**** WARNING ** WARNING ** WARNING ** WARNING ****
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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 ROUTE 405/101 SEPARATION TO 0.2 KM NORTH OF ROUTE 101/27 SEPARATION AT NORTH HOLLYWOOD HUB BUILDING AND AT TRAFFIC MANAGEMENT CENTER

DISTRICT 07, ROUTE 101

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

CONTRACT NO. 07-120754

07-LA-101-R27.8/R40.6

Federal Aid Project

ACNH-P101(985)E

Bids Open: May 29, 2003
Dated: April 28, 2003

OSD

****

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.

TABLE OF CONTENTS

NOTICE TO CONTRACTORS 1
SPECIAL PROVISIONS 8
SECTION 1. SPECIFICATIONS AND PLANS 8
AMENDMENTS TO JULY 1999 STANDARD SPECIFICATIONS 8
SECTION 2. PROPOSAL REQUIREMENTS AND CONDITIONS 47
2-1.01 GENERAL 47
2-1.015 FEDERAL LOBBYING RESTRICTIONS 47
2-1.02 DISADVANTAGED BUSINESS ENTERPRISE (DBE) 47
2-1.02A DBE GOAL FOR THIS PROJECT 49
2-1.02B SUBMISSION OF DBE INFORMATION 49
SECTION 3. AWARD AND EXECUTION OF CONTRACT 50
SECTION 4. BEGINNING OF WORK, TIME OF COMPLETION AND LIQUIDATED DAMAGES 51
SECTION 5. GENERAL 51
SECTION 5-1. MISCELLANEOUS 51
5-1.01 PLANS AND WORKING DRAWINGS 51
5-1.011 EXAMINATION OF PLANS, SPECIFICATIONS, CONTRACT, AND SITE OF WORK 51
5-1.012 DIFFERING SITE CONDITIONS 51
5-1.013 LINES AND GRADES 51
5-1.015 LABORATORY 51
5-1.017 CONTRACT BONDS 52
5-1.019 COST REDUCTION INCENTIVE 52
5-1.02 LABOR NONDISCRIMINATION 52
5-1.022 PAYMENT OF WITHHELD FUNDS 52
5-1.03 INTEREST ON PAYMENTS 52
5-1.031 FINAL PAYMENT AND CLAIMS 53
5-1.04 PUBLIC SAFETY 53
5-1.05 TESTING 54
5-1.06 REMOVAL OF ASBESTOS AND HAZARDOUS SUBSTANCES 54
5-1.07 YEAR 2000 COMPLIANCE 54
5-1.075 BUY AMERICA REQUIREMENTS 55
5-1.08 SUBCONTRACTOR AND DBE RECORDS 55
5-1.083 DBE CERTIFICATION STATUS 55
5-1.086 PERFORMANCE OF DBE SUBCONTRACTORS AND SUPPLIERS 55
5-1.09 SUBCONTRACTING 56
5-1.10 PROMPT PROGRESS PAYMENT TO SUBCONTRACTORS 56
5-1.102 PROMPT PAYMENT OF WITHHELD FUNDS TO SUBCONTRACTORS 57
5-1.103 RECORDS 57
5-1.11 PARTNERING 57
5-1.114 VALUE ANALYSIS 57
5-1.12 FORCE ACCOUNT PAYMENT 58
5-1.13 AREAS FOR CONTRACTOR'S USE 58
5-1.14 PAYMENTS 59
5-1.15 SOUND CONTROL REQUIREMENTS 59
5-1.16 AS-BUILT PLANS 59
5-1.17 AERIALLY DEPOSITED LEAD 60
SECTION 6. (BLANK) 60
SECTION 7. (BLANK) 60
SECTION 8. MATERIALS 60
SECTION 8-1. MISCELLANEOUS 60
8-1.01 SUBSTITUTION OF NON-METRIC MATERIALS AND PRODUCTS 60
8-1.02 PREQUALIFIED AND TESTED SIGNING AND DELINEATION MATERIALS 66
8-1.03 STATE-FURNISHED MATERIALS 71
8-1.04 SLAG AGGREGATE 72

SECTION 8-2. CONCRETE 72
8-2.01 PORTLAND CEMENT CONCRETE 72
SECTION 8-3. WELDING 73
8-3.01 WELDING 73
GENERAL 73
WELDING QUALITY CONTROL 75
PAYMENT 77
SECTION 9. DESCRIPTION OF BRIDGE WORK 77
SECTION 10. CONSTRUCTION DETAILS 78
SECTION 10-1. GENERAL 78
10-1.00 CONSTRUCTION PROJECT INFORMATION SIGNS 78
10-1.01 ORDER OF WORK 78
10-1.02 WATER POLLUTION CONTROL 79
RETENTION OF FUNDS 80
WATER POLLUTION CONTROL PROGRAM PREPARATION, APPROVAL AND AMENDMENTS 80
COST BREAK-DOWN 81
WPCP IMPLEMENTATION 84
MAINTENANCE 85
REPORTING REQUIREMENTS 85
PAYMENT 85
10-1.03 PRESERVATION OF PROPERTY 86
10-1.04 COOPERATION 86
10-1.05 PROGRESS SCHEDULE (CRITICAL PATH METHOD) 86
DEFINITIONS 86
GENERAL REQUIREMENTS 87
COMPUTER SOFTWARE 88
NETWORK DIAGRAMS, REPORTS AND DATA 88
PRE-CONSTRUCTION SCHEDULING CONFERENCE 89
BASELINE SCHEDULE 90
UPDATE SCHEDULE 90
TIME IMPACT ANALYSIS 90
FINAL UPDATE SCHEDULE 91
RETENTION 91
PAYMENT 91
10-1.06 TIME-RELATED OVERHEAD 92
10-1.07 OBSTRUCTIONS 93
10-1.08 MOBILIZATION 94
10-1.09 CONSTRUCTION AREA TRAFFIC CONTROL DEVICES 94
10-1.10 CONSTRUCTION AREA SIGNS 95
10-1.11 MAINTAINING TRAFFIC 95
10-1.12 CLOSURE REQUIREMENTS AND CONDITIONS 129
CLOSURE SCHEDULE 129
CONTINGENCY PLAN 130
LATE REOPENING OF CLOSURES 130
COMPENSATION 130
10-1.13 TRAFFIC CONTROL SYSTEM FOR LANE CLOSURE 130
STATIONARY LANE CLOSURE 131
MOVING LANE CLOSURE 131
PAYMENT 131
10-1.14 PORTABLE CHANGEABLE MESSAGE SIGN 132
10-1.15 TEMPORARY RAILING 132
10-1.16 CHANNELIZER 132
10-1.17 TEMPORARY TRAFFIC SCREEN 132
10-1.18 TEMPORARY CRASH CUSHION MODULE 133
10-1.19 EXISTING HIGHWAY FACILITIES 134
REMOVE METAL BEAM GUARD RAILING 134
REMOVE ASPHALT CONCRETE DIKE 134
RELOCATE ROADSIDE SIGN 134

ADJUST PULL BOX TO GRADE....134
EXISTING LOOP DETECTORS....134
ACCESS OPENING, SOFFIT....134
10-1.20 SIGN MOUNTED CAMERA....135
10-1.21 MAINTAIN EXISTING TRAFFIC MONITORING STATIONS....135
10-1.22 CLEARING AND GRUBBING....135
10-1.23 EARTHWORK....135
10-1.24 MATERIAL CONTAINING AERIALLY DEPOSITED LEAD....136
LEAD COMPLIANCE PLAN....136
EXCAVATION AND TRANSPORTATION PLAN....136
DUST CONTROL....137
MATERIAL TRANSPORTATION....137
DISPOSAL....137
MEASUREMENT AND PAYMENT....137
10-1.25 AGGREGATE BASE....137
10-1.26 ASPHALT CONCRETE....138
10-1.27 PILING....138
GENERAL....138
CAST-IN-DRILLED-HOLE CONCRETE PILES....138
MEASUREMENT AND PAYMENT (PILING)....144
10-1.28 CONCRETE STRUCTURES....145
10-1.29 STRUCTURE APPROACH SLABS (TYPE R)....145
GENERAL....145
TEMPORARY DECK BRIDGING....145
TEMPORARY ROADWAY STRUCTURAL SECTION....146
REMOVING PORTIONS OF EXISTING STRUCTURES....146
STRUCTURE APPROACH SLAB....146
MEASUREMENT AND PAYMENT....147
10-1.30 SOUND WALL....148
DESCRIPTION....148
SOUND WALL (MASONRY BLOCK)....148
MEASUREMENT AND PAYMENT....149
10-1.31 CORE CONCRETE....149
10-1.32 REINFORCEMENT....150
10-1.33 STEEL STRUCTURES....150
GENERAL....150
ROTATIONAL CAPACITY TESTING PRIOR TO SHIPMENT TO JOB SITE....150
INSTALLATION TENSION TESTING AND ROTATIONAL CAPACITY TESTING AFTER ARRIVAL ON THE JOB SITE....154
SURFACE PREPARATION....155
WELDING....155
10-1.34 SIGN STRUCTURES....155
10-1.35 DELINEATORS....156
10-1.36 METAL BEAM GUARD RAILING....156
TERMINAL SYSTEM (TYPE ET)....156
TERMINAL SYSTEM (TYPE SRT)....157
10-1.37 CONCRETE BARRIER....157
SECTION 10-2 HIGHWAY PLANTING AND IRRIGATION SYSTEMS....157
10-2.01 GENERAL....157
10-2.02 EXISTING HIGHWAY PLANTING....157
MAINTAIN EXISTING PLANTS....158
REMOVE TREE....158
PRUNE EXISTING PLANTS....158
10-2.03 EXISTING HIGHWAY IRRIGATION FACILITIES....158
LOCATE EXISTING IRRIGATION FACILITIES....158
MODIFY EXISTING IRRIGATION SYSTEM....158
CHECK AND TEST EXISTING IRRIGATION FACILITIES....159
FINAL IRRIGATION SYSTEM CHECK....159

SECTION 10-3. ELECTRICAL SYSTEMS 159
10-3.01 DESCRIPTION 159
10-3.02 ABBREVIATIONS AND GLOSSARY 162
Abbreviations: 162
Glossary: 164
10-3.03 COST BREAK-DOWN 165
10-3.04 EQUIPMENT LIST, DRAWINGS, AND FIELD CABINETS 166
FIELD CABINETS 166
CCTV CAMERA 166
VIDEO NODE, DATA NODE AND CABLE NODE 166
CHANGEABLE MESSAGE SIGN 166
10-3.05 MAINTAINING EXISTING ELECTRICAL SYSTEMS 166
MAINTAINING EXISTING COMMUNICATION SYSTEM ROUTING FACILITIES 167
RESTRICTIONS OF CHANGEABLE MESSAGE SIGN, RAMP METERING SYSTEM, TRAFFIC MONITORING STATION AND CONTROL STATION 167
10-3.06 COMMUNICATION SYSTEM ROUTING AND FIELD ELEMENT LOCATIONS 168
COMMUNICATION SYSTEM ROUTING 168
FIELD ELEMENT LOCATIONS 169
10-3.07 FOUNDATIONS 169
10-3.08 CONDUIT 169
10-3.09 COMMUNICATION CONDUIT 170
COMMUNICATION CONDUIT (BRIDGE) 170
HANGERS, CONCRETE AND METAL SUPPORTS (BRIDGE) 171
WARNING TAPE 172
COLORED CEMENT BACKFILL 172
FIBER UNDER GROUND WARNING SIGN 172
0.5-MM PLASTIC SHEET 172
10-3.10 SIZE 25 AND 32 INNERDUCTS 172
10-3.11 PULL BOXES 173
COMMUNICATION PULL BOXES 173
SPLICE VAULT 174
10-3.12 CONDUCTORS AND WIRING 174
10-3.13 FIBER OPTIC CABLE 174
DEFINITIONS 174
FIBER OPTIC OUTSIDE PLANT CABLE 176
LABELING 179
CABLE INSTALLATION 182
SPLICING 182
SPLICE CLOSURES 183
SPLICE TRAYS 183
PASSIVE CABLE ASSEMBLIES AND COMPONENTS 183
FIBER OPTIC CABLE TERMINATIONS 183
FIBER OPTIC TESTING 184
10-3.14 BONDING AND GROUNDING 189
10-3.15 SERVICE 189
10-3.16 STATE-FURNISHED TYPE 334 AND 334 CMS CONTROLLER ASSEMBLIES 189
10-3.17 DETECTORS 189
10-3.18 MODEL 500 CHANGEABLE MESSAGE SIGN SYSTEM 190
10-3.19 CCTV AND COMMUNICATION EQUIPMENT 190
GENERAL 190
CLOSED CIRCUIT TELEVISION CAMERA LOCATION 190
CLOSED CIRCUIT TELEVISION CAMERA POLE 191
SIGN TRUSS MOUNT 191
CLOSED CIRCUIT TELEVISION WIRINGS 191
TYPE 334 -TV CONTROLLER CABINET 191
CCTV CAMERA ASSEMBLY 192
CLOSED CIRCUIT TELEVISION DIGITAL SIGNAL PROCESSING COLOR VIDEO CAMERA UNIT 192
CLOSED CIRCUIT TELEVISION CAMERA LENS 194

ENCLOSED CAMERA CONTROL CABLES 195
CAMERA HOUSING 196
PAN AND TILT UNIT 197
CAMERA CONTROL RECEIVER 198
VIDEO TRANSMITTER 200
FIBER OPTIC DATA MODEM 201
NORTH HOLLYWOOD (NHD) COMMUNICATION HUB BUILDING EQUIPMENT 202
ACCESS TO EXISTING NORTH HOLLYWOOD (NHD) HUB BUILDING 202
CABLE NODE (LOCATION VE254) 203
MODIFY CABLE NODE (LOCATION VE171) 203
RESTRICTIONS OF WORKS AND ACCESS TO EXISTING CABLE NODE LOCATION VE171 203
VIDEO NODE (LOCATION VE213) 204
VIDEO RECEIVER 204
VIDEO MULTIPLEXER AND DEMULTIPLEXER 205
DATA NODE (LOCATION VE213) 207
D4 CHANNEL BANK 207
DS-1 OPTICAL MODEM 209
10-3.20 SYSTEM TESTING AND DOCUMENTATION 212
SYSTEM TESTING 212
FINAL ACCEPTANCE TESTING 214
SYSTEM DOCUMENTATION 215
FINAL ACCEPTANCE 216
10-3.21 COMMUNICATION SYSTEM ROUTING CUT-OVER 216
10-3.22 REMOVING, AND SALVAGING ELECTRICAL EQUIPMENT 217
10-3.23 PAYMENT 217
SECTION 11. (BLANK) 218
SECTION 12. (BLANK) 218
SECTION 13. (BLANK) 218
SECTION 14 FEDERAL REQUIREMENTS FOR FEDERAL-AID CONSTRUCTION PROJECTS 219

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
A62B	Limits of Payment for Excavation and Backfill - Bridge Surcharge and Wall
RSP A73C	Delineators, Channelizers and Barricades
A77A	Metal Beam Guard Railing – Typical Wood Post With Wood Block
A77F	Metal Beam Guard Railing – Typical Embankment Widening for End Treatments
RSP A77G	Metal Beam Guard Railing – End Treatment, Terminal Anchor Assembly (Type SFT)
A77J	Metal Beam Guard Railing Connections to Bridge Railings, Retaining Walls and Abutments
RSP A77L	Metal Beam Guard Railing and Single Faced Barrier Railing Terminal System - End Treatments
RSP A77M	Metal Beam Guard Railing and Single Faced Barrier Railing Terminal System - End Treatment
A87	Curbs, Dikes and Driveways
T1A	Temporary Crash Cushion, Sand Filled (Unidirectional)
T1B	Temporary Crash Cushion, Sand Filled (Bidirectional)

RSP T2	Temporary Crash Cushion, Sand Filled (Shoulder Installations)
T3	Temporary Railing (Type K)
T4	Temporary Traffic Screen
T7	Construction Project Funding Identification Signs
T10	Traffic Control System for Lane Closure On Freeways and Expressways
T10A	Traffic Control System for Lane and Complete Closures On Freeways and Expressways
T14	Traffic Control System for Ramp Closure
T16	Traffic Control System for Moving Lane Closure On Multilane Highways
RSP B0-3	Bridge Details
RSP B3-7	Retaining Wall Type 5
RSP B3-8	Retaining Wall Details No. 1
RSP B11-53	Concrete Barrier Type 25
B14-3	Communication and Sprinkler Control Conduits (Conduit Less Than size 103)
RS1	Roadside Signs, Typical Installation Details No. 1
RS2	Roadside Signs - Wood Post, Typical Installation Details No. 2
S9	Overhead Signs - Walkway Details No. 1
S10	Overhead Signs - Walkway Details No. 2
RSP S11	Overhead Signs - Walkway Safety Railing Details
ES-1A	Signal, Lighting and Electrical Systems - Symbols and Abbreviations
ES-1B	Signal, Lighting and Electrical Systems - Symbols and Abbreviations
ES-2C	Signal, Lighting and Electrical Systems - Service Equipment Notes, Type III Series
ES-2E	Signal, Lighting and Electrical Systems - Service Equipment and Typical Wiring Diagram Type III-B Series
ES-2F	Signal, Lighting and Electrical Systems - Service Equipment and Typical Wiring Diagram Type III-C Series
ES-3B	Signal, Lighting and Electrical Systems - Controller Cabinet Details
ES-3C	Signal, Lighting and Electrical Systems - Controller Cabinet Details
ES-5A	Signal, Lighting and Electrical Systems - Detectors
ES-5B	Signal, Lighting and Electrical Systems - Detectors
ES-5E	Signal, Lighting and Electrical Systems - Detectors
ES-8	Signal, Lighting and Electrical Systems - Pull Box Details
ES-9A	Signal, Lighting and Electrical Systems - Electrical Details, Structure Installations
ES-9B	Signal, Lighting and Electrical Systems - Electrical Details, Structure Installations
ES-11	Signal, Lighting and Electrical Systems - Foundation Installations
ES-13A	Signal, Lighting and Electrical Systems - Splicing Details
ES-13B	Signal, Lighting and Electrical Systems - Wiring Details and Fuse Ratings
ES-16A	Closed Circuit Television Pole Details
ES-16B	Closed Circuit Television Pole Details - Overhead Sign Mounted

DEPARTMENT OF TRANSPORTATION

NOTICE TO CONTRACTORS

CONTRACT NO. 07-120754

07-LA-101-R27.8/R40.6

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 ROUTE 405/101 SEPARATION TO 0.2 KM NORTH OF ROUTE 101/27 SEPARATION AT NORTH HOLLYWOOD HUB BUILDING AND AT TRAFFIC MANAGEMENT CENTER

will be received at the Department of Transportation, 3347 Michelson Drive, Suite 100, Irvine, CA 92612-1692, until 2 o'clock p.m. on May 29, 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 ROUTE 405/101 SEPARATION TO 0.2 KM NORTH OF ROUTE 101/27 SEPARATION AT NORTH HOLLYWOOD HUB BUILDING AND AT TRAFFIC MANAGEMENT CENTER

General work description: Closed Circuit Television and Fiber Optic Communications System

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.

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 April 28, 2003

JKB

COPY OF ENGINEER'S ESTIMATE
(NOT TO BE USED FOR BIDDING PURPOSES)
07-120754

Item	Item Code	Item	Unit of Measure	Estimated Quantity
1	070012	PROGRESS SCHEDULE (CRITICAL PATH METHOD)	LS	LUMP SUM
2	070018	TIME-RELATED OVERHEAD	WDAY	400
3	074017	PREPARE WATER POLLUTION CONTROL PROGRAM	LS	LUMP SUM
4	074020	WATER POLLUTION CONTROL	LS	LUMP SUM
5 (S)	120090	CONSTRUCTION AREA SIGNS	LS	LUMP SUM
6 (S)	120100	TRAFFIC CONTROL SYSTEM	LS	LUMP SUM
7 (S)	120165	CHANNELIZER (SURFACE MOUNTED)	EA	48
8 (S)	129000	TEMPORARY RAILING (TYPE K)	M	540
9	150662	REMOVE METAL BEAM GUARD RAILING	M	260
10	150771	REMOVE ASPHALT CONCRETE DIKE	M	390
11	152386	RELOCATE ROADSIDE SIGN-ONE POST	EA	1
12	153531	ACCESS OPENING, SOFFIT	EA	18
13	160101	CLEARING AND GRUBBING	LS	LUMP SUM
14	160120	REMOVE TREE	EA	5
15	190103	ROADWAY EXCAVATION (TYPE Y) (AERIALLY DEPOSITED LEAD)	M3	252
16	190110	LEAD COMPLIANCE PLAN	LS	LUMP SUM
17 (F)	192051	STRUCTURE EXCAVATION (TYPE Y) (AERIALLY DEPOSITED LEAD)	M3	1021
18 (F)	193013	STRUCTURE BACKFILL (RETAINING WALL)	M3	1270
19	198001	IMPORTED BORROW	M3	280
20	260201	CLASS 2 AGGREGATE BASE	M3	11

Item	Item Code	Item	Unit of Measure	Estimated Quantity
21	390103	ASPHALT CONCRETE (TYPE B)	TONN	1390
22	394002	PLACE ASPHALT CONCRETE (MISCELLANEOUS AREA)	M2	1990
23	394044	PLACE ASPHALT CONCRETE DIKE (TYPE C)	M	29
24	394049	PLACE ASPHALT CONCRETE DIKE (TYPE F)	M	390
25 (F)	510060	STRUCTURAL CONCRETE, RETAINING WALL	M3	544
26	046365	STRUCTURAL CONCRETE, APPROACH SLAB (TYPE R MODIFIED)	M3	37
27 (S)	515074	CORE CONCRETE (101 MM - 150 MM)	M	56
28 (F)	517961	SOUND WALL (BARRIER) (MASONRY BLOCK)	M2	250
29	519001	WATERSTOP	M	31
30 (F)	520103	BAR REINFORCING STEEL (RETAINING WALL)	KG	24 970
31 (F)	560218	FURNISH SIGN STRUCTURE (TRUSS)	KG	7746
32 (F)	560219	INSTALL SIGN STRUCTURE (TRUSS)	KG	7746
33 (S)	031254	1524 MM CAST-IN-DRILLED-HOLE CONCRETE PILE (SIGN FOUNDATION)	M	6.7
34	566011	ROADSIDE SIGN - ONE POST	EA	1
35	820118	GUARD RAILING DELINEATOR	EA	100
36 (S)	832003	METAL BEAM GUARD RAILING (WOOD POST)	M	420
37 (F)	833126	CONCRETE BARRIER (TYPE 25A)	M	252
38 (F)	031255	CONCRETE BARRIER (TYPE 736 MODIFIED)	M	92
39	839553	END SECTION	EA	10
40	839559	TERMINAL SYSTEM (TYPE ET)	EA	1

Item	Item Code	Item	Unit of Measure	Estimated Quantity
41 (S)	839565	TERMINAL SYSTEM (TYPE SRT)	EA	2
42 (S)	839568	TERMINAL ANCHOR ASSEMBLY (TYPE SFT)	EA	12
43	031256	SIZE 53 TYPE 1 CONDUIT (JACKED)	M	450
44	031257	SIZE 78 TYPE 1 CONDUIT (JACKED)	M	400
45	031258	TWO SIZE 103 TYPE 1 CONDUITS (JACKED)	M	200
46	031259	TWO SIZE 103 TYPE 1 CONDUITS (TRENCH IN PAVEMENT)	M	100
47	031260	SIZE 53 CONDUIT (TRENCH IN SOIL)	M	1090
48	031261	SIZE 53 CONDUIT (TRENCH IN PAVEMENT)	M	50
49	031262	SIZE 78 CONDUIT (TRENCH IN SOIL)	M	620
50	031263	TWO SIZE 103 CONDUITS (TRENCH IN SOIL)	M	310
51	031264	TWO SIZE 103 CONDUITS (TRENCH IN PAVEMENT)	M	9290
52	031265	SIZE 103 TYPE 1 CONDUIT (JACKED)	M	390
53	860767	SIZE 32 INNERDUCT	M	1240
54	031266	SIZE 25 INNERDUCT	M	53 900
55 (S-F)	860792	COMMUNICATION CONDUIT (BRIDGE)	M	1070
56	860811	DETECTOR LOOP	EA	140
57	031267	DETECTOR LEAD-IN CABLE (DLC)	M	12 600
58	031268	MODIFY RAMP METERING SYSTEM AT VARIOUS LOCATIONS	LS	LUMP SUM
59	867014	12 SINGLEMODE FIBER OPTIC CABLE	M	5170
60	867017	48 SINGLEMODE FIBER OPTIC CABLE	M	41 800

Item	Item Code	Item	Unit of Measure	Estimated Quantity
61	867130	FIBER OPTIC SPLICE CLOSURE	EA	29
62	869005	CONDUCTOR (NO. 8)	M	190
63	031269	DATA NODE (LOCATION VE213)	LS	LUMP SUM
64	031270	VIDEO NODE (LOCATION VE213)	LS	LUMP SUM
65	031271	CABLE NODE (LOCATION 254)	LS	LUMP SUM
66	031272	MODIFY CABLE NODE (LOCATION VE 171)	LS	LUMP SUM
67	031273	CLOSED CIRCUIT TELEVISION CAMERA (LOCATION VE176)	LS	LUMP SUM
68	031274	CLOSED CIRCUIT TELEVISION CAMERA (LOCATION VE186)	LS	LUMP SUM
69	031275	CLOSED CIRCUIT TELEVISION CAMERA (LOCATION VE193)	LS	LUMP SUM
70	031276	CLOSED CIRCUIT TELEVISION CAMERA (LOCATION VE203)	LS	LUMP SUM
71	031277	CLOSED CIRCUIT TELEVISION CAMERA (LOCATION VE213)	LS	LUMP SUM
72	031278	CLOSED CIRCUIT TELEVISION CAMERA (LOCATION VE223)	LS	LUMP SUM
73	031279	CLOSED CIRCUIT TELEVISION CAMERA (LOCATION VE232)	LS	LUMP SUM
74	031280	CLOSED CIRCUIT TELEVISION CAMERA (LOCATION VE243)	LS	LUMP SUM
75	031281	CLOSED CIRCUIT TELEVISION CAMERA (LOCATION VE254)	LS	LUMP SUM
76	031282	TRAFFIC MONITORING STATION (LOCATION 2668)	LS	LUMP SUM
77	031283	TRAFFIC MONITORING STATION (LOCATION 2001)	LS	LUMP SUM
78	031284	TRAFFIC MONITORING STATION (LOCATION 2669)	LS	LUMP SUM
79	031285	TRAFFIC MONITORING STATION (LOCATION 2670)	LS	LUMP SUM
80	031286	NORTH HOLLYWOOD COMMUNICATIONS HUB BUILDING EQUIPMENT	LS	LUMP SUM

Item	Item Code	Item	Unit of Measure	Estimated Quantity
81	031287	MODIFY TRAFFIC MONITORING STATION (LOCATION 2388)	LS	LUMP SUM
82	031288	MODIFY TRAFFIC MONITORING STATION (LOCATION 2389)	LS	LUMP SUM
83	869035	NO. 5 PULL BOX	EA	19
84	869036	NO. 6 PULL BOX	EA	61
85	869039	COMMUNICATION PULL BOX	EA	51
86	869043	REMOVE PULL BOX	EA	41
87	869047	SPLICE VAULT	EA	14
88	031289	FIBER OPTIC DATA MODEM (FODM)	EA	18
89	031290	FIBER DISTRIBUTION UNIT (FDU)	EA	18
90	031291	CHANGEABLE MESSAGE SIGN (NO. 129)	LS	LUMP SUM
91	031292	MODIFY CHANGEABLE MESSAGE SIGN (NO. 12)	LS	LUMP SUM
92	869075	SYSTEM TESTING AND DOCUMENTATION	LS	LUMP SUM
93	999990	MOBILIZATION	LS	LUMP SUM

STATE OF CALIFORNIA

DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISIONS

Annexed to Contract No. 07-120754

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 NOVEMBER 18, 2002

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:

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

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

- If the 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: December 31, 2001

Section 49-1.05, "Driving Equipment," of the Standard Specifications is amended by adding the following paragraph after the seventh paragraph:

• 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 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 bearing value 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 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.

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: November 18, 2002

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

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

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

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

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

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

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

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

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

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

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

- When falsework is supported on piles, the piles shall be driven and the actual bearing value 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 loading capacity greater than 900 kN, the Contractor shall conduct dynamic monitoring of pile driving and conduct penetration and bearing analyses 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/m^3, and need not be incised.

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

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

90-2 MATERIALS

90-2.01 CEMENT

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

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

when cement is to be used for precast prestressed concrete piling, precast prestressed concrete members, or steam cured concrete products, the mortar shall not contract in air more than 0.053 percent.

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

90-2.02 AGGREGATES

- Aggregates shall be free from deleterious coatings, clay balls, roots, bark, sticks, rags, and other extraneous material.
- Natural aggregates shall be thoroughly and uniformly washed before use.
- The Contractor, at the Contractor's expense, shall provide safe and suitable facilities, including necessary splitting devices for obtaining samples of aggregates, in conformance with California Test 125.
- Aggregates shall be of such character that it will be possible to produce workable concrete within the limits of water content provided in Section 90-6.06, "Amount of Water and Penetration."
- Aggregates shall have not more than 10 percent loss when tested for soundness in conformance with the requirements in California Test 214. The soundness requirement for fine aggregate will be waived, provided that the durability index, D_f, of the fine aggregate is 60, or greater, when tested for durability in conformance with California Test 229.
- If the results of any one or more of the Cleanness Value, Sand Equivalent, or aggregate grading tests do not meet the requirements specified for "Operating Range" but all meet the "Contract Compliance" requirements, the placement of concrete shall be suspended at the completion of the current pour until tests or other information indicate that the next material to be used in the work will comply with the requirements specified for "Operating Range."
- If the results of either or both the Cleanness Value and coarse aggregate grading tests do not meet the requirements specified for "Contract Compliance," the concrete that is represented by the tests shall be removed. However, if the Engineer determines that the concrete is structurally adequate, the concrete may remain in place, and the Contractor shall pay to the State $4.60 per cubic meter for paving concrete and $7.20 per cubic meter for all other concrete for the concrete represented by these tests and left in place. The Department may deduct the amount from any moneys due, or that may become due, the Contractor under the contract.
- If the results of either or both the Sand Equivalent and fine aggregate grading tests do not meet the requirements specified for "Contract Compliance," the concrete which is represented by the tests shall be removed. However, if the Engineer determines that the concrete is structurally adequate, the concrete may remain in place, and the Contractor shall pay to the State $4.60 per cubic meter for paving concrete and $7.20 per cubic meter for all other concrete for the concrete represented by these tests and left in place. The Department may deduct the amount from any moneys due, or that may become due, the Contractor under the contract.
- The 2 preceding paragraphs apply individually to the "Contract Compliance" requirements for coarse aggregate and fine aggregate. When both coarse aggregate and fine aggregate do not conform to the "Contract Compliance" requirements, both paragraphs shall apply. The payments specified in those paragraphs shall be in addition to any payments made in conformance with the provisions in Section 90-1.01, "Description."
- No single Cleanness Value, Sand Equivalent or aggregate grading test shall represent more than 250 m^3 of concrete or one day's pour, whichever is smaller.
- 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 SO_4, when tested in conformance with California Test 417. In prestressed concrete work, the water for curing, for washing aggregates, and for mixing shall be free from oil and shall not contain more than 650 parts per million of chlorides as Cl, when tested in conformance with California Test 422, nor more than 1300 parts per million of sulfates as SO_4, when tested in conformance with California Test 417. In no case shall the water contain an amount of impurities that will cause either: 1) a change in the setting time of cement of more than 25 percent when tested in conformance with the requirements in ASTM Designation: C 191 or ASTM Designation: C 266 or 2) a reduction in the compressive strength of mortar at 14 days of more than 5 percent, when tested in conformance with the requirements in ASTM Designation: C 109, when compared to the results obtained with distilled water or deionized water, tested in conformance with the requirements in ASTM Designation: C 109.

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

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

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

90-2.04 ADMIXTURE MATERIALS

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

A. Chemical Admixtures—ASTM Designation: C 494.
B. Air-entraining Admixtures—ASTM Designation: C 260.
C. Calcium Chloride—ASTM Designation: D 98.
D. Mineral Admixtures—Coal fly ash; raw or calcined natural pozzolan as specified in ASTM Designation: 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:

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

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

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

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

90-3.03 FINE AGGREGATE GRADING

- Fine aggregate shall be graded within the following limits:

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

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

90-3.04 COMBINED AGGREGATE GRADINGS

- Combined aggregate grading limits shall be used only for the design of concrete mixes. Concrete mixes shall be designed so that aggregates are combined in proportions that shall produce a mixture within the grading limits for combined aggregates as specified herein. 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 m^3 may be mixed by hand methods in conformance with the provisions in Section 90-6.05, "Hand-Mixing."
- Equipment having components made of aluminum or magnesium alloys that would have contact with plastic concrete during mixing, transporting, or pumping of portland cement concrete shall not be used.
- Concrete shall be homogeneous and thoroughly mixed, and there shall be no lumps or evidence of undispersed cement, mineral admixture, or cement plus mineral admixture.
- Uniformity of concrete mixtures will be determined by differences in penetration as determined by California Test 533, or slump as determined by ASTM Designation: C 143, and by variations in the proportion of coarse aggregate as determined by California Test 529.
- When the mix design specifies a penetration value, the difference in penetration, determined by comparing penetration tests on 2 samples of mixed concrete from the same batch or truck mixer load, shall not exceed 10 mm. When the mix design specifies a slump value, the difference in slump, determined by comparing slump tests on 2 samples of mixed concrete from the same batch or truck mixer load, shall not exceed the values given in the table below. Variation in the proportion of coarse aggregate will be determined by comparing the results of tests of 2 samples of mixed concrete from the same batch or truck mixer load and the difference between the 2 results shall not exceed 100 kg per cubic meter of concrete.

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

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

90-6.02 MACHINE MIXING

- Concrete mixers may be of the revolving drum or the revolving blade type, and the mixing drum or blades shall be operated uniformly at the mixing speed recommended by the manufacturer. Mixers and agitators that have an accumulation of hard concrete or mortar shall not be used.
- The temperature of mixed concrete, immediately before placing, shall be not less than 10°C or more than 32°C. Aggregates and water shall be heated or cooled as necessary to produce concrete within these temperature limits. Neither aggregates nor mixing water shall be heated to exceed 65°C. If ice is used to cool the concrete, discharge of the mixer will not be permitted until all ice is melted.
- The batch shall be so charged into the mixer that some water will enter in advance of cementitious materials and aggregates. All water shall be in the drum by the end of the first one - fourth of the specified mixing time.
- Cementitious materials shall be batched and charged into the mixer by means that will not result either in loss of cementitious materials due to the effect of wind, in accumulation of cementitious materials on surfaces of conveyors or hoppers, or in other conditions that reduce or vary the required quantity of cementitious material in the concrete mixture.
- Paving and stationary mixers shall be operated with an automatic timing device. The timing device and discharge mechanism shall be interlocked so that during normal operation no part of the batch will be discharged until the specified mixing time has elapsed.
- The total elapsed time between the intermingling of damp aggregates and all cementitious materials and the start of mixing shall not exceed 30 minutes.
- The size of batch shall not exceed the manufacturer's guaranteed capacity.
- When producing concrete for pavement or base, suitable batch counters shall be installed and maintained in good operating condition at jobsite batching plants and stationary mixers. The batch counters shall indicate the exact number of batches proportioned and mixed.
- Concrete shall be mixed and delivered to the jobsite by means of one of the following combinations of operations:

A. Mixed completely in a stationary mixer and the mixed concrete transported to the point of delivery in truck agitators or in non-agitating hauling equipment (central-mixed concrete).
B. Mixed partially in a stationary mixer, and the mixing completed in a truck mixer (shrink-mixed concrete).
C. Mixed completely in a truck mixer (transit-mixed concrete).
D. Mixed completely in a paving mixer.

- Agitators may be truck mixers operating at agitating speed or truck agitators. Each mixer and agitator shall have attached thereto in a prominent place a metal plate or plates on which is plainly marked the various uses for which the equipment is designed, the manufacturer's guaranteed capacity of the drum or container in terms of the volume of mixed concrete and the speed of rotation of the mixing drum or blades.
- Truck mixers shall be equipped with electrically or mechanically actuated revolution counters by which the number of revolutions of the drum or blades may readily be verified.
- When shrink-mixed concrete is furnished, concrete that has been partially mixed at a central plant shall be transferred to a truck mixer and all requirements for transit-mixed concrete shall apply. No credit in the number of revolutions at mixing speed shall be allowed for partial mixing in a central plant.

90-6.03 TRANSPORTING MIXED CONCRETE

- Mixed concrete may be transported to the delivery point in truck agitators or truck mixers operating at the speed designated by the manufacturer of the equipment as agitating speed, or in non-agitating hauling equipment, provided the consistency and workability of the mixed concrete upon discharge at the delivery point is suitable for adequate placement and consolidation in place, and provided the mixed concrete after hauling to the delivery point conforms to the provisions in Section 90-6.01, "General."
- Truck agitators shall be loaded not to exceed the manufacturer's guaranteed capacity and shall maintain the mixed concrete in a thoroughly mixed and uniform mass during hauling.
- Bodies of non-agitating hauling equipment shall be constructed so that leakage of the concrete mix, or any part thereof, will not occur at any time.
- Concrete hauled in open-top vehicles shall be protected during hauling against rain or against exposure to the sun for more than 20 minutes when the ambient temperature exceeds 24°C.
- No additional mixing water shall be incorporated into the concrete during hauling or after arrival at the delivery point, unless authorized by the Engineer. If the Engineer authorizes additional water to be incorporated into the concrete, the drum shall be revolved not less than 30 revolutions at mixing speed after the water is added and before discharge is commenced.
- The rate of discharge of mixed concrete from truck mixer-agitators shall be controlled by the speed of rotation of the drum in the discharge direction with the discharge gate fully open.
- When a truck mixer or agitator is used for transporting concrete to the delivery point, discharge shall be completed within 1.5 hours or before 250 revolutions of the drum or blades, whichever occurs first, after the introduction of the cement to the aggregates. Under conditions contributing to quick stiffening of the concrete, or when the temperature of the concrete is 30°C or above, the time allowed may be less than 1.5 hours.
- When non-agitating hauling equipment is used for transporting concrete to the delivery point, discharge shall be completed within one hour after the addition of the cement to the aggregates. Under conditions contributing to quick stiffening of the concrete, or when the temperature of the concrete is 30°C or above, the time between the introduction of cement to the aggregates and discharge shall not exceed 45 minutes.
- Each load of concrete delivered at the jobsite shall be accompanied by a weighmaster certificate showing the mix identification number, non-repeating load number, date and time at which the materials were batched, the total amount of water added to the load, and for transit-mixed concrete, the reading of the revolution counter at the time the truck mixer is charged with cement. This weighmaster certificate shall also show the actual scale masses (kilograms) for the ingredients batched. Theoretical or target batch masses shall not be used as a substitute for actual scale masses.
- Weighmaster certificates shall be provided in printed form, or if approved by the Engineer, the data may be submitted in electronic media. Electronic media shall be presented in a tab-delimited format on a 90 mm diskette with a capacity of at least 1.4 megabytes. Captured data, for the ingredients represented by each batch shall be "line feed, carriage return" (LFCR) and "one line, separate record" with allowances for sufficient fields to satisfy the amount of data required by these specifications.
- The Contractor may furnish a weighmaster certificate accompanied by a separate certificate that lists the actual batch masses or measurements for a load of concrete provided that both certificates are imprinted with the same non-repeating load number that is unique to the contract and delivered to the jobsite with the load.
- Weighmaster certificates furnished by the Contractor shall conform to the provisions in Section 9-1.01, "Measurement of Quantities."

90-6.04 TIME OR AMOUNT OF MIXING

- Mixing of concrete in paving or stationary mixers shall continue for the required mixing time after all ingredients, except water and admixture, if added with the water, are in the mixing compartment of the mixer before any part of the batch is released. Transfer time in multiple drum mixers shall not be counted as part of the required mixing time.

• The required mixing time, in paving or stationary mixers, of concrete used for concrete structures, except minor structures, shall be not less than 90 seconds or more than 5 minutes, except that when directed by the Engineer in writing, the requirements of the following paragraph shall apply.

• The required mixing time, in paving or stationary mixers, except as provided in the preceding paragraph, shall be not less than 50 seconds or more than 5 minutes.

• The minimum required revolutions at the mixing speed for transit-mixed concrete shall not be less than that recommended by the mixer manufacturer, but in no case shall the number of revolutions be less than that required to consistently produce concrete conforming to the provisions for uniformity in Section 90-6.01, "General."

90-6.05 HAND-MIXING

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

90-6.06 AMOUNT OF WATER AND PENETRATION

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

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

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

• The term free water is defined as the total water in the mixture minus the water absorbed by the aggregates in reaching a saturated surface-dry condition.

• Where there are adverse or difficult conditions that affect the placing of concrete, the above specified penetration and free water content limitations may be exceeded providing the Contractor is granted permission by the Engineer in writing to increase the cementitious material content per cubic meter of concrete. The increase in water and cementitious material shall be at a ratio not to exceed 30 kg of water per added 100 kg of cementitious material per cubic meter. The cost of additional cementitious material and water added under these conditions shall be at the Contractor's expense and no additional compensation will be allowed therefor.

• The equipment for supplying water to the mixer shall be constructed and arranged so that the amount of water added can be measured accurately. Any method of discharging water into the mixer for a batch shall be accurate within 1.5 percent of the quantity of water required to be added to the mix for any position of the mixer. Tanks used to measure water shall be designed so that water cannot enter while water is being discharged into the mixer and discharge into the mixer shall be made rapidly in one operation without dribbling. All equipment shall be arranged so as to permit checking the amount of water delivered by discharging into measured containers.

90-7 CURING CONCRETE

90-7.01 METHODS OF CURING

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

90-7.01A Water Method

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

90-7.01B Curing Compound Method

- Surfaces of the concrete that are exposed to the air shall be sprayed uniformly with a curing compound.
- Curing compounds to be used shall be as follows:

1. Pigmented curing compound conforming to the requirements in ASTM Designation: C 309, Type 2, Class B, except the resin type shall be poly-alpha-methylstyrene.
2. Pigmented curing compound conforming to the requirements in ASTM Designation: C 309, Type 2, Class B.
3. Pigmented curing compound conforming to the requirements in ASTM Designation: C 309, Type 2, Class A.
4. Non-pigmented curing compound conforming to the requirements in ASTM Designation: C 309, Type 1, Class B.
5. Non-pigmented curing compound conforming to the requirements in ASTM Designation: C 309, Type 1, Class A.
6. Non-pigmented curing compound with fugitive dye conforming to the requirements in ASTM Designation: C 309, Type 1-D, Class A.

- The infrared scan for the dried vehicle from curing compound (1) shall match the infrared scan on file at the Transportation Laboratory.
- The loss of water for each type of curing compound, when tested in conformance with the requirements in California Test 534, shall not be more than 0.15-kg/m^2 in 24 hours or more than 0.45-kg/m^2 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 m^2/L, unless otherwise specified.
- At any point, the application rate shall be within ±1.2 m^2/L of the nominal rate specified, and the average application rate shall be within ±0.5 m^2/L of the nominal rate specified when tested in conformance with the requirements in California Test 535. Runs, sags, thin areas, skips, or holidays in the applied curing compound shall be evidence that the application is not satisfactory.
- Curing compounds shall be applied using power operated spray equipment. The power operated spraying equipment shall be equipped with an operational pressure gage and a means of controlling the pressure. Hand spraying of small and irregular areas that are not reasonably accessible to mechanical spraying equipment, in the opinion of the Engineer, may be permitted.
- The curing compound shall be applied to the concrete following the surface finishing operation, immediately before the moisture sheen disappears from the surface, but before any drying shrinkage or craze cracks begin to appear. In the event of any drying or cracking of the surface, application of water with an atomizing nozzle as specified in Section 90-7.01A, "Water Method," shall be started immediately and shall be continued until application of the compound is resumed or started; however, the compound shall not be applied over any resulting freestanding water. Should the film of compound be damaged from any cause before the expiration of 7 days after the concrete is placed in the case of structures and 72 hours in the case of pavement, the damaged portion shall be repaired immediately with additional compound.
- At the time of use, compounds containing pigments shall be in a thoroughly mixed condition with the pigment uniformly dispersed throughout the vehicle. A paddle shall be used to loosen all settled pigment from the bottom of the container, and a power driven agitator shall be used to disperse the pigment uniformly throughout the vehicle.
- Agitation shall not introduce air or other foreign substance into the curing compound.

- The manufacturer shall include in the curing compound the necessary additives for control of sagging, pigment settling, leveling, de-emulsification, or other requisite qualities of a satisfactory working material. Pigmented curing compounds shall be manufactured so that the pigment does not settle badly, does not cake or thicken in the container, and does not become granular or curdled. Settlement of pigment shall be a thoroughly wetted, soft, mushy mass permitting the complete and easy vertical penetration of a paddle. Settled pigment shall be easily redispersed, with minimum resistance to the sideways manual motion of the paddle across the bottom of the container, to form a smooth uniform product of the proper consistency.
- Curing compounds shall remain sprayable at temperatures above 4°C and shall not be diluted or altered after manufacture.
- The curing compound shall be packaged in clean 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 m^3.
- When a precast concrete member is steam cured, the compressive strength of the concrete will be determined from test cylinders that have been handled and stored in conformance with Method 3 of California Test 540. The compressive strength of steam cured concrete will be evaluated on the basis of individual tests representing specific portions of production. When the concrete is designated by 28-day compressive strength rather than by cementitious material content, the concrete shall be considered to be acceptable whenever its compressive strength reaches the specified 28-day compressive strength provided that strength is reached in not more than the maximum number of days specified or allowed after the member is cast.
- When concrete is specified by compressive strength, prequalification of materials, mix proportions, mixing equipment, and procedures proposed for use will be required prior to placement of the concrete. Prequalification shall be accomplished by the submission of acceptable certified test data or trial batch reports by the Contractor. Prequalification data shall be based on the use of materials, mix proportions, mixing equipment, procedures, and size of batch proposed for use in the work.
- Certified test data, in order to be acceptable, shall indicate that not less than 90 percent of at least 20 consecutive tests exceed the specified strength at the maximum number of cure days specified or allowed, and none of those tests are less than 95 percent of specified strength. Strength tests included in the data shall be the most recent tests made on concrete of the proposed mix design and all shall have been made within one year of the proposed use of the concrete.
- Trial batch test reports, in order to be acceptable, shall indicate that the average compressive strength of 5 consecutive concrete cylinders, taken from a single batch, at not more than 28 days (or the maximum age allowed) after molding shall be at least 4 MPa greater than the specified 28-day compressive strength, and no individual cylinder shall have a strength less than the specified strength at the maximum age specified or allowed. Data contained in the report shall be from trial batches that were produced within one year of the proposed use of specified strength concrete in the project. Whenever air-entrainment is required, the air content of trial batches shall be equal to or greater than the air content specified for the concrete without reduction due to tolerances.
- Tests shall be performed in conformance with either the appropriate California Test methods or the comparable ASTM test methods. Equipment employed in testing shall be in good condition and shall be properly calibrated. If the tests are performed during the life of the contract, the Engineer shall be notified sufficiently in advance of performing the tests in order to witness the test procedures.
- The certified test data and trial batch test reports shall include the following information:

A. Date of mixing.

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

- Certified test data and trial batch test reports shall be signed by an official of the firm that performed the tests.
- When approved by the Engineer, concrete from trial batches may be used in the work at locations where concrete of a lower quality is required and the concrete will be paid for as the type or class of concrete required at that location.
- After materials, mix proportions, mixing equipment, and procedures for concrete have been prequalified for use, additional prequalification by testing of trial batches will be required prior to making changes that, in the judgment of the Engineer, could result in a strength of concrete below that specified.
- The Contractor's attention is directed to the time required to test trial batches and the Contractor shall be responsible for production of trial batches at a sufficiently early date so that the progress of the work is not delayed.
- When precast concrete members are manufactured at the plant of an established manufacturer of precast concrete members, the mix proportions of the concrete shall be determined by the Contractor, and a trial batch and prequalification of the materials, mix proportions, mixing equipment, and procedures will not be required.

90-10 MINOR CONCRETE

90-10.01 GENERAL

- Concrete for minor structures, slope paving, curbs, sidewalks and other concrete work, when designated as minor concrete on the plans, in the specifications, or in the contract item, shall conform to the provisions specified herein.
- The Engineer, at the Engineer's discretion, will inspect and test the facilities, materials and methods for producing the concrete to ensure that minor concrete of the quality suitable for use in the work is obtained.

90-10.02 MATERIALS

- Minor concrete shall conform to the following requirements:

90-10.02A Cementitious Material

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

90-10.02B Aggregate

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

90-10.02C Water

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

90-10.02D Admixtures

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

90-10.03 PRODUCTION

- Cementitious material, water, aggregate, and admixtures shall be stored, proportioned, mixed, transported, and discharged in conformance with recognized standards of good practice that will result in concrete that is thoroughly and uniformly mixed, that is suitable for the use intended, and that conforms to requirements specified herein. Recognized

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

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

90-10.04 CURING MINOR CONCRETE

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

90-10.05 PROTECTING MINOR CONCRETE

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

90-10.06 MEASUREMENT AND PAYMENT

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

90-11 MEASUREMENT AND PAYMENT

90-11.01 MEASUREMENT

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

90-11.02 PAYMENT

- Portland cement concrete will be paid for in conformance with the provisions specified in the various sections of these specifications covering construction requiring concrete.
- Full compensation for furnishing and incorporating admixtures required by these specifications or the special provisions will be considered as included in the contract prices paid for the concrete involved and no additional compensation will be allowed therefor.
- Should the Engineer order the Contractor to incorporate any admixtures in the concrete when their use is not required by these specifications or the special provisions, furnishing the admixtures and adding them to the concrete will be paid for as extra work as provided in Section 4-1.03D, "Extra Work."

• Should the Contractor use admixtures in conformance with the provisions in Section 90-4.05, "Optional Use of Chemical Admixtures," or Section 90-4.07, "Optional Use of Air-entraining Admixtures," or should the Contractor request and obtain permission to use other admixtures for the Contractor's benefit, the Contractor shall furnish those admixtures and incorporate them into the concrete at the Contractor's expense and no additional compensation will be allowed therefor.

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:

Districts 04, 05 (except San Luis Obispo and Santa Barbara Counties), 06 (except Kern County) and 10:	Districts 08 and 11:
Triaxial Management Services, Inc. - Oakland 1545 Willow Street, 1st Floor Oakland, CA 94607 Telephone: (510) 286-1313 FAX No.: (510) 286-6792	Padilla & Associates - San Diego 2725 Congress Street, Suite 1D San Diego, CA 92110 Telephone: (619) 725-0843 FAX No.: (619) 725-0854

Districts 07, 08, and 12; in San Luis Obispo and Santa Barbara Counties in District 05; and in Kern County in District 06:	Districts 01, 02, 03 and 09:
Padilla & Associates - Los Angeles 5675 East Telegraph Rd., Suite A-260 Los Angeles, CA 90040 Telephone: (323) 728-8847 FAX No.: (323) 728-8867	Triaxial Management Services, Inc. - Sacramento 930 Alhambra Blvd., #205 Sacramento, CA 95816 Telephone: (916) 553-4172 FAX No.: (916) 553-4173

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 furnish the Engineer with a statement from the vendor that the order for communication system routing cables and equipment and the electrical materials required for this contract has been received and accepted by the vendor; and the statement shall be furnished within 15 calendar days after the contract has been approved by the Attorney General, or the attorney appointed and authorized to represent the Department of Transportation. The statement shall give the date that the electrical materials will be shipped. If the Contractor has the necessary materials on hand, the Contractor will not be required to furnish the vendor's statement.

The Contractor shall begin work within 15 calendar days after the contract has been approved by the Attorney General or the attorney appointed and authorized to represent the Department of Transportation.

The work shall be diligently prosecuted to completion before the expiration of **400 WORKING DAYS** beginning on the date that work begins, or beginning on the fifteenth calendar day after approval of the contract, whichever occurs first.

The Contractor shall pay to the State of California the sum of $2600 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.

5-1.031 FINAL PAYMENT AND CLAIMS

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

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 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 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, 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. Attendance by the Contractor at the board of review meeting shall be mandatory.

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 District Director's board of review meeting shall be mandatory.

Failure of the Contractor to file a timely written statement of claims in response to the proposed final estimate, or to file a timely notification of disagreement with the District claim position letter, or to attend the District Director's board of review meeting shall constitute a failure to pursue diligently and exhaust the administrative procedures in the contract and shall be a bar to arbitration in conformance with the requirements in Section 10240.2 of the California Public Contract Code.

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 PARTNERING

The State will promote the formation of a "Partnering" relationship with the Contractor in order to effectively complete the contract to the benefit of both parties. The purpose of this relationship is to maintain a cooperative communication and to mutually resolve conflicts at the lowest responsible management level.

The Contractor may request the formation of a "Partnering" relationship by submitting a request in writing to the Engineer after approval of the contract. If the Contractor's request for "Partnering" is approved by the Engineer, scheduling of a "Partnering Workshop," selecting the "Partnering" facilitator and workshop site, and other administrative details shall be as agreed to by both parties. If agreed to by the parties, additional "Partnering Workshops" will be conducted as needed throughout the life of the contract.

The costs involved in providing the "Partnering Workshop" facilitator and workshop site will be borne equally by the State and the Contractor. The division of cost will be made by determining the cost in providing the "Partnering Workshop" facilitator and workshop site in conformance with the provisions in Section 9-1.03B, "Work Performed by Special Forces or Other Special Services," of the Standard Specifications, and paying to the Contractor one-half of that cost, except no markups will be allowed.

All other costs associated with "Partnering Workshops" will be borne separately by the party incurring the costs, such as wages and travel expenses, and no additional compensation will be allowed therefor.

The establishment of a "Partnering" relationship will not change or modify the terms and conditions of the contract and will not relieve either party of the legal requirements of the contract.

5-1.114 VALUE ANALYSIS

The Contractor may submit to the Engineer, in writing, a request for a "Value Analysis" workshop. The purpose for having a workshop is to identify value enhancing opportunities and to consider modifications to the plans and specifications that will reduce either the total cost, time of construction or traffic congestion, without impairing, in any manner, the essential functions or characteristics of the project including, but not limited to, service life, economy of operation, ease of maintenance, benefits to the travelling public, desired appearance, or design and safety standards.

To maximize the potential benefits of a workshop, the request should be submitted to the Engineer early in the project after approval of the contract. If the Contractor's request for a "Value Analysis" workshop is approved by the Engineer,

scheduling of a workshop, selecting the facilitator and workshop site, and other administrative details shall be determined cooperatively by the Contractor and the Engineer.

The workshop shall be conducted in conformance with the methodology described in the Department's "Value Analysis Team Guide" available at the Department's web site at:

http://www.dot.ca.gov/hq/oppd/value/

The facilitator shall be a Certified Value Specialist (CVS) as recognized by the Society of American Value Engineers (SAVE) International, which may be contacted as follows:

SAVE International, 60 Revere Drive, Northbrook, IL 60062
Telephone 1-847-480-1730, FAX 1-847-480-9282

The Contractor may submit recommendations resulting from a "Value Analysis" workshop for approval by the Engineer as cost reduction incentive proposals in conformance with the provisions in Section 5-1.14, "Cost Reduction Incentive," of the Standard Specifications.

The costs involved in providing the "Value Analysis" facilitator and workshop site will be borne equally by the State and the Contractor. The division of cost will be made by determining the cost in providing the "Value Analysis" facilitator and workshop site in conformance with the provisions in Section 9-1.03B, "Work Performed by Special Forces or Other Special Services," of the Standard Specifications, and paying to the Contractor one-half of that cost, except no markups will be allowed.

All other costs associated with the "Value Analysis" workshop will be borne separately by the party incurring the costs, such as wages and travel expenses, and no additional compensation will be allowed therefor.

5-1.12 FORCE ACCOUNT PAYMENT

The second, third and fourth paragraphs of Section 9-1.03A, "Work Performed by Contractor," in the Standard Specifications, shall not apply.

Attention is directed to "Time-Related Overhead" of these special provisions.

