufactured date is 2 years older than the contract award date. The design life of all components, operating for 24 hours a day in their circuit application, shall be 10 years or longer.

Encapsulation of 2 or more discrete components into circuit modules is prohibited, except for transient suppression circuits, resistor networks, diode arrays, solid state switches, optical isolators and transistor arrays.

Except as specified in these special provisions, all discrete components, such as resistors, capacitors, diodes, transistors, and integrated circuits shall be individually replaceable. Components shall be arranged so they are easily accessible for testing and maintenance.

The Contractor shall submit detailed engineering technical data on all components at the request of the Engineer. A letter from the component manufacturer shall be submitted with the detailed engineering data when the proposed application of the component alters the technical data. The letter shall certify that the component application meets specification requirements.

CAPACITORS

The DC and AC voltage ratings as well as the dissipation factor of a capacitor shall exceed the worst case design parameters of the circuitry by 150 percent.

A capacitor which may be damaged by shock or vibration shall be supported mechanically by a clamp or fastener.

Capacitor encasement shall be resistant to cracking, peeling, and discoloration.

All capacitors shall be insulated and shall be marked with their capacitance value and working voltage.

Electrolytic capacitors shall not be used for capacitance values of less than 1.0 microfarad and shall be marked with polarity.

All non-electrolytic capacitors of less than 1uf value shall not be of the ceramic disk type.

POTENTIOMETERS

Potentiometers with ratings from 1W to 2W shall be equivalent to Military Type RV4.

No potentiometers less than 1W rating shall be used (except for trimmer type function).

The power rating of any potentiometer shall be at least 100 percent greater than the maximum power requirements of the circuit.

All trimmer potentiometers shall have 10 turns minimum.

RESISTORS

Fixed carbon film, deposited carbon, or composition insulated resistors shall conform to the performance requirements of Military Specifications: MIL-R-11F or MIL-R-22684.

All resistors shall be insulated and shall be marked with their resistance value. Resistance values shall be indicated by the EIA color codes.

Resistor tolerance shall not exceed 10 percent.

The value of the resistors shall not vary by more than 5 percent between -37°C and 74°C .

Resistors that have a rating exceeding 2 watts shall not be used unless special ventilation or heat sinking is provided. They shall be insulated from the PCB.

SEMICONDUCTOR DEVICES

All solid state devices, except LEDs, shall be of the silicon type.

All transistors, integrated circuits, and diodes shall be a standard type listed by EIA and clearly identifiable.

All metal oxide semiconductor components shall contain circuitry to protect their inputs and outputs against damage due to high static voltages or electrical fields.

The pin "1" location of all sockets shall be properly marked on the PCB adjacent to each socket.

TRANSFORMERS and INDUCTORS

All power transformers and inductors shall have the manufacturer's name or logo and part number clearly and indelibly printed on the case or lamination.

All transformers and inductors shall have their windings insulated and shall be protected to exclude moisture.

All transformer and inductor leads shall be color coded with an approved EIA color code or identified in a manner to facilitate proper installation.

CIRCUIT BREAKERS (10 amperes or greater)

Circuit breakers shall be listed by UL or ETL. The trip and frame sizes shall be plainly marked (marked on the breaker by the manufacturer), and the ampere rating shall be visible from the front of the breaker. All circuit breakers (30A or greater) shall be quick-break on either automatic or manual operation. Contacts shall be silver alloy and enclosed in an arc quenching chamber. Overload tripping shall not be influenced by an ambient air temperature range of from -18°C to 50°C . Minimum interrupting capacity shall be 5,000A, RMS.

Circuit breakers shall be the trip-free type.

Multi-pole breakers shall not be the "mechanically ganged" type.

SWITCHES

Dip

Dual-inline-package, quick snap switch(es) shall be rated for a minimum of 30,000 operations per position at 50 mA, 30 VDC. The switch contact resistance shall be 100 milliohms maximum at 2 mA, 30 VDC. The contacts shall be gold over brass (or silver). The switch shall be rated for a minimum of 40,000 operations.

Logic

The switch contacts shall be rated for a minimum of one ampere resistive load at 120V(ac) or 28 VDC and shall be silver over brass. The switch shall be rated for a minimum of 40,000 operations.

Control

The switch contacts shall be rated for a minimum of 5 ampere resistive load at 120V(ac) or 28 VDC and shall be gold over brass. The switch shall be rated for a minimum of 40,000 operations.

Power

Ratings shall be the same as control except the contact rating shall be a minimum of 10A at 125V(ac).

MECHANICAL SECTION

ASSEMBLIES (INCLUDING CONTROLLER UNIT)

All assemblies shall be easily replaceable and incorporate plug-in capability for their associated devices or PCBs with the following exceptions:

The cabinet power supply.
Mother board assemblies.

Assemblies shall be provided with 2 nylon guides for each plug-in PCB or associated device (except relays). The guides shall extend to within 19.1 mm from the face of either the socket or connector and front edge of the assembly. The nylon guides shall be securely attached to the file or assembly chassis.

PRINTED CIRCUIT BOARDS

No components, traces, brackets, obstructions shall be within 3.2 mm of the board edge (guide edges).

The manufacturer's name or logo, model number, serial number, and circuit issue or revision number shall appear and be readily visible on all items. Placement of this information for modules such as the Model 2010 monitor unit, Model 222, 242, & 252 modules shall be on the PCB.

WORKMANSHIP

Workmanship shall be in accordance with the highest industry standards.

MODEL NUMBERS

The manufacturer's model number, serial number and circuit issue or revision number shall appear on the rear panel of all equipment and modules supplied.

In addition to any assignment of model numbers by the manufacturer, a model number assigned in the table below shall be displayed on the front panel in bold type, at least 6.4 mm high.

MODEL No.	TITLE
200	SWITCH PACK
204	FLASHER UNIT
2010	MONITOR UNIT
222	LOOP SENSOR UNIT
222LRT	LOOP SENSOR UNIT
242	DC ISOLATOR
252	AC ISOLATOR
255	AC ISOLATOR Railroad ONLY

CONNECTORS

All PCB connectors mounted on a motherboard shall be mechanically secured to the chassis or frame of the unit.

All screw type fasteners shall utilize locking devices or locking compounds except for finger screws which shall be captive.

TOLERANCES

The following tolerances shall apply, except as specifically shown on the plans or in these specifications:

Sheet metal ± 1.33 mm
PCB +0, -0.254 mm
Edge guides ± 0.381 mm

ENGINEERING SECTION

HUMAN ENGINEERING

To the highest practicable degree, the unit shall be engineered for simplicity and ease of operation and maintenance. This shall include the following:

All fuses shall be easily accessible and shall be replaceable without the use of ~~any~~ tools.
PCBs shall slide smoothly in their guides while being inserted into or removed from the frame and shall fit snugly into the plug-in PCB connectors.
PCBs shall require a force no less than 2.3 kg or greater than 22.7 kg for insertion or removal.

DESIGN ENGINEERING

The following practices shall be employed in the design of solid state equipment circuitry:

The design shall be inherently temperature compensated to prevent abnormal operation. The circuit design shall include such compensation as is necessary to overcome adverse effects due to temperature in the specified environmental range.

For reasons of personal safety, personnel shall be protected from all dangerous voltages.

Generated Noise

No item, component or subassembly shall emit a noise level exceeding the peak level of 55 dBa when measured at a distance of 1 meter away from its surface.

PRINTED CIRCUIT BOARDS

DEFINITIONS

Definitions for the purpose of this section on PCBs shall be taken from MIL-STD-429 and any current addendum.

DESIGN

All single-board modules shall be vertically mounted, including any combination of CPU, I/O, voltage regulation, display, or modem.

All contacts on PCBs shall be plated with a minimum thickness of 0.00076 mm gold over a minimum thickness of 0.0019 mm nickel.

PCB design shall be such that components may be removed and replaced without damage to boards, traces, or tracks.

FABRICATION

Fabrication of PCBs shall be in compliance with Military Specification: MIL-P-13949, except as follows:

Only NEMA FR-4 glass cloth base epoxy resin copper clad laminates 1.59 mm minimum thickness shall be used. Intercomponent wiring shall be by laminated copper clad track having a minimum weight of 670 grams per square meter with adequate cross section for current to be carried. All copper track shall be plated or soldered to provide complete coverage of all exposed copper track. Jumper wires will not be permitted, except from plated-through padded holes to an external component or for designed function selection with the jumper insulated and as short as possible.

Section 3.3.3 of Military Specification: MIL-P-13949E shall read "Pits and Dents. Grade of Pits and Dents shall be of Grade B quality (3.3.3.2) or better."

Section 3.3 of Military Specification: MIL-P-13949 shall be omitted.

Section 3.4 of Military Specification: MIL-P-13949 shall read "Warp or Twist. Class of permissible warp or twist shall be Class A (Table II) or better."

Sections 4.2 through 6.6 of Military Specification: MIL-P-13949 (inclusive) shall be omitted except as referenced in previous sections of this specification.

The fabrication of PCBs and the mounting of parts and assemblies thereon shall conform to Military Specification: MIL-STD-275E, except as follows:

All semiconductor devices required to dissipate more than 250 mw or any case temperature that is 10°C above ambient shall be mounted with spacers or transpads to prevent direct contact with the PCB.

When completed, all residual flux shall be removed from the PCB.

The resistance between any 2 isolated, independent conductor paths shall be at least 100 megohms when a 500 VDC potential is applied.

All PCBs shall be coated with a moisture resistant coating with ultra-violet tracer.

Where less than 6.4 mm lateral separation is provided between the PCB (or the components of a PCB) and any metal surface, a 0.794 (-0 to +0.396) mm thick Mylar (polyester) plastic cover shall be provided on the metal to protect the PCB.

MOUNTING

Each PCB connector edge shall be chamfered at 30 degrees from board side planes. The key slots shall also be chamfered so that the connector keys are not extracted upon removal of board or jammed upon insertion. The key slots shall be 1.14 (± 0.13) mm for 2.5 mm spacing and 1.40 (± 0.13) mm for 3.96 mm spacing.

SOLDERING

Hand soldering shall comply with Military Specification: MIL-P-55110.

Automatic flow soldering shall conform to the ANSI/IPC A-610 specification and the following conditions:

Constant speed conveyor system.

Conveyor speed shall be the optimum to minimize solder peaks or points which form at component terminals.

Temperature shall be controlled to within $\pm 8^\circ\text{C}$ of the optimum temperature.

The soldering process shall result in the complete coverage of all copper runs, joints, and terminals with solder except that which is covered by an electroplating process.

Wherever clinching is not used, a method of holding the components in the proper position for the flow process shall be provided.

If exposure to the temperature bath is of such a time-temperature duration, as to come within 80 of any component's maximum specified time-temperature exposure, that component shall be hand soldered to the PCB after the flow process has been completed.

QUALITY CONTROL SECTION

COMPONENTS

All components shall be lot sampled to assure a consistent high conformance standard to the design specification of the unit.

SUBASSEMBLY or MODULE

Visual inspections shall be performed on all modules, printed circuits, and subassemblies to determine any physical defects such as cracking, scaling, poor fastening, incorrect component values, etc.

ELECTRICAL TESTING

Complete electrical testing shall be performed on each module, printed circuit or subassembly to determine its compliance with the manufacturer's design function.

INSPECTION

Housing, chassis, and connection terminals shall be inspected for mechanical sturdiness, and harnessing to sockets shall be electrically tested for proper wiring sequence.

ASSEMBLED UNITS

Completely assembled units shall be subject to full environmental cycling and timing testing.

The unit shall be visually and physically inspected to assure proper placement, mounting, and compatibility of subassemblies.

PREDELIVERY REPAIR

The procedures listed below shall be followed in repair of equipment before shipment.

Any defects or deficiencies found by the inspection system involving mechanical structure or wiring shall be returned through the manufacturing process or special repair process for correction.

Defects in PCBs or electronic circuit components shall be specially treated as follows:

A PCB may be flow soldered a second time if copper runs and joints are not satisfactorily coated on the first run.

A PCB shall not be flow soldered more than twice.

Hand soldering may be used for printed circuit repair.

ELECTRICAL, ENVIRONMENTAL, and TESTING REQUIREMENTS SECTION

GENERAL

These test procedures shall be followed by the Contractor who shall certify that inspection and testing is in accordance with these special provisions.

Inspection

A visual and physical inspection shall include mechanical, dimensional, and assembly conformance of all parts of these specifications which can be checked visually or manually with simple measuring devices.

ELECTRICAL

All components shall operate properly within the following limits:

Applied Line Voltage- 90 to 135 V(ac)

Frequency: 60 (± 3.0) Hz

All circuits unless otherwise noted, shall commence operation at or below 90 V(ac) as the applied voltage is raised from 50 V(ac) to 90 V(ac) at a rate of 2 (± 0.5) volts per second.

All equipment, when housed within its associated cabinet, shall be unaffected by transient voltages normally experienced on commercial power lines. Equipment purchased separately from cabinet will be tested for compliance with the equipment housed within a Model 332 cabinet and the cabinet connected to the commercial power lines.

The power line surge protection (including the cabinet protection and that internal to the equipment) shall enable the equipment being tested to withstand (nondestructive) and operate normally following the discharge of a 25 microfarad capacitor, charged to plus and minus 2,000V, applied directly across the AC line (applied at the cabinet service terminal block) at a rate of once every 10 seconds for a maximum of 50 occurrences per test. The unit under test will be operated at 20°C ($\pm 5^\circ\text{C}$) and at 120 (± 12) V(ac).

All equipment shall be unaffected by transient voltages normally experienced on commercial power lines. Equipment purchased separately from the cabinet will be tested for compliance as follows:

Power from commercial power lines applied at cabinet service terminal block.

Equipment properly housed and connected within a Model 332 cabinet.

The cabinet power surge protectors deactivated or removed.

The equipment shall withstand (nondestructive) and operate normally when one discharge pulse of plus or minus 300V is synchronously added to the AC power at the cabinet service terminal block and moved uniformly over the full wave across 360 degrees or stay at any point of line cycle once every second. Peak noise power shall be 5 kilowatts with a pulse rise time of 500 ns. The unit under test will be operated at 20°C ($\pm 5^\circ\text{C}$) and at 120 (± 12) V(ac).

Within the circuit of any device, module or PCB, electrical isolation shall be provided between DC logic ground, equipment ground and the AC grounded conductor. The DC logic ground and equipment ground shall be electrically isolated from the AC grounded conductor and from each other by 500 megohms, minimum, when tested at the input terminals with 500 VDC.

All equipment shall be capable of normal operation following opening and closing of contacts in series with the applied voltage to the cabinet at a rate of 30 openings and closings per minute for a period of 2 minutes in duration.

All equipment shall resume normal operation following a period of at least 5 hours at -37°C, when 90 V(ac) is applied to the input terminals of the cabinet.

ENVIRONMENTAL

All components shall properly operate within the following limits:

Ambient Temperature

0°C to 55°C.

Humidity

5 to 95 percent, 1.1°C to 46.0°C.

The relative humidity and ambient temperature values in the following table shall not be exceeded.

AMBIENT TEMPERATURE
VERSUS
RELATIVE HUMIDITY
AT BAROMETRIC PRESSURES
(759.968 mm Hg.)

Ambient Temperature Dry Bulb (°C)	Relative Humidity (in percent)	Ambient Temperature Wet Bulb (°C)
.1 to 46.0	95	42.7
48.8	70	42.7
54.4	50	42.7
60.0	38	42.7
65.4	28	42.7
71.2	21	42.7
74	18	42.7

Shock Test

Per Military Specification: MIL-STD-810D Method 516.1

Vibration

Per Military Specification: MIL-STD-810D Method 514.1, equipment class G (Common Carrier)
Cabinets shall comply with the requirements of UL Bulletin of Research No. 23, "Rain Tests of Electrical Equipment".
All equipment shall continue normal operation when subjected to the following:

Low Temperature Test

With the item functioning at a line voltage of 90V(ac) in its intended operation, the ambient temperature shall be lowered from 20°C to 0°C at a rate of not more than 18°C per hour. The item shall be cycled at 0°C for a minimum of 5 hours and then returned to 20°C at the same rate. The test shall be repeated with the line voltage at 135 V(ac).

High Temperature Test

With the item functioning at a line voltage of 90V(ac) in its intended operation, the ambient temperature shall be raised from 20°C to 55°C at a rate of not more than 18°C per hour. The item shall be cycled at 55°C for a minimum of 5 hours and then returned to 20°C at the same rate. The test shall be repeated with the line voltage at 135-V(ac).

Diagnostic Test Programs

The Contractor shall furnish a cabinet verification program, resident in 27256 EPROM(s) that will execute in a Type 170 controller unit. The program shall test cabinet wiring related to the output file, input file, police panel, and flash switches. The program shall check conflict monitor operation by generating all possible conflicts, in sequence, and resetting the monitor automatically. It shall check all operational features of the supplied conflict monitor, including absence of red and the 'plus' features.

Five copies of a cabinet verification program software manual shall be supplied. The manual shall include full and complete documentation of test procedures, including, but not limited to the following:

Cabinet verification test operation

Individual diagnostic tests
Program listings in assembly format, with detailed comments
Detailed flow charts, which are keyed to the software listing using instruction addresses and subroutine names.

Contractor's Testing Certification

The Contractor shall supply, with each shipment, a full test report of the quality control and final test conducted on each item. The test report shall indicate the name of the tester and shall be signed by a responsible manager.

The Contractor shall submit a quality control procedure and format of test reports to the Engineer for approval within 15 days following the approval of the contract.

The quality control procedure shall include the following:

- Acceptance testing of all supplied components.
- Physical and functional testing of all modules.
- A minimum 100-hour burn-in of all modules.
- Physical and functional testing of all items.
- A minimum 24 hour operation of all controller units and cabinets.

SWITCHPACK and FLASHER

GENERAL REQUIREMENTS MODEL 200 SWITCHPACK

The switch pack unit shall be a plug-in device of solid state design. Each switch pack shall be a modular assembly containing 3 independent solid state switches to be used for opening and closing connections between the applied AC power and traffic signal lamps.

The module chassis shall provide rigid unit support for connector mounting, PCB support, module alignment and insertion and removal. It shall provide Triac heat sinking, and shall be made of metal suitable to meet support and environmental requirements. Where electrical isolation protection is the only requirement, plastic insulation material may be used in lieu of metal.

All indicator lights shall be water clear, Ultra Bright, T-1 3/4 package LEDs, General Instruments MK9160 (red), or equivalent.

Each switch shall be designed for a minimum of 30 million operations while switching a tungsten filament load of 1,000W at 70°C.

The front panel of the module shall be labeled with the manufacturer's name and Model 200.

ELECTRICAL REQUIREMENTS MODEL 200 SWITCHPACK

A low input state of 0 to +6 VDC (from the controller unit) shall cause the switch to be on. A high input state of +16 to +30 VDC shall cause the switch to be off. The outputs must respond to input change within 8.33 ms.

The low input load shall be less than -15 mA. The high input load shall be less than +1.0 mA.

The input of each switch shall have reverse polarity protection up to 30 VDC.

Each switch shall have the capability of switching any current from 0.05 to 10A into a tungsten lamp load or 10A at a power factor of 0.85, over a voltage range of 85 to 135V at 60 Hz and at 70°C.

Each switch shall have a one cycle surge rating of 175A rms and a 1 second surge rating of 40A rms.

Each switch shall turn on within ± 5 degrees of the zero voltage crossing of the AC sinusoidal line, and shall turn off within ± 5 degrees of the zero current crossing of the AC sinusoidal line. After power restoration, the zero voltage turn on may be within ± 10 degrees of the zero voltage crossing only during the first half cycle of line voltage in response to a low input.

Each switch shall have an off state dv/dt rating of 100V per microsecond or greater.

Each switch shall have an isolation greater than 2,000 VDC and DC resistance of 10 megohms between its input and output.

Each switch shall have an open resistance greater than 15 kohms between AC+ and its output. The leakage current of each switch shall be less than 10mA with 135V(ac) AC line and 1800W load.

Each switch shall have an isolation greater than a DC resistance of 50 megohms between its output and chassis ground.

Each switch shall be capable of withstanding a peak inverse voltage of 500V at 70°C with less than 20 mA leakage.

Each switch shall be isolated so that line transients or switch failure will not adversely affect the controller unit.

The maximum 24 VDC supply current shall be 60 mA at +30 VDC.

MECHANICAL REQUIREMENTS MODEL 200 SWITCHPACK

The front panel of the switch pack shall be provided with three LED indicators to indicate the state of the input to the switch pack. Indicators shall be mounted and labeled as follows: "red" at top, "yellow" in middle, and "green" at bottom when switch is installed. Indicators shall be vertically centered on the switch pack front panel.

Switch pack control circuitry and switches shall be readily accessible by the use of a screwdriver or common wrench. Only one type of screw head, slotted or phillips, shall be used throughout. It shall not be possible to bow any surface of the switch pack during assembly with a screwdriver or common wrench by more than 1.27 mm.

Live voltage shall not be exposed while inserting or removing the switch. A metal handle or gripping device shall be attached to the front of each switch pack to eliminate the need to insert hands or fingers into the cabinet output file.

A metal enclosure shall be used to provide electrical parts suitable protection from dust and corrosion.

The length dimension of the switch pack from the plug connector surface to the front panel of the switch pack (location of indicators) shall be 187.3 ± 3.2 mm. The switch pack shall be no wider than 44.45 mm and no higher than 106.7 mm.

The lower surface of the switch pack shall be no more than 53.3 mm below the centerline of the connector configuration and no part will extend more than 22.9 mm to the left and 27.9 mm to the right of the centerline of the connector pin configuration.

Edges shall be provided on the unit to mate with edge guides.

All electrical connections into and out of the switch pack shall be through a multi-terminal connector plug. The connector contact tails shall be solder hook or eye styles only, Beau P-5412-LAB or equivalent. Connectors soldered directly to the printed circuit board and quick connector connection styles will not be allowed. The connector shall be rigidly fixed to the rear of the unit.

Wires soldered to the printed circuit board shall be stranded type.

Solid state switches may utilize encapsulated components.

Components on printed circuit board shall be securely mounted to withstand damage by shock or vibration.

Machine screws shall be used to mount components to the heat sink.

GENERAL REQUIREMENTS MODEL 204

This specification establishes minimum standards for flasher units designed for use in Model 332 and 337 traffic signal controller cabinets supplied to the LADOT. General specifications for documentation, connectors, components, mechanical, engineering, printed circuit boards, quality control, electrical, environmental and testing.

FUNCTIONAL REQUIREMENTS MODEL 204

The flasher unit shall be a modular plug-in device containing one flasher control circuit and two solid state switches. Its function shall be to alternately open and close connections between the applied power and an external traffic signal lamp load during intersection flashing operation.

The module shall generate its own internal DC power, from the AC line, for logic and control.

The flasher unit shall commence flashing operation when AC power is applied to the AC+ terminal.

The flasher unit shall provide 50 to 60 flashes per minute with a 50 percent duty cycle. This shall be derived from the 60 Hz AC line.

ELECTRICAL REQUIREMENTS MODEL 204

Each output switch shall be capable of switching any current from 0.03 to 10A of tungsten lamp load at 120V(ac) and 60 Hz, or 10A at a power factor of 0.85, at 70°C.

The output switches shall have a one cycle surge rating of 175A RMS, of 247.5A peak and a 1 second surge rating of 40A RMS.

Each output switch shall be capable of withstanding a peak inverse voltage of 500V.

Each output switch shall turn on within plus or minus 5 degrees of the zero voltage crossing of the AC sinusoidal line, and shall turn off within plus or minus 5 degrees of the zero current crossing of the alternating current sinusoidal line. The zero voltage turn on may be within plus or minus 10 degrees of the zero voltage point only during the first half cycle of line voltage during which an input control signal is applied.

Each switch shall have an off state dv/dt rating of 200V per microsecond or greater.

The output switches shall have a mean time between failure of 30 million operations or greater when switching a tungsten filament load of 1,000W per switch.

Surge arrester shall be provided between AC+ and flasher outputs. The surge arrester shall be capable of reducing the effects of a transient voltage applied to the field signal circuits, and shall have the following ratings:

Recurrent peak voltage: 212V

Energy rating, maximum: 50 joules
Power dissipation, average: 0.85W
Peak current for pulses less than 6 microseconds: 2,000A
Standby current: less than 1 mA

Each circuit shall be designed to operate in an open circuit (without load) condition for a minimum of 10 years.

MECHANICAL REQUIREMENTS MODEL 204

Indicators shall be mounted on the flasher unit to indicate when each output from the solid state switches is on and off, with and without loads.

All indicator lights shall be water clear, ultra bright, T-1 3/4 package LEDs, General Instruments MK9160 (Red), or equivalent.

