**** WARNING ** WARNING ** WARNING ** WARNING ****
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STATE OF CALIFORNIA

DEPARTMENT OF TRANSPORTATION

NOTICE TO BIDDERS

AND

SPECIAL PROVISIONS

FOR CONSTRUCTION ON STATE HIGHWAY IN SAN DIEGO COUNTY IN SAN DIEGO FROM 1.2 KM EAST OF ROUTE 805/905 SEPARATION TO 0.8 KM EAST OF BRITANNIA OVERCROSSING

In District 11 On Route 905

Under

Bid book dated November 17, 2008	Standard Specifications dated 1999
Project Plans approved October 20, 2008	Standard Plans dated 2004

Identified by

Contract No. 11-288804

DESIGN SEQUENCING CONTRACT

11-SD-905-R9.5/R15.0

Federal-Aid Project
HPLU-6211(078)N

Bids Open: January 8, 2009 OSD

Dated: November 17, 2008 IH

****

SPECIAL NOTICES

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- The Department moved the Amendments to the Standard Specifications to the back of the book titled "Notice to Bidders and Special Provisions."

- The Department retitled the "Proposal and Contract" book to "Bid" book and:

  1. Simplified the language
  2. Moved clauses and the contract form from the "Proposal and Contract" book into the Amendments to the Standard Specifications
  3. Standardized the forms

- The Department retitled the "Notice to Contractors" to "Notice to Bidders" and:

  1. Simplified the language
  2. Moved clauses from the "Notice to Contractors" into the Amendments to the Standard Specifications
  3. Standardized instructions for bidders' inquiries

- The Department incorporated boilerplate special provisions into the Amendments to the Standard Specifications.

TABLE OF CONTENTS

NOTICE TO BIDDERS 1
COPY OF BID ITEM LIST 3
SPECIAL PROVISIONS 17
SECTION 1 SPECIFICATIONS AND PLANS 17
SECTION 2 BIDDING 18
SECTION 2-1 GENERAL 18
2-1.01 PRE-AWARD QUALIFICATION QUESTIONNAIRE 18
2-1.02 ESCROW OF BID DOCUMENTATION 18
SECTION 3 CONTRACT AWARD AND EXECUTION 20
SECTION 3. PRE-AWARD QUALIFICATION REVIEW AND AWARD AND EXECUTION OF CONTRACT 20
3-1.01 GENERAL 20
3-1.015 PRE-AWARD QUALIFICATIONS REVIEW 21
3-1.017 AWARD AND EXECUTION OF CONTRACT 21
SECTION 4. BEGINNING OF WORK, TIME OF COMPLETION, AND LIQUIDATED DAMAGES 22
SECTION 5 GENERAL 22
SECTION 5-1 MISCELLANEOUS 22
5-1.01 PARTNERING DISPUTE RESOLUTION 22
5-1.02 FORCE ACCOUNT PAYMENT 23
5-1.03 COMPENSATION ADJUSTMENTS FOR PRICE INDEX FLUCTUATIONS 23
5-1.04 AREAS FOR CONTRACTOR'S USE 25
5-1.05 PAYMENTS 25
5-1.06 SUPPLEMENTAL PROJECT INFORMATION 26
5-1.07 SOUND CONTROL REQUIREMENTS 26
5-1.08 HIGHWAY CONSTRUCTION EQUIPMENT 27
5-1.09 CALIFORNIA DEPARTMENT OF FISH AND GAME REQUIREMENTS 27
5-1.10 UNITED STATES ARMY CORPS OF ENGINEERS REQUIREMENTS 27
5-1.11 UNITED STATES FISH AND WILDLIFE SERVICE REQUIREMENTS 27
5-1.12 CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD REQUIREMENTS 28
5-1.13 CONTRACTOR ENVIRONMENTAL EDUCATION PROGRAM 28
5-1.14 PALEONTOLOGY 28
5-1.15 RELATIONS WITH CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD 29
WITHHOLDS 29
5-1.16 ENVIRONMENTALLY SENSITIVE AREA 30
5-1.17 MIGRATORY BIRDS 30
5-1.18 PRESERVATION OF PROPERTY 31
5-1.19 DAMAGE REPAIR 31
5-1.20 RELIEF FROM MAINTENANCE AND RESPONSIBILITY 32
SECTION 6. (BLANK) 32
SECTION 7. (BLANK) 32
SECTION 8. MATERIALS 32
SECTION 8-1. MISCELLANEOUS 32
8-1.01 SUBSTITUTION OF NON-METRIC MATERIALS AND PRODUCTS 32
8-1.02 PREQUALIFIED AND TESTED SIGNING AND DELINEATION MATERIALS 39
8-1.03 STATE-FURNISHED MATERIALS 45
8-1.04 SLAG AGGREGATE 45
8-1.05 ENGINEERING FABRICS 46
8-1.06 ASPHALTIC EMULSION 46
SECTION 8-2. CONCRETE 47
8-2.01 PORTLAND CEMENT CONCRETE 47
8-2.02 CORROSION CONTROL FOR PORTLAND CEMENT CONCRETE 47
8-2.03 CEMENTITIOUS MATERIAL AND AIR CONTENT 48
SECTION 8-3. WELDING 49
8-3.01 WELDING 49

WELDING QUALITY CONTROL 51
WELDING FOR OVERHEAD SIGN AND POLE STRUCTURES 54
PAYMENT 54
SECTION 9. DESCRIPTION OF BRIDGE WORK 55
SECTION 10. CONSTRUCTION DETAILS 55
SECTION 10-1. GENERAL 55
10-1.01 CONSTRUCTION PROJECT INFORMATION SIGNS 55
10-1.02 ORDER OF WORK 55
EMERGENCY CALL BOXES 57
10-1.03 MATERIAL CONTAINING LEAD AND BURN ASH MATERIALS 58
10-1.04 ARCHAEOLOGICAL MONITORING AREA 59
10-1.05 WATER POLLUTION CONTROL 59
GENERAL 59
STORM WATER POLLUTION PREVENTION PLAN 60
SAMPLING AND ANALYSIS 62
IMPLEMENTATION REQUIREMENTS 64
INSPECTION AND MAINTENANCE 64
REPORTING REQUIREMENTS 64
PAYMENT 65
10-1.06 CONSTRUCTION SITE MANAGEMENT 65
SPILL PREVENTION AND CONTROL 66
MATERIAL MANAGEMENT 67
WASTE MANAGEMENT 68
NON-STORM WATER MANAGEMENT 70
DEWATERING 73
PAYMENT 73
10-1.07 TEMPORARY HYDRAULIC MULCH 74
GENERAL 74
MATERIALS 74
CONSTRUCTION 75
MEASUREMENT AND PAYMENT 76
10-1.08 STREET SWEEPING 76
MEASUREMENT AND PAYMENT 77
10-1.09 TEMPORARY CONCRETE WASHOUT FACILITY 77
MATERIALS 77
INSTALLATION 78
MAINTENANCE 78
MEASUREMENT AND PAYMENT 79
10-1.10 TEMPORARY CONCRETE WASHOUT (PORTABLE) 79
PLACEMENT 79
PAYMENT 79
10-1.11 TEMPORARY CHECK DAM 80
MATERIALS 80
INSTALLATION 81
REMOVAL 81
MAINTENANCE 81
MEASUREMENT AND PAYMENT 81
10-1.12 TEMPORARY FIBER ROLL 82
MATERIALS 82
INSTALLATION 82
MAINTENANCE 83
MEASUREMENT AND PAYMENT 83
10-1.13 TEMPORARY FENCE (TYPE ESA) 83
MATERIALS 83
INSTALLATION 84
MAINTENANCE 84
MEASUREMENT AND PAYMENT 84
10-1.14 TEMPORARY CONSTRUCTION ENTRANCE 84
MATERIALS 85

INSTALLATION 85
MAINTENANCE 86
MEASUREMENT AND PAYMENT 86
10-1.15 MOVE-IN/MOVE-OUT (TEMPORARY EROSION CONTROL) 86
10-1.16 TEMPORARY DRAINAGE INLET PROTECTION 87
MATERIALS 87
INSTALLATION 90
MAINTENANCE 91
REMOVAL 91
MEASUREMENT 91
PAYMENT 91
10-1.17 MATERIALS HAULING EQUIPMENT LOADING ON BRIDGES 91
10-1.18 COOPERATION 92
10-1.19 PROGRESS SCHEDULE (CRITICAL PATH METHOD) 92
DESIGN SEQUENCING 97
10-1.20 TIME-RELATED OVERHEAD 98
10-1.21 OBSTRUCTIONS 101
10-1.22 DUST CONTROL 103
10-1.23 CONSTRUCTION AREA TRAFFIC CONTROL DEVICES 103
10-1.24 CONSTRUCTION AREA SIGNS 104
10-1.25 MAINTAINING TRAFFIC 104
10-1.26 CLOSURE REQUIREMENTS AND CONDITIONS 112
10-1.27 IMPACT ATTENUATOR VEHICLE 113
10-1.28 TRAFFIC CONTROL SYSTEM FOR LANE CLOSURE 114
STATIONARY LANE CLOSURE 115
MOVING LANE CLOSURE 115
PAYMENT 116
10-1.29 TEMPORARY PAVEMENT DELINEATION 116
10-1.30 BARRICADE 118
10-1.31 PORTABLE CHANGEABLE MESSAGE SIGN 119
10-1.32 TEMPORARY RAILING 119
10-1.33 CHANNELIZER (SURFACE MOUNTED) 119
10-1.34 CHANNELIZER (SURFACE MOUNTED) (LEFT IN PLACE) 119
10-1.35 TRAFFIC PLASTIC DRUMS 119
10-1.36 TEMPORARY CRASH CUSHION MODULE 120
10-1.37 EXISTING HIGHWAY FACILITIES 122
ABANDON CULVERT 122
ABANDON INLET 122
REMOVE METAL BEAM GUARD RAILING 123
REMOVE PAVEMENT MARKER 123
REMOVE TRAFFIC STRIPE 123
REMOVE ROADSIDE SIGN 124
RESET ROADSIDE SIGN 124
RELOCATE ROADSIDE SIGN 124
REMOVE BASE AND SURFACING 124
COLD PLANE ASPHALT CONCRETE PAVEMENT 125
REMOVE CONCRETE 125
10-1.38 CLEARING AND GRUBBING 125
VEGETATION MOWING AND TREE REMOVAL PRIOR TO THE MIGRATORY BIRD NESTING PERIOD 125
10-1.39 WATERING 126
10-1.40 EARTHWORK 126
10-1.41 GEOSYNTHETIC REINFORCED EMBANKMENT 128
REINFORCED CONCRETE CRIB MEMBERS 128
GEOSYNTHETIC REINFORCEMENT 128
EMBANKMENT BACKFILL 129
CONSTRUCTION 130
MEASUREMENT AND PAYMENT 131
10-1.42 CONTROLLED LOW STRENGTH MATERIAL 131

10-1.43 CLAY CAP 132
MATERIAL 132
MEASUREMENT AND PAYMENT 132
10-1.44 MOVE-IN/MOVE-OUT (EROSION CONTROL) 132
10-1.45 EROSION CONTROL (TYPE D) 133
MATERIALS 133
APPLICATION 136
MEASUREMENT AND PAYMENT 137
10-1.46 EROSION CONTROL (BIOFILTRATION) 137
MATERIALS 137
PREPARATION 139
APPLICATION 139
ESTABLISHMENT 139
MEASUREMENT AND PAYMENT 140
10-1.47 EROSION CONTROL (HYDRAULIC MATRIX) 140
MATERIALS 140
APPLICATION 143
MAINTENANCE 144
MEASUREMENT AND PAYMENT 144
10-1.48 FIBER ROLLS 144
MATERIALS 144
INSTALLATION 145
MEASUREMENT AND PAYMENT 145
10-1.49 CHECK DAM 145
10-1.50 DRAINAGE INLET PROTECTION 146
10-1.51 TRUCK WATERING 147
10-1.52 IRRIGATION CROSSOVERS 148
10-1.53 IRRIGATION SLEEVE 148
10-1.54 WATER SUPPLY LINE (BRIDGE) 148
10-1.55 AGGREGATE SUBBASE 150
10-1.56 AGGREGATE BASE 151
10-1.57 HOT MIX ASPHALT 151
10-1.58 HOT MIX ASPHALT (MISCELLANEOUS AREAS) 153
10-1.59 HOT MIX ASPHALT AGGREGATE LIME TREATMENT - SLURRY METHOD 153
10-1.60 HOT MIX ASPHALT AGGREGATE LIME TREATMENT - DRY LIME METHOD 155
10-1.61 LIQUID ANTISTRIP TREATMENT 158
10-1.62 JOINTED PLAIN CONCRETE PAVEMENT 160
10-1.63 EXIT RAMP TERMINI 173
10-1.64 PILING 173
STEEL PIPE PILING 174
NONDESTRUCTIVE TESTING FOR STEEL PIPE PILING 176
10-1.65 PRESTRESSING CONCRETE 177
10-1.66 CONCRETE STRUCTURES 177
DECK CRACK TREATMENT 178
FALSEWORK 178
COST REDUCTION INCENTIVE PROPOSALS FOR CAST-IN-PLACE PRESTRESSED BOX GIRDER BRIDGES 179
SLIDING BEARINGS 180
ELASTOMERIC BEARING PADS 180
MEASUREMENT AND PAYMENT 180
10-1.67 REINFORCED CONCRETE CRIB WALL 180
10-1.68 STRUCTURE APPROACH SLABS (TYPE N) 181
GENERAL 181
STRUCTURE APPROACH DRAINAGE SYSTEM 181
ENGINEERING FABRICS 182
TREATED PERMEABLE BASE UNDER APPROACH SLAB 182
APPROACH SLABS 183
JOINTS 183
MEASUREMENT AND PAYMENT 184

10-1.69 SOUND WALL 184
DESCRIPTION 184
SOUND WALL (MASONRY BLOCK) 184
MEASUREMENT AND PAYMENT 185
10-1.70 SEALING JOINTS 186
10-1.71 JOINT SEAL ASSEMBLIES (MAXIMUM MOVEMENT RATING, 100 MM) 186
ALTERNATIVE JOINT SEAL ASSEMBLY 186
10-1.72 PRE-MANUFACTURED BAT HOUSE 187
10-1.73 ARCHITECTURAL SURFACE (TEXTURED CONCRETE) 188
TEST PANEL 188
FORM LINERS 188
RELEASING FORM LINERS 189
CURING 189
MEASUREMENT AND PAYMENT 189
10-1.74 REINFORCEMENT 190
MEASUREMENT AND PAYMENT 190
10-1.75 HEADED BAR REINFORCEMENT 190
GENERAL 190
PRODUCTION TESTS 191
MEASUREMENT AND PAYMENT 191
10-1.76 STEEL STRUCTURES 191
GENERAL 191
MATERIALS 192
ROTATIONAL CAPACITY TESTING PRIOR TO SHIPMENT TO JOB SITE 192
INSTALLATION TENSION TESTING AND ROTATIONAL CAPACITY TESTING AFTER ARRIVAL ON THE JOB SITE 196
SURFACE PREPARATION 197
SEALING 197
WELDING 197
10-1.77 SIGN STRUCTURES 197
10-1.78 CLEAN AND PAINT SIGN STRUCTURES 199
CLEAN AND PAINT UNGALVANIZED SURFACES 199
PAYMENT 202
PAINT GALVANIZED SURFACES 202
10-1.79 ROADSIDE SIGNS 202
10-1.80 WEED CONTROL MAT (RUBBER) 203
MATERIALS 203
SITE PREPARATION 203
PLACEMENT 203
PAYMENT 203
10-1.81 HABITAT RESTORATION SIGN 204
10-1.82 FURNISH SIGN 204
SHEET ALUMINUM 205
RETROREFLECTIVE SHEETING 206
PROCESS COLOR AND FILM 206
SINGLE SHEET ALUMINUM SIGN 206
LAMINATED PANEL SIGN 206
MEASUREMENT AND PAYMENT 208
10-1.83 CLEAN AND PAINT STRUCTURAL STEEL 208
GENERAL 208
CLEANING 209
PAINTING 209
10-1.84 PREPARE AND PAINT CONCRETE 211
10-1.85 ALTERNATIVE PIPE 212
10-1.86 PLASTIC PIPE 212
CORRUGATED POLYVINYL CHLORIDE (PVC) PIPE WITH SMOOTH INTERIOR 212
GENERAL 212
10-1.87 REINFORCED CONCRETE PIPE 214
10-1.88 CORRUGATED METAL PIPE 214

COMPOSITE STEEL SPIRAL RIB PIPE WITH SMOOTH INTERIOR 214
10-1.89 OVERSIDE DRAIN 216
10-1.90 ALTERNATIVE PIPE DOWNDRAIN 216
10-1.91 MISCELLANEOUS FACILITIES 216
10-1.92 GRATED LINE DRAIN 216
10-1.93 SLOPE PROTECTION 218
10-1.94 SLOPE PAVING (STAMPED CONCRETE) 218
10-1.95 MISCELLANEOUS CONCRETE CONSTRUCTION 218
MINOR CONCRETE (TEXTURED PAVING) 219
10-1.96 MISCELLANEOUS IRON AND STEEL 219
10-1.97 MISCELLANEOUS METAL (BRIDGE) 219
10-1.98 BRIDGE DECK DRAINAGE SYSTEM 219
10-1.99 CHAIN LINK FENCE 220
10-1.100 WILDLIFE FENCE 220
10-1.101 POLE BARRIER 220
10-1.102 MARKERS AND DELINEATORS 221
10-1.103 METAL BEAM GUARD RAILING 221
ALTERNATIVE FLARED TERMINAL SYSTEM 221
10-1.104 CHAIN LINK RAILING 222
10-1.105 CABLE RAILING 222
10-1.106 CONCRETE BARRIER 222
10-1.107 THRIE BEAM BARRIER 222
10-1.108 TRANSITION RAILING (TYPE WB) 223
10-1.109 TRANSITION RAILING (TYPE DTB) 223
10-1.110 CRASH CUSHION (TYPE CAT) 223
10-1.111 CRASH CUSHION (REACT) 224
10-1.112 THERMOPLASTIC TRAFFIC STRIPE AND PAVEMENT MARKING 224
10-1.113 PAINT TRAFFIC STRIPE 225
10-1.114 PARKING BUMPER 225
10-1.115 PAVEMENT MARKERS 226
10-1.116 BICYCLE PARKING RACK 226
10-1.117 BICYCLE LOCKER 226
SECTION 10-2 HIGHWAY PLANTING AND IRRIGATION SYSTEMS 228
10-2.01 GENERAL 228
COST BREAK-DOWN 228
CONTROL AND NEUTRAL CONDUCTORS COST BREAK-DOWN 231
10-2.02 (BLANK) 233
10-2.03 (BLANK) 233
10-2.04 HIGHWAY PLANTING 233
HIGHWAY PLANTING MATERIALS 233
PESTICIDES 234
PLANTING 234
PLANT ESTABLISHMENT WORK 234
10-2.05 IRRIGATION SYSTEMS 235
VALVE BOXES 235
GATE VALVES 235
ELECTRIC AUTOMATIC IRRIGATION COMPONENTS 236
IRRIGATION SYSTEMS FUNCTIONAL TEST 237
PIPE 237
THRUST BLOCK 237
WATER METER 237
BACKFLOW PREVENTER ASSEMBLIES 238
BACKFLOW PREVENTER ASSEMBLY ENCLOSURE 238
IRRIGATION CONTROLLER ENCLOSURE 238
TESTING NEW BACKFLOW PREVENTERS 239
SPRINKLERS 239
PRESSURE REDUCING VALVE 239
FINAL IRRIGATION SYSTEM CHECK 239
SECTION 10-3. SIGNALS, LIGHTING AND ELECTRICAL SYSTEMS 240

10-3.01 DESCRIPTION 240
10-3.02 COST BREAK-DOWN 240
10-3.03 MAINTAINING EXISTING AND TEMPORARY ELECTRICAL SYSTEMS 256
10-3.04 MAINTAINING EXISTING TRAFFIC MANAGEMENT SYSTEM ELEMENTS DURING CONSTRUCTION 256
10-3.05 FOUNDATIONS 257
10-3.06 STANDARDS, STEEL PEDESTALS, AND POSTS 257
10-3.07 CONDUIT 257
10-3.08 MULTIDUCT CONDUIT SYSTEM 258
10-3.09 COMMUNICATION CONDUIT 258
10-3.10 HIGH DENSITY POLYETHYLENE CONDUIT 259
GENERAL 259
MATERIAL 259
CONDUIT 259
JOINING OF CONDUIT 260
INSTALLATION 260
CERTIFICATES OF COMPLIANCE, MATERIALS RECEIVING INSPECTION AND MANUFACTURER'S DATA 260
10-3.11 AIR BLOWN METHOD 261
10-3.12 SEALING PLUG 261
10-3.13 TRACER WIRE 262
10-3.14 WARNING TAPE 262
10-3.15 SLURRY CEMENT BACKFILL 262
10-3.16 DIRECTIONAL BORING METHOD 262
10-3.17 TRENCH DELINEATOR 263
10-3.18 PULL BOXES 263
10-3.19 FIBER OPTIC VAULT 263
10-3.20 CONDUCTORS AND WIRING 263
OPTICAL DETECTOR CABLE 263
10-3.21 CATEGORY 5E CABLE 264
10-3.22 FIBER OPTIC COMMUNICATION CABLE PLANT 264
10-3.23 FIBER OPTIC LABELING 266
10-3.24 FIBER OPTIC CABLE INSTALLATION 266
10-3.25 SPLICING 266
10-3.26 FIBER OPTIC SPLICE CLOSURE 267
10-3.27 SPLICE TRAY 267
10-3.28 PASSIVE CABLE ASSEMBLIES AND COMPONENTS 267
10-3.29 FIBER OPTIC TESTING 268
10-3.30 FIBER DISTRIBUTION UNIT 272
10-3.31 BONDING AND GROUNDING 272
10-3.32 SERVICE 272
10-3.33 NUMBERING ELECTRICAL EQUIPMENT 272
10-3.34 CONTROLLER CABINETS 273
10-3.35 STATE-FURNISHED CONTROLLER ASSEMBLIES 273
10-3.36 TELEPHONE DEMARCATION CABINET (TYPE G) 274
10-3.37 VEHICLE SIGNAL FACES AND SIGNAL HEADS 274
10-3.38 LIGHT EMITTING DIODE SIGNAL MODULE 274
10-3.39 BATTERY BACKUP SYSTEM 279
10-3.40 LIGHT EMITTING DIODE PEDESTRIAN SIGNAL FACE MODULES 281
10-3.41 SERIAL TO ETHERNET CONVERSION UNIT 284
10-3.42 ETHERNET SWITCH 285
10-3.43 ETHERNET EXTENDER PROVIDER 286
10-3.44 ETHERNET EXTENDER SUBSCRIBER 287
10-3.45 ETHERNET HUB 288
10-3.46 MEDIA CONVERTER 289
10-3.47 MEDIA CONVERTER (MULTIPOINT MEDIA CONVERTER) 290
10-3.48 ROUTER 291
10-3.49 DETECTORS 291
PREFORMED INDUCTIVE LOOPS 291

10-3.50 VIDEO IMAGE VEHICLE DETECTION SYSTEM 292
10-3.51 CLOSED CIRCUIT TELEVISION CAMERA ASSEMBLY 296
GENERAL 296
CAMERA 296
CLOSED CIRCUIT TELEVISION CAMERA LENS 297
ENVIRONMENTAL ENCLOSURE 298
PAN AND TILT UNIT 299
OVERALL REQUIREMENTS 300
CERTIFICATE OF COMPLIANCE 301
10-3.52 SIGN LIGHTING FIXTURES-INDUCTION 301
10-3.53 PHOTOELECTRIC CONTROLS 302
10-3.54 MODEL 500 CHANGEABLE MESSAGE SIGN SYSTEM 302
10-3.55 PAYMENT 303
SECTION 10-4. RELOCATION OF UTILITY FACILITIES 304
10-4.01 GENERAL DESCRIPTION 304
EXCAVATION 304
TRENCH EXCAVATION 304
TRENCH EXCAVATION AND PLACEMENT OF BEDDING 304
FOUNDATION STABILIZATION 305
DEWATERING 306
WATER IN TRENCH 306
EXCESS TRENCH EXCAVATION 306
ADDITIONAL BEDDING 307
IMPORTED BACKFILL 307
TRENCH RESURFACING 307
COORDINATION 307
STORAGE OF MATERIALS 307
EXISTING UTILITIES 308
WATER FOR CONSTRUCTION PURPOSES 309
BURIED WATER LINE WARNING AND IDENTIFICATION TAPE 309
BURIED WATER LINE IDENTIFICATION TRACER WIRE 309
POLYETHYLENE ENCASEMENT 310
CURB IDENTIFICATION 310
CONCRETE FOR ANCHOR, VALVE, AND THRUST BLOCKS 310
HYDROSTATIC TESTING OF MAINS 312
DISINFECTION OF PIPING 313
VALVE TESTING PROCEDURES 315
CLOSED CIRCUIT TELEVISION (CCTV) INSPECTIONS 318
SECTION 10-4. 02 WATER SYSTEM RELOCATION 319
GENERAL 319
DRAWINGS AND DATA REQUIRED 319
CONNECTIONS TO EXISTING WATER MAINS 319
BEDDING FOR WATER PIPE 321
BACKFILL 321
WATER MAIN REMOVAL AND DISPOSAL OF ABANDONED WATERLINE 323
PIPE LAYING-GENERAL 324
DISPOSAL OF ASBESTOS 324
DELIVERY, STORAGE, AND HANDLING OF CEMENT MORTAR LINED AND COATED STEEL PIPE AND SPECIALS 325
DELIVERY, STORAGE, AND HANDLING OF POLYVINYL CHLORIDE (PVC) WATER PIPE 325
DELIVERY, STORAGE AND HANDLING OF VALVES 326
INSTALLATION OF VALVES 326
HI-LINE 326
FLEXIBLE EXPANSION JOINTS 326
FLANGED CONNECTIONS 326
BUTT STRAP JOINTS 327
TEMPORARY BLOW-OFFS 327
GASKETS 327
BOLTS AND NUTS 327

INTERIOR JOINT FINISH FOR PIPES LESS THAN 600 MILLIMETERS IN DIAMETER 328
INTERIOR JOINT FINISH FOR PIPES 600 MILLIMETERS DIAMETER AND LARGER 328
EXTERIOR JOINT FINISH 328
FIELD PAINTING AND COATING 328
FIELD WELDED JOINTS 331
CATHODIC PROTECTION SYSTEM 332
SECTION 10-4.03 MATERIALS FOR WATER SYSTEM WORK 336
GENERAL 336
WATER MAIN 336
CEMENT MOTAR LINED AND COATED STEEL PIPE AND SPECIALS 336
TAPE COATING AND ROCK SHIELD 340
POLYVINYL CHLORIDE (PVC) PRESSURE PIPE 340
STEEL PIPE CASING 340
FLANGED COUPLING ADAPTORS 341
FLEXIBLE PIPE COUPLINGS 341
GROOVED END OR SHOULDERED COUPLINGS FOR DUCTILE IRON OR STEEL PIPE 341
BLOWOFF ASSEMBLIES 341
AIR RELEASE VALVE, AIR VACUUM VALVE 342
VALVE BOX AND EXTENSION STEMS 343
GATE WELLS 343
GATE VALVES – RESILIENT WEDGE 343
BUTTERFLY VALVES 344
METER BOXES 346
50 MM COPPER PIPE FOR SERVICES LINES 346
SECTION 10-4.04 WATER MEASUREMENT AND PAYMENT 347
MEASUREMENT 347
PAYMENT 347
SECTION 10-4.05 INSTALLATION AND RELOCATION OF SEWER FACILITIES 347
GENERAL DESCRIPTION 347
COORDINATION 348
DELIVERY, HANDLING, AND STORAGE OF MATERIALS 348
HAZARDOUS WASTE AND UNKNOWN PHYSICAL CONDITIONS 349
WATER FOR CONSTRUCTION PURPOSES 349
COST OF WATER WITHIN CITY OF SAN DIEGO 349
GENERAL SEWER SYSTEM REQUIREMENTS: 349
SEQUENCE OF WORK 349
SECTION 10-4.06 METHODS OF CONSTRUCTION 350
GENERAL DESCRIPTION 350
DRAWINGS AND DATA REQUIRED 350
PRODUCT TESTING 352
SEWAGE DIVERSION PLAN 352
SEWAGE BY-PASS 353
SEWER MAIN REMOVAL AND DISPOSAL 354
ADJUST SEWER MANHOLE 354
MODIFY MANHOLES 354
REMOVE SEWER MANHOLES 354
EXCAVATION 354
STRUCTURE EXCAVATION 354
TRENCH EXCAVATION 354
EXCESS TRENCH EXCAVATION 355
EXCAVATION SUPPORT SYSTEMS 355
DEWATERING 358
FOUNDATION STABILIZATION 358
BEDDING FOR SEWER MAINS 359
ADDITIONAL BEDDING 359
PIPE LAYING-GENERAL 359
CASING INSTALLATION – GENERAL 360
CARRIER PIPE INSTALLATION – GENERAL 360
MINOR CONCRETE 360

REINFORCED CONCRETE PIPE 360
GEOTEXTILE INSTALLATION 361
BACKFILL 361
IMPORTED BACKFILL 362
BURIED WARNING AND IDENTIFICATION TAPE 362
TRENCH RESURFACING 363
SEWER FACILITIES TESTING 363
DEFLECTION TESTING PVC PIPE 363
AIR PRESSURE TEST FOR SEWER PIPE 363
MANHOLE TESTING 363
TELEVISING SEWER MAINS 364
TELEVISING EQUIPMENT 364
GENERAL DESCRIPTION 366
AWWA C905, DR-25 POLYVINILYL CHLORIDE (PVC) SEWER PIPE 367
VITRIFIED CLAY (VCP) SEWER PIPE 367
HIGH DENSITY POLYETHYLENE (HDPE) SEWER PIPE 367
PIPE CASING – WELDED STEEL PIPE 367
ANNULAR SPACE MATERIAL FOR CASING 367
PIPE CASING SPACERS AND END SEALS 368
CATHODIC PROTECTION SYSTEM 368
CONCRETE VAULTS AND MANHOLES 372
MANHOLE FRAMES AND COVERS 373
MANHOLE COATING AND LINING 373
GEOTEXTILES 374
FIBERGLASS REINFORCED PLASTIC (FRP) ASSEMBLIES 375
SECTION 10-4.08 SEWER LINE MEASUREMENT AND PAYMENT 375
MEASUREMENT 375
PAYMENT 375
SECTION 10-4.09 APPROVED MATERIALS LIST 376
AMENDMENTS TO THE STANDARD SPECIFICATIONS 400

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	Acronyms and Abbreviations (A-L)
A10B	Acronyms and Abbreviations (M-Z)
A10C	Symbols (Sheet 1 of 2)
A10D	Symbols (Sheet 2 of 2)
A20A	Pavement Markers and Traffic Lines, Typical Details
A20B	Pavement Markers and Traffic Lines, Typical Details
A20C	Pavement Markers and Traffic Lines, Typical Details
A20D	Pavement Markers and Traffic Lines, Typical Details
A24A	Pavement Markings - Arrows
A24B	Pavement Markings - Arrows
RSP A24C	Pavement Markings – Symbols and Numerals
A24D	Pavement Markings – Words
A24E	Pavement Markings – Words and Crosswalks
A62A	Excavation and Backfill – Miscellaneous Details
A62B	Limits of Payment for Excavation and Backfill – Bridge Surcharge and Wall

A62C	Limits of Payment for Excavation and Backfill - Bridge
A62D	Excavation and Backfill – Concrete Pipe Culverts
A62DA	Excavation and Backfill – Concrete Pipe Culverts
A62E	Excavation and Backfill – Cast-In-Place Reinforced Concrete Box and Arch Culverts
A62F	Excavation and Backfill – Metal and Plastic Culverts
A63A	Portable Concrete Barrier (Type 60K)
A63B	Portable Concrete Barrier (Type 60K)
A73B	Markers
A73C	Delineators, Channelizers and Barricades
RSP A76A	Concrete Barrier Type 60
A76B	Concrete Barrier Type 60
A77A1	Metal Beam Guard Railing – Standard Railing Section (Wood Post with Wood Block)
A77A2	Metal Beam Guard Railing – Standard Railing Section (Steel Post with Notched Wood or Notched Plastic Block)
A77B1	Metal Beam Guard Railing – Standard Hardware
A77C1	Metal Beam Guard Railing – Wood Post and Wood Block Details
A77C2	Metal Beam Guard Railing Steel Post, Notched Wood Block and Notched Plastic Block Details
A77C3	Metal Beam Guard Railing – Typical Line Post Embedment and Hinge Point Offset Details
A77C4	Metal Beam Guard Railing – Typical Railing Delineation and Dike Positioning Details
NSP A77C8	Metal Beam Guard Railing – Typical Vegetation Control at Fixed Object
NSP A77C9	Metal Beam Guard Railing – Typical Vegetation Control at Fixed Object
NSP A77C10	Metal Beam Guard Railing – Typical Vegetation Control at Fixed Object
A77E1	Metal Beam Guard Railing – Typical Layouts for Embankments
A77F1	Metal Beam Guard Railing – Typical Layouts for Structure Approach
A77F3	Metal Beam Guard Railing – Typical Layouts for Structure Approach
A77G3	Metal Beam Guard Railing – Typical Layouts for Roadside Fixed Objects
A77H1	Metal Railing End Anchor Assembly (Type SFT)
A77H2	Metal Railing Rail Tensioning Assembly
A77H3	Metal Railing Anchor Cable and Anchor Plate Details
A77I2	Metal Beam Guard Railing – Buried Post End Anchor
A77J2	Metal Beam Guard Railing Connections to Bridge Railings without Sidewalks Details No. 2
A77J3	Metal Beam Guard Railing Connections to Abutments and Walls
A77J4	Metal Beam Guard Railing Transition Railing (Type WB)
A77K1	Metal Beam Guard Railing Connections to Bridge Railings with Sidewalks Details No. 1
A77K2	Metal Beam Guard Railing Connections to Bridge Railings with Sidewalks Details No. 2
A77L1	Metal Beam Railing Terminal System (Type SRT)
A78A	Thrie Beam Barrier Standard Barrier Railing Section (Wood Post with Wood Block)
A78D1	Thrie Beam Barrier at Fixed Objects in Median
RSP A81A	Crash Cushion, Sand Filled (Unidirectional)
RSP A81B	Crash Cushion, Sand Filled (Unidirectional)
A82A1	Crash Cushion (Type CAT)
RSP A82C1	Crash Cushion (Type React 9CBB)
A82C2	Crash Cushion (Type React 9CBB) – Backup Block Details
A82C3	Crash Cushion (Type React 9CBB) – Concrete Barrier Transition Details
A85	Chain Link Fence
RSP A87A	Curbs and Driveways
A87B	Asphalt Concrete Dikes
RSP A88A	Curb Ramp Details
RSP A88B	Curb Ramp and Island Passageway Details
RSP A90A	Accessible Parking – Off-Street
RSP P1	Jointed Plain Concrete Pavement
RSP P2	Jointed Plain Concrete Pavement – Widen Slab Details
NSP P3	Jointed Plain Concrete Pavement – Nondoweled Shoulder Addition/Reconstruction
RSP P10	Concrete Pavement – Dowel Bar Details