To the total of the direct costs for work performed on a force account basis, computed as provided in Sections 9-1.03A(1), "Labor," 9-1.03A(2), "Materials," and 9-1.03A(3), "Equipment Rental," of the Standard Specifications, there will be added the following markups:

Cost	Percent Markup
Labor	28
Materials	10
Equipment Rental	10

The above markups shall be applied to work performed on a force account basis, regardless of whether the work revises the current contract completion date.

The above markups, together with payments made for time-related overhead pursuant to "Time-Related Overhead" of these special provisions, shall constitute full compensation for all overhead costs for work performed on a force account basis. These overhead costs shall be deemed to include all items of expense not specifically designated as cost or equipment rental in conformance with the provisions in Sections 9-1.03A(1), "Labor," 9-1.03A(2), "Materials," and 9-1.03A(3), "Equipment Rental," of the Standard Specifications. The total payment made as provided above and in the first paragraph of Section 9-1.03A, "Work Performed by Contractor," of the Standard Specifications shall be deemed to be the actual cost of the work performed on a force account basis, and shall constitute full compensation therefor.

Full compensation for overhead costs for work performed on a force account basis, and for which no adjustment is made to the quantity for time-related overhead conforming to the provisions in "Time-Related Overhead" of these special provisions, shall be considered as included in the markups specified above, and no additional compensation will be allowed therefor.

When extra work to be paid for on a force account basis is performed by a subcontractor, approved in conformance with the provisions in Section 8-1.01, "Subcontracting," of the Standard Specifications, an additional markup of 7 percent will be added to the total cost of that extra work including all markups specified in this section "Force Account Payment". The additional 7 percent markup shall reimburse the Contractor for additional administrative costs, and no other additional payment will be made by reason of performance of the extra work by a subcontractor.

5-1.13 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.

5-1.14 PAYMENTS

Attention is directed to Sections 9-1.06, "Partial Payments," and 9-1.07, "Payment After Acceptance," of the Standard Specifications and these special provisions.

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

A.	Clearing and Grubbing	$10000
B.	Prepare Water Pollution Control Program	$ 5000
C.	Lead Compliance Plan	$ 4500
D.	Progress Schedule (Critical Path Method)	$10000

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

In determining the partial payments to be made to the Contractor, only the following listed materials will be considered for inclusion in the payment as materials furnished but not incorporated in the work:

A. CCTV poles, CCTV camera assemblies and CCTV controller cabinet.
B. Cable, data and video node controller cabinet.
C. Changeable message sign (CMS) pole and sign structures.
D. Metal beam guard railing and appurtenances.
E. Splice vaults and communication pull boxes.
F. Fiber optic and twisted pair cables and splice closures.
G. Service equipment enclosures.
H. Video Multiplexer and Demultiplexer

5-1.15 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.

5-1.16 AS-BUILT PLANS

The Contractor shall keep accurate as-built records on a set of project blueline prints of all additions and deletions to the work, and of all changes in location, elevation and character of work not otherwise shown or noted on contract documents. Prior to final acceptance of the work, the Contractor shall transmit this "As-Built" information to the Engineer for approval.

Reproducible "As-Built" construction plans shall be provided to the State within five (5) working days after completion of the project. Two copies shall be provided with changes shown in contrasting color to the original contract work. Details to be shown on the "As-Built" plans shall include, but not be limited to, location, type and installed depth or location of conduit runs, location of pull boxes, location and depth of underground utilities encountered during the course of the work and changes made to any facilities including the substitution of fiberglass conduit. "As-Built" plans shall be signed and date by the Contractor and by the Superintendent or Foreman of the crew that actually constructed the facility. In addition, employer or company names of the Contractor and Subcontractors shall be shown.

Full compensation for record keeping and for preparing "As-Built" plans shall be considered as included in the contract lump sum price paid for system testing and documentation and no additional compensation will be made therefor.

5-1.17 AERIALLY DEPOSITED LEAD

Aerially deposited lead is present within the project limits. Aerially deposited lead is lead deposited within unpaved areas or formerly unpaved areas, primarily due to vehicle emissions.

Attention is directed to "Material Containing Aerially Deposited Lead" of these special provisions.

Portions of the Site Investigation Report are included in the "Material Information" handout. The complete report, entitled "Task Order No. 07-020741-3X," is available for inspection at the Department of Transportation, District 7, Office of Construction, Change Order Desk, located in a secure building at 801 South Grand Avenue, Los Angeles, California 90017-4613. Prospective bidders shall telephone 213-897-0054 in advance to make arrangements for entering the building.

The Department has received from the California Department of Toxic Substances Control (DTSC) a Variance regarding the use of material containing aerially deposited lead. This project is subject to the conditions of the Variance, as amended. The Variance is available for inspection at the Department of Transportation, District 7, Office of Construction, Change Order Desk, located in a secure building at 801 South Grand Avenue, Los Angeles, California 90017-4613. Prospective bidders shall telephone 213-897-0054 in advance to make arrangements for entering the building.

Once the Contractor has completed the placement of material containing aerially deposited lead in conformance with these special provisions and as directed by the Engineer, the Contractor shall have no responsibility for such materials in place. The Department will not consider the Contractor a generator of such contaminated materials. Further cleanup, removal or remedial actions for such materials will not be required if handled or disposed of as specified herein.

Excavation, reuse, and disposal of material with aerially deposited lead shall be in conformance with all rules and regulations including, but not limited to, those of the following agencies:

United States Department of Transportation (USDOT)
United States Environmental Protection Agency (USEPA)
California Environmental Protection Agency (Cal-EPA)
California Department of Health Services
Department of Toxic Substances Control (DTSC), Region Southern California
California Division of Occupational Safety and Health Administration (Cal-OSHA)
Integrated Waste Management Board
Regional Water Quality Control Board (RWQCB), Region 4 (Los Angeles)
State Air Resources Control Board
South Coast Air Quality Management District (SCAQMD)

Materials containing hazardous levels of lead shall be transported and disposed of in conformance with Federal and State laws and regulations, as amended, and county and municipal ordinances and regulations, as amended. Laws and regulations that govern this work include, but are not limited to:

Health and Safety Code, Division 20, Chapter 6.5 (California Hazardous Waste Control Act)
Title 22, California Code of Regulations, Division 4.5 (Environmental Health Standards for the Management of Hazardous Waste)
Title 8, California Code of Regulations

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

[1]Bar designation numbers approximate the number of millimeters of the nominal diameter of the bars.
[2]Bar numbers are based on the number of eighths of an inch included in the nominal diameter of the bars.
No adjustment will be required in spacing or total number of reinforcing bars due to a difference in minimum yield strength between metric and non-metric bars.

SUBSTITUTION TABLE FOR SIZES OF:

(1) STEEL FASTENERS FOR GENERAL APPLICATIONS (ASTM Designation: A 307 or AASHTO Designation: M 314, Grade 36 or 55), and

(2) HIGH STRENGTH STEEL FASTENERS (ASTM Designation: A 325 or A 449)

METRIC SIZE SHOWN ON THE PLANS mm	SIZE TO BE SUBSTITUTED inch
6 or 6.35	1/4
8 or 7.94	5/16
10 or 9.52	3/8
11 or 11.11	7/16
13 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

THRIE 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. Relexite "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.
B. Padlocks.
C. Model 170 controller assemblies, including controller unit, completely wired Type 334 and 334 CMS controller cabinets, but without anchor bolts, for traffic monitoring station and changeable message sign, inductive loop detector sensor units, Model 500 changeable message sign, wiring harness, and changeable message sign control cables.

Type 334 controller assemblies, for traffic monitoring stations, including controller unit, completely wired controller cabinets, with auxiliary equipment but without controller unit, and inductive loop detector sensor units will be furnished to the Contractor at the following address:

Department of Transportation
District Maintenance Yard
7310 East Bandini Boulevard
Commerce, CA 90040
Telephone: (213)-620-2185

Model 500-X changeable message sign (CMS No. 129), wiring harness, and Type 334 CMS controller assembly, including the Model 170 controller unit, CMS control cables and completely wired cabinet, will be furnished to the Contractor at a location near job site, but no more than 50 km, and as designated by the Engineer.

The Contractor shall notify the Engineer not less than fifteen 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.

The Contractor will be permitted to use Type III portland cement for concrete used in the manufacture of precast concrete members.

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.

WELDING QUALITY CONTROL

Welding quality control shall conform to the requirements in the AWS welding codes, the Standard Specifications, and these special provisions.

Unless otherwise specified, welding quality control shall apply when any work is welded in conformance with the provisions in Section 49, "Piling," Section 52, "Reinforcement," Section 55, "Steel Structures," Section 56-1, "Overhead Sign Structures," Section 75-1.035, "Bridge Joint Restrainer Units," or Section 86-2.04, "Standards, Steel Pedestals and Posts," of the Standard Specifications.

The welding of fracture critical members (FCMs) shall conform to the provisions specified in the Fracture Control Plan (FCP) and herein.

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

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

The QCM shall not be employed or compensated by any subcontractor, or by other persons or entities hired by subcontractors, who will provide other services or materials for the project. The QCM may be an employee of the Contractor.

Welding inspection personnel or NDT firms to be used in the work shall not be employed or compensated by any subcontractor, or by other persons or entities hired by subcontractors, who will provide other services or materials for the project, except for the following conditions:

A. The welding is performed at a permanent fabrication or manufacturing facility which is certified under the AISC Quality Certification Program, Category Cbr, Major Steel Bridges.
B. The welding is performed at a permanent fabrication or manufacturing facility which is certified under the AISC Quality Certification Program, Category Sbd, Conventional Steel Building Structures. This condition shall apply only for work welded in conformance with the provisions in Section 56-1, "Overhead Sign Structures" or Section 86-2.04, "Standards, Steel Pedestals and Posts," of the Standard Specifications.
C. The welding is performed on pipe pile material at a permanent pipe manufacturing facility where an automatic welding process or seamless pipe operation is used in conformance with the requirements in the applicable welding code as specified elsewhere in these special provisions.

For welding performed at such facilities, the inspection personnel or NDT firms may be employed or compensated by the facility performing the welding.

Prior to submitting the Welding Quality Control Plan (WQCP) required herein, a pre-welding meeting between the Engineer, Contractor, and any entity performing welding for this project, shall be held to discuss the requirements for the WQCP.

The Contractor shall submit to the Engineer, in conformance with the provisions in Section 5-1.02, "Plans and Working Drawings," of the Standard Specifications, 3 copies of a separate WQCP for each item of work for which welding is to be performed.

The Contractor shall allow the Engineer 2 weeks to review the WQCP submittal after a complete plan has been received. Except for work that is welded in conformance with Section 86-2.04, "Standards, Steel Pedestals and Posts," of the Standard Specifications, and for pipe piling produced at a permanent manufacturing facility as specified above, no welding shall be performed until the WQCP is approved in writing by the Engineer. Materials welded in conformance with Section 86-2.04, "Standards, Steel Pedestals and Posts," of the Standard Specifications, and pipe piling produced at such permanent manufacturing facilities, shall not be incorporated into the work until the WQCP is approved in writing by the Engineer. In the event the Engineer fails to complete the review within the time allowed, and if, in the opinion of the Engineer, completion of the work is delayed or interfered with by reason of the Engineer's delay in completing the review, the Contractor will be compensated for any resulting loss, and an extension of time will be granted, in the same manner as provided for in Section 8-1.09, "Right of Way Delays," of the Standard Specifications.

An amended WQCP or any addendum to the approved WQCP shall be submitted to, and approved in writing by the Engineer, for proposed revisions to the approved WQCP. An amended WQCP or addendum will be required for revisions to the WQCP, including but not limited to a revised WPS, additional welders, changes in NDT firms or procedures, QC, or NDT personnel, or updated systems for tracking and identifying welds. The Engineer shall have 3 working days to complete the review of the amended WQCP or addendum. Work affected by the proposed revisions shall not be performed until the amended WQCP or addendum has been approved. In the event the Engineer fails to complete the review within the time allowed, and if, in the opinion of the Engineer, completion of the work is delayed or interfered with by reason of the Engineer's delay in completing the review, the Contractor will be compensated for any resulting loss, and an extension of time will be granted, in the same manner as provided for in Section 8-1.09, "Right of Way Delays," of the Standard Specifications.

Each WQCP shall include the applicable portions of the following, as determined by the Engineer:

A. The name of the welding firm and any required NDT inspection personnel or firms.
B. A manual prepared by the NDT inspection personnel or firm that shall include equipment, testing procedures, code of safe practices, the Written Practice of the NDT inspection personnel or firm, and the names, qualifications, and documentation of certifications for all personnel to be used.
C. The name of the QCM and the names, qualifications, and documentation of certifications for all QC Inspectors and Assistant QC Inspectors to be used.
D. An organizational chart showing all QC personnel and their assigned QC responsibilities.
E. The methods and frequencies for performing all required quality control procedures, including QC inspection forms to be used, as required by the specifications including:

    1. all visual inspections.
    2. all NDT including radiographic geometry, penetrameter and shim selection, film quality, film processing, radiograph identification and marking system, and film interpretation and reports.
    3. calibration procedures and calibration frequency for all NDT equipment.

F. A system for the identification and tracking of all welds, NDT, and any required repairs, and a procedure for the reinspection of repaired welds. The system shall have provisions for 1) permanently identifying each weld and the person who performed the weld, 2) placing all identification and tracking information on each radiograph, 3) a method of reporting nonconforming welds to the Engineer, and 4) a method of documentation of repairs and reinspection of nonconforming welds.
G. Standard procedures for performing noncritical repair welds. Noncritical repair welds are defined as welds to deposit additional weld beads or layers to compensate for insufficient weld size and to fill limited excavations that were performed to remove unacceptable edge or surface discontinuities, rollover or undercut. The depth of these excavations shall not exceed 65 percent of the specified weld size.
H. The WPS, including documentation of all supporting Procedure Qualification Record (PQR) tests performed, and the name of the testing laboratory who performed the tests, to verify the acceptability of the WPS. The submitted WPS shall be within the allowable period of effectiveness.
I. Documentation of all certifications for welders for each weld process and position that will be used. Certifications shall list the electrodes used, test position, base metal and thickness, tests performed, and the witnessing authority. All certifications shall be within the allowable period of effectiveness.

J. One authorized copy or original code book for each of all AWS welding codes and the FCP which are applicable to the welding to be performed. These codes and the FCP shall become the permanent property of the Department.
K. Forms to be used for Certificates of Compliance, daily production logs, and daily reports.

After final approval of the WQCP, amended WQCP, or addendum, the Contractor shall submit 7 copies to the Engineer of the approved documents.

It is expressly understood that the Engineer's approval of the Contractor's WQCP shall not relieve the Contractor of any responsibility under the contract for the successful completion of the work in conformance with the requirements of the plans and specifications. The Engineer's approval shall not constitute a waiver of any requirement of the plans and specifications nor relieve the Contractor of any obligation thereunder; and defective work, materials, and equipment may be rejected notwithstanding approval of the WQCP.

A daily production log for welding shall be kept by the QCM for each day that welding is performed. The log shall clearly indicate the locations of all welding, except partial penetration longitudinal seam welds performed in conformance with Section 86-2.04, "Standards, Steel Pedestals and Posts," of the Standard Specifications. The log shall include the welders' names, amount of welding performed, any problems or deficiencies discovered, and any testing or repair work performed, at each location. The daily report from each QC Inspector shall also be included in the log.

The following items shall be included in a Welding Report that is to be submitted to the Engineer within 7 days following the performance of any welding. For work welded in conformance with Section 86-2.04, "Standards, Steel Pedestals and Posts," of the Standard Specifications, and for piling produced at a permanent manufacturing facility, the following items shall be included in a Welding Report that is to be submitted to the Engineer 48 hours prior to furnishing a Certificate of Compliance for the material:

A. Reports of all visual weld inspections and NDT.
B. Radiographs and radiographic reports, and other required NDT reports.
C. Documentation that the Contractor has evaluated all radiographs and other nondestructive tests and corrected all rejectable deficiencies, and all repaired welds have been reexamined by the required NDT and found acceptable.
D. Daily production log.

Radiographic envelopes shall have clearly written on the outside of the envelope the following information: name of the QCM, name of the nondestructive testing firm, name of the radiographer, date, contract number, complete part description, and all included weld numbers or a report number, as detailed in the WQCP. In addition, all innerleaves shall have clearly written on them the part description and all included weld numbers, as detailed in the WQCP.

Reports regarding NDT, including radiographs, shall be signed by both the NDT technician and the person that performed the review, and then submitted directly to the QCM for review and signature prior to submittal to the Engineer. Corresponding names shall be clearly printed or typewritten next to all signatures.

The Engineer will review the Welding Report to determine if the Contractor is in conformance with the WQCP. Unless otherwise specified, the Engineer shall be allowed 7 working days to review the report and respond in writing after a complete Welding Report has been received. Prior to receiving notification from the Engineer of the Contractor's conformance with the WQCP, the Contractor may encase in concrete or cover welds for which a Welding Report has been submitted. However, should the Contractor elect to encase or cover those welds prior to receiving notification from the Engineer, it is expressly understood that the Contractor shall not be relieved of the responsibility for incorporating material in the work that conforms to the requirements of the plans and specifications. Material not conforming to these requirements will be subject to rejection. Should the Contractor elect to wait to encase or cover welds pending notification by the Engineer, and in the event the Engineer fails to complete the review within the time allowed, and if, in the opinion of the Engineer, completion of the work is delayed or interfered with by reason of the Engineer's delay in completing the review, the Contractor will be compensated for any resulting loss, and an extension of time will be granted, in the same manner as provided for in Section 8-1.09, "Right of Way Delays," of the Standard Specifications.

The QC Inspector shall provide reports to the QCM on a daily basis for each day that welding is performed.

Except for noncritical weld repairs, the Engineer shall be notified immediately in writing when welding problems, deficiencies, base metal repairs, or any other type of repairs not submitted in the WQCP are discovered and also of the proposed repair procedures to correct them. The Contractor shall allow the Engineer one week to review these procedures. No remedial work shall begin until the repair procedures are approved in writing by the Engineer. In the event the Engineer fails to complete the review within the time allowed, and if, in the opinion of the Engineer, completion of the work is delayed or interfered with by reason of the Engineer's delay in completing the review, the Contractor will be compensated for any resulting loss, and an extension of time will be granted, in the same manner as provided for in Section 8-1.09, "Right of Way Delays," of the Standard Specifications.

The QCM shall sign and furnish to the Engineer, a Certificate of Compliance in conformance with the provisions in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications for each item of work for which welding was

performed. The certificate shall state that all of the materials and workmanship incorporated in the work, and all required tests and inspections of this work, have been performed in conformance with the details shown on the plans, the Standard Specifications, and these special provisions.

PAYMENT

Full compensation for conforming to the requirements of 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. DESCRIPTION OF BRIDGE WORK

The bridge work to be done consists, in general, of placing communication conduits at the following structures:

EASTBOUND CONNECTOR SEPARATION UNDERCROSSING
(Bridge No. 53-1147R)

HASKELL AVENUE UNDERCROSSING
(Bridge No. 53-1103R)

HAYVENHURST AVENUE UNDERCROSSING
(Bridge No. 53-1104)

BALBOA BOULEVARD UNDERCROSSING
(Bridge No. 53-1052)

WHITE OAK AVENUE UNDERCROSSING
(Bridge No. 53-1054)

LINDLEY AVENUE UNDERCROSSING
(Bridge No. 53-1055)

BURBANK BOULEVARD UNDERCROSSING
(Bridge No. 53-1056)

RESEDA BOULEVARD UNDERCROSSING
(Bridge No. 53-1057)

DE SOTO AVENUE UNDERCROSSING
(Bridge No. 53-1062)

CANOGA AVENUE UNDERCROSSING
(Bridge No. 53-1063)

ROUTE 101 / ROUTE 27 SEPARATION
(Bridge No. 53-1064)

SECTION 10. CONSTRUCTION DETAILS

SECTION 10-1. GENERAL

10-1.00 CONSTRUCTION PROJECT INFORMATION SIGNS

Before any major physical construction work readily visible to highway users is started on this contract, the Contractor shall furnish and erect 2 Type 2 Construction Project Information signs at the locations designated by the Engineer.

The signs and overlays shall be of a type and material consistent with the estimated time of completion of the project and shall conform to the details shown on the plans.

The sign letters, border and the Department's construction logos shall conform to the colors (non-reflective) and details shown on the plans, and shall be on a white background (non-reflective). The colors blue and orange shall conform to PR Color Number 3 and Number 6, respectively, as specified in the Federal Highway Administration's Color Tolerance Chart.

The sign message to be used for fund types shall consist of the following, in the order shown:

FEDERAL HIGHWAY TRUST FUNDS
STATE HIGHWAY FUNDS

The sign message to be used for type of work shall consist of the following:

HIGHWAY IMPROVEMENT

The sign message to be used for the Year of Completion of Project Construction will be furnished by the Engineer. The Contractor shall furnish and install the "Year" sign overlay within 10 working days of notification of the year date to be used.

The letter sizes to be used shall be as shown on the plans. The information shown on the signs shall be limited to that shown on the plans.

The signs shall be kept clean and in good repair by the Contractor.

Upon completion of the work, the signs shall be removed and disposed of outside the highway right of way in conformance with the provisions in Section 7-1.13 of the Standard Specifications.

Full compensation for furnishing, erecting, maintaining, and removing and disposing of the construction project information signs shall be considered as included in the contract lump sum price paid for construction area signs and no additional compensation will be allowed therefor.

10-1.01 ORDER OF WORK

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

The Contractor shall submit to the Engineer a plan to meet the requirements of changeable message sign, traffic monitoring station, ramp metering system restrictions as defined under "Maintaining Existing Electrical Systems," elsewhere in these special provisions no less than 30 days prior to commencing work. The Engineer will have 20 days to review the plan. Should the Engineer fail to complete the review within 20 days, 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 plan, the delay will be considered a right of way delay in conformance with the provisions in Section 8-1.09, "Right of Way Delays," of the Standard Specifications.

Temporary railing (Type K) and temporary crash cushions shall be secured in place prior to commencing work for which the temporary railing and crash cushions are required.

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 communication system routing and electrical equipment, and to perform the jointly conducted pre-construction check with the Engineer according to the provisions under "Maintaining Existing and Electrical Systems," as described elsewhere in these special provisions. The Engineer shall be furnished a statement from the vendor that the order for the traffic signal equipment has been received and accepted by the vendor.

Attention is directed to the provisions in "Locate Existing Irrigation Facilities," elsewhere in these special provisions concerning locating and marking existing irrigation facilities prior to clearing and grubbing, excavating, grading and trenching operations.

The second order of work shall locate all edge drains where communications conduit will have to be installed as shown on the plans. In order to minimize the number of conduit bends the Contractor must locate edge drains that are in the path of communication conduit routing and transition the conduit to a constant minimum depth. The Contractor shall relocate existing conduits, pull boxes and irrigation lines before proceeding the trenching operations. Attention is directed to "Existing Highway Facilities" and "Earthwork" elsewhere in these special provisions regarding checking and locating existing irrigation crossovers, pipes supply lines, conductors and other facilities prior to excavating, grading and trenching operations. Existing pull boxes that fall within the areas where the trenching operations are to be performed, shall be removed and replaced with a pull box of the same size and designation outside of maintenance turnout areas.

Attention is directed to "Communication System Cut-Over" elsewhere in these special provisions regarding orderly disconnection of existing communications system routing equipment and the cut over connection, activation and testing of the modified communications system routing.

No later than 20 days after approval of the contract, the Contractor shall submit in advance to the Engineer:

1. A list of materials, including, but not limited to, fiber optic cable splice closures, fiber optic cables, and various communication equipment, that would be used in the event of damage caused by Contractor's works, or others, to the existing communications system routing and the field element locations.
2. A plan to meet the requirements of Communications system routing restrictions, as described under “Maintaining Existing Communication Systems Routing Facilities,” elsewhere in these special provisions.
3. A proposed schedule specifying the timetable of construction activities as described under “Communication systems routing,” elsewhere in these special provisions.
4. An installation and test plan which details the method of installation and all testing for all new material, cables and the associated schedule of activities, based on these special provisions, plans, the manufacturer's recommended test procedures, and industry standard practices.

The Engineer, in consultation with the District 7 Office of TMC Support, will have 20 days to review, comment, reject, or approve each item on the list of materials, the plan for Communications system routing restrictions, and the proposed schedule for the of construction activity timetable.

Should the Engineer fail to complete the review within 20 days, 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 list of materials, the plan for Communications System Routing restrictions, and the proposed schedule for the of construction activity timetable, the delay will be considered a right of way delay in conformance with the provisions in Section 8-1.09, "Right of Way Delays," of the Standard Specifications.

The Contractor shall resubmit for any rejected items within 10 days.

Attention is directed to "Maintaining Traffic" of these special provisions.

Attention is directed to "Progress Schedule (Critical Path Method)" of these special provisions regarding the submittal of a general time-scaled logic diagram within 10 days after approval of the contract. The diagram shall be submitted prior to performing any work that may be affected by any proposed deviations to the construction staging of the project.

Construction operations shall not be performed in areas where existing irrigation facilities are to remain in place until existing irrigation facilities have been checked for proper operation in conformance with the provisions in "Check and Test Existing Irrigation Facilities" of these special provisions.

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 7 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 5 working days to review the WPCP. If revisions are required, as determined by the Engineer, the Contractor shall revise and resubmit the WPCP within 5 working days of receipt of the Engineer's comments. The Engineer will have 3 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 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.

Attention is directed to "Time-Related Overhead" of these special provisions regarding compensation for time-related overhead.

Line items indicated in the Water Pollution Control Cost Break-Down in this section with a specified Estimated Quantity shall be considered 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, except for time-related overhead, shall be included in each individual item listed in the cost break-down.

WATER POLLUTION CONTROL COST BREAK-DOWN

Contract No. 07-120754

ITEM	ITEM DESCRIPTION	UNIT	ESTIMATED QUANTITY	VALUE	AMOUNT
SS-7	Geotextiles, Plastic Covers & Erosion Control Blankets/Mats	M2			
SC-1	Silt Fence	M			
SC-7	Street Sweeping and Vacuuming	LS			
SC-8	Sandbag Barrier	M			
SC-10	Storm Drain Inlet Protection	EA			
WE-1	Wind Erosion Control	LS			
TC-1	Stabilized Construction Entrance/Exit	EA			
NS-1	Water Conservation Practices	LS			
NS-3	Paving and Grinding Operations	LS			
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.

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 week outside of the defined rainy season.
E. Routinely, a minimum of once every day during the defined rainy season.
F. As directed by the Engineer.

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 are not to be removed, and are injured or damaged by reason of the Contractor's operations, shall be replaced by the Contractor. The minimum size of tree replacement shall be No. 15 container and the minimum size of shrub replacement shall be No. 15 container. Replacement ground cover plants shall be from flats and shall be planted 300 mm on center. Replacement planting shall conform to the requirements in Section 20-4.07, "Replacement," of the Standard Specifications. The Contractor shall water replacement plants in conformance with the provisions in Section 20-4.06, "Watering," of the Standard Specifications.

Damaged or injured plants shall be removed and disposed of outside the highway right of way in conformance with the provisions in Section 7-l.13 of the Standard Specifications. At the option of the Contractor, removed trees and shrubs may be reduced to chips. The chipped material shall be spread within the highway right of way at locations designated by the Engineer.

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

10-1.04 COOPERATION

Attention is directed to Section 7-1.14, "Cooperation," and Section 8-1.10, "Utility and Non-Highway Facilities," of the Standard Specifications and these special provisions.

Attention is directed to "Work at Transportation Management Center (TMC)," of these special provisions.

It is anticipated that work by another contractor (Contract No. 07-020744) to construct soundwalls in Los Angeles County on Route 101 from Reseda Boulevard to Winnetka Avenue (KP 34.1 to KP 37.5) may be in progress adjacent to or within the limits of this project during progress of the work on this contract.

10-1.05 PROGRESS SCHEDULE (CRITICAL PATH METHOD)

The Contractor shall submit to the Engineer practicable critical path method (CPM) progress schedules in conformance with these special provisions. Whenever the term "schedule" is used in this section it shall mean CPM progress schedule.

Attention is directed to "Payments" of Section 5 of these special provisions.

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

DEFINITIONS

The following definitions shall apply to this section:

A. ACTIVITY.—A task, event or other project element on a schedule that contributes to completing the project. Activities have a description, start date, finish date, duration and one or more logic ties.
B. BASELINE SCHEDULE.—The initial schedule representing the Contractor's work plan on the first working day of the project.
C. CONTRACT COMPLETION DATE.—The current extended date for completion of the contract shown on the weekly statement of working days furnished by the Engineer in conformance with the provisions in Section 8-1.06, "Time of Completion," of the Standard Specifications.
D. CRITICAL PATH.—The longest continuous chain of activities for the project that has the least amount of total float of all chains. In general, a delay on the critical path will extend the scheduled completion date.
E. CRITICAL PATH METHOD (CPM).—A network based planning technique using activity durations and the relationships between activities to mathematically calculate a schedule for the entire project.
F. DATA DATE.—The day after the date through which a schedule is current. Everything occurring earlier than the data date is "as-built" and everything on or after the data date is "planned."

G. EARLY COMPLETION TIME.—The difference in time between an early scheduled completion date and the contract completion date.
H. FLOAT.—The difference between the earliest and latest allowable start or finish times for an activity.
I. MILESTONE.—An event activity that has zero duration and is typically used to represent the beginning or end of a certain stage of the project.
J. NARRATIVE REPORT.—A document submitted with each schedule that discusses topics related to project progress and scheduling.
K. NEAR CRITICAL PATH.—A chain of activities with total float exceeding that of the critical path but having no more than 10 working days of total float.
L. SCHEDULED COMPLETION DATE.—The planned project finish date shown on the current accepted schedule.
M. STATE OWNED FLOAT ACTIVITY.—The activity documenting time saved on the critical path by actions of the State. It is the last activity prior to the scheduled completion date.
N. TIME IMPACT ANALYSIS.—A schedule and narrative report developed specifically to demonstrate what effect a proposed change or delay has on the current scheduled completion date.
O. TOTAL FLOAT.—The amount of time that an activity or chain of activities can be delayed before extending the scheduled completion date.
P. UPDATE SCHEDULE.—A current schedule developed from the baseline or subsequent schedule through regular monthly review to incorporate as-built progress and any planned changes.

GENERAL REQUIREMENTS

The Contractor shall submit to the Engineer baseline, monthly update and final update schedules, each consistent in all respects with the time and order of work requirements of the contract. The project work shall be executed in the sequence indicated on the current accepted schedule.

Schedules shall show the order in which the Contractor proposes to carry out the work with logical links between time-scaled work activities, and calculations made using the critical path method to determine the controlling operation or operations. The Contractor is responsible for assuring that all activity sequences are logical and that each schedule shows a coordinated plan for complete performance of the work.

The Contractor shall produce schedules using computer software and shall furnish compatible software for the Engineer's exclusive possession and use. The Contractor shall furnish network diagrams, narrative reports, tabular reports and schedule data as parts of each schedule submittal.

Schedules shall include, but not be limited to, activities that show the following that are applicable to the project:

A. Project characteristics, salient features, or interfaces, including those with outside entities, that could affect time of completion.
B. Project start date, scheduled completion date and other milestones.
C. Work performed by the Contractor, subcontractors and suppliers.
D. Submittal development, delivery, review and approval, including those from the Contractor, subcontractors and suppliers.
E. Procurement, delivery, installation and testing of materials, plants and equipment.
F. Testing and settlement periods.
G. Utility notification and relocation.
H. Erection and removal of falsework and shoring.
I. Major traffic stage switches.
J. Finishing roadway and final cleanup.
K. State-owned float as the predecessor activity to the scheduled completion date.

Schedules shall have not less than 50 and not more than 500 activities, unless otherwise authorized by the Engineer. The number of activities shall be sufficient to assure adequate planning of the project, to permit monitoring and evaluation of progress, and to do an analysis of time impacts.

Schedule activities shall include the following:

A. A clear and legible description.
B. Start and finish dates.
C. A duration of not less than one working day, except for event activities, and not more than 20 working days, unless otherwise authorized by the Engineer.
D. At least one predecessor and one successor activity, except for project start and finish milestones.
E. Required constraints.

F. Codes for responsibility, stage, work shifts, location and contract pay item numbers.

The Contractor may show early completion time on any schedule provided that the requirements of the contract are met. Early completion time shall be considered a resource for the exclusive use of the Contractor. The Contractor may increase early completion time by improving production, reallocating resources to be more efficient, performing sequential activities concurrently or by completing activities earlier than planned. The Contractor may also submit for approval a cost reduction incentive proposal in conformance with the provisions in Section 5-1.14, "Cost Reduction Incentive," of the Standard Specifications that will reduce time of construction.

The Contractor may show a scheduled completion date that is later than the contract completion date on an update schedule, after the baseline schedule is accepted. The Contractor shall provide an explanation for a late scheduled completion date in the narrative report that is included with the schedule.

State-owned float shall be considered a resource for the exclusive use of the State. The Engineer may accrue State-owned float by the early completion of review of any type of required submittal when it saves time on the critical path. The Contractor shall prepare a time impact analysis, when requested by the Engineer, to determine the effect of the action in conformance with the provisions in "Time Impact Analysis" specified herein. The Engineer will document State-owned float by directing the Contractor to update the State-owned float activity on the next update schedule. The Contractor shall include a log of the action on the State-owned float activity and include a discussion of the action in the narrative report. The Engineer may use State-owned float to mitigate past, present or future State delays by offsetting potential time extensions for contract change orders.

The Engineer may adjust contract working days for ordered changes that affect the scheduled completion date, in conformance with the provisions in Section 4-1.03, "Changes," of the Standard Specifications. The Contractor shall prepare a time impact analysis to determine the effect of the change in conformance with the provisions in "Time Impact Analysis" specified herein, and shall include the impacts acceptable to the Engineer in the next update schedule. Changes that do not affect the controlling operation on the critical path will not be considered as the basis for a time adjustment. Changes that do affect the controlling operation on the critical path will be considered by the Engineer in decreasing time or granting an extension of time for completion of the contract. Time extensions will only be granted if the total float is absorbed and the scheduled completion date is delayed one or more working days because of the ordered change.

The Engineer's review and acceptance of schedules shall not waive any contract requirements and shall not relieve the Contractor of any obligation thereunder or responsibility for submitting complete and accurate information. Schedules that are rejected shall be corrected by the Contractor and resubmitted to the Engineer within 5 working days of notification by the Engineer, at which time a new review period of one week will begin.

Errors or omissions on schedules shall not relieve the Contractor from finishing all work within the time limit specified for completion of the contract. If, after a schedule has been accepted by the Engineer, either the Contractor or the Engineer discover that any aspect of the schedule has an error or omission, it shall be corrected by the Contractor on the next update schedule.

COMPUTER SOFTWARE

The Contractor shall submit to the Engineer for approval a description of proposed software before delivery. The software shall be the current version of Primavera SureTrak Project Manager for Windows, or equal, and shall be compatible with Windows NT (version 4.0) operating system. If software other than SureTrak is proposed, it shall be capable of generating files that can be imported into SureTrak.

The Contractor shall furnish schedule software and all original software instruction manuals to the Engineer with submittal of the baseline schedule. The furnished schedule software shall become the property of the State and will not be returned to the Contractor. The State will compensate the Contractor in conformance with the provisions in Section 4-1.03, "Extra Work," of the Standard Specifications for replacement of software which is damaged, lost or stolen after delivery to the Engineer.

The Contractor shall instruct the Engineer in the use of the software and provide software support until the contract is accepted. Within 20 working days of contract approval, the Contractor shall provide a commercial 8-hour training session for 2 Department employees in the use of the software at a location acceptable to the Engineer. It is recommended that the Contractor also send at least 2 employees to the same training session to facilitate development of similar knowledge and skills in the use of the software. If software other than SureTrak is furnished, then the training session shall be a total of 16-hours for each Department employee.

NETWORK DIAGRAMS, REPORTS AND DATA

The Contractor shall include the following for each schedule submittal:

A. Two sets of originally plotted, time-scaled network diagrams.

B. Two copies of a narrative report.
C. Two copies of each of 3 sorts of the CPM software-generated tabular reports.
D. One 1.44-megabyte 90 mm (3.5 inch) floppy diskette containing the schedule data.

The time-scaled network diagrams shall conform to the following:

A. Show a continuous flow of information from left to right.
B. Be based on early start and early finish dates of activities.
C. Clearly show the primary paths of criticality using graphical presentation.
D. Be prepared on E-size sheets, 860 mm x 1120 mm (34 inch x 44 inch).
E. Include a title block and a timeline on each page.

The narrative report shall be organized in the following sequence with all applicable documents included:

A. Contractor's transmittal letter.
B. Work completed during the period.
C. Identification of unusual conditions or restrictions regarding labor, equipment or material; including multiple shifts, 6-day work weeks, specified overtime or work at times other than regular days or hours.
D. Description of the current critical path.
E. Changes to the critical path and scheduled completion date since the last schedule submittal.
F. Description of problem areas.
G. Current and anticipated delays:

    1. Cause of delay.
    2. Impact of delay on other activities, milestones and completion dates.
    3. Corrective action and schedule adjustments to correct the delay.

H. Pending items and status thereof:

    1. Permits
    2. Change orders
    3. Time adjustments
    4. Non-compliance notices

I. Reasons for an early or late scheduled completion date in comparison to the contract completion date.

Tabular reports shall be software-generated and provide information for each activity included in the project schedule. Three different reports shall be sorted by (1) activity number, (2) early start and (3) total float. Tabular reports shall be 215 mm x 280 mm (8 1/2 inch x 11 inch) in size and shall include, as a minimum, the following applicable information:

A. Data date
B. Activity number and description
C. Predecessor and successor activity numbers and descriptions
D. Activity codes
E. Scheduled, or actual and remaining durations (work days) for each activity
F. Earliest start (calendar) date
G. Earliest finish (calendar) date
H. Actual start (calendar) date
I. Actual finish (calendar) date
J. Latest start (calendar) date
K. Latest finish (calendar) date
L. Free float (work days)
M. Total float (work days)
N. Percentage of activity complete and remaining duration for incomplete activities.
O. Lags
P. Required constraints

Schedule submittals will only be considered complete when all documents and data have been provided as described above.

PRE-CONSTRUCTION SCHEDULING CONFERENCE

The Contractor shall schedule and the Engineer will conduct a pre-construction scheduling conference with the Contractor's project manager and construction scheduler within 10 working days of the approval of the contract. At this meeting the Engineer will review the requirements of this section of the special provisions with the Contractor.

The Contractor shall submit a general time-scaled logic diagram displaying the major activities and sequence of planned operations and shall be prepared to discuss the proposed work plan and schedule methodology that comply with the requirements of these special provisions. If the Contractor proposes deviations to the construction staging of the project, then the general time-scaled logic diagram shall also display the deviations and resulting time impacts. The Contractor shall be prepared to discuss the proposal.

At this meeting, the Contractor shall additionally submit the alphanumeric coding structure and the activity identification system for labeling the work activities. To easily identify relationships, each activity description shall indicate its associated scope or location of work by including such terms as quantity of material, type of work, bridge number, station to station location, side of highway (such as left, right, northbound, southbound), lane number, shoulder, ramp name, ramp line descriptor or mainline.

The Engineer will review the logic diagram, coding structure, and activity identification system, and provide any required baseline schedule changes to the Contractor for implementation.

BASELINE SCHEDULE

Beginning the week following the pre-construction scheduling conference, the Contractor shall meet with the Engineer weekly until the baseline schedule is accepted by the Engineer to discuss schedule development and resolve schedule issues.

The Contractor shall submit to the Engineer a baseline schedule within 20 working days of approval of the contract. The Contractor shall allow 3 weeks for the Engineer's review after the baseline schedule and all support data are submitted. In addition, the baseline schedule submittal will not be considered complete until the computer software is delivered and installed for use in review of the schedule.

The baseline schedule shall include the entire scope of work and how the Contractor plans to complete all work contemplated. The baseline schedule shall show the activities that define the critical path. Multiple critical paths and near-critical paths shall be kept to a minimum. A total of not more than 50 percent of the baseline schedule activities shall be critical or near critical, unless otherwise authorized by the Engineer.

The baseline schedule shall not extend beyond the number of working days specified in these special provisions. The baseline schedule shall have a data date of the first working day of the contract and not include any completed work to date. The baseline schedule shall not attribute negative float or negative lag to any activity.

If the Contractor submits an early completion baseline schedule that shows contract completion in less than 85 percent of the working days specified in these special provisions, the baseline schedule shall be supplemented with resource allocations for every task activity and include time-scaled resource histograms. The resource allocations shall be shown to a level of detail that facilitates report generation based on labor crafts and equipment classes for the Contractor and subcontractors. The Contractor shall use average composite crews to display the labor loading of on-site construction activities. The Contractor shall optimize and level labor to reflect a reasonable plan for accomplishing the work of the contract and to assure that resources are not duplicated in concurrent activities. The time-scaled resource histograms shall show labor crafts and equipment classes to be utilized on the contract. The Engineer may review the baseline schedule activity resource allocations using Means Productivity Standards or equivalent to determine if the schedule is practicable.

UPDATE SCHEDULE

The Contractor shall submit an update schedule and meet with the Engineer to review contract progress, on or before the first day of each month, beginning one month after the baseline schedule is accepted. The Contractor shall allow 2 weeks for the Engineer's review after the update schedule and all support data are submitted, except that the review period shall not start until the previous month's required schedule is accepted. Update schedules that are not accepted or rejected within the review period will be considered accepted by the Engineer.

The update schedule shall have a data date of the twenty-first day of the month or other date established by the Engineer. The update schedule shall show the status of work actually completed to date and the work yet to be performed as planned. Actual activity start dates, percent complete and finish dates shall be shown as applicable. Durations for work that has been completed shall be shown on the update schedule as the work actually occurred, including Engineer submittal review and Contractor resubmittal times.

The Contractor may include modifications such as adding or deleting activities or changing activity constraints, durations or logic that do not (1) alter the critical path(s) or near critical path(s) or (2) extend the scheduled completion date

compared to that shown on the current accepted schedule. The Contractor shall state in writing the reasons for any changes to planned work. If any proposed changes in planned work will result in (1) or (2) above, then the Contractor shall submit a time impact analysis as described herein.

TIME IMPACT ANALYSIS

The Contractor shall submit a written time impact analysis (TIA) to the Engineer with each request for adjustment of contract time, or when the Contractor or Engineer consider that an approved or anticipated change may impact the critical path or contract progress.

The TIA shall illustrate the impacts of each change or delay on the current scheduled completion date or internal milestone, as appropriate. The analysis shall use the accepted schedule that has a data date closest to and prior to the event. If the Engineer determines that the accepted schedule used does not appropriately represent the conditions prior to the event, the accepted schedule shall be updated to the day before the event being analyzed. The TIA shall include an impact schedule developed from incorporating the event into the accepted schedule by adding or deleting activities, or by changing durations or logic of existing activities. If the impact schedule shows that incorporating the event modifies the critical path and scheduled completion date of the accepted schedule, the difference between scheduled completion dates of the two schedules shall be equal to the adjustment of contract time. The Engineer may construct and utilize an appropriate project schedule or other recognized method to determine adjustments in contract time until the Contractor provides the TIA.

The Contractor shall submit a TIA in duplicate within 15 working days of receiving a written request for a TIA from the Engineer. The Contractor shall allow the Engineer 2 weeks after receipt to approve or reject the submitted TIA. All approved TIA schedule changes shall be shown on the next update schedule.

If a TIA submitted by the Contractor is rejected by the Engineer, the Contractor shall meet with the Engineer to discuss and resolve issues related to the TIA. If agreement is not reached, the Contractor will be allowed 15 days from the meeting with the Engineer to give notice in conformance with the provisions in Section 9-1.04, "Notice of Potential Claim," of the Standard Specifications. The Contractor shall only show actual as-built work, not unapproved changes related to the TIA, in subsequent update schedules. If agreement is reached at a later date, approved TIA schedule changes shall be shown on the next update schedule. The Engineer will withhold remaining payment on the schedule contract item if a TIA is requested by the Engineer and not submitted by the Contractor within 15 working days. The schedule item payment will resume on the next estimate after the requested TIA is submitted. No other contract payment will be retained regarding TIA submittals.

FINAL UPDATE SCHEDULE

The Contractor shall submit a final update, as-built schedule with actual start and finish dates for the activities, within 30 days after completion of contract work. The Contractor shall provide a written certificate with this submittal signed by the Contractor's project manager and an officer of the company stating, "To my knowledge and belief, the enclosed final update schedule reflects the actual start and finish dates of the actual activities for the project contained herein." An officer of the company may delegate in writing the authority to sign the certificate to a responsible manager.

RETENTION

The Department will retain an amount equal to 25 percent of the estimated value of the work performed during each estimate period in which the Contractor fails to submit an acceptable schedule conforming to the requirements of these special provisions as determined by the Engineer. Schedule retentions will be released for payment on the next monthly estimate for partial payment following the date that acceptable schedules are submitted to the Engineer or as otherwise specified herein. Upon completion of all contract work and submittal of the final update schedule and certification, any remaining retained funds associated with this section, "Progress Schedule (Critical Path Method)", will be released for payment. Retentions held in conformance with this section shall be in addition to other retentions provided for in the contract. No interest will be due the Contractor on retention amounts.

PAYMENT

Progress schedule (critical path method) will be paid for at a lump sum price. The contract lump sum price paid for progress schedule (critical path method) shall include full compensation for furnishing all labor, material, tools, equipment, and incidentals, including computer software, and for doing all the work involved in preparing, furnishing, and updating schedules, and instructing and assisting the Engineer in the use of computer software, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

Payments for the progress schedule (critical path method) contract item will be made progressively as follows:

A. A total of 25 percent of the item amount or a total of 25 percent of the amount listed for progress schedule (critical path method) in "Payments" of Section 5 of these special provisions, whichever is less, will be paid upon achieving all of the following:

   1. Completion of 5 percent of all contract item work.
   2. Acceptance of all schedules and TIAs required to the time when 5 percent of all contract item work is complete.
   3. Delivery of schedule software to the Engineer.
   4. Completion of required schedule software training.

B. A total of 50 percent of the item amount or a total of 50 percent of the amount listed for progress schedule (critical path method) in "Payments" of Section 5 of these special provisions, whichever is less, will be paid upon completion of 25 percent of all contract item work and acceptance of all schedules and TIAs required to the time when 25 percent of all contract item work is complete.
C. A total of 75 percent of the item amount or a total of 75 percent of the amount listed for progress schedule (critical path method) in "Payments" of Section 5 of these special provisions, whichever is less, will be paid upon completion of 50 percent of all contract item work and acceptance of all schedules and TIAs required to the time when 50 percent of all contract item work is complete.
D. A total of 100 percent of the item amount or a total of 100 percent of the amount listed for progress schedule (critical path method) in "Payments" of Section 5 of these special provisions, whichever is less, will be paid upon completion of all contract item work, acceptance of all schedules and TIAs required to the time when all contract item work is complete, and submittal of the certified final update schedule.

If the Contractor fails to complete any of the work or provide any of the schedules required by this section, the Engineer shall make an adjustment in compensation in conformance with the provisions in Section 4-1.03C, "Changes in Character of Work," of the Standard Specifications for the work not performed. Adjustments in compensation for schedules will not be made for any increased or decreased work ordered by the Engineer in furnishing schedules.

10-1.06 TIME-RELATED OVERHEAD

The Contractor will be compensated for time-related overhead in conformance with these special provisions.

Attention is directed to "Beginning of Work, Time of Completion and Liquidated Damages," "Force Account Payment," and "Progress Schedule (Critical Path Method)" of these special provisions.

The provisions in Section 9-1.08, "Adjustment of Overhead Costs," of the Standard Specifications shall not apply.

Time-related overhead shall consist of those overhead costs, including field and home office overhead, that are in proportion to the time required to complete the work. Time-related overhead shall not include costs that are not related to time, including but not limited to, mobilization, licenses, permits, and other charges incurred only once during the contract.

Field office overhead expenses include time-related costs associated with the normal and recurring operations of the construction project, and shall not include costs directly attributable to the work of the contract. Time-related costs of field office overhead include, but are not limited to, salaries, benefits, and equipment costs of project managers, general superintendents, field office managers and other field office staff assigned to the project, and rent, utilities, maintenance, security, supplies, and equipment costs of the project field office.

Home office overhead or general and administrative expenses refer to the fixed costs of operating the Contractor's business. These costs include, but are not limited to, general administration, insurance, personnel and subcontract administration, purchasing, accounting, and project engineering and estimating. Home office overhead costs shall exclude expenses specifically related to other contracts or other businesses of the Contractor, equipment coordination, material deliveries, and consultant and legal fees.

The quantity of time-related overhead associated with a reduction in contract time for cost reduction incentive proposals accepted and executed in conformance with the provisions in Section 5-1.14, "Cost Reduction Incentive," of the Standard Specifications shall be considered a construction cost attributable to the resultant estimated net savings due to the cost reduction incentive.

If the final increased quantity of time-related overhead exceeds 149 percent of the number of working days specified in the Engineer's Estimate, the Contractor shall, within 60 days of the Engineer's written request, submit to the Engineer an audit examination and report performed by an independent Certified Public Accountant of the Contractor's actual overhead costs. The independent 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 the Federal

Acquisition Regulations, 48 CFR, Chapter 1, Part 31. The audit examination and report shall determine if the rates of field office overhead and home office overhead are:

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

Within 20 days of the Engineer's written request, the Contractor shall make its financial records available for audit by the State for the purpose of verifying the actual rate of time-related overhead specified in the audit submitted by the Contractor. The actual rate of time-related overhead specified in the audit, submitted by the Contractor, will be subject to approval by the Engineer.

If the Engineer requests the independent Certified Public Accountant audit, or if it is requested in writing by the Contractor, the contract item payment rate for time-related overhead, in excess of 149 percent of the number of working days specified in the Engineer's Estimate, will be adjusted to reflect the actual rate.

The cost of performing an independent Certified Public Accountant audit examination and submitting the report, requested by the Engineer, will be borne equally by the State and the Contractor. The division of the cost will be made by determining the cost of providing an audit examination and report in conformance with the provisions of Section 9-1.03B, "Work Performed by Special Forces or Other Special Services," of the Standard Specifications, and paying to the Contractor one-half of that cost. The cost of performing an audit examination and submitting the independent Certified Public Accountant audit report for overhead claims other than for the purpose of verifying the actual rate of time-related overhead shall be entirely borne by the Contractor.

The quantity of time-related overhead to be paid will be measured by the working day, designated in the Engineer's Estimate as WDAY. The estimated number of working days is the number of working days, excluding days for plant establishment, as specified in "Beginning of Work, Time of Completion and Liquidated Damages" of these special provisions. The quantity of time-related overhead will be increased or decreased only as a result of suspensions or adjustments of contract time which revise the current contract completion date, and which satisfy any of the following criteria:

A. Suspensions of work ordered in conformance with the provisions in Section 8-1.05, "Temporary Suspension of Work," of the Standard Specifications, except:

1. Suspensions ordered due to weather conditions being unfavorable for the suitable prosecution of the controlling operation or operations.
2. Suspensions ordered due to the failure on the part of the Contractor to carry out orders given, or to perform the provisions of the contract.
3. Other suspensions mutually agreed upon between the Engineer and the Contractor.

B. Extensions of contract time granted by the State in conformance with the provisions in the fifth paragraph in Section 8-1.07, "Liquidated Damages," of the Standard Specifications and set forth in approved contract change orders, in conformance with the provisions in Section 4-1.03, "Changes," of the Standard Specifications.
C. Reductions in contract time set forth in approved contract change orders, in conformance with the provisions in Section 4-1.03, "Changes," of the Standard Specifications.

In the event an early completion progress schedule, as defined in "Progress Schedule (Critical Path Method)" of these special provisions, is submitted by the Contractor and approved by the Engineer, the amount of time-related overhead eligible for payment will be based on the total number of working days for the project, in conformance with the provisions in "Beginning of Work, Time of Completion and Liquidated Damages" of these special provisions, rather than the Contractor's early completion progress schedule.

The contract price paid per working day for time-related overhead shall include full compensation for time-related overhead, including the Contractor's share of costs of the independent Certified Public Accountant audit of overhead costs requested by the Engineer, as specified in these special provisions, and as directed by the Engineer.

The provisions in Sections 4-1.03B, "Increased or Decreased Quantities," and 4-1.03C, "Changes in Character of the Work," of the Standard Specifications shall not apply to the contract item of time-related overhead.

Full compensation for additional overhead costs incurred during days of inclement weather when the contract work is extended into additional construction seasons due to delays caused by the State shall be considered as included in the time-related overhead paid during the contract working days, and no additional compensation will be allowed therefor.

Full compensation for additional overhead costs involved in performing additional contract item work that is not a controlling operation shall be considered as included in the contract items of work involved and no additional compensation will be allowed therefor.

Full compensation for overhead, other than time-related overhead measured and paid for as specified above, and other than overhead costs included in the markups specified in "Force Account Payment" of these special provisions, shall be considered as included in the various items of work and no additional compensation will be allowed therefor.

Overhead costs incurred by joint venture partners, subcontractors, suppliers or other parties associated with the Contractor shall be considered as included in the various overhead costs for which the Contractor is compensated, and no additional compensation will be allowed therefor.

For the purpose of making partial payments pursuant to the provisions in Section 9-1.06, "Partial Payments," of the Standard Specifications, the number of working days to be paid for time-related overhead in each monthly partial payment will be the number of working days, specified above to be measured for payment that occurred during that monthly estimate period, including compensable suspensions and right of way delays. Working days granted by contract change order due to extra work or changes in character of the work, will be paid for upon completion of the contract. The amount earned per working day for time-related overhead shall be the lesser of the following amounts:

A) The contract item price.
B) Twenty percent of the original total contract amount divided by the number of working days specified in "Beginning of Work, Time of Completion and Liquidated Damages," of these special provisions.

After acceptance of the contract in conformance with the provisions in Section 7-1.17, "Acceptance of Contract," of the Standard Specifications, the amount of the total contract item price for time-related overhead not yet paid, will be included for payment in the first estimate made after acceptance of the contract in conformance with the provisions in Section 9-1.07, "Payment After Acceptance," of the Standard Specifications.

10-1.07 OBSTRUCTIONS

Attention is directed to Section 8-1.10, "Utility and Non-Highway Facilities," and Section 15, "Existing Highway Facilities," of the Standard Specifications and these special provisions.

Attention is directed to the existence of certain underground facilities that may require special precautions be taken by the Contractor to protect the health, safety and welfare of workers and of the public. Facilities requiring special precautions include, but are not limited to: conductors of petroleum products, oxygen, chlorine, and toxic or flammable gases; natural gas in pipelines greater than 150 mm in diameter or pipelines operating at pressures greater than 415 kPa (gage); underground electric supply system conductors or cables, with potential to ground of more than 300 V, either directly buried or in a duct or conduit which do not have concentric grounded or other effectively grounded metal shields or sheaths.

If these facilities are not located on the plans in both alignment and elevation, no work shall be performed in the vicinity of the facilities, except as provided herein for conduit to be placed under pavement, until the owner, or the owner's representative, has located the facility by potholing, probing or other means that will locate and identify the method in conformance with the provisions in "Conduit" of these special provisions. If, in the opinion of the Engineer, the Contractor's operations are delayed or interfered with by reason of the utility facilities not being located by the owner or the owner's representative, the State will compensate the Contractor for the delays to the extent provided in Section 8-1.09, "Right of Way Delays," of the Standard Specifications, and not otherwise, except as provided in Section 8-1.10, "Utility and Non-Highway Facilities," of the Standard Specifications.

The Contractor shall notify the Engineer and the appropriate regional notification center for operators of subsurface installations at least 2 working days, but not more than 14 calendar days, prior to performing any excavation or other work close to any underground pipeline, conduit, duct, wire or other structure. Regional notification centers include, but are not limited to, the following:

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

10-1.08 MOBILIZATION

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

10-1.09 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.

10-1.10 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.

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.

Attention is directed to "Construction Project Information Signs" of these special provisions regarding the number and type of construction project information signs to be furnished, erected, maintained, and removed and disposed of.

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.

10-1.11 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 "Portable Changeable Message Sign", "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.