The dimensions of the flasher unit shall be the same as shown on the plans. The flasher unit connector shall be centered in place of the Model 200 switch pack connector with same orientation of pin 12.

The flasher unit shall be constructed so that its lower surface will be 53.3 +1.3/-0.0 mm below the centerline and so that no part will extend more than 21.6 mm to the left or more than 26.7 mm to the right of the centerline of the connector configuration.

Flasher unit control circuitry and switches shall be readily accessible by the use of a screwdriver or common wrench. Only one type of screw head, slotted or phillips, shall be used throughout. It shall not be possible to bow any surface of the flasher unit during assembly with a screwdriver or common wrench by more than 1.27 mm.

Live voltage shall not be exposed while inserting or removing the flasher. A metal handle or gripping device shall be attached to the front of each flasher unit to eliminate the need to insert hands or fingers into the power distribution assembly or flasher slot.

A metal enclosure shall be used to provide electrical parts suitable protection from dust and corrosion.

Edges shall be provided on the flasher unit to mate with edge guides.

All electrical connections into and out of the flasher unit shall be through a multi-terminal connector plug. The connector contact tails shall be solder hook or eye styles only, Beau P-5406-LAB or equivalent. Connectors soldered directly to the printed circuit board and quick connector connection styles are not allowed. The connector shall be rigidly fixed to the rear of the unit.

The flasher unit shall intermate with a Beau S-5406 or equivalent connector as shown on the plans.

Wires soldered to the printed circuit board shall be stranded type.

Connector pinouts

Pins	Signal Name
7	Output #1
8	Output #2
9	Chassis Gnd
10	Neutral
11	AC +
12	Spare

Solid state switches may utilize encapsulated components.

Components on printed circuit board shall be securely mounted to withstand damage by shock or vibration.

Machine screws shall be used to mount components to the heat sink.

MODEL 2010 CONFLICT MONITOR

CONFLICT MONITOR

GENERAL REQUIREMENTS

FINAL APPROVAL

A conflict monitor shall be submitted by the Contractor and approved by the Engineer prior to acceptance.

MINIMUM STANDARDS

This specification establishes minimum standards for conflict monitors designed for use in Model 332 and 337 traffic signal controller cabinets. The dimensions are defined on the plans.

Front panel shall be removable without unsoldering connections.

All electrical/electronic components shall be mounted on the main PCB, diode matrix card, front panel or display board on the front panel.

All plated through holes shall be filled with solder.

INDICATOR LIGHTS

All indicator lights shall be water clear (not colored), not diffused lenses, ultra-bright, T-1 package LEDs, Ledtech LT0373-41 (red), LT0323-41HE (green), LT0333-41-UR (yellow) or equivalent with a minimum luminous intensity of 100 mcd at 20 mA. Indicator lights shall be clearly visible in direct sunlight.

The AC power indicator light shall be green. Fault indicator lights shall be red. Channel indicator lights shall be red, unless there are three indicators per channel. In that case, each channel will have one red, one yellow and one green indicator.

Indicator lights shall be arranged in a one vertical pattern with AC power on top, fault status lights as the upper indications, and the channel lights as the lower indications. Where there are three indicators per channel, the indicators shall form three columns, with red to left, yellow in center and green to right.

A fault shall cause only the corresponding fault indicator and appropriate channel indicators to display.

MONITOR POWER

The monitor shall not use current from the 24 VDC input being sensed to power any of its internal circuitry. The watchdog signal, stop time, external reset, and 24 VDC monitor input circuits shall be optically isolated from the monitor internal power supply.

POWER FAIL

A line voltage less than $85 \pm 2V(ac)$ for greater than 400 ± 100 ms shall be considered a power failure. A power failure shall not result in resetting the monitor.

POWER UP

The Model 2010 conflict monitor shall be compatible with the Model 170 controller as well as the Model 2070 controller which requires several seconds to power-up. When power is established, greater than $103 \pm 2 V(ac)$ for greater than 400 ± 50 ms, the 2010 will power up in the fault relay recovery mode:

When power is established, fault relay recovery shall be initiated. If the AC line voltage drops less than $103 \pm 2V(ac)$ for greater than 400 ± 50 ms at any time during this period, the monitor returns to fault relay mode. For an interval of 4.0 ± 0.5 seconds, the following will take place:

The failed state relay contacts remain closed.

All fault monitoring functions remain suspended.

The AC power indicator light flashes at a $4 \text{ Hz} \pm 20$ percent rate with 50 percent duty cycle.

At the end of this time interval the monitor begins counting watchdog signal transitions from the controller.

The resumption of normal fault monitoring shall follow fault relay recovery when:

The monitor has counted 5 transitions between the true and false state from the watchdog signal or 10 ± 0.5 seconds has elapsed from the time that power is established.

If the watchdog signal does not become active, the monitor shall enter a WDT error failed state (stop time output to the controller shall become active).

CABINET SIGNALS MONITORED

The Model 2010 conflict monitor shall be designed to monitor the green, yellow and red field output terminals of traffic signal cabinets. The cabinet 24 VDC supply, Model 170/2070 controller watchdog signal, red enable, special function 1, special function 2 and MC coil (pin EE) shall be monitored. If a fault condition is determined to have occurred, a relay output contact closure (failed state relay) places the cabinet and intersection into flash operation.

All monitored field output voltages shall be measured as true RMS up to 3 kHz, responsive to both positive half-wave and negative half-wave.

Dimming algorithms (such as alternating or omitting a cycle) shall not compromise the monitor's ability to detect fault conditions.

FAILED STATE OUTPUT CIRCUITS

An electro-mechanical relay shall be used to provide the failed state output circuit. The relay contacts shall be normally closed (failed state). The relay contacts shall be open when energized (normal operation). The function of this output circuit is to initiate flash operation within the cabinet and transfer field circuits from the load switch pack outputs to the flash bus during a failed state.

The failed state relay contacts shall be rated for a minimum of 3A at 120V(ac) and 100,000 operations. Contact opening and closing time shall be 30 ms or less.

A second output circuit (stop time output to the controller input) shall be provided separate from the failed state relay circuit. It shall be an optically coupled NPN open collector transistor circuit rated for 30 VDC open collector and shall sink a minimum 50 mA load to less than 1.5 VDC in the active state. A blocking diode shall be provided on the transistor output to prevent it from sourcing current into the controller.

The stop time output shall only be active during a failed state condition. The stop time output shall not be active during fault relay operation. When the monitor is reset, the stop time shall deactivate 250 ± 50 ms before the failed state relay.

MONITOR RESET

An internal reset (front panel momentary pushbutton switch labeled "RESET") and external test reset input shall be provided to reset the monitor to normal operation.

The internal reset switch shall be positioned so that it can be depressed while gripping the front panel handle. The external test reset input line shall be optically isolated from the internal circuitry.

The monitor, once triggered by detection of a fault, shall remain in that state until a reset command is issued. Reset is issued only by the internal reset or by the external test reset input. A reset issuance by either source (unit reset) shall be triggered by only the leading edge (to prevent a constant reset from a switch failure or a constant external input).

INPUT IMPEDANCE

Input impedance for all AC inputs (except power) shall be 150 kohms ± 20 percent. These resistors shall be capable of dissipating 1/4W each simultaneously.

CONNECTORS

The conflict program card connector shall be PCB 28/56P Type. The connectors shall use the "bifurcated bellow" type contact.

DOOR AJAR CIRCUIT

Pin 24 shall be connected to pin 25 on the monitor PCB at the edge connector and be capable of carrying 1.0A.

HANDLE

The top of the handle cannot be less than 102 mm below the top edge of the monitor front panel.

FUSE HOLDER

Fuse holders on the front panel shall be the low profile type. Fuses shall be 31.8 mm x 6.4 mm size.

SOCKETS

All microprocessors/micro controllers and erasable memory shall be socketed. Dip sockets shall have concentric funnel entry for lead insertion, Augat 500 Series or equivalent.

BATTERY

If a battery is used, battery failure shall not cause the monitor to fail to perform any required function or the loss of fault history.

EEPROM LABEL

All UV erasable memory shall be protected from UV light. All microprocessors, micro controllers and erasable memory with manufacturer's firmware shall be labeled with their name and firmware revision.

BLANK PCB

One blank PCB shall be supplied for each revision as a troubleshooting aid with every contract.

FUNCTIONAL REQUIREMENTS

GENERAL

BASIC FEATURES

The Model 2010 unit monitors the cabinet for unsafe operation. If an unsafe condition exists, the monitor will enter into a failed state. This places the cabinet into flash operation and applies stop time to the controller. If for any reason a basic feature is disabled, the corresponding indicator will flash at $2 \text{ Hz} \pm 20$ percent rate with 15 percent duty cycle.

24VDC FAIL

The cabinet +24 VDC does not meet the specified thresholds.

CONFLICT

When the green or yellow inputs to two or more channels are on simultaneously, and the combination(s) is not programmed as permissive on the conflict program card.

WDT ERROR

When the watchdog signal has ceased.

CONFLICT PROGRAM CARD AJAR

The conflict program card has been removed or is not properly seated in the connector.

MONITOR FAILURE

A fault is detected within the operation of the monitor itself.

CONFIGURATION CHANGE FAULT

A change in the configuration of the monitor from the stored setting.

EXTENDED FEATURES (RED MONITORING)

The monitor shall be designed to monitor multiple outputs, lack of outputs and duration of yellow interval. These comprise the extended features. To utilize extended features, the monitor requires a red enable signal. Extended features can be disabled by the MC Coil (pin EE) input. Extended features apply only to channels selected for red monitoring by turning the channel's dip switch on.

When extended features are not utilized, the Red Fail indicator will flash at $2 \text{ Hz} \pm 20$ percent rate with 15 percent duty cycle.

MULTIPLE OUTPUTS

Simultaneous indications of green, yellow or red field outputs on a single channel.

RED FAIL

No active field outputs on a channel(s) selected for extended features.

YELLOW ERROR

The absence of a minimum period of active yellow field output during a green to red sequence.

WATCHDOG SIGNAL

The monitor shall sense changes in the watchdog signal state. An absence of change for 1.00 ± 0.1 seconds shall place the monitor in a failed state.

YELLOW INHIBIT

Means shall be provided to selectively inhibit the monitoring of a yellow channel input. Yellow inhibit shall not disable multiple output and red fail monitoring on green and red.

POWER FAIL AFTER FAULT

In the event that the monitor senses a fault, followed by a loss of operating voltage, the initial failure status shall be redisplayed after restoration of power. When the monitor is in a failed state condition, it shall remain unchanged until a reset.

INSERTION OF UNIT

It shall be possible to insert the monitor, while the cabinet is energized, without placing the cabinet into flash operation, provided that the internal reset switch is held depressed while the unit is inserted. The failed state relay shall open in less than 1500 ms.

MONITOR FAIL

If a microprocessor is used in the monitor design, its program shall be written so that:

Hardware external to the microprocessor circuits shall be employed to constantly sense proper microprocessor operation.

An integrity test shall be performed on power up, on reset, and periodically at least once every 2 seconds. The test includes testing every cell of memory, wrap-around test, and as much hardware as practical. A checksum of the (E)EPROM contents shall be stored in a section of the (E)EPROM, for comparison in the integrity tests.

The monitor shall revert to monitor fail if a fault is detected with the microprocessor or during integrity tests.

The monitor fail condition shall not reset automatically when the fault condition goes away. A power off and on shall be required to clear the condition.

FRONT PANEL INDICATORS

The AC power indicator shall be green. Fault indicators shall be red. The monitor shall have either 16 red indicators or 16 sets of red, yellow and green indicators for channel inputs.

AC POWER

Shall illuminate when the AC line voltage exceeds $103 \pm 2V(ac)$, shall flash at a $2 \text{ Hz} \pm 20$ percent rate with 50 percent duty cycle during fault relay mode, and shall flash at a $4 \text{ Hz} \pm 20$ percent rate with 50 percent duty cycle during fault relay recovery.

VDC FAIL

Shall illuminate when the monitor has detected a 24 VDC failure.

CONFLICT

Shall illuminate when a conflicting signal condition has been detected.

WDT ERROR

Shall illuminate when the watchdog signal has ceased.

PC AJAR

Shall illuminate when the conflict program card has been removed or is not properly seated in its connector. This indicator shall remain illuminated until the monitor is manually reset. The indicator shall flash at $4 \text{ Hz} \pm 20$ percent rate with

15 percent duty cycle rate to indicate configuration change fault. The indicator shall flash in diagnostic mode to indicate previous faults.

MON FAIL

Shall illuminate to indicate an internal monitor failure.

RED FAIL

Shall illuminate when the monitor detects the absence of active output on any of the field outputs that comprise a monitored channel. The failed channel(s) shall be displayed on the corresponding channel indicator(s). When red monitoring is disabled, the indicator shall flash at 2 Hz ± 20 percent rate with 15 percent duty cycle.

MULT IND

Shall illuminate when the monitor detects simultaneous outputs on more than one of the field outputs that comprise a monitored channel (green, yellow, red). The failed channel(s) shall be displayed on the corresponding channel indicators(s).

YELLOW

Shall illuminate when the monitor detects the absence of a minimum period of active yellow field output during a green to red sequence. The failed channel shall be displayed on the corresponding channel indicator.

CHANNEL INDICATORS 1, 2, 3, ..., 16

ÿ One Indicator per channel

Channel indicators shall illuminate to display presently active green and yellow inputs in normal operation. Following VDC fail, conflict, WDT error and PC Ajar faults, indicators shall illuminate to display active inputs at the time of fault. Following red fail, mult ind or yellow faults, indicators shall illuminate to display channel(s) with problem.

ÿ Three Indicators per Channel (optional)

Indicators shall illuminate to display all active channels in normal operation. Following VDC fail, conflict, WDT error and PC Ajar faults, indicators shall illuminate to display active inputs at the time of fault. Following red fail or yellow faults, all 3 color indicators shall illuminate to display channel(s) with problem.

MONITOR BOARD EDGE CONNECTOR

PIN	FUNCTION (Back Side)	PIN	FUNCTION (Component Side)
1	Channel 2 Green	A	Channel 2 Yellow
2	Channel 13 Green	B	Channel 6 Green
3	Channel 6 Yellow	C	Channel 15 Green
4	Channel 4 Green	D	Channel 4 Yellow
5	Channel 14 Green	E	Channel 8 Green
6	Channel 8 Yellow	F	Channel 16 Green
7	Channel 5 Green	H	Channel 5 Yellow
8	Channel 13 Yellow	J	Channel 1 Green
9	Channel 1 Yellow	K	Channel 15 Yellow
10	Channel 7 Green	L	Channel 7 Yellow
11	Channel 14 Yellow	M	Channel 3 Green
12	Channel 3 Yellow	N	Channel 16 Yellow
13	Channel 9 Green	P	Not Assigned
14	Not Assigned	R	Channel 10 Green
15	Channel 11 Yellow	S	Channel 11 Green
16	Channel 9 Yellow	T	Not Assigned
17	Not Assigned	U	Channel 10 Yellow
18	Channel 12 Yellow	V	Channel 12 Green
19	Not Assigned	W	Not Assigned
20	Chassis Ground	X	Not Assigned

21	AC- Y		DC GROUND
22	Watchdog Signal	Z	External Test Reset
23	24VDC	AA	24VDC
24	Tied to Pin 25	BB	Stop Time (Output)
25	Tied to Pin 24	CC	Not Assigned
26	Not Assigned	DD	Not Assigned
27	Not Assigned	EE	Relay Output, Sd #2
28	Relay Output, Sd #1	FF	AC+

--Slotted for keying between pins 17/U and 18/V

MONITORING OF AC INPUT VOLTAGES

AC input voltages shall be measured as true RMS. At least 32 samples per cycle shall be used to determine RMS voltage. Inputs to any channels that exceed the specified threshold, shall be sensed as "on" and their respective channel indicators will be illuminated.

The on and off thresholds and associated timing apply to full-wave, positive half-wave, negative half-wave, alternating full-wave and any other dimming algorithms. The phase relationship of the channel input signals to the line voltage shall not affect the ability of the monitor to sense the defined input levels. Timing will not reset when the voltage at the field terminal is interrupted as part of a dimming algorithm. The RMS voltage in this case will be an average over several cycles.

CONFLICT PROGRAM CARD

A plug-in PCB conflict program card shall be provided in the monitor. The card shall insert through the monitor front panel. The card shall contain 120 diodes (1N4148 or equivalent). Each diode shall match 1 through 16 channels of possible conflict. The conflict program card shall be logically labeled and laid out in a horizontal/vertical pattern for easy identification of the diodes by channel as shown on the plan.

All diodes in place shall cause all output channels to be monitored for conflict. The anodes of the diodes shall be connected to the numbered pins on the edge connector and the cathodes to the lettered pins. When a diode is removed, its corresponding channel combination shall be defined as non-conflicting or permissive.

The conflict program card shall be 152.4 +2.5 -0.0 mm in depth (edge connector to monitor faceplate) by 133.4 +0.0 - 2.5 mm in height, and inter-mate with a 28/56 pin double sided connector having bifurcated contacts on 3.96 mm centers. The printed circuit board shall bisect its edge connector fingers at their centers to within ±0.40 mm. The center of the edge connector shall be 67.0 mm from either edge of the board. The conflict program card shall be provided with card ejectors for removal from the front panel.

Solder pads for 16 yellow inhibit jumpers shall be provided. Placement of a jumper between the channel yellow pin and the yellow inhibit common shall disable sensing that channel yellow input.

The monitor shall provide a mechanically sound support for the conflict program card and connector, with the use of continuous nylon card guides. When the conflict program card is resident in the monitor, the front edge shall be flush with the monitor front panel.

Pin 16 shall be connected to pin T on the conflict program card.

CONFLICT PROGRAM CARD

Connector Pin Assignments

PIN	FUNCTION (Back Side)	PIN	FUNCTION (Component Side)
1	Channel 2 Green	A	Channel 1 Green
2	Channel 3 Green	B	Channel 2 Green
3	Channel 4 Green	C	Channel 3 Green
4	Channel 5 Green	D	Channel 4 Green
5	Channel 6 Green	E	Channel 5 Green
6	Channel 7 Green	F	Channel 6 Green
7	Channel 8 Green	H	Channel 7 Green
8	Channel 9 Green	J	Channel 8 Green
9	Channel 10 Green	K	Channel 9 Green
10	Channel 11 Green	L	Channel 10 Green

11	Channel 12 Green	M	Channel 11 Green
12	Channel 13 Green	N	Channel 12 Green
13	Channel 14 Green	P	Channel 13 Green
14	Channel 15 Green	R	Channel 14 Green
15	Channel 16 Green	S	Channel 15 Green
16	PC AJAR	T	PC AJAR
17	Channel 1 Yellow	U	Channel 9 Yellow
18	Channel 2 Yellow	V	Channel 10 Yellow
19	Channel 3 Yellow	W	Channel 11 Yellow
20	Channel 4 Yellow	X	Channel 12 Yellow
21	Channel 5 Yellow	Y	Channel 13 Yellow
22	Channel 6 Yellow	Z	Channel 14 Yellow
23	Channel 7 Yellow	AA	Channel 15 Yellow
24	Channel 8 Yellow	BB	Channel 16 Yellow
25	Not Assigned	CC	Not Assigned
26	Not Assigned	DD	Not Assigned
27	Not Assigned	EE	Not Assigned
28	Yellow Inhibit Com	FF	N.C.

--The mating connector shall have a molded key between pins 24/BB and 25/CC.

FAULT RELAY MODE

LINE DROP OUT

The monitor will determine that a line drop out has occurred when:

The AC line voltage is less than 98 ± 2 V(ac) for great than 400 ± 50 ms

Within this time frame the monitor shall suspend all fault monitoring functions, close the failed state relay contacts and the AC power indicator on the front panel will flash at a rate of $2 \text{ Hz} \pm 20$ percent with 50 percent duty cycle to indicate line drop out status. The monitor remains in the fault relay mode until a line recovery has occurred.

LINE RECOVERY

The monitor will determine that a line recovery has occurred when:

The AC line voltage is greater than 103 ± 2 V(ac) for greater than 400 ± 50 ms

FAULT RELAY RECOVERY

When line recovery is established, fault relay recovery shall be initiated. If the AC line voltage drops less than 103 ± 2 V(ac) for greater than 400 ± 50 ms during this period, the monitor returns to fault relay mode. For an interval of 4.0 ± 0.5 seconds, the following will take place:

The failed state relay contacts remain closed.

All fault monitoring functions remain suspended.

The AC power indicator light flashes at a rate of $4 \text{ Hz} \pm 20$ percent rate with 50 percent duty cycle. At the end of this time interval the monitor begins counting watchdog signal transitions.

RESUMPTION OF NORMAL MONITORING

The resumption of normal monitoring shall follow fault relay recovery when:

The monitor has counted 5 transitions between the true and false state of the watchdog signal or 10 ± 0.5 seconds has elapsed from the time of line recovery.

If the watchdog signal does not become active, the monitor shall go into a WDT error failed state (stop time output to the controller shall become active).

RED MONITORING

RED ENABLE INPUT

The monitor extended features, red fail, multiple output, and yellow fail, are activated when the red enable input is on. The red enable controls all 16 channels.

Pin 20 of the red interface connector shall provide the red enable input to the monitor. When the red interface connector is disconnected, or red enable is off, the monitor performs only basic features.

The extended features are enabled on a per channel basis, by dip switch.

It shall be possible to plug and unplug the red interface connector without placing the cabinet into flash operation.

A connector, 3M - 3428-5302, with two 3518 polarizing keys, or equivalent, shall be mounted on the monitor front panel. The pin assignments of the red interface connector and terminal assembly.

MC COIL INPUT (PIN EE)

The monitor shall disable extended features when activation of the MC coil is detected, not initiated by the monitor (typically caused by the cabinet being in maintenance flash).

SPECIAL FUNCTION 1 AND 2 INPUTS

Special Function 1 (pin 8)

An AC input to the monitor, which will disable only the red fail monitoring functions while it is active (e.g. during railroad preempt).

Special Function 2 (pin 6)

Reserved for future use and shall be non-functional.

A means shall be provided to select either a presence of AC+ or lack of AC+ to enable these inputs.

RED INTERFACE CONNECTOR PIN ASSIGNMENTS

PIN	FUNCTION
1	Channel 15 Red
2	Channel 16 Red
3	Channel 14 Red
4	Chassis GND
5	Channel 13 Red
6	Special Function 2
7	Channel 12 Red
8	Special Function 1
9	Channel 10 Red
10	Channel 11 Red
11	Channel 9 Red
12	Channel 8 Red
13	Channel 7 Red
14	Channel 6 Red
15	Channel 5 Red
16	Channel 4 Red
17	Channel 3 Red
18	Channel 2 Red
19	Channel 1 Red
20	Red Enable

Keying shall be between pins 3 and 5, and between 17 and 19. The odd numbered pins are on one side, and the even pins are on the other. The P20 connector and the red interface connector shall be keyed the same (to prevent the red interface cable from being inserted into the P20 180 degrees out of alignment).

DIAGNOSTIC MODE

The monitor shall provide a means of reviewing the current and 2 previous faults, as well as the active channels at those times. Review of three faults shall be possible. Power loss shall not affect the retention of data.

The PC Ajar indicator shall flash to indicate which fault information is being displayed. While displaying information from the current fault, PC Ajar indicator shall flash at $1 \text{ Hz} \pm 20$ percent rate with 15 percent duty cycle. While displaying information from the previous fault, indicator shall pulse twice every second, 150 ms on, 150 ms off, 150 ms on, 550 ms off. While displaying information from the fault before that, the PC Ajar indicator shall pulse 3 times every second, 150 ms on, 150 ms off, 150 ms on, 150 ms off, 150 ms on, 250 ms off.

MONITOR CONFIGURATION

All settings: permissives, yellow inhibits, dip switch settings for extended features, other dip switch settings, jumper settings (if any) shall be clearly discernable visually on the monitor. The monitor configuration shall be transferred to non-volatile memory by pressing the reset switch for 5 seconds.

The monitor configuration will be compared to the stored configuration at power up, reset, and periodically, at least once every 2 seconds. A change in configuration shall cause a configuration change fault.

Configuration of the monitor may not be done through external means.

ELECTRICAL REQUIREMENTS

OPERATING RANGE

The monitor shall be fully operational from 85 to 135V(ac). Below $85 \pm 2\text{V(ac)}$ for $> 400 \pm 100$ ms the monitor shall suspend fault monitoring, de-energize the failed state relay and extinguish the AC power indicator light.

ISOLATION

AC (pin 31), chassis ground (pin 20) and controller logic ground (pin Y) shall be isolated from one another.