RSP P12	Concrete Pavement – Dowel Bar Basket Details
RSP P17	Concrete Pavement – Tie Bar Basket Details
P30	Concrete Pavement – End Panel Pavement Transitions
P35	Concrete Pavement – Ramp Gore Area Paving Details
P45	Concrete Pavement – Drainage Inlet Details No. 1
P46	Concrete Pavement – Drainage Inlet Details No. 2
P70	Asphalt Concrete Paving (Longitudinal Tapered Notched Wedge Joint)
C7C	Reinforced Concrete Crib Wall – Vertical Wall – Type A, B and C
C7D	Reinforced Concrete Crib Wall – Vertical Wall – Type D, E and F
C7E	Reinforced Concrete Crib Wall – Types A, B, C, D, E and F – Header and Stretcher Details
C7F	Design Data for Reinforced Concrete Crib Wall – Foundation Pressure – Battered Wall
C7G	Reinforced Concrete Crib Wall – Foundation Pressure – Vertical Wall
D72	Drainage Inlets
D73	Drainage Inlets
D74A	Drainage Inlets
D74B	Drainage Inlets
D74C	Drainage Inlets Details
D75A	Pipe Inlets
RSP D75B	Pipe Inlets
D75C	Pipe Inlets
RSP D77A	Grate Details
D77B	Bicycle Proof Grate Details
D78A	Gutter Depressions
D78B	Inlet Depressions – Portland Cement Concrete Shoulders
RSP D78C	Inlet Depressions – Asphalt Concrete Shoulders
D79	Precast Reinforced Concrete Pipe – Direct Design Method
D80	Cast-In-Place Reinforced Concrete Single Box Culvert
D81	Cast-In-Place Reinforced Concrete Double Box Culvert
D82	Cast-In-Place Reinforced Concrete Box Culvert Miscellaneous Details
D84	Box Culvert Wingwalls-Types A, B and C
D85	Box Culvert Wingwalls-Type D and E
D86A	Box Culvert Warped Wingwalls
D86B	Pipe Culvert Headwalls, Endwalls and Warped Wingwalls
D86C	Arch Culvert Headwalls, Endwalls and Warped Wingwalls
D87A	Corrugated Metal Pipe Downdrain Details
D87B	Plastic Pipe Downdrain Details
D87C	Cable Anchorage System
D87D	Overside Drains
D88	Construction Loads on Culverts
D89	Pipe Headwalls
D90	Pipe Culvert Headwalls, Endwalls and Wingwalls-Type A, B And C
D93A	Pipe Riser Connections
D94A	Metal and Plastic Flared End Sections
D94B	Concrete Flared End Sections
D97A	Corrugated Metal Pipe Coupling Details No. 1- Annular Coupling Band Bar And Strap and Angle Connections
D97C	Corrugated Metal Pipe Coupling Details No. 3- Helical and Universal Couplers
D97D	Corrugated Metal Pipe Coupling Details No. 4- Hugger Coupling Bands
RSP D97E	Corrugated Metal Pipe Coupling Details No. 5- Standard Joint
RSP D97F	Corrugated Metal Pipe Coupling Details No. 6- Positive Joint
RSP D97G	Corrugated Metal Pipe Coupling Details No. 7- Downdrain
D97H	Reinforced Concrete Pipe or Non-Reinforced Concrete Pipe-Standard and Positive Joints
NSP D97I	Corrugated Polyvinyl Chloride Pipe with Smooth Interior – Standard and Positive Joints
NSP D97J	Composite Steel Spiral Rib Pipe with Smooth Interior – Standard Joint
D98C	Grated Line Drain Details
D99A	Structural Section Drainage System Details

D102	Underdrains
H1	Planting and Irrigation – Abbreviations
RSP H2	Planting and Irrigation – Symbols
H3	Planting and Irrigation Details
H5	Planting and Irrigation Details
H6	Planting and Irrigation Details
H7	Planting and Irrigation Details
H9	Planting and Irrigation Details
NSP H51	Erosion Control Details (Fiber Roll)
RSP T1A	Temporary Crash Cushion, Sand Filled (Unidirectional)
RSP T1B	Temporary Crash Cushion, Sand Filled (Bidirectional)
RSP T2	Temporary Crash Cushion, Sand Filled (Shoulder Installations)
T3	Temporary Railing (Type K)
T5	Temporary Terminal Section (Type K)
RSP T7	Construction Project Funding Identification Signs
RSP T11	Traffic Control System for Lane Closure on Multilane Conventional Highways
RSP T12	Traffic Control System for Lane Closure on Multilane Conventional Highways
RSP T13	Traffic Control System for Lane Closure on Two Lane Conventional Highways
T51	Temporary Water Pollution Control Details (Temporary Silt Fence)
T53	Temporary Water Pollution Control Details (Temporary Cover)
T55	Temporary Water Pollution Control Details (Temporary Erosion Control Blanket)
T56	Temporary Water Pollution Control Details (Temporary Fiber Roll)
T57	Temporary Water Pollution Control Details (Temporary Check Dam)
T58	Temporary Water Pollution Control Details (Temporary Construction Entrance)
T59	Temporary Water Pollution Control Details (Temporary Concrete Washout Facility)
B0-1	Bridge Details
B0-3	Bridge Details
B0-5	Bridge Details
B0-13	Bridge Details
B2-8	Pile Details-Class 900
B3-1	Retaining Wall Type 1 – H=1200 Through 9100 mm
B3-7	Retaining Wall Type 5
B3-8	Retaining Wall Details No. 1
B3-9	Retaining Wall Details No. 2
RSP B6-21	Joint Seals (Maximum Movement Rating = 50 mm)
B7-1	Box Girder Details
B7-5	Deck Drains
B7-6	Deck Drains – Types D-1 and D-2
B7-10	Utility Opening – Box Girder
B7-11	Utility Details
RSP B8-5	Cast-In-Place Prestressed Girder Details
B11-7	Chain Link Railing
B11-47	Cable Railing
B11-51	Tubular Hand Railing
B11-52	Chain Link Railing Type 7
B11-54	Concrete Barrier Type 26
B11-55	Concrete Barrier Type 732
B11-56	Concrete Barrier Type 736
RSP B11-60	Concrete Barrier Type 80 (Sheet 1 of 2)
B11-61	Concrete Barrier Type 80 (Sheet 2 of 2)
B14-3	Communication and Sprinkler Control Conduits (Conduit Less Than Size 103)
B14-4	Water Supply Line (Bridge) (Pipe Sizes Less Than NPS 4)
B14-5	Water Supply Line (Details) (Pipe Sizes Less Than NPS 4)
B15-1	Soundwall Masonry Block on Footing Detail (1)
RSP B15-6	Soundwall Masonry Block on Type 736S/SV Barrier Details (1)
B15-9	Soundwall Masonry Block Miscellaneous Details

RS1	Roadside Signs, Typical Installation Details No. 1
RS2	Roadside Signs - Wood Post, Typical Installation Details No. 2
RS3	Roadside Signs - Laminated Wood Box Post Typical Installation Details No. 3
RS4	Roadside Signs, Typical Installation Details No. 4
RSP S1	Overhead Signs – Truss, Instructions and Examples
RSP S2	Overhead Signs – Truss, Single Post Type – Post Type II Thru IX
RSP S3	Overhead Signs – Truss, Single Post Type – Base Plate and Anchorage Details
RSP S4	Overhead Signs – Truss, Single Post Type – Structural Frame Members Details No. 1
S5	Overhead Signs – Truss, Single Post Type – Structural Frame Members Details No. 2
RSP S6	Overhead Signs – Truss, Gusset Plate Details
RSP S7	Overhead Signs – Truss, Single Post Type – Square Pedestal Foundation
RSP S8	Overhead Signs – Truss, Single Post Type – Round Pedestal Foundation
RSP S9	Overhead Signs – Truss, Two Post Type – Post Types I-S Thru VII-S
RSP S10	Overhead Signs – Truss, Two Post Type – Base Plate and Anchorage Details
RSP S11	Overhead Signs – Truss, Two Post Type – Structural Frame Members
RSP S12	Overhead Signs – Truss, Structural Frame Details
RSP S13	Overhead Signs – Truss, Frame Juncture Details
RSP S14	Overhead Signs – Truss, Two Post Type – Square Pedestal Foundation
RSP S15	Overhead Signs – Truss, Two Post Type – Round Pedestal Foundation
RSP S16	Overhead Signs – Walkway Details No. 1
RSP S17	Overhead Signs – Walkway Details No. 2
NSP S17A	Overhead Signs – Walkway Details No. 3
RSP S18	Overhead Signs – Walkway Safety Railing Details
RSP S19	Overhead Signs – Truss, Sign Mounting Details – Laminated Panel – Type A
RSP S20	Overhead Signs – Steel Frames – Removable Sign Panel Frames
S21	Overhead Signs – Removable Sign Panel Frames Mounting Details
RSP S43	Overhead Signs – Lightweight, Type A, Connection Details
RSP S45	Overhead Signs – Lightweight, Type C, Connection Details
S46	Overhead Signs – Lightweight, Sign Panel Mounting Details, Laminated Panel – Type A
S47	Overhead Signs – Lightweight, Light Fixture Mounting Details
RSP S48	Overhead Signs – Lightweight Post Details
S89	Roadside Formed Single Sheet Aluminum Panel
S93	Framing Details for Framed Single Sheet Aluminum Signs, Rectangular Shape
S94	Roadside Single Sheet Aluminum Signs, Rectangular Shape
S95	Roadside Single Sheet Aluminum Signs, Diamond Shape
RSP ES-1A	Electrical Systems (Symbols And Abbreviations)
RSP ES-1B	Electrical Systems (Symbols And Abbreviations)
RSP ES-1C	Electrical Systems (Symbols And Abbreviations)
RSP ES-2A	Electrical Systems (Service Equipment)
RSP ES-2C	Electrical Systems (Service Equipment Notes, Type III Series)
RSP ES-2E	Electrical Systems (Service Equipment and Typical Wiring Diagram, Type III – B Series)
RSP ES-2F	Electrical Systems (Service Equipment and Typical Wiring Diagram Type III – C Series)
ES-3A	Electrical Systems (Controller Cabinet Details)
RSP ES-3C	Electrical Systems (Controller Cabinet Details)
ES-4A	Electrical Systems (Signal Heads and Mountings)
ES-4B	Electrical Systems (Signal Heads and Mountings)
RSP ES-4C	Electrical Systems (Signal Heads and Mountings)
RSP ES-4D	Electrical Systems (Signal Heads and Mountings)
ES-4E	Electrical Systems (Signal Faces and Mountings)
RSP ES-5A	Electrical Systems (Detectors)
ES-5B	Electrical Systems (Detectors)
ES-5C	Electrical Systems (Detectors)
RSP ES-5D	Electrical Systems (Detectors)
RSP ES-6A	Electrical Systems (Lighting Standard Types 15 and 21)
ES-6B	Electrical Systems (Lighting Standards Types 15 and 21, Barrier Rail Mounted Details)
RSP ES-6D	Electrical Systems (Lighting Standard Types 15D and 21D, Double Arm)

RSP ES-6E	Electrical Systems (Lighting Standards Types 30 and 31)
ES-6F	Electrical Systems (Lighting Standards Types 30 and 31, Base Plate Details)
RSP ES-6K	Electrical Systems (Lighting Standards Type 5 and Type 10 Overhead Sign Mounted)
RSP ES-7A	Electrical Systems (Signal Standards Push Button Posts and Type 15TS Standard))
RSP ES-7B	Electrical Systems (Signal And Lighting Standard – Type 1 Standard and Equipment Numbering)
RSP ES-7D	Electrical Systems (Signal and Lighting Standard – Case 2 Arm Loading, Wind Velocity = 161 km/h, Arm Lengths 4.6 m to 9.1 m)
RSP ES-7E	Electrical Systems (Signal and Lighting Standard – Case 3 Arm Loading, Wind Velocity = 161 km/h, Arm Lengths 4.6 m to 13.7 m)
RSP ES-7F	Electrical Systems (Signal and Lighting Standard – Case 4 Arm Loading, Wind Velocity = 161 km/h, Arm Lengths 7.6 m to 13.7 m)
RSP ES-7G	Electrical Systems (Signal and Lighting Standard – Case 5 Arm Loading, Wind Velocity = 161 km/h, Arm Lengths 15.2 m to 16.8 m)
RSP ES-7H	Electrical Systems (Signal and Lighting Standard – Case 5 Arm Loading, Wind Velocity = 161 km/h, Arm Lengths 18.2 m to 19.8 m)
RSP ES-7M	Electrical Systems (Signal and Lighting Standards – Details No. 1)
ES-7N	Electrical Systems (Signal and Lighting Standards – Details No. 2)
RSP ES-8	Electrical Systems (Pull Box Details)
RSP ES-9A	Electrical Systems (Electrical Details, Structure Installations)
RSP ES-9B	Electrical Systems (Electrical Details, Structure Installations)
RSP ES-9C	Electrical Systems (Electrical Details, Structure Installations)
ES-9D	Electrical Systems (Electrical Details, Structure Installations)
ES-9E	Electrical Systems (Electrical Details, Structure Installations)
RSP ES-9F	Electrical Systems (Flush Soffit Luminaire Modification Details, Structure Installations)
RSP ES-10	Electrical Systems (Isolux Diagrams)
RSP ES-11	Electrical Systems (Foundation Installations)
RSP ES-13A	Electrical Systems (Splicing Details)
RSP ES-13B	Electrical Systems (Wiring Details and Fuse Ratings)
ES-15A	Electrical Systems (Sign Illumination Equipment)
RSP ES-15C	Electrical Systems (Sign Illumination Equipment)
RSP ES-15D	Electrical Systems (Lighting and Sign Illumination Control)
RSP ES-16A	Electrical Systems (Closed Circuit Television Pole Details)

DEPARTMENT OF TRANSPORTATION

NOTICE TO BIDDERS

Bids Open: January 8, 2009
Dated: November 17, 2008
General work description: Construct new 6 lane PCC freeway.

The Department will receive sealed bids for CONSTRUCTION ON STATE HIGHWAY IN SAN DIEGO COUNTY IN SAN DIEGO FROM 1.2 KM EAST OF ROUTE 805/905 SEPARATION TO 0.8 KM EAST OF BRITANNIA OVERCROSSING.

District-County-Route-Kilometer Post: 11-SD-905-R9.5/R15.0

Contract No. 11-288804

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

The Department has established a statewide overall DBE goal. The Department is required to report to FHWA on DBE participation for all federal-aid contracts each year so that attainment efforts may be evaluated. In order to ascertain whether the statewide overall DBE goal is achieved, the Department tracks DBE participation on all federal-aid contracts.

Federal-aid project no.:
HPLU-6211(078)N

Bids must be on a unit price basis.
Complete the work within 740 working days.
The estimated cost of the project is $81,300,000.
No prebid meeting is scheduled for this project.

The Department will receive bids until 2:00 p.m. on the bid open date at 3347 Michelson Drive, Suite 100, Irvine, CA 92612-1692. Bids received after this time will not be accepted.

The Department will open and publicly read aloud the bids immediately after the specified closing time. The Department invites bidders or their authorized agents to attend.

Standard Specifications and Standard Plans may be viewed at the Department's Web site and may be purchased at:
Department of Transportation, Publications Unit
1900 Royal Oaks Drive
Sacramento, CA 95815

Special Provisions and Project Plans may be viewed at:
1. The Department's Web site
2. District office of the district in which the work is located
3. Districts 4 and 12 offices
4. Department of Transportation, Bid Documents
   1120 N Street, Room 0200, Mail Station 26
   Sacramento, CA 95814
   Telephone no.: (916) 654-4490

District office addresses are provided in the Standard Specifications.

The Bid book, Special Provisions, Project Plans, and Information Handout may be obtained at the 1120 N Street location. To expedite orders, a bidder may obtain these documents by faxing an order to (916) 654-7028. Fax orders must include credit card charge number, card expiration date, and authorizing signature.

Bidders' inquiries may be presented to the Department by following the instructions at:

http://www.dot.ca.gov/hq/esc/oe/project_status/bid_inq.html

The Department posts responses to the questions at the District Web sites.
Questions about alleged patent ambiguity of the plans, specifications, or estimate must be asked before bid opening. After bid opening, such questions will not be treated as bid protests.

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

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

The federal minimum wage rates for this Contract as determined by the United States Secretary of Labor are available at http://www.dot.ca.gov/hq/esc/oe/federal-wages.

DEPARTMENT OF TRANSPORTATION

Dated November 17, 2008

KM

COPY OF BID ITEM LIST

(NOT TO BE USED FOR BIDDING PURPOSES)

11-288804

Item No.	Item Code	Item Description	Unit of Measure	Estimated Quantity
1	070012	PROGRESS SCHEDULE (CRITICAL PATH METHOD)	LS	LUMP SUM
2	070018	TIME-RELATED OVERHEAD	WDAY	740
3	071325	TEMPORARY FENCE (TYPE ESA)	M	860
4	074016	CONSTRUCTION SITE MANAGEMENT	LS	LUMP SUM
5	074019	PREPARE STORM WATER POLLUTION PREVENTION PLAN	LS	LUMP SUM
6	074028	TEMPORARY FIBER ROLL	M	97 700
7	074032	TEMPORARY CONCRETE WASHOUT FACILITY	EA	27
8	074033	TEMPORARY CONSTRUCTION ENTRANCE	EA	29
9	074035	TEMPORARY CHECK DAM	M	1010
10	074037	MOVE-IN/MOVE-OUT (TEMPORARY EROSION CONTROL)	EA	6
11	074038	TEMPORARY DRAINAGE INLET PROTECTION	EA	140
12	074041	STREET SWEEPING	LS	LUMP SUM
13	074042	TEMPORARY CONCRETE WASHOUT (PORTABLE)	LS	LUMP SUM
14	074051	TEMPORARY HYDRAULIC MULCH	M2	853 000
15	120090	CONSTRUCTION AREA SIGNS	LS	LUMP SUM
16	120100	TRAFFIC CONTROL SYSTEM	LS	LUMP SUM
17	120120	TYPE III BARRICADE	EA	30
18	120140	BARRICADE (LEFT IN PLACE)	EA	6
19	120149	TEMPORARY PAVEMENT MARKING (PAINT)	M2	140
20	120159	TEMPORARY TRAFFIC STRIPE (PAINT)	M	16 187

Item No.	Item Code	Item Description	Unit of Measure	Estimated Quantity
21	120165	CHANNELIZER (SURFACE MOUNTED)	EA	21
22	120166	CHANNELIZER (SURFACE MOUNTED) (LEFT IN PLACE)	EA	40
23	120199	TRAFFIC PLASTIC DRUM	EA	140
24	120300	TEMPORARY PAVEMENT MARKER	EA	2215
25	128650	PORTABLE CHANGEABLE MESSAGE SIGN	EA	10
26	129000	TEMPORARY RAILING (TYPE K)	M	9450
27	129100	TEMPORARY CRASH CUSHION MODULE	EA	370
28	150206	ABANDON CULVERT	EA	8
29	150221	ABANDON INLET	EA	7
30	015340	ABANDON SEWER MANHOLE	EA	6
31	015341	ABANDON WATER LINE	M	3
32	150241	ABANDON SEWER	M	390
33	150608	REMOVE CHAIN LINK FENCE	M	450
34	150645	REMOVE BARRICADE	M	14
35	150662	REMOVE METAL BEAM GUARD RAILING	M	490
36	150701	REMOVE YELLOW PAINTED TRAFFIC STRIPE	M	1340
37	150710	REMOVE TRAFFIC STRIPE	M	8660
38	150712	REMOVE PAINTED PAVEMENT MARKING	M2	87
39	150722	REMOVE PAVEMENT MARKER	EA	153
40	150742	REMOVE ROADSIDE SIGN	EA	50

Item No.	Item Code	Item Description	Unit of Measure	Estimated Quantity
41	150764	REMOVE SIGN OVERLAY	EA	20
42	015342	REMOVE WATER LINE	M	590
43	150860	REMOVE BASE AND SURFACING	M3	2920
44	152320	RESET ROADSIDE SIGN	EA	20
45	152390	RELOCATE ROADSIDE SIGN	EA	20
46	153103	COLD PLANE ASPHALT CONCRETE PAVEMENT	M2	19 700
47	153210	REMOVE CONCRETE	M3	3400
48	153229	REMOVE CONCRETE BARRIER (TYPE K)	M	240
49	160101	CLEARING AND GRUBBING	LS	LUMP SUM
50	170101	DEVELOP WATER SUPPLY	LS	LUMP SUM
51	190101	ROADWAY EXCAVATION	M3	1 210 000
52	190110	LEAD COMPLIANCE PLAN	LS	LUMP SUM
53 (F)	192003	STRUCTURE EXCAVATION (BRIDGE)	M3	7000
54	192036	STRUCTURE EXCAVATION (CRIB WALL)	M3	3780
55	192037	STRUCTURE EXCAVATION (RETAINING WALL)	M3	1980
56 (F)	193003	STRUCTURE BACKFILL (BRIDGE)	M3	6280
57 (F)	193012	STRUCTURE BACKFILL (CRIB WALL)	M3	9810
58	193013	STRUCTURE BACKFILL (RETAINING WALL)	M3	2260
59	193031	PERVIOUS BACKFILL MATERIAL (RETAINING WALL)	M3	180
60	193114	SAND BACKFILL	M3	520

Item No.	Item Code	Item Description	Unit of Measure	Estimated Quantity
61 (F)	193119	LEAN CONCRETE BACKFILL	M3	215
62	194001	DITCH EXCAVATION	M3	78
63	015343	CLAY CAP	M3	2840
64	015344	GEOSYNTHETIC REINFORCED EMBANKMENT	M2	57 600
65	200001	HIGHWAY PLANTING	LS	LUMP SUM
66	015345	EROSION CONTROL (BIOFILTRATION)	M2	23 700
67	203016	EROSION CONTROL (TYPE D)	M2	235 000
68	203017	EROSION CONTROL (HYDRAULIC MATRIX)	M2	9200
69	203021	FIBER ROLLS	M	41 900
70	015346	DRAINAGE INLET PROTECTION	EA	52
71	015347	CHECK DAM	M	1020
72	203026	MOVE-IN/MOVE-OUT (EROSION CONTROL)	EA	6
73	204099	PLANT ESTABLISHMENT WORK	LS	LUMP SUM
74	015348	TRUCK WATERING	LS	LUMP SUM
75	208000	IRRIGATION SYSTEM	LS	LUMP SUM
76	208038	NPS 3 SUPPLY LINE (BRIDGE)	M	410
77	208304	WATER METER	EA	1
78	208310	IRRIGATION SLEEVE	M	540
79	208731	200 MM CORRUGATED HIGH DENSITY POLYETHYLENE PIPE CONDUIT	M	780
80	250401	CLASS 4 AGGREGATE SUBBASE	M3	55 700

Item No.	Item Code	Item Description	Unit of Measure	Estimated Quantity
81	260201	CLASS 2 AGGREGATE BASE	M3	85 000
82	374002	ASPHALTIC EMULSION (FOG SEAL COAT)	TONN	19
83	390131	HOT MIX ASPHALT	TONN	89 300
84	394071	PLACE HOT MIX ASPHALT DIKE	M	6000
85	394090	PLACE HOT MIX ASPHALT (MISCELLANEOUS AREA)	M2	640
86	397005	TACK COAT	TONN	130
87	401000	CONCRETE PAVEMENT	M3	29 200
88	404092	SEAL PAVEMENT JOINT	M	66 700
89	490505	FURNISH STEEL PILING (HP 250 X 62)	M	264
90	490506	DRIVE STEEL PILE (HP 250 X 62)	EA	8
91	490566	FURNISH STEEL PILING (HP 360 X 132)	M	4500
92	490567	DRIVE STEEL PILE (HP 360 X 132)	EA	232
93	041580	FURNISH PILING (CLASS 900) (ALTERNATIVE W) (MODIFIED)	M	1920
94	041581	DRIVE PILE (CLASS 900) (ALTERNATIVE W) (MODIFIED)	EA	139
95	500001	PRESTRESSING CAST-IN-PLACE CONCRETE	LS	LUMP SUM
96 (F)	510051	STRUCTURAL CONCRETE, BRIDGE FOOTING	M3	1625
97 (F)	510053	STRUCTURAL CONCRETE, BRIDGE	M3	6160
98 (F)	510086	STRUCTURAL CONCRETE, APPROACH SLAB (TYPE N)	M3	570
99	510126	CLASS 2 CONCRETE (MINOR STRUCTURE)	M3	46
100 (F)	510220	CLASS 3 CONCRETE (BACKFILL)	M3	35

Item No.	Item Code	Item Description	Unit of Measure	Estimated Quantity
101	510314	CLASS 4 CONCRETE (BACKFILL)	M3	130
102	510408	CLASS 1 CONCRETE (RETAINING WALL)	M3	870
103	510502	MINOR CONCRETE (MINOR STRUCTURE)	M3	310
104	719569	MINOR CONCRETE (PIPE ENCASEMENT)	M3	900
105	510524	MINOR CONCRETE (SOUND WALL)	M3	8
106	511064	FRACTURED RIB TEXTURE	M2	1840
107	041582	PREMANUFACTURED BAT HOUSE	EA	4
108	513601	REINFORCED CONCRETE CRIB WALL (TYPE A)	M2	25
109	513602	REINFORCED CONCRETE CRIB WALL (TYPE B)	M2	70
110	513603	REINFORCED CONCRETE CRIB WALL (TYPE C)	M2	440
111	513604	REINFORCED CONCRETE CRIB WALL (TYPE D)	M2	830
112	015349	REINFORCED CONCRETE CRIB WALL (TYPE E)	M2	610
113	518002	SOUND WALL (MASONRY BLOCK)	M2	300
114	519117	JOINT SEAL (MR 30 MM)	M	78
115	519125	JOINT SEAL ASSEMBLY (MR 70 MM)	M	72
116	519142	JOINT SEAL (MR 40 MM)	M	48
117	519144	JOINT SEAL (MR 50 MM)	M	48
118 (F)	520102	BAR REINFORCING STEEL (BRIDGE)	KG	1 101 000
119	520103	BAR REINFORCING STEEL (RETAINING WALL)	KG	31 600
120 (F)	520120	HEADED BAR REINFORCEMENT	EA	112

Item No.	Item Code	Item Description	Unit of Measure	Estimated Quantity
121	560203	FURNISH SIGN STRUCTURE (BRIDGE MOUNTED WITH WALKWAY)	KG	1440
122	560204	INSTALL SIGN STRUCTURE (BRIDGE MOUNTED WITH WALKWAY)	KG	1440
123	560213	FURNISH SIGN STRUCTURE (LIGHTWEIGHT)	KG	5720
124	560214	INSTALL SIGN STRUCTURE (LIGHTWEIGHT)	KG	5720
125	560218	FURNISH SIGN STRUCTURE (TRUSS)	KG	92 300
126	560219	INSTALL SIGN STRUCTURE (TRUSS)	KG	92 300
127	560234	FURNISH LAMINATED PANEL SIGN (25.4 MM-TYPE A)	M2	720
128	560235	FURNISH LAMINATED PANEL SIGN (25.4 MM-TYPE B)	M2	60
129	560238	FURNISH SINGLE SHEET ALUMINUM SIGN (1.6 MM-UNFRAMED)	M2	300
130	560239	FURNISH SINGLE SHEET ALUMINUM SIGN (2.0 MM-UNFRAMED)	M2	150
131	560241	FURNISH SINGLE SHEET ALUMINUM SIGN (1.6 MM-FRAMED)	M2	100
132	560242	FURNISH SINGLE SHEET ALUMINUM SIGN (2.0 MM-FRAMED)	M2	100
133	561009	920 MM CAST-IN-DRILLED-HOLE CONCRETE PILE (SIGN FOUNDATION)	M	17
134	561013	1372 MM CAST-IN-DRILLED-HOLE CONCRETE PILE (SIGN FOUNDATION)	M	5
135	561015	1524 MM CAST-IN-DRILLED-HOLE CONCRETE PILE (SIGN FOUNDATION)	M	68
136	562002	METAL (BARRIER MOUNTED SIGN)	KG	200
137	015350	HABITAT RESTORATION SIGN	EA	4
138	015351	ROADSIDE SIGN-ONE POST (WEED CONTROL MAT RUBBER)	EA	10
139	566011	ROADSIDE SIGN - ONE POST	EA	200
140	566012	ROADSIDE SIGN - TWO POST	EA	30

Item No.	Item Code	Item Description	Unit of Measure	Estimated Quantity
141	568001	INSTALL SIGN (STRAP AND SADDLE BRACKET METHOD)	EA	40
142	597600	PREPARE AND PAINT CONCRETE	M2	340
143	620909	450 MM ALTERNATIVE PIPE CULVERT	M	1110
144	620913	600 MM ALTERNATIVE PIPE CULVERT	M	3730
145	620919	750 MM ALTERNATIVE PIPE CULVERT	M	850
146	620924	900 MM ALTERNATIVE PIPE CULVERT	M	140
147	620930	1050 MM ALTERNATIVE PIPE CULVERT	M	92
148	620933	1200 MM ALTERNATIVE PIPE CULVERT	M	88
149	620940	1500 MM ALTERNATIVE PIPE CULVERT	M	83
150	650069	450 MM REINFORCED CONCRETE PIPE	M	56
151	650075	600 MM REINFORCED CONCRETE PIPE	M	360
152	650077	750 MM REINFORCED CONCRETE PIPE	M	240
153	650084	1200 MM REINFORCED CONCRETE PIPE	M	89
154	015352	200 MM PLASTIC PIPE	M	140
155	698162	450 MM ALTERNATIVE PIPE DOWNDRAIN	M	9
156	698169	600 MM ALTERNATIVE PIPE DOWNDRAIN	M	95
157	015353	1200 MM ALTERNATIVE PIPE DOWNDRAIN	M	44
158	703233	GRATED LINE DRAIN	M	140
159	703284	900 MM CORRUGATED STEEL PIPE RISER (2.77 MM THICK)	M	3.2
160	015354	1850 MM WELDED STEEL PIPE CASING (10 MM)	M	97

Item No.	Item Code	Item Description	Unit of Measure	Estimated Quantity
161	015355	1850 MM WELDED STEEL PIPE CASING (21 MM)	M	170
162	015356	1500 MM WELDED STEEL CASING	M	190
163	015357	ANODES AND TEST STATIONS	EA	11
164	015358	300 MM CEMENT MORTAR LINED AND TAPE COATED WATER LINE	M	1200
165	015359	400 MM CEMENT MORTAR LINED AND TAPE COATED WATER LINE	M	62
166	015360	600 MM CEMENT MORTAR LINED AND TAPE COATED WATER LINE	M	540
167	015361	50 MM TYPE K COPPER PIPE	M	18
168	705224	600 MM CONCRETE FLARED END SECTION	EA	3
169	705226	750 MM CONCRETE FLARED END SECTION	EA	1
170	705336	450 MM ALTERNATIVE FLARED END SECTION	EA	1
171	705337	600 MM ALTERNATIVE FLARED END SECTION	EA	9
172	705338	750 MM ALTERNATIVE FLARED END SECTION	EA	1
173	015362	300 MM BUTTERFLY VALVE, CLASS 250 WITH BYPASS	EA	1
174	705954	300 MM GATE VALVE	EA	8
175	015363	400 MM BUTTERFLY VALVE, CLASS 250 WITH BYPASS	EA	9
176	015364	150 MM BLOW OFF ASSEMBLY	EA	2
177	015365	50 MM BLOW OFF ASSEMBLY	EA	3
178	015366	25 MM WATER TEST STATION ASSEMBLY	EA	1
179	015367	50 MM WATER SERVICE	EA	1
180	015368	600 MM BUTTERFLY VALVE, CLASS 250	EA	3

Item No.	Item Code	Item Description	Unit of Measure	Estimated Quantity
181	015369	50 MM COMBINATION AIR RELEASE AND AIR VACUUM VALVE	EA	4
182	015370	150 MM COMBINATION AIR RELEASE AND AIR VACUUM VALVE	EA	1
183	015371	100 MM COMBINATION AIR RELEASE AND AIR VACUUM VALVE	EA	1
184	707133	900 MM PRECAST CONCRETE PIPE INLET	M	11
185	707249	1500 MM PRECAST CONCRETE PIPE MANHOLE	EA	2
186	707479	900 MM REINFORCED CONCRETE PIPE RISER	M	34
187	015372	900 MM PRECAST CONCRETE PIPE INLET (MODIFIED)	M	9
188	015373	1050 MM VITRIFIED CLAY SEWER PIPE	M	250
189	015374	CATHODIC PROTECTION TEST STATION	EA	4
190	015375	80 MM POLYVINYL CHLORIDE PIPE	M	660
191	015376	400 MM POLYVINYL CHLORIDE WATER, CLASS 150 (T)	M	300
192	015377	600 MM POLYVINYL CHLORIDE FORCE MAIN	M	97
193	015378	300 MM FLEXIBLE EXPANSION JOINT WITH MECHANICAL JOINT ENDS	EA	4
194	015379	450 MM SEWER PIPE	M	480
195	015380	150 MM POLYVINYL CHLORIDE WATER PIPE, CLASS 200 (C900, DR14)	M	7
196	015381	400 MM POLYVINYL CHLORIDE DR 25 FORCE MAIN	M	120
197	015382	250 MM POLYVINYL CHLORIDE SEWER PIPE	M	21
198	719190	SEWER MANHOLE FRAME AND COVER	EA	5
199	015383	2450 MM PRECAST CONCRETE PIPE MANHOLE	EA	3
200	721009	ROCK SLOPE PROTECTION (FACING, METHOD B)	M3	280

Item No.	Item Code	Item Description	Unit of Measure	Estimated Quantity
201	721010	ROCK SLOPE PROTECTION (BACKING NO. 1, METHOD B)	M3	33
202	015384	CONCRETE (APRON AND DITCH LINING)	M3	250
203 (F)	041583	SLOPE PAVING (STAMPED CONCRETE)	M2	960
204	729010	ROCK SLOPE PROTECTION FABRIC	M2	650
205	731502	MINOR CONCRETE (MISCELLANEOUS CONSTRUCTION)	M3	430
206	731530	MINOR CONCRETE (TEXTURED PAVING)	M2	2680
207	015385	MINOR CONCRETE (GORE PAVING)	M3	410
208 (F)	750001	MISCELLANEOUS IRON AND STEEL	KG	16 996
209 (F)	750501	MISCELLANEOUS METAL (BRIDGE)	KG	1650
210 (F)	750505	BRIDGE DECK DRAINAGE SYSTEM	KG	6100
211	015386	WILDLIFE FENCE	M	1880
212	800391	CHAIN LINK FENCE (TYPE CL-1.8)	M	7690
213	015387	POLE BARRIER	M	160
214	802585	1.2 M CHAIN LINK GATE (TYPE CL-1.8)	EA	16
215	820107	DELINEATOR (CLASS 1)	EA	220
216	820110	MILEPOST MARKER	EA	8
217	820118	GUARD RAILING DELINEATOR	EA	170
218	820130	OBJECT MARKER	EA	10
219	832001	METAL BEAM GUARD RAILING	M	140
220 (F)	833032	CHAIN LINK RAILING (TYPE 7)	M	169