In addition to the provisions set forth in "Public Safety" of these special provisions, whenever work to be performed on the freeway traveled way (except installing loop detectors with a truck mounted attenuator (TMA) as a shadow vehicle and except the work of installing, maintaining and removing traffic control devices) is within 1.8 m of the adjacent traffic lane, the adjacent traffic lane shall be closed.

Personal vehicles of the Contractor's employees shall not be parked within the freeway right of way.

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 freeway shoulder within 1.8 m of a traffic lane, the shoulder area shall be closed as shown on the plans.

Except as otherwise provided in these special provisions or Table Z (Lane Closure Restrictions for Designated Legal Holidays and Special Days), freeway lanes, connectors, and ramps shall be closed only during the hours shown on Charts 1 through 7 and 21 through 59 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.

Except as otherwise provided in these special provisions, the Contractor may, at the Contractor's option, work during the hours designated as "No lane closure permitted; no work permitted ... " shown on Charts 1 through 9, provided temporary traffic screens are installed on top of temporary railings (Type K), as shown on the plans. Temporary traffic screens shall be furnished, installed, maintained, and removed at the Contractor's expense. Temporary traffic screen panels shall be new or used CDX Grade, or better, plywood or weather resistant strandboard mounted and anchored on temporary railing (Type K). Wale boards shall be new or used Douglas fir, rough sawn, Construction Grade, or better. Pipe screen supports shall be new or used galvanized steel pipe Schedule 40. Nuts, bolts, and washers shall be cadmium plated. Screws shall be black or cadmium plated flat head, cross slotted screws with full thread length.

Except as otherwise provided in these special provisions, Route 101 freeway may be closed to public traffic at one location in one direction at a time for the purpose of loop detector installation in conformance with the hours and requirements as shown on Charts 8 through 20.

No 2 consecutive on-ramps or consecutive off-ramps in the same direction of travel shall be closed at the same time unless otherwise permitted by the Engineer. If 2 or more consecutive on-ramps are permitted to be closed, the Contractor, at the Contractor's expense, shall furnish and install special signs for entrance ramp closures (sign SP-4) as directed by the Engineer.

When an off-ramp is closed, the Contractor shall furnish and erect, as directed by the Engineer, a special sign for exit ramp closures (sign SP-3 or SP-5) as shown on the plans.

Special advance notice publicity signs (sign SP-1), as shown on the plans shall be posted as directed by the Engineer, a minimum of 7 days prior to the actual ramp or connector closure. When work is not actively in progress, the SP-1 sign shall be removed or covered.

Full compensation for furnishing, erecting, maintaining, and removing special advance notice publicity signs (SP-1), special portable freeway detour signs (SP-2), and special signs for exit ramp closures (SP-3 or SP-5) as shown on the plans or in these special provisions shall be considered as included in the contract lump sum price paid for traffic control system and no additional payment will be made therefor.

All aforementioned special signs shall become the property of the Contractor at the conclusion of this project and shall be removed from the worksite.

No work on city streets that interferes with public traffic shall be performed between 6:00 a.m. and 9:00 a.m. nor between 3:00 p.m. and 7:00 p.m.

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.

Special Days are Martin Luther King Day, Lincoln's Birthday, Cesar Chavez Day, and Columbus Day.

Table Z

Lane Closure Restrictions for Designated Legal Holidays and Special Days											
Each row represents an individual legal holiday or special day situation	**Thu**	**Fri**	**Sat**	**Sun**	**Mon**	**Tues**	**Wed**	**Thr**	**Fri**	**Sat**	**Sun**
	x	**H** xx	xx	xx							
		SD xx									
	x	xx	**H** xx	xx							
			SD xx								
		x	xx	**H** xx	xx						
				SD xx							
		x	xx	xx	**H** **SD** xx						
		x	xx			**H** xx					
						SD xx					
						x	**H** xx				
							SD xx				
							x	**H** xx	xx		xx
								SD xx			

H = Designated Legal Holiday
SD = Special Day

	Refer to lane closure charts
x	The full width of the traveled way shall be open for use by public traffic after 6:00 a.m.
xx	The full width of the traveled way shall be open for use by public traffic.

Minor deviations from the requirements of this section concerning hours of work which do not significantly change the cost of the work may be permitted upon the written request of the Contractor, if in the opinion of the Engineer, public traffic will be better served and the work expedited. These deviations shall not be adopted by the Contractor until the Engineer has approved the deviations in writing. All other modifications will be made by contract change order.

Chart No. 1
Lane Requirements and Hours of Work

Location: SB Rte 405 Freeway at Rte 101 / Rte 405 interchange

	a.m.												p.m.												
FROM HOUR TO HOUR	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
Mondays through Thursdays	1	1	1	1	1	X	X	X	X	X	X	X	X	X	X	X	X	X	X				2	2	
Fridays	1	1	1	1	2	X	X	X	X	X	X	X	X	X	X	X	X	X	X					2	
Saturdays	1	1	1	1	1	2		X	X	X	X	X	X	X	X	X							2	2	
Sundays	1	1	1	1	1	1	2						X	X	X	X	X	X	X				2	2	

Legend:

1	Provide at least one through freeway lane open in direction of travel
2	Provide at least two through freeway lanes open in direction of travel
	No lane closure permitted; work permitted anywhere that does not require freeway lane closure
X	No lane closure permitted; no work permitted on Route 405 roadway

REMARKS: Number of Through Traffic Lanes - 3 (Does not include HOV lane)

Chart No. 2
Lane Requirements and Hours of Work

Location: NB (WB) Rte 101 Freeway - Rte 405 to Balboa Blvd. off-ramp

	a.m.												p.m.												
FROM HOUR TO HOUR	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
Mondays through Thursdays	2	1	1	1	2	4		X	X	X	X	X	X	X	X	X	X	X	X	X		5	4	3	
Fridays	2	1	1	1	2	4		X	X	X	X	X	X	X	X	X	X	X	X	X			5	4	
Saturdays	3	3	2	2	2	2	4		X	X	X	X	X	X	X	X	X	X	X				5	5	
Sundays	3	3	2	2	1	1	2	3	4	5		X	X	X	X	X	X	X	X	X		5	4	4	

Legend:

1	Provide at least one through freeway lane open in direction of travel
2	Provide at least two through freeway lanes open in direction of travel
3	Provide at least three through freeway lanes open in direction of travel
4	Provide at least four through freeway lanes open in direction of travel
5	Provide at least five through freeway lanes open in direction of travel
	No lane closure permitted; work permitted anywhere that does not require freeway lane closure
X	No lane closure permitted; no work permitted on Route 101 roadway

REMARKS: Number of Through Traffic Lanes - 5 or 6*
Legend* - Traffic lane which is outside of the through traffic lanes and is delineated with a double line of pavement markers as shown on "Pavement Markers and Traffic Lines Detail 37 series," may be closed at same time as adjacent ramp is permitted to be closed as shown on Charts 29 and 32, except as otherwise provided in this section.

Chart No. 3
Lane Requirements and Hours of Work

Location: NB (WB) Rte 101 Freeway - North of Balboa Blvd. off-ramp to Winnetka Avenue off-ramp

	a.m.												p.m.											
FROM HOUR TO HOUR	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
Mondays through Thursdays	2	1	1	1	1	3		X	X	X	X	X	X	X	X	X	X	X	X	X			4	3	
Fridays	2	1	1	1	1	3		X	X	X	X	X	X	X	X	X	X	X	X	X			4	3	
Saturdays	3	2	2	1	1	2	3	4			X	X	X	X	X	X	X	X	X	X		4	4	4	
Sundays	3	2	2	1	1	1	2	2	3	4			X	X	X	X	X	X	X			4	4	3	

Legend:

1	Provide at least one through freeway lane open in direction of travel
2	Provide at least two through freeway lanes open in direction of travel
3	Provide at least three through freeway lanes open in direction of travel
4	Provide at least four through freeway lanes open in direction of travel
	No lane closure permitted; work permitted anywhere that does not require freeway lane closure
X	No lane closure permitted; no work permitted on Route 101 roadway

REMARKS: Number of Through Traffic Lanes - 5

Chart No. 4
Lane Requirements and Hours of Work

Location: NB (WB) Rte 101 Freeway - North of Winnetka Avenue off-ramp to Topanga Canyon Blvd. off-ramp

	a.m.												p.m.												
FROM HOUR TO HOUR	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
Mondays through Thursdays	1	1	1	1	1	2		X	X	X	X	X	X	X	X	X	X	X			4	3	3	2	
Fridays	1	1	1	1	1	2				X	X	X	X	X	X	X	X	X	X			4	3	2	
Saturdays	2	1	1	1	1	1	2	3	3	4	4			X	X	X	X	X	X		4	3	3	2	
Sundays	2	1	1	1	1	1	2	2	2	2	3	4	4			X	X	X	X		4	3	3	2	

Legend:

1	Provide at least one through freeway lane open in direction of travel
2	Provide at least two through freeway lanes open in direction of travel
3	Provide at least three through freeway lanes open in direction of travel
4	Provide at least four through freeway lanes open in direction of travel
	No lane closure permitted; work permitted anywhere that does not require freeway lane closure
X	No lane closure permitted; no work permitted on Route 101 roadway

REMARKS: Number of Through Traffic Lanes - 5*
Legend* - Traffic lane which is outside of the through traffic lanes and is delineated with a double line of pavement markers as shown on "Pavement Markers and Traffic Lines Detail 37 series," may be closed at same adjacent ramp is permitted to be closed as shown on Chart 60, except as otherwise provided in this section.

Chart No. 5
Lane Requirements and Hours of Work

Location: SB (EB) Rte 101 Freeway - North of Topanga Canyon Blvd. off-ramp to De Soto Avenue off-ramp

	a.m.												p.m.											
FROM HOUR TO HOUR	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
Mondays through Thursdays	1	1	1	1	1	3	X	X	X	X	X	X	X	X	X	X	X	X		4	4	3	2	2	
Fridays	1	1	1	1	1	3	X	X	X	X	X	X	X	X	X	X	X	X		4	4	4	3	2	
Saturdays	2	1	1	1	1	2	3	3	4		X	X	X	X	X	X	X	X		4	4	4	3	2	
Sundays	2	1	1	1	1	1	2	2	3	3	4	4	X	X	X	X	X	X	X		4	3	2	2	

Legend:

1	Provide at least one through freeway lane open in direction of travel
2	Provide at least two through freeway lanes open in direction of travel
3	Provide at least three through freeway lanes open in direction of travel
4	Provide at least four through freeway lanes open in direction of travel
	No lane closure permitted; work permitted anywhere that does not require freeway lane closure
X	No lane closure permitted; no work permitted on Route 101 roadway

REMARKS: Number of Through Traffic Lanes - 5

Chart No. 6
Lane Requirements and Hours of Work

Location: SB (EB) Rte 101 Freeway - South of De Soto Avenue off-ramp to White Oak Avenue off-ramp

	a.m.												p.m.											
FROM HOUR TO HOUR	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
Mondays through Thursdays	1	1	1	1	1	4	X	X	X	X	X	X	X	X	X	X	X	X				4	3	2	
Fridays	1	1	1	1	1	4	X	X	X	X	X	X	X	X	X	X	X	X	X				4	3	
Saturdays	2	1	1	1	1	2	3	4				X	X	X	X	X	X	X	X				4	3	
Sundays	2	1	1	1	1	1	2	2	3	4	4		X	X	X	X	X	X	X			4	3	2	

Legend:

1	Provide at least one through freeway lane open in direction of travel
2	Provide at least two through freeway lanes open in direction of travel
3	Provide at least three through freeway lanes open in direction of travel
4	Provide at least four through freeway lanes open in direction of travel
	No lane closure permitted; work permitted anywhere that does not require freeway lane closure
X	No lane closure permitted; no work permitted on Route 101 roadway

REMARKS: Number of Through Traffic Lanes - 5

Chart No. 7
Lane Requirements and Hours of Work

Location: SB (EB) Rte 101 Freeway - South of White Oak Avenue off-ramp to Hayvenhurst Avenue

	a.m.												p.m.											
FROM HOUR TO HOUR	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
Mondays through Thursdays	2	1	1	1	1	4	X	X	X	X	X	X	X	X	X	X	X	X	X				4	3	
Fridays	2	1	1	1	1	4	X	X	X	X	X	X	X	X	X	X	X	X	X	X			4	4	
Saturdays	2	2	1	1	2	2	3		X	X	X	X	X	X	X	X	X	X	X	X			4	3	
Sundays	3	2	2	1	1	2	3	4	4	X	X	X	X	X	X	X	X	X	X	X			4	3	

Legend:

1	Provide at least one through freeway lane open in direction of travel
2	Provide at least two through freeway lanes open in direction of travel
3	Provide at least three through freeway lanes open in direction of travel
4	Provide at least four through freeway lanes open in direction of travel
	No lane closure permitted; work permitted anywhere that does not require freeway lane closure
X	No lane closure permitted; no work permitted on Route 101 roadway

REMARKS: Number of Through Traffic Lanes - 5

Chart No. 8
Complete Freeway Closure Hours

Location: NB (WB) Rte 101 Freeway at Haskell Avenue

	a.m.												p.m.											
FROM HOUR TO HOUR	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
Mondays through Thursdays	C	C	C	C	C																				
Fridays	C	C	C	C	C																				
Saturdays		C	C	C	C																				
Sundays		C	C	C	C	C																			

Legend:

C	Freeway may be closed completely
	No complete freeway closure is allowed

REMARKS:
Close the freeway at Route 405 off-connector, detour traffic to northbound Rte 405 freeway and exit at Burbank Blvd.; west on Burbank Blvd.; south on Balboa Blvd. to the on-ramp to northbound Rte 101 freeway.
Place a Portable Changeable Message Sign on the right shoulder of NB Rte 101 freeway 500 meters upstream of the Sepulveda Blvd. off-ramp with the message "FREEWAY / CLOSED / AHEAD - 405 FWY / TO / BALBOA".
Close NB Rte 405 to NB Rte 101 and SB Rte 405 to NB Rte 101 connectors. Detour traffic per charts 22 and 23. Close Haskell Avenue on-ramp. Close Burbank Blvd. on-ramp to SB Rte 405.
A minimum of 16 special freeway detour signs shall be posted along the detour route as shown on the plan and as directed by the Engineer.

Chart No. 9
Complete Freeway Closure Hours

Location: NB (WB) Rte 101 Freeway at Balboa Blvd.

	a.m.												p.m.											
FROM HOUR TO HOUR	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
Mondays through Thursdays		C	C	C	C																				
Fridays		C	C	C	C																				
Saturdays			C	C	C																				
Sundays				C	C	C																			

Legend:

C	Freeway may be closed completely
	No complete freeway closure is allowed

REMARKS:
Detour traffic to exit Balboa Blvd.; straight to the on-ramp to NB Rte 101 freeway. Place a Portable Changeable Message Sign on the right shoulder of NB of Rte 101 freeway 500 meters upstream of the Hayvenhurst off-ramp with the message "FREEWAY / CLOSED - AT / BALBOA / BLVD".
Close the Balboa Blvd. on-ramp.
A minimum of 6 special freeway detour signs shall be posted along the detour route as shown on the plan and as directed by the Engineer.

Chart No. 10
Complete Freeway Closure Hours

Location: NB (WB) Rte 101 Freeway from White Oak Avenue to Reseda Boulevard

	a.m.												p.m.											
FROM HOUR TO HOUR	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
Mondays through Thursdays		C	C	C	C																				
Fridays		C	C	C	C																				
Saturdays			C	C	C																				
Sundays				C	C	C																			

Legend:

C	Freeway may be closed completely
	No complete freeway closure is allowed

REMARKS:
Detour traffic to exit at White Oak Ave.; south on White Oak Ave.; west on Ventura Blvd.; north on Reseda Blvd to the on-ramp to NB Rte 101 freeway.
Place a Portable Changeable Message Sign on the right shoulder of NB of Rte 101 freeway 500 meters upstream of the Balboa Blvd. off-ramp with the message "FREEWAY / CLOSED / AHEAD - WHITE / OAK TO / BALBOA".
Close the White Oak Ave. on-ramp.
A minimum of 14 special freeway detour signs shall be posted along the detour route as shown on the plan and as directed by the Engineer.

Chart No. 11
Complete Freeway Closure Hours

Location: NB (WB) Rte 101 Freeway from Reseda Boulevard to Tampa Avenue

	a.m.												p.m.											
FROM HOUR TO HOUR	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
Mondays through Thursdays		C	C	C	C																				
Fridays		C	C	C	C																				
Saturdays			C	C	C																				
Sundays			C	C	C	C																			

Legend:

C	Freeway may be closed completely
	No complete freeway closure is allowed

REMARKS:
Detour traffic to exit Reseda Blvd.; south on Reseda Blvd.; west on Ventura Blvd.; north on Tampa Ave to Rte 101 freeway.
Place a Portable Changeable Message Sign on the right shoulder of NB of Rte 101 freeway 500 meters upstream of the White Oak off-ramp with the message "FREEWAY / CLOSED/ AHEAD - RESEDA / TO / TAMPA".
Close the Reseda Blvd. on-ramp.
A minimum of 14 special freeway detour signs shall be posted along the detour route as shown on the plan and as directed by the Engineer.

Chart No. 12
Complete Freeway Closure Hours

Location: NB (WB) Rte 101 Freeway from Tampa Avenue to Winnetka Avenue

	a.m.												p.m.											
FROM HOUR TO HOUR	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
Mondays through Thursdays		C	C	C	C																				
Fridays		C	C	C	C																				
Saturdays			C	C	C																				
Sundays			C	C	C	C																			

Legend:

C	Freeway may be closed completely
	No complete freeway closure is allowed

REMARKS:
Detour traffic to exit Tampa Ave.; south on Tampa Ave.; west on Ventura Blvd.; north on Winnetka Ave to the on-ramp to Rte 101 freeway.
Place a Portable Changeable Message Sign on the right shoulder of NB of Rte 101 freeway 500 meters upstream of the Reseda Blvd. off-ramp with the message "FREEWAY / CLOSED / AHEAD - TAMPA / TO / WINNETKA".
Close the Tampa Ave. on-ramp.
A minimum of 13 special freeway detour signs shall be posted along the detour route as shown on the plan and as directed by the Engineer.

Chart No. 13
Complete Freeway Closure Hours

Location: NB (WB) Rte 101 Freeway from Winnetka Avenue to De Soto Avenue

	a.m.												p.m.											
FROM HOUR TO HOUR	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
Mondays through Thursdays		C	C	C	C																				
Fridays		C	C	C	C																				
Saturdays		C	C	C	C																				
Sundays			C	C	C	C																			

Legend:

C	Freeway may be closed completely
	No complete freeway closure is allowed

REMARKS:
Detour traffic to exit Winnetka Ave.; south on Winnetka Ave.; west on Ventura Blvd.; north on De Soto Ave. to the on-ramp to NB Rte 101 freeway.
Place a Portable Changeable Message Sign on the right shoulder of NB of Rte 101 freeway 500 meters upstream of the Tampa Ave. off-ramp with the message "FREEWAY / CLOSED / AHEAD - TAMPA / TO / DE SOTO".
Close the Winnetka Ave. on-ramp.
A minimum of 13 special freeway detour signs shall be posted along the detour route as shown on the plan and as directed by the Engineer.

Chart No. 14
Complete Freeway Closure Hours

Location: NB (WB) Rte 101 Freeway from De Soto Avenue to Topanga Canyon Blvd.

	a.m.												p.m.											
FROM HOUR TO HOUR	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
Mondays through Thursdays		C	C	C	C																				
Fridays		C	C	C	C																				
Saturdays			C	C	C	C																			
Sundays			C	C	C	C																			

Legend:

C	Freeway may be closed completely
	No complete freeway closure is allowed

REMARKS:
Detour traffic to exit at De Soto Ave.; south on De Soto Ave.; west on Ventura Blvd.; north on De Soto Ave. to the on-ramp to NB Rte 101 freeway.
Place a Portable Changeable Message Sign on the right shoulder of NB of Rte 101 freeway 500 meters upstream of the Winnetka off-ramp with the message "FREEWAY / CLOSED / AHEAD - DE SOTO / TO / TOPANGA".
Close the De Soto Ave. on-ramp.
A minimum of 13 special freeway detour signs shall be posted along the detour route as shown on the plan and as directed by the Engineer.

Chart No. 15
Complete Freeway Closure Hours

Location: SB (EB) Rte 101 Freeway from Ventura Blvd. to Canoga Avenue

	a.m.												p.m.											
FROM HOUR TO HOUR	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
Mondays through Thursdays	C	C	C	C	C																				
Fridays	C	C	C	C	C																				
Saturdays		C	C	C	C																				
Sundays			C	C	C	C																			

Legend:

C	Freeway may be closed completely
	No complete freeway closure is allowed

REMARKS:
Detour traffic to exit at Ventura Blvd.; east on Ventura Blvd.; north on Canoga Ave. to the on-ramp to SB Rte 101 freeway.
Place a Portable Changeable Message Sign on the right shoulder of SB Rte 101 freeway 500 meters upstream of the Fallbrook Ave. off-ramp with the message "FREEWAY / CLOSED/ AHEAD - VENTURA / TO/ CANOGA".
Close the NB and SB Topanga Canyon Blvd. on-ramps, Canoga Ave. on-ramp and Ventura Blvd. on-ramp.
A minimum of 11 special freeway detour signs shall be posted along the detour route as shown on the plan and as directed by the Engineer.

Chart No. 16
Complete Freeway Closure Hours

Location: SB (EB) Rte 101 Freeway from De Soto Avenue to Winnetka Avenue

	a.m.												p.m.											
FROM HOUR TO HOUR	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
Mondays through Thursdays	C	C	C	C																					
Fridays	C	C	C	C																					
Saturdays		C	C	C	C																				
Sundays			C	C	C	C																			

Legend:

C	Freeway may be closed completely
	No complete freeway closure is allowed

REMARKS:
Detour traffic to exit at De Soto Ave.; south on De Soto Ave.; east on Ventura Blvd.; north on Winnetka Ave to the on-ramp to SB Rte 101 freeway.
Place a Portable Changeable Message Sign on the right shoulder of SB Rte 101 freeway 500 meters upstream of the Canoga Ave. off-ramp with the message "FREEWAY / CLOSED/ AHEAD - DE SOTO / TO/ WINNETKA".
Close the De Soto Ave. on-ramp.
A minimum of 14 special freeway detour signs shall be posted along the detour route as shown on the plan and as directed by the Engineer.

Chart No. 17
Complete Freeway Closure Hours

Location: SB (EB) Rte 101 Freeway from Winnetka Avenue to Tampa Avenue

	a.m.												p.m.											
FROM HOUR TO HOUR	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
Mondays through Thursdays	C	C	C	C																					
Fridays	C	C	C	C																					
Saturdays		C	C	C	C																				
Sundays			C	C	C	C																			

Legend:

C	Freeway may be closed completely
	No complete freeway closure is allowed

REMARKS:
Detour traffic to exit at SB Winnetka Ave.; south on Winnetka Ave.; east on Ventura Blvd.; north on Van Alden Ave. to the on-ramp to SB Rte 101 freeway.
Place a Portable Changeable Message Sign on the right shoulder of SB Rte 101 freeway 500 meters upstream of the De Soto Ave. off-ramp with the message "FREEWAY / CLOSED/ AHEAD - WINNETKA / TO / TAMPA".
Close the Winnetka Ave. on-ramp.
A minimum of 14 special freeway detour signs shall be posted along the detour route as shown on the plan and as directed by the Engineer.

Chart No. 18
Complete Freeway Closure Hours

Location: SB (EB) Rte 101 Freeway from Reseda Blvd. to White Oak Avenue

	a.m.												p.m.											
FROM HOUR TO HOUR	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
Mondays through Thursdays	C	C	C	C																					
Fridays	C	C	C	C																					
Saturdays		C	C	C	C																				
Sundays			C	C	C	C																			

Legend:

C	Freeway may be closed completely
	No complete freeway closure is allowed

REMARKS:
Detour traffic to exit at Reseda Blvd.; south on Reseda Blvd.; east on Ventura Blvd.; north on White Oak Ave. to the on-ramp to SB Rte 101 freeway. Place a Portable Changeable Message Sign on the right shoulder of SB of Rte 101 freeway 500 meters upstream of the Tampa Ave. off-ramp with the message "FREEWAY / CLOSED/ AHEAD - RESEDA / TO WHITE / OAK".
Close the Burbank Blvd. on-ramp.
A minimum of 17 special freeway detour signs shall be posted along the detour route as shown on the plan and as directed by the Engineer.

Chart No. 19
Complete Freeway Closure Hours

Location: SB (EB) Rte 101 Freeway from White Oak Avenue to Balboa Blvd.

	a.m.												p.m.											
FROM HOUR TO HOUR	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
Mondays through Thursdays	C	C	C	C																					
Fridays		C	C	C																					
Saturdays			C	C	C																				
Sundays			C	C	C																				

Legend:

C	Freeway may be closed completely
	No complete freeway closure is allowed

REMARKS:
Detour traffic to exit at White Oak Ave.; south on White Oak Ave.; east on Ventura Blvd.; north on Balboa Blvd. to the on-ramp to SB Rte 101 freeway.
Place a Portable Changeable Message Sign on the right shoulder of SB of Rte 101 freeway 500 meters upstream of the Reseda Blvd. off-ramp with the message "FREEWAY / CLOSED/ AHEAD - WHITE / OAK TO / BALBOA".
Close the White Oak Avenue on-ramp.
A minimum of 16 special freeway detour signs shall be posted along the detour route as shown on the plan and as directed by the Engineer.

Chart No. 20
Complete Freeway Closure Hours

Location: SB (EB) Rte 101 Freeway from Balboa Blvd. off-ramp to Rte 405

	a.m.												p.m.											
FROM HOUR TO HOUR	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
Mondays through Thursdays	C	C	C	C																					
Fridays		C	C	C																					
Saturdays			C	C	C																				
Sundays			C	C	C	C																			

Legend:

C	Freeway may be closed completely
	No complete freeway closure is allowed

REMARKS:
Detour traffic to exit Balboa Blvd.; south on Balboa Blvd.; east on Ventura Blvd. to the on-ramp to SB Rte 405 freeway; for 405 traffic, north on Sepulveda Blvd. to the on-ramp to NB 405 freeway. For SB 101 traffic, south on Sepulveda Blvd. to the on-ramp to SB Rte 101 freeway.
Place a Portable Changeable Message Sign on the right shoulder of SB of Rte 101 freeway 500 meters upstream of the White Oak Ave. off-ramp with the message "FREEWAY / CLOSED/ AHEAD - BALBOA / TO / 405 FWY".
Close the Balboa Blvd. on-ramp and Hayvenhurst on-ramp.
A minimum of 14 special freeway detour signs shall be posted along the detour route as shown on the plan and as directed by the Engineer.

Chart No. 21
Connector Closure Hours

Location: NB Rte 101 to SB Rte 405

	a.m.												p.m.											
FROM HOUR TO HOUR	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
Mondays through Thursdays	C	C	C	C	C	C																C	C	C	
Fridays	C	C	C	C	C	C																C	C	C	
Saturdays	C	C	C	C	C	C	C	C															C	C	
Sundays	C	C	C	C	C	C	C	C	C	C											C	C	C	C	

Legend:

C	Connector may be closed
	Work permitted that does not require connector lane closure

REMARKS:
Detour traffic to northbound Route 405 freeway and exit at Burbank Blvd. off-ramp; west on Burbank Blvd. to the on-ramp to southbound Route 405 freeway.
Place a portable changeable message sign at the right shoulder of northbound Route 101 freeway in advance of the off-connector to Route 405 freeway by Call Box #164 with the message: "S 405 / EXIT / CLOSED - DETOUR / N 405 TO / BURBANK".
A minimum of 9 special freeway detour signs shall be posted along the detour route as shown on the plan and as directed by the Engineer.

Chart No. 22
Connector Closure Hours

Location: NB Rte 405 to NB Rte 101

	a.m.												p.m.											
FROM HOUR TO HOUR	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
Mondays through Thursdays	C	C	C	C	C	C																			
Fridays	C	C	C	C	C	C																			
Saturdays		C	C	C	C	C	C																		
Sundays	C	C	C	C	C	C	C	C																	C

Legend:

C	Connector may be closed
	Work permitted that does not require connector lane closure

REMARKS:
Detour traffic to exit at Burbank Blvd. off-ramp; west on Burbank Blvd.; south on Balboa Blvd to the on-ramp to southbound Route 405 freeway.
Place a portable changeable message sign on the right shoulder of northbound Route 405 freeway in advance of the Ventura Blvd. off-ramp by Call Box #376 with the message: "N 101 / EXIT / CLOSED - DETOUR / USE / BURBANK".
Close Burbank Blvd. on-ramp to southbound Rte 405.
A minimum of 16 special freeway detour signs shall be posted along the detour route as shown on the plan and as directed by the Engineer.

Chart No. 23
Connector Closure Hours

Location: SB Rte 405 to NB Rte 101

	a.m.												p.m.											
FROM HOUR TO HOUR	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
Mondays through Thursdays	C	C	C	C	C	C															C	C	C	C	
Fridays	C	C	C	C	C	C															C	C	C	C	
Saturdays	C	C	C	C	C	C	C														C	C	C	C	
Sundays	C	C	C	C	C	C	C	C	C	C										C	C	C	C	C	

Legend:

C	Connector may be closed
	Work permitted that does not require connector lane closure

REMARKS:
Detour traffic to exit at Burbank Blvd. off-ramp; west on Burbank Blvd.; south on Balboa Blvd. to the on-ramp to northbound Rte 101 freeway.
Place a portable changeable message sign on the right shoulder of southbound Route 405 freeway in advance of the Burbank Blvd. off-ramp by Call Box #413 with the message: "N 101 / EXIT / CLOSED - DETOUR / USE / BURBANK".
A minimum of 15 special freeway detour signs shall be posted along the detour route as shown on the plan and as directed by the Engineer.

Chart No. 24
Connector Closure Hours

Location: SB Rte 405 to NB and SB Rte 101

	a.m.												p.m.											
FROM HOUR TO HOUR	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
Mondays through Thursdays	C	C	C	C	C	C																			C
Fridays	C	C	C	C	C	C																			
Saturdays	C	C	C	C	C	C																			
Sundays	C	C	C	C	C	C	C	C															C	C	

Legend:

C	Connector may be closed
	Work permitted that does not require connector lane closure

REMARKS:
Detour traffic to exit at Burbank Blvd. off-ramp; for northbound traffic, west on Burbank Blvd. to Balboa Blvd.; south to the on-ramp to northbound Rte 101 freeway. For southbound traffic, east on Burbank Blvd. to Sepulveda Blvd.; south to the on-ramp to southbound Route 101 freeway.
Place a portable changeable message sign on the right shoulder of southbound Route 405 freeway south of the Victory Blvd. on-ramp by Call Box #413 with the message: "RTE 101 / EXITS / CLOSED - DETOUR / USE / BURBANK".
Close Burbank Blvd on-ramp.
A minimum of 34 special freeway detour signs shall be posted along the detour route as shown on the plan and as directed by the Engineer.

Chart No. 25
Ramp Closure Hours

Location: NB (WB) Rte 101 - Haskell Avenue off-ramp

	a.m.												p.m.											
FROM HOUR TO HOUR	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
Mondays through Thursdays	C	C	C	C	C	C															C	C	C	C	
Fridays	C	C	C	C	C	C															C	C	C	C	
Saturdays	C	C	C	C	C	C	C	C	C												C	C	C	C	
Sundays	C	C	C	C	C	C	C	C	C	C											C	C	C	C	

Legend:

C	Ramp may be closed
	Work permitted anywhere that does not require ramp lane closure

REMARKS:

Chart No. 26
Ramp Closure Hours

Location: NB (WB) Rte 101 Freeway - Haskell Avenue on-ramp

	a.m.												p.m.												
FROM HOUR TO HOUR	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
Mondays through Thursdays	C	C	C	C	C	C				C	C	C	C	C	C						C	C	C	C	
Fridays	C	C	C	C	C	C				C	C	C	C	C	C						C	C	C	C	
Saturdays	C	C	C	C	C	C	C	C	C	C	C	C									C	C	C	C	
Sundays	C	C	C	C	C	C	C	C	C	C	C	C									C	C	C	C	

Legend:

C	Ramp may be closed
	Work permitted anywhere that does not require ramp lane closure

REMARKS:
When the ramp is closed, public traffic shall be detoured to the next available on-ramp upstream of the closed ramp. A minimum of 12 special freeway detour signs shall be posted along the detour route as shown on the plan and as directed by the Engineer.

Chart No. 27
Ramp Closure Hours

Location: SB (EB) Rte 101 Freeway - Haskell Avenue off-ramp

	a.m.												p.m.												
FROM HOUR TO HOUR	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
Mondays through Thursdays	C	C	C	C	C	C				C	C	C	C	C	C					C	C	C	C	C	
Fridays	C	C	C	C	C	C				C	C	C	C	C	C					C	C	C	C	C	
Saturdays	C	C	C	C	C	C	C	C	C	C	C	C								C	C	C	C	C	
Sundays	C	C	C	C	C	C	C	C	C	C	C	C								C	C	C	C	C	

Legend:

C	Ramp may be closed
	Work permitted anywhere that does not require ramp lane closure

REMARKS:

Chart No. 28
Ramp Closure Hours

Location: NB (WB) Rte 101 Freeway - Hayvenhurst Avenue off-ramp

	a.m.												p.m.											
FROM HOUR TO HOUR	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
Mondays through Thursdays	C	C	C	C	C	C														C	C	C	C	C	
Fridays	C	C	C	C	C	C														C	C	C	C	C	
Saturdays	C	C	C	C	C	C	C	C	C												C	C	C	C	
Sundays	C	C	C	C	C	C	C	C	C	C											C	C	C	C	

Legend:

C	Ramp may be closed
	Work permitted anywhere that does not require ramp lane closure

REMARKS:

Chart No. 29
Ramp Closure Hours

Location: SB (EB) Rte 101 Freeway - Hayvenhurst Avenue on-ramp

	a.m.												p.m.											
FROM HOUR TO HOUR	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
Mondays through Thursdays	C	C	C	C	C	C																C	C	C	
Fridays	C	C	C	C	C	C																C	C	C	
Saturdays	C	C	C	C	C	C	C	C	C														C	C	
Sundays	C	C	C	C	C	C	C	C	C	C												C	C	C	

Legend:

C	Ramp may be closed
	Work permitted anywhere that does not require ramp lane closure

REMARKS:
When the ramp is closed, public traffic shall be detoured to the next available on-ramp upstream of the closed ramp. A minimum of 12 special freeway detour signs shall be posted along the detour route as shown on the plan and as directed by the Engineer.

Chart No. 30
Ramp Closure Hours

Location: NB (WB) Rte 101 Freeway - Balboa Blvd. off-ramp

	a.m.												p.m.											
FROM HOUR TO HOUR	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
Mondays through Thursdays	C	C	C	C	C	C																C	C	C	
Fridays	C	C	C	C	C	C																C	C	C	
Saturdays	C	C	C	C	C	C	C	C	C													C	C	C	
Sundays	C	C	C	C	C	C	C	C	C	C												C	C	C	

Legend:

X	Ramp may be closed
	Work permitted anywhere that does not require ramp lane closure

REMARKS:

Chart No. 31
Ramp Closure Hours

Location: NB (WB) Rte 101 Freeway - Balboa Blvd. on-ramp

	a.m.												p.m.											
FROM HOUR TO HOUR	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
Mondays through Thursdays	C	C	C	C	C	C																	C	C	
Fridays	C	C	C	C	C	C																	C	C	
Saturdays	C	C	C	C	C	C	C	C	C																
Sundays	C	C	C	C	C	C	C	C	C	C															

Legend:

X	Ramp may be closed
	Work permitted anywhere that does not require ramp lane closure

REMARKS:
When the ramp is closed, public traffic shall be detoured to the next available on-ramp upstream of the closed ramp. A minimum of 11 special freeway detour signs shall be posted along the detour route as shown on the plan and as directed by the Engineer.

Chart No. 32
Ramp Closure Hours

Location: SB (EB) Rte 101 Freeway - Balboa Blvd. off-ramp

	a.m.												p.m.											
FROM HOUR TO HOUR	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
Mondays through Thursdays	C	C	C	C	C	C															C	C	C	C	
Fridays	C	C	C	C	C	C															C	C	C	C	
Saturdays	C	C	C	C	C	C	C	C	C													C	C	C	
Sundays	C	C	C	C	C	C	C	C	C	C											C	C	C	C	

Legend:

X	Ramp may be closed
	Work permitted anywhere that does not require ramp lane closure

REMARKS:

Chart No. 33
Ramp Closure Hours

Location: SB (EB) Rte 101 Freeway - Balboa Blvd. on-ramp

	a.m.												p.m.											
FROM HOUR TO HOUR	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
Mondays through Thursdays	C	C	C	C	C	C															C	C	C	C	
Fridays	C	C	C	C	C	C																C	C	C	
Saturdays	C	C	C	C	C	C	C	C	C													C	C	C	
Sundays	C	C	C	C	C	C	C	C	C	C											C	C	C	C	

Legend:

X	Ramp may be closed
	Work permitted anywhere that does not require ramp lane closure

REMARKS:
When the ramp is closed, public traffic shall be detoured to the next available on-ramp upstream of the closed ramp. A minimum of 8 special freeway detour signs shall be posted along the detour route as shown on the plan and as directed by the Engineer.

Chart No. 34
Ramp Closure Hours

Location: NB (WB) Rte 101 Freeway - White Oak Avenue off-ramp

	a.m.												p.m.											
FROM HOUR TO HOUR	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
Mondays through Thursdays	C	C	C	C	C	C																C	C	C	
Fridays	C	C	C	C	C	C																C	C	C	
Saturdays	C	C	C	C	C	C	C	C	C														C	C	
Sundays	C	C	C	C	C	C	C	C	C	C												C	C	C	

Legend:

X	Ramp may be closed
	Work permitted anywhere that does not require ramp lane closure

REMARKS:

Chart No. 35
Ramp Closure Hours

Location: NB (WB) Rte 101 Freeway - White Oak Avenue on-ramp

	a.m.												p.m.											
FROM HOUR TO HOUR	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
Mondays through Thursdays	C	C	C	C	C	C																			C
Fridays	C	C	C	C	C	C																			C
Saturdays	C	C	C	C	C	C	C	C																	C
Sundays	C	C	C	C	C	C	C	C	C														C	C	

Legend:

X	Ramp may be closed
	Work permitted anywhere that does not require ramp lane closure

REMARKS:
When the ramp is closed, public traffic shall be detoured to the next available on-ramp upstream of the closed ramp. A minimum of 12 special freeway detour signs shall be posted along the detour route as shown on the plan and as directed by the Engineer.

Chart No. 36
Ramp Closure Hours

Location: SB (EB) Rte 101 Freeway - White Oak Avenue off-ramp

	a.m.												p.m.											
FROM HOUR TO HOUR	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
Mondays through Thursdays	C	C	C	C	C	C																			C
Fridays	C	C	C	C	C	C																			
Saturdays	C	C	C	C	C	C	C																		
Sundays	C	C	C	C	C	C	C	C																	C

Legend:

X	Ramp may be closed
	Work permitted anywhere that does not require ramp lane closure

REMARKS:

Chart No. 37
Ramp Closure Hours

Location: SB (EB) Rte 101 Freeway - White Oak Avenue on-ramp

	a.m.												p.m.											
FROM HOUR TO HOUR	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
Mondays through Thursdays	C	C	C	C	C	C																			C
Fridays	C	C	C	C	C	C																			C
Saturdays	C	C	C	C	C	C	C	C																	C
Sundays	C	C	C	C	C	C	C	C															C	C	C

Legend:

X	Ramp may be closed
	Work permitted anywhere that does not require ramp lane closure

REMARKS:
When the ramp is closed, public traffic shall be detoured to the next available on-ramp upstream of the closed ramp. A minimum of 13 special freeway detour signs shall be posted along the detour route as shown on the plan and as directed by the Engineer.

Chart No. 38
Ramp Closure Hours

Location: NB (WB) Rte 101 Freeway - Reseda Blvd. off-ramp

	a.m.												p.m.											
FROM HOUR TO HOUR	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
Mondays through Thursdays	C	C	C	C	C	C																	C	C	
Fridays	C	C	C	C	C	C																	C	C	
Saturdays	C	C	C	C	C	C	C	C																C	
Sundays	C	C	C	C	C	C	C	C															C	C	

Legend:

X	Ramp may be closed
	Work permitted anywhere that does not require ramp lane closure

REMARKS:

Chart No. 39
Ramp Closure Hours

Location: NB (WB) Rte 101 Freeway - Reseda Blvd. on-ramp

	a.m.												p.m.											
FROM HOUR TO HOUR	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
Mondays through Thursdays	C	C	C	C	C	C																C	C	C	
Fridays	C	C	C	C	C	C																	C	C	
Saturdays	C	C	C	C	C	C	C	C	C														C	C	
Sundays	C	C	C	C	C	C	C	C	C	C	C											C	C	C	

Legend:

X	Ramp may be closed
	Work permitted anywhere that does not require ramp lane closure

REMARKS:
When the ramp is closed, public traffic shall be detoured to the next available on-ramp upstream of the closed ramp. A minimum of 13 special freeway detour signs shall be posted along the detour route as shown on the plan and as directed by the Engineer.

Chart No. 40
Ramp Closure Hours

Location: SB (EB) Rte 101 Freeway - Reseda Blvd. off-ramp

	a.m.												p.m.											
FROM HOUR TO HOUR	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
Mondays through Thursdays	C	C	C	C	C	C															C	C	C	C	
Fridays	C	C	C	C	C	C															C	C	C	C	
Saturdays	C	C	C	C	C	C	C	C	C													C	C	C	
Sundays	C	C	C	C	C	C	C	C	C												C	C	C	C	

Legend:

X	Ramp may be closed
	Work permitted anywhere that does not require ramp lane closure

REMARKS:

Chart No. 41
Ramp Closure Hours

Location: SB (EB) Rte 101 Freeway - Reseda Blvd./Burbank Blvd. on-ramp

	a.m.												p.m.											
FROM HOUR TO HOUR	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
Mondays through Thursdays	C	C	C	C	C	C																		C	
Fridays	C	C	C	C	C	C																		C	
Saturdays	C	C	C	C	C	C	C	C	C													C	C	C	
Sundays	C	C	C	C	C	C	C	C	C													C	C	C	

Legend:

X	Ramp may be closed
	Work permitted anywhere that does not require ramp lane closure

REMARKS:
When the ramp is closed, public traffic shall be detoured to the next available on-ramp upstream of the closed ramp. A minimum of 6 special freeway detour signs shall be posted along the detour route as shown on the plan and as directed by the Engineer.

Chart No. 42
Ramp Closure Hours

Location: NB (WB) Rte 101 Freeway - Tampa Avenue off-ramp

	a.m.												p.m.											
FROM HOUR TO HOUR	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
Mondays through Thursdays	C	C	C	C	C	C																	C	C	
Fridays	C	C	C	C	C	C																	C	C	
Saturdays	C	C	C	C	C	C	C	C	C														C	C	
Sundays	C	C	C	C	C	C	C	C	C	C													C	C	

Legend:

X	Ramp may be closed
	Work permitted anywhere that does not require ramp lane closure

REMARKS:

Chart No. 43
Ramp Closure Hours

Location: NB (WB) Rte 101 Freeway - Tampa Avenue on-ramp

	a.m.												p.m.											
FROM HOUR TO HOUR	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
Mondays through Thursdays	C	C	C	C	C	C															C	C	C	C	
Fridays	C	C	C	C	C	C															C	C	C	C	
Saturdays	C	C	C	C	C	C	C	C	C												C	C	C	C	
Sundays	C	C	C	C	C	C	C	C	C	C											C	C	C	C	

Legend:

X	Ramp may be closed
	Work permitted anywhere that does not require ramp lane closure

REMARKS:
When the ramp is closed, public traffic shall be detoured to the next available on-ramp upstream of the closed ramp. A minimum of 9 special freeway detour signs shall be posted along the detour route as shown on the plan and as directed by the Engineer.

Chart No. 44
Ramp Closure Hours

Location: SB (EB) Rte 101 Freeway - Tampa Avenue off-ramp

	a.m.												p.m.											
FROM HOUR TO HOUR	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
Mondays through Thursdays	C	C	C	C	C	C																C	C	C
Fridays	C	C	C	C	C	C																	C	C
Saturdays	C	C	C	C	C	C	C	C																C
Sundays	C	C	C	C	C	C	C	C	C														C	C

Legend:

X	Ramp may be closed
	Work permitted anywhere that does not require ramp lane closure

REMARKS:

Chart No. 45
Ramp Closure Hours

Location: SB (EB) Rte 101 Freeway - Ventura Blvd./ Van Alden Avenue on-ramp

	a.m.												p.m.											
FROM HOUR TO HOUR	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
Mondays through Thursdays	C	C	C	C	C	C																	C	C
Fridays	C	C	C	C	C	C																	C	C
Saturdays	C	C	C	C	C	C	C	C	C															C
Sundays	C	C	C	C	C	C	C	C	C	C													C	C

Legend:

X	Ramp may be closed
	Work permitted anywhere that does not require ramp lane closure

REMARKS:
When the ramp is closed, public traffic shall be detoured to the next available on-ramp upstream of the closed ramp. A minimum of 8 special freeway detour signs shall be posted along the detour route as shown on the plan and as directed by the Engineer.

Chart No. 46
Ramp Closure Hours

Location: NB (WB) Rte 101 Freeway - Winnetka Avenue off-ramp

	a.m.												p.m.											
FROM HOUR TO HOUR	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
Mondays through Thursdays	C	C	C	C	C	C																			C
Fridays	C	C	C	C	C	C																			C
Saturdays	C	C	C	C	C	C	C	C	C																C
Sundays	C	C	C	C	C	C	C	C	C	C													C	C	C

Legend:

X	Ramp may be closed
	Work permitted anywhere that does not require ramp lane closure

REMARKS:

Chart No. 47
Ramp Closure Hours

Location: NB (WB) Rte 101 Freeway - Winnetka Avenue on-ramp

	a.m.												p.m.											
FROM HOUR TO HOUR	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
Mondays through Thursdays	C	C	C	C	C	C				C	C	C	C	C							C	C	C	C	C
Fridays	C	C	C	C	C	C				C	C	C	C	C							C	C	C	C	C
Saturdays	C	C	C	C	C	C	C	C	C	C	C	C								C	C	C	C	C	C
Sundays	C	C	C	C	C	C	C	C	C	C	C	C								C	C	C	C	C	C

Legend:

X	Ramp may be closed
	Work permitted anywhere that does not require ramp lane closure

REMARKS:
When the ramp is closed, public traffic shall be detoured to the next available on-ramp upstream of the closed ramp. A minimum of 9 special freeway detour signs shall be posted along the detour route as shown on the plan and as directed by the Engineer.

Chart No. 48
Ramp Closure Hours

Location: SB (EB) Rte 101 Freeway - Winnetka Avenue off-ramp

	a.m.												p.m.											
FROM HOUR TO HOUR	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
Mondays through Thursdays	C	C	C	C	C	C				C	C	C	C	C	C						C	C	C	C	
Fridays	C	C	C	C	C	C				C	C	C	C	C	C						C	C	C	C	
Saturdays	C	C	C	C	C	C	C	C	C	C	C	C										C	C	C	
Sundays	C	C	C	C	C	C	C	C	C	C	C	C									C	C	C	C	

Legend:

X	Ramp may be closed
	Work permitted anywhere that does not require ramp lane closure

REMARKS:

Chart No. 49
Ramp Closure Hours

Location: SB (EB) Rte 101 Freeway - Winnetka Avenue on-ramp

	a.m.												p.m.											
FROM HOUR TO HOUR	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
Mondays through Thursdays	C	C	C	C	C	C																	C	C
Fridays	C	C	C	C	C	C																		C
Saturdays	C	C	C	C	C	C	C																C	C
Sundays	C	C	C	C	C	C	C	C															C	C

Legend:

X	Ramp may be closed
	Work permitted anywhere that does not require ramp lane closure

REMARKS:
When the ramp is closed, public traffic shall be detoured to the next available on-ramp upstream of the closed ramp. A minimum of 9 special freeway detour signs shall be posted along the detour route as shown on the plan and as directed by the Engineer.

Chart No. 50
Ramp Closure Hours

Location: NB (WB) Rte 101 Freeway - De Soto Avenue off-ramp

	a.m.												p.m.											
FROM HOUR TO HOUR	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
Mondays through Thursdays	C	C	C	C	C	C																C	C	C	
Fridays	C	C	C	C	C	C																C	C	C	
Saturdays	C	C	C	C	C	C	C	C															C	C	
Sundays	C	C	C	C	C	C	C	C	C													C	C	C	

Legend:

X	Ramp may be closed
	Work permitted anywhere that does not require ramp lane closure

REMARKS:

Chart No. 51
Ramp Closure Hours

Location: NB (WB) Rte 101 Freeway - De Soto Avenue on-ramp

	a.m.												p.m.											
FROM HOUR TO HOUR	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
Mondays through Thursdays	C	C	C	C	C	C				C	C	C	C	C	C						C	C	C	C	
Fridays	C	C	C	C	C	C				C	C	C	C	C	C						C	C	C	C	
Saturdays	C	C	C	C	C	C	C	C	C	C	C	C										C	C	C	
Sundays	C	C	C	C	C	C	C	C	C	C	C	C									C	C	C	C	

Legend:

X	Ramp may be closed
	Work permitted anywhere that does not require ramp lane closure

REMARKS:
When the ramp is closed, public traffic shall be detoured to the next available on-ramp upstream of the closed ramp. A minimum of 9 special freeway detour signs shall be posted along the detour route as shown on the plan and as directed by the Engineer.

Chart No. 52
Ramp Closure Hours

Location: SB (EB) Rte 101 Freeway - De Soto Avenue off-ramp

	a.m.												p.m.											
FROM HOUR TO HOUR	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
Mondays through Thursdays	C	C	C	C	C	C															C	C	C	C	
Fridays	C	C	C	C	C	C															C	C	C	C	
Saturdays	C	C	C	C	C	C	C	C														C	C	C	
Sundays	C	C	C	C	C	C	C	C	C												C	C	C	C	

Legend:

X	Ramp may be closed
	Work permitted anywhere that does not require ramp lane closure

REMARKS:

Chart No. 53
Ramp Closure Hours

Location: SB (EB) Rte 101 Freeway - De Soto Avenue on-ramp

	a.m.												p.m.											
FROM HOUR TO HOUR	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
Mondays through Thursdays	C	C	C	C	C	C																	C	C	
Fridays	C	C	C	C	C	C																	C	C	
Saturdays	C	C	C	C	C	C	C	C																C	
Sundays	C	C	C	C	C	C	C	C	C														C	C	

Legend:

X	Ramp may be closed
	Work permitted anywhere that does not require ramp lane closure

REMARKS:
When the ramp is closed, public traffic shall be detoured to the next available on-ramp upstream of the closed ramp. A minimum of 11 special freeway detour signs shall be posted along the detour route as shown on the plan and as directed by the Engineer.

Chart No. 54
Ramp Closure Hours

Location: NB (WB) Rte 101 Freeway - Canoga Avenue off-ramp

	a.m.												p.m.											
FROM HOUR TO HOUR	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
Mondays through Thursdays	C	C	C	C	C	C																	C	C
Fridays	C	C	C	C	C	C																	C	C
Saturdays	C	C	C	C	C	C	C	C	C															C
Sundays	C	C	C	C	C	C	C	C	C	C													C	C

Legend:

X	Ramp may be closed
	Work permitted anywhere that does not require ramp lane closure

REMARKS:

Chart No. 55
Ramp Lane Requirements and Hours of Work

Location: SB (EB) Rte 101 Freeway - Canoga Avenue on-ramp

	a.m.												p.m.											
FROM HOUR TO HOUR	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
Mondays through Thursdays	C	C	C	C	C	C																	C	C
Fridays	C	C	C	C	C	C																	C	C
Saturdays	C	C	C	C	C	C	C	C	C														C	C
Sundays	C	C	C	C	C	C	C	C	C	C													C	C

Legend:

X	Ramp may be closed
	Work permitted anywhere that does not require ramp lane closure

REMARKS:
When the ramp is closed, public traffic shall be detoured to the next available on-ramp upstream of the closed ramp. A minimum of 10 special freeway detour signs shall be posted along the detour route as shown on the plan and as directed by the Engineer.

Chart No. 56
Ramp Closure Hours

Location: NB (WB) Rte 101 Freeway - NB and SB Topanga Canyon Blvd. off-ramp

	a.m.												p.m.											
FROM HOUR TO HOUR	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
Mondays through Thursdays	C	C	C	C	C	C																C	C	C
Fridays	C	C	C	C	C	C																C	C	C
Saturdays	C	C	C	C	C	C	C	C	C	C	C	C											C	C
Sundays	C	C	C	C	C	C	C	C	C	C	C	C										C	C	C

Legend:

X	Ramp may be closed
	Work permitted anywhere that does not require ramp lane closure

REMARKS:

Chart No. 57
Ramp Closure Hours

Location: NB (WB) Rte 101 Freeway - Topanga Canyon Blvd. on-ramp

	a.m.												p.m.											
FROM HOUR TO HOUR	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
Mondays through Thursdays	C	C	C	C	C	C																	C	C
Fridays	C	C	C	C	C	C																	C	C
Saturdays	C	C	C	C	C	C	C	C	C														C	C
Sundays	C	C	C	C	C	C	C	C	C	C													C	C

Legend:

X	Ramp may be closed
	Work permitted anywhere that does not require ramp lane closure

REMARKS:
When the ramp is closed, public traffic shall be detoured to the next available on-ramp upstream of the closed ramp. A minimum of 8 special freeway detour signs shall be posted along the detour route as shown on the plan and as directed by the Engineer.

Chart No. 58
Ramp Closure Hours

Location: SB (EB) Rte 101 Freeway - NB and SB Topanga Canyon Blvd. on-ramp

	a.m.												p.m.											
FROM HOUR TO HOUR	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
Mondays through Thursdays	C	C	C	C	C	C															C	C	C	C	
Fridays	C	C	C	C	C	C															C	C	C	C	
Saturdays	C	C	C	C	C	C	C	C	C	C	C	C										C	C	C	
Sundays	C	C	C	C	C	C	C	C	C	C	C	C									C	C	C	C	

Legend:

X	Ramp may be closed
	Work permitted anywhere that does not require ramp lane closure

REMARKS:
When the ramp is closed, public traffic shall be detoured to the next available on-ramp upstream of the closed ramp. A minimum of 16 special freeway detour signs shall be posted along the detour route as shown on the plan and as directed by the Engineer.

Chart No. 59
Ramp Closure Hours

Location: SB (EB) Rte 101 Freeway - Ventura Blvd. on-ramp

	a.m.												p.m.											
FROM HOUR TO HOUR	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
Mondays through Thursdays	C	C	C	C	C	C																C	C	C	
Fridays	C	C	C	C	C	C																	C	C	
Saturdays	C	C	C	C	C	C	C	C															C	C	
Sundays	C	C	C	C	C	C	C	C	C													C	C	C	

Legend:

X	Ramp may be closed
	Work permitted anywhere that does not require ramp lane closure

REMARKS:
When the ramp is closed, public traffic shall be detoured to the next available on-ramp upstream of the closed ramp. A minimum of 16 special freeway detour signs shall be posted along the detour route as shown on the plan and as directed by the Engineer.

10-1.12 CLOSURE REQUIREMENTS AND CONDITIONS

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

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

CLOSURE SCHEDULE

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

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. Approval of amendments to the Closure Schedule will be at the discretion of the Engineer.

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.

For each 10 minute interval, or fraction thereof past the time specified to reopen the closure, the Department will deduct $7,200 per interval from moneys due or that may become due the Contractor under the contract.

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.

10-1.13 TRAFFIC CONTROL SYSTEM FOR LANE CLOSURE

A traffic control system shall consist of closing traffic lanes and ramps 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 of responsibility for providing additional devices or taking measures as may be necessary to comply with the provisions in Section 7-1.09, "Public Safety," of the Standard Specifications.

When performing traffic control on freeway where median shoulder is less than 2.4 meters, the Contractor shall conform to the requirements under the moving type lane closure for truck mounted attenuator (TMA).

During traffic stripe operations and pavement marker placement operations using bituminous adhesive, traffic shall be controlled, at the option of the Contractor, with either stationary or moving lane closures. During other operations, traffic shall be controlled with stationary lane closures. Attention is directed to the provisions in Section 84-1.04, "Protection From Damage," and Section 85-1.06, "Placement," of the Standard Specifications.