MONITORED AC INPUTS

The following voltage and time thresholds apply to all AC inputs, full-wave, positive half-wave, negative half-wave, alternating full-wave or other dimming algorithms.

GREEN AND YELLOW INPUTS

Any inputs less than 15.0V RMS shall be considered off
Any inputs greater than 25.0V RMS shall be considered on

RED, RED ENABLE AND SPECIAL FUNCTION INPUTS

Any inputs less than 50.0 V RMS shall be considered off
Any inputs greater than 70.0V RMS shall be considered on

MC COIL INPUT (PIN EE)

Input less than 50.0V RMS shall be considered MC coil in active
Input greater than 70.0V RMS shall be considered MC coil active

TIMING OF CONFLICTING INPUTS OR MULTIPLE INPUTS

Inputs on less than 200 ms shall not be considered a fault
Inputs on greater than 500 ms shall be considered a fault

TIMING OF RED FAIL

Lack of output less than 1200 ms shall not be considered a fault
Lack of output greater than 1500 ms shall be considered a fault

TIMING OF YELLOW FAIL

Duration of yellow greater than (minimum yellow setting) seconds shall not be considered a fault
Duration of yellow less than (minimum yellow setting) seconds shall be considered a fault

M in yellow setting shall be adjustable from 2.7 seconds to at least 4 seconds, in 0.2 second increments. Dip switches shall be used to configure the minimum yellow setting.

The duration shall be actual yellow time, not measured from end of green to start of red.

MONITORED DC INPUTS

24VDC INPUT

Input less than 18.0 VDC shall be considered low VDC input

Input greater than 22.0 VDC shall not be considered low VDC input

24VDC TIMING

Input less than 18.0 VDC shall be considered low VDC input

Input greater than 22.0 VDC shall not be considered low VDC input

WATCHDOG SIGNAL INPUT

Input less than 4.0 VDC shall be considered a low state

Input greater than 12.0 VDC (or open) shall be considered a high state

WATCHDOG ERROR TIMING

Lack of valid input state changes for less than 900 ms shall not be a fault

Lack of valid input state changes for greater than 1100 ms shall be a fault

PERIPHERALS

GENERAL REQUIREMENTS LOOP SENSORS

The sensor shall respond to changes in the inductance of the loop/lead-in combination. When there is sufficient change in induction, in response to vehicles passing over or remaining within vehicle loops, the sensor shall produce an output signal. The method of detection shall be based upon a design which shall provide reliable operation. The sensor shall be of solid state design.

The 222 sensor unit shall contain 2 channels and the 224 sensor unit shall contain 4 channels. Each sensor channel shall operate independently from each other. The sensor shall provide isolation between "field" input circuits and the controller unit input circuits.

A red detect indicator on the front panel, to indicate the true output, shall be provided for each channel.

A red or amber fault indicator on the front panel, to indicate the true output, shall be provided for each channel. The indicator shall flash in a pattern to indicate present or historical: open loop, shorted loop, or greater than 25 percent inductance change.

All indicator lights shall be water clear, ultra bright, T-1 package LEDs, clearly visible in direct sunlight.

A switch or switch position shall be provided to disable the field and output of each channel on an individual basis.

The sensor shall be mounted on a PCB with an edge-connector. It shall be conformal coated for environmental protection. The numbered and lettered sides of the PCB connector shall be commonly assigned.

The sensor shall operate and interface successfully with an associated LADOT sensing unit or element.

The sensors shall be capable of detecting all types of California licensed motor vehicles when connected to a loop/lead-in configuration as described below.

All UV erasable memory shall be protected from UV light. All microprocessors, microcontrollers and erasable memory with manufacturer's firmware shall be labeled with their name and firmware revision.

FUNCTIONAL REQUIREMENTS LOOP SENSORS

Each channel shall have a minimum of 4 operating frequencies selectable by switches. The frequencies shall be spaced so that there shall be no interference or crosstalk between different frequencies within one sensor and multiple sensors.

The sensor shall include means to prevent cross-talk with other modules. No additional external wiring shall be required to implement this.

Selection of frequency, sensitivity and mode shall be completely independent for each sensor channel.

Tuning for each sensor channel shall be done automatically. Environment changes and applied power drift shall not cause an actuation.

A valid channel input shall cause a ground true output of a minimum 100 ms duration.

An open, shorted or otherwise malfunctioning loop shall cause the sensor channel to output a constant ground true output to the controller for any modes.

Loop sensors shall comply with all performance requirements of this specification when connected to an inductance (loop plus lead-in) of 40 to 700 micro henries with a Q-parameter as low as 5 at the operating frequency.
A handle shall be provided to facilitate insertion and removal from the input standard file.

MODE SELECTION

Each sensor channel shall have two switch selectable modes of operation:

Pulse and presence.

Pulse Mode

Each new vehicle in the zone of detection shall initiate one channel output pulse of 125 ± 25 milliseconds. If a vehicle remains in a portion of the zone of detection for a period greater than 2 seconds, the channel shall automatically "tune out" the presence of this vehicle. The channel shall then be capable of detecting another vehicle entering the same zone of detection within 3 seconds of the first output pulse.

Presence Mode

The sensor channel shall recover to normal sensitivity within 1 second after termination of vehicle presence in the zone of detection, regardless of the duration of the presence.

With the sensitivity setting at its highest level, a vehicle that is within the zone of detection shall be detected for a minimum of 3 minutes when the inductance change is 0.02 percent, and a minimum of 10 minutes when the inductance change is 0.06 percent.

With the sensitivity setting at its lowest level, a vehicle that is within the zone of detection shall be detected for a minimum of 4 minutes when the inductance change is greater than 1.00 percent.

SENSITIVITY SELECTION

Test Configurations

Each sensor channel shall respond to an inductance change of 0.02 percent when connected to the following 3-turn loop configurations.

Each sensor channel shall be equipped with at least three selectable sensitivity settings to accomplish function with the following configurations:

Single 1.8 by 1.8 meter loop with a 76 meter lead-in cable.

Single 1.8 by 1.8 meter loop with a 305 meter lead-in cable.

Four 1.8 by 1.8 meter loops connected in series / parallel with a 76 meter lead-in cable.

Four 1.8 by 1.8 meter loops connected in series with a 305 meter lead-in cable.

Each sensor channel, when presence mode and lowest sensitivity are selected, shall respond to a nominal loop inductance change between 0.15 percent and 0.4 percent while connected to the above loop configurations. This setting shall not respond to an inductance change of less than 0.1 percent.

The sensor channel shall not detect vehicles, moving or stopped, at distances of 0.9 meters or more from the perimeter of any of the loop configurations listed above.

All sensitivity settings shall not differ more than ± 40 percent from the nominal value chosen.

In the presence mode, when the change is removed, the output shall open within 20 milliseconds.

RESPONSE TIMING-BOTH MODES

Response time of the sensor channel, when lowest sensitivity is selected, shall be less than 20 milliseconds.

Response time of the sensor channel, when highest sensitivity is selected, shall be less than 250 milliseconds.

ELECTRICAL REQUIREMENTS LOOP SENSORS

The loop sensor shall be fully operational within 30 seconds after the application of power.

The sensor shall be capable of compensating or tracking for an environmental change up to 0.001 percent change in inductance per second.

The sensor shall be capable of normal operation as the input inductance is changed ± 5.0 percent from the quiescent tuning point regardless of internal circuit drift.

The operation of the sensor shall not be affected by changes in the inductance or capacitance of the environment when the rate of change in temperature is less than 1°C per 3 minutes. The opening or closing of the controller cabinet door, with a temperature differential of up to 18°C between the inside and outside air, shall not affect the proper operation of the sensor.

Loop inputs to each channel shall be transformer isolated.

The output of each channel shall be an optically coupled NPN open collector transistor circuit rated for 30 VDC open collector and shall sink a minimum 50 mA load to less than 1.5 VDC in the active state. This output shall be compatible with the Model 170 and 2070 controller inputs.

The sensor shall respond to a ground reset signal of 15 microseconds or longer and begin normal operation within 2 seconds.

Each sensor channel shall be less than a 50 mA load to the +24 VDC supply and withstand a 700 mV RMS ripple on the +24 VDC supply.

LIGHTNING PROTECTION

Lightning protection shall be installed within the sensor unit.

Each sensor shall be able to withstand the discharge of a 10 microfarad capacitor charged to +1,000 VDC and -1,000 VDC directly across the loop input terminals without loop present.

Each sensor shall be able to withstand the discharge of a 10 microfarad capacitor charged to +2,000 VDC and -2,000 VDC directly across the loop input terminals and between either loop input terminal and earth ground. For purposes of this test, the sensor chassis shall be grounded and the loop input terminals shall have a 5.0 ohm resistive load attached.

EDGE CONNECTOR PIN ASSIGNMENT

The numbered and lettered sides of the PCB connector shall be commonly assigned.

PIN	FUNCTION
A	DC Common
B	+24VDC
---	Slotted for Keying
C	Reset
D/4	Loop #1 Input A
E/5	Loop #1 Input B
F	Output #1 (Collector)
H	Output #1 (Emitter)
J/8	Loop #2 Input A
K/9	Loop #2 Input B
L	Chassis Ground
M	AC neutral
---	Slotted for Keying
N	AC+
P/13*	Loop #3 Input A
R/14*	Loop #3 Input B
S*	Output #3 (Collector)
T*	Output #3 (Emitter)
U/17*	Loop #4 Input A
V/18*	Loop #4 Input B
W	Output #2 (Collector)
X	Output #2 (Emitter)
Y*	Output #4 (Collector)
Z*	Output #4 (Emitter)

Denotes terminals for the four channel unit, not used on two channel unit.

GENERAL REQUIREMENTS ISOLATORS - FUNCTIONAL

The isolators are units containing 2 channels which plug into the standard input file. Each channel shall provide isolation between field circuits and the controller unit.

Each isolator channel shall be operationally independent.

Each channel shall have a test switch to simulate a valid input. The test switch signal shall be inserted after the input isolation and prior to any of the timing circuits. The test switch shall be a 3 position toggle type with "on" (up), "off" (center) and "momentary on" (down) positions. The contacts shall be gold plated and capable of reliably carrying the switching current.

Each isolator channel shall have a LED indicator to provide visual indication of the status of the output. The indicator shall be "on" when the output is low, and the indicator shall be "off" when the output is high.

All indicator lights shall be water clear, ultra bright, T-1 3/4 package LEDs, General Instruments MK9160 (red), or equivalent.

The isolator shall be mounted on an edge connected printed circuit board. The numbered and lettered sides of the PCB connector shall be commonly assigned.

All controls and switches shall be accessible from the front panel.

The isolator shall be provided with a handle to facilitate insertion and removal from the standard input file.

The method of detection shall be based upon a design which shall provide reliable operation. The isolator shall be of solid state design.

The isolator shall operate and interface successfully with an associated LADOT sensing unit or element. A valid channel input shall cause a ground true output of a minimum 100 ms duration.

Power failure or restoration shall not cause an output to the controller unit.

GENERAL REQUIREMENTS ISOLATORS - ELECTRICAL

The output shall switch from the off state to the on state in less than 20 microseconds. The output shall switch from the on state to the off state in less than 20 microseconds.

Each channel output shall be an optically coupled NPN open collector transistor circuit rated for 30 VDC open collector and shall sink a minimum 50 mA load to less than 1.5 VDC in the active state. This output shall be compatible with the Model 170 and 2070 controller inputs.

The minimum isolation for DC isolators shall be 1,000 megohms and 2,500 VDC from input to output. The minimum isolation for AC isolators shall be 1,000 megohms at 500V(ac) from input to output.

The edge connector contacts shall be either silver or coin silver with gold over nickel plate rated for 5A at 120V(ac).

LIGHTNING PROTECTION

Lightning protection shall be installed inside the isolator.

The isolator shall withstand the discharge of a 10 microfarad capacitor charged to +1,000 VDC and -1,000 VDC directly across the input terminals without load present.

The isolator shall withstand the discharge of a 10 microfarad capacitor charged to +2,000 VDC and -2,000 VDC directly across the input terminals and between either input terminal and equipment ground. For this test, the isolator chassis shall be grounded and the input terminals shall have a 5.0 ohm resistive load.

BOARD EDGE CONNECTOR PIN ASSIGNMENT

PIN	FUNCTION
A	DC Common
B	+24VDC
---	Slotted for Keying
C	N/A
D	Input #1
E	Input #1 Common
F	Output #1 Collector
H	Output #1 Emitter
J	Input #2
K	Input #2 Common
L	Chassis Ground
M	AC neutral
---	Slotted for Keying
N	AC+
P	N/A
R	N/A
S	N/A
T	N/A
U	N/A
V	N/A
W	Output #2 Collector
X	Output #2 Emitter
Z	N/A

SPECIAL REQUIREMENTS - 242 DC ISOLATOR

Front panel of the isolator shall be labeled as to model number "242" and title "DC ISOLATOR". Channels shall be labeled as "CH 1" for the upper channel and "CH 2" for the lower channel.

Each input channel shall be turned on (true) when a contact closure causes an input voltage of less than +8 VDC, and shall be turned off (false) when the contact opening causes the input voltage to exceed +12 VDC. Each input shall deliver greater than 15 mA and less than 40 mA to an electrical contact closure.

A channel contact closure input of 5 ms or less shall not cause an output. An input duration of 25 ms or greater shall cause an output of 100 milliseconds minimum duration. An input duration between 5 ms and 25 ms may or may not cause an active output. The channel input shall reset within 25 ms after opening of either field input or input test switch.

The isolator shall have an internal power supply which shall supply $+20 \pm 4$ VDC to the field input side of the isolation channels. The Isolator shall not draw more than 2.5W from 120V(ac). No current shall be drawn from the +24 VDC.

SPECIAL REQUIREMENTS - 252 AC ISOLATOR

Front panel of the isolator shall be labeled as to model number "252" and title "AC ISOLATOR". Channels shall be labeled as "CH 1" for the upper channel and "CH 2" for the lower channel.

Each isolation channel shall be turned on, output true, when the input voltage exceeds 83 ± 3 V(ac) for a period of 150 ± 50 ms.

Each isolation channel shall be turned off, output false, when the input voltage falls below 67 ± 3 V(ac) for a period of 150 ± 50 ms.

INPUT - OUTPUT CONDITIONS

Refer to the following truth table for the relationship between the "AC input voltage", "front panel test switch", "front panel indicator" and the "output transistor".

AC Input Voltage	Test Switch	Indicator	Output Transistor
$> 83 \pm 3$	OFF	ON	ON
$> 83 \pm 3$	ON	ON	ON
$< 67 \pm 3$	ON	ON	ON
$< 67 \pm 3$	OFF	OFF	OFF

The input circuit shall be provided with hysteresis such that switching for the rising voltage occurs when the input exceeds $83 \pm 3V(ac)$ and switching for the falling voltage occurs when the voltage drops below $67 \pm 3V(ac)$. No change shall occur when the voltage remains in the hysteresis band i.e. between 70 and 80V(ac).

The input impedance of each input shall be greater than 8K ohms and less than 12K ohms at 60 Hz.

Each 252 AC isolator channel shall draw no more than 50 mA from the +24 VDC and shall withstand 700 millivolts RMS ripple on the +24 VDC line.

SPECIAL REQUIREMENTS - 255 RxR ISOLATOR UNIT

Front panel of the isolator shall be labeled as to model number "255" and title "RxR ISOLATOR". Channels shall be labeled as "CH 1" for the upper channel and "CH 2" for the lower channel.

Each isolation channel output shall be turned off, output false, when the input voltage exceeds $83 \pm 3V(ac)$ for a period of 150 ± 50 ms.

Each isolation channel output shall be turned on, output true, when the input voltage falls below $67 \pm 3V(ac)$ for a period of 150 ± 50 ms.

INPUT - OUTPUT CONDITIONS

Refer to the following truth table for the relationship between the "AC input voltage", "front panel test switch", "front panel indicator" and the "output transistor".

AC Input Voltage	Test Switch	Indicator	Output Transistor
$> 83 \pm 3$	OFF	OFF	OFF
$> 83 \pm 3$	ON	ON	ON
$< 67 \pm 3$	OFF	ON	ON
$< 67 \pm 3$	ON	ON	ON

The input circuit shall be provided with hysteresis such that switching for the rising voltage occurs when the input exceeds $83 \pm 3V(ac)$ and switching for the falling voltage occurs when the voltage drops below $67 \pm 3V(ac)$. No change shall occur when the voltage remains in the hysteresis band i.e. between 70 and 80V(ac).

The input impedance of each input shall be greater than 8K ohms and less than 12K ohms at 60 Hz.

Each 255 RxR isolator channel shall draw no more than 100 mA from the +24 VDC and shall withstand 700 millivolts RMS ripple on the +24 VDC line.

CABINET

GENERAL REQUIREMENTS

The cabinet shall be rainproof, with dimensions and design style as shown on the plans. The cabinet top shall be "crowned" a minimum of 12.7 mm to prevent standing water. Crown measurement is from cabinet top center to edge.

Each cabinet shall include City of Los Angeles identification. The name "City of Los Angeles" shall be molded, cast, or scribed in 6.4 mm letters on the outside, top center area of the front cabinet door.

Cabinet Assembly

The controller cabinet assembly shall be provided with a full complement of standard equipment, including, but not limited to:

- Power supply
- Input files I and J
- Power distribution assembly
- Output file
- Auxiliary output file (when requested)
- Communications terminal panel
- All related wiring and terminal facilities as described in the Specifications.

Output File

The output file shall be provided with:

- One monitor unit

Four flash transfer relays
One isolation relay
One logic relay

Power Distribution Assembly

The power distribution assembly shall be provided with:

One flash relay
Two Model 204 flashers

The following equipment shall be completely removable from the cabinet without removing any other equipment and using only a screwdriver:

24 VDC power supply assembly
Power distribution assembly
Input file
Output file
Monitor unit assembly
Cabinet light assembly

All fuses, circuit breakers, switches, (except police panel switches and fan fuse) and indicators shall be readily visible and accessible when the front door is open.

Shipping Pallet

The cabinet shall be delivered mounted on a plywood board shipping pallet whose construction and dimensions are shown on the plans. The pallet shall be bolted to the cabinet base. The cabinet shall be enclosed in a slipover cardboard packing shell.

All equipment in the cabinet shall be clearly and permanently labeled. Marker strips shall be located immediately below the item they are to identify and shall be clearly visible with the items installed. Marker strips shall be made of a material that can be easily and legibly written on using a pencil or ball point pen.

Resistor-capacitor transient suppression shall be provided at all AC relay sockets (across relay coils), the fan, and the cabinet light door switch.

A leakage resistor, which permits 3 to 8 VDC to be applied to the heavy duty relay coil, shall be installed across the terminals of each relay socket to overcome any residual magnetism.

MATERIAL AND STRUCTURE

The cabinet and doors shall be fabricated from 3.2 mm minimum thickness sheet aluminum. All exterior seams for cabinet and doors shall be continuously welded. All exterior welds shall be smooth. All edges shall be filed to a radius of 7.94 mm minimum.

The welding of the corners, sides and top of the cabinet shall be watertight and of equal or greater thickness than the base metal after the grinding and smoothing is completed. All construction shall be free of dents, scratches, weld burn-through and abrasions harmful to the strength and general appearance.

Cabinets fabricated from aluminum sheet shall conform to the requirements of ASTM Designation: B 209 for 5052-H32 aluminum sheet.

Welding on aluminum cabinets shall be done by the gas metal arc (Mig) or gas tungsten arc (Tig) process using bare aluminum welding electrodes. Electrodes shall conform to the requirements of the American Welding Society (AWS) A5.10 for ER5356 aluminum alloy bare welding electrodes.

Procedures, welders and welding operators for welding on aluminum shall be qualified in accordance with the requirements of AWS B3.0, "Welding Procedure and Performance Qualification". and to the practices recommended in AWS C5.6.

CABINET FINISH

The surface of each aluminum cabinet shall be finished using an anti-graffiti clear coat procedure as described below.

All exterior surfaces shall be cleaned with laquer thinner.

Wash all surfaces using a high pressure washer with liquid heated to 74°C.

Rinse all surfaces with clean water. Do not re-use rinse water.

Suspend all components to dry in such a manner as to prevent contamination on visible surfaces.

Place cabinet into oven for drying and initial heating for 15 minutes at 204°C.

Coat the entire cabinet exterior and doors with a base coat using TCI Wheel Silver #9811-0110. The film build shall not exceed 0.0508 mm total thickness.

Place coated items into oven and cycle for 10 minutes at 193°C to gel the silver base coat. Do not cure completely as this will result in poor inter-coat adhesion of the clear coat to the base coat.

Remove items from oven and once cool, apply a protective coat with a film build of 0.0635 mm to 0.0762 mm using TCI Anti-Graffiti Clear #9810-0231. Do not apply coat while surfaces are still hot. Return items to oven and fully cure at 193°C for 40 minutes.

The Engineer may require the Contractor to submit written certification of compliance to the requirements listed in these specifications.

DOORS

The cabinet shall have a front and a rear door, each equipped with a lock. When each door is closed and latched, the door shall be locked. The latching handles shall have provision for padlocking in the closed position. The operating handle shall be stainless steel with 190.5 mm handle and 12.7 mm minimum stainless steel shank. The handle shall open to the right out away from the cabinet on the front door, and to the left out away from the cabinet on the rear door.

The cabinet door frames shall be double flanged out on all 4 sides and shall be provided with strikers to hold tension on and form a firm seal between door gasketing and cabinet door frames. The flange width shall be a minimum of 25.4 mm, measured from the flange front edge to the housing inside surface. The cabinet door openings shall be a minimum 559 mm wide by 1435 mm high as shown on the plans.

Means shall be provided on the front door to hang 2 separate plastic envelopes. The envelopes shall be the side opening "zip" type, fabricated of heavy-duty clear plastic, measuring 279-x-381 (± 25) mm. Two, 9.525 mm (hole size) brass grommets shall be mounted on each envelope, spaced 320.68 mm center-to-center. The hanging apparatus and plastic envelopes shall be located so as not to interfere with the latching mechanism and air filter on the cabinet front door.

LOCKS

Cabinet locks shall be solid brass rim type comparable to Best Lock 5L series with interchangeable cores. For reference purposes, Best Lock numbers are:

Right Hand -- 5L6RL3XA7559-606

Left Hand -- 5L6RL4X47559-606

Each cabinet will be supplied with 2 locks, each with a contractor construction core, keyed alike to the standard factory construction core combination. Two keys will be supplied in each cabinet: one operating and one control.

The contractor shall furnish construction cores at no cost other than shipping charges for the return of the contractor construction cores to the manufacturer.

The locks shall have rectangular, spring-loaded bolts. The bolts shall have a 7.14 mm throw and shall be 19.05 mm wide by 9.53 mm thick (dimension tolerance is ± 0.89 mm). Locks shall be rigidly mounted with 2 stainless steel machine screws. In the locked position, the throw shall extend a minimum of 6.35 (± 7.94) mm.

The front portion of the lock shall not be recessed or allowed to extend more than 4.76 mm from the face of the door. Means shall be provided to prevent water from leaking into the cabinet between the Best Lock key shaft and the shaft hole of the cabinet. The locks shall be mounted on the door in such a position that the tumblers are in the upper quadrant.

LATCHES

The latching mechanism shall be a three-point draw roller type. The center catch and pushrods shall be plated. The pushrods shall be turned edgewise at the outward supports and have a cross section of 6.35 mm by 19.05 mm minimum. Supports shall be 2.67 mm minimum, and of the same material as specified for the housing. Rollers shall have a minimum diameter of 22.23 mm and shall be equipped with ball bearings and nylon wheels. The mounting hardware shall be 6.35 mm. The center catch shall be fabricated of 4.76 mm plated steel, minimum.

HINGES

Each door shall be equipped with 4 2-bolt hinges, minimum 88.9 mm long. Each hinge shall have a fixed pin. Front and rear doors shall be provided with catches to hold the door open at both 90 and 180(+10) degrees. The catches shall be 9.53 mm diameter minimum, plated steel rods.

Hinges shall be of the same material as the housing. Hinge pins and bolts shall be made of stainless steel. Hinge pins shall be welded at each end to form a cap and the welds filed or ground smooth. The pins and bolts shall be covered by the door edge and not accessible when the door is closed.

LIFTING EYES

The cabinet shall be provided with 2 removable lifting eyes. The lifting eyes shall be located to provide reasonable balance when the cabinet is lifted. Each eye opening shall have a minimum diameter of 25.4 mm and shall be capable of lifting 455 Kg. All dimensions shall be as shown on the plans. The lifting eye mounts shall be mechanically designed to eliminate possibility of water entry into the cabinet. The lifting screws shall be carriage bolt steel screws or compression sleeve with Allen head capable of lifting 455 Kg.