Item No.	Item Code	Item Description	Unit of Measure	Estimated Quantity
221 (F)	833142	CONCRETE BARRIER (TYPE 26 MODIFIED)	M	169
222	839301	SINGLE THRIE BEAM BARRIER	M	1350
223	839310	DOUBLE THRIE BEAM BARRIER	M	3780
224 (F)	839521	CABLE RAILING	M	415.7
225	839541	TRANSITION RAILING (TYPE WB)	EA	10
226	839542	TRANSITION RAILING (TYPE DTB)	EA	4
227	839568	TERMINAL ANCHOR ASSEMBLY (TYPE SFT)	EA	4
228	839572	RETURN CAP (TYPE TA)	EA	2
229	839582	END ANCHOR ASSEMBLY (TYPE CA)	EA	2
230	839585	ALTERNATIVE FLARED TERMINAL SYSTEM	EA	10
231	839601	CRASH CUSHION (TYPE CAT)	EA	1
232	839602	CRASH CUSHION (TYPE CAT) BACKUP	EA	1
233	839604	CRASH CUSHION (REACT 9CBB)	EA	1
234	839703	CONCRETE BARRIER (TYPE 60C)	M	170
235	839704	CONCRETE BARRIER (TYPE 60D)	M	71
236 (F)	839714	CONCRETE BARRIER (TYPE 80)	M	369
237 (F)	839725	CONCRETE BARRIER (TYPE 736)	M	139
238 (F)	839727	CONCRETE BARRIER (TYPE 736 MODIFIED)	M	175
239	015388	CONCRETE BARRIER (TYPE 736A) (MOD)	M	280
240 (F)	839731	CONCRETE BARRIER (TYPE 736B)	M	1039

Item No.	Item Code	Item Description	Unit of Measure	Estimated Quantity
241	840515	THERMOPLASTIC PAVEMENT MARKING	M2	720
242	840563	200 MM THERMOPLASTIC TRAFFIC STRIPE	M	5400
243	840564	200 MM THERMOPLASTIC TRAFFIC STRIPE (BROKEN 3.66 M - 0.92 M)	M	960
244	840567	100 MM THERMOPLASTIC TRAFFIC STRIPE (BROKEN 1.83 M - 0.30 M)	M	220
245	840571	100 MM THERMOPLASTIC TRAFFIC STRIPE (BROKEN 5.18 M - 2.14 M)	M	440
246	840656	PAINT TRAFFIC STRIPE (2-COAT)	M	73 500
247	842000	PARKING BUMPER (PRECAST CONCRETE)	EA	170
248	850101	PAVEMENT MARKER (NON-REFLECTIVE)	EA	5760
249	850111	PAVEMENT MARKER (RETROREFLECTIVE)	EA	3600
250	860090	MAINTAINING EXISTING TRAFFIC MANAGEMENT SYSTEM ELEMENTS DURING CONSTRUCTION	LS	LUMP SUM
251	860251	SIGNAL AND LIGHTING (LOCATION 1)	LS	LUMP SUM
252	860252	SIGNAL AND LIGHTING (LOCATION 2)	LS	LUMP SUM
253	860253	SIGNAL AND LIGHTING (LOCATION 3)	LS	LUMP SUM
254	860254	SIGNAL AND LIGHTING (LOCATION 4)	LS	LUMP SUM
255	860255	SIGNAL AND LIGHTING (LOCATION 5)	LS	LUMP SUM
256	860402	LIGHTING (CITY STREET)	LS	LUMP SUM
257	860407	LIGHTING (PARKING LOT)	LS	LUMP SUM
258	860460	LIGHTING AND SIGN ILLUMINATION	LS	LUMP SUM
259	860530	CHANGEABLE MESSAGE SIGN SYSTEM	LS	LUMP SUM
260 (F)	860796	SPRINKLER CONTROL CONDUIT (BRIDGE)	M	200

Item No.	Item Code	Item Description	Unit of Measure	Estimated Quantity
261	860931	TRAFFIC MONITORING STATION (LOCATION 1)	LS	LUMP SUM
262	860932	TRAFFIC MONITORING STATION (LOCATION 2)	LS	LUMP SUM
263	015389	FIBER OPTIC COMMUNICATON SYSTEM	LS	LUMP SUM
264	861101	RAMP METERING SYSTEM (LOCATION 1)	LS	LUMP SUM
265	861102	RAMP METERING SYSTEM (LOCATION 2)	LS	LUMP SUM
266	861103	RAMP METERING SYSTEM (LOCATION 3)	LS	LUMP SUM
267	994920	BICYCLE PARKING RACK	EA	8
268	994922	BICYCLE LOCKER	EA	15
269	999990	MOBILIZATION	LS	LUMP SUM

STATE OF CALIFORNIA

DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISIONS

SECTION 1 SPECIFICATIONS AND PLANS

The project plans for this project are not considered to be complete to construct the work anticipated by the contract. Design of the project, including preparation of final project plans, will be completed in phases after approval of the contract in conformance with the following:

Phase I shall consist of the following work:

Title Sheet
Typical Cross Sections
Layout
Profile
Superelevation
Temporary Water Pollution Control Plans, Details, and Quantities
Summary of Quantities
Construction Area Signs
Detour Plans (Partial)
Traffic Handling Plans
Structure Plans
Sanitary Sewer Plans, Details and Quantities
Utility Plans, Details, and Quantities

Complete design of Phase I, including final plans for Phase I, is included in the project plans for this project.

Phase II shall consist of the following work:

Construction Details
Erosion Control Plans and Quantities
Contour Grading Plans
Drainage Plans Profiles, and Details
Drainage Quantities
Stage Construction Plans
Stage Construction and Traffic Handling Plans
Stage Construction Quantities
Detour Plans (Partial)
Sign Plans (Partial)
Retaining Wall Plans and Quantities
Geosynthetic Reinforced Embankment Plans
Sound Wall Plan and Quantities
Plant List and Quantities
Planting Plan
Irrigation Plans
Landscape Details

Complete design of Phase II, including final plans for Phase II, will be provided to the Contractor within 60 days after approval of the contract, providing the submittals, including the cost-break downs, have been submitted to the Engineer and approved.

The issuance of Phase II will be by change order in conformance with Section 4, "Scope of Work," of the Standard Specifications.

Phase III shall consist of the following work:

Electrical Plans
Pavement Delineation and Sign Plan
Pavement Delineation Details and Quantities
Sign Plans (Partial), Details and Quantities

Complete design of Phase III, including final plans for Phase III, will be provided to the Contractor within 60 days after delivery of Phase II.

The issuance of Phase III will be by change order in conformance with Section 4, "Scope of Work," of the Standard Specifications.

Project plan sheets marked, "Preliminary for Bidding Purposes Only," shall not be considered complete as to the design. These plan sheets are provided only to show the scope of the work to be performed, and shall only be used for the purpose of bid preparation.

Should the Department fail to provide the complete design, including final plans for any phase within the times specified and, in the opinion of the Engineer, the controlling operation or operations are delayed or interfered with by the delay in providing the complete design, 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. Attention is directed to "Progress Schedule (Critical Path)" of these special provisions.

SECTION 2 BIDDING

SECTION 2-1 GENERAL

2-1.01 PRE-AWARD QUALIFICATION QUESTIONNAIRE

Bidders shall submit responses to the "Pre-Award Qualification Questionnaire" included in the Proposal. Responses to the questionnaire shall be submitted with the bid.

Joint venture contactors shall submit a combined "Pre-Award Qualification Questionnaire" providing separate responses for each joint venture partner.

In signing the signature page of the Proposal, the bidder certifies that the information and answers in response to the questionnaire are complete and accurate. Failure to completely answer the questionnaire may be a factor for rejection of the bid.

The bidder's attention is directed to "Pre-Award Qualifications Review," of these special provisions for the requirements of acceptance of bid.

Upon approval of the contract, the completed "Pre-Award Qualification Questionnaire" of each unsuccessful bidder will be returned, unless a determination of non-qualification has been made by the Department, or the award of the contract has been challenged.

2-1.02 ESCROW OF BID DOCUMENTATION

Bid documentation shall consist of all documentary and calculated information generated by the Contractor in preparation of the bid. The bid documentation shall conform to the requirements in these special provisions, and shall be submitted to the Department and held in escrow for the duration of the contract.

The escrowed bid documents will be the only documents accepted from the Contractor regarding preparation of the bid.

In signing the proposal, the bidder certifies that the material submitted for escrow constitutes all the documentary information used in preparation of the bid, that he has personally examined the contents of the container, and that they are complete.

The first, second and third apparent low bidders shall submit to the Department of Transportation, District 11 Construction Duty Senior, 4050 Taylor Street, San Diego, CA 92110 (619) 688-6635, fax (619) 688-6988 the identification of the bidder’s representative authorized to present the bid documentation and the persons responsible for preparing the bidder’s estimate before the close of business on the first Monday after bid opening.

Nothing in the bid documentation shall be construed to change or modify the terms or conditions of the contract.

Escrowed bid documentation will not be used for pre-award evaluation of the Contractor's anticipated methods of construction, nor to assess the Contractor's qualifications for performing the work.

Bid documentation shall clearly itemize the Contractor's estimated costs of performing the work. The documentation submitted shall be complete and so detailed as to allow for an in-depth analysis of the Contractor's estimate.

The Contractor shall submit its bid documentation which shall include, but not be limited to:

1. quantity takeoffs;
2. rate schedules for the direct costs and the time- and nontime-related indirect costs for

    2.1. labor (by craft),
    2.2. plant and equipment ownership and operation,
    2.3. permanent and expendable materials,
    2.4. insurance and subcontracted work;

3. estimated construction schedules, including sequence and duration and development of production rates;
4. quotations, terms and limitations of quotes and subcontracts related to subcontractors, manufacturers and suppliers;
5. estimates of field and home office overhead;
6. contingency and margin for each contract item of work;
7. names of the persons responsible for preparing the bidder's estimate, and other reports, calculations, assumptions and supplemental information used by the bidder to arrive at the estimate submitted with the proposal;
8. bid documentation for each subcontractor, manufacturer and supplier whose subcontract or purchase orders exceed or are expected to exceed $250,000.00. Bid documentation for other subcontractors, manufacturers, and suppliers may be submitted, if required by the Contractor, or requested by the subcontractor, manufacturer, or supplier.

If required by the Contractor or requested by the subcontractor, manufacturer, or supplier, additional information may be submitted by the subcontractor, manufacturer, or supplier. Subcontractor, manufacturer and supplier bid documentation shall conform to the requirements for the Contractor's documentation and shall be enclosed with the Contractor's submittal regardless of whether or not subcontracts or purchase orders have been executed or entered into on the date that bid documentation is submitted for escrow. If at the time that bid documentation is submitted for escrow, the subcontractor, manufacturer or supplier does not have an executed subcontract or purchase order, and a subcontract or purchase order is subsequently executed, then a copy of the executed subcontract or purchase order shall be submitted into escrow within 14 days of the execution of the respective subcontract or purchase orders. The examination of subcontractors', manufacturers' and suppliers' bid documentation will be accomplished in the same manner as for the Contractor's bid documentation. If a subcontractor, manufacturer or supplier is replaced, bid documentation for the new subcontractor, manufacturer or supplier shall be submitted for review and escrow before authorization for the substitution will be granted. Upon written request of a subcontractor, manufacturer or supplier, the bid documentation from that subcontractor, manufacturer or supplier shall be reviewed only by the subcontractor, manufacturer or supplier and the Department and shall be placed in a separate container within the Contractor's container. The written request from the subcontractor, manufacturer or supplier shall be included with the bid documentation.

If the bidder is a joint venture, the bid documentation shall include the joint venture agreement, the joint venture estimate comparison and final reconciliation of the joint venture estimate.

Copies of the proposals submitted by the first, second and third low bidders will be provided to the first, second, and third apparent low bidders by the District for inclusion in the bid documentation to be escrowed.

The first, second, and third apparent low bidders shall present the bid documentation for escrow at the District 11 Office, Construction Duty Senior (619) 688-6635, 4050 Taylor Street, San Diego, CA, 92110 on the first Tuesday between 1:00 p.m. and 2:00 p.m., following the time indicated in the "Notice to Contractors" for the opening of bids. The fourth and subsequent apparent low bidders shall present the bid documentation for escrow if requested by the Department to do so.

Bid documentation shall be submitted as a paper copy in a sealed container, clearly marked with the bidder's name, date of submittal, project contract number and the words, "Bid Documentation for Escrow."

Failure to submit the actual and complete bid documentation as specified herein within the time specified shall be cause for rejection of the proposal.

Upon submittal, the bid documentation of the apparent low bidder will be examined and inventoried by the duly designated representatives of the Contractor and the Department to ensure that the bid documentation is authentic, legible, and in accordance with the terms of this section "Escrow of Bid Documentation." The examination will not include review of, nor will it constitute approval of, proposed construction methods, estimating assumptions or interpretation of the contract. The examination will not alter any conditions or terms of the contract. The acceptance or rejection by the Department that the submitted bid documents are in compliance with this section, "Escrow of Bid Documentation," shall be completed within 48 hours of the time the bid documentation is submitted by the Contractor.

At the completion of the examination, the bid documents will be sealed and jointly deposited at an agreed commercial business in San Diego, CA.

Bid documentation submitted by the second and third apparent low bidders will be jointly deposited at an agreed commercial business in San Diego, CA. If the apparent low bid is withdrawn or rejected, the bid documentation of the second low bidder will be examined and inventoried in the manner specified above, then sealed and deposited again in escrow. If the second low bid is withdrawn or rejected, the bid documentation of the third low bidder will be examined and inventoried in the manner specified above, then sealed and deposited again in escrow. Bid documentation from subsequent bidders, if requested, will be examined and inventoried in the same manner as specified above, then sealed and deposited in escrow. Upon execution and final approval of the contract or rejection of all bids, the bid documentation will be returned to any remaining unsuccessful bidders.

Any and all components of the escrowed bid documentation may be examined by the designated representatives of both the Department and the Contractor, at any time deemed necessary by either the Department or the Contractor to assist in the negotiation of price adjustments and change orders, or to assist in the potential resolution or in the settlement of claims or disputes. Such a joint review shall be performed within 15 days of receipt of a written request to do so by either party. If the Contractor refuses to participate in the joint examination of any and all components of the escrowed bid documentation as provided herein, such refusal shall be considered as a failure by the Contractor to exhaust administrative claim remedies with respect to the particular protest, notice of potential claim, or claim. In addition, this refusal by the Contractor shall constitute a bar to future arbitration with respect to the protest, potential claim or claim as provided by Section 10240.2 of the California Public Contract Code.

If requested by a Disputes Review Board, the escrowed bid documentation may be utilized to assist the Board in its recommendations.

The bid documentation submitted by the Contractor will be held in escrow until the contract has been completed, the ultimate resolution of all disputes and claims has been achieved and receipt of final payment has been accepted by the Contractor. The escrowed bid documentation will then be released from escrow to the Contractor.

The bid documentation submitted by the bidder is, and shall remain, the property of the bidder, and is subject to only joint review by the Department and the bidder or upon written request of a subcontractor, manufacturer or supplier shall be reviewed only by the subcontractor, supplier or manufacturer and the Department unless it involves a dispute or claim**.** The Department stipulates and expressly acknowledges that the submitted bid documentation constitutes trade secrets and will not be deemed public records. This acknowledgment is based on the Department's express understanding that the information contained in the bid documentation is not known outside the bidder's business, is known only to a limited extent and only by a limited number of employees of the bidder, is safeguarded while in the bidder's possession, is extremely valuable to the bidder and could be extremely valuable to the bidder's competitors by virtue of it reflecting the bidder's contemplated techniques of construction. The Department acknowledges that the bid documentation includes a compilation of information used in the bidder's business, intended to give the bidder an opportunity to obtain an advantage over competitors who do not know of or use the contents of the documentation. The Department agrees to safeguard the bid documentation, and all information contained therein, against disclosure, including disclosure of subcontractor bid documentation to the Contractor and other subcontractors to the fullest extent permitted by law. However, in the event of arbitration or litigation, the bid documentation shall be subject to discovery, and the Department assumes no responsibility for safeguarding the bid documentation unless the Contractor has obtained an appropriate protective order issued by the arbitrator or the court.

Full compensation for preparing the bid documentation, submitting it for escrow, and presenting it upon request of the Engineer or a Disputes Review Board shall be considered as included in the contract prices paid for the various items of work, and no additional compensation will be allowed therefor.

The direct cost of depositing the bid documentation in escrow at the agreed commercial business will be paid by the State.

SECTION 3 CONTRACT AWARD AND EXECUTION

SECTION 3. PRE-AWARD QUALIFICATION REVIEW AND AWARD AND EXECUTION OF CONTRACT

3-1.01 GENERAL

The bidder's attention is directed to the provisions in Section 3, "Award and Execution of Contract," of the Standard Specifications and these special provisions for the requirements and conditions concerning award and execution of contract.

Requests for relief of bid and bid protests are to be delivered to the following address: Department of Transportation, MS 43, Attn: Office Engineer, 1727 30th Street, Sacramento, CA 95816 or by facsimile to the Office Engineer at (916) 227-6282.

3-1.015 PRE-AWARD QUALIFICATIONS REVIEW

The Engineer will review the responses to the "Pre-Award Qualification Questionnaire" submitted by the apparent low bidder and the Engineer will make a determination on the bidder's qualifications for performing the work in a manner that is safe for the workers and the public, based on the bidder's experience, qualifications of the on-site supervisory personnel, equipment, conceptual approach to the work, and safety history of the bidder and its supervisory personnel.

If the Engineer determines it necessary, a pre-award qualifications review meeting will be conducted by an agent of the Director, and the apparent low bidder shall participate. Notification of whether a meeting will be conducted will be provided on or before the first Thursday following the time indicated in the "Notice to Contractors" for the opening of bids. The meeting, if held, will be on second Thursday following the time indicated in the "Notice to Contractors" for the opening of bids at 10:00 a.m. in the third floor conference room, 1727 30th Street, Sacramento, CA. 95816. Non-attendance by the apparent low bidder at the pre-award qualifications review meeting shall be just cause for rejection of the bid and forfeiture of the proposal guaranty.

At the pre-award qualifications review meeting, the low bidder shall be prepared to discuss and answer questions relative to the responses to the "Pre-Award Qualification Questionnaire." The Director's agent will prepare written findings and recommendations to the Engineer regarding award of the contract to the apparent low bidder based on the "Pre-Award Qualification Questionnaire" and responses submitted, and on the information provided at the pre-award qualifications review meeting, if held. The decision of the Engineer regarding the bidder's qualifications shall be final.

The second and third apparent bidders shall participate in pre-award qualifications review meetings if requested to do so by the Department. Notification by the Department will be provided a least 48 hours prior to the pre-award qualifications review meeting. Non-attendance by the second or third apparent low bidder at any such requested meeting shall be just cause for rejection of bid and forfeiture of the proposal guaranty.

3-1.017 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.

The contract shall be executed by the successful bidder and shall be returned, together with the contract bonds and the documents identified in Section 3-1.025, "Insurance Policies," of the Standard Specifications, to the Department so that it is received within 10 business days after the bidder has received the contract for execution. Failure to do so shall be just cause for forfeiture of the proposal guaranty. The executed contract documents shall be delivered to the following address: Department of Transportation MS 43, Attn: Office Engineer, 1727 30th Street, Sacramento, CA 95816.

A "CALTRANS BIDDER-DBE INFORMATION" form will be included in the contract documents to be executed by the successful bidder. The purpose of the form is to collect data required under 49 CFR 26. Even if no DBE participation will be reported, the successful bidder must execute and return the form.

The bidder's "CALTRANS BIDDER-DBE INFORMATION" form should include the names, addresses and phone numbers of DBE firms that will participate, with a complete description of work or supplies to be provided by each, and the dollar value of each DBE transaction. When 100 percent of a contract item of work is not to be performed or furnished by a DBE, a description of the exact portion of that work to be performed or furnished by that DBE should be included in the DBE information, including the planned location of that work. A bidder certified as a DBE should describe the work it has committed to performing with its own forces as well as any other work that it has committed to be performed by DBE subcontractors, suppliers and trucking companies.

The bidder is encouraged to provide written confirmation from each DBE that the DBE is participating in the contract. A copy of a DBE's quote will serve as written confirmation that the DBE is participating in the contract. If a DBE is participating as a joint venture partner, the bidder is encouraged to submit a copy of the joint venture agreement.

The "CALTRANS BIDDER-DBE INFORMATION" form should be returned to the Department by the successful bidder with the executed contract, contract bonds and the documents identified in Section 3-1.025, "Insurance Policies," of the Standard Specifications.

A "Payee Data Record" form will be included in the contract documents to be executed by the successful bidder. The purpose of the form is to facilitate the collection of taxpayer identification data. The form shall be completed and returned to the Department by the successful bidder with the executed contract, contract bonds and the documents identified in Section 3-1.025, "Insurance Policies," of the Standard Specifications. For the purposes of the form, payee shall be deemed to mean the successful bidder. The form is not to be completed for subcontractors or suppliers. Failure to complete and return the "Payee Data Record" form to the Department as provided herein will result in the retention of 31 percent of payments due the Contractor and penalties of up to $20,000. This retention of payments for failure to complete the "Payee Data Record" form is in addition to any other retention of payments due the Contractor.

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

The 1st working day is the 55th day after contract approval.

Do not start work at the job site, except for measuring controlling field dimensions and locating utilities, until the Engineer approves your submittal for:

1. Baseline Progress Schedule (Critical Path Method)
2. Storm Water Pollution Prevention Plan (SWPPP)
3. Notification of Dispute Review Board (DRB) nominee and disclosure statement

In addition to the above submittals, do not start work at the job site, except for measuring controlling field dimensions and locating utilities, until you submit:

1. Notice of Materials To Be Used.
2. Contingency plan for reopening closures to public traffic.
3. Written statement from the vendor that the order for the sign panels has been received and accepted by the vendor. The statement must show the dates that the materials will be shipped.
4. Written statement from the vendor that the order for structural steel has been received and accepted by the vendor. The statement must show the dates that the materials will be shipped.

You may start work at the job site before the 55th day after contract approval if:

1. You obtain required approval for each submittal before the 55th day
2. The Engineer authorizes it in writing

The Department grants a time extension if a delay is beyond your control and prevents you from starting work at the job site on the 1st working day.

Complete the work, except plant establishment work, within 740 working days.

Liquidated damages are $11,400 per day starting on the 1st day after exceeding 740 working days.

Complete the work, including plant establishment work, within 990 working days.

The Department reduces liquidated damages to $600 per day if all the work, except plant establishment work, is complete and 990 working days have expired.

The Department does not simultaneously assess damages for untimely completion of work and plant establishment work.

SECTION 5 GENERAL

SECTION 5-1 MISCELLANEOUS

5-1.01 PARTNERING DISPUTE RESOLUTION

The Department encourages the project team to exhaust the use of partnering in dispute resolution before engagement of an objective third party. Comply with Section 5-1.102, "Partnering," of the Standard Specifications.

For certain disputes, facilitated partnering session or facilitated dispute resolution session may be appropriate and effective in clarifying issues and resolving all or part of a dispute.

To afford the project team enough time to plan and hold the session, a maximum of 20 days may be added to the dispute review board (DRB) referral time following the Engineer's written response to a supplemental notice of potential claim as specified in Section 5-1.15, "Dispute Resolution," of the Standard Specifications.

To allow this additional referral time, the project team must document its agreement and intention in the dispute resolution plan of the partnering charter. The team may further document agreement of any associated criteria to be met for use of the additional referral time.

If the session is not held, the DRB referral time remains in effect as specified in Section 5-1.15, "Dispute Resolution," of the Standard Specifications.

5-1.02 FORCE ACCOUNT PAYMENT

Payment for extra work at force account will be determined by either non-subcontracted or subcontracted force account payment unless otherwise specified.

Non-Subcontracted Force Account Payment

When extra work to be paid for on a force account basis is performed by the Contractor, compensation will be determined in accordance with Section 9-1.03, "Force Account Payment," of the Standard Specifications and these special provisions.

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

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

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

Cost	Percent Markup
Labor	28
Materials	10
Equipment Rental	10

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

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

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

Subcontracted Force Account Payment

When extra work to be paid for on a force account basis is performed by a subcontractor approved in conformance with the provisions in Section 8-1.01, "Subcontracting," of the Standard Specifications, compensation will be determined in accordance with the provisions in Section 9-1.03, "Force Account Payment," of the Standard Specifications.

5-1.03 COMPENSATION ADJUSTMENTS FOR PRICE INDEX FLUCTUATIONS

The provisions of this section shall apply only to the following contract items:

ITEM CODE	ITEM
390131	HOT MIX ASPHALT
397005	TACK COAT
374002	ASPHALTIC EMULSTION (FOG SEAL COAT)

The compensation payable for asphalt binder used in hot mix asphalt, asphaltic emulsion (fog seal coat), and tack coat will be increased or decreased in conformance with the provisions of this section for asphalt binder price fluctuations exceeding 10 percent (Iu/Ib is greater than 1.10 or less than 0.90) which occur during performance of the work.

The quantity of asphalt binder used in asphaltic emulsion (fog seal coat) and tack coat will be determined by multiplying the item quantity for asphaltic emulsion (fog seal coat) and asphaltic tack coat included in a monthly estimate by the minimum percent residue specified in Section 94, "Asphaltic Emulsions," of the Standard Specifications. The asphaltic emulsion minimum percent residue will be based on the type of emulsion used by the Contractor.

At the Contractor's option, the Contractor may provide actual daily test results for asphalt binder residue for the asphaltic emulsion (fog seal coat) and tack coat used. Test results provided by the Contractor shall be from an independent testing laboratory that participates in the AASHTO Proficiency Sample Program. The Contractor shall take samples of asphaltic emulsion from the distributor truck at mid-load from a sampling tap or thief. Two separate 2-liter samples shall be taken in the presence of the Engineer. The Contractor shall provide one sample to the Contractor's independent testing laboratory within 24 hours of sampling. The second sample shall be given to the Engineer. The test results from the Contractor's independent testing laboratory shall be delivered to the Engineer within 10 days from sample date.

The adjustment in compensation will be determined in conformance with the following formulae when the item of hot mix asphalt, asphaltic emulsion (fog seal coat), or tack coat are included in a monthly estimate:

A. Total monthly adjustment = AQ
B. For an increase in asphalt binder price index exceeding 10 percent:

$$A = 0.90\ (1.1023)\ (Iu/Ib - 1.10)\ Ib$$

C. For a decrease in asphalt binder price index exceeding 10 percent:

$$A = 0.90\ (1.1023)\ (Iu/Ib - 0.90)\ Ib$$

D. Where:

A = Adjustment in dollars per tonne of asphalt binder used to produce hot mix asphalt and asphaltic emulsion (fog seal coat) and asphaltic emulsion residue used as tack coat rounded to the nearest $0.01.
Iu = The California Statewide Paving Asphalt Price Index which is in effect on the first business day of the month within the pay period in which the quantity subject to adjustment was included in the estimate.
Ib = The California Statewide Paving Asphalt Price Index for the month in which the bid opening for the project occurred.
Q = Quantity in tonnes of asphalt binder that was used in producing the quantity of hot mix asphalt shown under "This Estimate" on the monthly estimate using the amount of asphalt binder determined by the Engineer plus the quantity in tonnes of asphalt binder that would have been used as residue in the asphaltic emulsion (fog seal coat) and tack coat shown under "This Estimate" on the monthly estimate.

The adjustment in compensation will also be subject to the following:

A. The compensation adjustments provided herein will be shown separately on payment estimates. The Contractor shall be liable to the State for decreased compensation adjustments and the Department may deduct the amount thereof from moneys due or that may become due the Contractor.
B. Compensation adjustments made under this section will be taken into account in making adjustments in conformance with the provisions in Section 4-1.03B, "Increased or Decreased Quantities," of the Standard Specifications.
C. In the event of an overrun of contract time, adjustment in compensation for asphalt binder included in estimates during the overrun period will be determined using the California Statewide Paving Asphalt Price Index in effect on the first business day of the month within the pay period in which the overrun began.

The California Statewide Paving Asphalt Price Index is determined each month on the first business day of the month by the Department using the median of posted prices in effect as posted by Chevron, ExxonMobil, and Union 76 for the Buena Vista, Huntington Beach, and Midway Sunset fields.

In the event that the companies discontinue posting their prices for a field, the Department will determine an index from the remaining posted prices. The Department reserves the right to include in the index determination the posted prices of additional fields.

The California Statewide Paving Asphalt Price Index is available on the Division of Engineering Services website at:

http://www.dot.ca.gov/hq/esc/oe/asphalt_index/astable.html

5-1.04 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.

Areas available for the exclusive use of the Contractor are designated on the plans. 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 these areas.

Residence trailers will not be allowed within the highway right of way, except that one trailer will be allowed for yard security purposes.

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

The Contractor shall secure, at the Contractor's own expense, areas required for plant sites, storage of equipment or materials or for other purposes, if sufficient area is not available to the Contractor within the contract limits, or at the sites designated on the plans outside the contract limits.

The Contractor shall not use State-owned property east of Station 165+00 "E4" line, unless otherwise shown on the plans, for plant sites, storage of equipment or materials, or otherwise occupy this area. When the Contractor performs work east of Station 165+00 "E4" line, only the immediate work area may be occupied and only while construction activities are in progress.

5-1.05 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	$400,000
B.	Develop Water Supply	$ 70,000
C.	Progress Schedule (Critical Path Method)	$ 30,000
D.	Lead Compliance Plan	$ 80,000
E.	Maintaining Existing Traffic Management System Elements During Construction	$ 10,000

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. Prestressing Steel including ducts and anchorages
B. Piling
C. Type B Joint Seal
D. Joint Seal Assembly
E. Bar Reinforcing Steel
F. Miscellaneous Bridge Metal
G. Chain Link Railing
H. Cable Railing
I. Plastic Pipe (Irrigation Systems)
J. Sound Wall (Masonry Block)
K. Culvert Pipe and Appurtenances
L. Miscellaneous Drainage Facilities
M. Welded Steel Pipe
N. Sewer Pipes and Appurtenances
O. Miscellaneous Iron and Steel
P. Fences and Gates
Q. Transition Railing
R. Crash Cushions

S. Pavement Markers
T. Fiber optic conduit
U. Fiber optic cable
V. Fiber optic vaults
W. Signal and lighting standards
X. Signal heads and mounting brackets
Y. Luminaires
Z. Lighting Fixtures
AA.Metal Sign Structures
BB.Service equipment enclosures
CC.Media Converter
DD.FDU

5-1.06 SUPPLEMENTAL PROJECT INFORMATION

Supplemental project information attached to the project plans are:

1. Caliente Avenue Overcrossing, Bridge Number 57-1142, Log of Test Borings
2. Heritage Road Undercrossing, Bridge Number 57-1143L/R, Log of Test Borings
3. Spring Canyon Bridge, Bridge Number 57-1155L/R, Log of Test Borings
4. Retaining Wall 123, Log of Test Borings
5. Retaining Wall 125, Log of Test Borings
6. Retaining Wall 126, Log of Test Borings
7. Retaining Wall 157, Log of Test Borings
8. Retaining Wall 158, Log of Test Borings

Supplemental project information included in the Information Handout are:

1. Caliente Avenue Overcrossing, Bridge Number 57-1142, Foundation Recommendations
2. Heritage Road Undercrossing, Bridge Number 57-1143L/R, Foundation Recommendations
3. Heritage Road Undercrossing, Bridge Number 57-1143L/R, Revised Foundation Recommendations
4. Spring Canyon Bridge, Bridge Number 57-1155L/R, Foundation Recommendations
5. Water Source information
6. Materials Report October 21, 2005
7. Materials Report July 16, 2008
8. Corrosion Study April 3, 2008
9. Geotechnical Design Report dated September 14, 2005
10. California Department of Fish and Game – Section 1602 Permit dated September 19, 2005
11. Department of Army Corps of Engineer – Section 404 Permit dated June 12, 2006
12. United States Fish and Wildlife Sevice – Biological Opinion dated July 12, 2004
13. California Regional Water Quality Control Board – Section 401 dated February 27, 2006
14. Photos of existing concrete slab located between Stations 158+40 and 160+00 "E5"

Supplemental project information available for inspection at the District Office are:

1. Cross Sections

5-1.07 SOUND CONTROL REQUIREMENTS

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

The noise level from the Contractor's operations, between the hours of 7:00 p.m. and 7:00 a.m., shall not exceed 86 dBa at a distance of 50 feet. This requirement shall not relieve the Contractor from responsibility for complying with local ordinances regulating noise level outside the limits of the State right of way.

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

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

5-1.08 HIGHWAY CONSTRUCTION EQUIPMENT

The first paragraph of Section 7-1.01D, "Vehicle Code," of the Standard Specifications shall not apply.

Pursuant to the authority contained in Section 591 of the Vehicle Code, the Department has determined that, within such areas as are within the limits of the project and are open to public traffic, the following requirements of the Vehicle Code will apply: the lighting requirements in Section 25803; the brake requirements in Chapter 3, Division 12; the splash apron requirements in Section 27600; and, when operated on completed or existing treated base, surfacing, pavement or structures, except as otherwise provided in Section 7-1.02, "Load Limitations," of the Standard Specifications, the weight limitation requirements contained in Division 15.

5-1.09 CALIFORNIA DEPARTMENT OF FISH AND GAME REQUIREMENTS

An agreement regarding a stream or lake has been entered into by the Department and the California Department of Fish and Game (CDFG) .for project areas located within the jurisdiction of the CDFG. The Contractor shall be fully informed of the requirements of this agreement as well as rules, regulations, and conditions that may govern the Contractor's operations in these areas and shall conduct the work accordingly.

Attention is directed to "Project Information" of these special provisions regarding environmental permits, agreements or additional information.

It is unlawful for any person to divert, obstruct or change the natural flow of the bed, channel or bank of a stream, river or lake without first notifying the CDFG, unless the project or activity is noticed and constructed in conformance with conditions imposed under Fish and Game Code Section 1602.

Modifications to the agreement between the Department and the CDFG that are proposed by the Contractor shall be submitted in writing to the Engineer for consideration for transmittal to the CDFG for their consideration.

No work shall be performed which is inconsistent with the original agreement or proposed modification prior to receiving written approval from the Engineer. A delay, when ordered by the Engineer, will be considered a temporary suspension of work, in accordance with the provisions in Section 8-1.05, "Temporary Suspension of Work," of the Standard Specifications.