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

STATIONARY LANE CLOSURE

When lane and ramp 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.

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 the components. Vehicles equipped with Type II flashing arrow sign not involved in placing, maintaining or removing the components when operated within a stationary type 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 the vehicles which are doing the placing, maintaining and removing of components of a traffic control system and shall be in place before a lane closure requiring the sign's use is completed.

The 150-m section of a lane closure, shown along lane lines between the 300-m lane closure tapers on the plans entitled "Traffic Control System for Lane Closures on Freeways and Expressways" and "Traffic Control System for Lane and Complete Closures on Freeways and Expressways" shall not be used.

MOVING LANE CLOSURE

Flashing arrow signs used in moving lane closures shall be truck-mounted. Changeable message signs used in moving lane closure operations shall conform to the provisions in Section 12-3.12, "Portable Changeable Message Signs," of the Standard Specifications, except the signs shall be truck-mounted and the full operation height of the bottom of the sign may be less than 2.1 m above the ground, but should be as high as practicable.

Truck-mounted attenuators (TMA) for use in moving lane closures shall be any of the following approved models, or equal:

A. Hexfoam TMA Series 3000, Alpha 1000 TMA Series 1000 and Alpha 2001 TMA Series 2001, manufactured by Energy Absorption Systems, Inc., One East Wacker Drive, Chicago, IL 60601-2076, Telephone (312) 467-6750.

   1. Distributor (Northern): Traffic Control Service, Inc., 8585 Thys Court, Sacramento, CA 95828, Telephone 1-800-884-8274, FAX (916) 387-9734.
   2. Distributor (Southern): Traffic Control Service, Inc., 1881 Betmor Lane, Anaheim, CA 92805, Telephone 1-800-222-8274.

B. Cal T-001 Model 2 or Model 3, manufacturer and distributor: Hexcel Corporation, 11711 Dublin Boulevard, P.O. Box 2312, Dublin, CA 94568, Telephone (510) 828-4200.
C. Renco Rengard Model Nos. CAM 8-815 and RAM 8-815, manufacturer and distributor: Renco Inc., 1582 Pflugerville Loop Road, P.O. Box 730, Pflugerville, TX 78660-0730, Telephone 1-800-654-8182.

Each TMA shall be individually identified with the manufacturer's name, address, TMA model number, and a specific serial number. The names and numbers shall each be a minimum 13 mm high and located on the left (street) side at the lower front corner. The TMA shall have a message next to the name and model number in 13 mm high letters which states, "The bottom of this TMA shall be _____ mm ± _____ mm above the ground at all points for proper impact performance." Any TMA which is damaged or appears to be in poor condition shall not be used unless recertified by the manufacturer. The Engineer shall be the sole judge as to whether used TMAs supplied under this contract need recertification. Each unit shall be certified by the manufacturer to meet the requirements for TMA in conformance with the standards established by the Transportation Laboratory.

Approvals for new TMA designs proposed as equal to the above approved models shall be in conformance with the procedures (including crash testing) established by the Transportation Laboratory. For information regarding submittal of new designs for evaluation contact: Transportation Laboratory, 5900 Folsom Boulevard, Sacramento, California 95819.

New TMAs proposed as equal to approved TMAs or approved TMAs determined by the Engineer to need recertification shall not be used until approved or recertified by the Transportation Laboratory.

PAYMENT

The contract lump sum price paid for traffic control system shall include full compensation for furnishing all labor, 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.

10-1.14 PORTABLE CHANGEABLE MESSAGE SIGN

Portable changeable message signs shall be furnished, placed, operated, and maintained at those locations provided for in these special provisions and as shown on the plans or where designated by the Engineer in conformance with the provisions in Section 12, "Construction Area Traffic Control Devices," of the Standard Specifications and these special provisions.

Attention is directed to Charts 8 through 24 in "Maintaining Traffic" of these special provisions regarding the use and locations of the portable changeable message signs.

The message displayed on the portable changeable message sign, as specified in these special provisions, as shown on the plans, or as directed by the Engineer, shall not be displayed until 5 minutes prior to the actual closure installation as permitted by these special provisions. Portable changeable message sign shall have either a 24 hour timer control or remote control capability.

The Contractor shall provide a representative on the job site with a cellular phone who is capable of modifying the message as directed by the Engineer for each work shift which requires a portable changeable message sign.

Full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in furnishing, placing, operating, maintaining, repairing, replacing, transporting from location to location, modifying the message, and removing portable changeable message signs as specified in these special provisions as shown on the plan shall be considered as included in the contract lump sum price paid for traffic control system and no separate payment will be made therefor.

10-1.15 TEMPORARY RAILING

Temporary railing (Type K) shall be placed as shown on the plans, as specified in the Standard Specifications or these special provisions or where ordered by the Engineer and shall conform to the provisions in Section 12, "Construction Area Traffic Control Devices," of the Standard Specifications and these special provisions.

Reflectors on temporary railing (Type K) shall conform to the provisions in "Prequalified and Tested Signing and Delineation Materials" of these special provisions.

Temporary railing (Type K), conforming to the details shown on 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 and vertical holes are not drilled in the top of the temporary railing to secure temporary traffic screen to the temporary railing.

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

Temporary railing (Type K) placed in conformance with the provisions in "Public Safety" of these special provisions will be neither measured nor paid for.

10-1.16 CHANNELIZER

Channelizers shall conform to the provisions in Section 12, "Construction Area Traffic Control Devices," of the Standard Specifications and these special provisions.

Channelizers shall conform to the provisions in "Prequalified and Tested Signing and Delineation Materials" of these special provisions.

When no longer required for the work as determined by the Engineer, channelizers and underlying adhesive used to cement the channelizer bases to the pavement shall be removed. Removed channelizers and adhesive shall become the property of the Contractor and shall be removed from the site of work.

10-1.17 TEMPORARY TRAFFIC SCREEN

Temporary traffic screen shall be furnished, installed, and maintained on top of temporary railing (Type K) as specified elsewhere in these special provisions, and shall conform to the provisions specified for traffic handling equipment and devices in Section 12, "Construction Area Traffic Control Devices," of the Standard Specifications and these special provisions.

Attention is directed to "Maintaining Traffic" of these special provisions regarding temporary traffic screen provided at the Contractor's option.

Temporary traffic screen panels shall be new or used CDX Grade, or better, plywood or weather resistant strandboard mounted and anchored on temporary railing (Type K). Wale boards shall be new or used Douglas fir, rough sawn, Construction Grade, or better. Pipe screen supports shall be new or used galvanized steel pipe, Schedule 40. Nuts, bolts, and washers shall be cadmium plated. Screws shall be black or cadmium plated flat head, cross slotted screws with full thread length.

When no longer required, as determined by the Engineer, temporary traffic screen shall be removed from the site of the work.

10-1.18 TEMPORARY CRASH CUSHION MODULE

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

Attention is directed to "Public Safety", "Order of Work", and "Temporary Railing" 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.

10-1.19 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.

Plans of the existing bridges may be requested by fax from the Office of Structure Maintenance and Investigations, 1801 30th Street, Sacramento, CA, Fax (916) 227-8357, and are available at the Office of Structure Maintenance and Investigations, Norwalk, CA, Telephone (562) 868-3828.

Plans of the existing bridges available to the Contractor are reproductions of the original contract plans with significant changes noted and working drawings and do not necessarily show normal construction tolerances and variances. Where dimensions of new construction required by this contract are dependent on the dimensions of the existing bridges, the Contractor shall verify the controlling field dimensions and shall be responsible for adjusting dimensions of the work to fit existing conditions.

Attention is directed to Section 7-1.06, "Safety and Health Provisions," of the Standard Specifications. Work practices and worker health and safety shall conform to the California Division of Occupational Safety and Health Construction Safety Orders Title 8, of the California Code of Regulations including Section 5158, "Other Confined Space Operations."

REMOVE METAL BEAM GUARD RAILING

Existing metal beam guard railing, where shown on the plans to be removed, shall be removed and disposed of.

Existing concrete anchors or steel foundation tubes shall be completely removed and disposed of. Full compensation for removing concrete anchors shall be considered as included in the contract price paid per meter for remove metal beam guard railing and no separate payment will be made therefor.

Full compensation for removing cable anchor assemblies, terminal anchor assemblies or steel foundation tubes shall be considered as included in the contract price paid per meter for remove metal beam guard railing and no separate payment will be made therefor.

REMOVE ASPHALT CONCRETE DIKE

Existing asphalt concrete dike, where shown on the plans to be removed, shall be removed.

Prior to removing the dike, the outside edge of the asphalt concrete to remain in place shall be cut on a neat line to a minimum depth of 50 mm.

The dike shall be removed in such a manner that the surfacing which is to remain in place is not damaged.

The dike shall be disposed of outside the highway right of way in conformance with the provisions in Section 7-1.13 of the Standard Specifications.

RELOCATE ROADSIDE SIGN

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

Each roadside sign shall be installed at the new location on the same day that the sign is removed from its original location.

Two holes shall be drilled in each existing post as required to provide the breakaway feature shown on the plans.

ADJUST PULL BOX TO GRADE

Pull boxes shown on the plans shall be adjusted to grade in conformance with the provisions in Section 15-2.05, "Reconstruction," of the Standard Specifications.

EXISTING LOOP DETECTORS

The existing inductive loop detectors shown on the plans shall remain in place.

If part of the loop conductor, including the portion leading to the adjacent pull box, is damaged by the Contractor's operations, the entire detector loop shall be replaced at the Contractor's expense. Adjacent loops damaged during the replacement shall also be replaced and shall conform to the requirements in Section 86-5.01, "Vehicle Detectors" of the Standard Specifications.

ACCESS OPENING, SOFFIT

Access openings in bridge soffits shall consist of removing portions of existing box girder bridge soffits at the locations and to the dimensions shown on the plans.

A 19-mm deep saw cut shall be made around the perimeter of the soffit areas to be removed.

Bar reinforcing steel shall be removed as shown on the plans. The ends of the remaining bars shall be coated with 2 applications of a zinc-rich primer in the same manner specified for exposed ends of prestressing steel in Section 50-1.05, "Prestressing Steel," of the Standard Specifications.

Within a cell where work is to be performed, existing formwork and miscellaneous concrete that will interfere with the work shall be removedAll material removed shall become the property of the Contractor and shall be disposed of outside the highway right of way as provided in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications.

When no longer required, soffit access openings shall be closed as shown on the plans. All materials, including galvanized sheet metal covers, steel hardware, hinges, and corrosion resistant concrete expansion anchorage devices, shall be commercial quality.

Thread locking system shall conform to the provisions in Section 75, "Miscellaneous Metal," of the Standard Specifications.

Unless specified as an option, using deck access openings in lieu of soffit access openings will not be allowed.

Access openings through soffits will be measured and paid for by the unit as access opening, soffit. Openings to be paid for will be determined from actual count of the completed units in place.

The contract unit price paid for access opening, soffit shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in constructing the soffit access opening, complete in place, including closing the soffit access opening and removing forms and miscellaneous concrete, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

10-1.20 SIGN MOUNTED CAMERA

Sign mounted camera shall be installed on existing sign structures as shown on the plans.

Electrical work is provided for elsewhere in these special provisions.

Location VE203 and Location VE213 require the CCTV cameras to be mounted on existing overhead sign structures. The height of cameras to be mounted from the top of the overhead signs is shown on the plans.

The camera poles shall be bolted to the upper and lower chord member of the sign truss as shown on the plans.

Full compensation for install sign mounted camera on existing sign structures shall be considered as included in the contract lump sum price paid for closed circuit television camera at the various locations involved and no separate payment will be made therefor.

Full compensation for modify sign structure shall be considered as included in the contract lump sum price paid for closed circuit television camera at the various locations involved and no separate payment will be made therefor.

10-1.21 MAINTAIN EXISTING TRAFFIC MONITORING STATIONS

Attention is directed to Section 7-1.11 "Preservation of Property," of the Standard Specifications. A Traffic Monitoring Station consists of detectors, the Model 170 Controller assembly, the telecommunication demarcation point, and all associated conduit and conductors necessary to interconnect these components and to provide reporting via the existing communication system to the Traffic Operations Center.

In areas where trenching operations are to be performed, the Contractor shall determine the exact location of the existing detectors, including the portion leading to the adjacent pull box, prior to beginning the trenching operations. If any part of the detector, including the portion leading to the adjacent pull box is damaged by the Contractor's operations the entire detector shall be replaced. The Engineer shall be notified immediately when damage occurs. Detectors damaged by the Contractor's operations shall be replaced within five calendar days of damage. Replacement detectors shall conform to the requirements specified under Section 86-5.01 "Vehicle Detectors" of the Standard Specifications.

Attention is directed to Sections 71.08, "Public Convenience," 7-1.09 "Public Safety," and 12, "Construction Area Traffic Control Devices" of the Standard Specifications and to the sections entitled "Public Safety" and "Maintaining Traffic" elsewhere in these special provisions.

Replacement of any vehicle detector damaged by the Contractor's operations, including necessary traffic control systems, shall be performed by the Contractor at no expense to the State, as directed by the Engineer.

Full compensation for maintain existing traffic surveillance stations shall be considered as included in the various contract items of work involved and no additional compensation will be allowed therefor.

10-1.22 CLEARING AND GRUBBING

Clearing and grubbing shall conform to the provisions in Section 16, "Clearing and Grubbing," of the Standard Specifications and these special provisions.

Existing vegetation outside the areas to be cleared and grubbed shall be protected from injury or damage resulting from the Contractor's operations.

Nothing herein shall be construed as relieving the Contractor of the Contractor's responsibility for final cleanup of the highway as provided in Section 4-1.02, "Final Cleaning Up," of the Standard Specifications.

10-1.23 EARTHWORK

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

10-1.24 MATERIAL CONTAINING AERIALLY DEPOSITED LEAD

Earthwork involving materials containing aerially deposited lead shall conform to the provisions in "Earthwork" and this section "Material Containing Aerially Deposited Lead" of these special provisions.

Attention is directed to "Aerially Deposited Lead" of these special provisions.

Type Y material contains aerially deposited lead in average concentrations greater than or equal to 5.0 mg/L Soluble Lead and between 0 - 350 mg/kg (inclusive) Total Lead, as tested using the California Waste Extraction Test. Type Y material exists between 0 m and 4 m, measured horizontally from the edges of existing pavement, from Station 276+00 to 456+00 Station, and from a depth of 0 m to 1.5 m below existing grade, or as shown on the plans. These materials shall be placed as shown on the plans, unless otherwise directed by the Engineer, and covered with a minimum 0.3-m layer of non-hazardous soil or pavement. These materials are hazardous waste regulated by the State of California that may be reused as permitted under the Variance of the Department of Toxic Substances Control. Temporary surplus material may be generated on this project due to the requirements of stage construction. Temporary surplus material shall not be transported outside the project limits. In order to conform to the requirements of these provisions, it may be necessary to stockpile materials for subsequent stages or construct some embankments out of stage or handle temporary surplus material more than once.

LEAD COMPLIANCE PLAN

The Contractor shall prepare a project specific Lead Compliance Plan to prevent or minimize worker exposure to lead while handling material containing aerially deposited lead. 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 for review and acceptance at least 15 days prior to beginning work in areas containing aerially deposited lead.

The Contractor shall not work in areas containing aerially deposited lead within the project limits, unless authorized in writing by the Engineer, until the Engineer has accepted the Lead Compliance Plan.

Prior to performing work in areas containing aerially deposited lead, personnel who have no prior training or are not current in their training status, including State personnel, shall complete a safety training program provided by the Contractor. The safety training program shall meet the requirements of Title 8, California Code of Regulations, Section 1532.1, "Lead."

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.

The Engineer will notify the Contractor of acceptance or rejection of any submitted or revised Lead Compliance Plan not more than 10 days after submittal of the plan.

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 personal protective equipment, training and medical surveillance, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

EXCAVATION AND TRANSPORTATION PLAN

Within 15 days after approval of the contract, the Contractor shall submit 3 copies of the Excavation and Transportation Plan to the Engineer. The Engineer will have 7 days to review the Excavation and Transportation Plan. If revisions are required, as determined by the Engineer, the Contractor shall revise and resubmit the Excavation and Transportation Plan within 7 days of receipt of the Engineer's comments. The Engineer will have 7 days to review the revisions. Upon the Engineer's approval of the Excavation and Transportation Plan, 3 additional copies of the Excavation and Transportation Plan incorporating the required changes shall be submitted to the Engineer. Minor changes or clarifications to the initial submittal may be made and attached as amendments to the Excavation and Transportation Plan. In order to allow construction to proceed, the Engineer may conditionally approve the Excavation and Transportation Plan while minor revisions or amendments to the Plan are being completed.

The Contractor shall prepare a written, project specific Excavation and Transportation Plan establishing the procedures the Contractor will use to comply with requirements for excavating, transporting, and placing (or disposing) of material containing aerially deposited lead. The Excavation and Transportation Plan shall conform to the regulations of the Department of Toxic Substance Control and the California Division of Occupational Safety and Health Administration (Cal-OSHA). The sampling and analysis plans shall meet the requirements for the design and development of the sampling plan, statistical analysis, and reporting of test results contained in USEPA, SW 846, "Test Methods for Evaluating Solid Waste," Volume II: Field Manual Physical/Chemical, Chapter Nine, Section 9.1. The plan shall contain, but not be limited to the following elements:

A. Excavation schedule (by location and date)
B. Temporary locations of stockpiled material
C. Sampling and analysis plans for areas after removal of a stockpile
    1. Location and number of samples
    2. Analytical laboratory
D. Dust control measures
E. Air monitoring
    1. Location and type of equipment
    2. Sampling frequency
    3. Analytical laboratory
F. Transportation equipment and routes
G. Method for preventing spills and tracking material onto public roads
H. Truck waiting and staging areas
I. Spill Contingency Plan for material containing aerially deposited lead

DUST CONTROL

Excavation, transportation, placement, and handling of materials containing aerially deposited lead shall result in no visible dust migration. The Contractor shall have a water truck or tank on the job site at all times while clearing and grubbing and performing earthwork operations in work areas containing aerially deposited lead.

Stockpiles of material containing aerially deposited lead shall not be placed where affected by surface run-on or run-off. Stockpiles shall be covered with plastic sheeting 0.33 mm minimum thickness or 0.3 m of non-hazardous material. Stockpiles shall not be placed in environmentally sensitive areas. Stockpiled material shall not enter storm drains, inlets, or waters of the State.

MATERIAL TRANSPORTATION

Prior to traveling on public roads, loose and extraneous material shall be removed from surfaces outside the cargo areas of the transporting vehicles and the cargo shall be covered with tarpaulins, or other cover, as outlined in the approved Excavation and Transportation Plan. The Contractor shall be responsible for costs due to spillage of material containing lead during transport. The Department will not consider the Contractor a generator of these hazardous materials, and the

Contractor will not be obligated for further cleanup, removal, or remedial action for such materials handled or disposed of in conformance with the requirements specified in these special provisions and the appropriate State and Federal laws and regulations and county and municipal ordinances and regulations regarding hazardous waste.

DISPOSAL

The Engineer will obtain the Environmental Protection Agency (EPA) Generator Identification Number for hazardous material disposal. The Engineer will sign all hazardous waste manifests. The Contractor shall notify the Engineer five days before the manifests are to be signed.

Sampling, analyzing, transporting, and disposing of materials containing aerially deposited lead excavated outside the pay limits of excavation and structure excavation will be at the Contractor's expense.

MEASUREMENT AND PAYMENT

Quantities of roadway excavation (aerially deposited lead) and structure excavation (aerially deposited lead), of the types shown in the Engineer's Estimate, will be measured and paid for in the same manner specified for roadway excavation and structure excavation, respectively, in Section 19, "Earthwork," of the Standard Specifications.

Full compensation for preparing an approved Excavation and Transportation Plan, transporting material containing aerially deposited lead reused in the work from location to location, and transporting and disposing of material containing aerially deposited lead shall be considered as included in the contract prices paid per cubic meter for the items of roadway excavation (aerially deposited lead) and structure excavation (aerially deposited lead) involved, and no additional compensation will be allowed therefor.

No payment for stockpiling of material containing aerially deposited lead will be made, unless the stockpiling is ordered by the Engineer.

10-1.25 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.

10-1.26 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.

The aggregate for Type B asphalt concrete shall be lime treated in conformance with "Lime Treated Aggregates" of these special provisions.The amount of asphalt binder used in asphalt concrete placed in dikes shall be increased one percent by mass of the aggregate over the amount of asphalt binder determined for use in asphalt concrete placed on the traveled way.

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.

Aggregate for asphalt concrete dikes shall be in conformance with the provisions for 9.5-mm Maximum grading in Section 39-2.02, "Aggregate," of the Standard Specifications.

10-1.27 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.

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.

Slurry

Slurry shall be commercial quality mineral or synthetic drilling slurry and shall conform to the requirements of these special provisions

Water for slurry shall conform to the provisions in Section 90-2.03, "Water," of the Standard Specifications and these special provisions. Natural ground water in the drilled hole may be used for slurry when approved by the Engineer.

Slurry shall not weaken the bond between the concrete and both the reinforcement and the foundation material at the sides of the excavation.

The Contractor shall sample and test all slurry in the presence of the Engineer, unless otherwise directed. The date, time, names of the persons sampling and testing the slurry, and results of the tests shall be recorded and shall be approved by the Engineer before concrete is placed. A copy of slurry test results shall be delivered to the Engineer at the completion of each pile.

Mineral

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

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

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

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

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

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

MINERAL SLURRY		
PROPERTY	REQUIREMENT	TEST

Density (kg/m^3) - before placement in the drilled hole - during drilling - prior to final cleaning - immediately prior to placing concrete	1030* to 1110* 1030* to 1200*	Mud Weight (Density) API 13B-1 Section 1
Viscosity (seconds/liter) bentonite attapulgite	29 to 53 29 to 42	Marsh Funnel and Cup API 13B-1 Section 2.2
pH	8 to 10.5	Glass Electrode pH Meter or pH Paper
Sand Content (percent) - prior to final cleaning - immediately prior to placing concrete	less than or equal to 4.0	Sand API 13B-1 Section 5
*When approved by the Engineer, slurry may be used in salt water, and the allowable densities may be increased up to 32 kg/m^3. Slurry temperature shall be at least 4 degrees Celsius when tested.		

Any caked slurry on the sides or bottom of hole shall be removed before placing reinforcement. If concrete is not placed immediately after placing reinforcement, the reinforcement shall be removed and cleaned of slurry, the sides of the drilled hole cleaned of caked slurry, and the reinforcement again placed in the hole for concrete placement.

Synthetic

Synthetic slurries shall be used in conformance with the manufacturer's recommendations and these special provisions. The following synthetic slurries may be used:

PRODUCT	MANUFACTURER
SlurryPro CDP	KB Technologies Ltd. Suite 216 735 Broad Street Chattanooga, TN 37402 (800) 525-5237
Super Mud	PDS Company 8140 East Rosecrans Ave. Paramount, CA 90723 (310) 634-8180

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 just prior to placing concrete. SlurryPro CDP synthetic slurries shall be tested for conformance to the requirements shown in the following table:

SLURRYPRO CDP KB Technologies Ltd.		
PROPERTY	REQUIREMENT	TEST
Density (kg/m^3) - during drilling - prior to final cleaning - just prior to placing concrete	less than or equal to 1075* less than or equal to 1025*	Mud Weight (Density) API 13B-1 Section 1
Viscosity (seconds/liter) - during drilling -prior to final cleaning - just prior to placing concrete	53 to 127 less than or equal to 74	Marsh Funnel and Cup API 13B-1 Section 2.2
pH	6 to 11.5	Glass Electrode pH Meter or pH Paper
Sand Content (percent) - prior to final cleaning - just prior to placing concrete	less than or equal to 0.5	Sand API 13B-1 Section 5
*When approved by the Engineer, slurry may be used in salt water, and the allowable densities may be increased up to 32 kg/m^3. Slurry temperature shall be at least 4 degrees Celsius when tested.		

Super Mud synthetic slurries shall be tested for conformance to the requirements shown in the following table:

SUPER MUD PDS Company		
PROPERTY	REQUIREMENT	TEST
Density (kg/m^3) - prior to final cleaning - just prior to placing concrete	less than or equal to 1025*	Mud Weight (Density) API 13B-1 Section 1
Viscosity (seconds/liter) - during drilling - prior to final cleaning - just prior to placing concrete	34 to 64 less than or equal to 64	Marsh Funnel and Cup API 13B-1 Section 2.2
pH	8 to 10.0	Glass Electrode pH Meter or pH Paper
Sand Content (percent) - prior to final cleaning -just prior to placing concrete	less than or equal to 0.5	Sand API 13B-1 Section 5
*When approved by the Engineer, slurry may be used in salt water, and the allowable densities may be increased up to 32 kg/m^3. Slurry temperature shall be at least 4 degrees Celsius when tested.		

Water

At the option of the Contractor water may be used as slurry when casing is used for the entire length of the drilled hole. Water slurry shall be tested for conformance to the requirements shown in the following table:

WATER SLURRY		
PROPERTY	REQUIREMENT	TEST

Density (kg/m^3) - prior to final cleaning - just prior to placing concrete	1017 *	Mud Weight (Density) API 13B-1 Section 1
Sand Content (percent) - prior to final cleaning -just prior to placing concrete	less than or equal to 0.5	Sand API 13B-1 Section 5
*When approved by the Engineer, salt water slurry may be used, and the allowable densities may be increased up to 32 kg/m^3.		

Construction

The Contractor shall submit a placing plan to the Engineer for approval prior to producing the test batch for cast-in-drilled-hole concrete piling and at least 10 working days prior to constructing piling. The plan shall include complete description, 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. Removal and disposal of excavation, slurry, and contaminated concrete, including methods and rates of removal.
6. Slurry agitating, recirculating, and cleaning methods and equipment.

In addition to compressive strength requirements, the consistency of the concrete to be deposited under slurry shall be verified before use by producing a batch to be tested. 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 testing in conformance with California Test 533. Depositing of test batch concrete under slurry will not be required. 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 both the specified nominal penetration and a penetration of at least 50 mm after twice that time has elapsed. 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 both the specified nominal penetration and a penetration of at least 50 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. 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.

Concrete deposited under slurry shall not be vibrated until all temporary casing is removed and concrete contaminated with soil, slurry, or other materials is removed. Concrete deposited under slurry shall be vibrated in the upper 2 m of the pile.

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. 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 water tight 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 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 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.

MEASUREMENT AND PAYMENT (PILING)

Full compensation for slurry and depositing concrete under slurry shall be considered as included in the contract lump sum price paid for closed circuit television cameras at various locations and no additional compensation will be allowed therefor.

10-1.28 CONCRETE STRUCTURES

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

10-1.29 STRUCTURE APPROACH SLABS (TYPE R)

Structure approach slabs (Type R) shall consist of removing portions of existing reinforced concrete approach slabs and constructing new portions of reinforced concrete approach slabs at structure approaches as shown on the plans and in conformance with these special provisions.

GENERAL

The thickness shown on the plans for structure approach slabs is the minimum thickness. The thickness will vary depending on the thickness of the pavement and base materials removed.

The Contractor shall establish a grade line for portions of new approach slabs which shall provide a smooth profile grade. The profile grade will be subject to the approval of the Engineer.

The Contractor shall schedule his operations so that the pavement and base materials removed during a work period shall be replaced, in that same work period, with approach slab concrete that shall be cured for at least 6 hours prior to the time the lane is to be opened to public traffic as designated in "Maintaining Traffic" of these special provisions. In the event the existing pavement and base materials are removed and the Contractor is unable to construct, finish, and cure the new approach slab by the time the lane is to be opened to public traffic, the void created by the removal of concrete and base materials shall be either bridged with temporary deck bridging or filled with a temporary roadway structural section.

TEMPORARY DECK BRIDGING

Temporary deck bridging for bridging deck gaps during deck reconstruction work shall be designed, constructed, monitored, maintained and removed as specified in these special provisions.

All temporary deck bridging components shall be stored at a location such that the void can be covered within 30 minutes.

The Contractor shall submit to the Engineer working drawings and design calculations for the temporary deck bridging. The drawings and design calculations shall be signed by an engineer who is registered as a Civil Engineer in the State of California. Three sets of the drawings and one copy of the design calculations shall be furnished.

The temporary deck bridging working drawings shall conform to the requirements in Section 5-1.02, "Plans and Working Drawings," of the Standard Specifications. Working drawings for any part of the temporary deck bridging shall include, but not be limited to, connection details, modifications to existing bridge members, shop details, erection and removal plans, and equipment lists.

The working drawings shall include descriptions and values of all loads, including construction equipment and vehicular live loads, descriptions of equipment to be used, and complete details and calculations for supporting all loads imposed.

The Contractor shall allow 3 weeks for the review of any temporary deck bridging working drawings after complete drawings, calculations and all support data have been submitted to the Engineer .

Should the Engineer fail to complete the review within the time allowed and if, in the opinion of the Engineer, the Contractor's controlling operation is delayed or interfered with by reason of the delay in temporary deck bridging working drawing review, 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.

The temporary deck bridging shall be mechanically connected to the existing structure while subjected to vehicular loads and shall not overstress, induce permanent forces into or produce cracking in the existing structure.

The temporary deck bridging shall be capable of supporting vehicular live loads, dead loads, construction equipment loads and additional loads imposed by the Contractor's operations. The construction equipment loads shall be the actual weight of the construction equipment.

As a minimum, the vehicular loading for the temporary deck bridging shall be the greater of AASHTO HS20-44 loading with 100 percent impact or AASHTO Permit loading with 100 percent impact.

The temporary deck bridging surface shall not vary more than 13 mm horizontally from the existing adjacent deck surfaces.

The temporary deck bridging shall have a uniform surface texture that provides a coefficient of friction of not less than 0.35.

Temporary deck bridging construction shall conform to the requirements for falsework in the first paragraph of Section 51-1.06B, "Falsework Construction," of the Standard Specifications.

Manufactured assemblies shall conform to the provisions in Section 51-1.06A(2), “Design Stresses, Loadings, and Deflections,” of the Standard Specifications and these special provisions.

Welding, welder qualification, and inspection of welding shall conform to the requirements of ANSI/AASHTO/AWS D1.5.

Should unanticipated displacements, cracking or other damage occur to the existing structure or to any new components installed at the joint, the construction shall be discontinued until corrective measures satisfactory to the Engineer are performed. Damage to the structure as a result of the Contractor's operations shall be repaired by the Contractor in conformance with the provisions in Section 7-1.11, "Preservation of Property," of the Standard Specifications.

When temporary deck bridging is no longer needed to bridge the void, all temporary deck bridging and connections shall be removed from the existing structure.

If the temporary deck bridging is recessed in the bridge deck, its surface shall not vary more than 6 mm vertically from the existing adjacent deck surfaces.

If the temporary deck bridging is not recessed in the bridge deck, the bridging shall be tapered at a 12 to 1 slope.

The temporary deck bridging shall remain in place and be maintained until it is no longer needed to bridge the void, at which time it shall be removed from the existing structure.

If a ledge adjacent to the concrete removal limits shown on the plans is used for the support of temporary deck bridging, when temporary bridging is removed, the ledge shall be chipped down at a minimum slope of 1:1.

TEMPORARY ROADWAY STRUCTURAL SECTION

The Contractor shall provide, at the job site, a sufficient quantity, as determined by the Engineer, of a commercial quality cold-laid plant mixture, sand and a suitable cover for the open joint, for construction of a temporary roadway structural section. The temporary structural section shall be maintained, and later removed as a first order of work when the Contractor is able to complete the installation of the new joint seal assembly. The temporary structural section shall consist of a 75-mm depth of cold-laid plant mixture over sand and a temporary cover for the joint.

At the option of the Contractor, he may design, construct and maintain a temporary structural section for the open joints.

If the Contractor elects to design a temporary structural section, he shall submit to the Engineer 3 weeks before starting any work at the existing joint, complete details and working drawings for approval of the temporary structural section, method and equipment he proposes to use in conformance with the provisions in Section 5-1.02, "Plans and Working Drawings," of the Standard Specifications. Three sets of drawings shall be submitted. These drawings shall show materials used for temporary structural section, including the method of maintaining and removing sections and such details as necessary to supplement the contract plans.

Should the Engineer fail to complete the review within the time allowed and if, in the opinion of the Engineer, the Contractor's controlling operation is delayed or interfered with by reason of the delay in temporary structural section working drawing review, 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.

The temporary structural section shall remain in place and be maintained until it is no longer needed to fill the void, at which time it shall be removed from the existing structure.

REMOVING PORTIONS OF EXISTING STRUCTURES

Attention is directed to "Existing Highway Facilities" of these special provisions.

Regardless of the type of equipment used to remove concrete within the sawed outline, the surface of the concrete to be removed shall not be impacted within 0.5-m of the pavement to remain in place. Removing existing pavement and base materials shall be performed without damage to the adjacent structure or pavement that is to remain in place. Damage to the structure or to the pavement that is to remain in place shall be repaired in conformance with the provisions in Section 7-1.11, "Preservation of Property," of the Standard Specifications.

Materials removed 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.

STRUCTURE APPROACH SLAB

Replacing portions of reinforced concrete approach slabs shall conform to the provisions for approach slabs in Section 51, "Concrete Structures," of the Standard Specifications and these special provisions.

Concrete for use in approach slabs shall contain not less than 400 kg of cement per cubic meter.

The steel angles at the concrete barrier joint shall conform to the provision in Section 75-1.03, "Miscellaneous Metal," of the Standard Specifications.

Approach slab concrete that requires a minimum curing period of 6 hours shall be constructed using a non-chloride Type C chemical admixture. Mineral admixture will not be required in this concrete.

Portland cement for use in concrete using a non-chloride Type C chemical admixture shall be Type II Modified, Type II Prestress, or Type III. Type II Modified and Type III cement shall conform to the provisions in Section 90-2.01, "Cement," of the Standard Specifications. Type II Prestress cement shall conform to the requirements of Type II Modified cement, except the mortar containing the portland cement to be used and Ottawa sand, when tested in conformance with California Test 527, shall not contract in air more than 0.053-percent.

The non-chloride Type C chemical admixture shall be approved by the Engineer and shall conform to the requirements in ASTM Designation: C 494 and Section 90-4, "Admixtures," of the Standard Specifications.

The concrete with non-chloride Type C chemical admixture shall be prequalified prior to placement in conformance with the provisions for prequalification of concrete specified by compressive strength in Section 90-9.01, "General," of the Standard Specifications and the following:

A. Immediately after fabrication of the 5 test cylinders, the cylinders shall be stored in a temperature medium of 21 ± 1.5°C until the cylinders are tested.
B. The 6-hour average strength of the 5 test cylinders shall not be less than 5.85 MPa. No more than 2 test cylinders shall have a strength of less than 5.5 MPa.

Building paper shall be commercial quality No. 30 asphalt felt.

Polyvinyl chloride (PVC) conduit used to encase the abutment tie rod shall be commercial quality.

Bar reinforcement in drilled holes shall be bonded in conformance with the provisions for drilling and bonding dowels in Section 83-2.02D(1), "General," of the Standard Specifications.

If reinforcement is encountered during drilling before the specified depth is attained, the Engineer shall be notified. Unless the Engineer approves coring through the reinforcement, the hole will be rejected and a new hole, in which reinforcement is not encountered, shall be drilled adjacent to the rejected hole to the depth shown on the plans.

The top surface of replaced portion of approach slabs shall be finished in conformance with the provisions in Section 51-1.17, "Finishing Bridge Decks," of the Standard Specifications. The finished top surface shall not vary more than 6 mm from the lower edge of a 3.6-m straightedge placed parallel with the centerline. Edges of slabs shall be edger finished.

The surface of the replaced portion of approach slab will not be profiled and the Profile Index requirements shall not apply.

Replaced portion of approach slabs shall be cured with pigmented curing compound (1) in conformance with the provisions for curing structures in Section 90-7.01B, "Curing Compound Method," of the Standard Specifications. The minimum curing period as specified herein shall be considered to begin at the start of discharge of the last truck load of concrete to be used in the slab. Fogging of the surface with water after the curing compound has been applied will not be required. Should the film of curing compound be damaged from any cause before the replaced portion of approach slab is opened to public traffic, the damaged portion shall be repaired immediately with additional compound, at the Contractor's expense. Damage to the curing compound after the replaced portion of approach slab is opened to public traffic shall not be repaired.

If the ambient temperature is below 18°C during the curing period, an insulating layer or blanket shall cover the surface. The insulation layer or blanket shall have an R-value rating given in the table below. At the Contractor's option, a heating tent may be used in lieu of or in combination with the insulating layer or blanket:

Temperature range during curing period	R-value, minimum
13°C to 18°C	1
7°C to 13°C	2
4°C to 7°C	3

Tests to determine the coefficient of friction of the final textured surface will be made only if the Engineer determines by visual inspection that the final texturing may not have produced a surface having the specified coefficient of friction. Tests to determine the coefficient of friction will be made after the approach slab is opened to public traffic, but not later than 5 days after concrete placement. The coefficient of friction will be measured by California Test 342. Portions of completed concrete surfaces that are found to have a coefficient of friction less than 0.35 shall be ground or grooved parallel to the center line in conformance with the provisions for bridge decks in Section 42, "Groove and Grind Pavement," of the Standard Specifications.

MEASUREMENT AND PAYMENT

Structural concrete, approach slab (Type R) will be measured and paid for in conformance with the provisions in Section 51-1.22, "Measurement," and Section 51-1.23, "Payment," of the Standard Specifications and these special provisions.

Full compensation for furnishing, stockpiling, and disposing of material for construction of temporary roadway structural sections; and for constructing, maintaining, removing, and disposing of temporary roadway structural sections; and for designing, furnishing, constructing, monitoring, maintaining and removing temporary bridge decking, including chipping down support ledges, if used, shall be considered as included in the contract price paid per cubic meter for structural concrete, approach slab (Type R Modified) and no separate payment will be made therefor.

10-1.30 SOUND WALL

DESCRIPTION

This work shall consist of constructing sound walls of masonry block. Sound walls shall be supported on concrete barriers on retaining walls as shown on the plans.

SOUND WALL (MASONRY BLOCK)

Sound wall (masonry block), consisting of a reinforced hollow unit masonry block stem, shall be constructed in conformance with the provisions in Sections 19, "Earthwork," 52, "Reinforcement," and 90, "Portland Cement Concrete," of the Standard Specifications and these special provisions.

Sound wall masonry unit stems shall be constructed with joints of portland cement mortar. Wall stems shall be constructed with hand laid block. Wall stems shall not be constructed with preassembled panels.

Concrete for sound wall footings, pile caps and grade beams, if required, shall be minor concrete.

Concrete masonry units shall be hollow, load bearing, conforming to the requirements in ASTM Designation: C 90, lightweight or medium weight classification, Type II. Standard or open end units may be used. Open end units, if used, shall not reduce the spacing of the bar reinforcement as shown on the plans.

The masonry units shall be nominal size and texture and of uniform color. The color shall be as indicated on the plans.

When high strength concrete masonry units with f'm=17.2 MPa are shown on the plans, the high strength masonry units shall have a minimum compressive strength of 26 MPa based on net area. Each high strength concrete masonry unit shall be identified with a groove embedded in an interior corner. The groove shall extend from a mortar surface for a length of about 50 mm and shall have a depth of about 5 mm.

Expansion joint filler shall conform to the requirements in ASTM Designation: D 1751 or ASTM Designation: D 2000 2AA-805.

Portland cement mortar shall be colored to match the units. Coloring shall be chemically inert, fade resistant mineral oxide or synthetic type.

Portland cement for wall stems shall conform to the provisions in Section 90-2.01, "Portland Cement," of the Standard Specifications.

Hydrated lime shall conform to the requirements in ASTM Designation: C 207, Type S.

Mortar sand shall be commercial quality.

Mortar for laying masonry units shall consist, by volume, of one part portland cement, 0 to 0.5 part hydrated lime, and 2.25 to 3 parts mortar sand. Sufficient water shall be added to make a workable mortar. Each batch of mortar shall be accurately measured and thoroughly mixed. Mortar shall be freshly mixed as required. Mortar shall not be retempered more than one hour after mixing.

Prepackaged mortar materials and mortar containing admixtures may be used when approved in writing by the Engineer, provided the mortar shall not contain more than 0.05 percent soluble chlorides when tested in conformance with California Test 422 nor more than 0.25 percent soluble sulfates, as SO_4, when tested in conformance with California Test 417.

Prior to laying masonry units using prepackaged mortar materials or mortar containing admixtures, the Contractor shall submit to the Engineer the proposed sources of the materials together with test data from an independent testing laboratory for mortar tested in conformance with California Test 551. The test data shall be from specimens having a moist cure, except, the sample shall not be immersed in lime water. The average 28-day compressive strength of the mortar shall be not less than 17.2 MPa.

Aggregate for grout used to fill masonry units shall consist of fine aggregate and coarse aggregate conforming to the provisions in Section 90-2.02, "Aggregates," of the Standard Specifications. At least 20 percent of the aggregate shall be coarse aggregate. The Contractor shall determine the grading except that 100 percent of the combined grading shall pass the 12.5-mm sieve.

At the option of the Contractor, grout for filling masonry units may be proportioned either by volume or mass. Grout shall contain only enough water to cause the grout to flow and fill the voids without segregation. The maximum amount of free water shall not exceed 0.7 times the weight of the cement for regular strength masonry. The maximum amount of free water shall not exceed 0.6 times the mass of the cement for high strength masonry.

Grout proportioned by volume for regular strength masonry shall consist of at least one part portland cement and 4.5 parts aggregate. Grout proportioned by volume for high strength masonry shall consist of at least one part portland cement and 3.5 parts aggregate. Aggregate volumes shall be based on a loose, air-dry condition.

Grout proportioned by mass for regular strength masonry shall contain not less than 325 kilograms of portland cement per cubic meter. Grout proportioned by mass for high strength masonry shall contain not less than 400 kilograms of portland cement per cubic meter.

Reinforced concrete masonry unit wall stems shall be constructed with portland cement mortar joints in conformance with the following:

A. Concrete masonry unit construction shall be true and plumb in the lateral direction and shall conform to the grade shown on the plans in the longitudinal direction. Bond beam units or recesses for horizontal reinforcement shall be provided.
B. Mortar joints shall be approximately 10 mm wide. Walls and cross webs forming cells to be filled with grout shall be full bedded in mortar to prevent leakage of grout. All head and bed joints shall be solidly filled with mortar for a distance in from the face of the wall or unit not less than the thickness of the longitudinal face shells. Head joints shall be shoved tight.
C. Mortared joints around cells to be filled shall be placed so as to preserve the unobstructed vertical continuity of the grout filling. Any overhanging mortar or other obstruction or debris shall be removed from the inside of such cells.
D. Reinforcement shall be securely held in position at top and bottom with either wire ties or spacing devices and at intervals not exceeding 192 bar diameters prior to placing any grout. Wire shall be 16-gage (1.57 mm) or heavier. Wooden, aluminum, or plastic spacing devices shall not be used.
E. Splices in vertical reinforcement shall be made only at the locations shown on the plans.
F. Only those cells containing reinforcement shall be filled solidly with grout. All grout in the cells shall be consolidated at the time of placement by vibrating, and reconsolidated after excess moisture has been absorbed, but before plasticity is lost. Grout shall not be sliced with a trowel.
G. Walls shall be constructed in 1.2-m maximum height lifts. Grouting of each lift shall be completed before beginning masonry unit construction for the next lift. The top course of each lift shall consist of a bond beam.
H. A construction joint shall be constructed at the top of the top course to permit placement of the mortar cap. The mix design for the mortar cap shall be as approved by the Engineer.
I. Construction joints shall be made when the placing of grout, in grout filled cells, is stopped for more than one hour. The construction joint shall be approximately 12 mm below the top of the last course filled with grout.
J. Bond beams shall be continuous. The top of unfilled cells under horizontal bond beams shall be covered with metal or plastic lath.
K. When fresh masonry joins masonry that is partially or totally set, the contact surface shall be cleaned, roughened, and lightly wetted.
L. Surfaces of concrete on which the masonry walls are to be constructed shall be roughened and cleaned, exposing the aggregate, and shall be flushed with water and allowed to dry to a surface dry condition immediately prior to laying the masonry units.
M. Where cutting of masonry units is necessary, all cuts shall be made with a masonry saw to neat and true lines. Masonry units with cracking or chipping of the finished exposed surfaces will not be acceptable.
N. Masonry shall be protected in the same manner specified for concrete structures in Section 90-8, "Protecting Concrete," of the Standard Specifications and these special provisions.
O. During erection, all cells shall be kept dry in inclement weather by covering partially completed walls. The covering shall be waterproof fabric, plastic or paper sheeting, or other approved material. Wooden boards and planks shall not be used as covering materials. The covering shall extend down each side of masonry walls approximately 0.6-m.
P. Splashes, stains or spots on the exposed faces of the wall shall be removed.

MEASUREMENT AND PAYMENT

Sound walls (barrier) of the types designated in the Engineer's Estimate will be measured by the square meter of wall projected on a vertical plane between the elevation lines shown on the plans or for walls supported on barriers from the top of the barrier to the upper elevation line and length of wall.

The contract prices paid per square meter for sound wall (barrier) shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in constructing the sound wall, complete in place, including all supports (except retaining walls and barriers), excavation, backfill and reinforcement, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

Retaining walls, concrete barrier, and barrier supports supporting sound walls (barrier) will be measured and paid for as separate items of work.

10-1.31 CORE CONCRETE

Coring concrete shall consist of coring holes through reinforced concrete bridge members as shown on the plans and in conformance with these special provisions.

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

Water for core drilling operations shall be from the local domestic water supply or shall not contain more than 1000 parts per million of chlorides as Cl, nor more than 1300 parts per million of sulfates as SO_4, nor shall the water contain any impurities in a sufficient amount that would cause discoloration of the concrete or produce etching of the surface.

Water from core drilling operations shall not be permitted to fall on public traffic, to flow across shoulders or lanes occupied by public traffic, or to flow into gutters or other drainage facilities.

Coring concrete will be measured by the meter as core concrete of the sizes listed in the Engineer's Estimate. The cored concrete will be measured along the centerline of the hole without deduction for expansion joints.

The contract price paid per meter for core concrete of the sizes listed in the Engineer's Estimate shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in coring the holes, including control of water from core drilling and repairing any damaged reinforcement, as shown on the plans, as specified in these special provisions, and as directed by the Engineer.

10-1.32 REINFORCEMENT

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

10-1.33 STEEL STRUCTURES

Construction of steel structures shall conform to the provisions in Section 55, "Steel Structures," of the Standard Specifications and these special provisions.

GENERAL

Attention is directed to "Welding" in Section 8, "Materials," of these special provisions.

The following substitutions of high-strength steel fasteners shall be made:

METRIC SIZE SHOWN ON THE PLANS	SIZE TO BE SUBSTITUTED
ASTM Designation: A 325M (Nominal bolt diameter (mm or mm x thread pitch))	ASTM Designation: A 325 (Nominal bolt diameter (inch))
13 or 12.70, M12, M12 x 1.75	1/2
16 or 15.88, M16, M16 x 2	5/8
19 or 19.05, M20, M20 x 2.5	3/4
22 or 22.22, M22, M22 x 2.5	7/8
24, 25, or 25.40, M24, M24 x 3	1
29 or 28.58, M27, M24 x 3	1 1/8
32 or 31.75, M30, M30 x 3.5	1 1/4
38 or 38.10, M36, M36 x 4	1 1/2

ROTATIONAL CAPACITY TESTING PRIOR TO SHIPMENT TO JOB SITE

Rotational capacity tests shall be performed on all lots of high-strength fastener assemblies prior to shipment of these lots to the project site. Zinc-coated assemblies shall be tested after all fabrication, coating, and lubrication of components has been completed. One hardened washer shall be used under each nut for the tests.

Each combination of bolt production lot, nut lot, and washer lot shall be tested as an assembly.

A rotational capacity lot number shall be assigned to each combination of lots tested. Each shipping unit of fastener assemblies shall be plainly marked with the rotational capacity lot number.

Two fastener assemblies from each rotational capacity lot shall be tested.

The following equipment, procedure, and acceptance criteria shall be used to perform rotational capacity tests on and determine acceptance of long bolts. Fasteners are considered to be long bolts when full nut thread engagement can be achieved when installed in a bolt tension measuring device:

A. Long Bolt Test Equipment:

1. Calibrated bolt tension measuring device with adequate tension capacity for the bolts being tested.
2. Calibrated dial or digital torque wrench. Other suitable tools will be required for performing Steps 7 and 8 of the Long Bolt Test Procedure. A torque multiplier may be required for large diameter bolts.
3. Spacer washers or bushings. When spacer washers or bushings are required, they shall have the same inside diameter and equal or larger outside diameter as the appropriate hardened washers conforming to the requirements in ASTM Designation: F436.
4. Steel beam or member, such as a girder flange or cross frame, to which the bolt tension measuring device will be attached. The device shall be accessible from the ground.

B Long Bolt Test Procedure:

1. Measure the bolt length. The bolt length is defined as the distance from the end of the threaded portion of the shank to the underside of the bolt head.
2. Install the nut on the bolt so that 3 to 5 full threads of the bolt are located between the bearing face of the nut and the underside of the bolt head. Measure and record the thread stickout of the bolt. Thread stickout is determined by measuring the distance from the outer face of the nut to the end of the threaded portion of the shank.
3. Insert the bolt into the bolt tension measuring device and install the required number of washers, and additional spacers as needed, directly beneath the nut to produce the thread stickout measured in Step 2 of this procedure.
4. Tighten the nut using a hand wrench to a snug-tight condition. The snug tension shall not be less than the Table A value but may exceed the Table A value by a maximum of 2 kips.

Table A

High-Strength Fastener Assembly Tension Values to Approximate Snug-Tight Condition	
Bolt Diameter (inches)	Snug Tension (kips)
1/2	1
5/8	2
3/4	3
7/8	4
1	5
1 1/8	6
1 1/4	7
1 3/8	9
1 1/2	10

5. Match-mark the assembly by placing a heavy reference start line on the face plate of the bolt tension measuring device which aligns with 1) a mark placed on one corner of the nut, and 2) a radial line placed across the flat on the end of the bolt, or on the exposed portions of the threads of tension control bolts. Place an additional mark on the outside of the socket that overlays the mark on the nut corner such that this mark will be visible while turning the nut. Make an additional mark on the face plate, either 2/3 of a turn, one turn, or 1 1/3 turn clockwise from the heavy reference start line, depending on the bolt length being tested as shown in Table B.

Table B

Required Nut Rotation for Rotational Capacity Tests[a,b]	
Bolt Length (measured in Step 1)	Required Rotation (turn)
4 bolt diameters or less	2/3
Greater than 4 bolt diameters but no more than 8 bolt diameters	1
Greater than 8 bolt diameters, but no more than 12 bolt diameters[c]	1 1/3

(a) Nut rotation is relative to bolt, regardless of the element (nut or bolt) being turned. For bolts installed by 1/2 turn and less, the tolerance shall be plus or minus 30 degrees; for bolts installed by 2/3 turn and more, the tolerance shall be plus or minus 45 degrees.
(b) Applicable only to connections in which all material within grip of the bolt is steel.
(c) When bolt length exceeds 12 diameters, the required rotation shall be determined by actual tests in a suitable tension device simulating the actual conditions.

6. Turn the nut to achieve the applicable minimum bolt tension value listed in Table C. After reaching this tension, record the moving torque, in foot-pounds, required to turn the nut, and also record the corresponding bolt tension value in pounds. Torque shall be measured with the nut in motion. Calculate the value, T (in ft-lbs), where T=[(the measured tension in pounds) x (the bolt diameter in inches) / 48 in/ft].

Table C

Minimum Tension Values for High-Strength Fastener Assemblies	
Bolt Diameter (inches)	Minimum Tension (kips)
1/2	12
5/8	19
3/4	28
7/8	39
1	51
1 1/8	56
1 1/4	71
1 3/8	85
1 1/2	103

7. Turn the nut further to increase bolt tension until the rotation listed in Table B is reached. The rotation is measured from the heavy reference line made on the face plate after the bolt was snug-tight. Record this bolt tension.
8. Loosen and remove the nut and examine the threads on both the nut and bolt.

C. Long Bolt Acceptance Criteria:

1. An assembly shall pass the following requirements to be acceptable: 1) the measured moving torque (Step 6) shall be less than or equal to the calculated value, T (Step 6), 2) the bolt tension measured in Step 7 shall be

greater than or equal to the applicable turn test tension value listed in Table D, 3) the nut shall be able to be removed from the bolt without signs of thread stripping or galling after the required rotation in Step 7 has been achieved, 4) the bolt does not shear from torsion or fail during the test, and 5) the assembly does not seize before the final rotation in Step 7 is reached. Elongation of the bolt in the threaded region between the bearing face of the nut and the underside of the bolt head is expected and will not be considered a failure. Both fastener assemblies tested from one rotational capacity lot shall pass for the rotational capacity lot to be acceptable.

Table D

Turn Test Tension Values	
Bolt Diameter (inches)	Turn Test Tension (kips)
1/2	14
5/8	22
3/4	32
7/8	45
1	59
1 1/8	64
1 1/4	82
1 3/8	98
1 1/2	118

The following equipment, procedure, and acceptance criteria shall be used to perform rotational capacity tests on and determine acceptance of short bolts. Fasteners are considered to be short bolts when full nut thread engagement cannot be achieved when installed in a bolt tension measuring device:

A. Short Bolt Test Equipment:

1. Calibrated dial or digital torque wrench. Other suitable tools will be required for performing Steps 7 and 8 of the Short Bolt Test Procedure. A torque multiplier may be required for large diameter bolts.
2. Spud wrench or equivalent.
3. Spacer washers or bushings. When spacer washers or bushings are required, they shall have the same inside diameter and equal or larger outside diameter as the appropriate hardened washers conforming to the requirements in ASTM Designation: F436.
4. Steel plate or girder with a hole to install bolt. The hole size shall be 1.6 mm greater than the nominal diameter of the bolt to be tested. The grip length, including any plates, washers, and additional spacers as needed, shall provide the proper number of threads within the grip, as required in Step 2 of the Short Bolt Test Procedure.

B. Short Bolt Test Procedure:

1. Measure the bolt length. The bolt length is defined as the distance from the end of the threaded portion of the shank to the underside of the bolt head.
2. Install the nut on the bolt so that 3 to 5 full threads of the bolt are located between the bearing face of the nut and the underside of the bolt head. Measure and record the thread stickout of the bolt. Thread stickout is determined by measuring the distance from the outer face of the nut to the end of the threaded portion of the shank.
3. Install the bolt into a hole on the plate or girder and install the required number of washers and additional spacers as needed between the bearing face of the nut and the underside of the bolt head to produce the thread stickout measured in Step 2 of this procedure.
4. Tighten the nut using a hand wrench to a snug-tight condition. The snug condition shall be the full manual effort applied to the end of a 305 mm long wrench. This applied torque shall not exceed 20 percent of the maximum allowable torque in Table E.

Table E

Maximum Allowable Torque for High-Strength Fastener Assemblies	
Bolt Diameter (inches)	Torque (ft-lbs)
1/2	145
5/8	285
3/4	500
7/8	820
1	1220
1 1/8	1500
1 1/4	2130
1 3/8	2800
1 1/2	3700

5. Match-mark the assembly by placing a heavy reference start line on the steel plate or girder which aligns with 1) a mark placed on one corner of the nut and 2) a radial line placed across the flat on the end of the bolt or on the exposed portions of the threads of tension control bolts. Place an additional mark on the outside of the socket that overlays the mark on the nut corner such that this mark will be visible while turning the nut. Make 2 additional small marks on the steel plate or girder, one 1/3 of a turn and one 2/3 of a turn clockwise from the heavy reference start line on the steel plate or girder.
6. Using the torque wrench, tighten the nut to the rotation value listed in Table F. The rotation is measured from the heavy reference line described in Step 5 made after the bolt was snug-tight. A second wrench shall be used to prevent rotation of the bolt head during tightening. Measure and record the moving torque after this rotation has been reached. The torque shall be measured with the nut in motion.