AIR INTAKE

The front door shall be provided with a louvered air intake. A disposable cotton/synthetic fiber filter shall be housed behind the intake (refer to APPENDIX A for filter specification). The filter's working area shall cover the intake opening area and be held firmly in place with bottom and side brackets and a spring loaded upper clamp. The filter supports shall be so structured that no incoming air shall bypass the filter.

The bottom filter bracket shall be formed into a waterproof sump with drain holes to the outside. The louvered intake shall be constructed such that a stream of water from an impulse-type sprinkler will not enter the housing.

POLICE PANEL

The police panel door shall be equipped with a lock keyed for a master police key and shall be mounted on the side of the cabinet as shown on the plans. The police panel assembly including switches shall not extend into the cabinet more than 38.1 mm. Two keys shall be furnished with each cabinet for the police lock. Each police key shall have a shaft at least 44.45 mm in length.

The police panel shall contain 2 DPST toggle switches. The switches shall be positioned so that the on position is up. One switch shall be labeled "ON-OFF" and the other "FLASH/AUTOMATIC". The switches shall have contacts rated for 15A at 120V(ac).

Police panel components connected to the line voltage shall be enclosed with a rigid metal covering to prevent electrical shock. The police panel doors that are flush mounted must be true to the surface of the cabinet and not misaligned in the closed position. There shall not be more than a 3.18 mm gap between the police door and the cabinet.

The isolation relay shall provide an input to the controller unit "flash sense" input when either the signals circuit breaker is in the "off" position or the auto-flash switch (police panel) is in the "flash" position.

RAILS

A Standard EIA 483 mm rack cage shall be installed inside the housing for mounting of the controller unit and cabinet assemblies. The EIA rack portion of the cage shall consist of 2 pairs of continuous, adjustable equipment mounting angles; angles are to be a minimum of 1346 mm in height, 3.4 mm nominal thickness plated steel tapped with 10-32 threads with EIA universal spacing. The angle shall comply with Standard EIA RE-310-B and shall be supported top and bottom by welded support angles to form a cage. The cage shall be attached to each side of the cabinet at 4 points, 2 at the top and 2 at the bottom of the rails. Cage support mounting angles shall be provided on either side level with the bottom edge of the door opening to provide both horizontal support and bolt attachment.

Clearance between rails for mounting assemblies shall be 451 mm. The distance between the front surface of the front mounting rail pair to the front surface of the rear mounting rail pair shall be 508 (± 2.54) mm.

Two plated supporting angles extending from the front to the back rails shall be supplied to support the controller unit. The angles shall be designed to support a minimum of 23 Kg each. The horizontal side of each angle shall be a minimum of 76 mm. The angles shall be mounted 445 mm from the top of the rail cage and shall be adjustable vertically.

The clear area for the controller unit shall extend a minimum of 38 mm in front of the front EIA angles and 406 mm behind the front EIA angles.

GASKETING

Gasketing shall be provided on all door openings and shall be dust-tight. Gaskets shall be 6.4 mm minimum thickness closed cell neoprene and shall be permanently bonded to the metal. The mating surface of the gasketing shall be covered with a silicone lubricant to prevent sticking to the mating surface. Should a substance other than a silicone lubricant be employed, the Contractor shall submit a sample to the Engineer for testing and evaluation. No cabinets employing the new substance shall be shipped without the prior written approval of the Engineer.

FAN AND EXHAUST VENT

Each cabinet shall be equipped with an electric fan with ball or roller bearings and a capacity of at least 2.8 cubic meters per minute.

The fan shall be mounted within the cabinet and vented out of the cabinet above the top of the door openings.

The fan shall be thermostatically controlled and shall be manually adjustable to turn on between 33°C. and 65°C. with a differential of not more than 6°C. between automatic turn-on and turn-off. The cabinet fan circuit shall be fused at 125 percent of the ampacity of the fan motor.

The intake and exhaust areas (including filter) shall pass a minimum of 1.7 cubic meters of air per minute.

The exhaust vent shall be so designed as to prevent water from entering the cabinet interior.

POWER SUPPLY ASSEMBLY

Electrical

A power supply shall be provided to supply +24 VDC to the input and output files for use by their associated devices. The power supply shall be of ferro-resonant design having no active components and conforming to the following requirements:

Line Regulation: Line regulation shall be 2 percent from 95 to 135V(ac) at 60 Hz, plus an additional 1.6 percent for each 1 percent deviation in frequency.

Load Regulation: Load regulation shall be 5 percent from 1A to 5A with a maximum temperature rise of 30°C above ambient.

Design Voltage: Design voltage shall be +24 +0.5 VDC at full load and 30°C with 115V(ac) input line after 0.5 hour warmup.

Maximum No-Load Voltage: Shall not exceed +27 VDC.

Full Load Current: 5A, minimum.

Ripple Noise: 2 volts peak-to-peak and 500 millivolts RMS at full load.

Line Voltage: 95 to 135V(ac).

Efficiency: 60 percent, minimum.

Minimum Voltage: 22.8 VDC

The assembly shall be furnished and mounted on the EIA 483 mm rack utilizing no more than 178 mm of rack height and having a maximum depth of 140 mm from the front surface of the front rails including rear terminal blocks.

The front panel shall include but not be limited to:

All fuses or circuit breakers properly labeled.

Power-on indicator for DC output, labeled "24 VDC PWR".

Power-on indicator for AC input, labeled "AC Power".

Test points or meter for monitoring the output DC voltages.

The power indicator, labeled "24 VDC PWR", shall be a 24 VDC lamp, Dialight 507 Series LED Cartridge, Type 507-4761-3331- 500 with dialight datalamp cartridge holder Type 508-8738-504 or equivalent. The lamp shall be tied across the power supply output on the fused side.

The test points shall be banana jacks and shall be connected in parallel with the power indicator. They shall be labeled by polarity with the positive jack red in color and the negative jack black in color.

The power supply fuses shall protect the input (AC) and output (DC) circuitry of the power supply. The fuses shall be rated at 125 percent of the full load current in their respective circuits.

The power supply assembly including terminals shall be protected to prevent accidental contact with energized parts.

The power supply cage and transformer shall be securely braced with nylon strapping to minimize the possibility of damage in transit.

The power indicator, labeled "AC Power", shall be a 120 volt ac lamp, Dialight 507 Series Neon Cartridge Type 507-4537-0937- 640 with dialight datalamp holder Type 508-8745-504 or equivalent. The lamp shall be tied to the fuse holder and after the fuse.

INPUT FILE

The input file shall be wired and connected as shown on the plans. The wiring harnesses from the field input terminal blocks to the rear of the input file from the detector inputs shall have lugs on both ends that have been crimped and soldered.

The file shall utilize no more than 133 mm of EIA rack height. The file shall intermate with and support 14 2-channel loop detector units. The file shall allow air circulation through the top and bottom of the assembly.

The file shall provide a 22 pin, single readout PC edge connector centered vertically for each 2-channel detector. The edge connectors shall be double-sided having contacts on 3.96 mm centers with the number and letter sides of each pin shorted internally. Pins D, E, F, J, K, L and W shall be brought out to an 8 position terminal block on the back of the file. The output emitters shall be common grounded with the ground terminating at TB15, position 4.

The input file shall have PC card guides both top and bottom. The card guides shall begin 25.4 (+12.7) mm from the front face of the file. The input file shall be provided with marker strips above and below the isolators and detectors in the file in order to identify them.

OUTPUT FILE

Card guides (top and bottom) shall be provided to support the switch packs and monitor unit.

The output file shall be provided with marker strips to identify switch packs in the file. The marker strips shall be made of a material that can be easily and legibly written on using a pencil or ball point pen. Marker strips shall be located immediately below the switchpack they identify.

Switch pack connectors, monitor unit connectors, flash transfer relay sockets and flash programming connectors shall be accessible, via a hinged swing down rear panel, from the back of the output file without the use of tools.

Field wire terminal blocks shall be mounted vertically on the back of the assembly. The 3 terminal blocks shall be the 12 terminal type.

Output files and 120V(ac) circuits shall be hand-wired; printed circuit boards will not be acceptable for current carrying circuits.

The monitor unit compartment including the housed monitor unit exclusive of handle shall extend no farther than 32 mm in front of the 483 mm rack front surface. The switch pack socket connector front surface shall be no more than 216 mm in depth from the front surface of the output file.

The output file shall utilize 267 mm of rack height and shall be capable of containing 12 Model 200 switch packs, 4 flash relays, and the monitor unit. Four flash relays and one monitor unit shall be furnished with each output file. The depth of the assembly shall not exceed 368 mm from the front cabinet rails including terminal blocks and relays.

The controller unit outputs to the output file shall be connected through connector C4.

The red and yellow signal circuits of all vehicle switch packs shall be available at a Molex Type 1375 plug to allow flash programming. Plug connectors, with programming jumpers shall be furnished for each circuit to allow red or yellow flash programming. Requirements are: 8 red and 8 yellow. Connectors shall be readily accessible without the removal of any other equipment. Plug pins shall be crimped and soldered.

The monitor connector shall be a rigidly supported printed circuit board edge connector, having 2 rows of 28/56 independent double readout bifurcated contacts on 3.96 mm centers. The connector shall intermate with the Model 2010 monitor unit. Anti static sheeting shall line the sides of the monitor housing.

It shall be possible to remove the monitoring device without causing the intersection to go into flashing operation. The cabinet shall be wired so that with the front cabinet door closed and with the monitor unit removed, the intersection shall go into flashing operation. The cabinet shall contain a conspicuous warning against operation with the monitor unit removed.

The monitor unit connector shall be wired in accordance with the pin assignment shown on the plans.

A connector and terminal assembly designated as P20 (Magnum P/N 722120 or equivalent) for monitoring the absence of red shall be an integral part of the output file. The connector shall intermate and be compatible with the cable and connector of a Type 2010 CMU capable of monitoring the absence of red. The pin assignments of the P20 connector and terminal assembly shall be as shown on the plans.

A means of connection shall be available to extend the monitoring of channels 9, 10, 11 and 12 to an auxiliary output file. Some means of connection shall be made available for the pedestrian don't walk circuits.

The P20 connector and the CMU connector shall be keyed physically alike to prevent the absence-of-red cable connector from being inserted into P20 180 degrees out of alignment.

The flash relay shall be a heavy duty type. It shall be energized only when the signals are in flashing operation and the police panel "on-off" switch is "on". The flash relay shall transfer field outputs from switch pack output to flash control. Transfer of the flash relay circuit to flash control shall not interrupt the operation of the controller unit.

AUXILIARY FILE

The auxiliary output file shall comply with electrical and mechanical plans and consist of the following:

- Six Model 200 switch packs
- Two flash transfer relays

The red and yellow output circuits of switch packs No. 1, 2, 4, and 5 shall be made available at a Molex receptacle/plug connection for flash selectability.

A C-5 connector amp part No. 206838-1

Three, 6 position terminal strips for field wire connection.

One, 7 position terminal strip for cabinet connection.

POWER DISTRIBUTION ASSEMBLY

The power distribution assembly shall be furnished and mounted on the EIA 483 mm rack utilizing no more than 178 mm of rack height. All equipment shall be readily accessible for ease of replacement. The depth of the assembly including terminal blocks shall not exceed 254 mm. Wiring leaving the rear of the PDA shall be of sufficient length and flexibility to allow access to the internal components.

The following equipment shall be provided with the power distribution assembly:

Two Equipment receptacles (one on the front panel and another on the back panel)

One controller unit duplex receptacle

One main circuit breaker

One five-pole signal bus circuit breaker

One two-pole flash bus circuit breaker

One equipment circuit breaker

One mercury contactor

One auto/flash switch

One flash relay (heavy duty type) and socket

Two flasher unit sockets

Two Model 204 flasher units

One flash indicator light required terminal blocks

The main circuit breaker shall be rated for 50A at 120V(ac). The signal bus circuit breakers shall be rated for 15A at 120V(ac) and the flash bus breakers for 20A at 120V(ac).

The 5 signal bus circuit breakers shall not be mechanically ganged. The opening of any one or more of the 5 signal breakers shall initiate a "flash transfer" and only those breakers that opened shall indicate so. The circuit breakers shall be of the same type as Potter and Brumfield single pole, 15A, 120V(ac), 50/60 Hz, curve 3 type breakers that have the auxiliary switch feature or equivalent.

The circuit breakers for the equipment receptacles shall be for 15A at 120V(ac). Rating of breakers shall be shown on face of breaker or handle. Breaker function shall be labeled below breakers on front panel.

Equipment receptacles shall be NEMA 5-15R duplex type and the first receptacle in the circuit shall have ground-fault circuit interruption as defined in the National Electrical Code. Circuit interruption shall occur on 6 mA of ground-fault current and shall not occur on less than 4 mA of ground-fault current.

An "auto/flash" switch shall be provided which, when placed in "flash" position (down), shall energize the mercury contactor (MC) coil. When the switch is placed in the "auto" position (up) the switch packs shall control the signal indications. The switch shall be a single-pole, single-throw toggle switch rated for 15A at 120V(ac).

The flash indicator shall be a 120V(ac) lamp, Dialight 507 Series Neon Cartridge Type 507-4537-0937-640 with dialight datalamp holder Type 508-8745-504 or equivalent. The lamp labeled "Flash Operation" shall be provided on the front panel of the assembly. The lamp shall be driven by the flasher unit output through transfer relay circuit No. 1.

The controller unit receptacle shall be a hospital grade NEMA 5-15R mounted on the back panel of the assembly.

Terminal blocks shall be provided and mounted on the back panel of the assembly. The blocks shall be of the type specified for signal field wire terminal blocks. All conductors from the power distribution assembly routed to the cabinet wiring shall be connected to the terminal block on the common side, except for the AC power conductor between the service terminal block and main circuit breaker. All internal wiring terminating at the blocks shall be connected to the opposite side of the blocks. Terminal position assignments shall be as shown on the plans.

The isolation relay shall provide an input to the controller unit "flash sense" input when either the signals circuit breaker is in the "off" position or the auto-flash switch (police panel) is in the "flash" position.

The operation of the flasher circuit breaker shall provide an "input" to the Input File J11-D position.

HEAVY DUTY RELAY

Heavy duty relays shall be the electro-mechanical type designed for continuous duty at 95 to 135V(ac).

Each relay shall have a BEAU 5408 plug connector (or equivalent) and be enclosed in a removable, clear plastic cover. The manufacturer's name, electrical rating and part number shall be placed on the cover. Markings shall be permanent, durable and readily visible from a distance of 0.9 meters.

Each relay shall be provided with double-pole, double-throw contacts. Contact points shall be of fine silver, silver alloy or superior alternative material. Contact points and arms shall be capable of switching a 20A tungsten load per contact at 120V(ac) once every 2 seconds with a 50 percent duty cycle for at least 250,000 operations without contact welding or excessive burning, pitting or cavitation. The relay coil shall have a power consumption of 10 volt-amperes or less.

Each relay shall withstand a potential of 1,500V(ac) at 60 Hz between insulated parts and between current carrying or noncarrying parts. Each relay shall have a one cycle surge rating of 175A RMS.

SIDE PANELS

Two panels shall be provided and mounted on the EIA rack parallel to the cabinet sides as shown on the plans.

In viewing from the back door, the left side panel shall be designated as the "input panel" and the right side panel shall be designated as the "service panel".

All input field terminal blocks for detector field cables and other input conductors, except service conductors, shall be mounted on the "input panel".

CONNECTORS

Connector C1P shall contain 104 pin contacts and shall intermate with connector C1S mounted on the controller unit chassis. Corner guide pins for connector C1P shall be stainless steel and shall be 27.9 mm in length. Corner guide socket assemblies shall be stainless steel and shall be 15.9 mm in length.

Connector C4 shall contain 37 contacts and shall be the circular plastic type with quick connect/disconnect capability and thread assist, positive detent coupling. The plug connector C4P shall be mounted on the output file. Contact assignments are shown on the plans.

Connector C5 shall contain 24 contacts and shall be the circular plastic type with quick connect/disconnect capability and thread assist, positive detent coupling. The plug connector C5 shall be mounted on the input file. Contact assignments are shown on the plans.

Connector blocks for connector C1 pin and socket connectors shall be constructed of diallyl phthalate or better. Contacts shall be secured in the blocks with springs of stainless steel.

All wires terminating in connectors, unless otherwise noted, shall be crimped or soldered. Any other type of connectors shall be approved by the Engineer prior to submitting the sample unit.

Data or signal carrying connectors shall have redundant areas of contact that will insure a contact resistance of 123 milliohms maximum at a rating of 3.0A of current.

Power carrying connectors shall have redundant areas of contact that will insure 12 milliohms maximum of contact resistance at 15A of current.

All connectors shall have an operating temperature range of 55°C to 105°.

Some method of internal or external keying shall be present in every connector. If 2 or more connectors in an assembly are of the same type, all connectors shall be keyed differently and shall be permanently labeled in a way that will identify their correct interconnection.

CABINET WIRING DIAGRAM

Four sets of non-fading cabinet wiring diagrams shall be supplied with each cabinet. The diagrams shall be nonproprietary. They shall identify all circuits in such a manner as to be readily interpreted. The cabinet drawing shall show complete, on a single plan sheet, the C-1 listing, the Input File assignment and the component layout in an elevation view (as viewed from the rear of the cabinet with the left and right cabinet walls shown in their relative positions).

The diagrams shall be placed in the plastic envelopes on the front door.

Detailed equipment layout scale drawings and wiring diagrams of all equipment installed in the cabinet shall be submitted for approval prior to production.

CONDUCTORS

Conductors used in cabinet wiring shall terminate with properly sized spring-spade type terminals or shall be soldered to a through-panel solder lug on the rear side of the terminal block. All crimp-style connectors shall be applied with a power tool, which prevents opening of the handles until the crimp is completed. Crimp type connectors shall not be used on solid wires within any assembly unless they are soldered.

Conductors in the controller cabinet between the service terminals and the signal bus breakers including the chassis ground conductor to the power distribution assembly shall be No. 6, or larger.

The loop detector lead-in, from the field terminals in the cabinet to the sensor unit rack connector shall be a cable containing 2 No. 22, or larger, conductors, with a minimum of 7 strands. The connections at each end of the cable shall be soldered as well as crimped. Each conductor shall be insulated with either:

- A minimum of 0.254 mm of polyvinylchloride and 0.0508 mm of nylon, or
- A minimum of 0.3556 mm of polyethylene or polypropylene.

The conductors shall be twisted and the twisted pair shall be protected with a shield. The shield or a stranded tinned copper drain wire shall be connected to a terminal on the input file terminal block. This input terminal shall be connected to the equipment grounding bus through a single conductor. The cable shall be provided with a polyethylene or polyvinyl chloride outer jacket with a minimum thickness of 0.506 mm, or with a chrome vinyl outer jacket with a minimum thickness of 0.635 mm.

All conductors, except those which can be readily traced, shall be labeled. Labels attached to each end of the conductor shall identify the destination of the other end of the conductor.

All conductors used in the controller cabinet shall conform to the following code requirements:

The grounded conductors of AC circuits shall be identified by a continuous white color.

The equipment grounding conductors shall be identified by a solid green color or by a continuous green color with one or more yellow stripes.

The DC logic ground conductors shall be identified by a solid white color with a red stripe.

The ungrounded conductors shall be identified by any color not specified in these special provisions.

All cabinet wiring harnesses shall be neat, firm and routed to minimize crosstalk and electrical interference. Printed motherboards are to be used where possible to eliminate or reduce cabinet wiring.

Wiring containing AC shall be routed and bundled separately or shielded separately from all logic voltage control circuits.

Cabling shall be routed to prevent conductors from being in contact with metal edges whenever possible. If cabling shall be in contact with metal edges, those edges shall be covered with a nylon (or equivalent) non-abrasive, smooth shield. Cabling shall be arranged so that any removable assembly may be removed without disturbing conductors not associated with that assembly.

All conductors, terminals or parts, which could be hazardous to maintenance personnel shall be protected with suitable insulating material.

Within the cabinet wiring, the DC logic ground and equipment ground shall be electrically isolated from the AC grounded conductor and each other by 500 megohms when tested at 250 VDC, with the power line surge protector disconnected.

Conductors from connector C1 to the input files shall be of sufficient length to allow any conductor to be connected to any detector output terminal (positions S, F, W).

The AC- copper terminal bus shall not be grounded to the cabinet or connected to the logic ground and shall provide a minimum of 10 terminals for connection to field conductors. Nylon screws with a minimum diameter of 6.4 mm shall be used for securing the bus to the service panel.

An equipment grounding (earth ground) bus shall be provided in each cabinet. The bus shall be copper and grounded to the cabinet.

One side of the load side of the cabinet power supply shall be connected to the DC logic ground bus using a No. 14, or larger, stranded copper wire.

The DC ground bus shall be located on the input panel as shown on the plans.

A No. 8, or larger, copper conductor shall be connected between equipment ground bus and rack rails.

CABINET LIGHT

Each 332 cabinet shall be equipped with one fluorescent lighting fixture Model Sentinal No. SL20A10RS or equivalent mounted inside the top front portion of the cabinet. Any fixture other than the specified unit shall be submitted to the Engineer for approval, prior to the delivery of the sample unit. The fixture shall have an F-15-T-8 cool white lamp; operated from a normal power factor, U.L. listed ballast. A door actuated switch shall be installed to turn the cabinet light on when the front door is opened. The door switch shall be on a separate circuit by itself; and used only to turn on the cabinet light.

CABINET VERIFICATION PROGRAM

The Vendor shall furnish a cabinet verification program with each contract, resident in 27256 EPROMS that will execute in a Type 170 controller unit. The program shall test cabinet wiring related to the output file, input file, the police panel, and flash switches. The program shall check conflict monitor operation by generating all possible conflicts, in sequence, and resetting the monitor automatically. It shall check all operational features of the monitor including red monitoring and the "plus" features.

Ten copies of a cabinet verification program software manual shall be supplied per contract. The manual shall give full and complete documentation of test procedures, including, but not limited to:

- Cabinet verification test operation
- Individual diagnostic tests
- Program listing in assembly format, with detailed comments
- Detailed flow charts, which are keyed to the software listing using instruction addresses and subroutine names

TERMINAL BLOCKS

Terminal blocks shall be provided for terminating field conductors. They shall be readily accessible through the cabinet rear door and shall be rated for 20A at 600 V(ac) RMS, minimum.

The terminal blocks for detector field conductors, auxiliary field wires and control wires shall be the heavy duty barrier type and shall be provided with 10-32 by 7.9 mm nickel plated brass binder head screws and nickel plated brass inserts.

The terminal blocks for field wires to the signal indications and power distribution assembly shall be the barrier type and shall be provided with 10-32 by 7.9 mm nickel plated brass, combination slotted/phillips, binder head screw and nickel plated brass inserts.

The terminal blocks for the input file and power supply shall be the barrier type and shall be provided with 8-32 by 7.9 mm nickel plated brass, combination slotted/phillips, binder head screws and nickel plated brass inserts.

The terminals of the power line service terminal block shall be labeled "L1" and "AC-", and shall be covered with a clear insulating material to prevent inadvertent contact. Terminating lugs large enough to accommodate No. 2 conductors shall be furnished for the service terminal block. The terminal block shall be rated for 50 amperes at 600 volts peak, minimum.

A 12 position terminal block, equivalent to those described in 6.1.26.2 (above), and labeled "TB0" shall be provided. The block shall be located a minimum 559 (± 25) mm, from the bottom, and 34.9 (± 3.2) mm, from the right edge of the 332 cabinet "service panel".

A 12 position terminal block conforming to the requirements of this special provision and labeled "TBB" shall be provided and wired according to the drawing.

POWER LINE SURGE PROTECTORS

Two types of power line surge protectors shall be provided between both line conductors (AC+ and AC-) and equipment ground. The protectors shall be installed at the service terminal block.

The first type of surge protector shall be the three-electrode gas tube type and shall have the following ratings:

Impulse Breakdown: Less than 1,000V in less than 0.1 microseconds at 10 kilovolts / microsecond.

Standby Current: Less than one milliamperere ! Striking Voltage: Greater than 212 VDC.

Capable of withstanding 15 pulses of peak current each of which will rise in 8 microseconds and fall in 20 microseconds to one-half of the peak voltage at 3 minute intervals. Peak current rating shall be 20,000 amps.

The second type of surge protector shall be the Metal Oxide Varistor (MOV) type. One shall be in-stalled between AC+ and equipment ground, AC- and equipment ground, and AC+ and AC-. The MOVs shall have the following ratings:

Recurrent Peak Voltage: 212V

Energy Rating Maximum: 50 joules

Power Dissipation: Average 0.85W

Peak Current for Pulses: 2,000A for less than 6 microseconds

Standby Current: Less than 1 milliamperere

TRANSIENT SUPPRESSION

Transient suppression circuits shall be provided at the relay bases (across relay coils), fan and cabinet light door switch.