Modifications to any agreement between the Department and the CDFG shall be fully binding on the Contractor.

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

5-1.10 UNITED STATES ARMY CORPS OF ENGINEERS REQUIREMENTS

The Army Corps of Engineers (ACOE) has issued a permit to the Department for project areas located within the jurisdiction of ACOE. The Contractor shall be fully informed of the requirements of this permit and all rules, regulations, and conditions that may govern the Contractor's operations in these areas and shall conduct the work accordingly.

Attention is directed to "Project Information" of these special provisions regarding environmental permits, agreements or additional information.

Modifications to the permit between the Department and the ACOE that are proposed by the Contractor shall be submitted in writing to the Engineer for consideration for transmittal to the ACOE for their consideration.

No work shall be performed which is inconsistent with the original permit or proposed modification prior to receiving written approval from the Engineer. A delay, when ordered by the Engineer, will be considered a temporary suspension of work, in accordance with the provisions in Section 8-1.05, "Temporary Suspension of Work," of the Standard Specifications.

Modifications to the permit between the Department and the ACOE shall be fully binding on the Contractor.

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

5-1.11 UNITED STATES FISH AND WILDLIFE SERVICE REQUIREMENTS

The United States Fish and Wildlife Service (USFWS) has issued a Biological Opinion to the Department for project areas located within the jurisdiction of the USFWS. The Contractor shall be fully informed of the requirements and all rules, regulations, and conditions that may govern the Contractor's operations in these areas and shall conduct the work accordingly.

Attention is directed to "Project Information" of these special provisions regarding environmental permits, agreements or additional information.

Modifications to the Biological Opinion issued to the Department and the USFWS that are proposed by the Contractor shall be submitted in writing to the Engineer for consideration for transmittal to the USFWS for their consideration.

No work shall be performed which is inconsistent with the original Biological Opinion or proposed modification prior to receiving written approval from the Engineer. A delay, when ordered by the Engineer, will be considered a temporary suspension of work, in accordance with the provisions in Section 8-1.05, "Temporary Suspension of Work," of the Standard Specifications.

Modifications to the Biological Opinion between the Department and the USFWS shall be fully binding on the Contractor.

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

5-1.12 CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD REQUIREMENTS

The California Regional Water Quality Control Board (CRWQCB) has issued a 401 certification permit to the Department for project areas located within the jurisdiction of the CRWQCB. The Contractor shall be fully informed of the requirements and all rules, regulations, and conditions that may govern the Contractor's operations in these areas and shall conduct the work accordingly.

Attention is directed to "Project Information" of these special provisions regarding environmental permits, agreements or additional information.

Modifications to the permit between the Department and CRWQCB that are proposed by the Contractor shall be submitted in writing to the Engineer for consideration for transmittal to the CRWQCB for their consideration.

No work shall be performed which is inconsistent with the original permit or proposed modification prior to receiving written approval from the Engineer. A delay, when ordered by the Engineer, will be considered a temporary suspension of work, in accordance with the provisions in Section 8-1.05, "Temporary Suspension of Work," of the Standard Specifications.

Modifications to the permit between the Department and CRWQCB shall be fully binding on the Contractor.

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

5-1.13 CONTRACTOR ENVIRONMENTAL EDUCATION PROGRAM

The United States Fish and Wild Life Service Biological Opinion requires a contractor education program to ensure that all the Contractor and State construction personnel are fully informed of the biological sensitivities associated with this project.

A Biologist will be provided by the State to present a 2-hour environmental educational program to all the Contractor's personnel prior to the start of work.

The content of the educational program will focus on:

1) The occurrence of listed and sensitive species within the project limits and their general ecology;
2) Species sensitivity to human activities;
3) Legal protection of the listed species,
4) Penalties for violations of Federal and State laws;
5) Reporting requirements;
6) Project features designed to reduce impacts to the listed species and promote their survival within the project limits.

The Biologist will provide a fact sheet that includes color photographs of the listed species within the project limits. The fact sheet shall be displayed at all construction field offices through the duration of the project.

The educational program shall be held at an agreed upon date, time and location by the Engineer and the Contractor.

New contractor personnel shall attend the educational program within 2 weeks of starting work on the project or as agreed upon by the Engineer and the Contractor.

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

5-1.14 PALEONTOLOGY

Attention is directed to the California Public Resources Code Section 5097.5, which protects vertebrate paleontological sites or other paleontological features situated on public lands. In compliance with the California Environmental Quality Act (CEQA) requirements a Paleontologist will monitor the excavation within the project limits to salvage fossil specimens as necessary during construction within the project limits.

A Paleontologist will be provided by the State for this project.

The Contractor shall provide the Engineer with a schedule of excavation operations within the project limits in writing at least 15 working days prior to construction and update the schedule as needed. The Contractor shall notify the Engineer 15 days in advance of the start of excavation operations.

If fossils are discovered, the Engineer may temporarily divert or suspend the excavation operations until the Paleontologist completes the salvage and removal of the fossil specimens.

All fossil specimens salvaged from within the State Right of Way shall remain the property of the State.

A delay due to paleontological monitoring or the salvage and removal of fossil specimens, when ordered by the Engineer, will be considered a temporary suspension of work, in accordance with the provisions in Section 8-1.05, "Temporary Suspension of Work," of the Standard Specifications.

Any additional excavation required due to the discovery of paleontological remains, when ordered by the Engineer will be paid for as extra work as provided in Section 4-1.03, "Extra Work," of the Standard Specifications.

5-1.15 RELATIONS WITH CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD

This project lies within the boundaries of the San Diego Regional Water Quality Control Board (RWQCB).

The State Water Resources Control Board (SWRCB) has issued to the Department a permit that governs storm water and non-storm water discharges from the Department's properties, facilities, and activities. The Department's permit is entitled "Order No. 99 - 06 - DWQ, NPDES No. CAS000003, National Pollutant Discharge Elimination System (NPDES) Permit, Statewide Storm Water Permit and Waste Discharge Requirements (WDRs) for the State of California, Department of Transportation (Caltrans)." Copies of the Department's permit are available for review from the SWRCB, Storm Water Permit Unit, 1001 "I" Street, P.O. Box 1977, Sacramento, California 95812-1977, Telephone: (916) 341-5254, and may also be obtained at:

http://www.waterboards.ca.gov/water_issues/programs/stormwater/

The Department's permit references and incorporates by reference the current statewide general permit issued by the SWRCB entitled "Order No. 99-08-DWQ, National Pollutant Discharge Elimination System (NPDES) General Permit No. CAS000002, Waste Discharge Requirements (WDRs) for Discharges of Storm Water Runoff Associated with Construction Activity" that regulates discharges of storm water and non-storm water from construction activities disturbing 0.4-hectare or more of soil in a common plan of development. Sampling and analysis requirements as specified in SWRCB Resolution No. 2001-46 are added to the statewide general permit. Copies of the statewide permit and modifications thereto are available for review from the SWRCB, Storm Water Permit Unit, 1001 "I" Street, P.O. Box 1977, Sacramento, California 95812-1977, Telephone: (916) 341-5254 and may also be obtained at:

http://www.waterboards.ca.gov/water_issues/programs/stormwater/

The NPDES permits that regulate this project, as referenced above, are collectively referred to in this section as the "permits."

This project shall conform to the permits and modifications thereto. The Contractor shall maintain copies of the permits at the project site and shall make them available during construction.

The Contractor shall know and comply with provisions of Federal, State, and local regulations and requirements that govern the Contractor's operations and storm water and non-storm water discharges from 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," 7-1.11, "Preservation of Property," and 7-1.12, "Indemnification and Insurance," of the Standard Specifications.

The Contractor shall be responsible for penalties assessed on the Contractor or the Department as a result of the Contractor's failure to comply with the provisions in "Water Pollution Control" of these special provisions or with the applicable provisions of the Federal, State, and local regulations and requirements.

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 applicable laws, regulations, or requirements. Costs incurred could include sums spent instead of penalties, in mitigation or to remediate or correct violations.

WITHHOLDS

The Department will withhold money due the Contractor, in an amount estimated by the Department, to include the full amount of penalties and mitigation costs proposed, assessed, or levied as a result of the Contractor's violation of the permits, or Federal or State law, regulations, or requirements. Funds will be withheld by the Department until final disposition of these costs has been made. The Contractor shall remain liable for the full amount until the potential liability is finally resolved with the entity seeking the penalties. Instead of the withhold, the Contractor may provide a suitable bond in favor of the Department to cover the highest estimated liability for any disputed penalties proposed as a result of the Contractor's violation of the permits, law, regulations, or requirements.

If a regulatory agency identifies a failure to comply with the permits and modifications thereto, or other Federal, State, or local requirements, the Department will withhold money due the Contractor, subject to the following:

A. The Department will give the Contractor 30 days notice of the Department's intention to withhold funds from payments which may become due to the Contractor before acceptance of the contract. Funds withheld after acceptance of the contract will be made without prior notice to the Contractor.

B. No withholds of additional amounts out of payments will be made if the amount to be withheld does not exceed the amount being withheld from partial payments in accordance with Section 9-1.06, "Partial Payments," of the Standard Specifications.
C. If the Department has withheld 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 withhold was made, the Department will return the excess amount withheld to the Contractor in the progress payment following the determination. If the matter is resolved for less than the amount withheld, the Department will pay interest at a rate of 6 percent per year on the excess withhold.

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

5-1.16 ENVIRONMENTALLY SENSITIVE AREA

An environmentally sensitive area (ESA) shall consist of an area within and near the limits of construction where access is prohibited or limited for the preservation of archeological site or existing vegetation, or protection of biological habitat as shown on the plans. The Engineer will determine the exact location of the boundaries of the ESA. No work shall be conducted within the ESA.

Attention is directed to Section 7—1.01 "Laws to be Observed," and Section 7—1.04 "Permits and Licenses," of the Standard Specifications regarding State and Federal regulations, permits, or agreements which pertain to an ESA.

Any lighting used during construction shall be shielded and directed away from adjacent ESA.

Attention is directed to "Migratory Birds," "Archaeological Monitoring Area," and "Paleontology" of these special provisions.

Prior to beginning work, the boundaries of the ESA shall be clearly delineated by the placement of temporary fence (Type ESA).

Prior to beginning work, temporary wildlife exclusion fence shall be clearly delineated and installed adjacent to and outside of the boundaries of ESA.

Vehicle access, storage or transport of materials or equipment, or other project related activities are prohibited within the boundaries of ESA.

The Contractor shall mitigate damage or impacts to the ESA caused by the Contractor's operations, at the Contractor's expense. If the Engineer determines mitigation work will be performed by others, or if mitigation fees are assessed the Department, deductions from moneys due or to become due the Contractor will be made for the mitigation costs.

5-1.17 MIGRATORY BIRDS

The Federal Migratory Bird Treaty Act (16 USC §703-711.), 50 CFR 10, and Fish & Game Code §3503, §3513, and §3800, protect migratory and nongame birds, their occupied nests, and their eggs.

The Federal Endangered Species Act of 1973 (16 USC §1531,§1543) and California Endangered Species Act (Fish & Game Code §2050-§2115.5) prohibit the take of listed species and protect occupied and unoccupied nests of threatened and endangered bird species.

The Bald and Golden Eagle Protection Act (16 USC §668) prohibits the destruction of bald and golden eagles and their occupied and unoccupied nests.

A Biologist will be provided by the State for this project. The Biologist will verify the presence or absence of migratory birds.

Attention is directed to "Order of Work" and "Clearing and Grubbing" of these special provisions.

Prior to the migratory bird nesting season of February 15 through September 15, vegetation mowing and tree removal within the limits of clearing and grubbing work shall be completed in conformance with the provisions in "Clearing and Grubbing" of these special provisions.

At any time during the year the Contractor shall notify the Engineer in writing 15 working days prior to beginning work disturbing the ground. The notification shall include the timing and order of work to be performed. The Contractor shall not begin work without written authorization from the Engineer.

The Contractor shall use exclusion techniques prior to the nesting season when determined by the Biologist and directed by the Engineer to prevent migratory birds from nesting on the ground within the project limits. Preventing nesting by using appropriate exclusion techniques will be paid for as extra work as provided in Section 4-1.03D, "Extra Work," of the Standard Specifications.

If evidence of bird nesting is discovered during the nesting season, the Contractor shall not disturb the nesting birds or nests, and shall immediately stop work adjacent to the nesting birds and notify the Engineer. During the nesting season migratory birds shall be handled as follows:

A. If burrowing owls are found nesting during the nesting season February 1 through August 31 within the project limits when exclusion or noise mitigation is not feasible, the nesting area shall be designated as an environmentally sensitive area and no work shall occur within 75 meters until the nesting season is over.
B. If any other nesting migratory birds are found within the project limits when exclusion or noise mitigation is not feasible, the nesting area shall be designated as an environmentally sensitive area and no work shall occur within 20 meters until the nesting season is over.

The Contractor shall place temporary noise barriers when determined by the Biologist and directed by the Engineer to minimize impacts to nesting migratory birds when discovered within the project limits. Placing temporary noise barriers to minimize impacts to nesting migratory birds when directed by the Engineer will be paid for as extra work as provided in Section 4-1.03D, "Extra Work," of the Standard Specifications.

The boundaries of the environmentally sensitive areas for migratory birds shall be delineated in conformance with"Environmentally Sensitive Area" and "Temporary Fence (Type ESA)" of these special provisions. Once the nesting season is over, the areas will no longer be considered an environmentally sensitive area and temporary fence (Type ESA) shall be removed.

Temporary fence (Type ESA), when required to delineate the boundaries of the environmentally sensitive areas for migratory birds, will be measured and paid for in conformance with "Temporary Fence (Type ESA)" of these special provisions.

A delay due to migratory birds or their nests, when ordered by the Engineer, will be considered a temporary suspension of work, in accordance with the provisions in Section 8-1.05, "Temporary Suspension of Work," of the Standard Specifications.

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

5-1.18 PRESERVATION OF PROPERTY

Attention is directed to Section 7-1.11, "Preservation of Property," of the Standard Specifications and these special provisions.

Existing trees, shrubs and other plants, that are not to be removed as shown on the plans or specified in these special provisions, and are injured or damaged by reason of the Contractor's operations, shall be replaced by the Contractor. The minimum size of tree replacement shall be 600 mm box and the minimum size of shrub replacement shall be No. 15 container. Replacement ground cover plants shall be from flats and shall be planted 300 mm on center. Replacement of Carpobrotus ground cover plants shall be from cuttings 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 prior to the start of the plant establishment period. Replacement planting shall conform to the provisions in Section 20-4.05, "Planting," of the Standard Specifications.

5-1.19 DAMAGE REPAIR

Attention is directed to Section 7-1.16, "Contractor's Responsibility for the Work and Materials," and Section 7-1.165, "Damage by Storm, Flood, Tsunami or Earthquake," of the Standard Specifications and these special provisions.

When as a result of freezing conditions (as defined herein) during the plant establishment period, plants have died or, in the opinion of the Engineer, have deteriorated to a point beyond which the plants will not mature as typical examples of their species, the Engineer may direct replacement of the affected plants. The total cost of ordered plant replacement work will be paid for as extra work as provided in Section 4-1.03D of the Standard Specifications. A freezing condition, for the purpose of this specification, occurs when the temperature at or near the affected area has been officially recorded below 0°C and plants have been killed or damaged to the degree described above.

When, as a result of drought conditions (as defined herein) during the plant establishment period, plants have died or, in the opinion of the Engineer, have deteriorated to a point beyond which the plants will not mature as typical examples of their species, the Engineer may direct replacement of the affected plants. The total cost of ordered plant replacements, after water has been restricted or stopped, will be paid for as extra work as provided in Section 4-1.03D of the Standard Specifications. Restriction or shutoff of available water shall not relieve the Contractor from performing other contract work. A drought condition occurs when the Department, or its supplier, restricts or stops delivery of water to the Contractor to the degree that plants have died or deteriorated as described above.

When the provisions in Section 7-1.165, "Damage by Storm, Flood, Tsunami or Earthquake," of the Standard Specifications are applicable, the provisions above for payment of costs for repair of damage due to rain, freezing conditions and drought shall not apply.

5-1.20 RELIEF FROM MAINTENANCE AND RESPONSIBILITY

The Contractor may be relieved of the duty of maintenance and protection for those items not directly connected with plant establishment work in conformance with the provisions in Section 7-1.15, "Relief From Maintenance and Responsibility," of the Standard Specifications. Water pollution control, maintain existing planted areas, maintain existing irrigation facilities, transplant trees, and transplant palm trees shall not be relieved of maintenance.

SECTION 6. (BLANK)

SECTION 7. (BLANK)

SECTION 8. MATERIALS

SECTION 8-1. MISCELLANEOUS

8-1.01 SUBSTITUTION OF NON-METRIC MATERIALS AND PRODUCTS

Only materials and products conforming to the requirements of the specifications shall be incorporated in the work. When metric materials and products are not available, and when approved by the Engineer, and at no cost to the State, materials and products in the United States Standard Measures which are of equal quality and of the required properties and characteristics for the purpose intended, may be substituted for the equivalent metric materials and products, subject to the following provisions:

A. Materials and products shown on the plans or in the special provisions as being equivalent may be substituted for the metric materials and products specified or detailed on the plans.
B. Before other non-metric materials and products will be considered for use, the Contractor shall furnish, at the Contractor's expense, evidence satisfactory to the Engineer that the materials and products proposed for use are equal to or better than the materials and products specified or detailed on the plans. The burden of proof as to the quality and suitability of substitutions shall be upon the Contractor and the Contractor shall furnish necessary information as required by the Engineer. The Engineer will be the sole judge as to the quality and suitability of the substituted materials and products and the Engineer's decision will be final.
C. When the Contractor elects to substitute non-metric materials and products, including materials and products shown on the plans or in the special provisions as being equivalent, the list of sources of material specified in Section 6-1.01, "Source of Supply and Quality of Materials," of the Standard Specification shall include a list of substitutions to be made and contract items involved. In addition, for a change in design or details, the Contractor shall submit plans and working drawings in conformance with the provisions in Section 5-1.02, "Plans and Working Drawings," of the Standard Specifications. The plans and working drawings shall be submitted at least 7 days before the Contractor intends to begin the work involved.

Unless otherwise specified, the following substitutions of materials and products will be allowed:

SUBSTITUTION TABLE FOR PLAIN WIRE REINFORCEMENT
ASTM Designation: A 82

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

SUBSTITUTION TABLE FOR BAR REINFORCEMENT

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

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

SUBSTITUTION TABLE FOR SIZES OF:

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

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

METRIC SIZE SHOWN ON THE PLANS mm	SIZE TO BE SUBSTITUTED inch
6 or 6.35	1/4
8 or 7.94	5/16
10 or 9.52	3/8
11 or 11.11	7/16
13, 12.70, or M12	1/2
14 or 14.29	9/16
16, 15.88, or M16	5/8
19, 19.05, or M20	3/4
22, 22.22, or M22	7/8
24, 25, 25.40, or M24	1
29, 28.58, or M27	1-1/8
32, 31.75, or M30	1-1/4
35 or 34.93	1-3/8
38, 38.10, or M36	1-1/2
44 or 44.45	1-3/4
51 or 50.80	2
57 or 57.15	2-1/4
64 or 63.50	2-1/2
70 or 69.85	2-3/4
76 or 76.20	3
83 or 82.55	3-1/4
89 or 88.90	3-1/2
95 or 95.25	3-3/4
102 or 101.60	4

SUBSTITUTION TABLE FOR NOMINAL THICKNESS OF SHEET METAL

UNCOATED HOT AND COLD ROLLED SHEETS		HOT-DIPPED ZINC COATED SHEETS (GALVANIZED)	
METRIC THICKNESS SHOWN ON THE PLANS mm	GAGE TO BE SUBSTITUTED inch	METRIC THICKNESS SHOWN ON THE PLANS mm	GAGE TO BE SUBSTITUTED inch
7.94	0.3125	4.270	0.1681
6.07	0.2391	3.891	0.1532
5.69	0.2242	3.510	0.1382
5.31	0.2092	3.132	0.1233
4.94	0.1943	2.753	0.1084
4.55	0.1793	2.372	0.0934
4.18	0.1644	1.994	0.0785
3.80	0.1495	1.803	0.0710
3.42	0.1345	1.613	0.0635
3.04	0.1196	1.461	0.0575
2.66	0.1046	1.311	0.0516
2.28	0.0897	1.158	0.0456
1.90	0.0747	1.006 or 1.016	0.0396
1.71	0.0673	0.930	0.0366
1.52	0.0598	0.853	0.0336
1.37	0.0538	0.777	0.0306
1.21	0.0478	0.701	0.0276
1.06	0.0418	0.627	0.0247
0.91	0.0359	0.551	0.0217
0.84	0.0329	0.513	0.0202
0.76	0.0299	0.475	0.0187
0.68	0.0269	--------	--------
0.61	0.0239	--------	--------
0.53	0.0209	--------	--------
0.45	0.0179	--------	--------
0.42	0.0164	--------	--------
0.38	0.0149	--------	--------

SUBSTITUTION TABLE FOR WIRE

METRIC THICKNESS SHOWN ON THE PLANS mm	WIRE THICKNESS TO BE SUBSTITUTED inch	GAGE NO.
6.20	0.244	3
5.72	0.225	4
5.26	0.207	5
4.88	0.192	6
4.50	0.177	7
4.11	0.162	8
3.76	0.148	9
3.43	0.135	10
3.05	0.120	11
2.69	0.106	12
2.34	0.092	13
2.03	0.080	14
1.83	0.072	15
1.57	0.062	16
1.37	0.054	17
1.22	0.048	18
1.04	0.041	19
0.89	0.035	20

SUBSTITUTION TABLE FOR PIPE PILES

METRIC SIZE SHOWN ON THE PLANS mm x mm	SIZE TO BE SUBSTITUTED inch x inch
PP 360 x 4.55	NPS 14 x 0.179
PP 360 x 6.35	NPS 14 x 0.250
PP 360 x 9.53	NPS 14 x 0.375
PP 360 x 11.12	NPS 14 x 0.438
PP 406 x 12.70	NPS 16 x 0.500
PP 460 x T	NPS 18 x T"
PP 508 x T	NPS 20 x T"
PP 559 x T	NPS 22 x T"
PP 610 x T	NPS 24 x T"
PP 660 x T	NPS 26 x T"
PP 711 x T	NPS 28 x T"
PP 762 x T	NPS 30 x T"
PP 813 x T	NPS 32 x T"
PP 864 x T	NPS 34 x T"
PP 914 x T	NPS 36 x T"
PP 965 x T	NPS 38 x T"
PP 1016 x T	NPS 40 x T"
PP 1067 x T	NPS 42 x T"
PP 1118 x T	NPS 44 x T"
PP 1219 x T	NPS 48 x T"
PP 1524 x T	NPS 60 x T"

The thickness in millimeters (T) represents an exact conversion of the thickness in inches (T").

SUBSTITUTION TABLE FOR CIDH CONCRETE PILING

METRIC SIZE SHOWN ON THE PLANS	ACTUAL AUGER SIZE TO BE SUBSTITUTED inches
350 mm	14
400 mm	16
450 mm	18
600 mm	24
750 mm	30
900 mm	36
1.0 m	42
1.2 m	48
1.5 m	60
1.8 m	72
2.1 m	84
2.4 m	96
2.7 m	108
3.0 m	120
3.3 m	132
3.6 m	144
4.0 m	156

SUBSTITUTION TABLE FOR STRUCTURAL TIMBER AND LUMBER

METRIC MINIMUM DRESSED DRY, SHOWN ON THE PLANS mm x mm	METRIC MINIMUM DRESSED GREEN, SHOWN ON THE PLANS mm x mm	NOMINAL SIZE TO BE SUBSTITUTED inch x inch
19x89	20x90	1x4
38x89	40x90	2x4
64x89	65x90	3x4
89x89	90x90	4x4
140x140	143x143	6x6
140x184	143x190	6x8
184x184	190x190	8x8
235x235	241x241	10x10
286x286	292x292	12x12

SUBSTITUTION TABLE FOR NAILS AND SPIKES

METRIC COMMON NAIL, SHOWN ON THE PLANS Length, mm Diameter, mm	METRIC BOX NAIL, SHOWN ON THE PLANS Length, mm Diameter, mm	METRIC SPIKE, SHOWN ON THE PLANS Length, mm Diameter, mm	SIZE TO BE SUBSTITUTED Penny-weight
50.80 2.87	50.80 2.51	_____	6d
63.50 3.33	63.50 2.87	_____	8d
76.20 3.76	76.20 3.25	76.20 4.88	10d
82.55 3.76	82.55 3.25	82.55 4.88	12d
88.90 4.11	88.90 3.43	88.90 5.26	16d
101.60 4.88	101.60 3.76	101.60 5.72	20d
114.30 5.26	114.30 3.76	114.30 6.20	30d
127.00 5.72	127.00 4.11	127.00 6.68	40d
_____	_____	139.70 7.19	50d
_____	_____	152.40 7.19	60d

SUBSTITUTION TABLE FOR IRRIGATION COMPONENTS

METRIC WATER METERS, TRUCK LOADING STANDPIPES, VALVES, BACKFLOW PREVENTERS, FLOW SENSORS, WYE STRAINERS, FILTER ASSEMBLY UNITS, PIPE SUPPLY LINES, AND PIPE IRRIGATION SUPPLY LINES SHOWN ON THE PLANS DIAMETER NOMINAL (DN) mm	NOMINAL SIZE TO BE SUBSTITUTED inch
15	1/2
20	3/4
25	1
32	1-1/4
40	1-1/2
50	2
65	2-1/2
75	3
100	4
150	6
200	8
250	10
300	12
350	14
400	16

Unless otherwise specified, substitutions of United States Standard Measures standard structural shapes corresponding to the metric designations shown on the plans and in conformance with the requirements in ASTM Designation: A 6/A 6M, Annex 2, will be allowed.

8-1.02 PREQUALIFIED AND TESTED SIGNING AND DELINEATION MATERIALS

The Department maintains the following list of Prequalified and Tested Signing and Delineation Materials. The Engineer shall not be precluded from sampling and testing products on the list of Prequalified and Tested Signing and Delineation Materials.

The manufacturer of products on the list of Prequalified and Tested Signing and Delineation Materials shall furnish the Engineer a Certificate of Compliance in conformance with the provisions in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications for each type of traffic product supplied.

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

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

PAVEMENT MARKERS, PERMANENT TYPE

Retroreflective With Abrasion Resistant Surface (ARS)

1. Apex, Model 921AR (100 mm x 100 mm)
2. Ennis Paint, Models C88 (100 mm x 100 mm), 911 (100 mm x 100 mm) and C80FH
3. Ray-O-Lite, Model "AA" ARS (100 mm x 100 mm) and ARC Round Shoulder (100 mm x 100 mm)
4. 3M Series 290 (89 mm x 100 mm)
5. 3M Series 290 PSA
6. Glowlite, Inc Model 988AR (100 mm x 100 mm)

Retroreflective With Abrasion Resistant Surface (ARS)

(for recessed applications only)

1. Ennis Paint, Model 948 (58 mm x 119 mm)
2. Ennis Paint, Model 944SB (51 mm x 100 mm)*
3. Ray-O-Lite, Model 2002 (51 mm x 117 mm)
4. 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

1. Apex Universal (Ceramic)
2. Apex Universal, Models 929 (ABS) and 929PP (Polypropylene)
3. Glowlite, Inc. (Ceramic) and PP (Polypropylene)
4. Hi-Way Safety, Inc., Models P20-2000W and 2001Y (ABS)
5. Interstate Sales, "Diamond Back" (Polypropylene)
6. Novabrite Models Cdot (White) Cdot-y (Yellow), Ceramic
7. Novabrite Models Pdot-w (White) Pdot-y (Yellow), Polypropylene
8. Three D Traffic Works TD10000 (ABS), TD10500 (Polypropylene)

PAVEMENT MARKERS, TEMPORARY TYPE

Temporary Markers For Long Term Day/Night Use (180 days or less)

1. 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)

1. Apex Universal, Model 932
2. Filtrona Extrusion, Models T.O.M., T.R.P.M., and "HH" (High Heat)
3. Hi-Way Safety, Inc., Model 1280/1281
4. Glowlite, Inc., Model 932

STRIPING AND PAVEMENT MARKING MATERIAL

Permanent Traffic Striping and Pavement Marking Tape

1. Advanced Traffic Marking, Series 300 and 400
2. Brite-Line, Series 1000
3. Brite-Line, "DeltaLine XRP"
4. Swarco Industries, "Director 35" (For transverse application only)
5. Swarco Industries, "Director 60"
6. 3M, "Stamark" Series 380 and 5730
7. 3M, "Stamark" Series 420 (For transverse application only)

Temporary (Removable) Striping and Pavement Marking Tape (180 days or less)

1. Advanced Traffic Marking, Series 200
2. Brite-Line, Series 100
3. Garlock Rubber Technologies, Series 2000
4. P.B. Laminations, Aztec, Grade 102
5. Swarco Industries, "Director-2"
6. Trelleborg Industries, R140 Series
7. 3M Series 620 "CR", and Series A750

8. 3M Series A145, Removable Black Line Mask
   (Black Tape: for use only on Hot mix asphalt surfaces)
9. Advanced Traffic Marking Black "Hide-A-Line"
   (Black Tape: for use only on Hot mix asphalt surfaces)
10. Brite-Line "BTR" Black Removable Tape
    (Black Tape: for use only on Hot mix asphalt surfaces)
11. Trelleborg Industries, RB-140
    (Black Tape: for use only on Hot mix asphalt surfaces)

Preformed Thermoplastic (Heated in place)

1. Flint Trading Inc., "Hot Tape"
2. Flint Trading Inc., "Premark Plus"
3. Ennis Paint Inc., "Flametape"

Ceramic Surfacing Laminate, 150 mm x 150 mm

1. Highway Ceramics, Inc.

CLASS 1 DELINEATORS

One Piece Driveable Flexible Type, 1700-mm

1. Filtrona Extrusion, "Flexi-Guide Models 400 and 566"
2. Carsonite, Curve-Flex CFRM-400
3. Carsonite, Roadmarker CRM-375
4. FlexStake, Model 654 TM
5. GreenLine Model CGD1-66

Special Use Type, 1700-mm

1. Filtrona Extrusion, Model FG 560 (with 450-mm U-Channel base)
2. Carsonite, "Survivor" (with 450-mm U-Channel base)
3. Carsonite, Roadmarker CRM-375 (with 450-mm U-Channel base)
4. FlexStake, Model 604
5. GreenLine Model CGD (with 450-mm U-Channel base)
6. Impact Recovery Model D36, with #105 Driveable Base
7. Safe-Hit with 200-mm pavement anchor (SH248-GP1)
8. Safe-Hit with 380-mm soil anchor (SH248-GP2) and with 450-mm soil anchor (SH248-GP3)

Surface Mount Type, 1200-mm

1. Bent Manufacturing Company, Masterflex Model MF-180EX-48
2. Carsonite, "Channelizer"
3. FlexStake, Models 704, 754 TM, and EB4
4. Impact Recovery Model D48, with #101 Fixed (Surface-Mount) Base
5. Three D Traffic Works "Channelflex" ID No. 522248W

CHANNELIZERS

Surface Mount Type, 900-mm

1. Bent Manufacturing Company, Masterflex Models MF-360-36 (Round) and MF-180-36 (Flat)
2. Filtrona Extrusion, Flexi-Guide Models FG300PE, FG300UR, and FG300EFX
3. Carsonite, "Super Duck" (Round SDR-336)
4. Carsonite, Model SDCF03601MB "Channelizer"
5. FlexStake, Models 703, 753 TM, and EB3
6. GreenLine, Model SMD-36
7. Hi-way Safety, Inc. "Channel Guide Channelizer" Model CGC36
8. Impact Recovery Model D36, with #101 Fixed (Surface-Mount) Base
9. Safe-Hit, Guide Post, Model SH236SMA and Dura-Post, Model SHL36SMA
10. Three D Traffic Works "Boomerang" 5200 Series

Lane Separation System

1. Filtrona Extrusion, "Flexi-Guide (FG) 300 Curb System"
2. Qwick Kurb, "Klemmfix Guide System"
3. Dura-Curb System
4. Tuff Curb

CONICAL DELINEATORS, 1070-mm

(For 700-mm Traffic Cones, see Standard Specifications)

1. Bent Manufacturing Company "T-Top"
2. Plastic Safety Systems "Navigator-1070 mm
3. TrafFix Devices "Grabber"
4. Three D Traffic Works "Ringtop" TD7000, ID No. 742143
5. Three D Traffic Works, TD7500
6. Work Area Protection Corp. C-42

OBJECT MARKERS

Type "K", 450-mm

1. Filtrona Extrusion, Model FG318PE
2. Carsonite, Model SMD 615
3. FlexStake, Model 701 KM
4. Safe-Hit, Model SH718SMA

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

1. Bent Manufacturing "Masterflex" Model MF-360-24
2. Filtrona Extrusion, Model FG324PE
3. Carsonite, "Channelizer"
4. FlexStake, Model 701KM
5. Safe-Hit, Models SH824SMA_WA and SH824GP3_WA
6. Three D Traffic Works ID No. 531702W and TD 5200
7. Three D Traffic Works ID No. 520896W

CONCRETE BARRIER MARKERS AND
TEMPORARY RAILING (TYPE K) REFLECTORS

Impactable Type

1. ARTUK, "FB"
2. Filtrona Extrusion, Models PCBM-12 and PCBM-T12
3. Duraflex Corp., "Flexx 2020" and "Electriflexx"
4. Hi-Way Safety, Inc., Model GMKRM100
5. Plastic Safety Systems "BAM" Models OM-BARR and OM-BWAR
6. Three D Traffic Works "Roadguide" Model TD 9304

Non-Impactable Type

1. ARTUK, JD Series
2. Plastic Safety Systems "BAM" Models OM-BITARW and OM-BITARA
3. Vega Molded Products, Models GBM and JD
4. Plastic Vacuum Forming, "Cap-It C400"

METAL BEAM GUARD RAIL POST MARKERS

(For use to the left of traffic)

1. Filtrona Extrusion, "Mini" (75 mm x 254 mm)
2. Creative Building Products, "Dura-Bull, Model 11201"
3. Duraflex Corp., "Railrider"
4. Plastic Vacuum Forming, "Cap-It C300"

CONCRETE BARRIER DELINEATORS, 400-mm

(For use to the right of traffic)

1. Filtrona Extrusion, Model PCBM T-16
2. Safe-Hit, Model SH216RBM

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

1. Stinson Equipment Company "SaddleMarker"

GUARD RAILING DELINEATOR

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

Wood Post Type, 686-mm

1. Filtrona Extrusion, FG 427 and FG 527
2. Carsonite, Model 427
3. FlexStake, Model 102 GR
4. GreenLine GRD 27
5. Safe-Hit, Model SH227GRD
6. Three D Traffic Works "Guardflex" TD9100
7. New Directions Mfg, NDM27

Steel Post Type

1. Carsonite, Model CFGR-327

RETROREFLECTIVE SHEETING

Channelizers, Barrier Markers, and Delineators

1. Avery Dennison T-6500 Series (For rigid substrate devices only)
2. Avery Dennison WR-7100 Series
3. Nippon Carbide Industries, Flexible Ultralite Grade (ULG) II
4. Reflexite, PC-1000 Metalized Polycarbonate
5. Reflexite, AC-1000 Acrylic
6. Reflexite, AP-1000 Metalized Polyester
7. Reflexite, Conformalight, AR-1000 Abrasion Resistant Coating
8. 3M, High Intensity

Traffic Cones, 100-mm and 150-mm Sleeves

1. Nippon Carbide Industries, Flexible Ultralite Grade (ULG) II
2. Reflexite, Vinyl, "TR" (Semi-transparent) or "Conformalight"
3. 3M Series 3840
4. Avery Dennison S-9000C

Drums

1. Avery Dennison WR-6100
2. Nippon Carbide Industries, Flexible Ultralite Grade (ULG) II
3. Reflexite, "Conformalight", "Super High Intensity" or "High Impact Drum Sheeting"
4. 3M Series 3810

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

1. Nippon Carbide Industries, CN8117
2. Avery Dennison, W 1100 series
3. 3M Series CW 44

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

1. Avery Dennison, W-2100 Series

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

1. Avery Dennison, T-2500 Series
2. Nippon Carbide Industries, Nikkalite 18000

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

1. Avery Dennison, T-5500A and T-6500 Series
2. Nippon Carbide Industries, Nikkalite Brand Ultralite Grade II
3. 3M 3870 and 3930 Series

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

1. Avery Dennison, T-6500 Series
2. Nippon Carbide Industries, Crystal Grade, 94000 Series
3. Nippon Carbide Industries, Model No. 94847 Fluorescent Orange
4. 3M Series 3930 and Series 3924S

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

1. Avery Dennison, WU-6014
2. Novabrite LLC, "Econobrite"
3. Reflexite "Vinyl"
4. Reflexite "SuperBright"
5. Reflexite "Marathon"
6. 3M Series RS20

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

1. 3M Series 3924S, Fluorescent Orange
2. 3M LDP Series 3970

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

1. Avery Dennison, T-7500 Series
2. Avery Dennison, T-7511 Fluorescent Yellow
3. Avery Dennison, T-7513 Fluorescent Yellow Green
4. Avery Dennison, W-7514 Fluorescent Orange
5. Nippon Carbide Industries, Nikkalite Crystal Grade Series 92800
6. Nippon Carbide Industries, Nikkalite Crystal Grade Model 92847 Fluorescent Orange

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

1. 3M VIP Series 3981 Diamond Grade Fluorescent Yellow
2. 3M VIP Series 3983 Diamond Grade Fluorescent Yellow/Green
3. 3M VIP Series 3990 Diamond Grade
4. Avery Dennison T-9500 Series
5. Avery Dennison, T9513, Fluorescent Yellow Green
6. Avery Dennison, W9514, Fluorescent Orange
7. Avery Dennison, T-9511 Fluorescent Yellow

SPECIALTY SIGNS

1. Reflexite "Endurance" Work Zone Sign (with Semi-Rigid Plastic Substrate)

ALTERNATIVE SIGN SUBSTRATES

Fiberglass Reinforced Plastic (FRP) and Expanded Foam PVC

1. Fiber-Brite (FRP)
2. Sequentia, "Polyplate" (FRP)
3. Inteplast Group "InteCel" (13 mm for Post-Mounted CZ Signs, 1200 mm or less)(PVC)

Aluminum Composite, Temporary Construction Signs and Permanent Signs up to 1400 mm.