Table F

Nut Rotation Required for Turn-of-Nut Installation[a,b]	
Bolt Length (measured in Step 1)	Required Rotation (turn)
4 bolt diameters or less	1/3
(a) Nut rotation is relative to bolt, regardless of the element (nut or bolt) being turned. For bolts installed by 1/2 turn and less, the tolerance shall be plus or minus 30 degrees. (b) Applicable only to connections in which all material within grip of the bolt is steel.	

7. Tighten the nut further to the 2/3-turn mark as indicated in Table G. The rotation is measured from the heavy reference start line made on the plate or girder when the bolt was snug-tight. Verify that the radial line on the bolt end or on the exposed portions of the threads of tension control bolts is still in alignment with the start line.

Table G

Required Nut Rotation for Rotational Capacity Test	
Bolt Length (measured in Step 1)	Required Rotation (turn)
4 bolt diameters or less	2/3

8. Loosen and remove the nut and examine the threads on both the nut and bolt.

C. Short Bolt Acceptance Criteria:

1. An assembly shall pass the following requirements to be acceptable: 1) the measured moving torque from Step 6 shall be less than or equal to the maximum allowable torque from Table E, 2) the nut shall be able to be

removed from the bolt without signs of thread stripping or galling after the required rotation in Step 7 has been achieved, 3) the bolt does not shear from torsion or fail during the test, and 4) the assembly shall not seize before the final rotation in Step 7 is reached. Elongation of the bolt in the threaded region between the bearing face of the nut and the underside of the bolt head will not be considered a failure. Both fastener assemblies tested from one rotational capacity lot shall pass for the rotational capacity lot to be acceptable.

INSTALLATION TENSION TESTING AND ROTATIONAL CAPACITY TESTING AFTER ARRIVAL ON THE JOB SITE

Installation tension tests and rotational capacity tests on high-strength fastener assemblies shall be performed by the Contractor prior to acceptance or installation and after arrival of the fastener assemblies on the project site. Installation tension tests and rotational capacity tests shall be performed at the job-site, in the presence of the Engineer, on each rotational capacity lot of fastener assemblies.

Installation tension tests shall be performed on 3 representative fastener assemblies in conformance with the provisions in Section 8, "Installation," of the RCSC Specification. For short bolts, Section 8.2, "Pretensioned Joints," of the RCSC Specification shall be replaced by the "Pre-Installation Testing Procedures," of the "Structural Bolting Handbook," published by the Steel Structures Technology Center, Incorporated.

The rotational capacity tests shall be performed in conformance with the requirements for rotational capacity tests in "Rotational Capacity Testing Prior to Shipment to Job Site" of these special provisions.

At the Contractor's expense, additional installation tension tests, tests required to determine job inspecting torque, and rotational capacity tests shall be performed by the Contractor on each rotational capacity lot, in the presence of the Engineer, if 1) any fastener is not used within 3 months after arrival on the jobsite, 2) fasteners are improperly handled, stored, or subjected to inclement weather prior to final tightening, 3) significant changes are noted in original surface condition of threads, washers, or nut lubricant, or 4) the Contractor's required inspection is not performed within 48 hours after all fasteners in a joint have been tensioned.

Failure of a job-site installation tension test or a rotational capacity test will be cause for rejection of unused fasteners that are part of the rotational capacity lot.

When direct tension indicators are used, installation verification tests shall be performed in conformance with Appendix Section X1.4 of ASTM Designation: F959, except that bolts shall be initially tensioned to a value 5 percent greater than the minimum required bolt tension.

SURFACE PREPARATION

For all bolted connections, the new contact surfaces shall be cleaned and coated before assembly in conformance with the provisions for cleaning and painting structural steel of these special provisions.

WELDING

Dimensional details and workmanship for welded joints in tubular and pipe connections shall conform to the provisions in Part A, "Common Requirements of Nontubular and Tubular Connections," and Part D, "Specific Requirements for Tubular Connections," in Section 2 of AWS D1.1.

10-1.34 SIGN STRUCTURES

Sign structures and foundations for overhead signs shall conform to the provisions in Section 56-1, "Overhead Sign Structures," of the Standard Specifications and these special provisions.

Before commencing fabrication of sign structures, the Contractor shall submit 2 sets of working drawings to the Engineer in conformance with the provisions in Section 5-1.02, "Plans and Working Drawings," of the Standard Specifications. The working drawings shall include sign panel dimensions, span lengths, post heights, anchorage layouts, proposed splice locations, a snugging and tensioning pattern for anchor bolts and high strength bolted connections, and details for permanent steel anchor bolt templates. The working drawings shall be supplemented with a written quality control program that includes methods, equipment, and personnel necessary to satisfy the requirements specified herein and in the special provisions.

Working drawings shall be 559 mm x 864 mm or 279 mm x 432 mm in size and each drawing and calculation sheet shall include the State assigned designations for the contract number, sign structure type and reference as shown on the contract plans, District-County-Route-Kilometer Post, and contract number.

The Engineer shall have 20 working days to review the sign structure working drawings after a complete submittal has been received. No fabrication or installation of sign structures shall be performed until the working drawings are approved in writing by the Engineer.

Should the Engineer fail to complete the review 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 reviewing the sign structure working drawings, the delay will be considered a right of way delay in conformance with the provisions in Section 8-1.09, "Right of Way Delays," of the Standard Specifications.

A permanent steel template shall be used to maintain the proper anchor bolt spacing.

One top nut, one leveling nut, and 2 washers shall be provided for the upper threaded portion of each anchor bolt.

Surfaces of base plates which are to come in contact with concrete, grout, or washers and leveling nuts shall be flat to within 3 mm tolerance in 305 mm, and to within 5 mm tolerance overall. Faying surfaces of plates in high-strength bolted connections including flange surfaces of field splices, chord joints, and frame junctures, and contact surfaces of plates used for breakaway slip base assemblies shall be flat to within 2 mm tolerance in 305 mm, and within 3 mm tolerance overall.

Thermally cut holes made in tubular members of sign supports, other than holes in base and flange plates, shall initially be made a minimum of 2 mm undersized, and then be mechanically enlarged by reaming or grinding to the final required size and shape. All edges shall have a surface roughness of not greater than 6.35 μm. Round holes may be drilled to the exact final diameter. No holes shall be made in members unless the holes are shown on the plans or are approved in writing by the Engineer.

Steel members used for overhead sign structures shall receive nondestructive testing (NDT) in conformance with AWS D1.1 and the following:

A.

Weld Location	Weld Type	Minimum Required NDT
Welds for butt joint welds in tubular sections, nontubular sections, and posts	CJP groove weld with backing ring	100% UT or RT
Longitudinal seam welds*	PJP groove weld	25% MT
	CJP groove weld	100% UT or RT
Welds for base plate, flange plate, or end cap to post or mast arm	CJP groove weld	25% UT or RT
	Fillet weld	25% MT
* Longitudinal seam welds shall have 60% minimum penetration, except that within 150 mm of any circumferential weld, longitudinal seam welds shall be CJP groove welds.		

B. A written procedure approved by the Engineer shall be used when performing UT on material less than 8 mm thick. Contoured shoes shall be used when performing UT on round tubular sections under 1270 mm in diameter.

C. When less than 100 percent of a weld is specified for NDT, and if defects are found during this inspection, additional NDT shall be performed. This additional NDT shall be performed on 25 percent of the total weld for all similar welds, as determined by the Engineer, produced for sign structures in the project. If any portion of the additional weld inspected is found defective, 100 percent of all similar welds produced for sign structures in the project, as determined by the Engineer, shall be tested.

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

Full compensation for furnishing anchor bolt templates and for testing of welds shall be considered as included in the contract price paid per kilogram for furnish sign structure and no additional compensation will be allowed therefor.

10-1.35 DELINEATORS

Delineators shall conform to the provisions in Section 82, "Markers and Delineators," of the Standard Specifications and these special provisions.

Delineators on flexible posts shall conform to the provisions in "Prequalified and Tested Signing and Delineation Materials" of these special provisions. Flexible posts shall be made from a flexible white plastic which shall be resistant to impact, ultraviolet light, ozone, and hydrocarbons. Flexible posts shall resist stiffening with age and shall be free of burns, discoloration, contamination, and other objectionable marks or defects which affect appearance or serviceability.

Retroreflective sheeting for metal and flexible target plates shall be the retroreflective sheeting designated for channelizers, markers, and delineators conforming to the requirements in ASTM Designation: D 4956-95 and in conformance with the provisions in "Prequalified and Tested Signing and Delineation Materials" of these special provisions.

10-1.36 METAL BEAM GUARD RAILING

Metal beam guard railing shall be constructed in conformance with the provisions in Section 83-1, "Railings," of the Standard Specifications and these special provisions.

Attention is directed to "Order of Work" of these special provisions.

Line posts and blocks shall be wood.

TERMINAL SYSTEM (TYPE ET)

Terminal system (Type ET) shall be furnished and installed as shown on the plans and in conformance with these special provisions.

Terminal system (Type ET) shall be an ET-2000 PLUS (4-tube system) extruder terminal as manufactured by Trinity Industries, Inc., and shall include all the items detailed for terminal system (Type ET) shown on the plans.

Arrangements have been made to insure that any successful bidder can obtain the ET-2000 PLUS (4-tube system) extruder terminal from the manufacturer, Trinity Industries Inc., P.O. Box 99, 950 West 400S, Centerville, UT 84014, Telephone 1-800-772-7976. The price quoted by the manufacturer for the ET-2000 PLUS (4-tube system) extruder terminal, FOB Centerville, Utah is $1325.00, not including sales tax.

The above price will be firm for orders placed on or before December 31, 2003, provided delivery is accepted within 90 days after the order is placed.

The Contractor shall provide the Engineer with a Certificate of Compliance from the manufacturer in conformance with the provisions in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications. The Certificate of Compliance shall certify that the terminal systems (Type ET) conform to the contract plans and specifications, conform to the prequalified design and material requirements, and were manufactured in conformance with the approved quality control program.

The terminal system (Type ET) shall be installed in conformance with the manufacturer's installation instructions and these requirements. The steel foundation tubes with soil plates attached shall be, at the Contractor's option, either driven, with or without pilot holes, or placed in drilled holes. Space around the steel foundation tubes shall be backfilled with selected earth, free of rock, placed in layers approximately 100 mm thick and each layer shall be moistened and thoroughly compacted. The wood terminal posts shall be inserted into the steel foundation tubes by hand and shall not be driven. Before the wood terminal posts are inserted, the inside surfaces of the steel foundation tubes to receive the wood posts shall be coated with a grease which will not melt or run at a temperature of 65°C or less. The edges of the wood terminal posts may be slightly rounded to facilitate insertion of the post into the steel foundation tubes.

Surplus excavated material remaining after the terminal system (Type ET) has been constructed shall be disposed of in a uniform manner along the adjacent roadway where designated by the Engineer.

TERMINAL SYSTEM (TYPE SRT)

Terminal system (Type SRT) shall be furnished and installed as shown on the plans and in conformance with these special provisions.

Terminal system (Type SRT) shall be a SRT-350 Slotted Rail Terminal (8 post system) as manufactured by Trinity Industries, Inc., and shall include all the items detailed for terminal system (Type SRT) shown on the plans.

The 5 mm x 44 mm x 75 mm plate washer shown on the elevation view and in Section D-D at Wood Post No. 1 shall be omitted.

Arrangements have been made to insure that any successful bidder can obtain the SRT-350 Slotted Rail Terminal (8 post system) from the manufacturer, Trinity Industries, Inc., P.O. Box 99, 950 West 400S, Centerville, UT 84014, Telephone 1-800-772-7976. The price quoted by the manufacturer for the SRT-350 Slotted Rail Terminal (8 post system), FOB Centerville, Utah is $845, not including sales tax.

The above price will be firm for orders placed on or before December 31, 2003, provided delivery is accepted within 90 days after the order is placed.

The Contractor shall provide the Engineer with a Certificate of Compliance from the manufacturer in conformance with the provisions in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications. The Certificate of Compliance shall certify that terminal systems (Type SRT) conform to the contract plans and specifications, conform to the prequalified design and material requirements and were manufactured in conformance with the approved quality control program.

The terminal system (Type SRT) shall be installed in conformance with the manufacturer's installation instructions and these requirements. The steel foundation tubes with soil plates attached, shall be, at the Contractor's option, either driven, with or without pilot holes, or placed in drilled holes. Space around the steel foundation tubes shall be backfilled with selected earth, free of rock, placed in layers approximately 100 mm thick and each layer shall be moistened and thoroughly compacted. Wood terminal posts shall be inserted into the steel foundation tubes by hand. Before the wood terminal posts are inserted, the inside surfaces of the steel foundation tubes to receive the wood posts shall be coated with a grease which

will not melt or run at a temperature of 65°C or less. The edges of the wood terminal posts may be slightly rounded to facilitate insertion of the post into the steel foundation tubes.

Surplus excavated material remaining after the terminal system (Type SRT) has been constructed shall be disposed of in a uniform manner along the adjacent roadway where designated by the Engineer.

10-1.37 CONCRETE BARRIER

Concrete barriers shall conform to the provisions in Section 83-2, "Barriers," of the Standard Specifications.

SECTION 10-2 HIGHWAY PLANTING AND IRRIGATION SYSTEMS

10-2.01 GENERAL

The work performed in connection with highway planting and irrigation systems shall conform to the provisions in Section 20, "Erosion Control and Highway Planting," of the Standard Specifications and these special provisions.

The Contractor shall notify the Engineer not less than 72 hours prior to requiring initial access to the existing irrigation controllers. When the Engineer determines that access to the controllers is required at other times, arrangements will be made to provide this access.

10-2.02 EXISTING HIGHWAY PLANTING

In addition to the provisions in Section 15 of the Standard Specifications, work performed in connection with existing highway planting shall be in conformance with the provisions in Section 20, "Erosion Control and Highway Planting," of the Standard Specifications and these special provisions.

Replacement planting shall conform to the requirements specified under "Preservation of Property" of these special provisions.

MAINTAIN EXISTING PLANTS

Existing plants, as determined by the Engineer, shall be maintained. Maintaining existing plants will be paid for as extra work as provided in Section 4-1.03D of the Standard Specifications.

REMOVE TREE

Removing tree shall conform to the provisions in Section 20-5.026, "Remove Existing Plants for Trenching," of the Standard Specifications and these special provisions.

PRUNE EXISTING PLANTS

Existing plants, as determined by the Engineer, shall be pruned. Pruning of the existing plants, except as otherwise provided under "Clearing and Grubbing," of the Standard Specifications, and provisions in "Remove Existing Plants for Communication System Trenching," of these special provisions, will be paid for as extra work as provided in Section 4-1.03D of the Standard Specifications.

10-2.03 EXISTING HIGHWAY IRRIGATION FACILITIES

In addition to the provisions in said Section 15, the work performed in connection with the various existing highway irrigation system facilities shall conform to the provisions in Section 20, "Erosion Control and Highway Planting," of the Standard Specifications and these special provisions.

Attention is directed to the provisions in Section 20-5.025, "Maintain Existing Water Supply," of the Standard Specifications.

Existing irrigation facilities consist of irrigation crossovers, pipe supply lines, control and neutral conductors, manual and remote control valves, irrigation controllers pull boxes, backflow preventers, gate valves, wye strainers, quick coupling valves, filter assembly units, and sprinklers. The Contractor shall at his expense, repair or replace the damaged facilities as follows:

Repair or replacement of damaged facilities shall be completed within 5 working days of the damage.

Replaced irrigation facilities shall be new, and of equal or better quality than the damaged facility. Such replacement irrigation facilities shall be compatible with the irrigation systems to remain.

After repair or replacement of such facilities is complete, the Contractor shall demonstrate to the Engineer that the repaired or replaced facilities operate properly. When remote control valves are repaired or replaced, the valves shall be tested with the irrigation controller in the automatic mode.

LOCATE EXISTING IRRIGATION FACILITIES

Existing irrigation facilities are located within the project limits and may conflict with trenching and construction operations for communication system work.

Where communication system conduits are to be installed in soil adjacent to the freeway shoulder, the existing underground irrigation facilities located within 2-m from edge of pavement shall be located and marked every 30-m intervals prior clearing and grubbing or trenching operations.

The location of underground irrigation facilities can be inferred from the presence of visible irrigation facilities such as sprinklers, valves, irrigation crossover markers and other irrigation facilities.

All exploratory holes used to locate existing irrigation facilities hall be performed by hand methods without the use of power equipment.

Markings for locating underground irrigation facilities shall be wooden stakes raised minimum 61-cm above grade.

The Contractor shall immediately notify the Engineer in writing of any irrigation facilities potentially conflicting with trenching or construction operations.

Full compensation for locating existing irrigation facilities, including exploratory holes and markings shall be considered as included in the contract prices paid for the items of work involved in communication system work and no additional compensation will be allowed therefor.

MODIFY EXISTING IRRIGATION SYSTEM

When ordered by the Engineer, the existing irrigation facilities conflicting with trenching or construction operations shall be modified (checked, removed, relocated, replaced or repaired) as directed by the Engineer.

Modifying existing irrigation facilities as directed by the Engineer will be paid for as extra work as provided in Section 4-1.03D of the Standard Specifications.

CHECK AND TEST EXISTING IRRIGATION FACILITIES

Existing irrigation facilities at each location of work, shall be checked in the presence of the Engineer for missing or damaged components and proper operation prior to performing trenching operations. Existing irrigation facilities outside of work areas that are affected by the construction work shall also be checked for proper operation.

A written list of existing irrigation system deficiencies shall be submitted to the Engineer within 2 working days after checking the existing facilities.

Deficiencies found during checking of the existing facilities shall be corrected as directed by the Engineer. Corrective work ordered by the Engineer will be paid for as extra work as provided in Section 4-1.03D of the Standard Specifications.

When existing irrigation facilities are checked, existing backflow preventers to remain shall be tested for proper operation in conformance with the provisions in Section 20-5.03J, "Check and Test Backflow Preventers," of the Standard Specifications.`

Existing backflow preventers shall be retested one year after the satisfactory completion of the previous test or 10 days prior to completion of the plant establishment period, whichever occurs first.

Repairs to the existing irrigation facilities ordered by the Engineer after checking and testing the facilities, and further repairs or modifications required thereafter as ordered by the Engineer, will be paid for as extra work as provided in Section 4-1.03D of the Standard Specifications.

After all work is completed at each location, the irrigation facilities shall be checked in the presence of the Engineer, and any damage to the existing and modified irrigation facilities caused by the Contractor's operations shall be repaired within 5 working days at the expense of the Contractor.

Full compensation for checking and testing existing irrigation facilities shall be considered as included in the contract lump sum price paid for checking existing irrigation system and no additional compensation will be allowed therefor.

FINAL IRRIGATION SYSTEM CHECK

A final check of existing irrigation facilities shall be performed in the presence of the Engineer not more than 20 working days prior to acceptance of the contract.

The length of watering cycles using potable water measured by water meters for the final check of irrigation facilities will be determined by the Engineer.

Remote control valves connected to existing irrigation controllers shall be checked for automatic performance when the controllers are in automatic mode.

Unsatisfactory performance of irrigation facilities installed or modified by the Contractor shall be repaired and rechecked at the Contractor's expense until satisfactory performance is obtained, as determined by the Engineer.

Repair or replacement of existing irrigation facilities due to unsatisfactory performance shall conform to the provisions in "Existing Highway Irrigation Facilities" of these special provisions.

Nothing in this section "Final Irrigation System Check" shall relieve the Contractor of full responsibility for making good or repairing defective work or materials found before the formal written acceptance of the entire contract by the Director.

SECTION 10-3. ELECTRICAL SYSTEMS

10-3.01 DESCRIPTION

Electrical systems for fiber optic communication system routing, closed circuit television (CCTV) camera system, changeable message sign (CMS) system, communication conduit (bridge), cable, video and data nodes, traffic monitoring stations (TMS), and modifying ramp metering systems (RMS), traffic monitoring station, and cable node, described in Section 10-3, shall conform to the provisions in Section 86, "Signals, Lighting and Electrical Systems," of the Standard Specifications and these special provisions.

Locations of traffic monitoring installations and modify traffic monitoring station are shown on the plans:

A. Traffic monitoring station (Location 2668), KP 29.1, Southbound Route 101 north of Collett Avenue.
B. Traffic monitoring station (Location 2001), KP 31.8, Northbound Route 101 north of Louise Avenue.
C. Traffic monitoring station (Location 2669), KP 36.5, Northbound Route 101 south of Corbin Avenue.
D. Traffic monitoring station (Location 2670), KP 38.1, Northbound Route 101 north of Winnetka Avenue.
E. Modify Traffic monitoring station (Location 2389), KP 27.7, Southbound Route 101 to Southbound Route 405.
F. Modify Traffic monitoring station (Location 2388), KP 28.0, Southbound Route 101 south of Haskell Avenue.

Locations of modify ramp metering system are shown on the communication system routing plans:

A. Modify Ramp metering system (Location 0032), KP 28.3, Northbound Route 101 at Haskell Avenue.
B. Modify Ramp metering system (Location 0418), KP 29.6, Southbound Route 101 south of Hayvenhurst Avenue.
C. Modify Ramp metering system (Location 0417), KP 30.6, Southbound Route 101 south of Balboa Boulevard.
D. Modify Ramp metering system (Location 0033), KP 31.2, Northbound Route 101 north of Balboa Boulevard.
E. Modify Ramp metering system (Location 0416), KP 32.3, Southbound Route 101 south of White Oak Avenue.
F. Modify Ramp metering system (Location 0402), KP 32.6, Northbound Route 101 north of White Oak Avenue.
G. Modify Ramp metering system (Location 0415), KP 33.7, Southbound Route 101 south of Burbank Boulevard.
H. Modify Ramp metering system (Location 0403), KP 34.4, Northbound Route 101 north Reseda Boulevard.
I. Modify Ramp metering system (Location 0414), KP 35.4, Southbound Route 101 south of Tampa Avenue.
J. Modify Ramp metering system (Location 0404), KP 35.9, Northbound Route 101 north of Tampa Avenue.
K. Modify Ramp metering system (Location 0413), KP 37.3, Southbound Route 101 south of Winnetka Avenue
L. Modify Ramp metering system (Location 0405), KP 37.6, Northbound Route 101 north of Winnetka Avenue.
M. Modify Ramp metering system (Location 0412), KP 38.7, Southbound Route 101 south of De Soto Avenue.
N. Modify Ramp metering system (Location 0406), KP 39.2, Northbound Route 101 north of De Soto Avenue.
O. Modify Ramp metering system (Location 0411), KP 39.7, Southbound Route 101 south of Canoga Avenue
P. Modify Ramp metering system (Location 0410), KP 40.5, Southbound Route 101 south of Topanga Canyon Boulevard.
Q. Modify Ramp metering system (Location 1156), KP 41.3, Northbound Route 101 north of Topanga Canyon Boulevard.
R. Modify Ramp metering system (Location 0409), KP 40.7, Southbound Route 101 north of Topanga Canyon Boulevard.

Changeable message sign (CMS) electrical systems works are to be performed at the following locations:

Changeable message sign (Location 129), KP 39.1, Northbound Route 101 north of De Soto Avenue.
Modify changeable message sign (Location 12), KP 32.5, Southbound Route 101 north of White Oak Ave.

Communication conduit is included in the following structures:

A. Eastbound Connector Separation Undercrossing (Bridge No. 53-1147R), KP 27.8.
B. Haskell Avenue Undercrossing (Bridge No. 53-1103), KP 28.2.
C. Hayvenhurst Avenue Undercrossing (Bridge No. 53-1104), KP 29.8.

D. Balboa Boulevard Undercrossing (Bridge No. 53-1052), KP 30.9.
F. White Oak Avenue Undercrossing (Bridge No. 53-1054), KP 32.5.
G. Lindley Avenue Undercrossing (Bridge No. 53-1055), KP 33.3.
H. Burbank Boulevard Undercrossing (Bridge No. 53-1056), KP 33.8.
I. Reseda Boulevard Undercrossing (Bridge No. 53-1057), KP 34.1.
J. Wilbur Avenue Undercrossing (Bridge No 53-1058), KP 35.0.
K. Tampa Avenue Undercrossing (Bridge No. 53-1059), KP 35.8.
L. Corbin Avenue Undercrossing (Bridge No. 53-1060), KP 36.6.
M. Winnetka Avenue Undercrossing (Bridge No. 53-1061), KP 37.4.
N. De Soto Avenue Undercrossing (Bridge No. 53-1062), KP 39.1.
O. Canoga Avenue Undercrossing (Bridge No. 53-1063), KP 39.9.
P. Route 101 / Route 27 Separation (Bridge No. 53-1064), KP 40.7.

In locations where conduit is installed in soil, there is a transition from soil to asphalt concrete before the bridge approach slab.

Closed circuit television (CCTV) work shall be performed at the following locations:

A. Closed circuit television Camera (Location VE176), KP 28.3, Northbound Route 101 at Haskell Avenue.
A. Closed circuit television Camera (Location VE186), KP 29.9, Southbound Route 101 south of Hayvenhurst Avenue.
C. Closed circuit television Camera (Location VE193), KP 31.0, Northbound Route 101 north of Balboa Boulevard.
D. Closed circuit television Camera (Location VE203), KP 32.7, Northbound Route 101 north of White Oak Avenue.
E. Closed circuit television Camera (Location VE213), KP 34.3, Northbound Route 101 north of Reseda Boulevard.
F. Closed circuit television Camera (Location VE223), KP 35.9, Northbound Route 101 north of Tampa Avenue.
G. Closed circuit television Camera (Location VE232), KP 37.3, Northbound Route 101 south of Winnetka Avenue.
H. Closed circuit television Camera (Location VE243), KP 39.1, Southbound Route 101 south of De Soto Avenue.
I. Closed circuit television Camera (Location VE254), KP 40.8, Northbound Route 101 north of Topanga Canyon Boulevard.

Video node work shall be performed at the following location:

Video node (Location VE213), KP 34.3, Northbound Route 101 north of Reseda Boulevard.

Data node work shall be performed at the following location:

Data node (Location VE213), KP 34.3, Northbound Route 101 north of Reseda Boulevard.

Cable node work shall be performed at the following location:

Cable node (Location VE254), KP 40.8, Northbound Route 101 at Route 101 / Route 27 Separation.
Modify cable node (Location VE171), KP 27.5, Southbound Route 101 at Route 101 / Route 405 Separation

The Transportation Management Center (TMC) is located at 120 S. Spring Street, Los Angeles, California 90012.
The Contractor shall confirm equipment placement with the Engineer before installing any equipment.

10-3.02 ABBREVIATIONS AND GLOSSARY

The following Abbreviations and Glossary apply to Section 10-3 of these special provisions.

Abbreviations:

&	And
#	number
ADM:	Add Drop Multiplexer.
AFC:	Automated Frequency Control.
AGC:	Automatic gain control.
AIS:	Alarm Indication Signal.
AISI:	American Iron and Steel Institute.
AMI:	Alternate Mark Inversion (a data transmission protocol.)
APD:	Avalanche Photo diode.
APL:	Average picture level.
APS:	Automatic Protection Switch.
AVC	Autmomatic vehicle classification system
AWG	American wire gauge
AWM:	Appliance Wiring Material.
B8ZS:	Bipolar 8 Zero Suppression(data transmission protocol)
BER:	Bit error rate.
BERTS:	Bit Error Rate Test Set.
BITS:	Building Integrated Timing Supply.
BNC:	Bayonet Navy Connector.
bps:	Bits per second.
BPV:	Bipolar Violation.
CCD:	Charge-Coupled Device.
CCK:	Camera Control Key pad.
CCR:	Camera Control Receiver
CCT:	Camera Control Transmitter.
CCTV:	Closed Circuit Television.
NTR:	Code of Federal Regulations.
CIDH:	Cast In Drilled Hole.
CMIP:	Configuration Management Information Protocol.
CMISE:	Common Management Information Service Entity.
CMP:	Configuration Management Plan.
CMS:	Changeable Message Sign.
CODEC:	Coder - Decoder.
COMM	Communication
CPU:	Central Processing Unit.
CRT:	Cathode Ray Tube.
CTRL	Controller
DACCS	Digital access and cross connection system
D4:	4th version of the D-signal format for time division multiplexers.
dB:	Decibel.
dBm:	Decibel referred to milliwatt.
dBrn:	Decibel above reference noise.
DCD:	Data carrier detect
DCE:	Data communication equipment.
DTE:	Data Circuit Terminating Equipment.
DEMARC	Demarcation

DEMUX	Demultiplexer
DCS:	Digital Cross-Connect System.
DS-1:	Digital Signal Level 1. Digital Transmission Rate - 1.544 megabits per second.
DS-3:	Digital Signal Level 3. Digital Transmission Rate - 44.876 megabits per second.
DWP:	LA Dept. of Water and Power
EIA:	Electronics Industries Association.
ELA	East Los Angeles
EMT:	Electrical Metallic Tubing.
ESF:	Extended Superframe or Extended Superframe Format (4).
E/O	east of
FCC	Federal Communications Commission
F/O or FO:	Fiber optic.
FDF	Fiber Distribution Frame
FDU:	Fiber Distribution Unit.
FRP:	Fiberglass Reinforced Plastic.
FXS:	Foreign Exchange Subscriber.
GFCI:	Ground Fault Circuit Interrupter.
GUI	Graphical User Interface.
HAR:	.
HVAC:	Heating Ventilation and Air Conditioning.
Hz:	Hertz.
IRE:	IRE is a SMPTE Standard video reference level.
ITUR	International Telecommunications Union Radio
JKFD:	Jackfield
KP	Kilometer Post
LA	Los Angeles
M13:	Multiplexer, 28 DS-1 circuits to 1 DS-3 circuit.
MHz:	Megahertz.
MMFO:	Multimode fiber optics
MUX:	Multiplexer
NEMA:	National Electrical Manufacturers Association.
nm:	nanometer.
NMS:	Network Management System.
NRZ:	Non-return to Zero.
NTSC:	National Television Standards Committee.
OC:	Optical Channel.
OD:	Outside Diameter.
OEM	Original Equipment Manufacturer.
OSHA:	Occupational Safety and Health Administration.
OW	Order wire (Multipule voice circuit)
P	Pair
P22	Pair 22 American Wire Gauge
PAC BELL	Pacific Bell telephone Company
p-p:	Peak to Peak.
PC:	Personal Computer.
PCMS:	Pasadena City Municipal Services

PDA	Power distribution assembly
PIN:	P-type, intrinsic, N-type.
PM:	Post Mile
PR	Pair
PRBS:	Pseudo-Random Bit Sequence pattern.
QRSS:	Quasi-Random Signal Source.
REA:	United States Rural Electrification Administration.
RETMA:	Radio-Electronics-Television Manufacturers Association (Former name of EIA.)
RF:	Radio Frequency.
RG:	Regulatory Guide.
RMS:	Ramp Metering System.
RMS:	Root-mean-square.
RTS:	Request to send.
SF:	Superframe Format (D4).
SM:	Singlemode.
SMFO:	Singlemode Fiber Optic.
SONET:	Synchronous Optical Network.
SSOVP:	Solid State Over-voltage Protector.
SSPC:	Steel Structures Painting Council.
ST:	Type of Connector.
TDM:	Time Division Multiplexer.
THHN:	Heat Resistant thermoplastic with Nylon Jacket Conductor.
THWN:	Moisture and Heat Resistant Thermoplastic with Nylon Jacket Conductor.
TIA:	Telecommunications Industries Association.
TL-1:	Transaction Language 1.
TLP:	Transmission Level Point.
TOSNET:	Traffic Operational System Network
TMC:	Traffic Management Center.
TSG:	Test Signal Generator.
TSI:	Time Slot Interchange.
UNC:	Unified National Coarse.
UNIX:	Specific operating system found in real-time applications.
UV:	Ultraviolet.
V:	Volt.
V(ac)	V, Alternating Current.
VID:	Video Identification and Date/Time Display.
VSK:	Video switch keypad.
VSM:	Video switch matrix.
VT-1.5:	Virtual Tributary-Level 1.5 (1.728 Mb/s.).
VT:	Virtual Tributary.
W:	Watt.
WFM:	Waveform Monitor.
WTO:	Wire Transit Only.
X.11, X.25:	specific protocol standards generated by the International Telecommunications Union (formerly CCITT.)
XHHW:	Moisture and Heat Resistant Cross Linked Synthetic Polymer Conductor.

Glossary:

Breakout.--The cable "breakout" is produced by (1) removing the jacket just beyond the last tie-wrap point, (2) exposing 0.9 m to 1.8 m of the cable buffers, aramid strength yarn and central fiberglass strength member, and (3) cutting the aramid yarn, central strength member and the buffer tubes to expose the individual glass fibers for splicing or connection to the appropriate device.

Cable Storage Cabinet.--A cabinet for holding excess cable slack for protection. The cable storage cabinet allows the user flexibility in equipment location and the ability to pull cable back for re-splicing.

Channel.--(1) An information path between a discrete input and a discrete output. (2) One single input to a multiplexer or output from a demultiplexer.

Closed Circuit Television Assembly.--Camera, lens, environmental enclosure, and necessary connectors and cables.

Connector.--A mechanical device used to provide a means for attaching to and decoupling from a transmitter, receiver, or another fiber (such as on a patch panel).

Connectorized.--A term that describes a fiber to which a connector has been affixed.

Connector Module Housing (CMH).--A patch panel used in the FDF to terminate singlemode fibers with most common connector types. It may include a jumper storage shelf and a hinged door.

Couplers.--Couplers are devices which mate two fiber optic connectors to facilitate the transition of optical light signals from one connector into another. Couplers may also be referred to as: adapters, feed-throughs, and barrels. They are normally located within FDF's mounted in panels. They may also be used unmounted, to join two simplex fiber runs.

Fiber Distribution Frame (FDF).--A rack mounted system that is usually installed in the TMC that consists of a standard equipment rack, fiber routing guides, horizontal jumper troughs, fiber distribution units (FDU), connector module housings (CMH), and splice module housings (SMH).

The FDF serves as the "home" for the passive fiber optic components from cable breakout, for connection by jumpers, to the electronics.

Fiber Distribution Unit (FDU).--An enclosure containing both a Connector Module Housing (CMH) and a Splice Module Housing enclosure.

Field Cabinet.--A roadside cabinet used for housing controllers or communications equipment.

Jumper.--A short fiber optic cable that has connectors installed on both ends, and is typically used for connection within a FDF.

Light Source.--A portable piece of fiber optic test equipment that, in conjunction with a power meter, is used to perform end-to-end attenuation testing. It contains a stabilized light source operating at the designed wavelength of the system under test.

Link.--A passive section of the system, the ends of which are to be connected to active components. A link may include splices and couplers. For example, a video link may be from a F/O transmitter to a video Multiplexer (MUX).

Mux/Demux.--Multiplexer/Demultiplexer.

Optical Time Domain Reflectometer (OTDR).--Fiber optic test equipment (similar in appearance to an oscilloscope) that is used to measure the total amount of power loss between two points and the corresponding distance. It provides a visual and printed display of the relative location of system components such as fiber sections, splices and connectors and as the losses that are attributed to each component or defect in the fiber.

Patchcord.--A short jumper.

Pigtail.--Relatively short length of fiber optic cable that has a connector installed on only one end.

Power Meter.--A portable piece of fiber optic test equipment that, in conjunction with a light source, is used to perform end-to-end attenuation testing. It contains a detector that is sensitive to light at the designed wavelength of the system under test. Its display indicates the amount of power injected by the light source that arrives at the receiving end of the link.

Segment.--A section of F/O cable that is not connected to any active device and may or may not have splices per the design.

Splice Closure.--Normally installed in a splice vault, a splice closure is an environmentally sealed container used to organize and protect splice trays. The container allows splitting or routing of fiber cables from multiple locations.

Splice Module Housing (SMH).--The SMH stores splice trays as well as pigtails and short cable lengths.

Splice Tray.--A container used to organize and protect spliced fibers.

Splice Vault.--A splice vault is used to house splice closures.

10-3.03 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.

The cost breakdown shall include the following items in addition to those listed in the Standard Specifications:

A. Splice vaults
B. Cable, Data and Video node controller cabinet
C. Fiber optic splice closures
D. CCTV camera, poles and controller cabinet
E. Camera control receivers
F. Video transmitters and receivers
G. Video multiplexer and demultiplexer
H. Fiber distribution units
I. Fiber optic data modems

10-3.04 EQUIPMENT LIST, DRAWINGS, AND FIELD CABINETS

A maintenance manual shall be furnished for all installed controller units, CCTV camera assemblies, video transmitters (Vx) and receivers (Vr), video multiplexers and demultiplexers (VMX), camera control receivers (CCR), fiber optic data modems (FODM), and auxiliary equipment. The maintenance manual and operation manual may be combined into one manual. A verified (accurate) and validated (correlated) maintenance manual or combined maintenance and operation manual shall be submitted at the time the controller units, CCTV camera assemblies, video transmitters and receivers, video multiplexers and demultiplexers, camera control receivers, fiber optic data modems, are delivered for testing or, if ordered by the Engineer, prior to purchase. In the event errors are uncovered in the course of testing, the Contractor shall assist in the resolution of the discrepancies, and provide the updated data. The maintenance manual shall include, but not be limited to, the following items:

A. Specifications (including input/output functions with tolerances).
B. Design characteristics.
C. General operation theory.
D. Function of all controls.
E. Trouble shooting procedure (diagnostic routine) with test points as applicable.
F. Block circuit diagram.
G. Geographical layout of components in wiring diagrams.
H. Schematic diagrams.
I. List of replaceable component parts with suppliers and their stock numbers.

FIELD CABINETS

Each field cabinet which is connected to the communication system under this contract 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:

CCTV CAMERA

A copy of the video channel assignment table
A copy of the fiber assignment tables
A copy of the system schematic diagrams
A copy of the element reference table

VIDEO NODE, DATA NODE AND CABLE NODE

A copy of the final node circuit assignment tables
A copy of the final wiring diagram for the communications elements at that site

A copy of the final fiber assignment tables
A copy of the final system schematic diagrams
A copy of the element reference table

CHANGEABLE MESSAGE SIGN

A copy of the final wiring diagram for the communications elements at that site
A copy of the system schematic diagrams
A copy of the element reference table

Additional information may be supplied by the Engineer to be used to produce the documentation listed above by adding the related information that applies to this project.

Full compensation for the maintenance manual and field cabinet documentation shall be considered as included in the contract lump sum price paid for system testing and documentation, and no separate payment will be made therefor.

10-3.05 MAINTAINING EXISTING ELECTRICAL SYSTEMS

Attention is directed to section 7-1.11, "Preservation of Property", of the Standard Specifications and these special provisions.

MAINTAINING EXISTING COMMUNICATION SYSTEM ROUTING FACILITIES

Existing communication system routing facilities are located within the project limits and may conflict with construction operations. In areas where excavation operations are performed, the Contractor shall notify the Engineer a minimum of 72 hours, prior to starting work and obtain as-built plans for the area. The Engineer will advise the District Office of Transportation Management Center (TMC) Support and the District Office of Intelligent Transportation System (ITS) of the Contractor's scheduled work.

The Contractor shall obtain written approval from the Engineer, a minimum of 72 hours prior to works of any system cut-over, disconnection of service from existing individual electrical systems for existing lighting and sign illumination, communication system routing, ramp metering system (RMS), traffic monitoring system (TMS), control station (CS), irrigation system (IRR), traffic signal systems, and changeable message sign (CMS) system.

The Contractor and the Engineer shall jointly conduct a pre-construction check of the existing communication system elements. The Engineer will determine the exact location of existing communication systems elements including, but not limited to, closed circuit television camera (CCTV), fiber optic cables, conduits, communication pull boxes of various types and splice vaults, prior to the Contractor beginning excavation operations. The Engineer will maintain the records of the pre-construction check of the existing communication system elements.

Existing communication system elements shall remain in place and shall be protected from damage.

The Contractor shall use hand tools to perform work involved in excavating, relocating, repairing, replacing and removing existing communication system field elements, and devices. If part of the existing communication system elements is damaged or failed by the Contractor's operations, the Engineer shall be notified immediately and the damaged communication system elements shall be repaired or replaced, at the Contractor's expense, within 5 working days. Replaced communication system elements shall be new, of equal or better quality than the damaged communication system elements.

The Engineer shall approve replacement methods and replaced facilities, including communication conduit types, bend radius and fusion splicing of all fiber optic cables, in advance and in writing.

In the event the fiber optic cables are damaged due to the Contractor's operations, the Contractor shall install new fiber optic cables from an original splice point to an original splice point, unless otherwise authorized in writing by the Engineer, but in no case shall the fiber optic cable be spliced other than at an existing splice vault.

The amount of new fiber optic cable slack in the splice vault and the number of new fiber optic cable splices shall be the same as the original. Fusion splicing is required for all fiber optic cables.

After repair or replacement of such facilities is complete, the Contractor shall demonstrate to the Engineer that the repaired or replaced facilities operate in the manner identical to that prior to the damage. Should the Contractor fail to perform the required repair or replacement work, as determined by the Engineer, the State will perform the repair or replacement work, and the cost of performing such repairs or replacement work shall be deducted from any money due or to become due to the Contractor. Electrically related construction on this project may be suspended, as determined by the Engineer, until all repairs and replacement works have been completed.

Works of maintaining existing communication system routing, including removing, relocating, repairing and replacing the existing communication system elements, including post-construction testing, ordered only by the Engineer, and further repairs required thereafter as ordered only by the Engineer, except as otherwise provided under "Existing Highway Facilities" of these special provisions, will be paid for as extra work in "Maintain Existing Electrical Systems," and as provided in Section 4-1.03D of the Standard Specifications.

Full compensation for pre-construction check of the existing communication system routing facilities shall be considered as included in the contract lump sum price paid for system testing and documentation and no additional compensation will be allowed therefor.

RESTRICTIONS OF CHANGEABLE MESSAGE SIGN, RAMP METERING SYSTEM, TRAFFIC MONITORING STATION AND CONTROL STATION

An individual electrical system for fiber optic communication system, ramp metering system, traffic monitoring system irrigation system, traffic signal systems and changeable message sign shall be considered to be "offline" for the duration of time that it is disconnected from AC power and disrupted from active communications with the Transportation Management Center (TMC), such that messages cannot be displayed to public traffic through the exercise of remote control commands from the TMC.

Except as otherwise provided in these special provisions or as directed by the Engineer, electrical systems for fiber optic communication system routing, ramp metering system, traffic monitoring station, control station, irrigation system (IRR), traffic signal system and changeable message signs work, described elsewhere in these special provisions, shall be subjected to the following restrictions:

No ramp metering, control station or traffic monitoring station controller shall be disconnected or disrupted between the hours of 6:00 a.m. and 9:00 a.m., and from 3:00 p.m. to 7:00 p.m., Monday through Friday.

No ramp metering, control station or traffic monitoring station controller shall be disconnected from its electrical power for more than 15 minutes in any 24-hour period without prior written approval from the Engineer.

No more than five individual Model 170 Controller locations, each with its own unique controller I.D. number, as indicated on the plans, shall be subject to disruption at any time during the system cut-over.

No CMS shall be disconnected or disrupted on a weekend, beginning at 9:00 p.m. Friday evening until 6:00 a.m. Monday morning.

No CMS shall be disconnected or disrupted between the hours of 6:00 a.m. and 7:00 p.m. of any day.

No CMS controller shall be disconnected from electrical power for more than 15 minutes in any 24-hour period, without written approval from the Engineer.

No individual CMS shall be offline for more than 20 consecutive calendar days.

Upon approval by the Engineer, the Contractor may place a portable changeable message sign, conforming to the provisions in Section 12-370 of these Special Provisions, in the vicinity of a CMS location in order to extend the duration that an individual CMS may be offline from the above-listed time period restrictions. The Engineer will determine the exact location for placement of such a portable changeable message sign. If the Contractor exercises this option, all costs maintaining, relocating, and removal of the portable changeable message sign(s) shall be at the Contractor's expense and no separate payment will be made therefore.

10-3.06 COMMUNICATION SYSTEM ROUTING AND FIELD ELEMENT LOCATIONS

Communication system routing consists of, but not limited to, communication conduits and fiber optic cables of various types, sizes, and installation methods, fiber optic splice closures, innerducts, communication pull boxes, and splice vaults

Communication system routing is connected to various field element locations such as closed circuit television (CCTV) camera, fiber optic video, data, and cable nodes, ramp metering system (RMS), traffic monitoring station (TMS), control station (CS), irrigation system, traffic signal system, changeable message sign (CMS) system and the North Hollywood Hub building.

Works on the communication system routing and various field element locations shall conform to all rules and regulations of the Federal Communications Commission (FCC) and shall conform to the provisions in Section 86, "Signals, Lighting and Electrical Systems," of the Standard Specifications and these special provisions.

Prototype equipment is not acceptable. All new equipment shall be current standard production units and shall have been in production for a minimum of six months. Rebuilt or reconditioned equipment will not be allowed.

In order to minimize the damage to the existing communication system routing and various field elements, the Contractor shall perform works as provided under “Order of Works”, described elsewhere in these special provisions, as shown on the plans, as directed by the Engineer, and in the following order:

1. The Contractor shall perform the jointly conducted pre-construction check with the Engineer, as provided under “Maintaining Existing Communication System Routing Facilities,” described elsewhere in these special provisions, and shall submit a test plan, in accordance with manufacturer's specifications, for approval in advance by the Engineer, also as described elsewhere in these special provisions. The test plan is also to verify that all existing equipment is functional before construction and to record the working condition of that equipment.

2. The Contractor shall perform the communication system routing works according to the approved schedule specifying the timetable of construction activities as described under “Order of Works”, described elsewhere in these special provisions.
3. The Contractor shall perform system testing and documentation as provided under “System Testing and Documentation,” and system cut-over work as provided under “Communication system routing cut-over,” described elsewhere in these special provisions.

The Contractor may arrange, at the Contractor's own expenses, to have a technician, qualified to work on existing communication system routing and field element equipment or employed by the communication system equipment manufacturer, or manufacturer's representative, present at the time the communication system routing and field element equipment is installed, modified or reconnected.

Except for verification and testing of the condition of the existing communication system routing before and after works of the communication system routing and various field element locations, the scope of the Contractor’s work shall be as shown on the plans.

COMMUNICATION SYSTEM ROUTING

Works on communication system routing shall consist of, but not limited to, removal, and disposal of existing conductors, of various sizes and types, furnishing and installing a new and permanent communication system routing, including conduits, pull boxes, fiber optic cables, fiber optic splice closures, of various sizes, types, and installation methods, innerducts, splice vaults, and performing system testing and documentation, and communication system routing cut-over, in order to provide the full functionality of the communication system, within the contract limits, complete in place, as shown on plans and as directed by the Engineer.

FIELD ELEMENT LOCATIONS

Works on the various field element locations consist of, but not limited to, removal of existing detector loop lead-in-cables, installing, connecting or reconnecting new detector loop lead-in-cables to existing ramp metering system (RMS), traffic monitoring station (TMS), control station (CS), connecting existing field element, including the North Hollywood Hub, to the installed communication system routing, furnishing and installing various video node, data nodes, cable nodes, CCTV cameras, ramp metering systems, traffic monitoring stations, changeable message sign, and performing system testing, and system cut-over, in order to provide, and to restore the full functionality of various field element locations in connection with the installed communication system routing, within the contract limits, complete in place, as shown on plans and as directed by the Engineer.

The video node, cable and data nodes typically consist of Type 334-TV cabinet and control equipment, camera control receiver (CCR), video multiplexer (VMX), video receiver (Vr), camera control circuits and accessories, D4 channel bank (D4) card multiplexers, interface cables, fiber distribution unit (FDU), fiber optic data modem (FODM), and other equipment, as shown on plans.

The CCTV camera location typically consists of Type 334-TV cabinet and control equipment, camera control receiver, video transmitter, fiber optic interface cables, fiber distribution unit, fiber optic data modem, camera control circuits and accessories, CCTV wiring, which includes enclosed cables for video and camera control, connectors, coaxial cables, CCTV camera assembly, which includes pan and tilt unit, color video camera, camera lens, camera housing, camera pole, camera junction box, and other equipment, as shown on plans.

The ramp metering system or traffic monitoring station typically consist of Type 334 cabinet and Model 170 controller, fiber optic interface cables, fiber distribution unit, fiber optic data modem, control equipment, detector loop lead-in cables, inductive loop detectors, connectors and sensor units, as shown on plans.

The changeable message sign typically consists of Type 334C cabinet and CMS controller, fiber optic interface cables, fiber distribution unit, fiber optic data modem, control equipment and cables, and connectors, as shown on plans.

10-3.07 FOUNDATIONS

Reinforced cast-in-drilled-hole concrete pile foundations for Changeable Message Sign and CCTV standards shall conform to the provisions in "Piling" of these special provisions.

Full compensation for cast-in-drilled-hole concrete pile foundation for CCTV locations shall be considered as included in the contract lump sum price for closed circuit television cameras at various locations and no separate payment will be made therefor.

10-3.08 CONDUIT

Conduit to be installed underground, including detector termination conduits, shall be Type 1 unless otherwise specified. The Contractor shall install tapes in all various empty innerducts and conduits.Type 3 conduit shall be used for communication trunk line.

Communication conduit shall be installed by the methods shown on the plans, as specified in these special provisions, and as directed by the Engineer. A flat, woven, lubricated, polyester tape with a minimum tensile strength of 80 kN minimum shall be placed in conduits. At least 1.2 m of tape shall be extended beyond termination.

The conduit in a foundation and between a foundation and the nearest pull box shall be Type 1.

Conduit sizes shown on the plans and specified in the Standard Specifications and these special provisions are referenced to metallic type conduit. When rigid non-metallic conduit is required or allowed, the nominal equivalent industry size shall be used as shown in the following table:

Size Designation for Metallic Type Conduit	Equivalent Size for Rigid Non-metallic Conduit
21	20
27	25
41	40
53	50
63	65
78	75
103	100

When 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.

When Type 3 communication conduit is placed in a trench, after the bedding material is placed and the conduit is installed, the trench shall be back-filled with slurry cement backfill conforming to the requirements in Section 19-3.062 of the standard Specification, except the maximum size of aggregate shall be 10 mm (pea gravel), and containing not less than 250 kg of Portland cement per cubic meter, and commercial quality cement sand to not less than 100 mm above the conduit before additional backfill material is placed.

In those areas where a jacking pit in a concrete shoulder is necessary to jack conduit across a roadway and the work has not been completed in a work shift the Contractor shall cover the jacking pit with steel plates after each completed work day. When the work has been completed in a particular jacking area the surface must be restored to its original condition. When conduit is placed in a trench, under paved shoulder, and after the bedding material is placed and conduit is installed, the trench shall be back-filled with cement slurry backfill, as specified above, to a minimum of 25 mm of existing shoulder surface.

Conduits located within the same trench shall have not less than 50-mm separation.

Trenches shall be less than or equal to 200-mm width.

The Contractor's attention is directed to "Aerially Deposited Lead" of these special provisions.

Immediately prior to installing conductors, cables and innerducts, all conduits shall be blown out with compressed air until all foreign material is removed.

After conductors have been installed, the ends of conduits terminating in various pull boxes, splice vaults, service equipment enclosures, and controller cabinets shall be sealed with an approved type of sealing compound.

Conduit shall not be installed by trenching along the pavement of freeway lanes except in sections of the highway where there is insufficient clearance to locate a longitudinal trench off the traveled way, or where obstructions off the traveled way would necessitate bends in the conduits in excess of those allowed.

Where conduits are shown on the plans to be installed parallel and adjacent to each other, the conduits shall be installed together in a common trench as shown on the conduit installation details.

Trenching in pavement method is not allowed across freeway lanes, connectors, and ramps.

Power conduits placed in the same trench, as communication conduits shall not terminate in communication pull boxes or splice vault.

Communication conduits shall not terminate in power pull boxes.

10-3.09 COMMUNICATION CONDUIT

Communication conduit shall conform to the provisions specified above under "Conduit" and the following.

Communication conduit shall include excavation, installation of the communication conduit, and placing sand and slurry cement backfill.

Excavation and slurry cement backfill shall conform to Section 19-3, “Structure Excavation and Backfill,” of the Standard Specifications. The slurry cement backfill shall reach initial set prior to placing of reinforced concrete for the approach slab.

Conduit shall enter splice vault and communication pull boxes through knockouts. Conduits entering the ends of these communication boxes shall be vertically and horizontally aligned with the conduits at the opposite end of the communication box. Conduit ends shall not extend beyond the interior wall face of splice vault and communication pull boxes. The space around conduits through end walls of splice vault and communication pull boxes shall be filled with Portland cement mortar conforming to the provisions in Section 51-1.135, "Mortar," of the Standard Specifications. In no case shall a conduit body or communication pull box be used in lieu of a specified bend to change the direction of the communication conduit run, except where specified.

No bends shall be placed in a section of conduit in excess of those indicated in the plans without the approval of the Engineer. The total degrees of bending in a section of conduit between splice vaults and communication pull boxes shall not exceed a total of 180 degrees, except where specified otherwise.

Changes in indicated conduit bends may be made in order to suit field conditions, as long as the change reduces the degree of the bend or increases the radius of the bend. In no case shall the angle of the bend be increased without the approval of the Engineer.

Minimum bending radius for size 53, size 78, and size 103 communication conduits shall be 610 mm, 915 mm, and 1220 mm, respectively. Bends of greater than 22 degrees shall be factory bends and bends greater than 45 degrees shall galvanized rigid steel with any necessary adapters.

Deflections from the indicated communication conduit routing to avoid obstructions shall not exceed 83.3 mm/m. Conduit from the typical trench sections shall not deflect by more than 83.3 mm/m from the alignment preceding or following communication pull boxes and splice vault.

Where edge drains are in the path of conduit routing the Contractor must first locate the edge drains and install the conduit maintaining a minimum depth. In the event an edge drain is damaged by the Contractor’s work, the repair shall be at the Contractor's expense.

Adjacent to over crossings or bridge foundations, the Contractor shall trench and install conduit in the shoulder as close as possible to the edge of traveled way so that a minimum of 1.5 m from the outside face of footing or pile cap is maintained.

COMMUNICATION CONDUIT (BRIDGE)

At the location shown on the plans, where communication conduits are to be installed on bridge, fiberglass conduit shall be used and shall conform to the details shown on the plans, and to these special provisions. Communication conduit (bridge) shall include excavation, installation of the fiberglass conduit with any required conduit hangers, cradles, and miscellaneous iron and steel, and placing sand and slurry cement backfill.

Excavation and slurry cement shall conform to Section 19-3, “Structure Excavation and Backfill,” of the Standard Specifications. The slurry cement backfill shall reach initial set prior to placing of reinforced concrete for the approach slab.

In those locations where conduit is installed in soil, there will be a transition from soil to asphalt before reaching the approach slab on a bridge; the Contractor must insure a 1.2 m minimum bending radius for conduit installation.

Full compensation for furnishing and incorporating the conduit transitions required shall be considered as included in the contract price paid per meter for the various sizes and types of Communication conduit (bridge) involved and no separate payment will be made therefor.

Measurement and Payment.--Communication conduit (bridge) will be measured by the meter.

FIBERGLASS CONDUIT

General.--Fiberglass conduit and components shall comply with the specifications in ANSI/NEMA Standards Publication TC-14A or TC-14B. All fiberglass conduit components shall be free of defects including delaminating, foreign inclusions, etc. All fiberglass conduit components shall be nominally uniform (as commercially practical) in color, density, and physical properties. Fiberglass conduit shall be straight and the ends shall be cut square and true.

The Contractor shall purchase all fiberglass conduits and other fiberglass conduit system components from the same manufacturer to insure component compatibility.

Conduit Sizes.--Fiberglass conduit shall be supplied in 6-m minimum lengths.

System Components.--Fiberglass conduit components shall include compatible fittings, adapters, expansion joints, and factory bends at nominal radii of 1.3 m for size 103 conduits.

Material.--All fiberglass conduit system components shall be produced from heat cured, corrosion resistant epoxy resin and continuous fiberglass roving. All materials shall be manufactured for use at temperatures from -40°C to 110°C. All

fiberglass conduit components shall be manufactured using a homogeneously dispersed UV inhibitor. When exposed to direct diurnal sunlight, the UV inhibitor shall prevent the degradation of all physical material properties, except for surface cosmetic appearance. Materials shall contain no halogens above trace levels and shall be fire resistant.

Joining Method.--Joints shall be watertight and withstand a minimum 4450 N of pullout tension.

Stiffness.--For all sizes of fiberglass conduit, under a load of 1.3 kN/m of conduit, the deflection of the inside diameter shall not exceed 5 percent.