COMMUNICATIONS TERMINATION PANEL

Each Model 332 cabinet shall be provided with a communications termination panel, which provides a mounting location for communications cable termination blocks, over voltage protection devices, and the termination points for the C2P harness and connector.

Panel Construction

The panel shall be fabricated from 3.2 mm sheet aluminum, and shall have the dimensions shown on the plans. The panel shall be drilled and tapped as necessary to mount the terminal blocks and other attachments described below, as well as to mount the panel to the EIA rack within the cabinet. Sharp edges or burrs caused by the cutting or drilling process shall be removed. Corners shall be rounded with a 19 mm radius.

Communications Cable Terminal Block (CTB-1)

Communications cable terminal blocks shall be quick-connected blocks consisting of 50 horizontal rows of 6 clips per row, mounted in a molded self-extinguishing plastic case. The horizontal rows of 6 clips shall be divided into 2 sets of 3 electrically common clips. The 2 sets of 3 clips shall be connected by a bridge clip. These blocks, commonly referred to "66B Type" blocks, shall terminate 25 pairs of 20 through 24 AWG solid unstripped conductors. The blocks shall be equipped with integral fanning strips and an enclosed back to prevent grounding of clips to the panel. The block shall be mounted on the panel, as shown on the plans.

Active Pairs Termination Block (CTB-2)

A 6 position, dual screw, closed back barrier strip shall be mounted on the communications termination panel, as shown on the plans. The strip shall be rated at 15A and shall be provided with 6-32 by 6.4 mm nickel plated brass binder head screws.

Test Point Termination Block (CTB-3)

An 8 position, single screw, closed back barrier strip shall be mounted on the communications termination panel, as shown on the plans. The strips shall be rated at 15A and shall be provided with 6-32 x 6.4 mm nickel plated brass binder head screws.

Over voltage Protection

An over voltage surge protector shall be provided on each of the 3 active communications cable pairs (the voice pair, audio-in pair, and audio-out pair) terminating in the cabinet. The protectors shall be installed on the active pairs termination block (CTB-2). Protectors shall be of the three-electrode gas tube type, and shall have the following ratings:

Impulse life (1,000A, 10/1000 waveshape at one minute intervals each direction, with 500 A on each side to ground simultaneously): 1,000 surges minimum, 2,500 surges typical

AC discharge current, 11 cycles, 60hz: 400A RMS, 200A on each side to ground simultaneously

Maximum Single Impulse Discharge Current, 8/20 waveshape: 40 ka maximum, 20 ka/side simultaneously

Capacitance: Line-ground = 4 pf, Line-line = 2 pf

DC Holdover: 180 VDC typical at 200 mA, 150 VDC minimum

DC Arc Voltage: 30V typical

Glow to Arc Transition Current: 1.0A typical

Transition Time: 0.5 microseconds maximum

Line-Ground Impulse Breakdown Voltage at 10 kv/sec: 1000V maximum average

Insulation Resistance

1,000 megohms minimum at 100 VDC (line-ground) The protectors shall be encapsulated, and shall be equipped with minimum 51 mm long, spade lug tipped leads. Maximum size of each protector shall be 13-by-13-by-51-mm. The grounding lead shall be attached to the panel's grounding stud.

Grounding Stud

A grounding stud shall be provided on each panel. The stud shall extend through the panel. The over voltage protection devices' ground leads shall be attached to the stud on the front side of the panel. A No. 8 AWG copper conductor shall connect to the stud on the back side of the panel, and shall connect to the cabinet's equipment grounding bus.

C2P Harness and Connector

A 12-conductor jacketed cable shall be attached to terminal blocks CTB-2 and CTB-3 with soldered ring lugs, as shown in the plans. The cable shall terminate in a standard C2P connector, and shall be routed through the cabinet and be of sufficient length to reach the C2S connector on the back of the Type 170 controller unit, when the unit is installed in the equipment rack.

Feed-Through Opening

As shown on the plans, a feed-through opening, complete with protective grommet, shall be provided on the panel to protect the C2P harness. A strain relief device shall also be provided.

Cable-Tie Openings

Two, 6.4 mm diameter holes shall be provided, as shown on the plans, for future installation of cable ties.

Attachment to Equipment Rack

The panel shall be securely attached to the equipment rack, as shown on the plans.

337 CABINET

GENERAL

The cabinet shall be a rainproof, outdoor, pedestal-mounted type with dimensions as shown on the plans. The cabinet top shall be "crowned" a minimum of 6.4 mm to prevent standing water. Crown measurement is from cabinet top center to edge.

Each cabinet shall include City of Los Angeles identification. The name "City of Los Angeles" shall be stamped in 6.4 mm letters on the outside, top center area of the front cabinet door.

The controller cabinet assembly shall be provided with a full complement of standard equipment, including, but not limited to:

- One slipfitter
- One monitor unit
- One Model 204 flasher
- Three Model 430 flash transfer relays
- One flash relay
- One Communications termination panel

All equipment requiring identification shall be clearly and "permanently" labeled (silk screening preferred).

Whenever feasible, cabling from the PDA, Input, and output files to any terminals or connectors shall be routed between the cabinet wall and the rack assembly side panels.

MATERIAL AND STRUCTURE

The cabinet and doors shall be fabricated from 3.2 mm minimum thickness sheet aluminum. All exterior seams for cabinet and doors shall be continuously welded. All exterior welds shall be smooth. All edges shall be filed to a radius of 0.76 mm minimum.

The welding of the corners, sides and top of the cabinet shall be watertight and of equal or greater thickness than the base metal after the grinding and smoothing is completed. All construction shall be free of dents, scratches, weld burn-through and abrasions harmful to the strength and general appearance.

The bottom of the cabinet shall be reinforced in such a manner as to provide solid support for the entire weight of the cabinet assembly, fully equipped, on a 102 mm pedestal mount slipfitter. Reinforcing shall consist of 2, 114-by-19-mm support channels, opened face down, welded across the bottom front and rear of the cabinet, and extending from side to side. 127 mm square slipfitter mounting support bracket shall be installed and welded to the 2 support channels. Four, 6.4 mm drain holes shall be provided through the lowest surface of each of the support panels. Four 3.2 mm drain holes shall be provided at the cabinet bottom as shown on the plans. Any bottom support configuration other than that specified must be approved by the Engineer.

Cabinets fabricated from aluminum sheet shall conform to the requirements of ASTM Designation: B 209 for 5052-H32 aluminum sheet.

Welding on aluminum cabinets shall be done by the gas metal arc (Mig) or gas tungsten arc (Tig) process using bare aluminum welding electrodes. Electrodes shall conform to the requirements of the American Welding Society (AWS) A5.10 for ER5356 aluminum alloy bare welding electrodes.

Procedures, welders and welding operators for welding on aluminum shall be qualified in accordance with the requirements of AWS B3.0, "Welding Procedure and Performance Qualification", and to the practices recommended in AWS C5.6.

CABINET FINISH

The surface of each aluminum cabinet shall be finished using an anti-graffiti clear coat procedure as described below:

All exterior surfaces shall be cleaned with lacquer thinner.

Wash all surfaces using a high pressure washer with liquid heated to 74°C.

Rinse all surfaces with clean water. Do not re-use rinse water.

Suspend all components to dry in such a manner as to prevent contamination on visible surfaces.

Place cabinet into oven for drying and initial heating for 15 minutes at 204°C.

Coat the entire cabinet exterior and doors with a base coat using TCI Wheel Silver #9811-0110. The film build shall not exceed 0.0508 mm total thickness.

Place coated items into oven and cycle for 10 minutes at 193°C to gel the silver base coat. Do not cure completely as this will result in poor intercoat adhesion of the clear coat to the base coat.

Remove items from oven and once cool, apply a protective coat with a film build of 0.0635 to 0.0762 mm using TCI Anti-Graffiti Clear #9810-0231 or equivalent. Do not apply coat while surfaces are still hot.

Return items to oven and fully cure at 193°C for 40 minutes.

DOORS

The cabinet shall have a front and a rear door, each equipped with a lock. When each door is closed and latched, the door shall be locked. The latching handles shall have provision for padlocking in the closed position. The operating handle shall be cast aluminum or stainless steel with 191 mm handle and 12.7 mm minimum shank. The handle shall open to the right away from the cabinet on the front door, and to the left away from the cabinet on the rear door. The cabinet door frame shall provide strikers to hold tension and form a firm seal between door gasketing and cabinet door frame. Doors shall be fitted to ensure a maximum gap between door flange and cabinet side of 3.2 mm. The cabinet door opening shall be a minimum 498 mm wide x 879 mm high.

The cabinet doors shall be reinforced with "L" channels 1.6 mm minimum thickness by 12.7 mm height and width. This channel shall be installed on all door perimeters as close to the gaskets as practical and shall not interfere with closing of the door or any equipment in the EIA mounting Rack.

Means shall be provided on the front and rear doors to hang a plastic envelope, which are to be supplied and installed by the vendor. The envelopes shall be the side opening "zip" type, fabricated of heavy-duty clear plastic, measuring 279 x 381 (± 25) mm. Two, 9.5 mm (hole size), brass grommets shall be mounted on each envelope, spaced 321 mm center-to-center. The envelope installed on the front door shall not cover the police panel and shall open towards the locking mechanism.

The door handle shall be installed 438 (± 6) mm, from the top edge of the door, to the center of the handle shaft.

LOCKS

Cabinet locks shall be solid brass rim type comparable to Best Lock 5L series with inter-changeable cores. For reference purposes, Best Lock numbers are:

Right Hand -- 5L6RL3XA7559-606

Left Hand -- 5L6RL4X47559-606

Each cabinet will be supplied with 2 locks, each with a Contractor construction core, keyed alike to the standard factory construction core combination. Two keys will be supplied in each cabinet: one operating and one control.

The Contractor shall furnish "LA-1" cores for the locks in exchange for the Contractor construction cores at no cost to the State other than shipping charges for the return of the contractor construction cores to the manufacturer.

The locks shall have rectangular, spring-loaded bolts. The bolts shall have a 7.14 mm throw and shall be 19.1 mm wide x 9.5 mm thick (dimension tolerance is ± 0.9 mm). Locks shall be rigidly mounted with 2 stainless steel machine screws. In the locked position, the throw shall extend a minimum of 6.4 (± 7.9) mm.

The front portion of the lock shall not be recessed or allowed to extend more than 4.8 mm from the face of the door. Means shall be provided to prevent water from leaking into the cabinet between the Best Lock key shaft and the shaft hole of the cabinet. The locks shall be mounted on the door in such a position that the tumblers are in the upper quadrant.

LATCHES

The latching mechanism shall be a 3-point type. The center catch and pushrods shall be stainless steel. Pushrods shall be 9.5 mm diameter minimum and shall be supported within 38.1 mm of their respective striker. The center catch shall be fabricated of 1.9 mm, minimum thickness, stainless steel. Details of alternative designs shall be submitted for review and approval prior to fabrication of the cabinets.

HINGES

Each door's hinging shall be either a continuous hinge or 3 butt hinges. Each hinge shall have a fixed pin. Front and rear doors shall be provided with catches to hold the door open at 90 degrees, plus or minus 10 degrees. The catches shall be 6.35 mm diameter, minimum stainless steel. Provision shall be made to ensure that it would require a conscious act on the part of the person opening the door to open it more than 90 degrees. Door hinges and pins shall be made of stainless steel. The hinges shall be bolted to the cabinet. Hinge bolts shall not be accessible to vandals. Hinge pins shall be welded top and bottom on each hinge.

LIFTING EYES

The cabinet shall be provided with 2 removable lifting eyes to be used when placing the cabinet on the pedestal. The lifting eyes shall be located to provide balance when the cabinet is lifted. Each eye opening shall have a minimum diameter of 25.4 mm and shall be capable of lifting 455 Kg. All dimensions shall be as shown on the plans. The lifting eye mounts shall be mechanically designed to eliminate any possibility of water entry into the cabinet. The lifting screws shall be button head steel socket screws with Allen head driver or the compression type sleeve with round Allen head.

AIR INTAKE

Each cabinet shall be provided with a louvered air intake in the front door with a disposable cotton/synthetic fiber filter housed behind the intake (refer to APPENDIX A for filter specification) to provide a minimum of 129 square centimeters of flow area. The filter's working area shall cover the intake opening and shall be held firmly in place by a bottom bracket and an upper spring or spring-loaded clamp. The bottom filter bracket shall be formed into a waterproof sump with drain holes to the outside. The louvered intake shall be designed and constructed such that a stream of water from a pressure head, such as an impulse or other type sprinkler, will not enter the cabinet.

POLICE PANEL

The police panel door shall be equipped with a lock keyed for a master police key and shall be mounted on the front door of the cabinet as shown on the plans. The police door shall provide access to the "auto-flash" and "signals off" switches mounted on the front panel of the power distribution assembly. Police access shall be limited to those 2 switches. The police panel door shall not protrude more than 12.7 mm maximum from the surface of the cabinet.

RAILS

Rails shall be provided, both front and rear, as an integral part of the cabinet. Rails shall extend the full height of the cabinet and shall conform to dimensional requirements of Standard EIA RS-310-C, except equipment mounting holes shall be provided with 10-32 threads and shall be located to secure equipment provided as shown on the plans.

Two plated supporting angles shall be supplied to support the controller unit. The angles shall be designed to support a minimum of 23 Kg each. The horizontal side of each angle shall be a minimum of 76 mm and the length a minimum of 279 mm.

GASKETING

Gasketing shall be provided on all door openings and shall be dust-tight. Gaskets shall be 6.35 mm minimum thickness closed cell neoprene and shall be permanently bonded to the metal. The mating surface of the gasketing shall be covered with a silicone lubricant to prevent sticking to the mating surface

FAN AND EXHAUST VENT

Each cabinet shall be equipped with an electric fan with ball or roller bearings and a capacity of at least 2.8 cubic meters per minute.

The fan shall be mounted within the cabinet directly above the controller unit power supply and vented near the top of the cabinet, through a grill arrangement incorporated in the right side of the cabinet when viewed from the front door.

The fan shall be thermostatically controlled and shall be manually adjustable to turn on between 33°C. and 65°C. with a differential of not more than 6°C. between automatic turn-on and turn-off. The cabinet fan circuit shall be fused at 125 percent of the ampacity of the fan motor.

The intake and exhaust areas (including filter) shall pass a minimum of 1.4 cubic meters of air per minute. The exhaust vent shall be so designed as to prevent water from entering the cabinet interior. All exhaust vent seams, between the vent housing and the cabinet, shall be continuously welded.

RACK ASSEMBLY

The rack assembly shall be self-supporting with side panels extending to the bottom support channels of the cabinet and shall allow a minimum free space beneath the lowest horizontal surface and between the side panels of 432 mm wide x 381 mm deep x 229 mm high with both cabinet doors closed. The assembly shall be equipped with mounting "ears" to allow mounting in rails. Overall width of the assembly shall conform to Standard EIA RS-310-C.

The rack assembly shall be fabricated and mounted according to the dimensions shown on the plans.

The rack assembly shall provide a space which shall intermate with and support a Model 204 flasher. The flasher shall be wired as shown on the plans, with its load balanced among switch packs 1 through 6.

An auto-flash switch shall be provided for use by maintenance personnel. The switch shall be located as shown on the plans. Provide an "input" to the controller unit's "flash sense" input, utilizing the isolation relay, when the auto-flash switch is in the "flash" position.

A Maintenance Interlock Switch (MIS), MFG. Cherry P/N-50KX Series E-23 or equivalent shall be provided to supply emergency power to the flasher and flash transfer relays in the event that the power distribution assembly is removed. This shall be accomplished in a manner which prevents the application of emergency power unless the maintenance auto-flash switch is in the flash position. Emergency power to the flasher and transfer relays shall be independently fused.

Any other switch shall be approved by the Engineer prior to shipment

The rack assembly shall provide a receptacle which shall intermate with and support the Power Distribution Assembly (PDA). The receptacle shall be equipped with a connector (BEAU SG 5413 ABT or equiv.). Dimensions for the receptacle and location and pin assignments for the connector shall be as shown on the plans. Means shall be provided to secure the PDA.

The front face of all plug-in assemblies shall be flush with the front face of the rack assembly. The sole exception shall be the flash relay, which may be mounted with its socket on the same plane as the flash transfer relay sockets.

The front face of the rack assembly may be inset from the mounting rails a minimum of 12.7 mm.

The rack assembly depth shall not exceed 330 mm from the front surface of the front mounting rails.

The assembly shall allow air circulation from bottom to top.

Field wire terminal blocks and bus bars shall be mounted on the back panel of the assembly. The 3 signal output terminal blocks shall be mounted vertically and shall be the 6 position type. The power line service terminal block and bus bars shall be mounted as shown on the plans. Other designs will be approved by the Engineer prior to submitting the Sample Unit.

The rear panel shall be hinged to allow it to swing down and provide access to terminals, relays and connections as detailed elsewhere in these specifications and on the plans.

The rack assembly shall provide for an input file subassembly and an output file subassembly, both of which shall be integral to the rack assembly as shown on the plans and specified in detail under separate headings.

INPUT FILE

The wiring harnesses from the field input terminal blocks to the rear of the input file from the detector inputs shall have lugs on both ends that have been crimped and soldered. The input file shall intermate with and support 11 two-channel loop detector units. The file shall utilize no more than 133 mm of rack height.

The input file shall provide card guides (top and bottom) and a 22-pin single-readout edge-connector centered vertically for each detector unit. The card guide shall begin 18.4 +6.4 mm back from the front of the file. The file shall allow air circulation through the top and bottom of the assembly.

Pins D,E,J & K on each edge connector shall be wired to the field terminals to provide for 2 loop detector channels or one magnetometer channel.

Loop No. 1 and No. 2 output collectors and emitters (pins F, H, W and X) for each slot shall terminate on a terminal block mounted on the rear of the input file and shall connect to the proper controller unit inputs in the connector C1S wiring harness. Common grounding of output emitters will be permitted.

The input file shall be connected as shown on the plans.

The edge connectors shall be double sided connectors with the numbered side shorted to its respective lettered side internally.

The input shall be provided with marker strips to identify items in the file. The marker strips shall be made of a material that can be easily and legibly written on using a pencil or ball point pen. Marker strips shall be located immediately above and below the item they identify.

OUTPUT FILE

Card guides shall be provided to support the switch packs and monitor unit.

The output file shall be capable of containing 6 Model 200 switch packs, 3 Model 430 flash transfer relays, one Model 2010 monitor unit and one flash relay.

The output file shall be provided with marker strips to identify items in the file. The marker strips shall be made of a material that can be easily and legibly written on using a pencil or ball point pen. Marker strips shall be located immediately below the item they identify.

Output files and 120 V(ac) circuits shall be hand-wired; printed circuit boards will not be acceptable for current carrying circuits.

Switch pack, flash transfer relay and monitor unit sockets shall be accessible from the back of the file without the use of tools.

The controller unit outputs to the output file shall be connected through connector C4.

The red and yellow signal circuits of all vehicle switch packs shall be available at a Molex Type 1375 receptacle which shall intermate with a Molex Type 1375 plug to allow flash programming. Plug connectors, with programming jumpers, shall be furnished for each circuit to allow red, yellow or pedestrian flash programming. Requirements are: 4 red, 3 yellow and 3 pedestrian. Connectors shall be readily accessible without the removal of any other equipment. Plug pins shall be crimped and soldered.

The monitor unit connector shall be a rigidly supported printed circuit board edge connector, having 2 rows of 28/56 independent double readout bifurcated contacts on 3.96 mm centers. The CMU connector shall be mounted on a printed circuit board that provides the capability of changing the channel assignments by wire jumper. Jumper wires shall be installed to enable the pedestrian switch pack centers to be used as shown on the plans. The connector shall intermate with the monitor unit.

It shall be possible to remove the monitor unit without causing the intersection to go into flashing operation. The cabinet shall be wired so that with the front door closed and the monitor unit removed, the intersection shall go into flashing operation. The cabinet shall contain a conspicuous warning against operation with the monitor unit removed.

A connector and terminal assembly designated as P20 (MFG. -Magnum P/N 722120 or equivalent) for monitoring the absence of red shall be an integral part of the output file. The connector shall intermate and be compatible with the cable and connector of a type 2070 CMU capable of monitoring the absence of red. The pin assignments of the P20 connector and terminal assembly shall be as shown on the plan. Any P20 incorporating variations or additions to this special provision shall be submitted to the Engineer for approval prior to delivery of the sample unit.

The P20 connector and the CMU connector shall be keyed physically alike to prevent the absence of red cable connector from being inserted into the P20 180 degrees out of alignment.

POWER DISTRIBUTION ASSEMBLY (PDA)

The PDA shall not have any protrusions (screw heads, rivets, etc.) extending beyond the outer surface of the side and back panels, except for the pins on the Cinch Jones connector. The PDA shall be electrically and mechanically interchangeable with any Model 337 cabinet assembly unit.

The PDA shall be furnished and installed in the Rack assembly. Maximum dimensions are 306 mm wide by 99 mm high by 184 mm deep. The top and bottom of the PDA shall be open faced without any mounting support plates of any size obstructing air flow.

The PDA shall be equipped with a connector to intermate with its associated connector in the Rack Assembly. Pin assignments shall be as shown on the plans.

The following equipment shall be provided with the PDA:

- One main circuit breaker
- One equipment circuit breaker
- One signals circuit breaker
- One flasher circuit breaker
- One 24 VDC power supply
- One power relay and socket
- One auto-flash switch (police)
- One signals-off switch
- One power indicator labeled "24 VDC PWR"

- One flash indicator
- One test points
- One power supply fuses (AC and DC)

All circuit breakers shall be rated for 120V(ac) with the following ampacity ratings:

Main and signals *	30A
Flasher *	20A
Equipment	15A

* The signal and flasher circuit breakers shall have the Potter and Brumfield "Curve 3" type operating characteristics.

The "auto-flash" switch, when placed in "flash" position, shall energize the power relay coil and apply stop time to the controller. When the switch is placed in the "auto" (up) position the switch packs shall control the signal indications. The switch shall be a double pole, single throw switch rated for 15A at 120V(ac).

The signals-off switch, when placed in the " off " position (down), shall energize the power relay coil and interrupt power to the flasher.

The switch shall be a three pole double throw switch rated for 15A at 120V(ac). Two of the 3 poles shall be tied in parallel to provide sufficient switching capacity for flasher power.

The power indicator, labeled "24 VDC PWR", shall be a 24 VDC lamp, Dialight 507 Series LED Cartridge Type 507-4761-3331-500 with dialight datalamp cartridge holder Type 508-8738-504 or equivalent. The lamp shall be tied across the power supply output on the fused side.

The flash indicator shall be a 120 V(ac) lamp, Dialight 507 Series Neon Cartridge Type 507-4537-0937-640 with dialight datalamp holder Type 508-8745-504 or equivalent. The lamp shall be tied across the power relay coil.

The power relay shall be a Model 430 relay wired as shown on the plans. When the relay is energized, it shall interrupt power to the switch packs.

The power supply shall be of ferro-resonant design having no active components and shall conform to the following requirements:

Line Regulation: Line regulation shall be 2 percent from 95 to 135 V(ac) to 60 Hz plus an additional 1.6 percent for each 1 percent deviation in frequency.

Load Regulation: Load regulation shall be 5 percent from 1 to 3A with a maximum temperature rise of 30°C above ambient temperature.

Design Voltage: Design voltage shall be +24.00 (± 0.30) volts DC at half load and 40°C. No-load voltage shall not exceed +27 VDC.

Full Load Current: Shall be 3A, minimum.

Ripple Noise: Shall be 2 volts peak-to-peak and 500 millivolts RMS at full load.

Line Voltage: 95 to 135V(ac).

Efficiency: 60 percent, minimum.

Minimum Voltage : 22.8 VDC

The test points shall be banana jacks and shall be connected in parallel with the power indicator. They shall be labeled by polarity with the positive jack red in color and the negative jack black in color.

The power supply fuses shall protect the input (AC) and output (DC) circuitry of the power supply. The fuses shall be rated at 125 percent of the full load current in their respective circuits.

The isolation relay shall provide an input to the controller unit "flash sense" input when either the signals circuit breaker is in the "off" position or the auto-flash switch (police panel) is in the "flash" position.

The operation of the flasher circuit breaker shall provide an "input" to the input file 8-D position.

The power supply shall be of ferro-resonant design having no active components and shall conform to the following requirements:

Line Regulation: Line regulation shall be 2 percent from 95 to 135V(ac) to 60 Hz plus an additional 1.6 percent for each 1 percent deviation in frequency.