1. Alcan Composites "Dibond Material, 2 mm"
2. 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. Changeable message sign controller, module and cable.
B. Padlocks for backflow preventer assembly enclosures, walk gates, irrigation controller enclosures.
C. Model 170 controller assemblies, including controller unit, completely wired controller cabinet, and inductive loop detector sensor units.
D. Individual or axle type scales for materials hauling equipment on bridges.

Completely wired controller cabinets, with auxiliary equipment but without controller unit, will be furnished to the Contractor at the District 11 Signal Laboratory, 7181 Opportunity Road, San Diego, California 92111, telephone No. (858) 467-4010.

Model 500 changeable message sign, wiring harness, and controller assembly, including the controller unit and completely wired cabinet, will be furnished to the Contractor at the District 11 Signal Laboratory, 7181 Opportunity Road, San Diego, California 92111, telephone No. (858) 467-4010.

The Contractor shall notify the District Warehouse Manager, Telephone (858) 467-3293 and the Engineer not less than 48 hours 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. The number, type, and size of the sign panels, and the contract number shall also be provided to the District Warehouse Manager.

8-1.04 SLAG AGGREGATE

Air-cooled iron blast furnace slag shall not be used to produce aggregate for:

1. Structure backfill material.
2. Pervious backfill material.
3. Permeable material.
4. Reinforced or prestressed portland cement concrete component or structure.
5. Nonreinforced portland cement concrete component or structure for which a Class 1 Surface Finish is required by the provisions in Section 51-1.18B, "Class 1 Surface Finish," of the Standard Specifications.

Aggregate produced from slag resulting from a steel-making process shall not be used for a highway construction project except for the following items:

1. Imported Borrow.
2. Aggregate Subbase.
3. Class 2 Aggregate Base.
4. Hot Mix Asphalt.

Steel slag to be used to produce aggregate for aggregate subbase and Class 2 aggregate base shall be crushed so that 100 percent of the material will pass a 19-mm sieve and then shall be control aged for a period of at least 3 months under conditions that will maintain all portions of the stockpiled material at a moisture content in excess of 6 percent of the dry mass of the aggregate.

A supplier of steel slag aggregate shall provide separate stockpiles for controlled aging of the slag. An individual stockpile shall contain not less than 9075 tonnes nor more than 45 350 tonnes of slag. The material in each individual stockpile shall be assigned a unique lot number and each stockpile shall be identified with a permanent system of signs. The supplier shall maintain a permanent record of the dates on which stockpiles are completed and controlled aging begun, of the dates when controlled aging was completed, and of the dates tests were made and the results of these tests. Moisture tests shall be made at least once each week. No credit for aging will be given for the time period covered by tests which show a moisture content of 6 percent or less. The stockpiles and records shall be available to the Engineer during normal working hours for inspection, check testing and review.

The supplier shall notify the Transportation Laboratory when each stockpile is completed and controlled aging begun. No more aggregate shall be added to the stockpile unless a new aging period is initiated. A further notification shall be sent when controlled aging is completed.

The supplier shall provide a Certificate of Compliance in conformance with the provisions in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications. Each stockpile or portion of a stockpile that is used in the work will be considered a lot. The Certificates of Compliance shall state that the steel slag aggregate has been aged in a stockpile for at least 3 months at a moisture content in excess of 6 percent of the dry mass of the aggregate.

Steel slag used for imported borrow shall be weathered for at least 3 months. Prior to the use of steel slag as imported borrow, the supplier shall furnish a Certificate of Compliance in conformance with the provisions in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications. The Certificate of Compliance shall state that the steel slag has been weathered for at least 3 months.

Each delivery of aggregate containing steel slag for use as aggregate subbase or Class 2 aggregate base shall be accompanied by a delivery tag for each load which will identify the lot of material by stockpile number, where the slag was aged, and the date that the stockpile was completed and controlled aging begun.

Air-cooled iron blast furnace slag or natural aggregate may be blended in proper combinations with steel slag aggregate to produce the specified gradings, for those items for which steel slag aggregate is permitted, unless otherwise provided.

Aggregate containing slag shall meet the applicable quality requirements for the items in which the aggregate is used.

The combined slag aggregate shall conform to the specified grading for the item in which it is used. The grading will be determined by California Test 202, modified by California Test 105 when there is a difference in specific gravity of 0.2 or more between the coarse and fine portion of the aggregate or between blends of different aggregates.

No aggregate produced from slag shall be placed within 0.3-m, measured in any direction, of a non-cathodically protected pipe or structure unless the aggregate is incorporated in portland cement concrete pavement, in hot mix asphalt, or in treated base.

When slag is used as aggregate in hot mix asphalt, the K_c factor requirements, as determined by California Test 303, will not apply.

Slag aggregate used for embankment construction shall not be placed within 0.46-m of finished slope lines, measured normal to the plane of the slope.

If steel slag aggregates are used to make hot mix asphalt, there shall be no other aggregates used in the mixture, except that up to 50 percent of the material passing the 4.75-mm sieve may consist of iron blast furnace slag aggregates or natural aggregates, or a combination thereof. If iron blast furnace aggregates or natural aggregates or a combination thereof are used in the mix, each type of aggregate shall be fed to the drier at a uniform rate. The rate of feed of each type of aggregate shall be maintained within 10 percent of the amount set. Adequate means shall be provided for controlling and checking the accuracy of the feeder.

Steel slag aggregate shall be stored separately from iron blast furnace slag aggregate and each type of slag aggregate shall also be stored separately from natural aggregate.

Hot mix asphalt produced from more than one of the following shall not be placed in the same layer: steel slag aggregates, iron blast furnace slag aggregates, natural aggregates or any combination thereof. Once a type of aggregate or aggregates is selected, it shall not be changed without prior approval by the Engineer.

If steel slag aggregates are used to produce hot mix asphalt, and if the specific gravity of a compacted stabilometer test specimen is in excess of 2.40, the quantity of hot mix asphalt to be paid for will be reduced. The stabilometer test specimen will be fabricated in conformance with the procedures in California Test 304 and the specific gravity of the specimen will be determined in conformance with Method C of California Test 308. The pay quantity of hot mix asphalt will be determined by multiplying the quantity of hot mix asphalt placed in the work by 2.40 and dividing the result by the specific gravity of the compacted stabilometer test specimen. Such reduction in quantity will be determined and applied as often as is necessary to ensure accurate results as determined by the Engineer.

8-1.05 ENGINEERING FABRICS

Engineering fabrics shall conform to the provisions in Section 88, "Engineering Fabrics," of the Standard Specifications and these special provisions.

Filter fabric for this project shall be ultraviolet (UV) ray protected.

8-1.06 ASPHALTIC EMULSION

Asphaltic emulsion shall conform to the provisions in Section 94, "Asphaltic Emulsions," of the Standard Specifications and these special provisions.

When tested in conformance with the "Residue and Oil Distallate by Distallation" test of AASHTO Designation: T 59, the composition of SS1 asphaltic emulsion shall be a minimum 57 percent of residue.

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.

The Department maintains a list of sources of fine and coarse aggregate that have been approved for use with a reduced amount of supplementary cementitious material 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. Before the testing starts, 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:

1. 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 each test of the previous 2 sets of concrete samples.
2. 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:

1. 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
2. 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.

If the aggregates used in the concrete are on the Department's list, the minimum amount of supplementary cementitious material shall conform to the following:

1. If fly ash or natural pozzolan conforming to the provisions in Section 90-2.01C, "Required Use of Supplementary Cementitious Materials," of the Standard Specifications is used, the minimum amount of supplementary cementitious material shall be 15 percent by mass of the total cementitious material; or
2. If silica fume conforming to the provisions in Section 90-2.01C, "Required Use of Supplementary Cementitious Materials," of the Standard Specifications is used, the minimum amount of supplementary cementitious material shall be 7 percent by mass of the total cementitious material.

The limitation on tricalcium silicate (C_3S) content in Type II cement specified in Section 90-2.01A, "Cement," of the Standard Specifications shall not apply.

8-2.02 CORROSION CONTROL FOR PORTLAND CEMENT CONCRETE

Portland cement concrete for the components at the locations listed in the following table is considered to be in a corrosive environment and shall conform to the provisions in Section 90, "Portland Cement Concrete," of the Standard Specifications and these special provisions.

Structure	Component
Caliente Avenue Overcrossing (Bridge Number 51-1142)	Footings, Columns, Abutments, Return Walls, and Wing Walls
Heritage Road Undercrossing (Bridge Number 57-1143L/R)	Pile Caps, Abutments, Curtain Walls, Return Walls, Footings and Retaining Walls
Retaining Wall 126	All
Retaining Wall 157	All
Retaining Wall 158	All
Retaining Wall 158A	All

Cementitious material to be used in portland cement concrete shall conform to the provisions in Section 90-2, "Materials," of the Standard Specifications, and shall be a combination of Type II portland cement and supplementary cementitious material.

Concrete in a corrosive environment shall contain not less than 400 kg of cementitous material per cubic meter.

Reduction in the cementitious material content specified or ordered, in conformance with the provisions in Section 90-4.05, "Optional Use of Chemical Admixtures," of the Standard Specifications, is not permitted for concrete in a corrosive environment.

Unless otherwise specified, for concrete in a corrosive environment, the amount of portland cement shall be 75 percent by mass, and the amount of supplementary cementitious material shall be 25 percent by mass, of the total amount of cementitious material to be used in the concrete mix.

The supplementary cementitious material for concrete in a corrosive environment shall be either flyash or natural pozzolan. At the option of the Contractor, this concrete may conform to A, B, C, or D below.

A. 20 percent by mass of either flyash or natural pozzolan, 5 percent by mass of silica fume, and 75 percent by mass of portland cement.
B. 10 percent by mass of silica fume and 90 percent by mass of portland cement.
C. 50 percent by mass of ground granulated blast furnace slag, and 50 percent by mass of portland cement.
D. 10 percent by mass of metakaolin conforming to AASHTO Designation: M 295 Class N and 90 percent by mass of portland cement. Metakaolin shall also conform to the following chemical and physical requirements:

Chemical Requirements	Percent
Silicon Dioxide (SiO_2) + Aluminum Oxide (Al_2O_3)	92.0 min.
Calcium Oxide (CaO)	1.0 max
Sulfur Trioxide (SO_3)	1.0 max.
Loss on ignition	1.2 max.
Available Alkalies (as Na_2O) equivalent	1.0 max.

Physical Requirements	Percent
Retained No. 325sieve	2.0 max
Strength Activity Index with portland cement 7 days 28 days	 100 (minimum % of control) 100 (minimum % of control)

The amount of free water used in concrete in a corrosive environment shall not exceed 160 kg/ m^3, plus 40 kg for each 100 kg of cementitious material in excess of 400 kg/ m^3.

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

8-2.03 CEMENTITIOUS MATERIAL AND AIR CONTENT

Except for concrete listed below, all concrete that is designated as Class 2 and all concrete for use in structures shall contain not less than 375 kg of cementitious material per cubic meter and shall be air entrained as provided in Section 90-4, "Admixtures," of the Standard Specifications. The air content at time of mixing and prior to placing shall be 3.0 ± 1.0 percent.

A. Paving concrete.
B. Concrete designated by 28-day compressive strength.
C. Concrete specified to have a cementitious material content that exceeds 375 kilograms per cubic meter.
D. Seal course concrete.
E. Concrete for deck slabs of bridges and structure approach slabs.
F. Concrete for piling.

SECTION 8-3. WELDING

8-3.01 WELDING

GENERAL

Flux cored 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	2006
D1.4	2005
D1.5	2002
D1.6	1999

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

Section 6.1.1.1 of AWS D1.5 is replaced with the following:

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

Unless otherwise specified, Sections 6.1.3 through 6.1.4.3 of AWS D1.1, Section 7.1.2 of AWS D1.4, and Sections 6.1.1.2 through 6.1.3.3 of AWS D1.5 are replaced with the following:

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

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

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

The QC Inspector may be assisted by an Assistant QC Inspector provided that this individual is currently certified as an AWS Certified Associate Welding Inspector (CAWI) in conformance with the requirements in AWS QC1, "Standard for AWS Certification of Welding Inspectors." The Assistant QC Inspector may perform inspection under the direct supervision of the QC Inspector provided the assistant is always within visible and audible range of the QC Inspector. The QC Inspector shall be responsible for signing all reports and for determining if welded materials conform to workmanship and acceptance criteria. The ratio of QC Assistants to QC Inspectors shall not exceed 5 to 1.

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

When any work is welded in conformance with the provisions in Section 75, "Miscellaneous Metal," of the Standard Specifications, not including Section 75-1.035, "Bridge Joint Restrainer Units," of the Standard Specifications, Section 6.1.4 of AWS D1.1 is replaced with the following:

The QC Inspector shall be responsible for quality control acceptance or rejection of materials and workmanship and shall be currently certified as an AWS CWI in conformance with the requirements in AWS QC1, "Standard for AWS Certification of Welding Inspectors," or as a Welding Inspector Specialist (WIS) in conformance with the requirements in AWS B5.2, "Specification for the Qualification of Welding Inspector Specialists and Welding Inspector Assistants."

Section 6.14.6, "Personnel Qualification," of AWS D1.1, Section 7.8, "Personnel Qualification," of AWS D1.4, and Section 6.1.3.4, "Personnel Qualification," of AWS D1.5 are replaced with the following:

Personnel performing nondestructive testing (NDT) shall be qualified and certified in conformance with the requirements of the American Society for Nondestructive Testing (ASNT) Recommended Practice No. SNT-TC-1A and the Written Practice of the NDT firm. The Written Practice of the NDT firm shall meet or exceed the guidelines of the ASNT Recommended Practice No. SNT-TC-1A. Individuals who perform NDT, review the results, and prepare the written reports shall be either:

A. Certified NDT Level II technicians, or;
B. Level III technicians who hold a current ASNT Level III certificate in that discipline and are authorized and certified to perform the work of Level II technicians.

Section 6.5.4 of AWS D1.5 is replaced with the following:

The QC Inspector shall inspect and approve each joint preparation, assembly practice, welding technique, joint fit-up, and the performance of each welder, welding operator, and tack welder to make certain that the applicable requirements of this code and the approved Welding Procedure Specification (WPS) are met. The QC Inspector shall examine the work to make certain that it meets the requirements of Sections 3 and 6.26. The size and contour of all welds shall be measured using suitable gages. Visual inspection for cracks in welds and base metal, and for other discontinuities shall be aided by strong light, magnifiers, or such other devices as may be helpful. Acceptance criteria different from those specified in this code may be used when approved by the Engineer.

Section 6.6.5, "Nonspecified NDT Other than Visual," of AWS D1.1, Section 7.6.5 of AWS D1.4 and Section 6.6.5 of AWS D1.5 shall not apply.

For any welding, the Engineer may direct the Contractor to perform NDT that is in addition to the visual inspection or NDT specified in the AWS or other specified welding codes, in the Standard Specifications, or in these special provisions. Except as provided for in these special provisions, additional NDT required by the Engineer, and associated repair work, will be paid for as extra work as provided in Section 4-1.03D, "Extra Work," of the Standard Specifications. Prior to release of welded material by the Engineer, if testing by NDT methods other than those originally specified discloses an attempt to defraud or reveals a gross nonconformance, all costs associated with the repair of the deficient area, including NDT of the weld and of the repair, and any delays caused by the repair, shall be at the Contractor’s expense. A gross nonconformance is defined as the sum of planar type rejectable indications in more than 20 percent of the tested length.

When less than 100 percent of NDT is specified for any weld, it is expected that the entire length of weld meet the specified acceptance-rejection criteria. Should any welding deficiencies be discovered by additional NDT directed or performed by the Engineer that utilizes the same NDT method as that originally specified, all costs associated with the repair of the deficient area, including NDT of the weld and of the weld repair, and any delays caused by the repair, shall be at the Contractor's expense.

Repair work to correct welding deficiencies discovered by visual inspection directed or performed by the Engineer, and any associated delays or expenses caused to the Contractor by performing these repairs, shall be at the Contractor's expense.

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

Inspection and approval of all joint preparations, assembly practices, joint fit-ups, welding techniques, and the performance of each welder, welding operator, and tack welder shall be documented by the QC Inspector on a daily basis for each day welding is performed. For each inspection, including fit-up, Welding Procedure Specification (WPS) verification, and final weld inspection, the QC Inspector shall confirm and document compliance with the requirements of the AWS or other specified code criteria and the requirements of these special provisions on all welded joints before welding, during welding, and after the completion of each weld.

In addition to the requirements specified in the applicable code, the period of effectiveness for a welder's or welding operator's qualification shall be a maximum of 3 years for the same weld process, welding position, and weld type. If welding will be performed without gas shielding, then qualification shall also be without gas shielding. Excluding welding of fracture critical members, a valid qualification at the beginning of work on a contract will be acceptable for the entire period of the contract, as long as the welder's or welding operator's work remains satisfactory.

In addition to the requirements of AWS D1.1, welding procedures qualification for work welded in conformance with that code shall conform to the following requirements:

A. The travel speed, amperage, and voltage values that are used for tests conducted per AWS D1.1, Section 4.1.1, shall be consistent for each pass in a weld joint and shall in no case vary by more than ±10 percent for travel speed, ±10 percent for amperage, and ±7 percent for voltage as measured from a predetermined target value or average within each weld pass. The travel speed shall in no case vary by more than ±15 percent when using submerged arc welding.
B. When a nonstandard weld joint is to be made using a combination of WPSs, a single test may be conducted combining the WPSs to be used in production, provided the essential variables, including weld bead placement, of each process are limited to those established in Table 4.5.

In addition to the requirements of AWS D1.5, Section 5.12 or 5.13, welding procedures qualification for work welded in conformance with that code shall conform to the following requirements:

A. Unless considered prequalified, fillet welds shall be qualified in each position. The fillet weld soundness test shall be conducted using the essential variables of the WPS as established by the Procedure Qualification Record (PQR).
B. For qualification of joints that do not conform to Figures 2.4 and 2.5 of AWS D1.5, a minimum of two WPS qualification tests are required. The tests shall be conducted using both Figure 5.1 and Figure 5.3. The test conforming to Figure 5.1 shall be conducted in conformance with AWS D1.5, Section 5.12 or 5.13. The test conforming to Figure 5.3 shall be conducted using the welding electrical parameters that were established for the test conducted conforming to Figure 5.1. The ranges of welding electrical parameters established during welding per Figure 5.1 in conformance with AWS D1.5, Section 5.12, shall be further restricted according to the limits in Table 5.3 during welding per Figure 5.3.
C. Multiple zones within a weld joint may be qualified. The travel speed, amperage, and voltage values that are used for tests conducted per AWS D1.5 Section 5.13 shall be consistent for each pass in a weld joint, and shall in no case vary by more than ±10 percent for travel speed, ±10 percent for amperage, and ±7 percent for voltage as measured from a predetermined target value or average within each weld pass or zone. The travel speed shall in no case vary by more than ±15 percent when using submerged arc welding.
D. For a WPS qualified in conformance with AWS D1.5 Section 5.13, the values to be used for calculating ranges for current and voltage shall be based on the average of all weld passes made in the test. Heat input shall be calculated using the average of current and voltage of all weld passes made in the test for a WPS qualified in conformance with Section 5.12 or 5.13.
E. Macroetch tests are required for WPS qualification tests, and acceptance shall be per AWS D1.5 Section 5.19.3.
F. When a nonstandard weld joint is to be made using a combination of WPSs, a test conforming to Figure 5.3 may be conducted combining the WPSs to be used in production, provided the essential variables, including weld bead placement, of each process are limited to those established in Table 5.3.
G. Prior to preparing mechanical test specimens, the PQR welds shall be inspected by visual and radiographic tests. Backing bar shall be 75 mm in width and shall remain in place during NDT testing. Results of the visual and radiographic tests shall comply with AWS D1.5 Section 6.26.2, excluding Section 6.26.2.2. Test plates that do not comply with both tests shall not be used.

WELDING QUALITY CONTROL

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

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

All welding will require inspection by the Engineer. The Contractor shall request inspection at least 3 working days prior to the beginning of welding for locations within California and 5 working days for locations outside of California. The Contractor shall request inspection at:

http://www.dot.ca.gov/hq/esc/Translab/smbforms.htm

Continuous inspection shall be provided when any welding is being performed. Continuous inspection, as a minimum, shall include having a QC Inspector within such close proximity of all welders or welding operators so that inspections by the QC Inspector of each welding operation at each welding location does not lapse for a period exceeding 30 minutes.

When joint weld details that are not prequalified to the details of Section 3 of AWS D1.1 or to the details of Figure 2.4 or 2.5 of AWS D1.5 are proposed for use in the work, the joint details, their intended locations, and the proposed welding parameters and essential variables, shall be approved by the Engineer. The Contractor shall allow the Engineer 2 weeks to complete the review of the proposed joint detail locations. In the event the Engineer fails to complete the review within the time allowed, and if, in the opinion of the Engineer, completion of the work is delayed or interfered with by reason of the Engineer's delay in completing the review, the Contractor will be compensated for any resulting loss, and an extension of time will be granted, in the same manner as provided for in Section 8-1.09, "Right of Way Delays," of the Standard Specifications. Upon approval of the proposed joint detail locations and qualification of the proposed joint details, welders and welding operators using these details shall perform a qualification test plate using the WPS variables and the joint detail to be used in production. The test plate shall have the maximum thickness to be used in production and a minimum length of 460 mm. The test plate shall be mechanically and radiographically tested. Mechanical and radiographic testing and acceptance criteria shall be as specified in the applicable AWS codes.

The Engineer will witness all qualification tests for WPSs that were not previously approved by the Department. Unless otherwise specified, an approved independent third party will witness the qualification tests for welders or welding operators. The independent third party shall be a current CWI and shall not be an employee of the contractor performing the welding. The Contractor shall allow the Engineer 2 weeks to review the qualifications and copy of the current certification of the independent third party. In the event the Engineer fails to complete the review within the time allowed, and if, in the opinion of the Engineer, completion of the work is delayed or interfered with by reason of the Engineer's delay in completing the review, the Contractor will be compensated for any resulting loss, and an extension of time will be granted, in the same manner as provided for in Section 8-1.09, "Right of Way Delays," of the Standard Specifications. The Contractor shall notify the Engineer one week prior to performing any qualification tests. Witnessing of qualification tests by the Engineer shall not constitute approval of the intended joint locations, welding parameters, or essential variables.

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

The QCM shall be the sole individual responsible to the Contractor for submitting, receiving, reviewing, and approving all correspondence, required submittals, and reports to and from the Engineer. The QCM shall be a registered professional engineer or shall be currently certified as a CWI.

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

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

A. The work is welded in conformance with AWS D1.5 and is performed at a permanent fabrication or manufacturing facility that is certified under the AISC Quality Certification Program, Category Cbr, Major Steel Bridges and Fracture Critical endorsement F, when applicable.
B. The welding is performed on pipe pile material at a permanent pipe manufacturing facility authorized to apply the American Petroleum Institute (API) monogram for API 5L pipe.

For welding performed at such facilities, the inspection personnel or NDT firms may be employed or compensated by the facility performing the welding provided the facility maintains a QC program that is independent from production.

Prior to submitting the Welding Quality Control Plan (WQCP) required herein, a prewelding meeting between the Engineer, the Contractor's QCM, and a representative from each entity performing welding or inspection for this project, shall be held to discuss the requirements for the WQCP.

The Contractor shall submit to the Engineer, in conformance with the provisions in Section 5-1.02, "Plans and Working Drawings," of the Standard Specifications, 2 copies of a separate WQCP for each subcontractor or supplier for each item of work for which welding is to be performed.

The Contractor shall allow the Engineer 2 weeks to review the WQCP submittal after a complete plan has been received. No welding shall be performed until the WQCP is approved in writing by the Engineer. In the event the Engineer fails to complete the review within the time allowed, and if, in the opinion of the Engineer, completion of the work is delayed or interfered with by reason of the Engineer's delay in completing the review, the Contractor will be compensated for any resulting loss, and an extension of time will be granted, in the same manner as provided for in Section 8-1.09, "Right of Way Delays," of the Standard Specifications.

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

Information regarding the contents, format, and organization of a WQCP, is available at the Transportation Laboratory and at:

http://www.dot.ca.gov/hq/esc/Translab/smbresources.htm

After final approval of the WQCP, amended WQCP, or addendum, the Contractor shall submit 7 copies to the Engineer of the approved documents. A copy of the Engineer approved document shall be available at each location where welding is to be performed.

A daily production log for welding shall be kept for each day that welding is performed. The log shall clearly indicate the locations of all welding. The log shall include the welders' names, amount of welding performed, any problems or deficiencies discovered, and any testing or repair work performed, at each location. The daily report from each QC Inspector shall also be included in the log.

The following items shall be included in a Welding Report that is to be submitted to the Engineer within 2 weeks following the performance of any welding:

A. A daily production log.
B. Reports of all visual weld inspections and NDT.
C. Radiographs and radiographic reports, and other required NDT reports.
D. A summary of welding and NDT activities that occurred during the reporting period.
E. Reports of each application of heat straightening.
F. A summarized log listing the rejected lengths of weld by welder, position, process, joint configuration, and piece number.
G. Documentation that the Contractor has evaluated all radiographs and other nondestructive tests and corrected all rejectable deficiencies, and that all repaired welds have been reexamined using the required NDT and found acceptable.

The following information shall be clearly written on the outside of radiographic envelopes: name of the QCM, name of the nondestructive testing firm, name of the radiographer, date, contract number, complete part description, and all included weld numbers, report numbers, and station markers or views, as detailed in the WQCP. In addition, all interleaves shall have clearly written on them the part description and all included weld numbers and station markers or views, as detailed in the WQCP. A maximum of 2 pieces of film shall be used for each interleave.

Reports of all visual inspections and NDT shall be signed by the inspector or technician and submitted daily 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. Reports of all NDT, whether specified, additional, or informational, performed by the Contractor shall be submitted to the Engineer.

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 2 weeks to review the report and respond in writing after the 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 the 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.

In addition to the requirements in AWS D1.1 and AWS D1.5, second-time excavations of welds or base metal to repair unacceptable discontinuities, regardless of NDT method, and all repairs of cracks require prior approval of the Engineer.

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. For requests to perform second-time repairs or repairs of cracks, the Contractor shall include an engineering evaluation of the proposed repair. The engineering evaluation, at a minimum, shall address the following:

A. What is causing each defect?
B. Why the repair will not degrade the material properties?
C. What steps are being taken to prevent similar defects from happening again?

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.

WELDING FOR OVERHEAD SIGN AND POLE STRUCTURES

The Contractor shall meet the following requirements for any 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.

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 when 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.

Welding Qualification Audit

Contractors or subcontractors performing welding operations for overhead sign and pole structures shall not deliver materials to the project without having successfully completed the Department's "Manufacturing Qualification Audit for Overhead Sign and Pole Structures," hereinafter referred to as the audit, not more than one year prior to the delivery of the materials. The Engineer will perform the audit. Copies of the audit form, and procedures for requesting and completing the audit, are available at the Transportation Laboratory or at:

http://www.dot.ca.gov/hq/esc/Translab/smbresources.htm

An audit that was approved by the Engineer no more than one year prior to the beginning of work on this contract will be acceptable for the entire period of this contract, provided the Engineer determines the audit was for the same type of work that is to be performed on this contract.

Successful completion of an audit shall not relieve the Contractor of the responsibility for furnishing materials or producing finished work of the quality specified in these special provisions and as shown on the plans.

Welding Report

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, a Welding Report shall be submitted in conformance with the provisions in "Welding Quality Control" of these special provisions.

PAYMENT

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

SECTION 9. DESCRIPTION OF BRIDGE WORK

This work shall consist, in general, of constructing cast in place prestressed concrete box girder bridges with approach slabs, Type N, as shown on the plans for:

Caliente Avenue Overcrossing
(Bridge Number 57-1142)

Heritage Road Undercrossing
(Bridge Number 57-1143L/R)

Spring Canyon Bridge
(Bridge Number 57-1155L/R)

SECTION 10. CONSTRUCTION DETAILS

SECTION 10-1. GENERAL

10-1.01 CONSTRUCTION PROJECT INFORMATION SIGNS

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

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

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

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

FEDERAL HIGHWAY TRUST FUNDS
STATE HIGHWAY FUNDS

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

HIGHWAY CONSTRUCTION

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

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

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

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

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

10-1.02 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 following parcels do not have Right-of-Way clearance, therefore the Contractor will not be permitted to enter the parcels as shown on the plans, until after the Right-of-Way clearance dates shown.

Right-of-Way Parcel Numbers and Clearance Dates			
	APN	Parcel No.	Clearance Dates
1	645-090-36	31346	5/04/2009
2	646-100-31	33278	3/30/2010
3	646-100-08	33086	3/30/2010
4	645-040-53	34382	3/30/2010
5	645-080-15	34383	3/30/2010
6	646-090-16	34384	3/30/2010
7	646-100-59	34385	3/30/2010
8	646-190-18	34387	3/30/2010
9	646-190-17	34388	3/30/2010
10	646-190-21,30	34389	3/30/2010

The Contractor will not be permitted to perform any work within 10 meters of the existing structure located north of Station 159+20 "E5", as shown on the plans, until it has been demolished by a separate contract no later than November 30, 2009. No pile driving at Spring Canyon between February 15 and September 1 to avoid impacts to nesting birds.

Upon completion of the construction of the Spring Canyon Bridge (Br. No. 57-1155L/R), and prior to planting and irrigation, the Contractor shall restore the existing streambed and canyon to the original elevations prior to construction as shown on the plans. Pole barrier shall be installed after bridge structure is complete, and original grading in Spring Canyon Bridge area is restored.

Permanent Right of Way chain link fence (Type CL-1.8) shall be installed as a first order of work.

Prior to performing any work off the pavement, the Contractor shall install temporary construction entrance as shown on the plans. Attention is directed to "Temporary Construction Entrance" of these special provisions.

Temporary concrete washout facility and temporary concrete washout (Portable) shall be in place prior to the start of any concrete work. Attention is directed to "Temporary Concrete Washout Facility" and to "Temporary Concrete Washout (Portable)" of these special provisions.

Application of temporary hydraulic mulch, erosion control (Type D and Biofiltration), may require several move-in/move-outs (Temporary Erosion Control or Erosion Control) of erosion control equipment. Attention is directed to "Move-In/Move-Out (Temporary Erosion Control)" and to "Move-In/Move-Out (Erosion Control)" of these special provisions.

Attention is directed to "Truck Watering" of these special provisions regarding watering requirements of erosion control (Biofiltration) areas.

Complete design of the various phases of the project will be provided to the Contractor in conformance with the provisions in Section 1, "Specifications and Plans," of these special provisions. Work in any phase of the project shall not begin until the complete design, including final plans, specifications and estimate of quantities, for that phase has been provided to the Contractor by the Engineer.

The work in any phase shall be performed in conformance with the stages of construction shown in the final plans for that phase. Nonconflicting work in subsequent stages within that phase may proceed concurrently with work in preceding stages, provided satisfactory progress is maintained in the preceding stages of construction.

Attention is directed to "Slope Paving" of these special provisions regarding constructing a 1.2 m by 1.8 m test panel prior to placing the permanent slope paving.

Attention is directed to "Miscellaneous Concrete Construction" of these special provisions regarding constructing a 600 mm by 600 mm test panel prior to constructing curb ramps with detectable warning surfaces.

Attention is directed to "Environmentally Sensitive Area" and "Temporary Fence (Type ESA)" of these special provisions. Prior to beginning work, the boundaries of the Environmentally Sensitive Areas (ESA) shall be clearly delineated in the field. The boundaries shall be delineated by the installation of temporary fence (Type ESA).