Impact Resistance.--The minimum impact resistance values for the fiberglass conduit shall be as follows when measured as described in ASTM Designation: D2444-70, using a 9 kg.tup "B" with a 50 mm radius nose:

Size 103 conduit	108 N/m.

HANGERS, CONCRETE AND METAL SUPPORTS (BRIDGE)

Wrapping tape for pipe in contact with the earth shall be a pressure sensitive polyvinyl chloride or polyethylene tape with a minimum thickness of 1.27 mm.

Pipe hanger assemblies shall consist of a concrete clevis plate or embedded steel welded linked eye rods, an adjustable steel yoke, a cast iron pipe roller, a steel roller rod and hex nuts. Parts shall be galvanized. The pipe hanger assembly shall be suitable for the type and size of pipe installed and shall be as shown on the plans.

Steel hangers, anchor bolts, pipe clamps, nuts and bolts, and other fittings shall be suitable for the type and size of the supply lines or casing and shall conform to the provisions in Section 75-1.03, "Miscellaneous Bridge Metal," of the Standard Specifications.

Concrete pipe supports shall consist of a precast concrete pipe cradle, galvanized steel pipe clamp, 2 anchor bolts and, where shown on the plans, a stainless steel pipe protection shield.

Concrete pipe supports and pipe stops shall conform to the dimensions shown on the plans and shall be constructed of commercial quality concrete with a cement content not less than 350 kg of Portland cement per cubic meter and commercial quality wire mesh. The concrete for pipe supports and pipe stops shall be moist cured for not less than 3 days.

Epoxy adhesive shall conform to the provisions in Section 95-1, "General," of the Standard Specifications and at the option of the Contractor, shall conform to the provisions in Section 95-2.03, "Epoxy Resin Adhesive for Bonding New Concrete to Old Concrete," or in Section 95-2.04, "Rapid Set Epoxy Adhesive for Pavement Markers," or in Section 95-2.05, "Standard Set Epoxy Adhesive for Pavement Markers," of the Standard Specifications.

Payment.-- Full compensation for furnishing and installing mechanical expansion bolt anchors, steel hangers, steel brackets and other fittings, concrete supports, pipe wrapping tape, epoxy-adhesives, and conduit expansion fittings shall be considered as included in the contract price paid per meter of communication conduit (bridge) involved and no additional compensation will be allowed therefor.

WARNING TAPE

Warning tape shall be furnished and installed in the trench, over new conduits to receive reinstalled or new fiber optic cables, as shown on the plans. The warning tape shall consist of 100-mm wide bright orange pigmented polyolefin film with a bold printed message of approximately 19-mm black characters on one side. The message shall be: "CAUTION: BURIED FIBER OPTIC CABLE - CALTRANS (213) 897-0340," repeated at approximately 910 mm intervals.

The warning tape shall not delaminate nor shall the message smear when wet. The tape and the printed message shall be resistant to insects and shall not degrade when exposed to alkalis, acids and other corrosive elements commonly found in soil. It shall have a minimum of 356 N tensile strength and a minimum of 700 percent elongation before breakage.

Warning tape shall be Condux International, Inc.; Allen System, Inc.; Reef Industries, Inc. or equal.

Full compensation for warning tape shall be considered as included in contract price paid per meter for the various sizes and types of conduit involved and no separate payment will be made therefor.

COLORED CEMENT BACKFILL

The slurry cement backfill for the installation of communication conduits that will contain fiber optic cable shall be a medium to dark, red or orange color to clearly distinguish the concrete backfill from other concrete and soil. The concrete shall be pigmented by the addition of commercial quality cement pigment to the concrete mix. The red or orange concrete pigment shall be LM Scofield Company; Orange Chromix Colorant; Davis Colors; or equal.

For trenches in pavement areas, only the top 100-mm of slurry cement backfill will be required to be pigmented concrete. At the option of the Contractor, the full depth may have the pigment.

Full compensation for furnishing and incorporating the cement pigment to achieve the color required shall be considered as included in the contract price paid per meter for the various sizes and types of conduit involved and no separate payment will be made therefor.

FIBER UNDER GROUND WARNING SIGN

Any communication conduit installed in soil where conduit can not be seen from above ground for more than 30 m must have a warning sign. The signs must be placed within 5 m of conduit at minimum 60-m intervals.

The signs shall say "FIBER UNDER GROUND CALL 213-897-4698 CALTRANS ITS DEPT." The dimensions of the signs shall be at a minimum of 130 mm x 170 mm x 2 mm and made of galvanized sheet metal or aluminum sheet. The sign colors shall be white lettering with black background. The signs shall be bolted to right of way fence at a height of 1.5 m. In the event the right of way fence is not within 5 m from conduit installation, than contractor shall install signs on a metal post, see A73B in the standard plans.

Full compensation for furnishing fiber underground warning sign shall be considered as included in the contract price paid per meter for the various sizes and types of conduit involved and no separate payment will be made therefor.

0.5-MM PLASTIC SHEET

The 0.5-mm plastic sheet shall be furnished and installed in the trench within roadway pavement, approximately 3 cm over new communication conduits, as shown on the plans, and as directed by the Engineer. The plastic sheet will serve as a breaking plane within the slurry cement backfill. The plastic sheet shall be manufactured from high-density polyethylene (HDPE) virgin compounds or polyvinyl chloride (PVC) virgin compounds.

Full compensation for 0.5-mm plastic sheet shall be considered as included in contract price paid per meter for the various sizes and types of conduit involved and no separate payment will be made therefor.

10-3.10 SIZE 25 AND 32 INNERDUCTS

Wherever fiber optic cable is used, innerduct shall be installed to provide protection for the fiber optic cable. A separate innerduct shall be installed for each fiber optic cable along the communication mainline as shown on the plans.

All innerducts shall be 25 and 32 mm, smooth or ribbed high tensile polyethylene duct. Innerduct shall have the following characteristics:

Inner diameter greater than, or equal to, 25 and 32 mm, nominal.
Environmental stress crack resistance in excess of 2000 hours at - 100˚C, no failures.
Cold impact resistance to -76˚C not brittle until -100˚C.
Minimum tensile strength of 2670 N for finished product.
Minimum crush strength of 2900 N.
Coefficient of friction shall be less than 0.4 un-lubricated on nonmetallic conduit and with common polyethylene cable jackets.

Different innerducts within the same conduit shall be different colors, and shall be consistent throughout the project. The colors shall be yellow for the 48SMFO fiber optic cables used for video/data and contrasting colors approved by the Engineer for the 12SMFO and 48SMFO for short haul video/voice and data/voice. The exterior of the innerduct shall be marked with sequential measurement markings each meter.

Innerduct shall be installed using the manufacturers recommended practices. A manufacturer recommended lubricant should be applied between the innerduct and the conduit during installation to reduce friction. Innerduct shall be installed using a cable pulling lubricant recommended by the innerduct manufacture and a non-abrasive pull tape conforming to the provisions described under "Conduit" elsewhere in these special provisions. If innerduct is to be installed with adjacent cables in the same conduit, the innerduct and the cable shall be installed together in one operation. Innerduct shall be installed in continuous runs between communication pull boxes and splice vaults without splices or joints.

All ends shall be smoothed to prevent scraping of the cable. A dynamometer shall be used to record installation tension and a tension-limiting device shall be used to prevent exceeding the maximum pulling tension during installation. A breakaway device shall be used to limit the pulling tension. One device shall be placed in series with every element rated for less than the maximum pulling tension of that element. The innerduct shall not be stressed beyond the minimum-bending radius allowed by either the innerduct or fiber optic cable manufacturer.

The tension shall be set to the manufacturer's maximum limit. The maximum pulling tension shall be recorded for each innerduct run.

Immediately prior to installing cables, innerduct shall be blown out with compressed air until all foreign material is removed. After cables have been installed, the ends of innerducts shall be sealed with an approved type of sealing compound.

10-3.11 PULL BOXES

Grout shall not be placed in the bottom of pull boxes.

Additional pull boxes shall not be installed without the Engineer's written approval. All communication pull boxes outside of the structures shall be installed in the unpaved area immediately adjacent to the paved shoulder, or behind guardrail, or to be determined by the Engineer. Communication conduit shall be directed from the shoulder to the boxes with 15-degree (maximum) sweeps. Dikes shall be replaced in kind, as necessary.

Full compensation for replacing the dikes shall be considered as included in the contract unit price paid for the various sizes and types of pull boxes involved and no separate payment will be made therefor.

COMMUNICATION PULL BOXES

Communication pull boxes and covers shall have a vertical proof-load strength of 111 kN. The 111 kN load shall be distributed through a 229-mm x 229-mm x 51-mm steel plate according to Federal Specification RR-F-621e. This load shall be placed anywhere on the box and cover for a period of one minute without causing any cracks or permanent deformations.

The communication pull boxes shall be reinforced with a galvanized Z-bar welded frame and cover similar to that shown on the plans for No. 6(T) boxes. Frames shall be anchored to the boxes by means of 6-mm x 57-mm long concrete anchors. Six concrete anchors shall be provided for each communication pull box, one placed in each corner and one placed near the middle of each of the longer sides.

Hold down screws shall be 9-mm hex flange cap screws of Type 316 stainless steel. The nut shall be zinc plated carbon steel and shall be made vibration resistant with a wedge ramp at the root of the thread. The nut shall be spot welded to the underside of, or fabricated with, the galvanized Z-bar pull box frame.

Steel covers shall be countersunk approximately 6-mm to accommodate the bolt head. The bolt head shall not extend more than 3-mm above the top of the cover when tightened down. A 6 -mm tapped hole and brass-bonding screw shall be provided.

Communication pull boxes shall have " CALTRANS COMMUNICATION" marking on the steel cover.

The opening of communication pull boxes shall have the following dimensions.

Pull Box Type	Width (±25 mm)	Length (±25 mm)
Communication	432 mm	762 mm

Concrete placed around and under communication pull boxes as shown on the plans shall contain a minimum of 325 kg of cement per cubic meter.

After the installation of communication pull boxes, the steel covers shall be installed and kept bolted down during periods when work is not actively in progress at the pull box. When placing the steel cover for the final time, the cover and the Z-bar frame shall be cleaned of all debris and securely tightened down.

Communication pull boxes shown on the plans in the shoulder are shown for general location only. The exact location shall be outside the paved shoulder and shall be determined by the Engineer.

Communication pull boxes will be measured as units determined from actual count in place. Communication pull boxes to be paid for, as units shall be those units designated on the plans or ordered by the Engineer. Additional communication pull boxes shall not be installed without the Engineer written approval.

SPLICE VAULT

Splice vault shall be 1520 mm (L) x 760 mm (W) x 760 mm (D) nominal inside dimensions and shall conform to Section 86-2.06, "Pull Boxes," of the Standard Specifications. Covers shall be in one or two sections. Hold down bolts or cap screws and nuts shall be of brass, stainless steel, or other non-corroding metal material. Each cover portion shall have inset lifting pull slots. Cover marking shall be "CALTRANS COMMUNICATION" on each cover section. Enclosures, covers, and extensions shall be concrete gray color. Vault and covers may be constructed of reinforced Portland cement concrete or of non-PCC material.

Non-PCC vault and covers shall be of sufficient rigidity that when a 445 N concentrated force is applied perpendicularly to the midpoint of one of the long sides at the top, while the opposite long side is supported by a rigid surface, it shall be possible to remove the cover without the use of tools. When a vertical force of 6675 N is applied, through a 13-mm by 75-mm by 150-mm steel plate, to a non-PCC cover in place on a splice vault, the cover shall not fail and shall not deflect more than 6-mm.

Splice vault shall be installed as detailed and where shown on the plans. Splice vault and cover shall have an AASHTO HS 20-44 rating where shown on the plans, except in the area protected from vehicular traffic, as directed by the Engineer, may be rated for AASHTO H5 loads (25 percent of HS 20-44):

a. Behind structures, retaining walls, barrier railing, or guard railing.
b. In other areas protected from vehicular traffic as directed by the Engineer.

Splice vault shall be installed 24-mm above grade in unpaved area.

Splice vaults shown on the plans in the shoulder are shown for general location only, exact location shall be directed by the Engineer.

Metallic or non-metallic cable racks shall be installed on the interior of both sides of the splice vault. The rack shall be capable of supporting a load of 445 N, minimum, per rack arm. Racks shall be supplied in lengths appropriate to the box in which they will be placed. Rack arms shall not be less than 150 mm in length. All metallic cable racks shall be fabricated from ASTM Designation: A36 steel plate and shall be hot-dip galvanized after fabrication. Steel plate, hardware, and galvanizing shall be in accordance with the requirements of Section 75, "Miscellaneous Metal," of the Standard Specifications. Metallic cable racks shall be bonded and grounded.

10-3.12 CONDUCTORS AND WIRING

Splices shall be insulated by "Method B".

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.

Fiber optic cables are provided for elsewhere in these special provisions.

10-3.13 FIBER OPTIC CABLE

Fiber optic cable shall conform to the details shown on the plans and these special provisions.

DEFINITIONS

The following definitions shall apply to these special provisions:

A. Active Component Link Loss Budget.—The active component link loss budget is the difference between the average transmitter launch power (in dBm) and the receiver maximum sensitivity (in dBm).
B. Backbone.—Fiber cable that provides connections between the TMC and hubs, as well as between equipment rooms or buildings, and between hubs. The term is used interchangeably with "trunk" cable.
C. Connector.—A mechanical device used to align and join two fibers together to provide a means for attaching to and decoupling from a transmitter, receiver, or another fiber (patch panel).
D. Connectorized.--The termination point of a fiber after connectors have been affixed.
E. Connector Module Housing (CMH).--A patch panel used to terminate singlemode fibers with most common connector types. It may include a jumper storage shelf and a hinged door.
F. Couplers.--Devices which mate fiber optic connectors to facilitate the transition of optical light signals from one connector into another. They are normally located within FDUs, mounted in panels. They may also be used unmounted, to join two simplex fiber runs.
G. Distribution Cable.--Fiber cable that provides connections between hubs. Drop cables are typically spliced into a distribution cable.
H. Drop Cable.--Fiber cable that provides connections between a distribution cable to a field element. Typically these run from a splice vault to a splice tray within a field cabinet. Drop cables are usually short in length (less than 20m) and are of the same construction as outside plant cable. The term “breakout cable” is used interchangeably with drop cable.
I. End-to-End Loss.--The maximum permissible end-to-end system attenuation is the total loss in a given link. This loss could be the actual measured loss, or calculated using typical (or specified) values. A designer should use typical values to calculate the end-to-end loss for a proposed link. This number will determine the amount of optical power (in dB) needed to meet the System Performance Margin.
J. Fan Out Termination.--Permits the branching of fibers contained in an optical cable into individual cables and can be done at field locations; thus, allowing the cables to be connectorized or terminated per system requirements. A kit provides pullout protection for individual bare fibers to support termination. It provides three layers of protection consisting of a Teflon inner tube, a dielectric strength member, and an outer protective PVC jacket. Fan out terminations shall not be used for more than 6 fibers. Using a patch panel would be appropriate.
K. Fiber Distribution Frame (FDF).--A rack mounted system that is usually installed in hubs or the Transportation Management Center (TMC), that may consist of a standard equipment rack, fiber routing guides, horizontal jumper

troughs and Fiber Distribution Units (FDU). The FDF serves as the termination and interconnection of passive fiber optic components from cable breakout, for connection by jumpers, to the equipment.

L. Fiber Distribution Unit (FDU).--An enclosure or rack mountable unit containing both a patch panel with couplers and splice tray(s). The unit's patch panel and splice trays may be integrated or separated by a partition.
M. F/O.--Fiber optic.
N. FOIP.--Fiber optic inside plant cable.
O. FOOP.--Fiber optic outside plant cable.
P. FOTP.--Fiber optic test procedure(s) as defined by TIA/EIA standards.
Q. Jumper.--A short cable, typically one meter or less, with connectors on each end, used to join two CMH couplers or a CMH to active electronic components.
R. Light Source.--Portable fiber optic test equipment that, when coupled with a power meter, is used to perform end-to-end attenuation testing. It contains a stabilized light source operating at the wavelength of the system under test.
S. Link.--A passive section of the system, the ends of which are connectorized. A link may include splices and couplers. For example, a video link may be from a F/O transmitter to a video multiplexer (VMX).
T. Loose Tube Cable.--Type of cable construction in which fibers are placed in buffer tubes to isolate them from outside forces (stress). A flooding compound or material is applied to the interstitial cable core to prevent water migration and penetration. This type of cable is primarily for outdoor applications.
U. Mid-span Access Method.--Description of a procedure in which fibers from a single buffer tube are accessed and spliced to an adjoining cable without cutting the unused fibers in the buffer tube, or disturbing the remaining buffer tubes in the cable.
V. MMFO.--Multimode Fiber Optic Cable.
W. Optical Time Domain Reflectometer (OTDR).--Fiber optic test equipment similar in appearance to an oscilloscope that is used to measure the total amount of power loss in a F/O cable between two points. It provides a visual and printed display of the losses associated with system components such as fiber, splices, and connectors.
X. Optical Attenuator.--An optical element that reduces the intensity of a signal passing through it.
Y. Patchcord.--A term used interchangeably with "jumper".
Z. Patch Panel.--A precision drilled metal frame containing couplers used to mate two fiber optic connectors.
AA. Pigtail.--A short optical fiber permanently attached to a source, detector, or other fiber optic device.
AB. Power Meter.--Portable fiber optic test equipment that, when coupled with a light source, is used to perform end-to-end attenuation testing. It contains a detector that is sensitive to light at the designed wavelength of the system under test. Its display indicates the amount of optical power being received at the end of the link.
AC. Riser Cable.--NEC approved cable installed in a riser (a vertical shaft in a building connecting floors).
AD. Segment.--A section of F/O cable that is not connected to any active device and may or may not have splices per the design.
AE. SMFO.--Singlemode Fiber Optic Cable.
AF. Splice.--The permanent joining of two fiber ends using a fusion splicer.
AG. Splice Closure.--A environmentally sealed container used to organize and protect splice trays. The container allows splitting or routing of fiber cables from multiple locations. Normally installed in a splice vault.
AH. Splice Module Housing (SMH).--A unit that stores splice trays as well as pigtails and short cable lengths. The unit allows splitting or routing of fiber cables to or from multiple locations.
AI. Splice Tray.--A container used to organize and protect spliced fibers.
AJ. Splice Vault.--An underground container used to house excess cable and splice closures.
AK. System Performance Margin.--A calculation of the overall "End to End" permissible attenuation from the fiber optic transmitter (source) to the fiber optic receiver (detector). The system performance margin should be at least 6 dB. This includes the difference between the active component link loss budget, the passive cable attenuation (total fiber loss), and the total connector/splice loss.
AL. Tight Buffered, Non-Breakout Cable (Tight Buffer Cable).--Type of cable construction where each glass fiber is tightly buffered (directly coated) with a protective thermoplastic coating to 900 µm (compared to 250 µm for loose tube fibers).

FIBER OPTIC OUTSIDE PLANT CABLE

General

Each fiber optic outside plant cable (FOOP) for this project shall be all dielectric, gel filled or water-blocking material, duct type, with loose buffer tubes and shall conform to these special provisions. Cables with singlemode fibers shall contain singlemode (SM) dual-window (1310 nm and 1550 nm) fibers. The optical fibers shall be contained within loose buffer

tubes. The loose buffer tubes shall be stranded around an all dielectric central member. Aramid yarn or fiberglass shall be used as a primary strength member, and a polyethylene outside jacket shall provide for overall protection.

All fiber optic (F/O) cable on this project shall be from the same manufacturer, who is regularly engaged in the production of this material.

The cable shall be qualified as compliant with RUS Federal Rule 7NTR1755.900.

CABLE TYPE	DESCRIPTION
A	12SMFO
B	48SMFO

Fiber Characteristics

Each optical fiber shall be glass and consist of a doped silica core surrounded by concentric silica cladding. All fibers in the buffer tube shall be usable fibers, and shall be sufficiently free of surface imperfections and occlusions to meet the optical, mechanical, and environmental requirements of these specifications. The required fiber grade shall reflect the maximum individual fiber attenuation, to guarantee the required performance of each and every fiber in the cable.

The coating shall be a dual layered, UV cured acrylate. The coating shall be mechanically or chemically strippable without damaging the fiber.

The cable shall comply with the optical and mechanical requirements over an operating temperature range of -40°C to +70°C. The cable shall be tested in accordance with EIA-455-3A (FOTP-3), "Procedure to Measure Temperature Cycling Effects on Optical Fiber, Optical Cable, and Other Passive Fiber Optic Components." The change in attenuation at extreme operational temperatures (-40°C to +70°C) for singlemode fiber shall not be greater than 0.20 dB/km, with 80 percent of the measured values no greater than 0.10 dB/km. The singlemode fiber measurement is made at 1550 nm.

For all fibers the attenuation specification shall be a maximum attenuation for each fiber over the entire operating temperature range of the cable.

Singlemode fibers within the finished cable shall meet the requirements in the following table:

Fiber Characteristics Table		
Parameters		Singlemode
Type		Step Index
Core diameter		8.3 µm (nominal)
Cladding diameter		125 µm ±1.0 µm
Core to Cladding Offset		≤0.8 µm
Coating Diameter		250 µm ±15 µm
Cladding Non-circularity defined as: [1-(min. cladding dia ÷max. cladding dia.)] x 100		≤1.0%
Proof/Tensile Test		345 Mpa, min.
Attenuation: (-40(C to +70(C) @850 nm @1300 nm (MM)/1310 nm (SM) @1550 nm		 N/A ≤0.4 dB/km ≤0.3 dB/km
Attenuation at the Water Peak		≤2.1 dB/km @ 1383 ±3 nm
Bandwidth:		
@ 850 nm		N/A
@1,300 nm (MM)/1310 nm (SM)		N/A
Chromatic Dispersion: Zero Dispersion Wavelength Zero Dispersion Slope		 1301.5 to 1321.5 nm ≤0.092 ps/(nm2*km)
Maximum Dispersion:		≤3.3 ps/(nm*km) for 1285 – 1330 nm <18 ps/(nm*km) for 1550 nm
Cut-Off Wavelength		<1260 nm
Numerical Aperture (measured in Accordance with EIA-455-47)		N/A
Mode Field Diameter (Petermann II)		9.3 ±0.5 µm at 1310 nm 10.5 ±1.0 µm at 1550 nm

Color Coding

In buffer tubes containing multiple fibers, each fiber shall be distinguishable from others in the same tube by means of color-coding according to the following:

1. Blue (BL)
2. Orange (OR)
3. Green (GR)
4. Brown (BR)
5. Slate (SL)
6. White (WT)
7. Red (RD)
8. Black (BK)
9. Yellow (YL)
10. Violet (VL)
11. Rose (RS)
12. Aqua (AQ)

Buffer tubes containing fibers shall also be color-coded with distinct and recognizable colors according to the same table listed above for fibers.

These colors shall be targeted in accordance with the Munsell color shades and shall meet EIA/TIA-598 "Color Coding of Fiber Optic Cables."

The color formulation shall be compatible with the fiber coating and the buffer tube filling compound, and be heat stable. It shall not fade or smear or be susceptible to migration and it shall not affect the transmission characteristics of the optical fibers and shall not cause fibers to stick together.

Cable Construction

The fiber optic cable shall consist of, but not be limited to, the following components:

1. Buffer tubes

2. Central member
3. Filler rods
4. Stranding
5. Core and cable flooding
6. Tensile strength member
7. Ripcord
8. Outer jacket

1. Buffer Tubes

Clearance shall be provided in the loose buffer tubes between the fibers and the inside of the tube to allow for expansion without constraining the fiber. The fibers shall be loose or suspended within the tubes. The fibers shall not adhere to the inside of the buffer tube. Each buffer tube shall contain a maximum of 12 fibers. SM fibers shall not be mixed within the same buffer tube.

The loose buffer tubes shall be extruded from a material having a coefficient of friction sufficiently low to allow free movement of the fibers. The material shall be tough and abrasion resistant to provide mechanical and environmental protection of the fibers, yet designed to permit safe intentional "scoring" and breakout, without damaging or degrading the internal fibers.

Buffer tube filling compound shall be a homogeneous hydrocarbon-based gel with anti-oxidant additives and used to prevent water intrusion and migration. The filling compound shall be non-toxic and dermatologically safe to exposed skin. It shall be chemically and mechanically compatible with all cable components, non-nutritive to fungus, non-hygroscopic and electrically non-conductive. The filling compound shall be free from dirt and foreign matter and shall be readily removable with conventional nontoxic solvents.

Buffer tubes shall be stranded around a central member by a method, such as the reverse oscillation stranding process, that will prevent stress on the fibers when the cable jacket is placed under strain.

2. Central Member

The central member which functions as an anti-buckling element shall be a glass reinforced plastic rod with similar expansion and contraction characteristics as the optical fibers and buffer tubes. To ensure the proper spacing between buffer tubes during stranding, a symmetrical linear overcoat of polyethylene may be applied to the central member to achieve the optimum diameter.

3. Filler Rods

Fillers may be included in the cable to maintain the symmetry of the cable cross-section. Filler rods shall be solid medium or high-density polyethylene. The diameter of filler rods shall be the same as the outer diameter of the buffer tubes.

4. Stranding

Completed buffer tubes shall be stranded around the overcoated central member using stranding methods, lay lengths and positioning such that the cable shall meet mechanical, environmental and performance specifications. A polyester binding shall be applied over the stranded buffer tubes to hold them in place. Binders shall be applied with sufficient tension to secure the buffer tubes to the central member without crushing the buffer tubes. The binders shall be non-hygroscopic, non-wicking (or rendered so by the flooding compound), and dielectric with low shrinkage.

5. Core and Cable Flooding

The cable core interstices shall contain a water blocking material, to prevent water ingress and migration. The water blocking material shall be either a polyolefin based compound which fills the cable core interstices, or an absorbent polymer, which fills voids and swells to block the ingress of water. The flooding compound or material shall be homogeneous, non-hygroscopic, electrically non-conductive, and non-nutritive to fungus. The compound or material shall also be nontoxic, dermatologically safe, and compatible with all other cable components.

6. Tensile Strength Member

Tensile strength shall be provided by high tensile strength aramid yarns and fiberglass which shall be helically stranded evenly around the cable core and shall not adhere to other cable components.

7. Ripcord

The cable shall contain at least one ripcord under the jacket for easy sheath removal.

8. Outer Jacket

The jacket shall be free of holes, splits, and blisters and shall be medium or high-density polyethylene (PE), or medium density cross-linked polyethylene with minimum nominal jacket thickness of 1 mm ± 0.076 mm. Jacketing material shall be applied directly over the tensile strength members and water blocking material and shall not adhere to the aramid strength material. The polyethylene shall contain carbon black to provide ultraviolet light protection and shall not promote the growth of fungus.

The jacket or sheath shall be marked with the manufacturer's name, the words "Optical Cable", the number of fibers, "SM", as applicable, year of manufacture, and sequential measurement markings every meter. The actual length of the cable shall be within -0/+1 percent of the length marking. The marking shall be in a contrasting color to the cable jacket. The height of the marking shall be 2.5 mm ±0.2 mm.

General Cable Performance Specifications

The F/O cable shall withstand water penetration when tested with a one meter static head or equivalent continuous pressure applied at one end of a one meter length of filled cable for one hour. No water shall leak through the open cable end. Testing shall be done in accordance with EIA-455-82 (FOTP-82), "Fluid Penetration Test for Fluid-Blocked Fiber Optic Cable."

A representative sample of cable shall be tested in accordance with EIA/TIA-455-81 (FOTP-81), "Compound Flow (Drip) Test for Filled Fiber Optic Cable". No preconditioning period shall be conducted. The cable shall exhibit no flow (drip or leak) at 70 80°C as defined in the test method.

Crush resistance of the finished F/O cables shall be 220 N/mm applied uniformly over the length of the cable without showing evidence of cracking or splitting when tested in accordance with EIA-455-41 (FOTP-41), "Compressive Loading Resistance of Fiber Optic Cables". The average increase in attenuation for the fibers shall be ≤0.10 dB at 1550 nm (singlemode) for a cable subjected to this load. The cable shall not exhibit any measurable increase in attenuation after removal of load. Testing shall be in accordance with EIA-455-41 (FOTP-41), except that the load shall be applied at the rate of 3 mm to 20 mm per minute and maintained for 10 minutes.

The cable shall withstand 25 cycles of mechanical flexing at a rate of 30 ±1 cycles/minute. The average increase in attenuation for the fibers shall be ≤0.20 dB at 1550 nm (singlemode) at the completion of the test. Outer cable jacket cracking or splitting observed under 10x magnification shall constitute failure. The test shall be conducted in accordance with EIA-455-104 (FOTP-104), "Fiber Optic Cable Cyclic Flexing Test," with the sheave diameter a maximum of 20 times the outside diameter of the cable. The cable shall be tested in accordance with Test Conditions I and II of (FOTP-104).

The cable shall withstand 20 impact cycles, with a total impact energy of 5.9 N•m. Impact testing shall be conducted in accordance with TIA/EIA-455-25B (FOTP-25) "Impact Testing of Fiber Optic Cables and Cable Assemblies." The average increase in attenuation for the fibers shall be <0.20 dB at 1550 nm for singlemode fiber. The cable shall not exhibit evidence of cracking or splitting.

The finished cable shall withstand a tensile load of 2700 N without exhibiting an average increase in attenuation of greater than 0.20 dB (singlemode). The test shall be conducted in accordance with EIA-455-33 (FOTP-33), "Fiber Optic Cable Tensile Loading and Bending Test." The load shall be applied for one-half hour in Test Condition II of the EIA-455-33 (FOTP-33) procedure.

Packaging and Shipping Requirements

Documentation of compliance to the required specifications shall be provided to the Engineer prior to ordering the material.

Attention is directed to "Fiber Optic Testing," elsewhere in these special provisions.

The completed cable shall be packaged for shipment on reels. The cable shall be wrapped in weather and temperature resistant covering. Both ends of the cable shall be sealed to prevent the ingress of moisture.

Each end of the cable shall be securely fastened to the reel to prevent the cable from coming loose during transit. Four m of cable length on each end of the cable shall be accessible for testing.

Each cable reel shall have a durable weatherproof label or tag showing the manufacturer's name, the cable type, the actual length of cable on the reel, the Contractor's name, the contract number, and the reel number. A shipping record shall also be included in a weatherproof envelope showing the above information and also include the date of manufacture, cable characteristics (size, attenuation, bandwidth, etc.), factory test results, cable identification number and any other pertinent information.

The minimum hub diameter of the reel shall be at least thirty times the diameter of the cable. The F/O cable shall be in one continuous length per reel with no factory splices in the fiber. Each reel shall be marked to indicate the direction the reel should be rolled to prevent loosening of the cable.

Installation procedures and technical support information shall be furnished at the time of delivery.

LABELING

General

The Contractor shall label all fiber optic cabling in a permanent consistent manner. All tags shall be of a material designed for long term permanent labeling of fiber optic cables and shall be marked with permanent ink on non-metal types, or embossed lettering on metal tags. Metal tags shall be constructed of stainless steel. Non-metal label materials shall be approved by the Engineer. Labels shall be affixed to the cable per the manufacturer's recommendations and shall not be affixed in a manner, which will cause damage to the fiber. Handwritten labels shall not be allowed.

Label Identification

1. Labeling of Cables

Labeling of the backbone, distribution and drop fiber optic cables shall conform to the following unique identification code elements:

UNIQUE IDENTIFICATION CODE ELEMENTS For Backbone, Distribution or Drop Cables		
DESCRIPTION	CODE	NUMBER OF CHARACTERS
District	District number	2
Cable Type	Fiber: S: Singlemode	1
Cable fiber (or copper pairs) Count	Number of fibers or conductor pairs (Examples: 144 fibers; or 100 TWP)	3
Route Number	Hwy. Rte (Example: 005)	3
Begin Function	T: TMC; H: HUB; V: Video Node; D: Data Node; C: Cable Node; M: CCTV Camera; N: CMS; P: Traffic Signal; Z: Ramp Meter; U: Traffic Monitoring/Count Station/Vehicle Count Station (VDS, TOS); S: Splice Vault	1
Begin Function Number	Unique ID number corresponds to Begin Function (Example: H02 [Hub 02])	2
End Function	T: TMC; H: HUB; V: Video Node; D: Data Node; C: Cable Node; M: CCTV Camera; N: CMS; P: Traffic Signal; Z: Ramp Meter; U: Traffic Monitoring/Count Station; S: Splice Vault	1
End Function Number	Unique ID number corresponds to Begin Function (Example: H03 [Hub 03])	2
Unique Identifier	XX: If two or more cables of the same count are in the same run	2
TOTAL		17

Each cable shall display one unique identification, regardless of where the cable is viewed. The begin function and end function correspond to the end points of each cable. The order of the begin and end function follow a hierarchy as listed below, where the lowest number corresponding to the begin/end function is listed first.

List of Hierarchy										
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
TMC	HUB	Video Node (VN)	Data Node (DN)	Cable Node	CCTV Camera	CMS	Traffic Signal	Ramp Meter	Traffic Monitoring/ Count Station	Splice Vault

This scheme will work as follows: A cable between the TMC and a HUB will always have the TMC listed as the start function and the HUB as the end function. Between a CMS and a Splice Vault, the start function will always be listed as the CMS, and so on. If a cable is connected between HUBs, for example HUB-01 and HUB-03, the lowest number, in this case HUB-01, will be listed as the start function and HUB-03 as the end function.

A. Example 1: 08S060010H02H0302

This cable is located in District 8, identified as a singlemode fiber optic cable containing 60 fibers, installed along highway Route 10, beginning in Hub 2, and ending in Hub 3, with unique ID of number 2. The implication for the unique ID is that there may be another 60 fiber optic cable between those hubs. This is an example for a backbone cable.

B. Example 2: 11S048008H01S04

This cable is located in District 11, identified as a singlemode fiber optic cable containing 48 fibers, installed along highway Route 8, beginning in Hub 1, and ending in Splice Vault 04. In this case, no additional digits are necessary for a unique ID. This is an example for a distribution cable.

C. Example 3: 11S006163N03S04

This cable is located in District 11, identified as a singlemode fiber optic cable containing 6 fibers, installed along highway Route 163, beginning at CMS-03, and ending in Splice Vault 04. In this case, no additional digits are necessary for a unique ID. This is an example for a drop cable.

2. Labeling of Jumpers and Pigtails

Labeling of the jumpers and pigtails shall conform to the following unique identification code elements:

UNIQUE IDENTIFICATION CODE ELEMENTS for JUMPERS (active component to FDU) and PIGTAILS (to connector # on patch panel)		
DESCRIPTION	CODE	NUMBER OF CHARACTERS
Hub Identifier	Hub, TMC , VN or DN ID Numbers or Alphanumeric or both	2
From (Source) Device	MU: Multiplexer FD: FDU (Fiber Distribution Unit) RP: Repeater	2
From (Source) Device Identifier	Numbers or Alphanumeric or both	2
Transmitter or Receiver	T or R	1
To (Destination) Device	MU: Multiplexer FD: FDU (Fiber Distribution Unit) RP: Repeater	2
To (Destination) Device Identifier	Numbers or Alphanumeric or both	2
Connector Identifier	Connector ID	2
TOTAL		13

A. Example 1: 01MU01TFD0203.

This pigtail is located in Hub 1, from multiplexer 01, transmitting to FDU 02 to patch panel position (connector) 03.

B. Example 2: 02MUA1TFD0B08.

This jumper is located in Hub 2, from multiplexer A1, transmitting to FDU B, to patch panel position (connector) 08.

Label Placement

1. Cables

All cables shall be clearly labeled with the unique identification code element method described elsewhere in these special provisions, at all terminations, even if no connections or splices are made, and at all splice vault entrance and exit points.

2. Cable to Cable Splices

All cable jackets entering the splice closure shall be labeled in accordance with the identification method described elsewhere in these special provisions.

3. Cable to Fiber Distribution Units

The cable jackets shall be clearly labeled at entry to the FDU in accordance with the unique identification code element method described elsewhere in these special provisions. In addition, each fiber shall be labeled with the Fiber ID and pigtails shall be labeled at the connector with the Fiber ID. The FDU shall be clearly labeled with the Cable ID on the face of the FDU. If multiple cables are connected to the FDU, each block of connectors relating to each individual cable shall be clearly identified by a single label with the Cable ID. Individual connections shall be clearly marked on the face of the FDU in the designated area with the Fiber ID.

4. Fiber

Fiber labels shall be placed next to the connectors of the individual fibers.

5. Patch Panels

The cable jackets shall be clearly labeled at entry to the Patch Panel in accordance with the unique identification code element method described elsewhere in these special provisions. In addition, each fiber shall be labeled with the Fiber ID and pigtails shall be labeled at the connector with the Fiber ID. The Patch panel shall be clearly labeled with the Cable ID on the face of the Panel. If multiple cables are connected to the Patch Panel, each block of connectors relating to each individual cable shall be clearly identified by a single label with the Cable ID. Individual connections shall be clearly marked on the face of the Panel in the designated area with the Fiber ID.

6. Jumpers

Equipment to FDU jumpers shall be labeled as to the equipment type connected and shall be labeled at both ends. FDU to FDU jumpers shall be labeled at each end in accordance with the unique identification code element method described elsewhere in these special provisions.

7. Pigtails

Pigtails shall be labeled at the connector in accordance with the unique identification code element method described elsewhere in these special provisions.

CABLE INSTALLATION

Installation procedures shall be in conformance with the procedures specified by the cable manufacturer for the specific cable being installed. The contractor shall submit the manufacturer's recommended procedures for pulling fiber optic cable at least 20 working days prior to installing cable. Mechanical aids may be used provided that a tension measuring device, and a break-away swivel are placed in tension to the end of the cable. The tension in the cable shall not exceed 2225 N, or the manufacturer's recommended pulling tension, whichever is less.

During cable installation, the bend radius shall be maintained at a minimum of twenty times the outside diameter. The cable grips for installing the fiber optic cable shall have a ball bearing swivel to prevent the cable from twisting during installation.

The F/O cable shall be installed using a cable pulling lubricant recommended by the F/O cable or the innerduct manufacturer, and a pull tape conforming to the provisions described under "conduit" elsewhere in these special provisions. Contractor's personnel shall be stationed at each splice vault and pull box through which the cable is to be pulled to lubricate and prevent kinking or other damage.

The F/O cable shall be installed without splices except where specifically allowed on the plans. If splice locations are not shown on the plans, splicing shall be limited to one cable splice every 6 km. Any midspan access splice or FDU termination shall involve only those fibers being spliced as shown on the plans. Cable splices shall be located in splice closures, installed in splice vaults shown on the plans. A minimum of 20 m of slack shall be provided for each F/O cable at each splice vault. Slack shall be divided equally on each side of the F/O splice closure.

Unless shown or provided otherwise, only F/O cable shall be installed in each innerduct. Pulling a separate F/O cable into a spare duct to replace damaged fiber will not be allowed.

At the Contractor's option, the fiber may be installed using the air blown method. If integral innerduct is used, the duct splice points or any temporary splices of innerduct used for installation must withstand a static air pressure of 758 kPa.

The fiber installation equipment must incorporate a mechanical drive unit or pusher, which feeds cable into the pressurized innerduct to provide a sufficient push force on the cable, which is coupled with the drag force created by the high-speed airflow. The unit must be equipped with controls to regulate the flow rate of compressed air entering the duct and any hydraulic or pneumatic pressure applied to the cable. It must accommodate longitudinally ribbed, or smooth wall ducts from nominal 16 mm to 51 mm inner diameter. Mid assist or cascading of equipment must be for the installation of long cable runs. The equipment must incorporate safety shutoff valves to disable the system in the event of sudden changes in pneumatic or hydraulic pressure.

The equipment must not require the use of a piston or any other air capturing device to impose a pulling force at the front end of the cable, which also significantly restricts the free flow of air through the inner duct. It must incorporate the use of a counting device to determine the speed of the cable during installation and the length of the cable installed.

SPLICING

Field splices shall be done either in splice vaults or cabinets as shown on the plans. All splices in splice vaults shall be done in splice trays, housed in splice closures. All splices in cabinets shall be done in splice trays housed in FDU's.

Unless otherwise specified, fiber splices shall be the fusion type. The mean splice loss shall not exceed 0.07 dB per splice. The mean splice loss shall be obtained by measuring the loss through the splice in both directions and then averaging the resultant values.

All splices shall be protected with a metal reinforced thermal shrink sleeve.

The mid-span access method shall be used to access the individual fibers in a cable for splicing to another cable as shown on the plans. Cable manufacturers recommended procedures and approved tools shall be used when performing a mid-span access. Only the fibers to be spliced may be cut. All measures shall be taken to avoid damaging buffer tubes and individual fibers not being used in the mid-span access.

The individual fibers shall be looped one full turn within the splice tray to avoid micro bending. A 45 mm minimum bend radius shall be maintained during installation and after final assembly in the optical fiber splice tray. Each bare fiber shall be individually restrained in a splice tray. The optical fibers in buffer tubes and the placement of the bare optical fibers in the splice tray shall be such that there is no discernable tensile force on the optical fiber.

The Contractor will be allowed to splice a total of 12 percent of all fibers to repair any damage done during mid-span access splicing without penalty. The Contractor shall be assessed a fine of $300.00 for each additional and unplanned splice. Any single fiber may not have more than 3 unplanned splices. If any fiber requires more than 3 unplanned splices, the entire length of F/O cable must be replaced at the Contractor's expense.

SPLICE CLOSURES

The F/O field splices shall be enclosed in splice closures, which shall be complete with splice organizer trays, brackets, clips, cable ties, seals and sealant, as needed. The splice closure shall be suitable for a direct burial or pull box application. Manufacturer's installation instructions shall be supplied to the Engineer prior to the installation of any splice closures. Location of the splice closures shall be where a splice is required as shown on the plans, designated by the Engineer, or described in these special provisions.

The splice closure shall conform to the following specifications:

A. Non-filled thermoplastic case
B. Rodent proof, water proof, re-enterable and moisture proof
C. Expandable from 2 cables per end to 8 cables per end by using adapter plates
D. Cable entry ports shall accommodate 10 mm to 25-mm diameter cables
E. Multiple grounding straps
F. Accommodate up to 8 splice trays
G. Suitable for "butt" or "through" cable entry configurations
H. Place no stress on finished splices within the splice trays

The splice closure shall be bolted to the side wall of the splice vault.

The Contractor shall verify the quality of each splice prior to sealing the splice closure. The splice closure shall not be sealed until link testing is performed and is approved by the Engineer.

SPLICE TRAYS

Splice trays must accommodate a minimum of 12 fusion splices and must allow for a minimum bend radius of 45 mm. Individual fibers must be looped one full turn within the splice tray to allow for future splicing. No stress is to be applied on the fiber when it is located in its final position. Buffer tubes must be secured near the entrance of the splice tray to reduce the chance that an inadvertent tug on the pigtail will damage the fiber. The splice tray cover may be transparent.

Splice trays in the splice closure shall conform to the following:

A. Accommodate up to 24 fusion splices
B. Place no stress on completed within the tray
C. Stackable with a snap-on hinge cover
D. Buffer tubes securable with channel straps
E. Accommodate a fusion splice with the addition of an alternative splice holder
F. Be labeled after splicing is completed.

Only one single splice tray may be secured by a bolt through the center of the tray in the fiber termination unit. Multiple trays must be securely held in place as per the manufacturer's recommendation.

PASSIVE CABLE ASSEMBLIES AND COMPONENTS

The F/O cable assemblies and components shall be compatible components, designed for the purpose intended, and manufactured by a company regularly engaged in the production of material for the fiber optic industry. All components or assemblies shall be best quality, non-corroding, with a design life of at least 20 years.

The cable assemblies and components manufacturer shall be ISO9001 registered.

FIBER OPTIC CABLE TERMINATIONS

Fiber Optic Cable Assemblies and Pigtails

1. Pigtails

Pigtails shall be of simplex (one fiber) construction, in 900-µm tight buffer form, surrounded by aramid for strength, with a PVC jacket with manufacturer identification information, and a nominal outer jacket diameter of 3 mm. Singlemode simplex cable jackets shall be yellow in color. All pigtails shall be factory terminated and tested and at least one meter in length.

2. Jumpers

Jumpers may be of simplex or duplex design. Duplex jumpers shall be of duplex round cable construction, and shall not have zipcord (siamese) construction. All jumpers shall be at least 2 m in length, sufficient to avoid stress and allow orderly routing.

The outer jacket of duplex jumpers shall be colored according to the singlemode color (yellow) specified above. The two inner simplex jackets shall be contrasting colors to provide easy visual identification for polarity.

3. Connectors

Connectors shall be of the ceramic ferrule ST type for SMFO. Indoor ST connector body housings shall be either nickel-plated zinc or glass reinforced polymer construction. Outdoor ST connector body housing shall be glass reinforced polymer.

The associated coupler shall be of the same material as the connector housing.

All F/O connectors shall be the 2.5-mm connector ferrule type with Zirconia Ceramic material with a PC (Physical Contact) pre-radiused tip.

The ST connector operating temperature range shall be -40°C to +70°C. Insertion loss shall not exceed 0.4 dB for singlemode, and the return reflection loss on singlemode connectors shall be at least -35 dB. Connection durability shall be less than a 0.2 dB change per 500 mating cycles per EIA-455-21A (FOTP-21). All terminations shall provide a minimum 222 N pull out strength. Factory test results shall be documented and submitted to the Engineer prior to installing any of the connectors. Singlemode connectors shall have a yellow color on the body or boot that renders them easily identifiable.

Field terminations shall be limited to splicing of adjoining cable ends or cables to ST pigtails.

All connectors shall be factory-installed and tested. There shall be no installation of connectors in the field.

All unmated connectors shall have protective caps installed.

Fiber Distribution Units

The Contractor shall furnish and install all components to terminate the incoming fiber optic communication cables.

The Contractor shall furnish and install various types of fiber distribution units (FDU) as shown on plans and as directed by the Engineer to make various field element locations fully operational:

FDU Type	Accomodates Termination of
A	12 SMFO fibers
B	48 SMFO fibers

The fiber distribution unit (FDU) shall include the following:

1. A patch panel to terminate the appropriate number of singlemode fibers with ST type connector feed through couplers.
2. Splice trays.
3. Storage for splice trays.
4. A slide out metal drawer for the storage of spare jumpers.

Strain relief shall be provided for the incoming fiber optic cable. Cable accesses shall have rubber grommets or similar material to prevent the cable from coming in contact with bear metal. All fibers shall be terminated and individually identified in the FDU and on the patch panel.

The patch panel shall be hinged or have coupler plates to provide easy access and maintenance. Brackets shall be provided to spool the incoming fiber a minimum of two turns, each turn shall not be less than 300 mm, before separating out individual fibers to the splice tray.

The FDU shall be 482 mm rack mountable.

The FDU shall not exceed 250 mm in height and 380 mm in depth.

FIBER OPTIC TESTING

General

Testing shall include the tests on elements of the passive fiber optic components: (1) at the factory, (2) after delivery to the project site but prior to installation, (3) after installation but prior to connection to any other portion of the system. The Contractor shall provide all personnel, equipment, instrumentation, and materials necessary to perform all testing. The Engineer shall be notified two working days prior to all field tests. The notification shall include the exact location or portion of the system to be tested.

Documentation of all test results shall be provided to the Engineer within 2 working days after the test involved.

A minimum of 15 working days prior to arrival of the cable at the site, the Contractor shall provide detailed test procedures for all field testing for the Engineer's review and approval. The procedures shall include the tests involved and how the tests are to be conducted. Included in the test procedures shall be the model, manufacturer, configuration, calibration, and alignment procedures for all proposed test equipment.

Factory Testing

Documentation of compliance with the fiber specifications as listed in the Fiber Characteristics Table shall be supplied by the original equipment manufacturer. Before shipment, but while on the shipping reel, 100 percent of all fibers shall be tested for attenuation. Copies of the results shall be (1) maintained on file by the manufacturer with a file identification number for a minimum of seven years, (2) attached to the cable reel in a waterproof pouch, and (3) submitted to the Contractor and to the Engineer.

Arrival On Site

The cable and reel shall be physically inspected on delivery and 100 percent of the fibers shall be attenuation tested to confirm that the cable meets requirements. The failure of any single fiber in the cable to comply with these special provisions, is cause for rejection of the entire reel. Test results shall be recorded, dated, compared, and filed with the copy accompanying the shipping reel in a weatherproof envelope. Attenuation deviations from the shipping records of greater than five percent shall be brought to the attention of the Engineer. The cable shall not be installed until completion of this test sequence and the Engineer provides written approval. Copies of traces and test results shall be submitted to the Engineer. If the test results are unsatisfactory, the reel of F/O cable shall be considered unacceptable and all records corresponding to that reel of cable shall be marked accordingly. The unsatisfactory reels of cable shall be replaced with new

reels of cable at the Contractor's expense. The new reels of cable shall then be tested to demonstrate acceptability. Copies of the test results shall be submitted to the Engineer.

After Cable Installation

Index matching gel shall not be allowed in connectors during testing. After the fiber optic cable has been pulled but before breakout and termination, 100 percent of all the fibers shall be tested with an OUTDOORS for attenuation. Test results shall be recorded, dated, compared, and filed with the previous copies of these tests. Copies of traces and test results shall be submitted to the Engineer. If the OTDR test results are unsatisfactory, the F/O cable segment of cable shall be unacceptable. The unsatisfactory segment of cable shall be replaced with a new segment, without additional splices, at the Contractor's expense. The new segment of cable then shall be tested to demonstrate acceptability. Copies of the test results shall be submitted to the Engineer.

System Cable Verification At Completion

1. Power Meter and Light Source

At the conclusion of the OTDR testing, 100 percent of the fiber links shall be tested end to end with a power meter and light source, in accordance with EIA Optical Test Procedure 171 and in the same wavelengths specified for the OTDR tests. These tests shall be conducted in one direction. As shown in Appendix A, the Insertion Loss (1C) shall be calculated. Test results shall be recorded, compared, and filed with the other recordings of the same links. Test results shall be submitted to the Engineer. These values shall be recorded in the Cable Verification Worksheet in Appendix A.

2. OTDR Testing

Once the passive cabling system has been installed and is ready for activation, 100 percent of the fibers shall be tested with the OTDR for attenuation at wavelengths of both 1310 nm and 1550 nm. OTDR testing shall be performed in both directions (bi-directional), on all fibers. Test results shall be generated from software of the test equipment, recorded, dated, compared, and filed with previous copies. A hard copy printout and an electronic copy on a DOS based 89-mm diskette of traces and test results shall be submitted to the Engineer. The average of the two losses shall be calculated, and recorded in the Cable Verification Worksheet in Appendix A. The OTDR shall be capable of recording and displaying anomalies of at least 0.02 dB. All connector losses must be displayed on the OTDR traces.

3. Cable Verification Worksheet

The Cable Verification Worksheet shown in Appendix A shall be completed for all links in the fiber optic system, using the data gathered during cable verification. The completed worksheets shall be included as part of the system documentation.

4. Test Failures

If the link loss, measured from the power meter and light source, exceeds the calculated link loss, or the actual location of the fiber ends does not agree with the expected location of the fiber ends (as would occur with a broken fiber), the fiber optic link will not be accepted. The unsatisfactory segments of cable, or splices shall be replaced with a new segment of cable or splice at the Contractor's expense. The OTDR testing, power meter and light source testing and Cable Verification Worksheet shall be completed for the repaired link to determine acceptability. Copies of the test results shall be submitted to the Engineer. The removal and replacement of a segment of cable shall be interpreted as the removal and replacement of a single contiguous length of cable connecting two splices and two connectors. The removal of a small section containing the failure, and therefore introducing new unplanned splices, will not be allowed.

Passive Component Package Testing and Documentation

All components in the passive component package (FDUs, pigtails, jumpers, couplers, and splice trays) shall be from a manufacturer who is ISO9001 registered.

In developing the passive component package, each connector termination (pigtail, or jumper) shall be tested for insertion attenuation loss using an optical power meter and source. In addition, all singlemode terminations shall be tested for return reflection loss. These values shall meet the loss requirements specified earlier and shall be recorded on a tag attached to the pigtail or jumper.

Once an assembly is complete, the manufacturer shall visually verify all tagging of loss values is complete. As a final quality control measure, the manufacturer shall do an "end to end" optical power meter/light source test from pigtail end to end to the terminating point assure continuity and overall attenuation loss valued.

The final test results shall be recorded, along with previous individual component values, on a special form assigned to each FDU. The completed form shall be dated and signed by the Manufacturer’s Quality Control supervisor. One copy of

this form will be attached in a plastic envelope to the assembled FDU unit. Copies will be provided separately to the Contractor and to the Engineer, and shall also be maintained on file by the manufacturer or supplier.

The assembled and completed FDU unit shall then be protectively packaged for shipment to the Contractor for installation.

Fiber Optic System Performance Margin Design Criteria

The installed system performance margin shall be at least 6 dB for every link. If the design system performance margin is less than 6 dB, the Engineer shall be notified and informed of the Contractor's plan to meet that requirement.

Active Component Testing

The transmitters and receivers shall be tested with a power meter and light source, to record the transmitter average output power (dBm) and receiver sensitivity (dBm). These values shall be recorded in the Fiber System Performance Margin Calculations Worksheet in Appendix B, section C, number 6.

APPENDIX A

Cable Verification Worksheet
End-to-End Attenuation (Power Meter and Light Source) Testing and OTDR Testing

Contract No. _____ Contractor: _____

Operator: _____ Date: _____

Link Number: _____ Fiber Number: _____

Test Wavelength (Circle one): 1310 nm 1550 nm

Expected Location of fiber ends: End 1: _____ End 2: _____

Power Meter and Light Source Test Results:

Power In:	_____ dBm	1A
Output Power:	_____ dBm	1B
Insertion Loss [1A - 1B]:	_____ dB	1C

OTDR Test Results:

Forward Loss:	_____ dB	2A
Reverse Loss:	_____ dB	2B
Average Loss [(2A + 2B)/2]:	_____ dB	2C

To Be Completed by Caltrans:
Resident Engineer's Signature: _____
Cable Link Accepted: _____

APPENDIX B
Fiber System Performance Margin Calculations Worksheet

A. Calculate the Passive Cable Attenuation

1. Calculate Fiber Loss at Operating Wavelength: _____ nm	Cable Distance (times) Individual Fiber Loss (equal) @ 1310 nm (0.4 dB/km) @ 1550 nm (0.3 dB/km)	_____ km x ___ dB/km =
	Total Fiber Loss:	_____ dB

B. Calculate the Total Connector/Splice Loss

2. Calculate Connectors/couplers Loss: (exclude Tx and Rx connectors)	Individual Connector Loss (times) Number of Connector Pairs (equal) **Total Connector Loss:**	0.4 dB x ____ = _____ dB
3. Calculate Splice Loss:	Individual Splice Loss (times) Number of Splices (equal) **Total Splice Loss:**	0.1 dB x ____ = _____ dB
4. Calculate Other Components Loss:	**Total Components:**	_____ dB
5. Calculate Total Losses:	Total Connector Loss (plus) Total Splice Loss (plus) Total Components (equal)	+ dB + dB + dB =
	Total Connector/Splice Loss:	_____ dB

C. Calculate Active Component Link Loss Budget

System Wavelength: Fiber Type: Average Transmitter Output (Launch Power):		_____ nm singlemode _____ dBm
Receiver MAX Sensitivity (10^9 BER) (minus) Receiver MIN Sensitivity (equal) **Receiver Dynamic Range:**		_____ dBm - _____ dBm = _____ dB
6. Calculate Active Component Link Loss Budget:	Average Transmitter Output (Launch Power) (minus) Receiver MAX Sensitivity (equal)	_____ dBm - _____ dBm =
	Active Component Link Loss Budget:	_____ dB

D. Verify Performance

7. Calculate System Performance Margin to Verify Adequate Power:	Active Component Link Loss Budget **[C]** (minus) Passive Cable Attenuation **[A]** (minus) Total Connector/Splice Lost **[B]** (equal)	_____ dB - _____ dB - _____ dB =
	System Performance Margin:	_____ dB

10-3.14 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.

10-3.15 SERVICE

Continuous welding of exterior seams in service equipment enclosures is not required.

Circuits with Model 500 changeable message signs shall have service equipment enclosures, which have main busses, and terminal lugs rated for 100 A, minimum, and a No. 2 bare copper ground wire.