Load Regulation: Load regulation shall be 5 percent from 1 to 3A with a maximum temperature rise of 30°C above ambient temperature.

Design Voltage: Design voltage shall be +24.00 (± 0.30) VDC at half load and 40°C. No-load voltage shall not exceed +27 VDC.

Full Load Current: Shall be 3A, minimum.
Ripple Noise: Shall be 2 volts peak-to-peak and 500 millivolts RMS at full load.
Line Voltage: 95 to 135V(ac).
Efficiency: 60 percent, minimum.
Minimum Voltage : 22.8 VDC

The test points shall be banana jacks and shall be connected in parallel with the power indicator. They shall be labeled by polarity with the positive jack red in color and the negative jack black in color.

The power supply fuses shall protect the input (AC) and output (DC) circuitry of the power supply. The fuses shall be rated at 125 percent of the full load current in their respective circuits.

The isolation relay shall provide an input to the controller unit "flash sense" input when either the signals circuit breaker is in the "off" position or the auto-flash switch (police panel) is in the "flash" position.

The operation of the flasher circuit breaker shall provide an "input" to the input file 8-D position.

The power supply shall be of ferro-resonant design having no active components and shall conform to the following requirements:

Line Regulation: Line regulation shall be 2 percent from 95 to 135 V(ac) to 60 Hz plus an additional 1.6 percent for each 1 percent deviation in frequency.

Load Regulation: Load regulation shall be 5 percent from 1 to 3A with a maximum temperature rise of 30°C above ambient temperature.

Design Voltage: Design voltage shall be +24.00 (\pm 0.30) volts DC at half load and 40°C. No-load voltage shall not exceed +27 VDC.

Full Load Current: Shall be 3A, minimum.
Ripple Noise: Shall be 2 volts peak-to-peak and 500 millivolts RMS at full load.
Line Voltage: 95 to 135V(ac).
Efficiency: 60 percent, minimum.
Minimum Voltage : 22.8 VDC

The test points shall be banana jacks and shall be connected in parallel with the power indicator. They shall be labeled by polarity with the positive jack red in color and the negative jack black in color.

The power supply fuses shall protect the input (AC) and output (DC) circuitry of the power supply. The fuses shall be rated at 125 percent of the full load current in their respective circuits.

The isolation relay shall provide an input to the controller unit "flash sense" input when either the signals circuit breaker is in the "off" position or the auto-flash switch (police panel) is in the "flash" position.

The operation of the flasher circuit breaker shall provide an "input" to the input file 8-D position.

FLASH TRANSFER RELAY

A leakage resistor, which shall permit a small amount of current to pass through the coil if the contacts remain closed after the coil circuit is opened, shall be installed across the relay socket to overcome the effects of residual magnetism.

The coil of the flash transfer relay shall be energized only when the signals are in flashing operation.

The flash transfer relay shall transfer switch pack output to flash control. Transfer of the flash transfer relay to flash control shall not prohibit the operation of the controller unit.

SPECIAL PURPOSE RELAYS

The flash relay shall be normally energized by the power relay output and, when de-energized, shall apply power to the flash transfer relay coils. The flash relay shall be P&B KRP11 style, DPDT or equivalent.

The isolation relay shall energize with the flash transfer relays and provide an input to the controller unit's "flash sense" input during flash operation. The relay shall be P&B R10 style, DPDT or equivalent.

The logic relay shall be energized as long as the monitor unit remains plugged in. When de-energized, it shall provide continuity between the front door switch and the power relay coil, energizing the power relay in the event the door is closed while the monitor unit is removed.

The remote flash relay, when energized by a logic ground signal from the controller unit or external source, shall energize the power relay.

Both the logic relay and remote flash relay shall be P&B KUP style, DPDT or equivalent.

OUTLET PANEL

An outlet panel shall be provided at a convenient location. It shall contain the following:

- One equipment receptacle
- One controller receptacle
- One terminal block (TB1)

The equipment receptacle shall be NEMA 5-15R duplex type and shall have ground fault circuit interruption as defined in the National Electrical Code. Circuit interruption shall occur on 6 mA of ground fault current and shall not occur on less than 4 mA of ground fault current.

The controller receptacle shall be a NEMA type 5-15R.

TB1 shall be a 6-position double-row terminal block and shall be wired as shown on the plans.

PEDESTAL ADAPTER COLLAR

Each cabinet shall be provided with a bronze pedestal adapter collar, slipfitter type painted silver, with straight top for mounting fabricated aluminum cabinets on a pedestal with a 114 mm outside diameter.

CONNECTORS

Connector C1P shall contain 104 pin contact positions and shall intermate with connector C1S mounted on the controller chassis. Corner guide pins for connector C1P shall be stainless steel and shall be 27.9 mm in length. Corner guide socket assemblies shall be stainless steel and shall be 15.9 mm in length.

Connector C4 shall contain 24 contacts and shall be the circular plastic type with quick connect/disconnect capability and thread assist, positive detent coupling. The plug connector C4 shall be mounted on the rack assembly. Contact assignments are shown on the plans.

Connector blocks for connector C1 pin and socket connectors shall be constructed of diallyl phthalate or better. Contacts shall be secured in the blocks with springs of stainless steel.

All wires terminating in connectors, unless otherwise noted, shall be crimped or soldered. Any other Type of connectors shall be approved by the Engineer prior to submitting the sample unit.

Data or signal carrying connectors shall have redundant areas of contact that will insure a contact resistance of 12 milliohms maximum at a rating of 3.0A of current.

Power carrying connectors shall have redundant areas of contact that will insure 12 milliohms maximum of contact resistance at 15A of current.

All connectors shall have a operating temperature range of -55°C to 105°C.

Some method of internal or external keying shall be present in every connector. If any 2 or more connectors in an assembly are of the same type, all such connectors shall be keyed differently and shall be permanently labeled in a way that will identify their correct interconnection.

CABINET WIRING DIAGRAM

Four sets of non-fading cabinet wiring diagrams shall be supplied with each cabinet. The diagrams shall be nonproprietary. They shall identify all circuits in such a manner as to be readily interpreted. The cabinet drawing shall show complete, on a single plan sheet, the C-1 listing and the input file assignments, the component layout in an elevation view (as viewed from the rear of the cabinet with the left and right cabinet walls shown in their relative positions). Alternatively, the supplier may choose to have 2 plan sheets, one for the ATSAC program and one for the universal program. If this option is chosen, both plan sheets shall be supplied with each cabinet assembly conforming to the requirements of this special provision.

The diagrams shall be placed in the plastic envelope on the front door. Detailed equipment layout scale drawings and wiring diagrams of all equipment installed in the cabinet shall be submitted for approval prior to production. Review and approval does not lessen the Contractor's responsibility to meet the specifications.

CONDUCTORS

Conductors in the controller cabinet between the service terminals and the switch pack power bus shall be No. 10, or larger.

All conductors used in the controller cabinet shall be No. 22, or larger, with a minimum of 19 strands. Conductors shall conform to Military Specification: MIL-W-16878D, Type B or better. The insulation shall have a minimum thickness of 0.254 mm and shall be nylon jacketed polyvinyl chloride except that conductors No. 14 and larger may be UL Type THHN, with a minimum of 7 strands.

The loop detector lead-in, from the field terminals in the cabinet to the sensor unit rack connector, shall be a cable containing 2 No. 22, or larger, conductors with a minimum of 7 strands. Each conductor shall be insulated with either:

- A minimum of 0.254 mm of polyvinyl chloride and 0.0508 mm of nylon, or
- A minimum of 0.356 mm of polyethylene or polypropylene.

The conductors shall be twisted and the twisted pair shall be protected with a shield. The shield or a stranded tinned copper drain wire shall be connected to a terminal on the input file terminal block. This input terminal shall be connected to the equipment grounding bus through a single conductor. The cable shall be provided with a polyethylene or polyvinyl chloride outer jacket with a minimum thickness of 0.508 mm, or with a chrome vinyl outer jacket with a minimum thickness of 0.635 mm.

All conductors, except those which can be readily traced, shall be labeled. Labels attached to each end of the conductor shall identify the destination of the other end of the conductor.

All conductors used in the controller cabinet shall conform to the following color code requirements:

The grounded conductors of AC circuits shall be identified by a continuous white color.

The equipment grounding conductors shall be identified by a continuous green color or by a continuous green color with one or more yellow stripes.

The DC logic ground conductors shall be identified by a solid white color with a red stripe.

The ungrounded conductors shall be identified by any color not specified above.

All cabinet wiring harnesses shall be neat, firm and routed to minimize crosstalk and electrical interference.

Wiring containing AC shall be routed and bundled separately or shielded separately from all logic voltage control circuits.

Cabling shall be routed to prevent conductors from being in contact with metal edges whenever possible. If cabling shall be in contact with metal edges, those edges shall be covered with a nylon or similar non-abrasive, smooth shield. Cabling shall be arranged so that any removable assembly may be removed without disturbing conductors not associated with that assembly.

All conductors, terminals or parts, which could be hazardous to maintenance personnel shall be protected with suitable insulating material.

Within the cabinet wiring, the DC logic ground and equipment ground shall be electrically isolated from the AC grounded conductor and each other by 500 megohms when tested at 250 volts DC, with the power line surge protector disconnected.

Conductors from connector C1 to the input files shall be of sufficient length to allow any conductor to be connected to any detector output terminal.

The AC- copper terminal bus shall not be grounded to the cabinet or connected to logic ground and shall provide a minimum of 8 terminals for connection of field conductors.

An equipment grounding (earth ground) bus shall be provided in each cabinet. The bus shall be copper and grounded to the cabinet.

CABINET LIGHT

Each cabinet shall be equipped with a fluorescent lighting fixture mounted inside the top front of the cabinet. The fixture shall have an 8 watt lamp F8T5, operated from a normal power factor, U.L. listed ballast. The lamp shall be shaded to diffuse the light. A door actuated switch shall be installed to turn the cabinet light on when the front door is opened. The door switch shall be on a separate circuit by itself; and used only to turn on the cabinet light.

CABINET VERIFICATION PROGRAM

The Contractor shall furnish a cabinet verification program, resident in 27256 EPROM(s) that will execute in a Type 170 controller unit. The program shall test cabinet wiring related to the output file, input file, the police panel, and flash switches. The program shall check conflict monitor operation by generating all possible conflicts, in sequence, and resetting the monitor automatically. It shall also check all operational features of the monitor including absence of red and the "plus" features.

Ten copies of a cabinet verification program software manual shall be . The manual shall give full and complete documentation of test procedures, including, but not limited to:

Cabinet verification test operation

Individual diagnostic tests

TERMINAL BLOCKS

Terminal blocks shall be provided for terminating field conductors.

The terminal blocks for detector field conductors, auxiliary field wires and control wires shall be the barrier type with marker strips and shall be provided with 8-32 by 7.9 mm minimum nickel plated brass binder head screws and inserts.

The terminal blocks for field wires to the signal indications and for service connections shall be the barrier type with marker strips and shall be provided with 10-32 by 7.9 mm nickel plated brass binder head screws and inserts.

The terminal blocks shall be readily accessible through the cabinet rear door and shall be rated for 30A at 600V, minimum.

The terminal blocks for the Input File shall be the barrier type and shall be provided with 8-32 by 7.9 mm nickel plated brass binder head screws and inserts. They shall be rated for 20A at 600V, minimum.

Terminal block TB01 shall be as specified for the input file terminal blocks.

POWER LINE SURGE PROTECTORS

Two types of power line surge protectors shall be provided between both line conductors (AC+ and AC-) and equipment ground. The protectors shall be installed at the service terminal block.

The first type of surge protector shall be a three-electrode gas tube type and shall have the following ratings:

Impulse Breakdown: less than 1,000V in less than 0.1 microseconds at 10 kilovolts/microsecond.

Standby Current: less than one mA

Striking Voltage: greater than 212VDC.

Capable of withstanding 15 pulses of peak current each of which will rise in 8 microseconds and fall in 20 microseconds to one half the peak voltage at 3 minute intervals. Peak current rating shall be 20,000A.

The second type of surge protector shall be a Metal Oxide Varistor (MOV). One shall be installed between AC+ and equipment ground, AC- and equipment ground, and AC+ and AC-. The MOVs shall have the following ratings:

Recurrent Peak Voltage: 212V

Energy Rating Maximum: 50 joules

Power Dissipation: Average 0.85W

Peak Current for Pulses: 2,000A for less than 6 microseconds

Standby Current: Less than 1 mA

TRANSIENT SUPPRESSION

Transient suppression circuits shall be provided at the relay bases (across relay coils), the fan, and the cabinet light door switch.

COMMUNICATIONS TERMINATION PANEL

Each Model 337 cabinet shall be provided with a communications termination panel, which provides a mounting location for communications cable termination blocks, over voltage protection devices and the termination points for the C2P harness and connector.

Panel Construction

The panel shall be fabricated of 3.2 mm sheet aluminum, and shall have the dimensions shown on the plans.

The panel shall be drilled and tapped as necessary to mount the terminal blocks and other attachments described below, as well as to mount the panel to the rack within the cabinet. Sharp edges and burrs caused by the cutting or drilling process shall be removed.

Corners shall be rounded with a 19.1 mm radius.

Communications Cable Termination Block (CTB-1)

Communications cable termination blocks shall be quick-connected blocks consisting of 24 horizontal rows of 8 clips per row. The horizontal rows of 8 clips shall be divided into 2 sets of 4 electrically common clips. The 2 sets of 4 shall be connected with a bridge clip. It shall be mounted in a molded self-extinguishing plastic case. These blocks, commonly referred to as "66B" blocks, shall terminate 12 pairs of No. 20 through 24 AWG solid unstripped conductors.

The blocks shall be equipped with integral fanning strips and an enclosed back to prevent grounding of clips to the panel. The block shall be mounted on the panel, as shown on the plans.

Active Pairs Termination Block (CTB-2)

A 6-position dual screw, closed back barrier strip shall be mounted on communications termination panel, as shown on the plans. The strip shall be rated at 15A, and shall be provided with 6-32 x 6.4 mm nickel-plated brass binder head screws.

Test Point Termination Block (CTB-3)

An 8 position single screw, closed back barrier strip shall be mounted on the communications termination panel, as shown on the plans. The strip shall be rated at 15A and shall be provided with 6-32 x 6.4 mm nickel-plated brass binder head screws.

Over voltage Protection

An over voltage surge protector shall be provided on each of the 3 active communications cable pairs (the voice pair, audio-in pair, and audio-out pair) terminating in the cabinet. The protectors shall be installed on the active pairs termination block (CTB-2).

Protectors shall be of a three-electrode gas tube type, and shall have the following ratings:

Impulse Life (1000A, 10/1000 waveshape at one minute intervals each direction, with 500A on each side to ground simultaneously): 1000 surges minimum, 2500 surges typical.

AC discharge current, 11 cycles, 60 Hz: 400A RMS, 200A each side to ground simultaneously.

Maximum Single Impulse Discharge Current, 8/20 waveshape: 40 ka maximum, 20 ka/side simultaneously.

Capacitance: Line-ground = 4 pf, Line-line = 2 pf.

DC Holdover: 180 VDC typical at 200 mA, 150 VDC minimum.

DC Arc Voltage: 30V typical.

Glow to Arc Transition Current: 1.0A typical.

Transition Time: 0.5 microseconds maximum.

Line-Ground Impulse Breakdown Voltage at 10 kv/sec: 1,000 volts maximum average.

Insulation Resistance: 1,000 megohms minimum at 100 VDC (line-ground).

The protectors shall be encapsulated, and shall be equipped with spade lug tipped leads, 51 mm long minimum. Maximum size of each protector shall be 13 x 13 mm x 51 mm. The grounding lead shall be attached to the panel's grounding stud.

Grounding Stud

A grounding stud shall be provided on each panel. The stud shall extend through the panel. The over voltage protection devices' ground leads shall be attached to the stud on the front side of the panel. A No. 8 AWG copper conductor shall connect to the stud on the front side of the panel and shall connect to the cabinet's equipment grounding bus.

C2P Harness and Connector

A 12-conductor jacketed cable shall be attached to terminal blocks CTB-2 and CTB-3 with soldered ring lugs, as shown on the plans. The cable shall terminate in a standard C2P connector, and shall be routed through the cabinet and be of sufficient length to reach the C2S connector on the back of the Type 170 controller unit, when the unit is installed in the equipment rack.

Cable-Tie Openings

Two, 6.4 mm diameter holes shall be provided, as shown on the plans, for future installation of cable ties.

Attachment to Cabinet

The panel shall be securely attached to the rack assembly left side panel, as shown on the plans.

APPENDIX A

AIR FILTERS FOR 332 & 337 CABINET ASSEMBLIES

DIMENSIONS

CABINET

The overall dimensions of a Model 332 cabinet filter shall be:

Height = 304.8 mm, (tolerance of: plus zero (0) mm and minus 12.7 mm)
Length = 406.4 mm, (tolerance of: plus zero (0) mm and minus 12.7 mm)
Width = 25.4 mm, (tolerance of: plus zero (0) mm and minus 3.2 mm)

The filter shall have a minimum of two thousand seven hundred seventy four (2774) square centimeters of media area.
The overall dimensions of a Model 337 cabinet filter shall be:

Height = 203.2 mm, (tolerance of: plus zero (0) mm and minus 12.7 mm)
Length = 381.0 mm, (tolerance of: plus zero (0) mm and minus 12.7 mm)
Width = 25.4 mm, (tolerance of: plus zero (0) mm and minus 3.2 mm)

The filter shall have a minimum of one thousand six hundred thirteen (1613) square centimeters of media area.

CONSTRUCTION

The filter shall be constructed of non-woven cotton/synthetic fibers, 25 to 35 percent efficient per ASHRAE test standard 52-76.

MEDIA SUPPORT

The media shall be continuously laminated to an expanded aluminum or galvanized metal grid on the air leaving side.

PLEAT DESIGN

The media material shall be radial wedge pleated, allowing total media usage.

MEDIA FRAME

The enclosing frame shall be constructed from moisture-resistant chipboard. The entire unit shall be sealed to insure a positive media-to-frame bond, eliminating air bypass.

UNDERWRITERS LABORATORIES RATING

The filter shall be Underwriters Laboratory rated as a Class II filter unit per U.L. Standard 900.

IDENTIFICATION

Each filter shall be printed with manufacturer's name and location, air flow direction, nominal and actual size, and UL Class II rating.

10-3.15 VEHICLE SIGNAL FACES AND SIGNAL HEADS

Light emitting diode signal modules for vehicular traffic signal units (except programmed visibility type) will be State-furnished in conformance with the provisions in "Materials" of these special provisions.

10-3.16 PEDESTRIAN SIGNALS

Light emitting diode (LED) pedestrian signal face modules for Type A pedestrian signals will be State-furnished in conformance with the provisions in "Materials" of these special provisions.

PEDESTRIAN SIGNAL FACES

Type B Pedestrian signal faces

Each Type B pedestrian signal shall consist of a housing with visor and front screen, a message plate and 2 light sources. Each light source shall consist of luminous tubing and transformers for the luminous tubing.

The message plate shall be either 3-mm nominal thickness ultraviolet stabilized polycarbonate plastic with external prismatic pattern, 4.7-mm nominal thickness hammered glass, 4.7-mm nominal thickness hammered wire glass, 4.7-mm nominal thickness ultraviolet stabilized acrylic plastic with external prismatic pattern, or 3-mm nominal thickness glass fiber

reinforced plastic. The message shall be formed on the message plate by painting the inside of the plate except for the area forming the symbols. The message plate shall be uncolored.

Transformers shall be of the protected outdoor type and shall be UL or ETL listed. The power factor shall be 90 percent or greater. Two transformers shall be provided in each signal; one to operate the UPRAISED HAND symbol, and the other for the WALKING PERSON symbol.

Secondary conductor length between each transformer and the terminals of its respective grid shall not exceed 300 mm. Secondary conductors shall be Gas Tube Sign and Oil Burner Ignition Cable, UL Type GTO-15.

Each transformer shall be provided with a disconnect switch mounted within the signal housing. Each switch shall conform to the provisions in Section 86-3.06A, "Toggle Switches," of the Standard Specifications.

Alternative tubing configurations or message plate-tubing module construction may be used, provided the required brightness is obtained.

Type C Pedestrian signal faces

The Contractor shall provide one visible operating pedestrian head at all times for each direction of each signalized crosswalk while modifying the pedestrian head. Non-functioning pedestrian heads at a signalized crosswalk shall be covered.

10-3.17 FLASHING BEACONS

Sign panels to be mounted on each cantilever flashing beacon standard, and light emitting diode modules for the flashing beacon units, will be State-furnished in conformance with the provisions in "Materials" of these special provisions.

10-3.18 DETECTORS

Loop detector sensor units will be State-furnished in conformance with the provisions in "Materials" of these special provisions.

Detector lead-in cable shall conform to the requirements in City Standard Drawing S-70.2 as shown on the plan.

Loop detectors shall conform to the requirements in LADOT Standard Drawing No. S-70.1A and LADOT Standard Drawing No. S-70.2 as shown on the plans.

Slots in portland cement concrete shall be filled with elastomeric sealant or hot-melt rubberized asphalt sealant, or shall be filled with an epoxy sealant conforming to the provisions in Section 95-2.09, "Epoxy Sealant for Inductive Loops (State Specification 8040-06)," of the Standard Specifications.

10-3.19 PEDESTRIAN PUSH BUTTONS

At the option of the Contractor, pedestrian push button housings may be the plastic type.

Pedestrian push buttons shall conform to the requirements in LADOT Standard Drawing No. S-72.0A and LADOT Standard Drawing No. S-72.1.1 as shown on the plans.

10-3.20 LUMINAIRES

Ballasts shall be the lag regulator type.

Photoelectric controls will be State-furnished in conformance with the provisions in "Materials" of these special provisions.

10-3.21 REMOVING, REINSTALLING OR SALVAGING ELECTRICAL EQUIPMENT

All arrangements for traffic signal equipment specified to be returned to City of Los Angeles, Department of Transportation (LADOT), shall be made with the Material Control Section. The Contractor shall contact the Engineer 8 working days prior to the desired delivery date.

The Contractor shall exercise due care in the removal of traffic signal equipment, including signs and sign posts, that have been specified to be reused or salvaged, so that the equipment will remain in the same condition as that prior to removal. The Contractor will be required to replace any traffic signal equipment that was damaged or destroyed while in the Contractor's care. The Contractor shall be responsible for cleaning traffic signal equipment prior to delivery.

The Contractor shall provide the equipment, as necessary, to safely unload and stockpile the material.

10-3.22 PAYMENT

Full compensation for hauling and stockpiling electrical materials shall be considered as included in the contract price paid for the item requiring the material to be salvaged and no additional compensation will be allowed therefor.

The contract lump sum prices paid for smart pedestrian system shall include full compensation for furnishing all labor, materials, tools, equipment, testing and incidentals and for doing all the work involved smart pedestrian system, including smart pedestrian system hardware, interconnection wiring and connectors of various sizes and types, various system tests,

documentation and final acceptance, complete in place, as shown on the plans, as specified in the Standard Specifications and these special provisions and as directed by the Engineer and no additional compensation will be allowed therefor.

Full compensation for modifying street lighting shall be considered as included in the contract lump sum price paid for signal and lighting and no additional compensation will be allowed therefor.

SECTION 11. (BLANK)

SECTION 12. (BLANK)

SECTION 13. (BLANK)

SECTION 14 FEDERAL REQUIREMENTS FOR FEDERAL-AID CONSTRUCTION PROJECTS

GENERAL.—The work herein proposed will be financed in whole or in part with Federal funds, and therefore all of the statutes, rules and regulations promulgated by the Federal Government and applicable to work financed in whole or in part with Federal funds will apply to such work. The "Required Contract Provisions, Federal-Aid Construction Contracts, Form FHWA 1273, are included in this Section 14. Whenever in said required contract provisions references are made to "SHA contracting officer", "SHA resident engineer", or "authorized representative of the SHA", such references shall be construed to mean "Engineer" as defined in Section 1-1.18 of the Standard Specifications.

PERFORMANCE OF PREVIOUS CONTRACT.—In addition to the provisions in Section II, "Nondiscrimination," and Section VII, "Subletting or Assigning the Contract," of the required contract provisions, the Contractor shall comply with the following:

The bidder shall execute the CERTIFICATION WITH REGARD TO THE PERFORMANCE OF PREVIOUS CONTRACTS OR SUBCONTRACTS SUBJECT TO THE EQUAL OPPORTUNITY CLAUSE AND THE FILING OF REQUIRED REPORTS located in the proposal. No request for subletting or assigning any portion of the contract in excess of \$10,000 will be considered under the provisions of Section VII of the required contract provisions unless such request is accompanied by the CERTIFICATION referred to above, executed by the proposed subcontractor.