The first order of work shall be to place the order for the electrical equipment. The Engineer shall be furnished a statement from the vendor that the order for the electrical equipment has been received and accepted by the vendor.

Loop detectors may be placed after the uppermost layer of new pavement has been placed.

The uppermost layer of new pavement shall not be placed until all underlying conduits have been installed.

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

Attention is directed to "Maintaining Traffic" and "Temporary Pavement Delineation" of these special provisions and to the stage construction sheets of the plans.

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

The work shall be performed in conformance with the stages of construction shown on the plans. Nonconflicting work in subsequent stages may proceed concurrently with work in preceding stages, provided satisfactory progress is maintained in the preceding stages of construction.

In each stage, after completion of the preceding stage, the first order of work shall be the removal of existing pavement delineation as directed by the Engineer. Pavement delineation removal shall be coordinated with new delineation so that lane lines are provided at all times on traveled ways open to public traffic.

Before obliterating any pavement delineation (traffic stripes, pavement markings, and pavement markers) that is to be replaced on the same alignment and location, as determined by the Engineer, the pavement delineation shall be referenced by the Contractor, with a sufficient number of control points to reestablish the alignment and location of the new pavement delineation. The references shall include the limits or changes in striping pattern, including one- and 2-way barrier lines, limit lines, crosswalks and other pavement markings. Full compensation for referencing existing pavement delineation shall be considered as included in the contract prices paid for new pavement delineation and no additional compensation will be allowed therefor.

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

When traffic is moved from an established path to a new path and pavement delineation changes are required, all material and equipment needed for new delineation shall be at the site of the work before any shift of traffic is undertaken. The equipment shall be in good working condition.

At those locations exposed to public traffic where guard railings or barriers are to be constructed, reconstructed, or removed and replaced, the Contractor shall schedule operations so that at the end of each working day there shall be no post holes open nor shall there be any railing or barrier posts installed without the blocks and rail elements assembled and mounted thereon.

Some plants required for this project may not be readily available and may have to be grown specifically for this project. Within 30 days after the contract has been approved, furnish to the Engineer a statement from the vendor that the order for the plants to be grown for this contract, including inspection plants and replacement plants, has been received and accepted by the vendor. The statement from the vendor must include the names, sizes, and quantities of plants ordered and the anticipated dates of delivery. Notify the Engineer in writing when the vendor has started to grow the plants.

At least 60 days before planting the plants, furnish the Engineer a statement from the vendor that the order for the plants required for this contract, including inspection plants, has been received and accepted by the vendor. The statement from the vendor must include the names, sizes, and quantities of plants ordered and the anticipated date of delivery.

Place orders for replacement plants with the vendor at the appropriate time so that the roots of the replacement plants are not in a root-bound condition.

At least 60 days before applying seeds, furnish the Engineer a statement from the vendor that the order for the seed required for this contract has been received and accepted by the vendor. The statement from the vendor must include the names and quantity of seed ordered and the anticipated date of delivery.

The Engineer designates ground locations of erosion control by directing the placing of stakes or other suitable markers before application of erosion control materials as specified under "Erosion Control (Type D)," "Erosion Control (Biofiltration)," and "Erosion Control (Hydraulic Matrix)" of these special provisions.

Unless otherwise shown on the plans or specified in these special provisions, conduits to be jacked or drilled or installed by the open trench method for water line crossovers and sprinkler control crossovers must be installed before the installation of other pipe supply lines.

Submittal of working drawings for electrical components must comply with Section 20-5.027B, "Wiring Plans and Diagrams," of the Standard Specifications.

When embankment settlement periods or surcharge embankment settlement periods are specified, the settlement periods and the deferment of portions of the work shall comply with the provisions in Section 19-6.025, "Settlement Period," of the Standard Specifications and in "Earthwork" of these special provisions.

EMERGENCY CALL BOXES

The Contractor's attention is directed to the presence of emergency call boxes within the limits of this project.

The Contractor shall notify the Engineer and the Operators of the facility 10 days prior to commencing work affecting access to the facilities in order to allow the removal or relocation of the emergency call boxes by the operator. The facility operators may be reached at the following:

Facility Operator	Telephone Number
T3	1-858-279-1299

Ten days prior to the completion of the work, affecting access to the facilities, the Contractor shall notify the Engineer and Operator of the emergency call boxes. The Contractor shall provide access to the operator for the installation of the emergency call boxes.

If, in the opinion of the Engineer, the Contractor's operations are delayed or interfered with, the State will compensate the Contractor for such delays to the extent provided in Section 8-1.09, "Right of Way Delays," of the Standard Specifications.

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

10-1.03 MATERIAL CONTAINING LEAD AND BURN ASH MATERIALS

This work shall consist of handling material contaminated by lead and burn ash materials in conformance with the Standard Specifications and these special provisions. These materials do not contain concentrations of lead and burn ash materials that constitute a hazardous waste, nor do they meet the criteria for notification under Proposition 65. However as a precaution, workers should be made aware of the presence of lead and burn ash materials in the soil. Proper dust control measures, use of personal protective equipment, and onsite hygiene methods should be performed in order to avoid inhalation of fugitive dust during construction activities. The precautions are to be presented in detail in a Lead Compliance Plan.

Lead and burn ash materials will be found within the top 2.0 meters of material in unpaved areas within the proposed highway right of way between station 156+20 and station 157+20. Levels of lead found near the project limits range from less than 2.5 mg/kg to 550.0 mg/kg total lead with an average concentration of 200 mg/kg total lead, as analyzed by EPA Test Method 6010 or EPA Test Method 7000 series.

After the Contractor has completed handling materials containing lead and burn ash, in conformance with the plans, Standard Specifications, and these special provisions, the Contractor shall have no responsibility for such materials in place and shall not be obligated for further cleanup, removal, or remedial actions for such materials.

Handling material containing lead and burn ash materials shall be in conformance with rules and regulations including, but not limited to, those of the following agencies:

California Division of Occupational Safety and Health Administration (Cal-OSHA)
California Regional Water Quality Control Board, Region 9.

Full compensation for conforming to the requirements of this section, except for the Lead Compliance Plan, 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.

LEAD COMPLIANCE PLAN

The Contractor shall prepare a project specific Lead Compliance Plan to prevent or minimize worker exposure to lead and burn ash while handling material containing lead and burn ash. Attention is directed to Title 8, California Code of Regulations, and Section 1532.1, "Lead," for specific Cal-OSHA requirements when working with lead. Handling of soil containing burn ash materials will be the same as soil containing lead. The Lead Compliance Plan is required for submittal to the City of San Diego Local Enforcement Agency for approval.

The Lead Compliance Plan shall contain the elements listed in Title 8, California Code of Regulations, Section 1532.1(e)(2)(B). Before submission to the Engineer, the Lead Compliance Plan shall be approved by an Industrial Hygienist certified in Comprehensive Practice by the American Board of Industrial Hygiene. The plan shall be submitted to the Engineer at least 30 days prior to beginning work in areas containing lead and burn ash.

Prior to performing work in areas containing lead and burn ash, personnel who have no prior training, including State personnel, shall complete a safety training program provided by the Contractor, that meets the requirements of Title 8, California Code of Regulations, Section 1532.1, "Lead," and the Contractor's Lead Compliance Program.

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

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.

SOIL HANDLING

Handling of materials containing lead and burn ash shall result in no visible dust migration. The Contractor shall have a means of dust control available at all times while handling material in work areas containing lead and burn ash.

The Contractor shall separate soil material from asphalt capping material and the soils shall remain on site. This will not be required for vegetation removal performed during plant establishment.

Surplus material excavated from areas containing lead and burn ash shall remain in the area of soil disturbance. The surplus soil shall not be disposed of outside the area of soil disturbance.

Full compensation for handling material contaminated with lead and burn ash, except as otherwise provided, shall be considered as included in the prices paid for the various contract items of work involved and no additional compensation will be allowed therefor.

10-1.04 ARCHAEOLOGICAL MONITORING AREA

An archaeological monitoring area (AMA) within and near the limits of construction is shown on the plans. The Department assigns an archaeological monitor to monitor job site activities within the AMA. Work within an AMA shall conform to the requirements of the section of these special provisions entitled "Archaeological Discoveries" and these special provisions. Do not work within the AMA unless the archeological monitor is present.

The Engineer conducts a field review with you and the Department archaeological monitor of the location of AMAs shown on the plans at least 5 days before start of work. The Engineer will determine and mark the exact boundaries of the AMA at the job site.

Notify the Engineer in writing at least 5 days before starting work within an AMA, and include with the notification a schedule of days and hours to be worked.

If an archaeological find is discovered within an AMA, stop all work within a 18.5 meter radius of the find. Archaeological materials found are the property of the State. Do not resume work within the 18.5 meter radius of the find until the Engineer gives you written approval. If, in the opinion of the Engineer, completion of the work is delayed or interfered with by reason of an archaeological find or investigation or recovery of archeological materials, you 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 Department may use other forces to investigate and recover archaeological materials from the site of an AMA. When ordered by the Engineer, furnish labor, material, tools and equipment, to assist in the investigation or recovery of archaeological materials within the AMA and the cost will be paid for as extra work as provided in Section 4-1.03D, "Extra Work," of the Standard Specifications.

10-1.05 WATER POLLUTION CONTROL

GENERAL

Water pollution control work shall conform to the provisions in Section 7-1.01G, "Water Pollution," of the Standard Specifications, section of these special provisions entitled "Relations With California Regional Water Quality Control Board," and these special provisions.

The Contractor may obtain other National Pollutant Discharge Elimination System (NPDES) permits that apply to activities and mobile operations within or outside of the project limits including hot mix asphalt batch plants, material borrow areas, concrete plants, staging areas, storage yards, or access roads.

The Contractor shall perform water pollution control work in conformance with the requirements in the "Storm Water Pollution Prevention Plan (SWPPP) and Water Pollution Control Program (WPCP) Preparation Manual" and its addenda in effect on the day the Notice to Contractors is dated. This manual is referred to as the "Preparation Manual." Copies of the Preparation Manual may be obtained from:

State of California
Department of Transportation
Publication Distribution Unit
1900 Royal Oaks Drive
Sacramento, California 95815
Telephone: (916) 445-3520

The Preparation Manual and other references for performing water pollution control work are available from the Department's Construction Storm Water and Water Pollution Control web site at:

http://www.dot.ca.gov/hq/construc/stormwater/stormwater1.htm

Before the start of job site activities, the Contractor shall provide training for project managers, supervisory personnel, and employees involved with water pollution control work. The training shall include:

A. Rules and regulations
B. Implementation and maintenance for:

    1. Temporary Soil Stabilization
    2. Temporary Sediment Control
    3. Tracking Control
    4. Wind Erosion Control

The Contractor shall designate in writing a Water Pollution Control Manager (WPCM). The Contractor shall submit a statement of qualifications describing the training, work history, and expertise of the proposed WPCM. The qualifications shall include either:

A. A minimum of 24 hours of Department approved storm water management training described at Department's Construction Storm Water and Water Pollution Control web site.
B. Certification as a Certified Professional in Erosion and Sediment Control (CPESC).

The WPCM shall be:

A. Responsible for water pollution control work.
B. The primary contact for water pollution control work.
C. Have authority to mobilize crews to make immediate repairs to water pollution control practices.

The Contractor may designate one manager to prepare the SWPPP and a different manager to implement the plan. The WPCP preparer shall meet the training requirements for the WPCM.

STORM WATER POLLUTION PREVENTION PLAN

The Contractor shall submit a Storm Water Pollution Prevention Plan (SWPPP) to the Engineer for approval. The SWPPP shall conform to the requirements in the Preparation Manual, the NPDES permit, and these special provisions. The SWPPP shall be submitted in place of the water pollution control program required by the provisions in Section 7-1.01G, "Water Pollution," of the Standard Specifications.

The SWPPP shall include water pollution control practices:

A. For storm water and non-storm water from areas outside of the job site related to construction activities for this contract such as:

    1. Staging areas.
    2. Storage yards.
    3. Access roads.

B. Appropriate for each season as described in "Implementation Requirements" of these special provisions.
C. For activities or mobile operations related to all NPDES permits.

The SWPPP shall include a schedule that:

A. Describes when work activities that could cause water pollution will be performed.
B. Identifies soil stabilization and sediment control practices for disturbed soil area.
C. Includes dates when these practices will be 25, 50, and 100 percent complete.
D. Shows 100 percent completion of these practices before the rainy season.

The SWPPP shall include the following temporary water pollution control practices and their associated contract items of work as shown on the plans or specified in these special provisions:

A. Temporary Soil Stabilization

    1. Temporary Hydraulic Mulch
    2. Move-In/Move-Out (Temporary Erosion Control)

B. Temporary Sediment Control

1. Temporary Fiber Roll
2. Temporary Check Dam
3. Temporary Drainage Inlet Protection
4. Street Sweeping

C. Tracking Control

1. Temporary Construction Entrance
2. Street Sweeping

D. Wind Erosion Control

1. Construction Site Management
2. Temporary Hydraulic Mulch

E. Non-Storm Water Management

1. Construction Site Management

F. Waste Management and Materials Pollution Control

1. Construction Site Management
2. Temporary Concrete Washout Facility
3. Temporary Concrete Washout (Portable)

The SWPPP shall include the following contract items of work for permanent water pollution control as shown on the plans or as specified in these special provisions:

A. Fiber Rolls
B. Check Dam
C. Drainage Inlet Protection
D. Erosion Control (Type D)
E. Erosion Control (Biofiltration)
F. Erosion Control (Hydraulic Matrix)

Within 20 days after contract approval, the Contractor shall submit 3 copies of the SWPPP to the Engineer. The Contractor shall allow 20 days for the Engineer's review. If revisions are required, the Engineer will provide comments and specify the date that the review stopped. The Contractor shall revise and resubmit the SWPPP within 15 days of receipt of the Engineer's comments. The Engineer's review will resume when the complete SWPPP is resubmitted. When the Engineer approves the SWPPP, the Contractor shall submit 4 copies of the approved SWPPP to the Engineer. The Contractor may proceed with construction activities if the Engineer conditionally approves the SWPPP while minor revisions are being completed. If 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, the Contractor will be compensated for resulting losses, and an extension of time will be granted, as provided for in Section 8-1.09, "Right of Way Delays," of the Standard Specifications.

The SWPPP shall include a copy of the Notification of Construction, United States Army Corps of Engineers Section 404 Permit, California Department of Fish and Game Section 1602 Permit, California Regional Water Quality Control Board Section 401 Permit, and United States Fish and Wildlife Service Opinion dated July 12, 2004.

The Contractor shall not perform work that may cause water pollution until the SWPPP has been approved by the Engineer. The Engineer's review and approval shall not waive any contract requirements and shall not relieve the Contractor from complying with Federal, State and local laws, regulations, and requirements.

The Contractor shall amend the SWPPP annually and shall resubmit it to the Engineer 25 days before the defined rainy season.

If there is a change in construction schedule or activities, the Contractor shall prepare an amendment to the SWPPP to identify additional or revised water pollution control practices. The Contractor shall submit the amendment to the Engineer for review within a time agreed to by the Engineer not to exceed the number of days specified for the initial submittal of the SWPPP. The Engineer will review the amendment within the same time allotted for the review of the initial submittal of the SWPPP.

If directed by the Engineer or requested in writing by the Contractor and approved by the Engineer, changes to the water pollution control work specified in these special provisions will be allowed. Changes may include addition of new water pollution control practices. The Contractor shall incorporate these changes in the SWPPP. Additional water pollution control work will be paid for as extra work in accordance with Section 4-1.03D, "Extra Work," of the Standard Specifications.

The Contractor shall keep a copy of the approved SWPPP at the job site. The SWPPP shall be made available when requested 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 from the public shall be directed to the Engineer.

SAMPLING AND ANALYSIS

The Contractor shall include a Sampling and Analysis Plan (SAP) in the SWPPP to monitor the effectiveness of the water pollution control practices. The Contractor shall prepare the SAP in conformance with the Preparation Manual.

The Contractor shall designate trained personnel to collect water quality samples. The personnel and training shall be documented in the SAP. Training shall consist of the following elements:

A. SAP review,
B. Health and safety review, and
C. Sampling simulations.

In the SAP the Contractor shall describe the following water quality sampling procedures:

A. Sampling preparation,
B. Collection,
C. Quality assurance and quality control,
D. Sample labeling,
E. Collection documentation,
F. Sample shipping,
G. Chain of custody,
H. Sample numbering, and
I. Precautions from the construction site health and safety plan.

The Contractor shall document sample collection during precipitation.

Samples to be analyzed in the field shall be taken by the Contractor's designated sampling personnel using collection and analysis methods, and equipment calibration specified by the manufacturer of the sampling equipment. Samples to be analyzed by a laboratory, shall be sampled, preserved, and analyzed by a State-certified laboratory in conformance with the requirements in 40 CFR Part 136, "Guidelines Establishing Test Procedures for the Analysis of Pollutants." The Contractor shall identify the State-certified laboratory, sample containers, preservation requirements, holding times, and analysis method in the SAP. A list of State-certified laboratories that are approved by the Department is available at:

http://www.dhs.ca.gov/ps/ls/ELAP/html/lablist.htm

Non-Visible Pollutants

This project has the potential to discharge non-visible pollutants in storm water from the construction site. The Contractor shall include in the SAP a description of the sampling and analysis strategy to be implemented on the project for monitoring non-visible pollutants.

In the SAP the Contractor shall identify potential non-visible pollutants that will be present on the construction site associated with the following:

A. Construction materials and wastes;
B. Existing contamination due to historical site usage; or
C. Application of soil amendments, including soil stabilization products, with the potential to alter pH or contribute toxic pollutants to storm water.

The Contractor shall show the locations planned for storage and use of the potential non-visible pollutants on the SWPPP Water Pollution Control Drawings.

The Contractor shall include in the SAP the following list of conditions that require sampling when observed during a storm water inspection:

A. Materials or wastes containing potential non-visible pollutants are not stored under watertight conditions.
B. Materials or wastes containing potential non-visible pollutants are stored under watertight conditions, but:

    1. A breach, leakage, malfunction, or spill is observed;
    2. The leak or spill has not been cleaned up before precipitation; and
    3. There is the potential for discharge of non-visible pollutants to surface waters or drainage system.

C. Construction activities; such as application of fertilizer, pesticide, herbicide, methyl methacrylate concrete sealant, or non-pigmented curing compound; have occurred during precipitation or within 24 hours preceding precipitation, and have the potential to discharge pollutants to surface waters or drainage system.
D. Soil amendments, including soil stabilization products, with the potential to alter pH levels or contribute toxic pollutants to storm water runoff have been applied, and have the potential to discharge pollutants to surface waters or drainage system (unless independent test data are available that demonstrate acceptable concentrations of non-visible pollutants in the soil amendment).
E. Storm water runoff from an area contaminated by historical usage of the site has the potential to discharge pollutants to surface waters or drainage system.

The Contractor shall describe in the SAP the schedule for collecting a sample downhill from each non-visible pollutant source and an uncontaminated control sample, during the first 2 hours of discharge from precipitation during daylight hours that result in enough discharge for sample collection. If discharge flows to the non-visible pollutant source, a sample shall be collected immediately downhill from where the discharge enters the Department's right of way. If precipitation occurs again after at least 72 hours of dry weather the Contractor shall take new samples.

In the SAP the Contractor shall identify sampling locations for collecting downstream and control samples, and the reason for their selection. The control sampling location shall be selected so the sample does not come into contact with materials, wastes or areas associated with potential non-visible pollutants or disturbed soil areas. The Contractor shall show non-visible pollutant sampling locations on the SWPPP Water Pollution Control Drawings.

The Contractor shall identify in the SAP the analytical method to be used for downhill and control samples for potential non-visible pollutants on the project.

Analytical Results and Evaluation

The Contractor shall submit a hard copy and electronic copy of water quality analytical results, and quality assurance and quality control data to the Engineer within 5 days of sampling for field analyses, and within 30 days for laboratory analyses. The Contractor shall also provide an evaluation of whether the downhill samples show levels of the tested parameter higher than in the control sample. If downhill or downstream samples show increased levels, the Contractor will assess the water pollution control measures, site conditions, and surrounding influences to determine the probable cause for the increase. As determined by the assessment, the Contractor will repair or modify water pollution control measures to address increases and amend the SWPPP as necessary. Electronic results (in one of the following file formats: .xls, .txt, .csv, .dbs, or .mdb) shall have the following information:

A. Sample identification number.
B. Contract number.
C. Constituent.
D. Reported value.
E. Analytical method.
F. Method detection limit.
G. Reported limit.

The Contractor shall maintain the water quality sampling documentation and analytical results with the SWPPP on the project site.

If construction activities or knowledge of site conditions change such that discharges or sampling locations change, the Contractor shall amend the SAP in conformance with this section, "Water Pollution Control."

IMPLEMENTATION REQUIREMENTS

The Contractor's responsibility for SWPPP 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.

If the Contractor or the Engineer identifies a deficiency in the implementation of the approved SWPPP, the deficiency shall be corrected immediately, unless an agreed date for correction is approved in writing by the Engineer. The deficiency shall be corrected before the onset of precipitation. If the Contractor fails to correct the deficiency by the agreed date or before the onset of precipitation, the Department may correct the deficiency and deduct the cost of correcting deficiencies from payments.

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

The Contractor shall construct permanent water pollution control items identified in the SWPPP as specified in "Order of Work" of these special provisions. The Contractor shall maintain the permanent water pollution control items in the locations and condition shown on the plans throughout the duration of the project.

Year-Round

The Contractor shall monitor the National Weather Service weather forecast on a daily basis during the contract. The Contractor may use an alternative weather forecasting service if approved by the Engineer. Appropriate water pollution control practices shall be in place before precipitation.

The Contractor may discontinue earthwork operations for a disturbed area for up to 21 days and the disturbed soil area will still be considered active. When earthwork operations in the disturbed area have been completed, the Contractor shall implement appropriate water pollution control practices within 15 days, or before predicted precipitation, whichever occurs first.

Rainy Season

The Contractor shall provide soil stabilization and sediment control practices during the rainy season between October 1 and May 1.

The Contractor shall implement soil stabilization and sediment control practices a minimum of 10 days before the start of the rainy season.

During the defined rainy season, the active disturbed soil area of the project site shall be not more than 2 hectares. The Engineer may approve expansions of the active disturbed soil area limit if requested in writing. The Contractor shall maintain soil stabilization and sediment control materials on site to protect disturbed soil areas.

INSPECTION AND MAINTENANCE

The WPCM shall inspect the water pollution control practices identified in the SWPPP as follows:

A. Before a forecasted storm,
B. After precipitation that causes site runoff,
C. At 24-hour intervals during extended precipitation,
D. On a predetermined schedule, a minimum of once every 2 weeks outside of the defined rainy season, and
E. On a predetermined schedule, a minimum of once a week during the defined rainy season.

The WPCM shall oversee the maintenance of the water pollution control practices.

The WPCM shall use the Storm Water Quality Construction Site Inspection Checklist provided in the Preparation Manual or an alternative inspection checklist provided by the Engineer. A copy of the completed site inspection checklist shall be submitted to the Engineer within 24 hours of finishing the inspection.

The Contractor may request approval from the Engineer to suspend inspections of water pollution control practices after work except plant establishment is complete. The Engineer's approval is contingent on approval from the Regional Water Quality Control Board. The Contractor shall not suspend inspections until written approval from the Engineer is received.

REPORTING REQUIREMENTS

If the Contractor identifies discharges into surface waters or drainage systems causing or potentially causing 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, notice or order. The report shall include the following information:

A. The date, time, location, and nature of the operation, type of discharge and quantity, and the cause of the notice or order.
B. The water pollution control practices used before the discharge, or before receiving the notice or order.
C. The date of placement and type of additional or altered water pollution control practices placed after the discharge, or after receiving the notice or order.
D. A maintenance schedule for affected water pollution control practices.

Annual Certifications

By June 15 of each year, the Contractor shall complete and submit to the Engineer an Annual Certification of Compliance, as contained in the Preparation Manual.

PAYMENT

During each estimate period the Contractor fails to conform to the provisions in this section, "Water Pollution Control," or fails to implement the water pollution control practices shown on the plans or specified elsewhere in these special provisions as items of work, the Department will withhold 25 percent of the progress payment.

Withholds for failure to perform water pollution control work will be in addition to all other withholds provided for in the contract. The Department will return performance-failure withholds in the progress payment following the correction of noncompliance.

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

Payments for prepare storm water pollution prevention plan will be made as follows:

A. After the SWPPP has been approved by the Engineer, 50 percent of the contract item price for prepare storm water pollution prevention plan will be included in the monthly progress estimate.
B. Forty percent of the contract item price for prepare storm water pollution prevention plan will be paid over the life of the contract.
C. 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 10 percent of the contract item price for prepare storm water pollution prevention plan will be made in conformance with the provisions in Section 9-1.07A, "Payment Prior to Proposed Final Estimate."

Storm water sampling and analysis will be paid for as extra work as provided in Section 4-1.03D, "Extra Work," of the Standard Specifications. No payment will be made for the preparation, collection, analysis, and reporting of storm water samples where appropriate water pollution control practices are not implemented before precipitation or if a failure of a water pollution control practice is not corrected before precipitation.

Implementation of water pollution control practices in areas outside the highway right of way not specifically provided for in the SWPPP or in these special provisions will not be paid for.

Water pollution control practices for which there are separate contract items of work will be measured and paid for as those contract items of work.

10-1.06 CONSTRUCTION SITE MANAGEMENT

Construction site management shall consist of controlling potential sources of water pollution before they come in contact with storm water systems or watercourses. The Contractor shall control material pollution and manage waste and non-storm water existing at the construction site by implementing effective handling, storage, use, and disposal practices.

Attention is directed to "Water Pollution Control" of these special provisions regarding the Contractor's appointment of a water pollution control manager (WPCM) for the project.

The Contractor shall train all employees and subcontractors regarding:

A. Material pollution prevention and control;
B. Waste management;
C. Non-storm water management;
D. Identifying and handling hazardous substances; and
E. Potential dangers to humans and the environment from spills and leaks or exposure to toxic or hazardous substances.

Training shall take place before starting work on this project. New employees shall receive the complete training before starting work on this project. The Contractor shall have regular meetings to discuss and reinforce spill prevention and control; material delivery, storage, use, and disposal; waste management; and non-storm water management procedures.

Instructions for material and waste handling, storage, and spill reporting and cleanup shall be posted at all times in an open, conspicuous, and accessible location at the construction site.

Nonhazardous construction site waste and excess material shall be recycled when practical or disposed of in accordance with the provisions in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications, unless otherwise specified.

Vehicles and equipment at the construction site shall be inspected by the WPCM on a frequent, predetermined schedule, and by the operator each day of use. Leaks shall be repaired immediately, or the vehicle or equipment shall be removed from the construction site.

SPILL PREVENTION AND CONTROL

The Contractor shall implement spill and leak prevention procedures when chemicals or hazardous substances are stored. Spills of petroleum products; substances listed under CFR Title 40, Parts 110, 117, and 302; and sanitary and septic waste shall be contained and cleaned up as soon as is safe.

Minor spills involve small quantities of oil, gasoline, paint, or other material that can be controlled by the first responder upon discovery of the spill. Cleanup of minor spills includes:

A. Containing the spread of the spill,
B. Recovering the spilled material using absorption,
C. Cleaning the contaminated area, and
D. Disposing of contaminated material promptly and properly.

Semi-significant spills are those that can be controlled by the first responder with the help of other personnel. Cleanup of semi-significant spills shall be immediate. Cleanup of semi-significant spills includes:

A. Containing the spread of the spill;
B. Recovering the spilled material using absorption if the spill occurs on paved or an impermeable surface;
C. Containing the spill with an earthen dike and digging up contaminated soil for disposal if the spill occurs on dirt;
D. Covering the spill with plastic or other material to prevent contaminating runoff if the spill occurs during precipitation; and
E. Disposing of contaminated material promptly and properly.

Significant or hazardous spills are those that cannot be controlled by construction personnel. Notifications of these spills shall be immediate. The following steps shall be taken:

A. Construction personnel shall not attempt to cleanup the spill until qualified staff have arrived;
B. Notify the Engineer and follow up with a written report;
C. Obtain the services of a spills contractor or hazardous material team immediately;
D. Notify the local emergency response team by dialing 911 and county officials at the emergency phone numbers kept on the construction site;
E. Notify the Governor's Office of Emergency Services Warning Center at (805) 852-7550;
F. Notify the National Response Center at (800) 424-8802 regarding spills of Federal reportable quantities in conformance with CFR Title 40, Parts 110, 119, and 302;
G. Notify other agencies as appropriate, including:

    1. Fire Department,
    2. Public Works Department,
    3. Coast Guard,
    4. Highway Patrol,
    5. City Police or County Sheriff Department,
    6 Department of Toxic Substances,
    7. California Division of Oil and Gas,
    8. Cal OSHA, or
    9. Regional Water Resources Control Board.

The WPCM shall oversee and enforce proper spill prevention and control measures. Minor, semi-significant, and significant spills shall be reported to the Contractor's WPCM who shall notify the Engineer immediately.

The Contractor shall prevent spills from entering storm water runoff before and during cleanup. Spills shall not be buried or washed with water.

The Contractor shall keep material or waste storage areas clean, well organized, and equipped with enough cleanup supplies for the material being stored. Plastic shall be placed under paving equipment when not in use to catch drips.

MATERIAL MANAGEMENT

Material shall be delivered, used, and stored for this contract in a manner that minimizes or eliminates discharge of material into the air, storm drain systems, or watercourses.

The Contractor shall implement the practices described in this section when taking delivery of, using, or storing the following materials:

A. Hazardous chemicals including:

    1. Acids,
    2. Lime,
    3. Glues,
    4. Adhesives,
    5. Paints,
    6. Solvents, and
    7. Curing compounds;

B. Soil stabilizers and binders;
C. Fertilizers;
D. Detergents;
E. Plaster;
F. Petroleum products including:

    1. Fuel,
    2. Oil, and
    3. Grease;

G. Asphalt components and concrete components; and
H. Pesticides and herbicides.

The Contractor shall supply the Material Safety Data Sheet to the Engineer for material used or stored. The Contractor shall keep an accurate inventory of material delivered and stored at the construction site.

Employees trained in emergency spill cleanup procedures shall be present when hazardous materials or chemicals are unloaded.

The Contractor shall use recycled or less hazardous products when practical.

Material Storage

The Contractor shall store liquids, petroleum products, and substances listed in CFR Title 40, Parts 110, 117, and 302 in containers or drums approved by the United States Environmental Protection Agency, and place them in secondary containment facilities.

Secondary containment facilities shall be impervious to the materials stored there for a minimum contact time of 72 hours.

Throughout the rainy season secondary containment facilities shall be covered during non-working days and when precipitation is predicted. Secondary containment facilities shall be adequately ventilated.

The Contractor shall keep the secondary containment facility free of accumulated rainwater or spills. After precipitation, or in the event of spills or leaks, accumulated liquid shall be collected and placed into drums within 24 hours. These liquids shall be handled as hazardous waste in accordance with the provisions in "Hazardous Waste" of these special provisions, unless testing determines them to be nonhazardous.

Incompatible materials, such as chlorine and ammonia, shall not be stored in the same secondary containment facility.

Materials shall be stored in the original containers with the original product labels maintained in legible condition. Damaged or illegible labels shall be replaced immediately.

The secondary containment facility shall have the capacity to contain precipitation from a 24-hour-long, 25-year storm; and 10 percent of the aggregate volume of all containers, or all of the volume of the largest container within the facility, whichever is greater.

The Contractor shall store bagged or boxed material on pallets. Throughout the rainy season, bagged or boxed material shall be protected from wind and rain during non-working days and when precipitation is predicted.

The Contractor shall provide sufficient separation between stored containers to allow for spill cleanup or emergency response access. Storage areas shall be kept clean, well organized, and equipped with cleanup supplies appropriate for the materials being stored.

The Contractor shall repair or replace perimeter controls, containment structures, covers, and liners as needed. Storage areas shall be inspected before and after precipitation, and at least weekly during other times.

Stockpile Management

The Contractor shall reduce or eliminate potential air and water pollution from stockpiled material including soil, paving material, or pressure treated wood. Stockpiles shall be located out of floodplains when possible, and at least 15 m from concentrated flows of storm water, drainage courses, or inlets unless written approval is obtained from the Engineer.

The Contractor may discontinue adding or removing material for up to 21 days and a stockpile will still be considered active.

The Contractor shall protect active stockpiles with plastic or geotextile cover, soil stabilization measures, or with linear sediment barrier when precipitation is predicted. Active stockpiles of cold mix asphalt concrete shall be placed on an impervious surface and covered with plastic when precipitation is predicted.

The Contractor shall protect inactive soil stockpiles with a plastic or geotextile cover, or with soil stabilization measures at all times during the rainy season. A linear sediment barrier around the perimeter of the stockpile shall also be used. During the non-rainy season soil stockpiles shall be covered and protected with a linear sediment barrier when precipitation is predicted. The Contractor shall control wind erosion during dry weather as provided in Section 10, "Dust Control," of the Standard Specifications.

Stockpiles of portland cement concrete rubble, asphalt concrete (AC), hot mix asphalt (HMA), AC and HMA rubble, aggregate base, or aggregate subbase shall be covered with plastic or geotextile, or protected with a linear sediment barrier at all times during the rainy season, and when precipitation is predicted during the non-rainy season.

Stockpiles of cold mix asphalt concrete shall be placed on and covered with impermeable material at all times during the rainy season, and when precipitation is predicted during the non-rainy season.

Stockpiles of pressure treated wood shall be covered with impermeable material and placed on pallets at all times during the rainy season, and when precipitation is predicted during the non-rainy season.

The Contractor shall repair or replace linear sediment barriers and covers as needed or as directed by the Engineer to keep them functioning properly. Sediment shall be removed when it accumulates to 1/3 of the linear sediment barrier height.

WASTE MANAGEMENT

Solid Waste

The Contractor shall not allow litter or debris to accumulate anywhere on the construction site, including storm drain grates, trash racks, and ditch lines. The Contractor shall pick up and remove trash and debris from the construction site at least once a week. The WPCM shall monitor solid waste storage and disposal procedures on the construction site. The Contractor shall provide enough dumpsters of sufficient size to contain the solid waste generated by the project. Dumpsters shall be emptied when refuse reaches the fill line. Dumpsters shall be watertight. The Contractor shall not wash out dumpsters on the construction site. The Contractor shall provide additional containers and more frequent pickup during the demolition phase of construction

Solid waste includes:

A. Brick,
B. Mortar,
C. Timber,
D. Metal scraps,
E. Sawdust,
F. Pipe,
G. Electrical cuttings,
H. Non-hazardous equipment parts,
I. Styrofoam and other packaging materials,
J. Vegetative material and plant containers from highway planting, and
K. Litter and smoking material, including litter generated randomly by the public.