Each service shall be provided with up to 2 main circuit breakers, which shall disconnect ungrounded service entrance conductors. Where the "Main" circuit breaker consists of 2 circuit breakers as shown on the plans or required in the special provisions, each of the circuit breakers shall have a minimum interrupting capacity of 10 000 A, rms.

An engraved phenolic nameplate shall be installed with stainless steel rivets on the exterior of the front panel indicating the identification number and the service address of the service cabinet enclosure. Character size shall be a minimum of 5 mm in height.

Service conduit between the serving utility owned power pole and service equipment enclosure shall not be installed until service location has been verified by the serving utility.

Where a new service is to be installed, the Contractor shall notify the Engineer in writing at least 5 working days prior to the date service is required.

Full compensation for Type III-BF service equipment enclosures shall be considered as included in the contract lump sum price paid for the items involved and no additional compensation will be allowed therefor.

10-3.16 STATE-FURNISHED TYPE 334 AND 334 CMS CONTROLLER ASSEMBLIES

The Model 170 controller assemblies, including controller unit, completely wired Type 334 and Type 334 CMS controller cabinets and inductive loop detector sensor units, but without anchor bolts, for traffic monitoring station and changeable message sign, will be State-furnished as provided under "Materials" of these special provisions and shall conform to the provisions in Section 86-3.03, "Model 170 and Model 2070 Controller Assemblies," of the Standard Specifications and these special provisions.

The Contractor shall construct each controller cabinet foundation as shown on the plans for Model 334 cabinets (including furnishing and installing anchor bolts), shall install the controller cabinet on the foundation, and shall make field wiring connections to the terminal blocks in the controller cabinet.

A listing of field conductor terminations, in each State-furnished controller cabinet, will be furnished free of charge to the Contractor at the site of the work.

State forces will maintain controller assemblies. The Contractor's responsibility for controller assemblies shall be limited to conforming to the provisions in Section 6-1.02, "State-Furnished Materials," of the Standard Specifications.

Foundations for Type 1 housing shall conform to the details on Standard Plan ES-3C for Type 334 and 334 CMS cabinets.

Full compensation for installation of State-furnished Type 334 and 334 CMS controller assemblies and foundations shall be considered as included in the contract price paid for the items involved and no additional compensation will be allowed therefor.

10-3.17 DETECTORS

Loop detector sensor units will be State-furnished in conformance with the provisions in "Materials" of these special provisions.

Loop detector lead-in cable shall be Type B.

Detector loops shall be Type E. For Type E detector loops, sides of the slot shall be vertical and the minimum radius of the slot entering and leaving the circular part of the loop shall be 40 mm. Slot width shall be a maximum of 20 mm. Loop wire for circular loops shall be Type 2. Depth of slots of circular loops shall be filled with elastomeric sealant or hot melt rubberized asphalt sealant not exceed the depth of pavement.

The depth of loop sealant above the top of the uppermost loop wire in the sawed slots shall be as shown on Standard plans.

10-3.18 MODEL 500 CHANGEABLE MESSAGE SIGN SYSTEM

Model 500 changeable message sign (CMS) systems consist of a Model 500 changeable message sign, a Type 334 CMS controller assembly in a completely wired Type 1 or similar cabinet and the required wiring and auxiliary equipment required to control the CMS shown on the plans and in conformance with these special provisions.

The Model 500 changeable message signs, wiring harness and Type 334 CMS controller assembly including controller unit and completely wired cabinet, but without anchor bolts, will be State-furnished in conformance with the provisions in "Materials" of these special provisions.

Attention is directed to "Sign Structures" of these special provisions.

The sign assembly shall be installed on the sign structure. The controller cabinet foundation shall be constructed as shown on the plans for Type 334 CMS cabinet (including furnishing and installing anchor bolts), the controller cabinet shall be installed on the foundation, and the field wiring connections shall be made to the terminal blocks in the sign assembly and in the controller cabinet.

Field conductors No. 12 and smaller shall terminate with spade terminals. Field conductors No. 10 and larger shall terminate in spade or ring terminals.

A listing of field conductor terminations, in each State-furnished changeable message sign and controller cabinet, will be furnished free of charge to the Contractor at the site of the work.

The exact location of the foundation for CMS controller cabinet will be determined by the Engineer.

State forces will maintain the sign assemblies. The Contractor's responsibility shall be limited to conformance with the provisions in Section 6-1.02, "State-Furnished Materials," of the Standard Specifications.

The Contractor shall arrange to have a signal technician, qualified to work on the CMS controller unit, present at the time the equipment is turned on, at the Contractor's own expenses.

Foundations for Type 1 housing shall conform to the details on Standard Plan ES-3C for Type 334 CMS cabinets.

Full compensation for installation of State-furnished CMS controller assembly and CMS control cables, foundation, and connecting wires shall be considered as included in the contract price paid for the items involved and no additional compensation will be allowed therefor.

10-3.19 CCTV AND COMMUNICATION EQUIPMENT

GENERAL

Closed Circuit Television and communication equipment consist of, but not limited to, various field element locations, such as, closed circuit television (CCTV) cameras, changeable message signs (CMS), and fiber optic video node, data nodes, cable nodes, ramp metering systems (RMS), traffic monitoring and control stations, and the existing North Hollywood (NHD) Hub building.

Prototype equipment is not acceptable. All equipment shall be current standard production units and shall have been in production for a minimum of six months. Rebuilt or reconditioned equipment will not be allowed.

All equipment racks shall be industrial grade and conform to EIA standard RS-310-D.

All rack mounted equipment and card cage assemblies shall have metal filler plates to cover any unused channel slots or card slots.

Before working on the existing communication equipment, the Contractor shall perform the jointly conducted pre-construction check with the Engineer according to “Maintaining Existing and Temporary Electrical Systems,” elsewhere in these special provisions, and shall submit a test plan, in accordance with manufacturer's specifications, for approval in advance by the Engineer, also as described elsewhere in these special provisions.

The test plan is also to verify that all existing communication equipment is functional before construction and to record the working condition of this equipment.

The Contractor may arrange, at his own expenses, to have a technician, qualified to work on existing and new communication equipment and employed by the communication equipment manufacturer, or his representative, present at the time the communication equipment is installed or modified.

Except for testing and verification of the condition of the existing communication equipment before and after the works on the existing communication equipment, the scope of the Contractor’s work shall be as shown on the plans.

CLOSED CIRCUIT TELEVISION CAMERA LOCATION

Closed circuit television (CCTV) camera at various locations shall consist of providing electrical service and installing Type 334-TV controller cabinet on new foundation, camera pole, sign truss mounts where required, CCTV wirings, CCTV camera assembly, camera control receiver (CCR), camera control circuits and accessories, connectors and coaxial cables, video transmitter (Vx), fiber optic data modem (FODM), fiber optic distribution unit (FDU), where required, and other required equipment, as shown on plans and as directed by the Engineer, to provide a fully functional location as shown on the plans.

The Closed circuit television (CCTV) Type 334-TV cabinet and control equipment shall consist of a Type 334-TV cabinet, video transmitter, camera control receiver, fiber optic data modem, and fiber optic distribution unit, as described elsewhere in these special provisions and plans.

After installation, all CCTV camera location equipment shall be tested at each individual site according to "System Testing and Documentation," as described elsewhere in these special provisions.

CLOSED CIRCUIT TELEVISION CAMERA POLE

Camera poles shall conform to the provisions in Section 86-2.04, "Standards, Steel Pedestals and Posts," of the Standard Specifications and these special provisions.

The CCTV camera pole shall be made from sheet steel, shall have a minimum yield of 331 MPa and shall be hot-dip galvanized after fabrication in accordance with the provisions in Section 75-1.05, "Galvanizing," of the Standard Specifications. The pole shall be fabricated to the dimensions and with all the accessories as shown in the plans.

The horizontal plane of the pan and tilt base plate shall be perpendicular to the vertical plane of the CCTV camera pole. The CCTV camera pole shall be erected plumb. The vertical axis of the erected CCTV camera pole shall be within 76 mm of the theoretical vertical axis when measured without the action of sunlight or wind.

SIGN TRUSS MOUNT

The Contractor shall provide camera pole and camera mounts on existing sign structure trusses at CCTV camera locations VE203 and VE213, as shown on the plans. Electrical work is provided for elsewhere in these special provisions.

The Contractor shall field verify all dimensions and shall provide shop drawings to the Engineer for approval prior to fabrication. The camera pole and camera mount shall be mechanically connected to the truss structure as shown on the plans. No field welding will be permitted. The mount shall have drilled holes provided to mount the pole, or manually adjust head, as shown on the plans.

The camera/housing assembly shall be mounted at the proper elevation and shall be set at the proper vertical and horizontal angles to provide a clear and unobstructed view of the freeway.

All mounting plates and brackets shall be fabricated from ASTM Designation: A36 steel plate and shall be hot-dip galvanized after fabrication. Steel plate, hardware and galvanizing shall be in accordance with the requirements of Section 75, "Miscellaneous Metal", of the Standard Specifications.

The truss mount shall be capable of supporting a CCTV camera assembly load of 91kgs.

Full compensation for installation of sign truss-mounted camera on existing sign structures shall be considered as included in the contract lump sum price paid for closed circuit television camera at the various locations involved and no separate payment will be made therefor.

CLOSED CIRCUIT TELEVISION WIRINGS

The CCTV wirings shall be installed between the camera assembly, and the camera control receiver, and shall consist of enclosed camera control cables. The CCTV wirings shall be compatible with the camera assembly and the camera control receiver.

CCTV wirings and connectors shall be configured to make the CCTV sub-system completely operational.

A bonding wire shall be provided between the junction box and the Type 334-TV cabinet.

All cables shall be:

Installed without damaging the conductors or insulation.
Installed without kinks.
Handled in accordance with manufacturer’s specifications and recommended bending radius.
Run continuously between terminations without splices.
Installed with sufficient slack for equipment movement.
Neatly tagged at both terminations to indicate source, destination, and function.

All cables, cable assemblies, and connectors shall meet all National Electrical Code standards with regards to voltage, current and environmental ratings. Specifications of all cables, cable assemblies, and connectors with strain relief backshells intended for use by the Contractor shall be submitted to the Engineer as part of the shop drawings for review and approval. The Contractor shall test the cables for continuity prior to and after installation. Cables shall be installed as shown on the plan sheet "Electrical Diagram for CCTV with Pan and Tilt Unit."

TYPE 334 -TV CONTROLLER CABINET

The Type 334-TV controller cabinet shall include a Type 334-TV, Model 170 controller cabinet, power distribution assembly, thermostatically controlled fan, door locks, EIA standard 482-mm equipment racks, all necessary mounting hardware and wiring, foundation and anchor bolts and other equipment as shown on the plans and specified in these special provisions.

The Contractor shall install a power distribution assembly at the bottom of the 482-mm equipment rack, inside the Type 334-TV controller cabinet in accordance with the plans. The power distribution assembly shall consist of the following: one 30 A, 120 or 240 V minimum, single pole main breaker; three 15 A, 120 V minimum, single pole secondary breakers; eight standard duplex 117 VAC receptacles; and one duplex, three prong, NEMA Type 5-15R grounded utility type outlet with ground fault interrupter. The power distribution assembly shall protect the electronic equipment powered by the assembly from power transients. Over voltage protection shall be provided for the power distribution assembly and shall contain as a minimum, a surge arrestor, which shall reduce the effect of power line voltage transients and be rated as follows:

Recurrent peak voltage	212 V
Energy rating (maximum)	50 J
Power dissipation, average	0.85 W
Peak current for pulses less than 6 µs	2,000 A
Standby current for 60 Hz sinusoidal	1 mA or less

The Contractor shall install a thermostatically controlled fan in the Type 334-TV controller cabinets. The fan shall provide shall provide 150 cfm of ventilation. The fan shall be activated when the temperature inside the cabinet exceeds 24°C and shut off when the temperature is less than 18°C. All vents shall be filtered.

The Contractor shall provide prime power to the cabinet and perform all internal wiring in accordance with these special provisions and plans.

The Contractor shall provide all necessary mounting hardware and wiring to install and commission the equipment in new controller cabinets as shown on the plans. The Contractor shall test all controller cabinet assemblies and demonstrate the correct function of all controls in the presence of the Engineer.

The Contractor shall construct each Type 334 controller cabinet foundation, as shown on the plans, including furnishing and installing anchor bolts, and shall make all fields wiring connections to the controller cabinet.

All cabinet assemblies shall be tested to demonstrate the correct function of all controls in the presence of the Engineer.

Full compensation for Type 334-TV controller cabinet shall be considered as included in the contract lump sum price paid for the items requiring Type 334-TV cabinets at various locations and no additional compensation will be allowed therefor.

CCTV CAMERA ASSEMBLY

The CCTV camera assembly shall consist of a Digital Signal Processing (DSP) Color video camera unit, camera lens, enclosed camera control cables, pan and tilt unit, connectors, and camera housing. The CCTV camera assembly shall be protected from brown outs and voltage spikes to 1000 V or brown outs.

The Contractor shall verify that the units work in accordance with manufacturer's specifications before installation. All CCTV camera assembly equipment shall also be tested after installation as described elsewhere in these special provisions.

CLOSED CIRCUIT TELEVISION DIGITAL SIGNAL PROCESSING COLOR VIDEO CAMERA UNIT

The CCTV digital signal processing color video camera shall operate reliably under a full range of environmental and lighting conditions and shall provide clear and usable images. All cameras supplied on this project shall be fully interchangeable and meet the following specifications.

All DSP color video cameras shall be of solid state design, and shall meet the following requirements:

Performance.--The following are the performance specifications for the camera:

Optical device	Color CD interline transfer
Optical device size	13 mm
Pixels	682 (horizon.) x 492 (vertical) min.
Horizontal resolution	430 television lines minimum
Minimum usable illumination	1 lx (measured with fl.4 lens)
Scanning system	525 lines 2:1 interlace. No interlace jitter or line pairing on the viewing monitor shall be discernible
Back focus adjustment	Required
Frame frequency	30 frames per second
Width to height aspect ratio	4:3.

The system shall be capable of providing clear, low-bloom and low-lag video pictures under all conditions from bright sunlight to nighttime scene illumination.

White Balance:

Auto: Color quality shall be maintained by a continuous through the lens automatic white balance system for color temperatures from 2850K to greater than 5100K with less than 10 IRE units unbalance.
Set: Allows user to set white as preferred. For instance, the camera could be focused on an Off White scene and Set to white balance. The camera will then automatically track color temperature changes, biasing the auto white balance on the Off White instead of the factory-defined white.
Lock: Locks the white balance at the current levels.
Indoor: Sets the White to be consistent with 3200K
Outdoor: Sets the White to be consistent with 5100K
Fluorescent: Sets the White to be consistent with Fluorescent Lighting.

Electrical Specifications.--The following are the electrical specifications for the camera:

Operating voltage	115 VA. @ 50/60 Hz. (±10%)
Heater Power Input Requirements:	115 VAC @ 50/60 Hz. (±10%)
Power Consumption:	7 W with Heater Off; 12 W with Heater On
Video output signal	Standard NTSC color TV
Motorized-Iris connector	Required
Gamma:	0.45
Sensitivity (3200K): Full Video, AGE off, iris @ f/1.6, shutter @ 1/60: 80% Video, AGE on:, Iris @ f/1.6, shutter @ 1/60 : 30% Video, AGE on, Iris @ f/1.6, shutter @ 1/60: 30% Video, AGE on, 1/4-second integration:	110 lux scene illumination (8.5 lux faceplate illume) 10 lux scene illumination (0.8 lux faceplate illume) 2 lux scene illumination (0.16 lux faceplate illume) 0.125 lux scene illumination (0.01 lux faceplate illume) Note 1: Scene Illumination is based on 100% reflectance.
Video output connector	Standard BNC bulkhead on rear of camera
Imager:	Interline transfer micro-lens CD with mosaic-type color compensating filter.
Image Area	3.6 mm (H) x 2.7 mm (V) [Format]
Resolution:	460 horizontal; 350 vertical- NTSC
Digital Zoom Range:	Digital Zoom Range: 1X (Off) through 8X
Effective Digital Focal Length:	85.8mm to 686.4mm
Horizontal Angle of View:	48.94 to 2.51 At 8X Digital: to 0.31
Minimum Focus Distance:	0.7 at max. wide; 29.5 at max tele
Auto Focus:	Selectable Auto/Manual. Minimum Scene Illumination for Reliable Auto Focus, 30% video
Zoom & Focus Presets:	64 preset positions (Note: recalling a preset position puts camera into manual focus mode)
Long Term Integration Range:	Provides manual selection of integration duration for enhanced sensitivity. Integration times are 1/4 second, 1/8 second, 1/15 second, 1/30 second. Frame Store video output provides continuous video output, updated at the integration rate.
Signal to noise ratio	56 dB (HPF: 200 kHz; LPF: 6 mHz; Weighted, Minimum Camera Gain, Lens Capped)
Synchronization	Internal Crystal sync or line lock
Video output level	1.0 V p-p (75 Ω composite), unbalanced, NTSC
Gain control	Automatic
Automatic white balance:	Required

The Contractor shall provide the camera with a suitable power supply that operates with an AC input voltage.

The camera shall have automatic gain control (AGC) from 0 to 16 dB in order to be able to handle the range of lighting extremes from very low light night scenes to full sunlight conditions. If the AGC control is switchable, the Contractor shall set the AGC to the "on" position.

The camera shall be equipped with an electronic shutter with adjustable speeds. Manual Shutter: Selectable shutter speeds of 1/60, 1/100; 1/250; 1/500; 1/1,000; 1/2,000; 1/4,000; 1/10,000 second. Auto Shutter: Automatically controls shutter speed between 1/60 and 1/10,000 second to maintain correct video level output. Auto Iris: Iris automatically adjusts to compensate for changes in scene illumination to maintain constant video level output within sensitivity specifications. Manual Iris: In the manual iris mode the iris opens and closes in steps.

The Contractor shall set the shutter speed of the camera at 1/60th of a second.

Physical Specifications.--The following are the physical specifications for the camera:

Lens mount	C type
Camera mount	6 mm - 20 UNC (minimum of two located on bottom)
Maximum weight	0.73 kg without lens
Maximum dimensions	70 mm (H) x 70 mm (W) x 216 mm (D) (body)

Environmental Specifications.--The following are the environmental specifications for the camera:

Operating temperature	10°C to 50°C
Storage temperature	-40°C to 60°C
Operating humidity	20 to 80% non-condensing
Storage humidity	20 to 90% non-condensing

Shock and Vibration Specifications.--The following are the shock and vibration specifications for the camera:

Shock	15 g
Vibration	5-60 Hz with 2.0 mm total excursion, and 5 g rms vibration from 60-1000 Hz.

The CCTV camera shall not incur any physical damage after a shock, return to normal operation immediately, and operate within the specified vibration.

Installation.--The Contractor shall install and fully adjust the camera with the associated lens, power supplies, housings, and all necessary cabling, etc., to make the assembly completely operational.

The Contractor shall firmly attach the camera to the housing enclosure. The Contractor shall exercise care to tighten the camera mount within the torque limits specified by the camera manufacturer.

The Contractor shall properly terminate all of the electrical cables to the camera and firmly attach them.

The Contractor shall dress and secure the electrical cables inside the housing and cabinet so that they do not interfere with the closing of the cabinet, with the fan or with any other moving part.

The camera shall be mounted in the housing within 6 mm of the optical window. This distance is-measured with the lens attached and adjusted to its maximum physical length.

The Contractor shall mount the camera in the housing enclosure such that the lens is centered in the optical window.

The Contractor shall adjust the back-focus adjustment on the camera such that the lens focus is properly set and maintained over the zoom range. This adjustment shall be made such that when the zoom is adjusted from long range (telephoto) to wide angle that no refocusing is necessary.

The Contractor shall provide operation and maintenance manuals for the CCTV digital signal processing (DSP) color video camera, as described under "System Testing and Documentation" elsewhere in these special provisions.

CLOSED CIRCUIT TELEVISION CAMERA LENS

The CCTV camera lens shall work properly in conjunction with the camera as well as all of the other video system components. It shall operate reliably and produce clear images when properly adjusted and meet the following specifications.

The CCTV camera lens shall be an integral component of the specified camera. The lens shall be factory assembled, back-focused, and adjusted during manufacturing of the camera. Separate camera and lens combinations shall not be accepted. The lens shall provide an adjustable focal range of 22X, 3.9 mm to 85.8 mm @ minimum F1.6. The lens shall provide auto iris with manual iris over-ride capabilities.

Performance.--The following are the performance specifications for the lens:

Format	13 mm, minimum
Mount	C
Zoom magnification range	10:1
Zoom focal length range	3.9 mm to 85.8 mm
Aperture range	F1.2 to F560, minimum
Iris type	Motorized iris

Electrical Specifications.--The following are the electrical specifications for the lens:

Operating voltage	±12 VDC
Iris position without power	Closed

When the camera is pointed at a very bright object and or when the camera and lens is first turned on, the image produced by the lens and camera combination should not optically "oscillate" (i.e., produce an image that alternates from too light to too dark) or otherwise be unstable. The lens and camera combination should react to temporary overload situations (such as described above) in a smooth and rapid fashion and with minimum overshoot.

The motorized-iris cable shall be strain relieved or sufficiently rugged such that the cable will not fail at the point where it leaves the lens assembly.

Optical Specifications.--The following are the optical specifications for the lens:

When the power is removed from the lens, the lens iris shall automatically close.

The lens shall incorporate an integral variable-density filter.

The lens shall include mechanical or electrical means to protect the motors from over running in the extreme position.

Environmental Specifications.--The following are the environmental specifications for the lens:

Operating temperature	–10°C to +50°C (min. range).
Storage temperature	–40°C to 60°C
Operating humidity	20 to 80% non-condensing
Storage humidity	20 to 90% non-condensing

Shock/Vibration Specifications.--The following are the shock and vibration specifications for the lens:

The lens shall be constructed such that it is able to withstand the vibration that it will be subjected to when mounted in the camera housing in all locations specified.

The auto-iris function shall not be affected by normal vibration.

The focus and zoom mechanism shall not be affected by normal vibration.

The lens shall be constructed such that it is able to withstand the shock that occurs during shipment and normal installation.

Presets.--The lens shall be supplied with zoom and focus preset position.

Installation.--The Contractor shall adjust the back-focus adjustment on the camera such that the lens focus is properly set and maintained when adjusting the focal length from zoom to wide angle. The Contractor shall make this adjustment with the lens iris at full open position. This adjustment shall be made such that when the zoom is adjusted from long range (telephoto) to wide angle, no refocusing is necessary.

The Contractor shall properly terminate the motorized iris electrical cable and connect it between the lens and the camera body.

The Contractor shall provide operation and maintenance manuals for the camera lens as described under "System Testing and Documentation" elsewhere in these special provisions.

ENCLOSED CAMERA CONTROL CABLES

The enclosed camera control cables shall connect the CCTV camera assembly to the camera control receiver (bypass module), located in the Type 334-TV controller cabinet, and shall be compatible with a COHU ER3490K cable, or equal, as shown on the plan sheet "Electrical Diagram for CCTV and Pan and Tilt Unit," and as approved by the Engineer.

Each conductor in the cables shall be insulated with a polypropylene jacket, color coded for positive identification, have a resistance of 23.4 Ω/km at 20°C or less and be stranded.

Each cable shall have an overall PVC jacket of no less than 1.14-mm thickness.

The RG-6A/U coaxial cable shall be compatible to Comm/Scope No. F59SSEF, Alpha 9006A, Manhattan M4204, or equal, and as approved by the Engineer.

CAMERA HOUSING

The camera housing shall house the camera and CCTV camera lens. It shall protect the camera and CCTV camera lens from rain, dust, wind, and other elements. It shall offer ease of accessibility for maintenance, have a sufficiently large

interior dimension to house the camera and lens, offer a means of securing the camera and lens and allow for entry of required cables to make an operational system. The camera housing shall be mounted to the pan and tilt unit specified elsewhere in these special provisions.

The contractor shall furnish and install a corrosion resistant and tamperproof sealed and pressurized housing with five pounds psi dry nitrogen with Schraeder purge fitting and 137.9K Pascals relief valve for each camera. The size of the housing shall be 90 mm diameter or smaller.

The camera housing shall include a loss of pressure sensor that will trigger an alarm message that will be inserted in the video output signal.

The camera/lens/housing shall be assembled and tested and configured only by the camera manufacturer at the camera manufacturer facility. The camera shall have been adjusted for color balance and lens tracking/focus, and all configurable items shall have been properly set per specifications. Each camera/lens/housing delivered to the project site shall be accompanied with a written certification of assembly and configuration from the camera manufacturer. This certification shall serve as the manufacturer documentation that the assembly and configuration of the camera/lens/housing equipment was performed. A sample certification document shall be furnished as part of the materials submittal data.

The enclosure shall be constructed from 6061-T6 standard aluminum tubing with a wall thickness of 5mm +/- 2mm. Internal components shall be mounted to a rail assembly. A copper plated spring-steel ring shall be used to ensure electrical bonding of the rail assembly and components to the camera housing. The housing exterior shall be finished by pre-treatment with a conversion coating and baked enamel paint.

The camera enclosure shall be designed to withstand the effects of sand, dust, and hose-directed water. All connections shall be watertight.

A gas-tight connector shall be used at the rear plate of the housing. Wiring to the connector shall be sealed with silicon or potting compound.

The internal humidity of the housing shall be less than 10 percent, when sealed and pressurized. Desiccant packs shall be securely placed inside the housing to absorb any residual moisture and maintain internal humidity at 10 percent or less.

The viewing window shall be constructed in such a way that unrestricted camera views can be obtained at all camera and lens positions.

A sun shield shall be provided to shield the entire housing from direct sunlight. It shall be constructed in such a way as to allow the free passage of air between the housing and the shield, but shall not form a sail to place an excessive load on the pan and tilt unit in high winds.

Each housing shall be provided with an internal 115 V, 5 W low temperature heater with its own thermostat control.

Mechanical Specifications:

Weight:	1.9 kg
Length (less connectors):	300 mm
Housing Diameter:	90 mm
Height (Including mounting base)	130 mm
Mounting:	4 mounting 6.35 mm 20 UNC on enclosure bottom of base. Platform mount with adjustment fore & aft
Interior Dimensions	Suitable for camera, lens & wiring
Pressure valve	Schraeder type w. pressure relief

The housing shall protect the camera and lens assembly from dirt, rain, and other adverse environmental conditions.

The housing shall be purge pressurized by the contractor during installation. The pressure shall be between 48 kPa to 69 kPa and the pressurizing gas shall be dry nitrogen.

The interior of the housing unit shall provide an adjustable camera sled for mounting the camera and lens assembly.

If cameras of low centerline profile are used, then the contractor shall provide a means of elevating the camera for proper lens clearance. The Contractor shall position the lens in the center of the housing window.

The housing enclosure shall include a sun shield or shroud. The purpose of the sun shroud shall be to protect the housing enclosure from the direct rays of the sun and to reduce the internal temperatures of the enclosure by at least 10˚ F. The sun shroud shall be made specifically for the model of housing enclosure that is selected.

Contractor shall provide any adapter plates required to mount positioning system to camera pole.

Shock / Vibration Specifications:

Shock	15 g
Vibration	5-60 Hz with 2.08 mm total excursion, and 5 g's rms vibration from 60-1000 Hz.

The camera housing shall not incur any physical damage after a shock, return to normal operation immediately, and operate within the specified vibration.

Electrical Specifications:

Power requirements	120 VAC ± 15%, 60 Hz ± 5%
Power consumption	Less than 170 W
Heater Operation	Thermostatically controlled turn-on for internal temp < 4˚C.
Elect. Connector	Single sealed multi-pin for all video, power and control cabling

Environmental Specifications:

Ambient Temperature Limits (Operating):	-40°C to 60°C (-40°F to 140eF)
Ambient Temperature Limits (Storage):	-30°C to 70°C (-22°F to 157°F)
Humidity:	Up to 100% relative humidity (per MIL-E-5400T, paragraph 3.2.24.4)
Other:	Withstands exposure to sand, dust, fungus, and salt atmosphere per MIL-E-5400T, paragraph 3.2.24.7, 3.2.24.8, and 3.2.24.9.

Installation.--Upon completion of the installation by the Contractor, the Engineer shall verify proper installation of the camera housing and camera lens.

The Contractor shall provide operation and maintenance manuals for the camera housing as described under "System Testing and Documentation" elsewhere in these special provisions.

PAN AND TILT UNIT

The pan and tilt unit will consist of the pan and tilt unit itself along with any electrical or communication interfaces required performing the specified functions. The pan and tilt unit shall operate reliably over extended periods of time with little or no maintenance, be environment and weather-resistant under a full range of environmental conditions and provide repeatable day-to-day operation. The pan and tilt unit will be compatible with the COHU 3855-1000/PED series, or equal and as approved in writing by the Engineer.

Performance Specifications:

The pan and tilt unit shall meet the following performance specifications:

Load Rating	Greater than 36.3 kgs
Braking: Pan and Tilt	Mechanical or Electrical to limit coasting
Overload Protection	Motors: Impedance protected
Construction	Corrosion resistant steel or aluminum
Angular Travel	Pan: At least 350 degrees Tilt: At least +30 degrees to -90 degrees
Motor Reversal	Instantaneous

The pan and tilt unit with camera assembly mounted shall be able to withstand a wind load of 145 km/h.

Electrical Specifications:

The pan and tilt unit shall meet the following specifications:

Power requirements	120 VA. ± 15%, 60 Hz ± 5%
Power consumption	less than 100 W
Duty cycle	Pan: continuous Tilt: intermittent
Pan/Tilt position preset	Enables preset position to a predetermined Azimuth, elevation and lens position
Motor type	High Speed Stepper
Variable speed	Motor Technology

Physical Specifications:

The pan and tilt unit shall meet the following physical specifications:

Size	Less than 406 mm H x 356 mm W x 203 mm D
Weight	Less than 25 kg
Pan Speed	Greater than or equal to 6 degrees / second
Tilt Speed	Greater than or equal to 3 degrees / second
Gears	Hardened steel
Mounting (Base)	178 mm + 3 mm
Camera Mount	Compatible with camera housing
Bearings on Rotating Surfaces	Heavy duty roller type
Overload Protection	Provided - internal

Shock / Vibration Specifications:

The pan and tilt unit shall meet the following vibration specifications:

Shock	15g
Vibration	5-60 Hz with 2.08 mm total excursion, and 5 g rms vibration from 60-1000 Hz

The pan and tilt unit shall not incur any physical damage after a shock, shall return to normal operation immediately, and shall operate within the specified vibration.

Environmental Specifications:

The pan and tilt unit shall meet the following environmental specifications:

Operating temperature	-23˚C to + 60˚C
Finish	Weather resistant paint or polyurethane
Seals	"O" ring or gaskets for all weather protection of Pan and Tilt Unit and cables.

Pan and Tilt Stops:

The pan and tilt unit shall have pan and tilt stops, the setting shall be determined by the Engineer. Pan and tilt stops shall have both mechanical and electrical stops.

Installation

The Engineer will notify the Contractor of the pan and tilt stops for the pan and tilt unit for the Contractor to set prior to installation check. The Contractor shall perform the installation check in the presence of the Engineer. The operation of the pan and tilt unit will be performed at the Type 334-TV controller cabinet adjacent to the camera pole, or sign truss-mounted pole, where the camera is mounted. The Contractor shall furnish a color video monitor, for testing only, to view the actual camera image. The Engineer shall direct adjustments for pan and tilt presets and pan and tilt stops, to be made by the Contractor. Upon completion of the installation, the Engineer shall verify operation of the pan and tilt unit.

The Contractor shall provide operation and maintenance manuals for the pan and tilt unit, as described under "System Testing and Documentation" elsewhere in these special provisions.

CAMERA CONTROL RECEIVER

The camera control receiver (CCR) shall include all auxiliary equipment required to interface with the communication sub-system, outdoor pan and tilt units, and the closed circuit television camera assemblies.

Functional Description.--The camera control receiver shall receive commands from the existing camera control transmitter (CCT) in the North Hollywood Hub building and decode them within the switch closure, that is used to operate and orient a CCTV camera. In addition, the camera control receiver shall generate outputs to control ancillary equipment and operations as defined elsewhere in these special provisions. The CCR shall be connected to the CCT by cables, providing a circuit equipped with fiber optic data modem(s) (FODM). The CCR shall be fully compatible with the existing Javelin Model JO1400R camera control transmitter and Javelin Model JO4100DT camera control keypad located in the North Hollywood Hub building and shall be completely interchangeable with COHU Series ER3490 and shall be compatible with a COHU ER3490K cable, or equal and as approved by the Engineer.

The contractor shall furnish one Javelin Model JO1400R camera control transmitter and one Javelin Model JO1400DT camera control keypad, or equal as approved by the Engineer, at the video node VE166 and at the North Hollywood Hub building to test the video links, CCR, and other elements of the CCTV communication system.

Functional Requirements.--The command messages addressed to the CCR shall cause an immediate response. In response to command messages, the state of the control relays shall be engaged for a specific period of time and returned automatically to a neutral state. If the action is to continue, an additional command from the video transmitter shall be required. This shall provide a fail-safe mode of operation should communications be interrupted between the CCR and the existing CCT in the North Hollywood Hub building.

The specific length of time that any command remains latched shall be determined by the operational impact of that command, system, and component requirements. Commands for camera movement and adjustment, such as, pan, tilt, iris and lens control shall use shorter latching times on the order of milliseconds, compared to external contact closures that shall latch for periods of seconds to minutes. The manufacturer shall provide documented evidence that the chosen time intervals for the latched commands do not negatively affect the operation of the camera, lens, or the pan and tilt unit.

One set of dry contacts shall be permanently latched until a second command is received by the CCR. This function will be used to turn on communications equipment at selected locations. This communications equipment will remain operational until disengaged by the operator.

The CCR and FODM shall provide an EIA-RS232 compatible interface. It shall be possible to communicate with the CCR by way of the EIA-232-D interface and exercise all CCR functions.

The CCR shall be designed for continuous operation in outdoor weather conditions when installed in Type 334-TV, or equivalent, cabinets.

The CCR communication protocol shall be fully compatible with the existing CCT communication protocol and shall provide signaling rate 9600 bps to communicate with the existing CCT at the North Hollywood Hub building. Contractor shall configure the transmission rate of the equipment to 9600 bps.

A unique address shall be used to identify and accept commands sent from the camera control transmitter. This unique address shall be included in all signals sent from the CCR to the CCT.

Parity checks on each byte and any additional cyclic redundancy codes (CRC) or checksums required to ensure that random or fortuitous noise is not interpreted by the CCR as a valid message from the existing CCT at the North Hollywood Hub building.

Transmissions to the existing CCT at the North Hollywood Hub building only in response to a valid poll or command message which contains a unique address for the CCR.

Transmissions to different CCRs to share a communication channel without interference or erroneous operation.

Acknowledgment of all correct messages.

Unique commands to exercise all functions of the CCR.

The Contractor shall provide the Engineer with detailed descriptions of the CCR communication protocol and interface specifications and license agreement to develop devices to interface with the existing CCT at the North Hollywood Hub building.

The CCR shall provide the following functions:

The CCR shall receive and decode signals from the existing CCT at the North Hollywood Hub building and activate pan, tilt, zoom, focus, iris, and auxiliary functions at the remote camera site in the camera and pan, tilt and zoom unit. The CCR shall provide both local automatic and remote manual iris adjustment and shall provide control for automatic or manual shutter speed with the selections made by commands initiated from the existing CCT at the North Hollywood Hub building.

The CCR shall provide the capability to locally store and activate a minimum of 15 camera-preset positions. The preset information shall be digitally stored at the CCR. Presets shall be assignable and activated from the existing CCT at the North Hollywood Hub building. In the event of a power failure preset settings shall be maintained. The CCR or CCT shall be able to re-calculate the preset values should the pan/tilt unit be replaced.

The CCR shall provide the capability of transmitting positioning feedback information from the pan, tilt, and zoom position to the existing CCT at the North Hollywood Hub building using an eight bit, or equivalent, digital format. The positioning feedback information shall only be transmitted when a command requesting positioning feedback is received from the existing CCT at the North Hollywood Hub building.

The CCR shall include the capability to process and implement a minimum of three auxiliary control signals. For example, auxiliary control signals may provide needed control of heaters, washers, and wipers on cameras, etc. At least two of the auxiliary control signals shall be latching. At least three inputs capable of sensing a dry contact closure shall also be provided.

The CCR shall provide local control functions for pan, tilt, zoom, focus, and other operations. These control functions shall be performed from a portable unit communicating through a serial port on the CCR. A switch shall be provided to defeat remote commands from the existing CCT at the North Hollywood Hub building and allow the activation of all local control functions.

The failure of a CCR unit or its associated modem shall not cause any other units to become inoperative or damage to its associated camera.

If communications to the CCR are interrupted, the CCR shall cause the camera to remain in the current position or move it to a preset position.

Operational Requirements.--The Contractor shall provide a certification from the original equipment manufacturer that the CCR will interface and operate over singlemode fiber optic cable as required by these specifications when it is correctly connected to existing pan and tilt units and zoom lenses. In addition, the CCR shall meet the following requirements:

Electrical.--The CCR shall operate from a 120 VAC ±10 percent, at 60 Hz ±5 percent, power source and incorporate an internal, regulated power supplies. The maximum power consumption shall be 45 W. Protection from power brown outs, current surges or voltage spikes of up to 1000 V shall be provided. The lens driver circuit shall provide power at the appropriate voltage for zoom, focus and iris controls, listed elsewhere in these special provisions. The pan and tilt driver circuit shall provide power at the appropriate voltages to control the movement of the pan and tilt unit.

Physical.--The CCR shall be supplied in a durable enclosure suitable for mounting in an EIA 482 mm rack. The maximum dimensions of the CCR shall be 203 mm (H) x 482 mm (W) x 355 mm (D).

The CCR shall be fully operational over an ambient temperature range of -23°C to 50°C. with relative humidity 5 to 90 percent. The CCR enclosure shall have all necessary bulkhead connectors for access to all required external cables.

Functional Testing of CCR.--The Contractor shall perform a functional test to verify that the CCR to be placed in the cabinet works in accordance with these specifications before installing the CCR. The CCR shall be installed as shown on the plans. The Contractor shall confirm equipment placement with the Engineer before installing any equipment.

The Contractor shall test the camera control system for the following functions:

After installing all equipment at each CCTV camera location, the Contractor shall confirm the operation of the camera control receiver and the fiber optic data modem using test equipment and other necessary equipment that emulates all the functions of the CCT and fiber optic data modem at the North Hollywood Hub building, and shall document all results.

After installing all camera control receivers and fiber optic data modems and the communication system, the Contractor shall demonstrate the operation of the camera control system and shall assign all system parameters using test equipment that emulates all the functions of the camera control keypad, camera control transmitter and fiber optic data modem from the existing CCT at the North Hollywood Hub building and shall keep test equipment in operation until witnessed and approved by the Engineer.

Test equipment that emulates all the functions of the camera control transmitter and fiber optic data modem shall address all camera control receivers and shall operate all remote control functions, including pan and tilt, zoom, focus, set up, and shall recall a minimum of ten preset positions per remote CCR address. The response to the test equipment signals shall appear to be immediate.

The Contractor shall provide operation and maintenance manuals for the camera control receiver, as described under "System Testing and Documentation" elsewhere in these special provisions.

Full compensation for camera control receiver shall be considered as included in the contract lump sum price paid for the items requiring CCR and no additional compensation will be allowed therefor.

VIDEO TRANSMITTER

The video transmitter (Vx) shall accept any NTSC baseband video signal and convert it to an optical signal suitable for launching into singlemode fiber.

The video interface to the video transmitter shall be a nickel-plated, bulkhead female BNC-style connector with a gold plated contact. The video transmitter shall accept a composite video signal at a level of 1.0 V peak to peak between sync tip and reference white, as measured on an oscilloscope. The transmitter shall operate as specified when the peak-to-peak value of the signal varies between 0.71 and 1.4 V. The nominal input impedance shall be 75 Ω and the return loss shall be at least 30 dB in compliance with EIA RS 250 medium haul for an unbalanced connection.

The video signal shall modulate the optical source to produce a frequency modulated optical signal. The optical emitter shall have a center wavelength in the range of 1300 nm to 1330 nm at 25˚C. The transmitter shall interface to fiber with a ST style compatible connector. The video transmitter launch power shall be defined as the power launched by the transmitter into at least 1 m of the singlemode fiber optic cable, installed for CCTV camera locations. The video transmitter launch power shall be at least 18 dB greater than the video receiver sensitivity. The optical modulation bandwidth required by the video transmitter for specified video link performance shall be 60 MHz, minimum.

The video transmitter shall include all mounting hardware necessary to mount it in the EIA standard 482-mm equipment rack in each cabinet. The size and mounting arrangements shall be consistent with the space allocated in the cabinet layout plans. It shall be mounted in a manner, which allows easy access to all connections and indicators. It may be mounted in a video transmitter mainframe supplied and installed in accordance with these special provisions and plans.

The video transmitter shall operate over a temperature range of 0°C to 50°C. Power shall be from existing 120 V ±15 percent, 60 Hz ±5 percent power receptacle inside the cabinet reserved for communications equipment. The video transmitter shall include a power supply, which may be external to the remainder to the video transmitter components. The power supply shall supply all voltages required by the video transmitter for operation, and a panel indicator visible from the front that shows DC power on shall be provided.

The Contractor shall perform pre-installation testing to verify that the video transmitter and video receiver (Vr) are compatible, meet manufacturers specifications and the requirements of these special provisions.

The video transmitters shall be installed at the controller cabinet locations as shown on the cabinet layouts on the plans. The Contractor shall coordinate the physical space required by the video transmitters with the allocated space.

Prior to installation, the operation of all equipment shall be verified using the same type of fiber it is to be installed with. The fiber optic path for each video link shall have been tested and verified in accordance with these special provisions and plans prior to the video transmitter installation.

The Contractor shall connect the correct optical pigtail to the optical connector on the video transmitters. The Contractor shall neatly train all pigtails together when routing them along the same path and the support rails in the equipment racks. No cables shall be installed with a bend radius less than the manufacturer's minimum recommended bending radius.

The Contractor shall input a video test signal into the video transmitter and use a variable optical attenuator to set the optical power at the video receiver to the video receiver sensitivity level. The optical signal shall then be connected to the video receiver with a monitor connected to its output. The Engineer shall then qualitatively assess the monitor output. The signal-to-noise and signal-to-low frequency noise shall be measured and recorded.

Attention is directed to "System Testing and Documentation," elsewhere in these special provisions regarding testing the video transmitter.

The Contractor shall provide operation and maintenance manuals for the video transmitter as described under "System Testing and Documentation" elsewhere in these special provisions.

Full compensation for video transmitter shall be considered as included in the contract lump sum price paid for the items requiring video transmitter and no additional compensation will be allowed therefor.

FIBER OPTIC DATA MODEM

The fiber optic data modem shall provide the interface between the camera control receiver and the existing camera control transmitter in the North Hollywood Hub building.

The FODM shall be used as an asynchronous RS-232C interface between field elements and the time division multiplexer (TDM) via singlemode fiber optic links. The FODM at each field element shall be stand-alone type and shall be securely fastened. LED indicators shall be provided for transmitter status (on/off) and received optical power above the receiver sensitivity.

The modem shall meet the following requirements:

Electrical Signaling:	Per EIA RS-232 with full handshake control signals
Electrical Power:	Stand-alone version: 115 V(ac) ±10%, 60 Hz.
Bit Error Rate:	1 in 10^9 within optical budget.
Operating Mode:	Asychronous, simplex, or full duplex.
Input/Output Logic Level:	I: +3.75 to +12 V. O: - 3.75 to –12 V.
Input/Output Impedance:	Per RS-232
System Bandwidth:	DC to 19.2 kbps
Optical Wavelength:	1310 nm.
Loss Budget:	Singlemode: 15 dB
Connectors Optical:	ST
Connectors Electrical (Data):	DB25 female
Mechanical Size:	95 mm (W) x 70 mm (D) x 28 mm (H) for module
Temperature Range:	-20°C to +70°C
Storage Temperature:	-40°C to +85°C

The FODMs shall be tested as follows:

Each optical modem shall be functionally tested by looping back the optical transmit connector to the optical receive connector using a variable optical attenuator with measured optical loss of 15 dB at 1300 nm. A test set shall be connected to the modem and set for RS-232 communication testing. A fifteen-minute test after burn-in shall be error free.

After performing the fifteen minute bit error rate test (BERT), at least two modems shall be tested for receiver dynamic range. To do this the optical attenuation shall be increased to the point at which the data test just begins to register bit errors. The optical receive power into the modem shall be measured and recorded. The optical attenuation shall be then decreased until the data test once again registers errors. At no time shall the optical power into the receiver exceed the manufacturer's specified saturation level. The optical receive level shall once again be measured and recorded. These minimum and maximum receive levels define the modem receiver's dynamic range and shall meet or exceed manufacturers specifications.

One pair of modems shall be interconnected using optical jumpers and attenuators with a loss of 15 dB in each direction. The RS-232 interface shall be looped back on one modem and a test set connected to the RS-232 interface of the other modem. A bit error rate of less than one in 10^9 shall be demonstrated.

The Contractor shall provide operation and maintenance manuals for the fiber optic cable modem (FODM) as described under "System Testing and Documentation" elsewhere in these special provisions.

Full compensation for fiber optic cable modem (FODM) shall be considered as included in the contract lump sum price paid for the items requiring fiber optic cable modem and no additional compensation will be allowed therefor.

NORTH HOLLYWOOD (NHD) COMMUNICATION HUB BUILDING EQUIPMENT

The North Hollywood (NHD) Hub building is located at Route 10 / Route 134 Separation.

North Hollywood (NHD) communication Hub building equipment shall consist of furnishing, installing a new DS1 optical modem for the data circuit, a new video demultiplexer for the video circuit, connecting and terminating wires and cables, and incidentals required to make the installed equipment at the North Hollywood Hub fully operational.

The Contractor's attention is directed to "Video multiplexer and demultiplexer," as described under "Video Node", and to "DS-1 optical modems," as described under "Data Node," and to "Video link testing" and "Data link testing" as described under "System Testing and Documentation," elsewhere in these special provisions.

ACCESS TO EXISTING NORTH HOLLYWOOD (NHD) HUB BUILDING

Except as otherwise provided in these special provisions, or as directed by the Engineer, any work that requires access to the existing North Hollywood (NHD) Hub building shall be subjected to the following restrictions:

Work in the existing North Hollywood Hub building shall be limited to the hours between 6:00 AM and 4:00 PM Mondays through Fridays and between 7:00 AM and 3:30 PM on Saturdays, Sundays and designated legal holidays.

The Contractor shall obtain approval from the Engineer a minimum of 48 hours before scheduling any work in the North Hollywood Hub building. In addition, the Engineer and the Caltrans Electrical Maintenance Supervisor shall be notified a minimum of 48 hours in advance before access is required to the North Hollywood Hub building. Access to the equipment room in the North Hollywood Hub building shall be strictly limited to the hours needed to complete that portion of work being performed within these rooms. The work performed in the equipment room shall take place only in the presence of the Engineer and the TMC Support Engineer, telephone (213) 897-0244, or (213) 897-0329, or the Caltrans Maintenance Supervisor or any designee as directed by the Engineer.

The work performed in the North Hollywood Hub building shall be done in such a manner so as to maintain the integrity of the equipment room as neatly as possible. At all times, the Contractor shall provide a clear walking path to all equipment in the North Hollywood Hub building for the building staff's use.

The Contractor shall protect all existing equipment within the equipment room from damage from the Contractor's operations. Access to hardware, electronics and peripheral equipment shall be limited strictly to those items necessary for the Contractor to perform the work required as stated elsewhere in these special provisions.

The Contractor shall cooperate with other contractors, vendors, and support personnel for ongoing systems work that may be in progress at the North Hollywood Hub building during the term of this contract.

CABLE NODE (LOCATION VE254)

Cable node shall be installed at location VE254 as shown on the plans.

Cable node shall consist of a Type 334-TV cabinet, a cable node assembly and other equipment housed in a Type 334-TV cabinet, as shown on the plans to provide full equipment operation.

The cable node assembly shall consist of five 72-fiber distribution units (FDU), as shown on the plans. The fiber distribution unit shall consist of termination and distribution cable tray assembly for 48 and 12 singlemode fiber optic cables. The termination and distribution cable trays shall have sufficient tray area for excess optical fiber storage with provisions to assure that the optical fibers do not exceed 50-mm bend radius.

The termination and distribution cable trays shall include a designation strip for identification of the 48 and 12 singlemode fiber optic cables. All fiber optic cables shall be labeled in the splice tray with permanent vinyl markers.

The Contractor's attention is directed to "Fiber distribution units," as described under "Fiber Optic Cable," and to "Video link testing" and "Data link testing" under "System Testing and Documentation," elsewhere in these special provisions.

MODIFY CABLE NODE (LOCATION VE171)

The existing cable node (Location VE171) is located at Route 101 / Route 405 Separation.

Modify cable node (Location VE171) shall consist of furnishing and installing four 72-fiber distribution units (FDU), and terminating three 48 SMFO cables and one 12SMFO cable at said four 72-fiber FDU's, as shown on the plans and as directed by the Engineer, to make the installed fiber optic cables and the existing cable node fully operational.

Each 48 SMFO and the 12SMFO cable shall terminate on the patch panel a separate FDU. The termination and distribution cable trays shall have sufficient tray area for excess optical fiber storage with provisions to assure that the optical fibers do not exceed 50-mm bend radius and shall include a designation strip for identification of the three 48 SMFO cables and one 12SMFO cables. All fiber optic cables shall be labeled in the splice tray with permanent vinyl markers. Fiber bonds shall also be labeled to identify the physical designation of each individual fiber strand.

The Contractor's attention is directed to "Fiber distribution units," as described under "Fiber Optic Cable," and to "Video link testing" and "Data link testing" under "System Testing and Documentation," in these special provisions.

RESTRICTIONS OF WORKS AND ACCESS TO EXISTING CABLE NODE LOCATION VE171

Except as otherwise provided in these special provisions or as directed by the Engineer, any work that requires access to the existing cable node Location VE171 shall be limited to the hours between 6:30 a.m. and 3:00 p.m. Tuesdays through Saturdays. Access to the cable node Location 171 shall be strictly limited to the hours needed to complete that portion of work being performed within the cabinet. The Contractor shall obtain approval from the Engineer a minimum of 48 hours before scheduling any work in the existing cable node Location VE171. In addition, the Engineer and the Caltrans Electrical Maintenance Supervisor shall be notified a minimum of 48 hours in advance before access is required to the existing cable node location 171. The work performed in the existing cable node Location VE171 cabinet shall take place only in the presence of the Engineer or the TMC Support Engineer, telephone (213) 897-0329, or the Caltrans Maintenance Supervisor, or any designee as directed by the Engineer, and shall be done in such a manner so as to maintain the integrity of the existing cable node Location VE171 as neatly as possible.

The Contractor shall protect all existing equipment within the existing cable node Location VE171 from damage from the Contractor's operations. Access to hardware, electronics and peripheral equipment shall be limited strictly to those items necessary for the Contractor to perform the work required as stated elsewhere in these special provisions. The Contractor

shall cooperate with other contractors, vendors, and support personnel for ongoing systems work that may be in progress at the existing cable node Location VE171 during the term of this contract.

VIDEO NODE (LOCATION VE213)

Video node shall be installed at location VE213 as shown on the plans.

The equipment at video node (location VE213) shall consist of a Type 334-TV cabinet, a video multiplexer (VMX), seven rack-mounted video receivers, three 72-fiber distribution units (FDU), and other equipment housed in a Type 334-TV cabinet, as shown on the plans, to provide full operation.

The Contractor's attention is directed to "Fiber distribution units," as described under "Fiber Optic Cable," to "Video multiplexer and demultiplexer," under "Video Node," to "Video receiver," under "Equipment at video node (Location VE213)," and to "Video link testing," and "Data link testing," under "System Testing and Documentation," as described elsewhere in these special provisions.

VIDEO RECEIVER

The video receiver shall be connected to the video transmitter by optical fiber to form a video link having a center wavelength in the range of 1300 nm to 1330 nm at 25˚C. The video link is to provide point-to-point transmission and reception of a full motion NTSC baseband video signal using an optical fiber as the transmission medium.

The video receiver shall receive the optical signal launched into the singlemode optical fiber by the corresponding video transmitter. The optical interface to the receiver shall be a ST-style connector. The video receiver shall use a PIN photo diode or an avalanche photo diode to convert the optical signal into an electrical signal. The receiver sensitivity shall be defined as the minimum optical power required operating at the minimum video link performance specifications. The video receiver shall have an optical dynamic range of at least 10 dB. If the saturation level of the receiver is not greater than the received signal level plus one dB, attenuators shall be installed between the fiber and the transmitter to attenuate the received signal level. The video output interface from the video receiver shall be a nickel-plated, bulkhead female BNC-type connector with a gold plated contact.

The baseband video signal output from the video receiver, while it is receiving an optical signal from the video transmitter at an average power level equal to the video receiver sensitivity shall meet the following performance specifications defined and measured in accordance with EIA-250 medium haul for end-to-end modified performance:

Output signal level per RIA 250.
Amplitude vs. frequency characteristic.
Chrominance to luminance gain inequality.
Chrominance to luminance delay inequality.
Field time waveform distortion.
Line time waveform distortion.
Insertion gain variation.
Differential gain.
Differential phase -- less than or equal to 5 degrees.
Signal-to-noise ratio -- equal to or better than 50 dB weighted.
Signal-to-low frequency noise ratio.

The video receiver installation shall include all mounting hardware necessary to mount it in the EIA standard 482-mm equipment rack in each cabinet. The size and mounting arrangements shall be consistent with the space allocated in the cabinet layout plans. It shall be mounted in a manner that allows easy access to all connections and indicators. It may be mounted in a video receiver mainframe supplied and installed in accordance with these special provisions and plans.

The video receiver shall operate over a temperature range of 0°C to 50°C. Power shall be supplied from an existing 120 V ±15 percent, 60 Hz ±5 percent, power receptacle inside the cabinet reserved for communications equipment. The video receiver shall include a power supply, which may be external to the video receiver. The power supply shall supply all voltages required by the video receiver for operation, and panel indicators visible from the front of the receiver that show DC power on and received optical signal present.

Prior to installing any equipment in the field cabinets, the Contractor shall verify that the video transmitter and video receiver are compatible, meet manufacturer's specifications and the requirements of these special provisions.

The video receivers shall be installed at the cabinet locations identified in the plans. The Contractor shall coordinate the physical space required by the video receivers with the allocated space.

Prior to installation, the operation of all equipment shall be verified using the same type of fiber the equipment is to be installed with. The fiber optic path for each video link shall have been tested and verified in accordance with these special provisions and plans prior to the video receiver installation.

Optical attenuators shall be provided in as such that the optical power received at the video receiver is the maximum possible within the dynamic range.

The Contractor shall connect the correct optical pigtail to the optical connector on the video receivers. The Contractor shall neatly train all pigtails together when routing them along the same path and the support rails in the equipment racks. No cables shall be installed with a bend radius less than the manufacturer's minimum recommended bending radius.

The Contractor shall connect the video receiver power supply to one of the existing receptacles reserved for communications equipment in the cabinet.

The Contractor is responsible for all testing and documentation required for approval and acceptance of the production, installation and operation of this equipment. All indicators shall be verified to function correctly.

Attention is directed to "System Testing and Documentation" elsewhere in these special provisions regarding testing the single video receivers.

Full compensation for video receiver shall be considered as included in the contract lump sum price paid for the items requiring video receiver and no additional compensation will be allowed therefor.

VIDEO MULTIPLEXER AND DEMULTIPLEXER

The video multiplexer (VMX) shall consist of a FM (Frequency Modulation) video modulator, RF (Radio Frequency) splitter/combiner, a fiber optic transmitter, and a fiber optic receiver.

The video demultiplexer shall consist of a FM video demodulator, a RF splitter/combiner, a fiber optic transmitter, and a fiber optic receiver.

The video multiplexer and demultiplexer shall be connected by singlemode optical fiber to form video link. A video link shall provide point-to-point transmission of at least 16 full motion, NTSC baseband video signals.