NON-COLLUSION PROVISION.—The provisions in this section are applicable to all contracts except contracts for Federal Aid Secondary projects.

Title 23, United States Code, Section 112, requires as a condition precedent to approval by the Federal Highway Administrator of the contract for this work that each bidder file a sworn statement executed by, or on behalf of, the person, firm, association, or corporation to whom such contract is to be awarded, certifying that such person, firm, association, or corporation has not, either directly or indirectly, entered into any agreement, participated in any collusion, or otherwise taken any action in restraint of free competitive bidding in connection with the submitted bid. A form to make the non-collusion affidavit statement required by Section 112 as a certification under penalty of perjury rather than as a sworn statement as permitted by 28, USC, Sec. 1746, is included in the proposal.

PARTICIPATION BY MINORITY BUSINESS ENTERPRISES IN SUBCONTRACTING.—Part 23, Title 49, Code of Federal Regulations applies to this Federal-aid project. Pertinent sections of said Code are incorporated in part or in its entirety within other sections of these special provisions.

Schedule B—Information for Determining Joint Venture Eligibility

(This form need not be filled in if all joint venture firms are minority owned.)

1. Name of joint venture _____
2. Address of joint venture _____
3. Phone number of joint venture _____
4. Identify the firms which comprise the joint venture. (The MBE partner must complete Schedule A.) _____

 - a. Describe the role of the MBE firm in the joint venture. _____
 - b. Describe very briefly the experience and business qualifications of each non-MBE joint venturer: _____

5. Nature of the joint venture's business _____

6. Provide a copy of the joint venture agreement.
7. What is the claimed percentage of MBE ownership? _____
8. Ownership of joint venture: (This need not be filled in if described in the joint venture agreement, provided by question 6.).
 - a. Profit and loss sharing.
 - b. Capital contributions, including equipment.

- c. Other applicable ownership interests.
9. Control of and participation in this contract. Identify by name, race, sex, and "firm" those individuals (and their titles) who are responsible for day-to-day management and policy decision making, including, but not limited to, those with prime responsibility for:
- a. Financial decisions _____
 - b. Management decisions, such as:
 - (1) Estimating _____
 - (2) Marketing and sales _____
 - (3) Hiring and firing of management personnel _____
 - (4) Purchasing of major items or supplies _____
 - c. Supervision of field operations _____

Note.—If, after filing this Schedule B and before the completion of the joint venture's work on the contract covered by this regulation, there is any significant change in the information submitted, the joint venture must inform the grantee, either directly or through the prime contractor if the joint venture is a subcontractor.

Affidavit

"The undersigned swear that the foregoing statements are correct and include all material information necessary to identify and explain the terms and operation of our joint venture and the intended participation by each joint venturer in the undertaking. Further, the undersigned covenant and agree to provide to grantee current, complete and accurate information regarding actual joint venture work and the payment therefor and any proposed changes in any of the joint venture arrangements and to permit the audit and examination of the books, records and files of the joint venture, or those of each joint venturer relevant to the joint venture, by authorized representatives of the grantee or the Federal funding agency. Any material misrepresentation will be grounds for terminating any contract which may be awarded and for initiating action under Federal or State laws concerning false statements."

Name of Firm	Name of Firm
Signature	Signature
Name	Name
Title	Title
Date	Date

Date _____

State of _____

County of _____

On this ____ day of _____, 19 __, before me appeared (Name) _____, to me personally known, who, being duly sworn, did execute the foregoing affidavit, and did state that he or she was properly authorized by (Name of firm) _____ to execute the affidavit and did so as his or her free act and deed.

Notary Public _____

Commission expires _____

[Seal]

Date _____

State of _____

County of _____

On this ____ day of _____, 19 __, before me appeared (Name) _____ to me personally known, who, being duly sworn, did execute the foregoing affidavit, and did state that he or she was properly authorized by (Name of firm) _____ to execute the affidavit and did so as his or her free act and deed.

Notary Public _____

Commission expires _____

[Seal]

**REQUIRED CONTRACT PROVISIONS
FEDERAL-AID CONSTRUCTION CONTRACTS**

I. GENERAL

1. These contract provisions shall apply to all work performed on the contract by the contractor's own organization and with the assistance of workers under the contractor's immediate superintendence and to all work performed on the contract by piecework, station work, or by subcontract.
2. Except as otherwise provided for in each section, the contractor shall insert in each subcontract all of the stipulations contained in these Required Contract Provisions, and further require their inclusion in any lower tier subcontract or purchase order that may in turn be made. The Required Contract Provisions shall not be incorporated by reference in any case. The prime contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with these Required Contract Provisions.
3. A breach of any of the stipulations contained in these Required Contract Provisions shall be sufficient grounds for termination of the contract.
4. A breach of the following clauses of the Required Contract Provisions may also be grounds for debarment as provided in 29 CFR 5.12:

Section I, paragraph 2;
Section IV, paragraphs 1, 2, 3, 4, and 7;
Section V, paragraphs 1 and 2a through 2g.

5. Disputes arising out of the labor standards provisions of Section IV (except paragraph 5) and Section V of these Required Contract Provisions shall not be subject to the general disputes clause of this contract. Such disputes shall be resolved in accordance with the procedures of the U.S. Department of Labor (DOL) as set forth in 29 CFR 5, 6, and 7. Disputes within the meaning of this clause include disputes between the contractor (or any of its subcontractors) and the contracting agency, the DOL, or the contractor's employees or their representatives.
6. **Selection of Labor:** During the performance of this contract, the contractor shall not:
 - a. discriminate against labor from any other State, possession, or territory of the United States (except for employment preference for Appalachian contracts, when applicable, as specified in Attachment A), or
 - b. employ convict labor for any purpose within the limits of the project unless it is labor performed by convicts who are on parole, supervised release, or probation.

II. NONDISCRIMINATION

(Applicable to all Federal-aid construction contracts and to all related subcontracts of \$10,000 or more.)

1. **Equal Employment Opportunity:** Equal employment opportunity (EEO) requirements not to discriminate and to take affirmative action to assure equal opportunity as set forth under laws, executive orders, rules, regulations (28 CFR 35, 29 CFR 1630, and 41 CFR 60) and orders of the Secretary of Labor as modified by the provisions prescribed herein, and imposed pursuant to 23 U.S.C. 140 shall constitute the EEO and specific affirmative action standards for the contractor's project activities under this contract. The Equal Opportunity Construction Contract Specifications set forth under 41 CFR 60-4.3 and the provisions of the American Disabilities Act of 1990 (42 U.S.C. 12101 et seq.) set forth under 28 CFR 35 and 29 CFR 1630 are incorporated by reference in this contract. In the execution of this contract, the contractor agrees to comply with the following minimum specific requirement activities of EEO:
 - a. The contractor will work with the State highway agency (SHA) and the Federal Government in carrying out EEO obligations and in their review of his/her activities under the contract.
 - b. The contractor will accept as his operating policy the following statement:

"It is the policy of this Company to assure that applicants are employed, and that employees are treated during employment, without regard to their race, religion, sex, color, national origin, age or disability. Such action shall include: employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship, preapprenticeship, and/or on-the-job training."

2. **EEO Officer:** The contractor will designate and make known to the SHA contracting officers an EEO Officer who will have the responsibility for and must be capable of effectively administering and promoting an active contractor program of EEO and who must be assigned adequate authority and responsibility to do so.
3. **Dissemination of Policy:** All members of the contractor's staff who are authorized to hire, supervise, promote, and discharge employees, or who recommend such action, or who are substantially involved in such action, will be made fully cognizant of, and will implement, the contractor's EEO policy and contractual responsibilities to provide EEO in each grade and classification of employment. To ensure that the above agreement will be met, the following actions will be taken as a minimum:
 - a. Periodic meetings of supervisory and personnel office employees will be conducted before the start of work and then not less often than once every six months, at which time the contractor's EEO policy and its implementation will be reviewed and explained. The meetings will be conducted by the EEO Officer.
 - b. All new supervisory or personnel office employees will be given a thorough indoctrination by the EEO Officer, covering all major aspects of the contractor's EEO obligations within thirty days following their reporting for duty with the contractor.
 - c. All personnel who are engaged in direct recruitment for the project will be instructed by the EEO Officer in the contractor's procedures for locating and hiring minority group employees.
 - d. Notices and posters setting forth the contractor's EEO policy will be placed in areas readily accessible to employees, applicants for employment and potential employees.
 - e. The contractor's EEO policy and the procedures to implement such policy will be brought to the attention of employees by means of meetings, employee handbooks, or other appropriate means.
4. **Recruitment:** When advertising for employees, the contractor will include in all advertisements for employees the notation: "An Equal Opportunity Employer." All such advertisements will be placed in publications having a large circulation among minority groups in the area from which the project work force would normally be derived.
 - a. The contractor will, unless precluded by a valid bargaining agreement, conduct systematic and direct recruitment through public and private employee referral sources likely to yield qualified minority group applicants. To meet this requirement, the contractor will identify sources of potential minority group employees, and establish with such identified sources procedures whereby minority group applicants may be referred to the contractor for employment consideration.
 - b. In the event the contractor has a valid bargaining agreement providing for exclusive hiring hall referrals, he is expected to observe the provisions of that agreement to the extent that the system permits the contractor's compliance with EEO contract provisions. (The DOL has held that where implementation of such agreements have the effect of discriminating against minorities or women, or obligates the contractor to do the same, such implementation violates Executive Order 11246, as amended.)
 - c. The contractor will encourage his present employees to refer minority group applicants for employment. Information and procedures with regard to referring minority group applicants will be discussed with employees.
5. **Personnel Actions:** Wages, working conditions, and employee benefits shall be established and administered, and personnel actions of every type, including hiring, upgrading, promotion, transfer, demotion, layoff, and termination, shall be taken without regard to race, color, religion, sex, national origin, age or disability. The following procedures shall be followed:

- a. The contractor will conduct periodic inspections of project sites to insure that working conditions and employee facilities do not indicate discriminatory treatment of project site personnel.
 - b. The contractor will periodically evaluate the spread of wages paid within each classification to determine any evidence of discriminatory wage practices.
 - c. The contractor will periodically review selected personnel actions in depth to determine whether there is evidence of discrimination. Where evidence is found, the contractor will promptly take corrective action. If the review indicates that the discrimination may extend beyond the actions reviewed, such corrective action shall include all affected persons.
 - d. The contractor will promptly investigate all complaints of alleged discrimination made to the contractor in connection with his obligations under this contract, will attempt to resolve such complaints, and will take appropriate corrective action within a reasonable time. If the investigation indicates that the discrimination may affect persons other than the complainant, such corrective action shall include such other persons. Upon completion of each investigation, the contractor will inform every complainant of all of his avenues of appeal.
6. Training and Promotion:
- a. The contractor will assist in locating, qualifying, and increasing the skills of minority group and women employees, and applicants for employment.
 - b. Consistent with the contractor's work force requirements and as permissible under Federal and State regulations, the contractor shall make full use of training programs, i.e., apprenticeship, and on-the-job training programs for the geographical area of contract performance. Where feasible, 25 percent of apprentices or trainees in each occupation shall be in their first year of apprenticeship or training. In the event a special provision for training is provided under this contract, this subparagraph will be superseded as indicated in the special provision.
 - c. The contractor will advise employees and applicants for employment of available training programs and entrance requirements for each.
 - d. The contractor will periodically review the training and promotion potential of minority group and women employees and will encourage eligible employees to apply for such training and promotion.
7. **Unions:** If the contractor relies in whole or in part upon unions as a source of employees, the contractor will use his/her best efforts to obtain the cooperation of such unions to increase opportunities for minority groups and women within the unions, and to effect referrals by such unions of minority and female employees. Actions by the contractor either directly or through a contractor's association acting as agent will include the procedures set forth below:
- a. The contractor will use best efforts to develop, in cooperation with the unions, joint training programs aimed toward qualifying more minority group members and women for membership in the unions and increasing the skills of minority group employees and women so that they may qualify for higher paying employment.
 - b. The contractor will use best efforts to incorporate an EEO clause into each union agreement to the end that such union will be contractually bound to refer applicants without regard to their race, color, religion, sex, national origin, age or disability.
 - c. The contractor is to obtain information as to the referral practices and policies of the labor union except that to the extent such information is within the exclusive possession of the labor union and such labor union refuses to furnish such information to the contractor, the contractor shall so certify to the SHA and shall set forth what efforts have been made to obtain such information.
 - d. In the event the union is unable to provide the contractor with a reasonable flow of minority and women referrals within the time limit set forth in the collective bargaining agreement, the contractor will, through

independent recruitment efforts, fill the employment vacancies without regard to race, color, religion, sex, national origin, age or disability; making full efforts to obtain qualified and/or qualifiable minority group persons and women. (The DOL has held that it shall be no excuse that the union with which the contractor has a collective bargaining agreement providing for exclusive referral failed to refer minority employees.) In the event the union referral practice prevents the contractor from meeting the obligations pursuant to Executive Order 11246, as amended, and these special provisions, such contractor shall immediately notify the SHA.

8. **Selection of Subcontractors, Procurement of Materials and Leasing of Equipment:** The contractor shall not discriminate on the grounds of race, color, religion, sex, national origin, age or disability in the selection and retention of subcontractors, including procurement of materials and leases of equipment.
 - a. The contractor shall notify all potential subcontractors and suppliers of his/her EEO obligations under this contract.
 - b. Disadvantaged business enterprises (DBE), as defined in 49 CFR 23, shall have equal opportunity to compete for and perform subcontracts which the contractor enters into pursuant to this contract. The contractor will use his best efforts to solicit bids from and to utilize DBE subcontractors or subcontractors with meaningful minority group and female representation among their employees. Contractors shall obtain lists of DBE construction firms from SHA personnel.
 - c. The contractor will use his best efforts to ensure subcontractor compliance with their EEO obligations.
9. **Records and Reports:** The contractor shall keep such records as necessary to document compliance with the EEO requirements. Such records shall be retained for a period of three years following completion of the contract work and shall be available at reasonable times and places for inspection by authorized representatives of the SHA and the FHWA.
 - a. The records kept by the contractor shall document the following:
 - (1) The number of minority and non-minority group members and women employed in each work classification on the project;
 - (2) The progress and efforts being made in cooperation with unions, when applicable, to increase employment opportunities for minorities and women;
 - (3) The progress and efforts being made in locating, hiring, training, qualifying, and upgrading minority and female employees; and
 - (4) The progress and efforts being made in securing the services of DBE subcontractors or subcontractors with meaningful minority and female representation among their employees.
 - b. The contractors will submit an annual report to the SHA each July for the duration of the project, indicating the number of minority, women, and non-minority group employees currently engaged in each work classification required by the contract work. This information is to be reported on Form FHWA-1391. If on-the-job training is being required by special provision, the contractor will be required to collect and report training data.

III. NONSEGREGATED FACILITIES

(Applicable to all Federal-aid construction contracts and to all related subcontracts of \$10,000 or more.)

- a. By submission of this bid, the execution of this contract or subcontract, or the consummation of this material supply agreement or purchase order, as appropriate, the bidder, Federal-aid construction contractor, subcontractor, material supplier, or vendor, as appropriate, certifies that the firm does not maintain or provide for its employees any segregated facilities at any of its establishments, and that the firm does not permit its employees to perform their services at any location, under its control, where segregated facilities are maintained. The firm agrees that a breach of this certification is a violation of the EEO provisions of this contract. The firm further certifies that no employee will be denied access to adequate facilities on the basis of sex or disability.

- b. As used in this certification, the term "segregated facilities" means any waiting rooms, work areas, restrooms and washrooms, restaurants and other eating areas, time clocks, locker rooms, and other storage or dressing areas, parking lots, drinking fountains, recreation or entertainment areas, transportation, and housing facilities provided for employees which are segregated by explicit directive, or are, in fact, segregated on the basis of race, color, religion, national origin, age or disability, because of habit, local custom, or otherwise. The only exception will be for the disabled when the demands for accessibility override (e.g. disabled parking).
- c. The contractor agrees that it has obtained or will obtain identical certification from proposed subcontractors or material suppliers prior to award of subcontracts or consummation of material supply agreements of \$10,000 or more and that it will retain such certifications in its files.

IV. PAYMENT OF PREDETERMINED MINIMUM WAGE

(Applicable to all Federal-aid construction contracts exceeding \$2,000 and to all related subcontracts, except for projects located on roadways classified as local roads or rural minor collectors, which are exempt.)

1. General:

- a. All mechanics and laborers employed or working upon the site of the work will be paid unconditionally and not less often than once a week and without subsequent deduction or rebate on any account [except such payroll deductions as are permitted by regulations (29 CFR 3)] issued by the Secretary of Labor under the Copeland Act (40 U.S.C. 276c) the full amounts of wages and bona fide fringe benefits (or cash equivalents thereof) due at time of payment. The payment shall be computed at wage rates not less than those contained in the wage determination of the Secretary of Labor (hereinafter "the wage determination") which is attached hereto and made a part hereof, regardless of any contractual relationship which may be alleged to exist between the contractor or its subcontractors and such laborers and mechanics. The wage determination (including any additional classifications and wage rates conformed under paragraph 2 of this Section IV and the DOL poster (WH-1321) or Form FHWA-1495) shall be posted at all times by the contractor and its subcontractors at the site of the work in a prominent and accessible place where it can be easily seen by the workers. For the purpose of this Section, contributions made or costs reasonably anticipated for bona fide fringe benefits under Section 1(b)(2) of the Davis-Bacon Act (40 U.S.C. 276a) on behalf of laborers or mechanics are considered wages paid to such laborers or mechanics, subject to the provisions of Section IV, paragraph 3b, hereof. Also, for the purpose of this Section, regular contributions made or costs incurred for more than a weekly period (but not less often than quarterly) under plans, funds, or programs, which cover the particular weekly period, are deemed to be constructively made or incurred during such weekly period. Such laborers and mechanics shall be paid the appropriate wage rate and fringe benefits on the wage determination for the classification of work actually performed, without regard to skill, except as provided in paragraphs 4 and 5 of this Section IV.
- b. Laborers or mechanics performing work in more than one classification may be compensated at the rate specified for each classification for the time actually worked therein, provided, that the employer's payroll records accurately set forth the time spent in each classification in which work is performed.
- c. All rulings and interpretations of the Davis-Bacon Act and related acts contained in 29 CFR 1, 3, and 5 are herein incorporated by reference in this contract.

2. Classification:

- a. The SHA contracting officer shall require that any class of laborers or mechanics employed under the contract, which is not listed in the wage determination, shall be classified in conformance with the wage determination.
- b. The contracting officer shall approve an additional classification, wage rate and fringe benefits only when the following criteria have been met:
 - (1) the work to be performed by the additional classification requested is not performed by a classification in the wage determination;
 - (2) the additional classification is utilized in the area by the construction industry;

- (3) the proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination; and
 - (4) with respect to helpers, when such a classification prevails in the area in which the work is performed.
- c. If the contractor or subcontractors, as appropriate, the laborers and mechanics (if known) to be employed in the additional classification or their representatives, and the contracting officer agree on the classification and wage rate (including the amount designated for fringe benefits where appropriate), a report of the action taken shall be sent by the contracting officer to the DOL, Administrator of the Wage and Hour Division, Employment Standards Administration, Washington, D.C. 20210. The Wage and Hour Administrator, or an authorized representative, will approve, modify, or disapprove every additional classification action within 30 days of receipt and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary.
 - d. In the event the contractor or subcontractors, as appropriate, the laborers or mechanics to be employed in the additional classification or their representatives, and the contracting officer do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits, where appropriate), the contracting officer shall refer the questions, including the views of all interested parties and the recommendation of the contracting officer, to the Wage and Hour Administrator for determination. Said Administrator, or an authorized representative, will issue a determination within 30 days of receipt and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary
 - e. The wage rate (including fringe benefits where appropriate) determined pursuant to paragraph 2c or 2d of this Section IV shall be paid to all workers performing work in the additional classification from the first day on which work is performed in the classification.

3. Payment of Fringe Benefits:

- a. Whenever the minimum wage rate prescribed in the contract for a class of laborers or mechanics includes a fringe benefit which is not expressed as an hourly rate, the contractor or subcontractors, as appropriate, shall either pay the benefit as stated in the wage determination or shall pay another bona fide fringe benefit or an hourly case equivalent thereof.
- b. If the contractor or subcontractor, as appropriate, does not make payments to a trustee or other third person, he/she may consider as a part of the wages of any laborer or mechanic the amount of any costs reasonably anticipated in providing bona fide fringe benefits under a plan or program, provided, that the Secretary of Labor has found, upon the written request of the contractor, that the applicable standards of the Davis-Bacon Act have been met. The Secretary of Labor may require the contractor to set aside in a separate account assets for the meeting of obligations under the plan or program.

4. Apprentices and Trainees (Programs of the U.S. DOL) and Helpers:

a. Apprentices:

- (1) Apprentices will be permitted to work at less than the predetermined rate for the work they performed when they are employed pursuant to and individually registered in a bona fide apprenticeship program registered with the DOL, Employment and Training Administration, Bureau of Apprenticeship and Training, or with a State apprenticeship agency recognized by the Bureau, or if a person is employed in his/her first 90 days of probationary employment as an apprentice in such an apprenticeship program, who is not individually registered in the program, but who has been certified by the Bureau of Apprenticeship and Training or a State apprenticeship agency (where appropriate) to be eligible for probationary employment as an apprentice.
- (2) The allowable ratio of apprentices to journeyman-level employees on the job site in any craft classification shall not be greater than the ratio permitted to the contractor as to the entire work force under the registered program. Any employee listed on a payroll at an apprentice wage rate, who is not registered or otherwise employed as stated above, shall be paid not less than the applicable wage rate listed in the wage determination for the classification of work actually performed. In addition, any apprentice performing

work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. Where a contractor or subcontractor is performing construction on a project in a locality other than that in which its program is registered, the ratios and wage rates (expressed in percentages of the journeyman-level hourly rate) specified in the contractor's or subcontractor's registered program shall be observed.

- (3) Every apprentice must be paid at not less than the rate specified in the registered program for the apprentice's level of progress, expressed as a percentage of the journeyman-level hourly rate specified in the applicable wage determination. Apprentices shall be paid fringe benefits in accordance with the provisions of the apprenticeship program. If the apprenticeship program does not specify fringe benefits, apprentices must be paid the full amount of fringe benefits listed on the wage determination for the applicable classification. If the Administrator for the Wage and Hour Division determines that a different practice prevails for the applicable apprentice classification, fringes shall be paid in accordance with that determination.
- (4) In the event the Bureau of Apprenticeship and Training, or a State apprenticeship agency recognized by the Bureau, withdraws approval of an apprenticeship program, the contractor or subcontractor will no longer be permitted to utilize apprentices at less than the applicable predetermined rate for the comparable work performed by regular employees until an acceptable program is approved.

b. Trainees:

- (1) Except as provided in 29 CFR 5.16, trainees will not be permitted to work at less than the predetermined rate for the work performed unless they are employed pursuant to and individually registered in a program which has received prior approval, evidenced by formal certification by the DOL, Employment and Training Administration.
- (2) The ratio of trainees to journeyman-level employees on the job site shall not be greater than permitted under the plan approved by the Employment and Training Administration. Any employee listed on the payroll at a trainee rate who is not registered and participating in a training plan approved by the Employment and Training Administration shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any trainee performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed.
- (3) Every trainee must be paid at not less than the rate specified in the approved program for his/her level of progress, expressed as a percentage of the journeyman-level hourly rate specified in the applicable wage determination. Trainees shall be paid fringe benefits in accordance with the provisions of the trainee program. If the trainee program does not mention fringe benefits, trainees shall be paid the full amount of fringe benefits listed on the wage determination unless the Administrator of the Wage and Hour Division determines that there is an apprenticeship program associated with the corresponding journeyman-level wage rate on the wage determination which provides for less than full fringe benefits for apprentices, in which case such trainees shall receive the same fringe benefits as apprentices.
- (4) In the event the Employment and Training Administration withdraws approval of a training program, the contractor or subcontractor will no longer be permitted to utilize trainees at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

c. Helpers:

Helpers will be permitted to work on a project if the helper classification is specified and defined on the applicable wage determination or is approved pursuant to the conformance procedure set forth in Section IV.2. Any worker listed on a payroll at a helper wage rate, who is not a helper under an approved definition, shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed.