Trash receptacles shall be provided and used in the Contractor's yard, field trailers, and locations where workers gather for lunch and breaks.

Hazardous Waste

The Contractor shall implement hazardous waste management practices when waste is generated on the construction site from the following substances:

A. Petroleum products,
B. Asphalt products,
C. Concrete curing compound,
D. Pesticides,
E. Acids,
F. Paints,
G. Stains,
H. Solvents,
I. Wood preservatives,
J. Roofing tar, and
K. Materials classified as hazardous by California Code of Regulations, Title 22, Division 4.5; or listed in CFR Title 40, Parts 110, 117, 261, or 302.

Nothing in these special provisions shall relieve the Contractor of the responsibility for compliance with Federal, State, and local laws regarding storage, handling, transportation, and disposal of hazardous wastes.

Hazardous material existing on the construction site shall be handled and disposed of in accordance with "Material Containing Lead and Burn Ash Materials" of these special provisions.

The WPCM shall oversee and enforce hazardous waste management practices. Production of hazardous materials and hazardous waste on the construction site shall be kept to a minimum. Perimeter controls, containment structures, covers, and liners shall be repaired or replaced when damaged.

The Contractor shall have a laboratory certified by the Department of Health Services (DHS) sample and test waste when hazardous material levels are unknown to determine safe methods for storage and disposal.

The Contractor shall segregate potentially hazardous waste from nonhazardous waste at the construction site. Hazardous waste shall be handled, stored, and disposed of as required in California Code of Regulations, Title 22, Division 4.5, Section 66262.34; and in CFR Title 49, Parts 261, 262, and 263.

The Contractor shall store hazardous waste in sealed containers constructed and labeled with the contents and date accumulated as required in California Code of Regulations, Title 22, Division 4.5; and in CFR Title 49, Parts 172, 173, 178, and 179. Hazardous waste containers shall be kept in temporary containment facilities conforming to the provisions in "Material Storage" of these special provisions.

There shall be adequate storage volume and containers shall be conveniently located for hazardous waste collection. Containers of hazardous waste shall not be overfilled and hazardous wastes shall not be mixed. Containers of dry waste that are not watertight shall be stored on pallets. The Contractor shall not allow potentially hazardous waste to accumulate on the ground. Hazardous waste shall be stored away from storm drains, watercourses, moving vehicles, and equipment.

The Contractor shall clean water based or oil based paint from brushes or equipment within a contained area and shall not contaminate soil, watercourses, or storm drain systems. Paints, thinners, solvents, residues, and sludges that cannot be recycled or reused shall be disposed of as hazardous waste. When thoroughly dry, latex paint and paint cans, used brushes, rags, absorbent materials, and drop cloths shall be disposed of as solid waste.

The Contractor shall dispose of hazardous waste within 90 days of being generated. Hazardous waste shall be disposed of by a licensed hazardous waste transporter using uniform hazardous waste manifest forms and taken to a Class I Disposal Site. A copy of the manifest shall be provided to the Engineer.

Contaminated Soil

The Contractor shall identify contaminated soil from spills or leaks by noticing discoloration, odors, or differences in soil properties. Soil with evidence of contamination shall be sampled and tested by a laboratory certified by DHS. If levels of contamination are found to be hazardous, the soil shall be handled and disposed of as hazardous waste.

Contaminated soil existing on the construction site shall be handled and disposed of in accordance with "Material Containing Lead and Burn Ash Materials" of these special provisions.

The Contractor shall prevent the flow of water, including ground water, from mixing with contaminated soil by using one or a combination of the following measures:

A. Berms,
B. Cofferdams,
C. Grout curtains,
D. Freeze walls, or

E. Concrete seal course.

If water mixes with contaminated soil and becomes contaminated, the water shall be sampled and tested by a laboratory certified by the DHS. If levels of contamination are found to be hazardous, the water shall be handled and disposed of as hazardous waste.

Concrete Waste

The Contractor shall implement practices to prevent the discharge of portland cement concrete, AC, or HMA waste into storm drain systems or watercourses.

Portland cement concrete, AC, or HMA waste shall be collected at the following locations and disposed of:

A. Where concrete material, including grout, is used;
B. Where concrete dust and debris result from demolition;
C. Where sawcutting, coring, grinding, grooving, or hydro-concrete demolition of portland cement concrete, AC, or HMA creates a residue or slurry; or
D. Where concrete trucks or other concrete-coated equipment is cleaned at the construction site.

Sanitary and Septic Waste

Wastewater from sanitary or septic systems shall not be discharged or buried within the Department right of way. The WPCM shall inspect sanitary or septic waste storage and monitor disposal procedures at least weekly. Sanitary facilities that discharge to the sanitary sewer system shall be properly connected and free from leaks.

The Contractor shall obtain written approval from the local health agency, city, county, and sewer district before discharging from a sanitary or septic system directly into a sanitary sewer system, and provide a copy to the Engineer. The Contractor shall comply with local health agency requirements when using an on-site disposal system.

Liquid Waste

The Contractor shall not allow construction site liquid waste, including the following, to enter storm drain systems or watercourses:

A. Drilling slurries or fluids,
B. Grease-free or oil-free wastewater or rinse water,
C. Dredgings,
D. Liquid waste running off a surface including wash or rinse water, or
E. Other non-storm water liquids not covered by separate permits.

The Contractor shall hold liquid waste in structurally sound, leak proof containers such as:

A. Sediment traps,
B. Roll-off bins, or
C. Portable tanks.

Liquid waste containers shall be of sufficient quantity and volume to prevent spills and leaks. The containers shall be stored at least 15 m from storm drains, watercourses, moving vehicles, and equipment.

The Contractor shall remove and dispose of deposited solids from sediment traps as provided in "Solid Waste" of these special provisions, unless determined infeasible by the Engineer.

Liquid waste may require testing to determine hazardous material content before disposal.

Drilling fluids and residue shall be disposed of outside the highway right of way. If the Engineer determines that an appropriate location is available, fluids and residue exempt under California Code of Regulations, Title 23, Section 2511(g) may be dried by infiltration and evaporation in a leak proof container. The remaining solid waste may be disposed of as provided in "Solid Waste" of these special provisions.

NON-STORM WATER MANAGEMENT

Water Control and Conservation

The Contractor shall prevent erosion or the discharge of pollutants into storm drain systems or watercourses by managing the water used for construction operations. The Contractor shall obtain the Engineer's approval before washing anything on the construction site with water that could discharge into a storm drain system or watercourse. Discharges shall be reported to the Engineer immediately.

The Contractor shall implement water conservation practices when water is used on the construction site. Irrigation areas shall be inspected and watering schedules shall be adjusted to prevent erosion, excess watering, or runoff. The Contractor shall shut off the water source to broken lines, sprinklers, or valves, and they shall be repaired as soon as possible. When possible, water from waterline flushing shall be reused for landscape irrigation. Paved areas shall be swept and vacuumed, not washed with water.

Construction water runoff, including water from water line repair, shall be directed to areas to infiltrate into the ground and shall not be allowed to enter storm drain systems or watercourses. Spilled water shall not be allowed to escape water truck filling areas. When possible, the Contractor shall direct water from off-site sources around the construction site, or shall minimize contact with the construction site.

Illegal Connection and Discharge Detection and Reporting

The Contractor shall inspect the construction site and the site perimeter before beginning work for evidence of illegal connections, discharges, or dumping. Subsequently, the construction site and perimeter shall be inspected on a frequent, predetermined schedule.

The Contractor shall immediately notify the Engineer when illegal connections, discharges, or dumping are discovered. The Contractor shall take no further action unless directed by the Engineer. Unlabeled or unidentifiable material shall be assumed to be hazardous.

The Contractor shall look for the following evidence of illegal connections, discharges, or dumping:

A. Debris or trash piles,
B. Staining or discoloration on pavement or soils,
C. Pungent odors coming from drainage systems,
D. Discoloration or oily sheen on water,
E. Stains or residue in ditches, channels or drain boxes,
F. Abnormal water flow during dry weather,
G. Excessive sediment deposits,
H. Nonstandard drainage junction structures, or
I. Broken concrete or other disturbances near junction structures.

Vehicle and Equipment Cleaning

The Contractor shall limit vehicle and equipment cleaning or washing on the construction site to that necessary to control vehicle tracking or hazardous waste. Vehicles and equipment shall not be cleaned on the construction site with soap, solvents, or steam until the Engineer has been notified. The resulting waste shall be contained and recycled, or disposed of as provided in "Liquid Waste" or "Hazardous Waste" of these special provisions, whichever is applicable. The Contractor shall not use diesel to clean vehicles or equipment, and shall minimize the use of solvents.

The Contractor shall clean or wash vehicles and equipment in a structure equipped with disposal facilities. If using a structure is not possible, vehicles and equipment shall be cleaned or washed in an outside area with the following characteristics:

A. Located at least 15 m from storm drainage systems or watercourses,
B. Paved with AC, HMA or portland cement concrete,
C. Surrounded by a containment berm, and
D. Equipped with a sump to collect and dispose of wash water.

When washing vehicles or equipment with water, the Contractor shall use as little water as possible. Hoses shall be equipped with a positive shutoff valve.

Wash racks shall discharge to a recycle system or to another system approved by the Engineer. Sumps shall be inspected regularly, and liquids and sediments shall be removed as needed.

Vehicle and Equipment Fueling and Maintenance

The Contractor shall fuel or perform maintenance on vehicles and equipment off the construction site whenever practical. When fueling or maintenance must be done at the construction site, the Contractor shall designate a site, or sites, and obtain approval from the Engineer before using. The fueling or maintenance site shall be protected from storm water, shall be on level ground, and shall be located at least 15 m from drainage inlets or watercourses. The WPCM shall inspect the fueling or maintenance site regularly. Mobile fueling or maintenance shall be kept to a minimum.

The Contractor shall use containment berms or dikes around the fueling and maintenance area. Adequate amounts of absorbent spill cleanup material and spill kits shall be kept in the fueling and maintenance area and on fueling trucks. Spill cleanup material and kits shall be disposed of immediately after use. Drip pans or absorbent pads shall be used during fueling or maintenance unless performed over an impermeable surface.

Fueling or maintenance operations shall not be left unattended. Fueling nozzles shall be equipped with an automatic shutoff control. Vapor recovery fueling nozzles shall be used where required by the Air Quality Management District. Nozzles shall be secured upright when not in use. Fuel tanks shall not be topped-off.

The Contractor shall recycle or properly dispose of used batteries and tires.

Material and Equipment Used Over Water

Drip pans and absorbent pads shall be placed under vehicles or equipment used over water, and an adequate supply of spill cleanup material shall be kept with the vehicle or equipment. Drip pans or plastic sheeting shall be placed under vehicles or equipment on docks, barges, or other surfaces over water when the vehicle or equipment will be idle for more than one hour.

The Contractor shall provide watertight curbs or toe boards on barges, platforms, docks, or other surfaces over water to contain material, debris, and tools. Material shall be secured to prevent spills or discharge into water due to wind.

Structure Removal Over or Adjacent to Water

The Contractor shall not allow demolished material to enter storm water systems or watercourses. The Contractor shall use covers and platforms approved by the Engineer to collect debris. Attachments shall be used on equipment to catch debris on small demolition operations. Debris catching devices shall be emptied regularly and debris shall be handled as provided in "Waste Management" of these special provisions.

The WPCM shall inspect demolition sites within 15 m of storm water systems or watercourses every day.

Paving, Sealing, Sawcutting, and Grinding Operations

The Contractor shall prevent the following material from entering storm drain systems or water courses:

A. Cementitious material,
B. Asphaltic material,
C. Aggregate or screenings,
D. Grinding or sawcutting residue,
E. Pavement chunks, or
F. Shoulder backing.

The Contractor shall cover drainage inlets and use linear sediment barriers to protect downhill watercourses until paving, sealing, sawcutting, or grinding operations are completed and excess material has been removed. Drainage inlets and manholes shall be covered during the application of seal coat, tack coat, slurry seal, or fog seal.

During the rainy season or when precipitation is predicted, paving, sawcutting, and grinding operations shall be limited to places where runoff can be captured. Seal coat, tack coat, slurry seal, or fog seal operations shall not begin if precipitation is predicted for the application or the curing period. The Contractor shall not excavate material from existing roadways during precipitation.

The Contractor shall vacuum up slurry from sawcutting operations immediately after the slurry is produced. Slurry shall not be allowed to run onto lanes open to public traffic or off the pavement.

The Contractor shall collect residue from portland cement concrete grinding operations with a vacuum attachment on the grinding machine. The residue shall not be left on the pavement or allowed to flow across the pavement.

Material excavated from existing roadways may be stockpiled as provided in "Stockpile Management" of these special provisions if approved by the Engineer. AC or HMA chunks used in embankment shall be placed above the water table and covered by at least 0.3-m of material.

Substances used to coat asphalt trucks and equipment shall not contain soap, foaming agents, or toxic chemicals.

Thermoplastic Striping and Pavement Markers

Thermoplastic striping and preheating equipment shutoff valves shall work properly at all times when on the construction site. The Contractor shall not preheat, transfer, or load thermoplastic within 15 m of drainage inlets or watercourses. The Contractor shall not fill the preheating container to more than 150 mm from the top. Truck beds shall be cleaned daily of scraps or melted thermoplastic.

The Contractor shall not unload, transfer, or load bituminous material for pavement markers within 15 m of drainage inlets or watercourses. All pressure shall be released from melting tanks before removing the lid to fill or service. Melting tanks shall not be filled to more than 150 mm from the top.

The Contractor shall collect bituminous material from the roadway after marker removal.

Pile Driving

The Contractor shall keep spill kits and cleanup material at pile driving locations. Pile driving equipment shall be parked over drip pans, absorbent pads, or plastic sheeting where possible. When not in use, pile driving equipment shall be stored at least 15 m from concentrated flows of storm water, drainage courses, or inlets. The Contractor shall protect pile driving equipment by parking it on plywood and covering it with plastic when precipitation is predicted. The WPCM shall inspect the pile driving area every day for leaks and spills.

The Contractor shall use vegetable oil instead of hydraulic fluid when practical.

Concrete Curing

The Contractor shall not overspray chemical curing compound. Drift shall be minimized by spraying as close to the concrete as possible. Drainage inlets shall be covered before applying curing compound.

The Contractor shall minimize the use and discharge of water by using wet blankets or similar methods to maintain moisture when curing concrete.

Concrete Finishing

The Contractor shall collect and dispose of water and solid waste from high-pressure water blasting. Drainage inlets within 15 m shall be covered before sandblasting. The nozzle shall be kept as close to the surface of the concrete as possible to minimize drift of dust and blast material. Blast residue may contain hazardous material.

Containment structures for concrete finishing operations shall be inspected for damage before each day of use and before predicted precipitation. Liquid and solid waste shall be removed from the containment structure after each work shift.

DEWATERING

Dewatering shall consist of discharging accumulated storm water, ground water, or surface water from excavations or temporary containment facilities. The Contractor shall discharge water within the limits of the project.

Dewatering discharge shall not cause erosion, scour, or sedimentary deposits that impact natural bedding materials.

The Contractor shall conduct dewatering activities in accordance with the Field Guide for Construction Dewatering available at:

http://www.dot.ca.gov/hq/construc/stormwater/manuals.htm

Before dewatering the Contractor shall submit a Dewatering and Discharge Plan to the Engineer in conformance with the provisions in Section 5-1.02, "Plans and Working Drawings," of the Standard Specifications and "Water Pollution Control," of these special provisions. At a minimum, the Dewatering and Discharge Plan shall include the following:

A. A title sheet and table of contents;
B. A description of the dewatering and discharge operations detailing the locations, quantity of water, equipment, and discharge point;
C. The estimated schedule for dewatering and discharge (begin and end dates, intermittent or continuous);
D. Discharge alternatives such as dust control or percolation; and
E. Visual monitoring procedures with inspection log.

The Contractor shall not discharge storm water or non-storm water that has an odor, discoloration other than sediment, an oily sheen, or foam on the surface and shall notify the Engineer immediately upon discovery.

If water cannot be discharged within the project limits due to site constraints it shall be disposed of in the same manner specified for material in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications.

PAYMENT

The contract lump sum price paid for construction site management shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals and for doing all the work involved in spill prevention and control, material management, waste management, non-storm water management, and dewatering and identifying, sampling, testing, handling, and disposing of hazardous waste, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

10-1.07 TEMPORARY HYDRAULIC MULCH

GENERAL

Summary

This work includes applying, maintaining, and removing temporary hydraulic mulch. Hydraulic mulch uses a mixture of fiber, tackifier, and water to stabilize active and nonactive disturbed soil areas.

The SWPPP must describe and include the use of temporary hydraulic mulch as a water pollution control practice for soil stabilization.

Submittals

At least 5 business days before applying hydraulic mulch, submit:

1. Material Safety Data Sheet for the tackifier.
2. Product label describing the tackifier as an erosion control product.
3. List of pollutant indicators and potential pollutants for the use of temporary hydraulic mulch. Pollutant indicators are described under "Sampling and Analysis Plan for Non-Visible Pollutants" in the Preparation Manual.
4. Determination of acute and chronic toxicity for aquatic organisms conforming to EPA methods for the tackifier.
5. Composition of ingredients including chemical formulation.

Submit a Certificate of Compliance as specified in Section 6-1.07, "Certificates of Compliance" of the Standard Specifications for:

1. Tackifier
2. Fiber

Quality Control and Assurance

Retain and submit records of temporary hydraulic mulch applications including:

1. Compliance with specified rates
2. Application area
3. Application time
4. Quantity

MATERIALS

Tackifier

The tackifier must be:

1. Nonflammable
2. Nontoxic to aquatic organisms
3. Free from growth or germination inhibiting factors
4. Either a plant-based product or a polymeric-emulsion blend

Tackifier classified as a plant-based product must be:

1. A natural high molecular weight polysaccharide
2. A high viscosity hydrocolloid that is miscible in water
3. Functional for at least 180 days
4. Labeled as either guar, psyllium, or starch

Guar must be:

1. A guar gum based product derived from the ground endosperm of the guar plant, cyanmopsis tetragonolobus
2. Treated with dispersant agents for easy mixing
3. Able to be diluted at the rate of 1.2 to 6.0 kg per 1000 liters of water

Psyllium must be:

1. Made of the finely ground muciloid coating of plantago ovata or plantago ispaghula seeds
2. Able to dry and form a firm but rewettable membrane

Starch must be a non-ionic, water-soluble granular material derived from corn, potato, or other plant-based source.
Tackifier classified as polymeric emulsion blend must be:

1. A liquid or dry powder formulation
2. Anionic with a residual monomer content that is at most 0.05 percent by weight
3. Functional for at least 180 days
4. A prepackaged product labeled as containing one of the following as the primary active ingredient of the polymeric emulsion blend:

    4.1. Acrylic copolymers and polymers
    4.2. Polymers of methacrylates and acrylates
    4.3. Copolymers of sodium acrylates and acrylamides
    4.4. Polyacrylamide (PAM) and copolymer of acrylamide
    4.5. Hydrocolloid polymers

Fiber

Fiber must be wood fiber, cellulose fiber, alternate fiber, or a combination of these fibers as specified. Fiber must be:

1. Free from lead paint, printing ink, varnish, petroleum products, seed germination inhibitors, or chlorine bleach
2. Free from synthetic or plastic materials
3. At most 7 percent ash

If wood fiber is specified, wood fiber must be:

1. Long strand, whole wood fibers, thermo-mechanically processed from clean, whole wood chips
2. Not made from sawdust, cardboard, paper, or paper byproducts
3. At least 25 percent of fibers 10 mm long
4. At least 40 percent held on a 710 μm sieve

If cellulose fiber is specified, cellulose fiber must be made from natural or recycled pulp fiber, such as wood chips, sawdust, newsprint, chipboard, corrugated cardboard, or a combination of these materials.
If alternate fiber is specified, alternate fiber must be:

1. Long strand, whole natural fibers made from clean straw, cotton, corn, or other natural feed stock
2. At least 25 percent of fibers 10 mm long
3. At least 40 percent held on a 710 μm sieve

Coloring Agent

Use a biodegradable nontoxic coloring agent free from copper, mercury, and arsenic to ensure the hydraulic mulch contrasts with the application area.

CONSTRUCTION

Application

Apply temporary hydraulic mulch when an area is ready to receive temporary erosion control under "Move-in/Move-out (Temporary Erosion Control)."
Dilute hydraulic mulch with water to spread the mulch evenly.
Use hydroseeding equipment to apply hydraulic mulch.
Adjust quantities of wood fiber, cellulose fiber, and alternate fiber. Fiber blends of 50/50 or 30/70 wood to cellulose (paper) are common. If substitution of the cellulose fiber is allowed, delete row for "Alternate fiber", add a row to end of table (merge cells), and add the following text in Table (Lt) style: "Wood fiber or alternate fiber may be substituted for cellulose fiber."

Apply hydraulic mulch:

1. At the application rate shown. Successive applications or passes may be needed to achieve the required rate:

Material	Application Rate kg/ha
Wood fiber	1250 kg/ha
Cellulose fiber	1250 kg/ha

2. To form a continuous mat with no gaps between the mat and the soil surface.
3. From 2 or more directions to achieve a continuous mat.
4. In layers to avoid slumping and to aid drying.
5. During dry weather or at least 24 hours before predicted rain.

Do not apply hydraulic mulch if:

1. Water is standing on or moving across the soil surface
2. Soil is frozen
3. Air temperature is below 4 ºC during the tackifier curing period unless allowed by the tackifier manufacturer and approved by the Engineer

Do not over-spray hydraulic much onto the traveled way, sidewalks, lined drainage channels, or existing vegetation.

Maintenance

Reapply hydraulic mulch within 24 hours of discovering visible erosion unless the Engineer approves a longer period.

Temporary hydraulic mulch disturbed or displaced by your vehicles, equipment, or operations must be reapplied at your expense.

Cleanup, repair, removal, disposal, or replacement due to improper installation or your negligence are not included in the cost for performing maintenance.

Removal

Remove hydraulic mulch by mechanically blending it into the soil with track laying equipment, disking, or other approved method.

MEASUREMENT AND PAYMENT

Temporary hydraulic mulch is measured by the square meter from measurements along the slope of the areas covered by the hydraulic mulch.

The contract price paid per square meter for temporary hydraulic mulch includes full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in applying temporary hydraulic mulch, complete in place, including removal of hydraulic mulch, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

The State and you share the cost of maintaining the temporary hydraulic mulch. The State determines the maintenance cost under Section 9-1.03, "Force Account Payment," of the Standard Specifications and pays you one-half of that cost.

10-1.08 STREET SWEEPING

Street sweeping shall be conducted where sediment is tracked from the job site onto paved roads, as described in the approved Storm Water Pollution Prevention Plan (SWPPP) in accordance with "Water Pollution Control" of these special provisions, and as directed by the Engineer.

Street sweeping shall be one of the water pollution control practices for sediment control. The SWPPP shall include the use of street sweeping. Street sweeping shall be performed in accordance with Section 4, SC-7 in the Construction Site Best Management Practices Manual of the Caltrans Storm Water Quality Handbooks.

The number of street sweepers shall be as designated in the approved SWPPP. The Contractor shall maintain at least one sweeper on the job site at all times during the period that sweeping work is required. Sweepers shall be self-loading, motorized, and shall have spray nozzles. Sweepers may include a vacuum apparatus.

Street sweeping shall start at the beginning of clearing and grubbing and shall continue until completion of the project, or as directed by the Engineer. Street sweeping shall be performed immediately after soil disturbing activities occur or offsite tracking of material is observed. Street sweeping shall be performed so that dust is minimized. If dust generation is excessive or sediment pickup is ineffective as determined by the Engineer, the use of water or a vacuum will be required.

At the option of the Contractor, collected material may be temporarily stockpiled in accordance with the approved SWPPP. Collected material shall be disposed of at least once per week.

Material collected during street sweeping operations shall be disposed of in conformance with Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications.

MEASUREMENT AND PAYMENT

The contract lump sum price paid for street sweeping shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals and for doing all the work involved in street sweeping, including disposal of collected material, as shown on the plans, as specified in the Standard Specifications, these special provisions, and as directed by the Engineer.

10-1.09 TEMPORARY CONCRETE WASHOUT FACILITY

Temporary concrete washout facilities shall be constructed, maintained, and later removed at the locations shown on the approved Storm Water Pollution Prevention Plan (SWPPP) in conformance with "Water Pollution Control" of these special provisions, and in conformance with details shown on the plans and these special provisions.

Temporary concrete washout facilities shall be one of the water pollution control practices for waste management and materials pollution control. The SWPPP shall include the use of temporary concrete washout facilities.

MATERIALS

Plastic Liner

Plastic liners shall be single ply, new polyethylene sheeting, a minimum of 0.25-mm thick and shall be free of holes, punctures, tears or other defects that compromise the impermeability of the material. Plastic liners shall not have seams or overlapping joints.

Gravel-filled Bags

Gravel bag fabric shall be nonwoven polypropylene geotextile (or comparable polymer) and shall conform to the following requirements:

Specification	Requirements
Mass per unit area, grams per square meter, min. ASTM Designation: D 5261	270
Grab tensile strength (25-mm grip), kilonewtons, min. ASTM Designation: D4632*	0.89
Ultraviolet stability, percent tensile strength retained after 500 hours, ASTM Designation: D4355, xenon arc lamp method	70

* or appropriate test method for specific polymer

Gravel bags shall be between 600 mm and 800 mm in length, and between 400 mm and 500 mm in width.

Yarn used for binding gravel bags shall be as recommended by the manufacturer or bag supplier and shall be of a contrasting color.

Gravel shall be between 10 mm and 20 mm in diameter, and shall be clean and free from clay balls, organic matter, and other deleterious materials.

The opening of gravel-filled bags shall be secured to prevent gravel from escaping. Gravel-filled bags shall be between 13 kg and 22 kg in mass.

Straw Bales

Straw for straw bales shall conform to the provisions in Section 20-2.06, "Straw," of the Standard Specifications.

Straw bales shall be a minimum of 360 mm in width, 450 mm in height, 900 mm in length and shall have a minimum mass of 23 kg. The straw bale shall be composed entirely of vegetative matter, except for binding material.

Straw bales shall be bound by either wire, nylon or polypropylene string. Jute or cotton binding shall not be used. Baling wire shall be a minimum 1.57 mm in diameter. Nylon or polypropylene string shall be approximately 2 mm in diameter with 360 N of breaking strength.

Stakes

Stakes shall be wood or metal. Wood stakes shall be untreated fir, redwood, cedar, or pine and cut from sound timber. They shall be straight and free of loose or unsound knots or other defects which would render them unfit for the purpose intended. Wood stakes shall be a minimum 50 mm x 50 mm in size. Metal stakes may be used as an alternative, and shall be a minimum 13 mm in diameter. Stakes shall be a minimum 1.2 m in length. The tops of the metal stakes shall be bent at a 90-degree angle or capped with an orange or red plastic safety cap that fits snugly to the metal stake. The Contractor shall submit a sample of the metal stake and plastic cap, if used, for the Engineer's approval before installation.

Staples

Staples shall be as shown on the plans. An alternative attachment device such as geotextile pins or plastic pegs may be used instead of staples. The Contractor shall submit a sample of the alternative attachment device for the Engineer's approval before installation.

Signs

Wood posts for signs shall conform to the provisions in Section 56-2.02B, "Wood Posts," of the Standard Specifications. Lag screws shall conform to the provisions in Section 56-2.02D, "Sign Panel Fastening Hardware," of the Standard Specifications.

Plywood shall be freshly painted for each installation with not less than 2 applications of flat white paint. Sign letters shown on the plans shall be stenciled with commercial quality exterior black paint. Testing of paint will not be required.

INSTALLATION

Temporary concrete washout facilities shall be as follows:

1. Temporary concrete washout facilities shall be installed before beginning placement of concrete and located a minimum of 15 m from storm drain inlets, open drainage facilities, and water courses unless determined infeasible by the Engineer. Temporary concrete washout facilities shall be located away from construction traffic or access areas at a location determined by the Contractor and approved by the Engineer.
2. A sign shall be installed adjacent to each washout facility at a location determined by the Contractor and approved by the Engineer. Signs shall be installed in conformance with the provisions in Section 56-2.03, "Construction," and Section 56-2.04, "Sign Panel Installation," of the Standard Specifications.
3. The length and width of a temporary concrete washout facility may be increased from the minimum dimensions shown on the plans upon approval of the Engineer.
4. Temporary concrete washout facilities shall be constructed in sufficient quantity and size to contain liquid and concrete waste generated by washout operations for concrete wastes. These facilities shall be constructed to contain liquid and concrete waste without seepage, spills, or overflow.
5. Berms for below grade temporary concrete washout facilities shall be constructed from compacted native material. Gravel may be used in conjunction with compacted native material.
6. A plastic liner shall be installed in below grade temporary concrete washout facilities.

Details for an alternative temporary concrete washout facility shall be submitted to the Engineer for approval at least 7 days before installation.

When temporary concrete washout facilities are no longer required for the work, as determined by the Engineer, the hardened concrete and liquid residue shall be removed and disposed of in conformance with the provisions in Section 15-3.02, "Removal Methods," of the Standard Specifications. Temporary concrete washout facilities shall be disposed of in conformance with the provisions in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications.

Ground disturbance, including holes and depressions, caused by the installation and removal of the temporary concrete washout facilities shall be backfilled and repaired in conformance with the provisions in Section 15-1.02, "Preservation of Property," of the Standard Specifications.

MAINTENANCE

Temporary concrete washout facilities shall be maintained to provide adequate holding capacity with a minimum freeboard of 300 mm. Maintaining temporary concrete washout facilities shall include removing and disposing of hardened concrete and returning the facilities to a functional condition. Hardened concrete materials shall be removed and disposed of in conformance with the provisions in Section 15-3.02, "Removal Methods," of the Standard Specifications. Holes, rips, and voids in the plastic liner shall be patched and repaired by taping or the plastic liner shall be replaced. The plastic liner shall be replaced when patches or repairs compromise the impermeability of the material as determined by the Engineer.

Gravel bags shall be replaced when the bag material is ruptured or when the yarn has failed, allowing the bag contents to spill out.

Temporary concrete washout facilities shall be repaired or replaced on the same day the damage occurs. Damage to temporary concrete washout facilities resulting from the Contractor's vehicles, equipment, or operations shall be repaired at the Contractor's expense.

MEASUREMENT AND PAYMENT

Quantities of temporary concrete washout facilities will be measured as units determined from actual count in place.

The contract unit price paid for temporary concrete washout facility shall include full compensation for furnishing all labor, materials, tools, equipment and incidentals, and for doing all the work involved in constructing a temporary concrete washout facility, complete in place, including excavation and backfill, maintenance, and removal, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

10-1.10 TEMPORARY CONCRETE WASHOUT (PORTABLE)

A portable temporary concrete washout shall be furnished, maintained, and removed as specified in the approved Storm Water Pollution Prevention Plan in conformance with "Water Pollution Control" of these special provisions and as directed by the Engineer.

A portable temporary concrete washout shall consist of a commercially available drum at a minimum size of 208-liter or alternate container upon written approval from the Engineer. The drum shall be stenciled "Concrete Waste Material." The letters shall be black and 100 mm in height on a white background. The top of the stenciling shall be 300 mm from the top of the barrel.

PLACEMENT

A portable temporary concrete washout shall be as follows:

A. A portable temporary concrete washout shall be in place prior to placement of concrete and shall be located in the immediate area of the concrete work as approved by the Engineer. The temporary concrete washout shall be located away from construction traffic or public access areas. After initial placement, temporary concrete washout shall be moved as needed for concrete construction work. When the temporary concrete washout is no longer required, as determined by the Engineer, it shall be removed and disposed of in conformance with the provisions in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications.
B. A sign shall be installed adjacent to each washout at a location determined by the Contractor and approved by the Engineer. Signs shall be installed in conformance with the provisions in Section 12-3.06B, "Portable Signs" of the Standard Specifications. Each portable sign shall consist of a base, framework and a sign panel. The sign panel shall be made out of plywood and shall have a minimum size of 610 mm by 1200 mm. The sign panel shall read "Concrete Washout" with black letters, 150 mm in height, on a white background.
C. The Contractor shall provide sufficient temporary concrete washout capacity to contain liquid and concrete waste generated by washout operations without seepage or spills.

Maintaining the portable temporary concrete washout shall include removing and disposing of concrete waste. Concrete waste material generated shall be removed each day and disposed of in conformance with the provisions in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way" of the Standard Specifications.

The Contractor shall provide the name and location of the disposal facility to the Engineer before disposal of solid and liquid concrete waste. The Contractor shall provide verification that the off-site commercial or noncommercial disposal site has a permit issued by the California Regional Water Quality Control Board (RWQCB). If the disposal site is located outside of the State of California, the Contractor shall provide a copy of the permit issued by the state or local agency having jurisdiction over the disposal site.

When relocating or transporting a portable temporary concrete washout, the portable washout shall be properly secured to prevent spilling of concrete waste material.

PAYMENT

The contract lump sum price paid for temporary concrete washout (portable) shall include full compensation for furnishing all labor, materials, tools, equipment, including the sign, and incidentals, and for doing all the work involved in furnishing, placing, maintaining, repairing, replacing, transporting, disposing of concrete waste, and removing the washout, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

10-1.11 TEMPORARY CHECK DAM

Temporary check dams shall be constructed, maintained, and later removed at the locations shown on the approved Storm Water Pollution Prevention Plan (SWPPP) in conformance with "Water Pollution Control" of these special provisions, and in conformance with details shown on the plans and these special provisions.

Temporary check dams shall be one of the water pollution control practices for sediment control. The SWPPP shall include the use of temporary check dams.

Temporary check dams shall be either Type 1 (fiber roll) or Type 2 (gravel bag).

MATERIALS

Fiber Roll

Fiber rolls shall be one of the following:

1. Constructed with a premanufactured blanket consisting of one material or a combination of materials consisting of wood excelsior, rice or wheat straw, or coconut fibers. The blanket shall be between 2.0 m and 2.4 m in width and between 20 m and 29 m in length. Wood excelsior shall be individual fibers, of which 80 percent shall be 150 mm or longer in length. The blanket shall have a photodegradable plastic netting or biodegradable jute, sisal, or coir fiber netting on at least one side. The blanket shall be rolled along the width and secured with jute twine spaced 2 m apart along the full length of the roll and placed 150 mm from the ends of each roll. The finished roll shall be between 200 mm and 250 mm in diameter, between 3 m and 6 m in length and shall weigh at least 0.81-kg/m. More than one blanket may be required to achieve the finished roll diameter. When more than one blanket is required, blankets shall be jointed longitudinally with an overlap of 150 mm along the length of the blanket.
2. A premanufactured roll of rice or wheat straw, wood excelsior, or coconut fiber encapsulated within a photodegradable plastic or biodegradable jute, sisal, or coir fiber netting. Rolls shall be between 200 mm and 250 mm in diameter, between 3 m and 6 m in length and shall weigh at least 1.6 kg/m. The netting shall have a minimum durability of one year after installation. The netting shall be secured tightly at each end of the rolls.