The video multiplexer and demultiplexer shall mount in an EIA 482-mm equipment rack, either as separately mountable sub-units or as a card cage. The equipment shall include all necessary hardware mounting and adapters. The video multiplexer and the demultiplexer, including power supply, shall each occupy no more than 445-mm of rack space and shall be fully configured for not less than 16 video channels as shown on plans**.**

Each system component described below shall be mounted on one or more PC boards. In addition, one PC board may support two or more functional components or the partial function of a component with the exception of the power supply, which shall be mounted on a separate PC board or boards. All electronic components shall be mounted on PC boards. The PC boards shall be easily replaceable without requiring special tools.

All specifications for the video multiplexer and demultiplexer equipment shall be met over an operating temperature range from 0°C to 50°C. The power supply for the video multiplexer and demultiplexer equipment shall be powered from a 120 V, 60 Hz power receptacle located in the Type 334-TV cabinet as shown on the plans.

FM VIDEO MODULATOR.--The modulator shall accept any NTSC baseband video signal and convert it to a frequency-modulated electrical signal suitable for mixing or combining with other electrical signals to produce a composite broadband signal to the optical transmitter. The video modulator shall be capable of modulating the input video signal using a Frequency Division Multiplexing scheme. The output frequency of the modulator shall be remotely selectable.

Each modulator shall consist of either plug-in modules that fit into the multiplexer card cage or 482 mm rack mountable units. The video inputs to the modulator shall be nickel plated, female BNC connectors with a gold plated contact. The nominal input impedance shall be 75 Ω and the return loss shall be at least 30 dB. Each modulator shall operate as specified with a 0.7 V to 1.4 V peak to peak composite input video signal. The modulator shall continue to operate satisfactorily with an input level of 0.5 V to 2.0 V.

After selection of the appropriate output frequency, any video modulator shall be interchangeable with any other video modulator in the subsystem. A female BNC bulkhead connector of the same design as the video input connector, or a female F bulkhead connector shall be installed at the rear of the module to deliver the modulated signal output. Either type of connector shall be designed to interface with 75-Ω coaxial cable.

Test points shall be provided on the front panel of the video modulator to allow in-service measurement of relevant signals without causing any disturbances in the output of the video modulator. Indicators shall be provided on the front panel of the video modulator to allow operator verification of the correct performance of the video modulator.

RF SPLITTER/COMBINER.--The RF splitter/combiner shall be capable of combining the outputs of all of the video modulators. In addition, it shall provide attenuation of each input that is uniform across all inputs within ±1 dB. The RF combiner and splitter shall provide a high degree of isolation between each input with the worst case isolation being 30 dB.

The RF splitter/combiner shall provide a return loss of greater than 20 dB at all taps. It shall have input and output impedance of 75 Ω and shall be constructed with female F bulkhead connectors. All unused RF combiner and splitter inputs and outputs shall be terminated with 75 Ω resistive loads.

FIBER OPTIC TRANSMITTER.--The fiber optic transmitter shall accept the output from the RF splitter/combiner in the configuration of various video modulators in quantities as shown in the plans. The fiber optic transmitter shall use a laser with center wavelength of 1300 nm to 1330 nm at 24°C, with the spectral width not to exceed 10 nm. The laser shall operate at 1310 nm and shall provide an optical launch power of 0 dBm. The combined electrical signal from the modulators shall modulate the laser and be coupled into a singlemode optical fiber. The transmitter launch power shall be defined as the power launched by the laser into one meter of step-index optical fiber having a mode field diameter of 10 µm. The transmitter launch power shall be at least 20 dB greater than the receiver sensitivity and greater than –8 dBm.

A female BNC bulkhead connector, or a female bulkhead connector shall be installed at the rear of the module to accept the input signal from the RF splitter/combiner combiner and splitter. Either type of RF connector shall be designed to interface with 75-Ω coaxial cable.

The fiber optic transmitter shall use a ST style compatible connector and be compatible with the fiber optic cable Type ST connector mating connector on the fiber optic cable specified in these special provisions.

Test points shall be provided on the front panel of the fiber optic transmitter to allow in-service measurement of relevant signals without causing any disturbances in the output of the fiber optic transmitter.

Indicators shall be provided on the front panel of the video modulator to allow operator verification of the correct performance of the fiber optic transmitter. The fiber optic transmitter shall be capable of interfacing with and operating over fiber optic cable as specified elsewhere in these special provisions.

FIBER OPTIC RECEIVER.--The fiber optic receiver shall receive the optical signal launched into a singlemode optical fiber by the transmitter and output an electrical signal suitable for splitting and demodulating. The fiber optic receiver shall employ an avalanche photo diode (APD) as the input-sensing device. The receiver shall be designed to operate in accordance with the above indicated special provisions with an optical input power range of –8 dBm to –30 dBm. The fiber optic receiver shall provide sufficient RF output power to directly drive, or feed a wide band RF line amplifier to drive, a minimum of 16 video demodulators to at least middle range of the demodulators required input power levels. The input power level to any of the video demodulators shall not be effected by loading changes to the other video demodulators feed by the fiber optic receiver.

The fiber optic receiver shall be equipped with an AGC system that shall maintain an RF signal output level consistent with the requirements of the video demodulator under varying optical power input conditions. A front panel control shall be provided to allow operator override and adjustment of the AGC system within ±5 dB of the nominal output level.

The fiber optic receiver shall be compatible with the fiber optic cable specified in these special provisions. The fiber optic receiver shall be equipped with a Type ST connector compatible with the mating connector on the fiber optic cable. A female BNC bulkhead connector or a female bulkhead connector shall be installed at the rear of the module to deliver the output signal. Either type of connector shall be designed to interface with 75-Ω coaxial cable.

Test points shall be provided on the front panel of the fiber optic receiver to allow in-service measurement of relevant signals without causing any disturbances in the output of the fiber optic receiver.

Indicators shall be provided on the front panel of the fiber optic receiver to allow operator verification of the correct performance of the fiber optic receiver.

VIDEO DEMODULATOR.--The video demodulators shall consist of either plug-in modules that fit into the demultiplexer card cage or 482 mm rack mountable units. The demodulators shall convert the RF signal output of the fiber optic receiver, with a bandwidth of 50 to 550 MHz, to electrical baseband NTSC video signals.

The video demodulator shall be capable of demodulating any one of the 16 frequencies in the range of 50 to 550 MHz comprising the input RF signal. The frequency to be demodulated shall be selectable by the operator. The video demodulator shall provide as an output one baseband video signal as specified by the RS-170 Standard. After selection of the appropriate frequency, any video demodulator shall be interchangeable with any other video demodulator in the subsystem.

A female BNC bulkhead connector shall be installed at the rear of the video demodulator to accept the RF input signal. The connector shall be designed to interface with 75-Ω cable. A female BNC bulkhead connector shall be installed at the rear of the video modulator to deliver the output video signal. The female BNC connector shall be nickel plated except for the center contact, which shall be gold-plated. The female BNC connector shall be designed to interface with a 75-Ω coaxial cable.

Test points shall be provided on the front panel of the video demodulator to allow in-service measurement of relevant signals without causing any disturbances in the output of the video demodulator.

Indicators shall be provided on the front panel of the video demodulator to allow operator verification of the correct performance of the video demodulator.

RACK FRAME AND POWER SUPPLY.--The rack frame and power supply shall contain all of the various modules of the video multiplexer and video demultiplexer. The rack frame and power supply shall provide power to all of the modules contained therein and shall operate from input power supply of 120 V ±15 percent, 60 Hz ±5 percent. The rack frame and power supply shall be suitable for installation in an EIA standard 482-mm equipment rack.

Modules not designed to be contained in the rack frame and power supply shall be suitable for installation directly into an EIA standard 482-mm equipment rack and shall be powered directly from a power supply of 120 V ±15 percent, 60 Hz ±5 percent.

FIBER OPTIC ATTENUATOR.--The fiber optic attenuator shall be suitable for installation at the receiver end of the optical signal path. The value of each fiber optic attenuator shall be such that, for each optical signal path into which a fiber optic attenuator is inserted, the optical power level delivered to the respective fiber optic receiver is at least three dBm above the minimum level required, and does not exceed the maximum level acceptable by the fiber optic receiver. Fiber optic attenuators shall be provided if the saturation level of the receiver minus the received signal level is greater than one dB.

INSTALLATION.--All components of the video multiplexer and demultiplexer shall be installed at the locations and in the quantities as shown in the plans. Installation shall include all required interface cable types as specified in these special provisions. All blank module slots in rack frame and power supply assemblies shall be filled with a plate of similar construction and finish consistent with those of the modules. The filler plate shall be field removable without requiring special tooling or any disassembly of the system. The system shall provide the ability to remove and replace any module in the system without requiring that the power supply be turned off and without disturbing the operation of any other modules in the same rack frame and power supply assembly. All modules shall be labeled on the front panel to identify the video signal or fiber passing through the module. The labeling technique shall be such that all labels are neat and legible and shall be removable and replaceable to allow for substitution of modules in the event of failure.

TESTING.--The Contractor shall test all modules and components prior to installation in accordance with the manufacturer's test procedures in the presence of the Engineer and shall furnish documentation demonstrating the compliance of all modules of these special provisions.

DATA NODE (LOCATION VE213)

Data node shall be installed at location VE213 as shown on the plans.

Data node (location VE213) shall consist of a Type 334-TV cabinet, camera control receiver (CCR), time domain multiplexer (TDM) which includes D4 channel banks equipped with D4 channel bank cards and a DS-1 optical modem, fourteen fiber optic data modems (FODM), fiber optic data modems, two 72-fiber distribution units (FDU), and other equipment, housed in a Type 334-TV cabinet.

The Contractor's attention is directed to "DS-1 optical modems," and "D4 channel bank," under "Equipment at Data Node (location VE213)," to "Fiber optic data modem," and "Type 334-TV cabinet,", under "CCTV Camera Assembly," to "Fiber distribution unit" under "Fiber Optic Cable," and to "Data link testing" under "System Testing and Documentation, as described elsewhere in these special provisions.

The channel bank cards supplied for each channel of the 24 channel D4 channel bank unit shall be as indicated on the Data Node Circuit Assignment Tables as shown on the plans.

In addition to what is shown on the plans, each D4 channel bank shall contain one each RS-232 data and one each 2-wire foreign exchange (FXS) channel card for a protection circuit. The equipment shall also include any ancillary or incidental items required providing full equipment operation at each site.

The fiber distribution unit shall consist of termination and distribution cable tray assembly for 48 and 12 singlemode fiber optic cables. The termination and distribution cable trays shall have sufficient tray area for excess optical fiber storage with provisions to assure that the optical fibers do not exceed 51-mm bend radius.

The termination and distribution cable trays shall include a designation strip for identification of the 48 and 12 and singlemode fiber optic cables. All fibers shall be labeled in the splice tray with permanent vinyl markers. Fiber bonds shall also be labeled to identify the physical designation of each individual fiber strand.

D4 CHANNEL BANK

The D4 channel bank shall include a DS-1 optical modem. This equipment will be used to digitize the narrow bandwidth analog and quasi-analog signals and to time-division multiplex them into a 1.544 Mb/s composite data signal.

The D4 channel bank shall satisfy the following requirements:

Physical specifications:

Operating temperature	0°C to 50°C
Relative Humidity	95 percent non-condensing

Dimensions specifications:

Height	less than 457 mm
Width	482 mm
Depth	less than 508 mm

Electrical specifications:

Line Rate	1.544 Mbps ± 200 bps (stratum 4)
Line Code	AMI or B8ZS (user selectable)
Sampling Format	D4
Framing Format	ESF
Line Impedance	100 Ω +/- Ω
Power Input	120 VAC ±10 percent at 60 Hz ±3 H, 3 A minimum

The D4 channel bank shall be fully configured to house up to 24 DS-O channel bank cards at 64 kbps framing with 8 kbps overhead and shall multiplex up to 24 voice or data channels for transmission over a DS-1 data channel. The channel bank shall be type-accepted in accordance with the FCC Regulations, Part 68. The common card units shall provide the transmit, receive, power distribution, timing, and alarm functions.

The D4 channel bank shall be installed in the standard equipment EIA 482-mm racks as shown on the plans. The D4 shall be cross-connected to the audio jackfield as shown on the plans. Each slot within the D4 channel bank shall be individually tested by moving cards from slot-to-slot.

The power supply shall convert 120 VAC to 48 VDC with a 2 A output.

The D4 channel bank shall include the following D4 channel bank cards of the types and quantities as shown on plans.

2-wire Foreign Exchange - Subscriber (FXS)
RS232 data channel card

The Contractor shall supply the quantities of each card identified on the plans. The D4 channel bank shall be installed in accordance with the manufacturer's installation instructions.

The Contractor shall adjust the levels of the D4 channel bank to achieve a 0 transmission level point (TLP) at the NHD hub communication building. The Contractor shall measure end-to-end performance of the analog and digital parameters under full operation.

The D4 channel bank cards shall be designed to physically plug into any of the available channel card slots of the D4 multiplex unit with electrical power on. Each D4 channel card shall use no more than 5 W maximum power supplied by the D4 channel bank multiplex unit. The A/D and D/A channel conversion frequency for all channel bank cards shall be 8000 ±2 Hz.

The D4 channel bank cards shall meet all required operating specifications over a temperature range from 0°C to 50°C and with maximum relative humidity of 95%, non-condensing.

All channel bank card shall satisfy the following requirements:

Return Loss:	(per AT&T Pub. 43801):
ERL:	28 dB
SRL:	20 dB
Idle Noise, Single Ended:	19 dBrnC0
Idle Noise, End-to-End:	22 dBrnC0
Crosstalk Coupling Loss:	65 dB, 200 to 3400 Hz
C-message weighted.	

2 Wire Foreign Exchange - (2WFXS) --The 2-wire foreign exchange channel card shall meet the following requirements:

Channel Coding Resolution	8 voice bits per channel, 5 of 6 frames, 7 voice bits per channel, 1 of 6 frames, 1 signaling bit per channel, 1 of 6 frames
Normal Transmission Level Point (TLP)	transmit: -17.5 dBm to +2.8 dBm receive: -21.5 dBm to +7 dBm
TLP range	-22 to +8 dBm transmit and receive
Drop Impedance	600 or 900 Ω and 2.15 µF

Frequency Response (1004 Hz reference):		
Frequency (Hz)	Transmit Level (dB)	Receive Level (dB)
60	-14 max.	-14 max.
200	-3.0 to +0	-2.0 to +0
300-3000	-0.5 to +0.25	-0.5 to +0.25
3200	-0.75 to +0.25	-0.75 to +0.25
3400	-1.5 to +0.25	-1.5 to +0.25

Signaling specifications:

Dial pulse distortion	-5 percent to +3 percent, at 12 PPS, 60 percent break
Pulse rate range	8 to 14 PPS.
Loop length limit	< 2000 Ω without buildout resistors < 1000 Ω with buildout resistors
Ring trip time	≤ 250 ms
Ring ground detect range	≤1500 Ω without buildout resistors ≤1000 Ω with buildout resistors
Interrupted ringing (PLAR)	2 seconds on and 4 seconds off

RS232 Data Channel Card.-- The RS232 Data Channel Card shall meet the following requirements:

Data Transmission Specifications:

Asynchronous Data rate	Full Duplex Single Channel 19.2 kb/s max Full Duplex Dual Channel: 6 kb/s max
Electrical Interface	EIA:RS232-C CCITT:V.24
Cable length	25 m max
Encoder Format	3 bit transitional coder with mark for idle state
Asynchronous Distortion	15% max for max data rates; proportionally lower for lower data rates
Power requirements Voltages	+5 V, + or – 12 V, supplied by 2430 power supply unit.
Power dissipation	1.0 W nominal 1.4 W max

General Specifications:

Operating Temperature Range	0˚C to +50˚C
Dimensions Width	120 mm Height, 240 mm Depth, 25 mm Width
Weight	34 kg
Mounting	Telco systems DDI-24 mounting assembly
Electrical Connection	44-pin card edge connector

DS-1 OPTICAL MODEM

The DS-1 optical modem converts the electrical signals of the Time Division Multiplexer's (TDM) aggregate interface and the optical signals used on the singlemode optical fiber facility. Two DS-1 optical modems and the fibers connecting them will form the T-1 transmission facility.

The electrical DS-1 interface of the optical modem shall comply with the ANSI T1.102-1987 standard. The physical interface shall be either a 15 pin D-type connector or a 4-position terminal strip with provision for grounding the cables shield. The optical connectors shall be of the ST type. The DS-1 optical modem shall be transparent to any zero-code suppression used by the terminal equipment. If necessary, the output power of each modem shall be externally attenuated to be compatible with the optical loss of the fiber being used.

The optical interface shall be designed for singlemode operation using an optical wavelength of between 1300 and 1350 nm. The optical launch power of the transmitter shall be at least 20 dB greater than the sensitivity of the receiver.

Sensitivity is defined as the minimum optical receive power required to maintain the specified error rate. The saturation level is the maximum optical received power that the receiver can tolerate before the error rate is exceeded. At no time shall the received optical power exceed the receiver's saturation level. Fixed optical attenuators with a return loss of greater than 15 dB shall be provided. A bit error rate of less than or equal to 1 in 10-9 shall be certified over the specified operating ranges.

As shown on the plans for field locations, the optical modems shall be installed as stand-alone units on a shelf. The DS-1 cables shall be connectorized as appropriate. The DS-1 modem shall be available in stand-alone and rack-mount versions. The rack-mount card cage shall be capable of housing a minimum of seven modems in no more than 533 mm of vertical rack space. All hardware necessary for mounting both versions of the modem in a standard 482-mm rack shall be provided. The DS-1 optical modems shall operate from standard 60 Hz, 120 V power and operate as specified over the temperature range of 0˚C to 50˚C.

The optical receive power at each modem shall be measured and recorded before connection of the receive optical pigtail. The optical fibers shall be attached as required.

Fibers shall be tested as follows:

Each optical modem shall be functionally tested by looping back the optical transmit connector to the optical receive connector using a variable optical attenuator with measured optical loss of 10 dB at 1300 nm. A DS-1 test set shall

be connected to the modem and set for ESF framing, B8ZS coding, internal timing, and a QRS pattern. The test set shall also be set for the standard DSX-1 output level and terminated input. A fifteen-minute test after burn-in shall be error free.

After performing the fifteen-minute bit error rate (BER) test, at least two modems shall be tested for receiver dynamic range. To do this the optical attenuation shall be increased to the point at which the data test just begins to register bit errors. The optical receive power into the modem shall be measured and recorded. The optical attenuation shall be then decreased until the data test once again registers errors. At no time shall the optical power into the receiver exceed the manufacturer's specified saturation level. The optical receive level shall once again be measured and recorded. These minimum and maximum receive levels define the modem receiver's dynamic range.

One pair of modems shall be interconnected using optical patchcords and attenuators with a loss of 10 dB in each direction. The DS-1 interface shall be looped back on one modem and a DS-1 test set connected to the DS-1 interface of the other modem. A bit error rate of less than 1 in 10 to the minus (-) 10 shall be demonstrated.

The following test sheet shall be filled out in the presence of the engineer.

APPENDIX C

Worksheet

Contract No. _____ Contractor: _____

Operator: _____ Date: _____

Location: _____

DS-1 Optical Modem, Modem No. :

Optical Receiver Power (max) into modem (109 BER)	_____ dB	3A
Optical Receiver Level (minimum) into modem	_____ dB	3B
Receiver Dynamic Range (3A-3B):	_____ dB	3C

DS-1 Optical Modem, Modem No. :

Optical Receiver Power (max) into modem (109 BER)	_____ dB	4A
Optical Receiver Level (minimum) into modem	_____ dB	4B
Receiver Dynamic Range (4A-4B):	_____ dB	4C

DS-1 Optical Modem, Modem No. :

Optical Receiver Power (max) into modem (109 BER)	_____ dB	5A
Optical Receiver Level (minimum) into modem	_____ dB	5B
Receiver Dynamic Range (5A-5B):	_____ dB	5C

S-1 Optical Modem, Modem No. :

Optical Receiver Power (max) into modem (109 BER)	_____ dB	6A
Optical Receiver Level (minimum) into modem	_____ dB	6B
Receiver Dynamic Range (6A-6B):	_____ dB	6C

10-3.20 SYSTEM TESTING AND DOCUMENTATION

SYSTEM TESTING

The following existing system testing specification is the same as from those used on the contract for the existing communication system routing installation. The Contractor shall provide system testing, as required, to meet these specifications, as part of the communication system routing, as shown on the plans. The existing communication system routing is described in these special provisions to assist the Contractor in understanding the scope of work involved. Except for verification and testing of the condition of the existing system before and after the new system, the scope of the Contractors work shall be as defined on plans.

As built plans for the existing communication system routing are available for inspection at the Department of Transportation, Construction Office, 120 South Spring Street, Room 244, Los Angeles California 90012, telephone (213) 897-0054.

The system testing shall cover pre-installation testing, fiber optic cable testing, video link testing, data link testing, physical inspection, functional testing, performance testing, final acceptance testing and recording test results, and system documentation that are required to validate the operational performance of the installed fiber optic and twisted pair cables as described elsewhere in these special provisions.

Test Plan.--The Contractor shall develop and submit within 20 working days, after the approval of the Contract, to the Engineer an installation and test plan for approval, which details the method of installation and all testing for all new material, 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 approves, or disapproves, the plan within two weeks. If the Engineer rejects the test plan the Contractor shall submit a revised test plan within 20 working days for review and approval by the Engineer. No testing shall be performed until the Engineer has approved the Contractor's test plan. The tests shall demonstrate that the design and production of new material and cables 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 supply all test equipment.

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. 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 new material, and cables in a laboratory environment prior to delivery to the site. The Contractor shall arrange use of laboratory facilities, including an environmental simulation chamber. The tests shall either be conducted at the 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 in the laboratory of not less than 48 hours.

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 an approved test plan. Any material, 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 delivered to the site.

The manufacturer in accordance with a test plan developed by the Contractor and approved by the Engineer shall perform full performance test.

Sub-system Testing.--Sub-system testing shall encompass the testing of all new and existing material, and cables after installation of new material at the site, and cables, but prior to acceptance tests. These tests shall be done in accordance with the performance testing called under each individual item in these special provisions.

New material and cables shall be installed in accordance with the plans and special provisions. 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 new material, and cables 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.
Test equipment models 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.

Fiber Optic Cable Testing.--Attention is directed to "Fiber Optic Testing" elsewhere in these special provisions.

Video Link Testing.--The video link 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 and cable involved.

Video link testing shall be conducted from the existing North Hollywood (NHD) Hub building and from the new video node VE213 to the new CCTV camera locations that are connected to the existing and new trunk line fiber optic cables, as shown on the plans and as directed by the Engineer.

A video communications link shall include a video transmitter (Vx) in a new CCTV camera controller cabinet, a new video multiplexer at the new video node VE213, and a new video demultiplexer at the existing North Hollywood Hub building, interconnecting fiber optic cables, connectors, and power supplies.

The video link is to provide point-to-point transmission and reception of a full motion NTSC baseband video signal using an optical fiber as the transmission medium. Video system performance tests for any particular video link shall be performed after the interconnecting fiber optic cables have been installed and tested.

The video link in the communications system shall be tested with a video test signal at the video transmitter input. The Contractor shall perform all level adjustments and alignments required on the video link in order for it to operate in accordance with these special provisions. If any video link fails to meet the performance requirements, the Contractor shall take all steps necessary to restore the failed link to the required performance.

Each video link in the communication system routing shall be tested for qualitative performance with its associated camera turned on and connected to the BNC connector of the video transmitter. The Contractor shall measure, record and tabulate a video receiver's dynamic range at the optical connector of the new video demultiplexer at the existing North Hollywood (NHD) Hub building and at the new video multiplexer in the new video node VE123 under test using a 90 percent APL (average picture level) flat field input to the existing single video transmitter. Measurements shall be made from the baseband-in to baseband-out connections.

To do this, the measured optical attenuation of the fiber being used shall be increased to the point at which the video test set just begins to show a 3 dB degradation of the video signal to noise ratio in accordance with EIA 250 video test procedures. The optical receive power into the video (de)multiplexers shall be measured and recorded. Then the optical attenuation shall be decreased until the video test set once again shows degradation of the video and registers errors. At no time shall the optical power into the video (de)multiplexers exceed the manufacturer's specified saturation level. The optical receive level shall once again be measured and recorded. These minimum and maximum receive levels define the video (de)multiplexers dynamic range and shall meet or exceed the specifications as specified elsewhere under these special provisions. The Contractor shall measure and record the base-band video output level from the video (de)multiplexers under test. This measurement shall be repeated for each video link affected by the Contractor’s work.

The output video signal shall be connected to a video display monitor. The observed picture on the video display monitor shall be assessed for qualitative performance. All qualitative comments shall be recorded for each camera.

The Engineer shall approve the video test set. All video links affected by the Contractor’s work shall be tested for the following performance characteristics. The Contractor shall measure, record and demonstrate that the performance meets or exceed the specified EIA RS-250 requirements listed below:

Differential gain.
Differential phase.
Chrominance to luminance delay inequality.
Amplitude vs. frequency characteristics.
Frequency response characteristic.

Signal to noise ratio.
Signal to low frequency noise.
Signal to periodic noise.
Output signal level.

Data Link Testing.--The data link testing shall be conducted after the Contractor submits a test plan and receives approval from the Engineer, based on these special provisions, plans for the equipment involved.

Data link testing is for the alignment and testing of the data system. The activities shall include verification of all data circuits in the low speed data links, and in the integrated data system. The Contractor shall adjust levels required for the data system to operate. Data link tests shall be conducted in one phase:

Data link performance.--Data link performance tests shall consist of functional tests conducted from D4 channel banks (multiplexes) at the existing North Hollywood Hub building and from the new data node VE213 to various new field element locations, such as closed circuit television (CCTV) cameras, changeable message signs, video node and cable nodes, ramp metering systems, and traffic monitoring and control stations, that are connected to the existing and new trunk line fiber optic cables, as shown on the plans and as directed by the Engineer. The audio channel shall be verified in both directions using telephone instruments. The signaling system shall be verified in both directions.

Records of all tests shall be delivered to the Engineer. Circuits shall be fully tested to the D4 channel bank card manufacturer's specifications. Modem manufacturer required channel specifications shall be measured. In addition, end-to-end bit error rate tests (BERTS) shall be conducted using the type modem to be employed on the link at the bit rate to be employed. The bit error rate tests (BERTS) shall be with the modem at the equipment site(s) configured in a loop back and with the test setup at the node. The BERTS shall be a minimum of 3 hours for each circuit exactly and fully configured for operation in accordance with these Special Provisions and the Plans including required bridges.

All circuits affected by the Contractor's work shall provide an error rate less than 1×10^{-6}.

FINAL ACCEPTANCE TESTING

The final acceptance testing shall be conducted in accordance with the approved final acceptance test plan and shall include conducting acceptance tests, as described below and subsequent retest, and documentation of the test results.

The final acceptance testing shall take place only in the presence of the Engineer and the TMC Support Engineer, telephone (213) 897-0329, or the Caltrans Maintenance Supervisor, or any designated person, as directed by the Engineer.

Final acceptance tests shall be conducted after the site and sub-system test results have been reviewed and accepted by the Engineer. These final acceptance tests shall include the complete system in normal operations. The final acceptance test plan shall address the full testing requirements of the specifications. The final acceptance test plan shall detail all tests to be performed, the expected test results, and the test schedule.

The final acceptance test plan shall include the following major tests and acceptance categories:

Physical inspection.
Functional tests.
Performance tests.

The Contractor shall test the communications system according to the approved acceptance test plan and shall provide all test equipment, labor and ancillary items required to perform the testing. The test equipment shall be certified to be calibrated to the manufacturer's specifications. The model and part numbers and date of last calibration of all test equipment shall be included with the test results.

Acceptance testing shall not commence until all material required by these special provisions and plans are delivered, installed, and aligned and the Engineer has approved all production test and site test documentation and results.

All acceptance test results shall be fully documented and such documentation provided as a condition of acceptance.

Physical Inspection.--The Contractor shall provide documentation to prove delivery of all material, equipment, cable, and documentation. If any material or documentation is outstanding or have been replaced under pre-acceptance warranty a physical inspection and documentation shall be provided for this material. The physical inspection shall consist of inspecting all installed material to ensure workmanship satisfies the specified requirements.

Functional Tests.--The Contractor shall test all system functions to demonstrate that all circuits (video, data, and voice), cameras, camera control and all equipment satisfies the functional requirements of the specifications.

This testing shall include subjective testing of each camera image and verification of camera control from the camera control receiver. The connectivity of each data channel shall be demonstrated. The Contractor shall document all functional test results. In the event that any aspect of the functional tests are determined by the Engineer to have failed, the Contractor all cease all acceptance testing and determine the cause of the failure and make repairs to the satisfaction of the Engineer. Acceptance testing shall, at the discretion of the Engineer, be repeated beginning from the start of functional tests.

Performance Tests.--The Contractor shall conduct operational performance tests on the following:

1. The video links from the existing North Hollywood Hub building and from the new video node VE123 to new closed circuit television camera locations that are connected to the existing and new trunk line fiber optic cables.
2. All data links from the D4 channel banks (multiplexes) at the existing North Hollywood Hub building and the new data node VE213 to various field element locations, such as closed circuit television (CCTV) cameras, changeable message signs, fiber optic video node and cable nodes, ramp metering systems, and traffic monitoring stations, that are connected to the existing and new trunk line fiber optic cables, as shown on the plans and as directed by the Engineer.

Video link tests shall satisfy the end-to-end performance requirements under normal operating conditions. Video tests shall be measured with the camera video output transmitting a video signal at the input of the video display monitors. The Contractor shall test the video sub-system and record the results.

The video signal to noise shall be measured according to EIA-250. The video signal to noise ratio shall be measured and recorded with both the camera providing the video-input reference and with suitable video test equipment providing the video reference signal. When the source is the test equipment, the video signal to noise ratio shall be greater than 47 dB.

Adjustments shall be calculated to account for any deviation in output level of the camera resulting from the variable light conditions, the automatic iris, and associated automatic gain control. The resulting video signal to noise ratio shall be recorded.

The video signal to low frequency noise ratio shall be measured according to EIA-250. The resulting video signal to low frequency noise ratio shall be greater than 39 dB. If an AGC circuit does not allow measurement as per EIA-250, the Contractor shall submit an alternative test plan for approval.

The video signal to periodic noise ratio shall be measured according to EIA-250. The resulting video signal to periodic noise ratio shall be greater than 52 dB.

Data tests shall be performed on all operational and voice data circuits affected by the Contractor's work using appropriate test equipment for the measurement of the following parameters:

End-to-end bit error rate tests shall be run from the data nodes 6 and 7 to each remote drop of each data circuit. A data test set shall be used at both the data nodes 6 and 7 and the remote modems to insert an asynchronous pseudo-random pattern using 8 data bits, 1 start bit, I stop bit and even parity. The data test set at the remote modem must hold RTS high for the duration of the data test. The data rate of the test sets shall be set to rate as employed in the system.

A 15-minute test on each drop of each multi-point circuit shall be error free in both directions. One drop of each circuit as chosen by the Engineer shall be tested for 72 hours. The average bit error rate in both directions shall be less than 1×10^{-6} at 9600 bps.

SYSTEM DOCUMENTATION

The Contractor shall submit a draft copy of all documentation for review and approval prior to production of documentation. The Engineer will review and approve or reject the draft documentation within four weeks of receipt.

The Contractor shall modify the documentation if required and submit provisional documentation. The Engineer will approve or reject the provisional documentation within three weeks of receipt. The Contractor shall arrange for re-submission in a timely manner to meet the schedule in the case that the documents were rejected.

Draft documentation shall be submitted eight weeks prior to the start of installation. The draft documentation shall show the general approach in preparing the final manuals.

Upon approval of he draft documentation provisional documentation shall be supplied three weeks prior to the start of site testing. The provisional documentation shall be of the same format as the final manuals but with temporary insertion for items, which cannot be finalized until the system is completed tested and accepted. Final documentation shall be submitted no later than four weeks after completion of the acceptance tests and shall incorporate all comments made during the approval stages. The Contractor shall be responsible for all delay caused by non-compliance to the specified requirements.

Final documentation shall be approved prior to its production. Ten copies of all final documents shall be delivered. The copies shall be 215 mm x 279 mm (8.5 x 11 inch) paper and bound in three-ring hard-covered binders complete with

dividers. System documentation shall be arranged in an operation and maintenance (O & M) manual format providing all the information necessary to operate, maintain, and repair the equipment and cable to the lowest module or component level. The operation and maintenance manual shall as a minimum consist of the following sub-section as described below:

Master Items Index.--This shall be the first section of the O & M manual. The section shall describe the purpose of each manual and brief description to the directory of the manual. It shall also reference equipment manuals as required for additional and support material.

System Description and Technical Data. --This section shall contain an overall description of the system and associated equipment and cables with illustrative block diagrams. This section shall identify all equipment and cables in the system stating the exact module and option number that are employed in the system. Technical data specification and settings for every type of equipment or cable shall be provided. Any modification that has been done on the equipment shall be clearly described.

Theory of Operation. --The manual shall contain a functional description of each element of the system, explaining how each function is being achieved separately and how each element works together to form the complete system.

Software Documentation. --Proper documentation for all software shall be provided. The software documentation shall include a clear description of the system's functionality and specifications. Description on each software modules and programs shall be provided. The Contractor shall supply related programming and system user manuals, application and utilities software use manual, and all associated proprietary software manuals. Software listing of all custom programs shall also be provided, as well as a copy of any software source code.

Operations.--The manual shall describe how to operate the system and each particular type of equipment and software. Equipment layout, layout of controls, displays, software operating procedures and all other information required to correctly operate the system and each functional unit shall be provided. Procedures shall also be provided for initial tune-up of the system and adjustment and checkout required to ensure that the system is functioning within the performance requirements. Warning of special procedures shall be given. The functions and setting of all parameters shall be explained.

Corrective Maintenance.--The manual shall include fault diagnostic and repair procedures to permit the location and correction of faults to the level of each replaceable module. Procedures shall include alignment and testing of the equipment following repair, the test equipment, tools, diagnostic software required and the test set up.

Preventative Maintenance--The manual shall include procedures for preventative maintenance in order to maintain the performance parameters of the system, equipment and cables within the requirements of the specifications.

Parts List.--The manual shall include a list of all replaceable parts with exact parts description and number and a directory of recommended suppliers with correspondence address, telephone, and fax numbers.

Test Results.--This section shall include a copy of the results for all the tests that have been conducted for the contract.

Manuals.--Twelve complete sets of operation and maintenance manuals shall be provided. The manuals shall, as a minimum, include the following:

A. Complete and accurate Block Diagrams.
B. Complete installation and turn-on procedures.
C. Complete performance specifications (functional, electrical, mechanical, and environmental) identified by a universal part number such as JEDEC, RETMA, or EIA.
D. Complete stage-by-stage explanation and trouble-shooting procedures.
E. Complete stage-by-stage explanation of operation.

System schematic drawings shall be provided to identify the type of equipment at each location and the function of all equipment. The drawings shall also show how the system is interconnected. A comprehensive list of cabling and wiring shall be provided to clearly identify the interconnection and labeling of all equipment in the field.

FINAL ACCEPTANCE

The final acceptance of the system will not occur until all of the following conditions have been met as follows:

Physical, functional, and full performance acceptance tests have been completed and the Engineer approves the results.
All documentation has been completed and submitted to the Engineer.
All connections that were changed to perform acceptance tests are restored and tested.

10-3.21 COMMUNICATION SYSTEM ROUTING CUT-OVER

Communication system routing cut-over is the orderly disconnection of existing communication system routing elements and the connection, activation, testing the new communication system routing elements. The integration and testing shall begin at the new field element locations, such as flashing beacon and sign assemblies, closed circuit television (CCTV) cameras, changeable message signs, station, ramp metering systems, and traffic monitoring stations, that are connected to the existing and new trunk line fiber optic cables, of the communication system routing with direction from the existing North Hollywood Hub building, the new video node VE213, and data node VE213. The communication system routing is described in these special provisions to assist the Contractor in understanding the scope of work involved. Except for verification and testing of the condition of the existing communication system routing before and after the installation, the scope of the Contractor work shall be as defined on the plans.

Communication system routing cut-over of individual field elements shall consist of:

1. Installation of the new fiber optics cables, as shown on the plans.
2. Integration and testing at the site over the fiber optic communication system routing with local control from the CCTV camera and remote control from the existing North Hollywood Hub building, the new video node VE213, and the new data node VE213.

Communication system routing cut-over shall begin after the following tasks have been performed:

1. Performing manufacturer recommended pre-installation tests on all new fiber optic cables and new equipment (all new communication system routing elements).
2. Installing and testing the entire project cable plant.
3. Installing all fiber distribution units at all controller cabinets and all termination equipment in the existing North Hollywood Hub building, the new video node VE213, and the data node VE213.
4. Testing video and data links from the existing North Hollywood Hub building, the new video node VE213, and the data node VE213 to the various new field element locations, such as closed circuit television (CCTV) cameras, changeable message signs, ramp metering systems, and traffic monitoring stations, that are connected to the existing and new trunk line fiber optic cables.
5. Perform subsystem testing on all affected D4 channel bank cards, data links, and video links.

Communication system routing cut-over of individual field element locations shall be performed in the following sequence:

1) New data, cable and video nodes.
2) All closed circuit television camera locations.
3) All ramp metering systems, traffic monitoring and control stations, and changeable message sign, detailed on the Route 101schematics, as shown in the plans, and other plans, and on a circuit basis. No new cut-over shall begin until the previous circuit cut-over is completed.

All testing listed above shall be performed as described in "System Testing and Documentation," elsewhere in these special provisions.

The Contractor shall provide a detailed communication system routing cut-over plan to the Engineer for approval, at least 20 working days prior to the beginning of communication system routing cut-over. The Contractor shall coordinate all communication system routing cut-over activity with the Engineer.

Except as otherwise provided in these special provisions, communication with ramp metering and traffic monitoring station system controllers shall be interrupted only during the hours specified and under the restrictions described else where in these special provisions.

Full compensation for communication system routing cut-over shall be considered as included in the contract lump sum price paid for system testing and documentation and no separate payment will be made therefor.

10-3.22 REMOVING, AND SALVAGING ELECTRICAL EQUIPMENT

Salvaged electrical materials shall be hauled to Department of Transportation, Electrical Maintenance Yard, at 1425 Channing Street, Los Angeles, CA, 90021, (213) 746-3181, or to a location within 50 miles, as directed by the Engineer, and by appointment only, prior to delivery.

The Contractor shall provide the equipment and materials, as necessary, to clean, to safely unload, and stockpile the salvaged electrical material. A minimum of 5 working days' notice shall be given to the Engineer prior to delivery.

10-3.23 PAYMENT

The contract price paid per meter for conduit of various sizes, types and installation methods listed in the Engineer's Estimate, shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, for finding all edge drains in the path of conduit routing, for all trenching and backfill material required and pull boxes not otherwise paid for, and for doing all the work involved in installing communication conduits of various sizes, types and installation methods, complete in place, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

The contract price paid per meter for communication conduit (bridge) shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals and for doing all the work involved in installing fiberglass conduit, including excavation, and placing sand and slurry backfill, complete in place, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

The contract unit price paid for pull boxes of various sizes and types listed in the Engineer's Estimate shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in the installation of pull boxes of various sizes and types, complete in place, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

The contract price paid per linear meter for fiber optic cables of various types and sizes listed in the Engineer's Estimate shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in the installation of fiber optic cables of various types and sizes, including fiber optic testing, marking and labeling fiber optic cable assemblies, break out cables, connectors, cable trays, and splicing, complete in place, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

The contract lump sum price for closed circuit television camera at various locations shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in closed circuit television camera, including providing electrical service, furnishing and installing a Type 334-TV controller cabinet on new foundation, camera pole, sign truss mounts, CCTV wirings, CCTV camera assembly, camera control receiver, video transmitter, fiber optic data modem, camera control circuits and accessories, connectors and coaxial cables, and other equipment, complete in place, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

The contract lump sum price paid for work at North Hollywood (NHD) communication Hub building equipment shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in the North Hollywood (NHD) communication Hub building equipment, including furnishing and installing one video demultiplexer, five D4 channel banks, and connecting wires and cables, complete in place, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

The contract lump sum price for cable node (location VE254) shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in cable node (location VE254), including furnishing and installing a Type 334-TV cabinet, and a cable node assembly, and other equipment, complete in place, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

The contract lump sum price for work at modify cable node (location VE171) shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in work at modify cable node (location VE171) including furnishing and installing four fiber distribution units (FDU), and other equipment, complete in place, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

The contract lump sum price paid for video node (location VE213) shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals required to provide fully equipped and operating system, and for doing all the work involved in installing video node (location VE213), including furnishing and installing a Type 334-TV cabinet, a video multiplexer (VUMX), rack-mounted video receivers (Vr), and other equipment, complete in place, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

The contract lump sum price paid for data node (location VE213) shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals required to provide fully equipped and operating system, and for doing all the work involved in installing data node (location VE213), including furnishing and installing a Type 334-TV cabinet, D4

channel banks, fiber optic data modems (FODM), fiber distribution units (FDU), and other equipment, complete in place, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

The contract lump sum price paid for changeable message sign No. 129 shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in changeable message sign No. 129, complete in place, including 12 fiber distribution unit (FDU), and fiber optic data modem (FODM), as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

The contract lump sum price paid for modify changeable message sign No. 12 shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in modify changeable message sign No. 12, complete in place, including 12 fiber distribution unit (FDU), and fiber optic data modem (FODM), as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

The contract lump sum price paid for modify ramp metering system at various locations shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in modify ramp metering system at various locations, complete in place, excluding communications conduits, fiber optic cables, pull boxes of various types and sizes, splice vaults, inductive loop detectors, loop detector cable, fiber optic data modem (FODM) and fiber optic distribution unit (FDU) paid for per unit elsewhere in the estimate, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

Full compensation for technical support from the various communication equipment manufacturers and for arranging for a qualified technician employed by these manufacturers, or their representatives, for the purpose of system turn-on, shall be considered as included in the contract price paid for the items involved 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 that the applicable wage rate and fringe benefits or cash equivalent for the classification of worked performed, as specified in the applicable wage determination incorporated into the contract.

e. The weekly submission of a properly executed certification set forth on the reverse side of Optional Form WH-347 shall satisfy the requirement for submission of the "Statement of Compliance" required by paragraph 2d of this Section V.

f. The falsification of any of the above certifications may subject the contractor to civil or criminal prosecution under 18 U.S.C. 1001 and 31 U.S.C. 231.

g. The contractor or subcontractor shall make the records required under paragraph 2b of this Section V available for inspection, copying, or transcription by authorized representatives of the SHA, the FHWA, or the DOL, and shall permit such representatives to interview employees during working hours on the job. If the contractor or subcontractor fails to submit the required records or to make them available, the SHA, the FHWA, the DOL, or all may, after written notice to the contractor, sponsor, applicant, or owner, take such actions as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds. Furthermore, failure

to submit the required records upon request or to make such records available may be grounds for debarment action pursuant to 29 CFR 5.12.

VI. RECORD OF MATERIALS, SUPPLIES, AND LABOR

1. On all Federal-aid contracts on the National Highway System, except those which provide solely for the installation of protective devices at railroad grade crossings, those which are constructed on a force account or direct labor basis, highway beautification contracts, and contracts for which the total final construction cost for roadway and bridge is less than $1,000,000 (23 CFR 635) the contractor shall:

   a. Become familiar with the list of specific materials and supplies contained in Form FHWA-47, "Statement of Materials and Labor Used by Contractor of Highway Construction Involving Federal Funds," prior to the commencement of work under this contract.

   b. Maintain a record of the total cost of all materials and supplies purchased for and incorporated in the work, and also of the quantities of those specific materials and supplies listed on Form FHWA-47, and in the units shown on Form FHWA-47.

   c. Furnish, upon the completion of the contract, to the SHA resident engineer on Form FHWA-47 together with the data required in paragraph 1b relative to materials and supplies, a final labor summary of all contract work indicating the total hours worked and the total amount earned.

2. At the prime contractor's option, either a single report covering all contract work or separate reports for the contractor and for each subcontract shall be submitted.

VII. SUBLETTING OR ASSIGNING THE CONTRACT

1. The contractor shall perform with its own organization contract work amounting to not less than 30 percent (or a greater percentage if specified elsewhere in the contract) of the total original contract price, excluding any specialty items designated by the State. Specialty items may be performed by subcontract and the amount of any such specialty items performed may be deducted from the total original contract price before computing the amount of work required to be performed by the contractor's own organization (23 CFR 635).

   a. "Its own organization" shall be construed to include only workers employed and paid directly by the prime contractor and equipment owned or rented by the prime contractor, with or without operators. Such term does not include employees or equipment of a subcontractor, assignee, or agent of the prime contractor.

   b. "Specialty Items" shall be construed to be limited to work that requires highly specialized knowledge, abilities, or equipment not ordinarily available in the type of contracting organizations qualified and expected to bid on the contract as a whole and in general are to be limited to minor components of the overall contract.

2. The contract amount upon which the requirements set forth in paragraph 1 of Section VII is computed includes the cost of material and manufactured products which are to be purchased or produced by the contractor under the contract provisions.

3. The contractor shall furnish (a) a competent superintendent or supervisor who is employed by the firm, has full authority to direct performance of the work in accordance with the contract requirements, and is in charge of all construction operations (regardless of who performs the work) and (b) such other of its own organizational resources (supervision, management, and engineering services) as the SHA contracting officer determines is necessary to assure the performance of the contract.

4. No portion of the contract shall be sublet, assigned or otherwise disposed of except with the written consent of the SHA contracting officer, or authorized representative, and such consent when given shall not be construed to relieve the contractor of any responsibility for the fulfillment of the contract. Written consent will be given only after the SHA has assured that each subcontract is evidenced in writing and that it contains all pertinent provisions and requirements of the prime contract.

VIII. SAFETY: ACCIDENT PREVENTION

1. In the performance of this contract the contractor shall comply with all applicable Federal, State, and local laws governing safety, health, and sanitation (23 CFR 635). The contractor shall provide all safeguards, safety devices and protective equipment and take any other needed actions as it determines, or as the SHA contracting officer may determine, to be reasonably necessary to protect the life and health of employees on the job and the safety of the public and to protect property in connection with the performance of the work covered by the contract.

2. It is a condition of this contract, and shall be made a condition of each subcontract, which the contractor enters into pursuant to this contract, that the contractor and any subcontractor shall not permit any employee, in performance of the contract, to work in surroundings or under conditions which are unsanitary, hazardous or dangerous to his/her health or safety, as determined under construction safety and health standards (29 CFR 1926) promulgated by the Secretary of Labor, in accordance with Section 107 of the Contract Work Hours and Safety Standards Act (40 U.S.C. 333).

3. Pursuant to 29 CFR 1926.3, it is a condition of this contract that the Secretary of Labor or authorized representative thereof, shall have right of entry to any site of contract performance to inspect or investigate the matter of compliance with the construction safety and health standards and to carry out the duties of the Secretary under Section 107 of the Contract Work Hours and Safety Standards Act (40 U.S.C. 333).

IX. FALSE STATEMENTS CONCERNING HIGHWAY PROJECTS

In order to assure high quality and durable construction in conformity with approved plans and specifications and a high degree of reliability on statements and representations made by engineers, contractors, suppliers, and workers on Federal-aid highway projects, it is essential that all persons concerned with the project perform their functions as carefully, thoroughly, and honestly as possible. Willful falsification, distortion, or misrepresentation with respect to any facts related to the project is a violation of Federal law. To prevent any misunderstanding regarding the seriousness of these and similar acts, the following notice shall be posted on each Federal-aid highway project (23 CFR 635) in one or more places where it is readily available to all persons concerned with the project:

Notice To All Personnel Engaged On Federal-Aid Highway Projects

18 U.S.C. 1020 READS AS FOLLOWS:

"Whoever being an officer, agent, or employee of the United States, or any State or Territory, or whoever, whether a person, association, firm, or corporation, knowingly makes any false statement, false representation, or false report as to the character, quality, quantity, or cost of the material used or to be used, or the quantity or quality of the work performed or to be performed, or the cost thereof in connection with the submission of plans, maps, specifications, contracts, or costs of construction on any highway or related project submitted for approval to the Secretary of Transportation; or

Whoever knowingly makes any false statement, false representation, false report or false claim with respect to the character, quality, quantity, or cost of any work performed or to be performed, or materials furnished or to be furnished, in connection with the construction of any highway or related project approved by the Secretary of Transportation; or

Whoever knowingly makes any false statement or false representation as to material fact in any statement, certificate, or report submitted pursuant to provisions of the Federal-aid Roads Act approved July 1, 1916, (39 Stat. 355), as amended and supplemented;

Shall be fined not more that $10,000 or imprisoned not more than 5 years or both."

X. IMPLEMENTATION OF CLEAN AIR ACT AND FEDERAL WATER POLLUTION CONTROL ACT

(Applicable to all Federal-aid construction contracts and to all related subcontracts of $100,000 or more.)

By submission of this bid or the execution of this contract, or subcontract, as appropriate, the bidder, Federal-aid construction contractor, or subcontractor, as appropriate, will be deemed to have stipulated as follows:

1. That any facility that is or will be utilized in the performance of this contract, unless such contract is exempt under the Clean Air Act, as amended (42 U.S.C. 1857 et seq., as amended by Pub.L. 91-604), and under the Federal Water

Pollution Control Act, as amended (33 U.S.C. 1251 et seq., as amended by Pub.L. 92-500), Executive Order 11738, and regulations in implementation thereof (40 CFR 15) is not listed, on the date of contract award, on the U.S. Environmental Protection Agency (EPA) List of Violating Facilities pursuant to 40 CFR 15.20.

2. That the firm agrees to comply and remain in compliance with all the requirements of Section 114 of the Clean Air Act and Section 308 of the Federal Water Pollution Control Act and all regulations and guidelines listed thereunder.

3. That the firm shall promptly notify the SHA of the receipt of any communication from the Director, Office of Federal Activities, EPA, indicating that a facility that is or will be utilized for the contract is under consideration to be listed on the EPA List of Violating Facilities.

4. That the firm agrees to include or cause to be included the requirements of paragraph 1 through 4 of this Section X in every nonexempt subcontract, and further agrees to take such action as the government may direct as a means of enforcing such requirements.

XI. CERTIFICATION REGARDING DEBARMENT, SUSPENSION, INELIGIBILITY AND VOLUNTARY EXCLUSION

1. Instructions for Certification - Primary Covered Transactions:

(Applicable to all Federal-aid contracts - 49 CFR 29)

a. By signing and submitting this proposal, the prospective primary participant is providing the certification set out below.

b. The inability of a person to provide the certification set out below will not necessarily result in denial of participation in this covered transaction. The prospective participant shall submit an explanation of why it cannot provide the certification set out below. The certification or explanation will be considered in connection with the department or agency's determination whether to enter into this transaction. However, failure of the prospective primary participant to furnish a certification or an explanation shall disqualify such a person from participation in this transaction.

c. The certification in this clause is a material representation of fact upon which reliance was placed when the department or agency determined to enter into this transaction. If it is later determined that the prospective primary participant knowingly rendered an erroneous certification, in addition to other remedies available to the Federal Government, the department or agency may terminate this transaction for cause of default.

d. The prospective primary participant shall provide immediate written notice to the department or agency to whom this proposal is submitted if any time the prospective primary participant learns that its certification was erroneous when submitted or has become erroneous by reason of changed circumstances.

e. The terms "covered transaction," "debarred," "suspended," "ineligible," "lower tier covered transaction," "participant," "person," "primary covered transaction," "principal," "proposal," and "voluntarily excluded," as used in this clause, have the meanings set out in the Definitions and Coverage sections of rules implementing Executive Order 12549. You may contact the department or agency to which this proposal is submitted for assistance in obtaining a copy of those regulations.

f. The prospective primary participant agrees by submitting this proposal that, should the proposed covered transaction be entered into, it shall not knowingly enter into any lower tier covered transaction with a person who is debarred, suspended, declared ineligible, or voluntarily excluded from participation in this covered transaction, unless authorized by the department or agency entering into this transaction.

g. The prospective primary participant further agrees by submitting this proposal that it will include the clause titled "Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion-Lower Tier Covered Transaction," provided by the department or agency entering into this covered transaction, without modification, in all lower tier covered transactions and in all solicitations for lower tier covered transactions.

h. A participant in a covered transaction may rely upon a certification of a prospective participant in a lower tier covered transaction that is not debarred, suspended, ineligible, or voluntarily excluded from the covered transaction, unless it knows that the certification is erroneous. A participant may decide the method and frequency by which it determines the eligibility of its principals. Each participant may, but is not required to, check the nonprocurement portion of the "Lists of Parties Excluded From Federal Procurement or Nonprocurement Programs" (Nonprocurement List) which is compiled by the General Services Administration.

i. Nothing contained in the foregoing shall be construed to require establishment of a system of records in order to render in good faith the certification required by this clause. The knowledge and information of participant is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.

j. Except for transactions authorized under paragraph f of these instructions, if a participant in a covered transaction knowingly enters into a lower tier covered transaction with a person who is suspended, debarred, ineligible, or voluntarily excluded from participation in this transaction, in addition to other remedies available to the Federal Government, the department or agency may terminate this transaction for cause or default.

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	6.8
	CA Lassen; CA Modoc;CA Plumas;CA Shasta; CA Siskiyou; CA Tehama.	
175	**Eureka, CA**	
	Non-SMSA Counties	6.6
	CA Del Norte; CA Humboldt; CA Trinity.	
176	**San Francisco-Oakland-San Jose, CA:**	
	SMSA Counties:	
	7120 Salinas-Seaside-Monterey, CA	28.9
	CA Monterey.	
	7360 San Francisco-Oakland	25.6
	CA Alameda; CA Contra Costa; CA Marin; CA San Francisco; CA San Mateo.	
	7400 San Jose, CA	19.6
	CA Santa Clara.	
	7485 Santa Cruz, CA.	14.9
	CA Santa Cruz.	
	7500 Santa Rosa, CA	9.1
	CA Sonoma.	
	8720 Vallejo-Fairfield- Napa, CA	17.1
	CA Napa; CA Solano	
	Non-SMSA Counties	23.2
	CA Lake; CA Mendocino; CA San Benito	
177	**Sacramento, CA**:	
	SMSA Counties:	
	6920 Sacramento, CA	16.1
	CA Placer; CA Sacramento; CA Yolo.	
	Non-SMSA Counties	14.3
	CA Butte; CA Colusa; CA El Dorado; CA Glenn; CA Nevada; CA Sierra; CA Sutter; CA Yuba.	
178	**Stockton-Modesto, CA:**	
	SMSA Counties:	
	5170 Modesto, CA	12.3
	CA Stanislaus.	
	8120 Stockton, CA	24.3
	CA San Joaquin.	
	Non-SMSA Counties	19.8
	CA Alpine; CA Amador; CA Calaveras; CA Mariposa;CA Merced; CA Tuolumne.	

		Goal (Percent)
179	**Fresno-Bakersfield, CA**	
	SMSA Counties:	
	0680 Bakersfield, CA	19.1
	CA Kern.	
	2840 Fresno, CA	26.1
	CA Fresno.	
	Non-SMSA Counties	23.6
	CA Kings; CA Madera; CA Tulare.	
180	**Los Angeles, CA:**	
	SMSA Counties:	
	0360 Anaheim-Santa Ana-Garden Grove, CA	11.9
	CA Orange.	
	4480 Los Angeles-Long Beach, CA	28.3
	CA Los Angeles.	
	6000 Oxnard-Simi Valley-Ventura, CA	21.5
	CA Ventura.	
	6780 Riverside-San Bernardino-Ontario, CA.	19.0
	CA Riverside; CA San Bernardino.	
	7480 Santa Barbara-Santa Maria-Lompoc, CA	19.7
	CA Santa Barbara.	
	Non-SMSA Counties	24.6
	CA Inyo; CA Mono; CA San Luis Obispo.	
181	**San Diego, CA:**	
	SMSA Counties	
	7320 San Diego, CA.	16.9
	CA San Diego.	
	Non-SMSA Counties	18.2
	CA Imperial.	

In addition to the reporting requirements set forth elsewhere in this contract the Contractor and subcontractors holding subcontracts, not including material suppliers, of $10,000 or more, shall submit for every month of July during which work is performed, employment data as contained under Form FHWA PR-1391 (Appendix C to 23 CFR, Part 230), and in accordance with the instructions included thereon.