5. Apprentices and Trainees (Programs of the U.S. DOT):

Apprentices and trainees working under apprenticeship and skill training programs which have been certified by the Secretary of Transportation as promoting EEO in connection with Federal-aid highway construction programs are not subject to the requirements of paragraph 4 of this Section IV. The straight time hourly wage rates for apprentices and trainees under such programs will be established by the particular programs. The ratio of apprentices and trainees to journeymen shall not be greater than permitted by the terms of the particular program.

6. Withholding:

The SHA shall upon its own action or upon written request of an authorized representative of the DOL withhold, or cause to be withheld, from the contractor or subcontractor under this contract or any other Federal contract with the same prime contractor, or any other Federally-assisted contract subject to Davis-Bacon prevailing wage requirements which is held by the same prime contractor, as much of the accrued payments or advances as may be considered necessary to pay laborers and mechanics, including apprentices, trainees, and helpers, employed by the contractor or any subcontractor the full amount of wages required by the contract. In the event of failure to pay any laborer or mechanic, including any apprentice, trainee, or helper, employed or working on the site of the work, all or part of the wages required by the contract, the SHA contracting officer may, after written notice to the contractor, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds until such violations have ceased.

7. Overtime Requirements:

No contractor or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers, mechanics, watchmen, or guards (including apprentices, trainees, and helpers described in paragraphs 4 and 5 above) shall require or permit any laborer, mechanic, watchman, or guard in any workweek in which he/she is employed on such work, to work in excess of 40 hours in such workweek unless such laborer, mechanic, watchman, or guard receives compensation at a rate not less than one-and-one-half times his/her basic rate of pay for all hours worked in excess of 40 hours in such workweek.

8. Violation:

Liability for Unpaid Wages; Liquidated Damages: In the event of any violation of the clause set forth in paragraph 7 above, the contractor and any subcontractor responsible thereof shall be liable to the affected employee for his/her unpaid wages. In addition, such contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory) for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer, mechanic, watchman, or guard employed in violation of the clause set forth in paragraph 7, in the sum of \$10 for each calendar day on which such employee was required or permitted to work in excess of the standard work week of 40 hours without payment of the overtime wages required by the clause set forth in paragraph 7.

9. Withholding for Unpaid Wages and Liquidated Damages:

The SHA shall upon its own action or upon written request of any authorized representative of the DOL withhold, or cause to be withheld, from any monies payable on account of work performed by the contractor or subcontractor under any such contract or any other Federal contract with the same prime contractor, or any other Federally-assisted contract subject to the Contract Work Hours and Safety Standards Act, which is held by the same prime contractor, such sums as may be determined to be necessary to satisfy any liabilities of such contractor or subcontractor for unpaid wages and liquidated damages as provided in the clause set forth in paragraph 8 above.

V. STATEMENTS AND PAYROLLS

(Applicable to all Federal-aid construction contracts exceeding \$2,000 and to all related subcontracts, except for projects located on roadways classified as local roads or rural collectors, which are exempt.)

1. Compliance with Copeland Regulations (29 CFR 3):

The contractor shall comply with the Copeland Regulations of the Secretary of Labor which are herein incorporated by reference.

2. Payrolls and Payroll Records:

- a. Payrolls and basic records relating thereto shall be maintained by the contractor and each subcontractor during the course of the work and preserved for a period of 3 years from the date of completion of the contract for all laborers, mechanics, apprentices, trainees, watchmen, helpers, and guards working at the site of the work.
- b. The payroll records shall contain the name, social security number, and address of each such employee; his or her correct classification; hourly rates of wages paid (including rates of contributions or costs anticipated for bona fide fringe benefits or cash equivalent thereof the types described in Section 1(b)(2)(B) of the Davis Bacon Act); daily and weekly number of hours worked; deductions made; and actual wages paid. In addition, for Appalachian contracts, the payroll records shall contain a notation indicating whether the employee does, or does not, normally reside in the labor area as defined in Attachment A, paragraph 1. Whenever the Secretary of Labor, pursuant to Section IV, paragraph 3b, has found that the wages of any laborer or mechanic include the amount of any costs reasonably anticipated in providing benefits under a plan or program described in Section 1(b)(2)(B) of the Davis Bacon Act, the contractor and each subcontractor shall maintain records which show that the commitment to provide such benefits is enforceable, that the plan or program is financially responsible, that the plan or program has been communicated in writing to the laborers or mechanics affected, and show the cost anticipated or the actual cost incurred in providing benefits. Contractors or subcontractors employing apprentices or trainees under approved programs shall maintain written evidence of the registration of apprentices and trainees, and ratios and wage rates prescribed in the applicable programs.
- c. Each contractor and subcontractor shall furnish, each week in which any contract work is performed, to the SHA resident engineer a payroll of wages paid each of its employees (including apprentices, trainees, and helpers, described in Section IV, paragraphs 4 and 5, and watchmen and guards engaged on work during the preceding weekly payroll period). The payroll submitted shall set out accurately and completely all of the information required to be maintained under paragraph 2b of this Section V. This information may be submitted in any form desired. Optional Form WH-347 is available for this purpose and may be purchased from the Superintendent of Documents (Federal stock number 029-005-0014-1), U.S. Government Printing Office, Washington, D.C. 20402. The prime contractor is responsible for the submission of copies of payrolls by all subcontractors.
- d. Each payroll submitted shall be accompanied by a "Statement of Compliance," signed by the contractor or subcontractor or his/her agent who pays or supervises the payment of the persons employed under the contract and shall certify the following:
 - (1) that the payroll for the payroll period contains the information required to be maintained under paragraph 2b of this Section V and that such information is correct and complete;
 - (2) that such laborer or mechanic (including each helper, apprentice, and trainee) employed on the contract during the payroll period has been paid the full weekly wages earned, without rebate, either directly or indirectly, and that no deductions have been made either directly or indirectly from the full wages earned, other than permissible deductions as set forth in the Regulations, 29 CFR 3;
 - (3) that each laborer or mechanic has been paid not less than the applicable wage rate and fringe benefits or cash equivalent for the classification of work performed, as specified in the applicable wage determination incorporated into the contract.
- e. The weekly submission of a properly executed certification set forth on the reverse side of Optional Form WH-347 shall satisfy the requirement for submission of the "Statement of Compliance" required by paragraph 2d of this Section V.
- f. The falsification of any of the above certifications may subject the contractor to civil or criminal prosecution under 18 U.S.C. 1001 and 31 U.S.C. 231.
- g. The contractor or subcontractor shall make the records required under paragraph 2b of this Section V available for inspection, copying, or transcription by authorized representatives of the SHA, the FHWA, or the DOL, and shall permit such representatives to interview employees during working hours on the job. If the contractor or subcontractor fails to submit the required records or to make them available, the SHA, the FHWA, the DOL, or all may, after written notice to the contractor, sponsor, applicant, or owner, take such actions as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds. Furthermore, failure

to submit the required records upon request or to make such records available may be grounds for debarment action pursuant to 29 CFR 5.12.

VI. RECORD OF MATERIALS, SUPPLIES, AND LABOR

1. On all Federal-aid contracts on the National Highway System, except those which provide solely for the installation of protective devices at railroad grade crossings, those which are constructed on a force account or direct labor basis, highway beautification contracts, and contracts for which the total final construction cost for roadway and bridge is less than \$1,000,000 (23 CFR 635) the contractor shall:
 - a. Become familiar with the list of specific materials and supplies contained in Form FHWA-47, "Statement of Materials and Labor Used by Contractor of Highway Construction Involving Federal Funds," prior to the commencement of work under this contract.
 - b. Maintain a record of the total cost of all materials and supplies purchased for and incorporated in the work, and also of the quantities of those specific materials and supplies listed on Form FHWA-47, and in the units shown on Form FHWA-47.
 - c. Furnish, upon the completion of the contract, to the SHA resident engineer on Form FHWA-47 together with the data required in paragraph 1b relative to materials and supplies, a final labor summary of all contract work indicating the total hours worked and the total amount earned.
2. At the prime contractor's option, either a single report covering all contract work or separate reports for the contractor and for each subcontract shall be submitted.

VII. SUBLETTING OR ASSIGNING THE CONTRACT

1. The contractor shall perform with its own organization contract work amounting to not less than 30 percent (or a greater percentage if specified elsewhere in the contract) of the total original contract price, excluding any specialty items designated by the State. Specialty items may be performed by subcontract and the amount of any such specialty items performed may be deducted from the total original contract price before computing the amount of work required to be performed by the contractor's own organization (23 CFR 635).
 - a. "Its own organization" shall be construed to include only workers employed and paid directly by the prime contractor and equipment owned or rented by the prime contractor, with or without operators. Such term does not include employees or equipment of a subcontractor, assignee, or agent of the prime contractor.
 - b. "Specialty Items" shall be construed to be limited to work that requires highly specialized knowledge, abilities, or equipment not ordinarily available in the type of contracting organizations qualified and expected to bid on the contract as a whole and in general are to be limited to minor components of the overall contract.
2. The contract amount upon which the requirements set forth in paragraph 1 of Section VII is computed includes the cost of material and manufactured products which are to be purchased or produced by the contractor under the contract provisions.
3. The contractor shall furnish (a) a competent superintendent or supervisor who is employed by the firm, has full authority to direct performance of the work in accordance with the contract requirements, and is in charge of all construction operations (regardless of who performs the work) and (b) such other of its own organizational resources (supervision, management, and engineering services) as the SHA contracting officer determines is necessary to assure the performance of the contract.
4. No portion of the contract shall be sublet, assigned or otherwise disposed of except with the written consent of the SHA contracting officer, or authorized representative, and such consent when given shall not be construed to relieve the contractor of any responsibility for the fulfillment of the contract. Written consent will be given only after the SHA has assured that each subcontract is evidenced in writing and that it contains all pertinent provisions and requirements of the prime contract.

VIII. SAFETY: ACCIDENT PREVENTION

1. In the performance of this contract the contractor shall comply with all applicable Federal, State, and local laws governing safety, health, and sanitation (23 CFR 635). The contractor shall provide all safeguards, safety devices and protective equipment and take any other needed actions as it determines, or as the SHA contracting officer may determine, to be reasonably necessary to protect the life and health of employees on the job and the safety of the public and to protect property in connection with the performance of the work covered by the contract.
2. It is a condition of this contract, and shall be made a condition of each subcontract, which the contractor enters into pursuant to this contract, that the contractor and any subcontractor shall not permit any employee, in performance of the contract, to work in surroundings or under conditions which are unsanitary, hazardous or dangerous to his/her health or safety, as determined under construction safety and health standards (29 CFR 1926) promulgated by the Secretary of Labor, in accordance with Section 107 of the Contract Work Hours and Safety Standards Act (40 U.S.C. 333).
3. Pursuant to 29 CFR 1926.3, it is a condition of this contract that the Secretary of Labor or authorized representative thereof, shall have right of entry to any site of contract performance to inspect or investigate the matter of compliance with the construction safety and health standards and to carry out the duties of the Secretary under Section 107 of the Contract Work Hours and Safety Standards Act (40 U.S.C. 333).

IX. FALSE STATEMENTS CONCERNING HIGHWAY PROJECTS

In order to assure high quality and durable construction in conformity with approved plans and specifications and a high degree of reliability on statements and representations made by engineers, contractors, suppliers, and workers on Federal-aid highway projects, it is essential that all persons concerned with the project perform their functions as carefully, thoroughly, and honestly as possible. Willful falsification, distortion, or misrepresentation with respect to any facts related to the project is a violation of Federal law. To prevent any misunderstanding regarding the seriousness of these and similar acts, the following notice shall be posted on each Federal-aid highway project (23 CFR 635) in one or more places where it is readily available to all persons concerned with the project:

Notice To All Personnel Engaged On Federal-Aid Highway Projects

18 U.S.C. 1020 READS AS FOLLOWS:

"Whoever being an officer, agent, or employee of the United States, or any State or Territory, or whoever, whether a person, association, firm, or corporation, knowingly makes any false statement, false representation, or false report as to the character, quality, quantity, or cost of the material used or to be used, or the quantity or quality of the work performed or to be performed, or the cost thereof in connection with the submission of plans, maps, specifications, contracts, or costs of construction on any highway or related project submitted for approval to the Secretary of Transportation; or

Whoever knowingly makes any false statement, false representation, false report or false claim with respect to the character, quality, quantity, or cost of any work performed or to be performed, or materials furnished or to be furnished, in connection with the construction of any highway or related project approved by the Secretary of Transportation; or

Whoever knowingly makes any false statement or false representation as to material fact in any statement, certificate, or report submitted pursuant to provisions of the Federal-aid Roads Act approved July 1, 1916, (39 Stat. 355), as amended and supplemented;

Shall be fined not more than \$10,000 or imprisoned not more than 5 years or both."

X. IMPLEMENTATION OF CLEAN AIR ACT AND FEDERAL WATER POLLUTION CONTROL ACT

(Applicable to all Federal-aid construction contracts and to all related subcontracts of \$100,000 or more.)

By submission of this bid or the execution of this contract, or subcontract, as appropriate, the bidder, Federal-aid construction contractor, or subcontractor, as appropriate, will be deemed to have stipulated as follows:

1. That any facility that is or will be utilized in the performance of this contract, unless such contract is exempt under the Clean Air Act, as amended (42 U.S.C. 1857 et seq., as amended by Pub.L. 91-604), and under the Federal Water

Pollution Control Act, as amended (33 U.S.C. 1251 et seq., as amended by Pub.L. 92-500), Executive Order 11738, and regulations in implementation thereof (40 CFR 15) is not listed, on the date of contract award, on the U.S. Environmental Protection Agency (EPA) List of Violating Facilities pursuant to 40 CFR 15.20.

2. That the firm agrees to comply and remain in compliance with all the requirements of Section 114 of the Clean Air Act and Section 308 of the Federal Water Pollution Control Act and all regulations and guidelines listed thereunder.
3. That the firm shall promptly notify the SHA of the receipt of any communication from the Director, Office of Federal Activities, EPA, indicating that a facility that is or will be utilized for the contract is under consideration to be listed on the EPA List of Violating Facilities.
4. That the firm agrees to include or cause to be included the requirements of paragraph 1 through 4 of this Section X in every nonexempt subcontract, and further agrees to take such action as the government may direct as a means of enforcing such requirements.

XI. CERTIFICATION REGARDING DEBARMENT, SUSPENSION, INELIGIBILITY AND VOLUNTARY EXCLUSION

1. Instructions for Certification - Primary Covered Transactions:

(Applicable to all Federal-aid contracts - 49 CFR 29)

- a. By signing and submitting this proposal, the prospective primary participant is providing the certification set out below.
- b. The inability of a person to provide the certification set out below will not necessarily result in denial of participation in this covered transaction. The prospective participant shall submit an explanation of why it cannot provide the certification set out below. The certification or explanation will be considered in connection with the department or agency's determination whether to enter into this transaction. However, failure of the prospective primary participant to furnish a certification or an explanation shall disqualify such a person from participation in this transaction.
- c. The certification in this clause is a material representation of fact upon which reliance was placed when the department or agency determined to enter into this transaction. If it is later determined that the prospective primary participant knowingly rendered an erroneous certification, in addition to other remedies available to the Federal Government, the department or agency may terminate this transaction for cause of default.
- d. The prospective primary participant shall provide immediate written notice to the department or agency to whom this proposal is submitted if any time the prospective primary participant learns that its certification was erroneous when submitted or has become erroneous by reason of changed circumstances.
- e. The terms "covered transaction," "debarred," "suspended," "ineligible," "lower tier covered transaction," "participant," "person," "primary covered transaction," "principal," "proposal," and "voluntarily excluded," as used in this clause, have the meanings set out in the Definitions and Coverage sections of rules implementing Executive Order 12549. You may contact the department or agency to which this proposal is submitted for assistance in obtaining a copy of those regulations.
- f. The prospective primary participant agrees by submitting this proposal that, should the proposed covered transaction be entered into, it shall not knowingly enter into any lower tier covered transaction with a person who is debarred, suspended, declared ineligible, or voluntarily excluded from participation in this covered transaction, unless authorized by the department or agency entering into this transaction.
- g. The prospective primary participant further agrees by submitting this proposal that it will include the clause titled "Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion-Lower Tier Covered Transaction," provided by the department or agency entering into this covered transaction, without modification, in all lower tier covered transactions and in all solicitations for lower tier covered transactions.

- h. A participant in a covered transaction may rely upon a certification of a prospective participant in a lower tier covered transaction that is not debarred, suspended, ineligible, or voluntarily excluded from the covered transaction, unless it knows that the certification is erroneous. A participant may decide the method and frequency by which it determines the eligibility of its principals. Each participant may, but is not required to, check the nonprocurement portion of the "Lists of Parties Excluded From Federal Procurement or Nonprocurement Programs" (Nonprocurement List) which is compiled by the General Services Administration.
- i. Nothing contained in the foregoing shall be construed to require establishment of a system of records in order to render in good faith the certification required by this clause. The knowledge and information of participant is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.
- j. Except for transactions authorized under paragraph f of these instructions, if a participant in a covered transaction knowingly enters into a lower tier covered transaction with a person who is suspended, debarred, ineligible, or voluntarily excluded from participation in this transaction, in addition to other remedies available to the Federal Government, the department or agency may terminate this transaction for cause or default.

Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion — Primary Covered Transactions

1. The prospective primary participant certifies to the best of its knowledge and belief, that it and its principals:
 - a. Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from covered transactions by any Federal department or agency;
 - b. Have not within a 3-year period preceding this proposal been convicted of or had a civil judgement rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, State or local) transaction or contract under a public transaction; violation of Federal or State antitrust statutes or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property;
 - c. Are not presently indicted for or otherwise criminally or civilly charged by a governmental entity (Federal, State or local) with commission of any of the offenses enumerated in paragraph 1b of this certification; and
 - d. Have not within a 3-year period preceding this application/proposal had one or more public transactions (Federal, State or local) terminated for cause or default.
2. Where the prospective primary participant is unable to certify to any of the statements in this certification, such prospective participant shall attach an explanation to this proposal.

2. Instructions for Certification - Lower Tier Covered Transactions:

(Applicable to all subcontracts, purchase orders and other lower tier transactions of \$25,000 or more - 49 CFR 29)

- a. By signing and submitting this proposal, the prospective lower tier is providing the certification set out below.
- b. The certification in this clause is a material representation of fact upon which reliance was placed when this transaction was entered into. If it is later determined that the prospective lower tier participant knowingly rendered an erroneous certification, in addition to other remedies available to the Federal Government, the department or agency with which this transaction originated may pursue available remedies, including suspension and/or debarment.
- c. The prospective lower tier participant shall provide immediate written notice to the person to which this proposal is submitted if at any time the prospective lower tier participant learns that its certification was erroneous by reason of changed circumstances.
- d. The terms "covered transaction," "debarred," "suspended," "ineligible," "primary covered transaction," "participant," "person," "principal," "proposal," and "voluntarily excluded," as used in this clause, have the

meanings set out in the Definitions and Coverage sections of rules implementing Executive Order 12549. You may contact the person to which this proposal is submitted for assistance in obtaining a copy of those regulations.

- e. The prospective lower tier participant agrees by submitting this proposal that, should the proposed covered transaction be entered into, it shall not knowingly enter into any lower tier covered transaction with a person who is debarred, suspended, declared ineligible, or voluntarily excluded from participation in this covered transaction, unless authorized by the department or agency with which this transaction originated.
- f. The prospective lower tier participant further agrees by submitting this proposal that it will include this clause titled "Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion-Lower Tier Covered Transaction," without modification, in all lower tier covered transactions and in all solicitations for lower tier covered transactions.
- g. A participant in a covered transaction may rely upon a certification of a prospective participant in a lower tier covered transaction that is not debarred, suspended, ineligible, or voluntarily excluded from the covered transaction, unless it knows that the certification is erroneous. A participant may decide the method and frequency by which it determines the eligibility of its principals. Each participant may, but is not required to, check the Nonprocurement List.
- h. Nothing contained in the foregoing shall be construed to require establishment of a system of records in order to render in good faith the certification required by this clause. The knowledge and information of participant is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.
- i. Except for transactions authorized under paragraph e of these instructions, if a participant in a covered transaction knowingly enters into a lower tier covered transaction with a person who is suspended, debarred, ineligible, or voluntarily excluded from participation in this transaction, in addition to other remedies available to the Federal Government, the department or agency with which this transaction originated may pursue available remedies, including suspension and/or debarment.

Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion — Lower Tier Covered Transactions

1. The prospective lower tier participant certifies, by submission of this proposal, that neither it nor its principals is presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participation in this transaction by any Federal department or agency.
2. Where the prospective lower tier participant is unable to certify to any of the statements in this certification, such prospective participant shall attach an explanation to this proposal.

XII. CERTIFICATION REGARDING USE OF CONTRACT FUNDS FOR LOBBYING

(Applicable to all Federal-aid construction contracts and to all related subcontracts which exceed \$100,000 - 49 CFR 20)

1. The prospective participant certifies, by signing and submitting this bid or proposal, to the best of his or her knowledge and belief, that:
 - a. No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of any Federal agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.
 - b. If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any Federal agency, a Member of Congress, an officer or

employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form-LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions.

2. This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by 31 U.S.C. 1352. Any person who fails to file the required certification shall be subject to a civil penalty of not less than \$10,000 and not more than \$100,000 for each such failure.
3. The prospective participant also agrees by submitting his or her bid or proposal that he or she shall require that the language of this certification be included in all lower tier subcontracts, which exceed \$100,000 and that all such recipients shall certify and disclose accordingly.

FEDERAL-AID FEMALE AND MINORITY GOALS

In accordance with Section II, "Nondiscrimination," of "Required Contract Provisions Federal-aid Construction Contracts" the following are the goals for female utilization:

Goal for Women (applies nationwide).....(percent) 6.9

The following are goals for minority utilization:

CALIFORNIA ECONOMIC AREA

		Goal (Percent)
174	Redding, CA: Non-SMSA Counties CA Lassen; CA Modoc; CA Plumas; CA Shasta; CA Siskiyou; CA Tehama.	6.8
175	Eureka, CA Non-SMSA Counties CA Del Norte; CA Humboldt; CA Trinity.	6.6
176	San Francisco-Oakland-San Jose, CA: SMSA Counties: 7120 Salinas-Seaside-Monterey, CA CA Monterey. 7360 San Francisco-Oakland CA Alameda; CA Contra Costa; CA Marin; CA San Francisco; CA San Mateo. 7400 San Jose, CA CA Santa Clara. 7485 Santa Cruz, CA. CA Santa Cruz. 7500 Santa Rosa, CA CA Sonoma. 8720 Vallejo-Fairfield- Napa, CA CA Napa; CA Solano Non-SMSA Counties CA Lake; CA Mendocino; CA San Benito	28.9 25.6 19.6 14.9 9.1 17.1 23.2
177	Sacramento, CA: SMSA Counties: 6920 Sacramento, CA CA Placer; CA Sacramento; CA Yolo. Non-SMSA Counties CA Butte; CA Colusa; CA El Dorado; CA Glenn; CA Nevada; CA Sierra; CA Sutter; CA Yuba.	16.1 14.3
178	Stockton-Modesto, CA: SMSA Counties: 5170 Modesto, CA CA Stanislaus. 8120 Stockton, CA CA San Joaquin. Non-SMSA Counties CA Alpine; CA Amador; CA Calaveras; CA Mariposa; CA Merced; CA Tuolumne.	12.3 24.3 19.8

		Goal (Percent)
179	Fresno-Bakersfield, CA	
	SMSA Counties:	
	0680 Bakersfield, CA CA Kern.	19.1
	2840 Fresno, CA CA Fresno.	26.1
	Non-SMSA Counties CA Kings; CA Madera; CA Tulare.	23.6
180	Los Angeles, CA:	
	SMSA Counties:	
	0360 Anaheim-Santa Ana-Garden Grove, CA CA Orange.	11.9
	4480 Los Angeles-Long Beach, CA CA Los Angeles.	28.3
	6000 Oxnard-Simi Valley-Ventura, CA CA Ventura.	21.5
	6780 Riverside-San Bernardino-Ontario, CA. CA Riverside; CA San Bernardino.	19.0
	7480 Santa Barbara-Santa Maria-Lompoc, CA CA Santa Barbara.	19.7
	Non-SMSA Counties CA Inyo; CA Mono; CA San Luis Obispo.	24.6
181	San Diego, CA:	
	SMSA Counties	
	7320 San Diego, CA. CA San Diego.	16.9
	Non-SMSA Counties CA Imperial.	18.2

In addition to the reporting requirements set forth elsewhere in this contract the Contractor and subcontractors holding subcontracts, not including material suppliers, of \$10,000 or more, shall submit for every month of July during which work is performed, employment data as contained under Form FHWA PR-1391 (Appendix C to 23 CFR, Part 230), and in accordance with the instructions included thereon.