Stakes

Wood stakes shall be a minimum of 19 mm x 38 mm x 450 mm. Wood stakes shall be untreated fir, redwood, cedar, or pine and cut from sound timber. They shall be straight and free of loose or unsound knots or other defects which would render them unfit for the purpose intended. Metal stakes may be used as an alternative. The Contractor shall submit a sample of the metal stake for the Engineer's approval before installation. The tops of the metal stakes shall be bent at a 90-degree angle.

Rope

Rope shall be biodegradable, such as sisal or manila, with a minimum diameter of 6.35 mm.

Gravel-filled Bag

Gravel bag fabric shall be nonwoven polypropylene geotextile (or comparable polymer) and shall conform to the following requirements:

Specification	Requirements
Mass per unit area, grams per square meter, min. ASTM Designation: D 5261	270
Grab tensile strength (25-mm grip), kilonewtons, min. ASTM Designation: D4632*	0.89
Ultraviolet stability, percent tensile strength retained after 500 hours, ASTM Designation: D4355, xenon arc lamp method	70

* or appropriate test method for specific polymer

Gravel bags shall be between 600 mm and 800 mm in length, and between 400 mm and 500 mm in width.

Yarn used in construction of the gravel bags shall be as recommended by the manufacturer or bag supplier and shall be of a contrasting color.

Gravel shall be between 10 mm and 20 mm in diameter, and shall be clean and free from clay balls, organic matter, and other deleterious materials. The opening of gravel-filled bags shall be secured to prevent gravel from escaping. Gravel-filled bags shall be between 13 kg and 22 kg in mass.

INSTALLATION

Temporary check dams shall be installed as follows:

1. Temporary check dam (Type 1): Rope and notched stakes shall be used to restrain the fiber rolls against the surface of the unlined ditch or swale. Stakes shall be driven into the slope until the notch is even with the top of the fiber roll. Rope shall be knotted at each stake and laced between stakes. After installation of the rope, stakes shall be driven into the slope so that the rope will hold the fiber roll tightly to the slope. Furrows will not be required. If metal stakes are used, the rope may be laced and knotted on the bend at the top of the metal stakes.
2. Temporary check dam (Type 2): A single layer of gravel bags shall be placed in lined ditches with ends abutted tightly and not overlapped.
3. The bedding area for the temporary check dam shall be cleared of obstructions including, rocks, clods, and debris greater than 25 mm in diameter before installation.
4. The temporary check dam shall be installed across and approximately perpendicular to the centerline of a ditch or drainage line.
5. The temporary check dam shall be installed with sufficient spillway depth to prevent flanking of concentrated flow around the ends of the check dam.
6. The temporary check dam shall be installed in an unlined ditch or swale before the application of other temporary erosion control or soil stabilization material in the same unlined ditch or swale.
7. The temporary check dam shall be installed upon completion of temporary erosion control blanket in earthen ditches or swales.

Details for an alternative temporary check dam shall be submitted to the Engineer for approval at least 7 days before installation.

REMOVAL

When the temporary check dam is no longer required, as determined by the Engineer, it shall be removed and disposed of in conformance with the provisions in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications.

Ground disturbances including holes and depressions caused by the installation and removal of the temporary check dam shall be backfilled and repaired in conformance with the provisions in Section 15-1.02, "Preservation of Property," of the Standard Specifications.

MAINTENANCE

Temporary check dams shall be maintained to provide sediment holding capacity and to reduce runoff velocities. Split, torn, or unraveling rolls shall be repaired or replaced. Broken or split stakes shall be replaced. Sagging or slumping fiber rolls shall be repaired with additional stakes or replaced. Gravel bags shall be replaced when the bag material is ruptured or when the yarn has failed, allowing the bag contents to spill out. Locations where rills and other evidence of concentrated runoff have occurred beneath the check dams shall be corrected.

When sediment exceeds 1/3 of the height of the check dam above ground, or when directed by the Engineer, sediment shall be removed. The removed sediment shall be deposited within the project limits so that the sediment is not subject to erosion by wind or by water.

Temporary check dams shall be repaired or replaced the same day damage occurs. Washouts or scour beneath the temporary check dam shall be repaired. Temporary check dams damaged during the progress of work or resulting from the Contractor's vehicles, equipment, or operations shall be repaired or replaced at the Contractor's expense.

MEASUREMENT AND PAYMENT

Quantities of temporary check dams to be paid for will be determined by the meter measured along the centerline of the installed check dam.

The contract price paid per meter for temporary check dam shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in installing temporary check dams, complete in place, including removal, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

Temporary check dam disturbed or displaced by the Contractor's vehicles, equipment, or operations shall be reapplied at the Contractor's expense.

The cost of maintaining temporary check dam will be borne equally by the State and the Contractor. The division of cost will be made by determining the cost of maintaining temporary check dam in conformance with the provisions in Section 9-1.03, "Force Account Payment," of the Standard Specifications and paying half of that cost to the Contractor.

Cleanup, repair, removal, disposal, or replacement due to improper installation or the Contractor's negligence will not be considered as included in the cost for performing maintenance.

10-1.12 TEMPORARY FIBER ROLL

Temporary fiber roll shall be furnished, installed, maintained, and later removed at the locations shown on the approved Storm Water Pollution Prevention Plan (SWPPP) in conformance with "Water Pollution Control" of these special provisions, and in conformance with details shown on the plans and these special provisions.

Temporary fiber roll shall be installed on excavation and embankment slopes and other disturbed soil areas, active or nonactive.

Temporary fiber roll shall be one of the water pollution control practices for sediment control. The SWPPP shall include the use of temporary fiber roll.

Temporary fiber roll shall be either Type 1 or Type 2.

MATERIALS

Fiber Roll

Fiber roll shall be either:

1. Constructed with a premanufactured blanket consisting of either wood excelsior, rice or wheat straw, or coconut fibers or a combination of these materials. The blanket shall be between 2.0 m and 2.4 m in width and between 20 m and 29 m in length. Wood excelsior shall be individual fibers, of which 80 percent shall be 150 mm or longer in length. The blanket shall have a photodegradable plastic netting or biodegradable jute, sisal, or coir fiber netting on at least one side. The blanket shall be rolled along the width and secured with jute twine spaced 2 m apart along the full length of the roll and placed 150 mm from the ends of each roll. The finished roll shall be between 200 mm and 250 mm in diameter, a minimum of 6 m in length, and shall weigh a minimum 0.81-kg/m. More than one blanket may be required to achieve the finished roll diameter. When more than one blanket is required, blankets shall be jointed longitudinally with an overlap of 150 mm along the length of the blanket.
2. A premanufactured roll of rice or wheat straw, wood excelsior, or coconut fiber encapsulated within a photodegradable plastic or biodegradable jute, sisal, or coir fiber netting. The netting shall have a minimum durability of one year after installation. The netting shall be secured tightly at each end of the roll. Rolls shall be between 200 mm and 300 mm in diameter. Rolls between 200 mm and 250 mm in diameter shall have a minimum weight of 1.6 kg/m and a minimum length of 6 m. Rolls between 250 mm and 300 mm in diameter shall have a minimum weight of 4.5 kg/m and a minimum length of 3 m.
3. Where shown on the plans, a premanufactured roll of rice or wheat straw encapsulated within biodegradable jute, sisal, or coir fiber netting. The netting shall have a minimum durability of one year after installation. The netting shall be secured tightly at each end of the roll. Rolls shall be between 200 mm and 300 mm in diameter. Rolls between 200 mm and 250 mm in diameter shall have a minimum weight of 1.6 kg/m and a minimum length of 6 m. Rolls between 250 mm and 300 mm in diameter shall have a minimum weight of 4.5 kg/m and a minimum length of 3 m.

Stakes

Wood stakes shall be a minimum of 19 mm x 19 mm x 450 mm in size for Type 1 installation, or a minimum of 19 mm x 38 mm x 450 mm in size for Type 2 installation. Wood stakes shall be untreated fir, redwood, cedar, or pine and cut from sound timber. They shall be straight and free of loose or unsound knots and other defects which would render them unfit for the purpose intended. Metal stakes shall not be used.

Rope

Rope shall be biodegradable, such as sisal or manila, with a minimum diameter of 6.35 mm.

INSTALLATION

Temporary fiber roll shall be installed as follows:

1. Temporary fiber roll (Type 1): Furrows shall be constructed to a depth between 50 mm and 100 mm, and to a sufficient width to hold the fiber roll. Stakes shall be installed 600 mm apart along the length of the fiber rolls and stopped at 300 mm from each end of the rolls. Stakes shall be driven to a maximum of 50 mm above, or flush with the top of the roll.

2. Temporary fiber roll (Type 2): Rope and notched stakes shall be used to restrain the fiber rolls against the slope. Stakes shall be driven into the slope until the notch is even with the top of the fiber roll. Rope shall be knotted at each stake and laced between stakes. After installation of the rope, stakes shall be driven into the slope such that the rope will hold the fiber roll tightly to the slope. Furrows will not be required.
3. Temporary fiber rolls shall be placed as shown on plans.
4. The bedding area for the fiber roll shall be cleared of obstructions including rocks, clods, and debris greater than 25 mm in diameter before installation.
5. Temporary fiber rolls shall be installed approximately parallel to the slope contour.
6. Temporary fiber rolls shall be installed before the application of temporary hydraulic mulch materials in the same area.

When no longer required, as determined by the Engineer, temporary fiber rolls shall be removed and disposed of in conformance with the provisions in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications. Temporary fiber rolls may be abandoned in place when approved in writing by the Engineer.

Ground disturbances including holes and depressions caused by the installation and removal of the temporary fiber roll shall be backfilled and repaired in conformance with the provisions in Section 15-1.02, "Preservation of Property," of the Standard Specifications.

MAINTENANCE

Temporary fiber rolls shall be maintained to disperse concentrated water runoff and to reduce runoff velocities. Split, torn, or unraveling rolls shall be repaired or replaced. Broken or split stakes shall be replaced. Sagging or slumping fiber rolls shall be repaired with additional stakes or replaced. Locations where rills and other evidence of concentrated runoff have occurred beneath the rolls shall be corrected. Temporary fiber rolls shall be repaired or replaced within 24 hours of identifying the deficiency.

MEASUREMENT AND PAYMENT

Quantities of temporary fiber rolls to be paid for will be determined by the meter measured along the centerline of the installed roll. Where temporary fiber rolls are joined and overlapped, the overlap will be measured as a single installed roll.

The contract price paid per meter for temporary fiber roll shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in installing temporary fiber rolls, complete in place, including furrow excavation and backfill, and removal, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

Damage to temporary fiber rolls resulting from the Contractor's vehicles, equipment, or operations shall be repaired at the Contractor's expense.

The cost of maintaining temporary fiber rolls will be borne equally by the State and the Contractor. The division of cost will be made by determining the cost of maintaining temporary fiber rolls in conformance with the provisions in Section 9-1.03, "Force Account Payment," of the Standard Specifications and paying half of that cost to the Contractor.

Cleanup, repair, removal, disposal, or replacement due to improper installation or the Contractor's negligence will not be considered as included in the cost for performing maintenance.

10-1.13 TEMPORARY FENCE (TYPE ESA)

Temporary fence (Type ESA) shall be furnished, installed, maintained, and later removed in conformance with the details shown on the plans, as specified in these special provisions and as directed by the Engineer.

MATERIALS

Used materials may be installed provided the used materials conform to these special provisions. Materials for temporary fence (Type ESA) shall conform to the following:

High Visibility Fabric

High visibility fabric shall be machine produced, orange colored mesh manufactured from polypropylene or polyethylene. High visibility fabric may be made of recycled materials. Materials shall not contain biodegradable filler materials that can degrade the physical or chemical characteristics of the finished fabric. High visibility fabric shall be fully stabilized ultraviolet resistant, shall be a minimum of 1.22 m in width with a maximum mesh opening of 50 mm x 50 mm. High visibility fabric shall be furnished in one continuous width and shall not be spliced to conform to the specified width dimension.

Posts

Posts for temporary fence (Type ESA) shall be of one of the following:

A. Wood posts shall be fir or pine, shall have a minimum cross section of 50 mm x 50 mm, and a minimum length of 1.6 m. The end of the post to be embedded in the soil shall be pointed. Wood posts shall not be treated with wood preservative.
B. Steel posts shall have a "U", "T", "L" or other cross sectional shape that resists failure by lateral loads. Steel posts shall have a minimum mass per length of 1.1 kg/m and a minimum length of 1.6 m. One end of the steel post shall be pointed and the other end shall have a high visibility colored top.

Fasteners

Fasteners for attaching high visibility fabric to the posts shall be as follows:

A. The high visibility fabric shall be attached to wooden posts with commercial quality nails or staples, or as recommended by the manufacturer or supplier.
B. Tie wire or locking plastic fasteners shall be used for attaching the high visibility fabric to steel posts. Maximum spacing of tie wire or fasteners shall be 600 mm along the length of the steel post.

Signs

The sign legend and dimensions shall be as shown on the plans. The sign shall be weatherproof and fade-proof and may include plastic laminated printed paper affixed to an inflexible weatherproof backer board. The sign panel shall be affixed to the high visibility fabric with tie wire or locking plastic fasteners. The top of the sign panel shall be flush with the top of the high visibility fabric. Sign panels shall be placed at 30 m apart along the length of the temporary fence (Type ESA), and at each end of the fence.

INSTALLATION

Temporary fence (Type ESA) shall be installed as follows:

A. All fence construction activities shall be conducted from outside the ESA as shown on the plans or as staked.
B. Posts shall be embedded in the soil a minimum of 380 mm. Post spacing shall be 2.5 m maximum from center to center and shall at all times support the fence in a vertical position.
C. Temporary fence (Type ESA) shall be constructed prior to clearing and grubbing work, shall enclose the foliage canopy (drip line) of protected plants, and shall not encroach upon visible roots of the plants.

When Type ESA temporary fence is no longer required, as determined by the Engineer, the temporary fence shall become the property of the Contractor and shall be removed and disposed of in conformance with the provisions in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications, except when reused as provided in this section.

Holes caused by the removal of temporary fence (Type ESA) shall be backfilled in conformance with the provisions in Section 15-1.02, "Preservation of Property," of the Standard Specifications.

MAINTENANCE

Temporary fence (Type ESA) that is damaged during the progress of the work shall be repaired or replaced by the Contractor the same day the damage occurs.

MEASUREMENT AND PAYMENT

Temporary fence (Type ESA) shall be measured and paid for in the same manner specified for permanent fence as provided in Section 80, "Fences," of the Standard Specifications.

Full compensation for maintaining, removing, and disposing of temporary fence (Type ESA) shall be considered as included in the contract price paid per meter for temporary fence (Type ESA) and no additional compensation will be allowed therefor.

10-1.14 TEMPORARY CONSTRUCTION ENTRANCE

Temporary construction entrances shall be constructed, maintained, and later removed at the locations shown on the approved Storm Water Pollution Prevention Plan (SWPPP) in conformance with "Water Pollution Control" of these special provisions, and in conformance with details shown on the plans and these special provisions.

Temporary construction entrances shall be one of the water pollution control practices for tracking control. The SWPPP shall include the use of temporary construction entrances.

Temporary construction entrances shall be Type 2.

MATERIALS

Temporary Entrance Fabric

Temporary entrance fabric shall be manufactured from polyester, nylon, or polypropylene material, or any combination thereof. Temporary entrance fabric shall be a nonwoven, needle-punched fabric, free of needles which may have broken off during the manufacturing process. Temporary entrance fabric shall be permeable and shall not act as a wicking agent.

Temporary entrance fabric shall be manufactured from virgin, recycled, or a combination of virgin and recycled polymer materials. No virgin or recycled materials shall contain biodegradable filler materials that can degrade the physical or chemical characteristics of the finished fabric. The Engineer may order tests to confirm the absence of biodegradable filler materials in conformance to the requirements in ASTM Designation: E 204 (Fourier Transformed Infrared Spectroscopy-FTIR).

Temporary entrance fabric shall conform to the following requirements:

Specification	Requirements
Mass per unit area, grams per square meter, min. ASTM Designation: D 5261	235
Grab tensile strength (25-mm grip), kilonewtons, min. ASTM Designation: D4632*	0.89
Elongation at break, percent min. ASTM Designation: D4632*	50
Toughness, kilonewtons, min. (percent elongation x grab tensile strength)	53

* or appropriate test method for specific polymer

Rocks

Rocks shall conform to the material quality requirements in Section 72-2.02, "Materials," of the Standard Specifications for shape and for apparent specific gravity, absorption, and durability index. Rocks used for the temporary entrance shall conform to the following sizes:

Square Screen Size (mm)	Percentage Passing	Percentage Retained
150	100	0
75	0	100

Corrugated Steel Panels

Corrugated steel panels shall be prefabricated and shall be pressed or shop welded, with a slot or hooked section to facilitate coupling at the ends of the panels.

INSTALLATION

Temporary construction entrances shall be installed as follows:

1. Before placing the temporary entrance fabric, the areas shall be cleared of all trash and debris. Vegetation shall be removed to the ground level. Trash, debris, and removed vegetation shall be disposed of in conformance with the provisions in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications.
2. A sump shall be constructed within 6 m of each temporary construction entrance as shown on the plans.
3. Before placing the temporary entrance fabric, the ground shall be graded to a uniform plane. The relative compaction of the top 0.5-m shall be not less than 90 percent. The ground surface shall be free of sharp objects that may damage the temporary entrance fabric, and shall be graded to drain to the sump as shown on the plans.
4. Temporary entrance fabric shall be positioned longitudinally along the alignment of the entrance, as directed by the Engineer.
5. The adjacent ends of the fabric shall be overlapped a minimum length of 300 mm.
6. Rocks to be placed directly over the fabric shall be spread in the direction of traffic, longitudinally and along the alignment of the temporary construction entrance.

7. During spreading of the rocks, vehicles or equipment shall not be driven directly on the fabric. A layer of rocks a minimum 150 mm thick shall be placed between the fabric and the spreading equipment to prevent damage to the fabric.
8. For Type 2 temporary construction entrances, a minimum of 6 coupled panel sections shall be installed for each temporary construction entrance. Before installing the panels, the ground surface shall be cleared of all debris to ensure uniform contact with the ground surface.

Fabric damaged during rock placement shall be repaired by placing a new piece of fabric over the damaged area. The piece of fabric shall be large enough to cover the damaged area and provide a minimum 450-mm overlap on all edges.

Details for a proposed alternative temporary construction entrance or alternative sump shall be submitted to the Engineer for approval at least 7 days before installation. The Contractor may eliminate the sump if approved in writing by the Engineer.

When no longer required as determined by the Engineer, temporary construction entrances shall be removed and disposed of in conformance with the provisions in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications.

Ground disturbance, including holes and depressions, caused by the installation and removal of the temporary construction entrance, including the sumps, shall be backfilled and repaired in conformance with the provisions in Section 15-1.02, "Preservation of Property," of the Standard Specifications.

While the temporary construction entrance is in use, pavement shall be cleaned and sediment removed at least once a day, and as often as necessary when directed by the Engineer. Soil and sediment or other extraneous material tracked onto existing pavement shall not be allowed to enter drainage facilities.

MAINTENANCE

The Contractor shall maintain temporary construction entrances throughout the contract or until removed. The Contractor shall prevent displacement or migration of the rock surfacing or corrugated steel panels. Significant depressions resulting from settlement or heavy equipment shall be repaired by the Contractor, as directed by the Engineer.

Temporary construction entrances shall be maintained to minimize tracking of soil and sediment onto existing public roads.

If buildup of soil and sediment deter the function of the temporary construction entrance, the Contractor shall immediately remove and dispose of the soil and sediment, and install additional corrugated steel panels and spread additional rocks to increase the capacity of the temporary construction entrance.

Temporary construction entrances shall be repaired or replaced on the same day the damage occurs. Damage to the temporary construction entrance resulting from the Contractor's vehicles, equipment, or operations shall be repaired at the Contractor's expense.

MEASUREMENT AND PAYMENT

Quantities of temporary construction entrances will be determined from actual count in place.

The contract unit price paid for temporary construction entrance shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in constructing temporary construction entrance, complete in place, including excavation and backfill and removal, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

The cost of maintaining the temporary construction entrance will be borne equally by the State and the Contractor. The division of cost will be made be determining the cost of maintaining temporary construction entrance in conformance with the provisions in Section 9-1.03, "Force Account Payment," of the Standard Specifications and paying to the Contractor one-half of that cost.

Cleanup, repair, removal, disposal, or replacement due to improper installation or the Contractor's negligence will not be considered as included in the cost for performing maintenance.

10-1.15 MOVE-IN/MOVE-OUT (TEMPORARY EROSION CONTROL)

Move-in/move-out (temporary erosion control) shall include moving onto the project when an area is ready to receive temporary erosion control as determined by the Engineer, setting up required personnel and equipment for the application of erosion control materials, and moving out all personnel and equipment when temporary erosion control in that area is completed. Temporary erosion control shall consist of any temporary soil stabilization practice specified elsewhere in these special provisions.

When areas are ready to receive applications of temporary erosion control, as determined by the Engineer, the Contractor shall begin erosion control work in that area within 5 working days of being notified by the Engineer.

Attention is directed to the requirements of temporary erosion control specified elsewhere in these special provisions.

Quantities of move-in/move-out (temporary erosion control) will be determined as units from actual count. A move-in followed by a move-out will be considered one unit.

The contract unit price paid for move-in/move-out (temporary erosion control) shall include full compensation for furnishing all labor, materials (excluding temporary erosion control materials), tools, equipment, and incidentals and for doing all the work involved in moving in and removing from the project all personnel and equipment necessary for application of temporary erosion control, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

10-1.16 TEMPORARY DRAINAGE INLET PROTECTION

Temporary drainage inlet protection shall be constructed, maintained, and removed at the locations shown on the approved Storm Water Pollution Prevention Plan (SWPPP) in accordance with "Water Pollution Control" of these special provisions, and in accordance with the details shown on the plans and these special provisions.

Temporary drainage inlet protection shall be one of the water pollution control practices for sediment control. The SWPPP shall include the use of temporary drainage inlet protection.

The Contractor shall select the appropriate drainage inlet protection in accordance with the details to meet the conditions around the drainage inlet. Throughout the duration of the contract, the Contractor shall provide protection to meet the changing conditions around the drainage inlet.

Temporary drainage inlet protection shall be Type 3A, 3B, 4A, 4B or 5.

MATERIALS

Erosion Control Blanket

The erosion control blanket shall be a rolled erosion control product (RECP) and shall be classified either as temporary and degradable or long-term and nondegradable, and shall conform to one of the following:

A. Temporary and degradable:

1. Machine produced mats consisting of curled wood excelsior with 80 percent of the fiber 150 mm or longer. The excelsior blanket shall be of consistent thickness with wood fiber evenly distributed over the entire area of the blanket. The top surface of the blanket shall be covered with extruded photodegradable plastic netting or lightweight nonsynthetic netting. The blanket shall be smolder resistant without the use of chemical additives and shall be nontoxic and noninjurious to plant and animal life. The excelsior blanket shall be furnished in rolled strips with a minimum mass per unit area of 0.40-kg/m^2.
2. Machine produced mats consisting of 70 percent straw and 30 percent coconut fiber with extruded photodegradable plastic netting or lightweight nonsynthetic netting on the top and bottom surfaces of the blanket. The straw and coconut shall adhere to the netting using thread or glue strip. The straw and coconut blanket shall be of consistent thickness, and straw and coconut fiber shall be evenly distributed over the entire area of the blanket. The straw and coconut fiber blanket shall be furnished in rolled strips with a minimum mass per unit area of 0.27-kg/m^2.
3. Machine produced mats that are 100 percent coir consisting of coconut fiber with extruded photodegradable plastic netting or lightweight nonsynthetic netting on the top and bottom surfaces of the blanket. The coconut fiber shall adhere to the netting using thread or glue strip. The coconut blanket shall be of consistent thickness, with coconut fiber evenly distributed over the entire area of the blanket. The coconut fiber blanket shall be furnished in rolled strips with a minimum mass per unit area of 0.27-kg/m^2.
4. Machine woven netting that is 100 percent spun coir consisting of coconut fiber with an average open area of 63 percent to 70 percent. Coconut coir netting shall be furnished in rolled strips with a minimum mass per unit area of 0.40-kg/m^2.

B. Long-term and nondegradable:

1. Geotextile blanket shall conform to the provisions for rock slope protection fabric (Type A) in Section 88-1.04, "Rock Slope Protection Fabric," of the Standard Specifications.

Staples

Staples shall be as shown on the plans. An alternative attachment device such as geotextile pins or plastic pegs may be used instead of staples. The Contractor shall submit a sample of the alternative attachment device for the Engineer's approval before installation.

Fiber Roll

A fiber roll shall be one of the following:

A. Constructed with a premanufactured blanket made of one material or a combination of materials consisting of wood excelsior, rice or wheat straw, or coconut fibers. The blanket shall be between 2.0 m and 2.4 m in width and between 20 m and 29 m in length. Wood excelsior shall be individual fibers, of which 80 percent shall be 150 mm or longer in length. The blanket shall have a photodegradable plastic netting or biodegradable jute, sisal, or coir fiber netting on at least one side. The blanket shall be rolled along the width and secured with jute twine spaced 2 m apart along the full length of the roll and placed 150 mm from the ends of each roll. The finished roll shall be between 200 mm and 250 mm in diameter, between 3 m and 6 m in length, and shall weigh at least 0.81-kg/m. More than one blanket may be required to achieve the finished roll diameter. When more than one blanket is required, blankets shall be jointed longitudinally with an overlap of 150 mm along the length of the blanket.
B. A premanufactured roll of rice or wheat straw, wood excelsior, or coconut fiber encapsulated within a photodegradable plastic or biodegradable jute, sisal, or coir fiber netting. The rolls shall be between 200 mm and 250 mm in diameter, between 3 m and 6 m in length, and shall weigh at least 1.6 kg/m. The netting shall have a minimum durability of one year after installation. The netting shall be secured tightly at each end of the roll.

Wood Stakes

Wood stakes shall be a minimum of 19 mm x 19 mm x 450 mm in size for Type 1 installation, or shall be a minimum of 19 mm x 38 mm x 450 mm in size for Type 2 installation. Wood stakes shall be untreated fir, redwood, cedar, or pine and cut from sound timber. They shall be straight and free of loose or unsound knots and other defects which would render them unfit for the purpose intended.

Rope

Rope shall be biodegradable, such as sisal or manila, with a minimum diameter of 6.35 mm.

Gravel-filled Bags

Gravel-filled bag fabric shall be nonwoven polypropylene geotextile or polymer material and shall conform to the following requirements:

Specification	Requirements
Mass per unit area, grams per square meter, minimum. ASTM Designation: D 5261	270
Grab tensile strength (25-mm grip), kilonewtons, minimum. ASTM Designation: D4632*	0.89
Ultraviolet stability, percent tensile strength retained after 500 hours, ASTM Designation: D4355, xenon arc lamp method	70

* or appropriate test method for specific polymer

Gravel-filled bags shall be between 600 mm and 800 mm in length, and between 400 mm and 500 mm in width.

Yarn used for binding gravel bags shall be as recommended by the manufacturer or bag supplier and shall be of a contrasting color.

Gravel shall be between 10 mm and 20 mm in diameter, and shall be clean and free from clay balls, organic matter, and other deleterious materials. The opening of gravel-filled bags shall be secured to prevent gravel from escaping. Gravel-filled bags shall be between 13 kg and 22 kg in mass.

Silt Fence

At the Contractor's option, temporary silt fence shall be prefabricated or constructed with silt fence fabric, posts, and fasteners.

Silt fence fabric shall conform to the following requirements:

Specification	Requirements
Width, mm, min.	900
Grab tensile strength (25-mm grip), kilonewtons, minimum. in each direction ASTM Designation: D 4632 or appropriate test method for specific polymer	0.55
Elongation, percent minimum in each direction ASTM Designation: D 4632 or appropriate test method for specific polymer	15
Permittivity, 1/sec., minimum. ASTM Designation: D 4491	1.5
Flow rate, liters per minute per square meter, minimum. ASTM Designation: D 4491	400
Ultraviolet stability, percent tensile strength retained after 500 hours, minimum. ASTM Designation: D 4355 (xenon-arc lamp and water spray weathering method)	70

Silt fence fabric shall be geotextile manufactured from woven polypropylene or polymer material. Silt fence fabric may be made of recycled materials. No materials shall contain biodegradable filler materials that can degrade the physical or chemical characteristics of the finished fabric. The Engineer may order tests to confirm the absence of biodegradable filler materials in conformance to the requirements in ASTM Designation: E 204.

Posts for temporary silt fences shall be one of the following:

A. Posts shall be untreated fir, redwood, cedar, or pine, shall be cut from sound timber, and shall be straight and free of loose or unsound knots and other defects which would render them unfit for the purpose intended. Wood post shall be a minimum of 34 mm x 40 mm in size, and 4 feet in length. The end of the post to be embedded in the soil shall be pointed.
B. Posts shall be steel and have a "U," "T," "L," or other cross sectional shape that can resist failure from lateral loads. The steel posts shall have a minimum mass per length of 1.1 kg/m and a minimum length of 1.2 m. One end of the steel posts shall be pointed and the other end shall be capped with an orange or red plastic safety cap which fits snugly to the steel post. The Contractor shall submit to the Engineer for approval a sample of the capped steel post before installation.

Fasteners for attaching silt fence fabric to posts shall be as follows:

A. When prefabricated silt fence is used, posts shall be inserted into sewn pockets.
B. Silt fence fabric shall be attached to wooden posts with nails or staples as shown on the plans or as recommended by the manufacturer or supplier. Tie wire or locking plastic fasteners shall be used to fasten the silt fence fabric to steel posts. Maximum spacing of fasteners shall be 200 mm along the length of the steel post.

Foam Barriers

The foam barrier fabric cover and skirt shall be a woven polypropylene fabric with a minimum tensile strength of 0.44-kN, conforming to ASTM Designation: D 4632. The prefabricated fabric shall be high visibility orange in color that is integral to the fabric; painting shall not be allowed. The fabric shall have an ultraviolet stability exceeding 70 percent.

The foam core shall be urethane foam and shall be shaped and dimensioned as shown on the plans.

Adhesive for foam barriers shall be a solvent-free rubber modified asphalt emulsion. The color of the emulsion shall be brown when wet and shall have a drying period of not more than 3 hours.

Anchoring nails or spikes for foam barriers shall be a minimum of 25 mm in length and capable of penetrating concrete or asphalt surfaces.

Sediment Filter Bag

Sediment filter bag fabric shall be geotextile manufactured from woven polypropylene or polymer material. Sediment filter bag fabric may be made from recycled polymer materials. Polymer materials shall not contain biodegradable filler materials and shall conform to the requirements in ASTM Designation: E 204.

Sediment filter bag fabric shall conform to the following requirements:

Specification	Requirements
Grab tensile strength (25-mm grip), kilonewtons, minimum. in each direction ASTM Designation: D 4632 or appropriate test method for specific polymer	1.35
Elongation, percent minimum in each direction ASTM Designation: D 4632 or appropriate test method for specific polymer	15
Permittivity, 1/sec., minimum. ASTM Designation: D 4491	1.5
Flow rate, liters per minute per square meter, minimum. ASTM Designation: D 4491	8140
Ultraviolet stability, percent tensile strength retained after 500 hours, minimum. ASTM Designation: D 4355 (xenon-arc lamp and water spray weathering method)	80

The sediment filter bag shall be sized to fit the catch basin or drainage inlet and shall be complete with lifting loops and dump straps attached at the bottom to facilitate emptying of the sediment filter bag. The sediment filter bags shall have a restraint cord approximately halfway up the bag to keep the sides away from the catch basin walls.

INSTALLATION

Temporary drainage inlet protection shall be installed at drainage inlets in paved and unpaved areas as follows:

A. Temporary drainage inlet protection shall be installed such that ponded runoff does not encroach on the traveled way or overtop the curb or dike. Gravel-filled bags shall be placed to control ponding and prevent runoff from overtopping the curb or dike.
B. The bedding area for the temporary drainage inlet protection shall be cleared of obstructions including rocks, clods, and debris greater than 25 mm in diameter before installation.
C. A temporary linear sediment barrier shall be installed up-slope of the existing drainage inlet and parallel with the curb, dike, or flow line to prevent sediment from entering the drainage inlet.

Erosion Control Blanket and Geotextile Fabric

The erosion control blanket and geotextile fabric shall be secured to the surface of the excavated sediment trap with staples and embedded in a trench adjacent to the drainage inlet. The perimeter edge of the erosion control blanket and geotextile fabric shall be anchored in a trench.

Silt Fence

Silt fence shall be installed along the perimeter of the erosion control blanket or geotextile fabric, with the posts facing the drainage inlet. The trench shall be backfilled and tamped to secure the silt fence fabric in the bottom of the trench.

Gravel-filled Bags

Gravel-filled bags shall be stacked to form a gravel bag barrier. The gravel-filled bags shall be placed so that the bags are tightly abutted and overlap the joints in adjacent rows. A spillway shall be created by removing one or more gravel-filled bags from the upper layer of the gravel bag barrier.

Gravel-filled bags shall only be used within shoulder areas when placed behind temporary railing (Type K).

Fiber Rolls

Fiber rolls shall be placed over the erosion control blanket or geotextile fabric with the ends of the fiber roll abutted tightly together. Fiber rolls shall be secured with stakes installed along the length of the fiber rolls. Stakes shall not be installed within 300 mm of the end of the rolls.

Foam Barriers

Foam barriers shall be installed in individual sections adjacent to existing drainage inlets. Foam barriers shall be securely attached to the pavement according to the angle and spacing shown on the plans. Foam barriers shall be installed flush against the sides of concrete, asphalt concrete, or hot mix asphalt curbs, dikes, and pavement with the inner material and fabric cover cut smoothly and evenly to provide a tight flush joint.

Sediment Filter Bags

Sediment filter bags shall be installed by removing the drainage inlet grate, placing the sediment bag in the opening, and replacing the grate to secure the sediment filter bag in place.

MAINTENANCE

Temporary drainage inlet protection shall be maintained to provide sediment holding capacity and to reduce runoff velocities. Temporary drainage inlet protection shall be repaired or replaced immediately after the damage occurs.

Sediment deposits, trash, and debris shall be removed from temporary drainage inlet protection as needed or when directed by the Engineer. Removed sediment shall be deposited within the project limits so that the sediment is not subject to erosion by wind or by water. Trash and debris shall be removed and disposed of in accordance with the provisions in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications.

At locations where rills and other evidence of concentrated runoff have occurred beneath the drainage inlet protection, the protection shall be adjusted to prevent another occurrence.

Temporary silt fence shall be repaired or replaced when silt fence fabric becomes split, torn, or unraveled. Sagging or slumping silt fence shall be repaired with additional stakes or replaced. Broken or split stakes shall be replaced. Temporary silt fence shall be maintained to provide a sediment holding capacity of approximately 1/3 the height of the silt fence fabric above ground.

Sediment in excess of 50 mm above the surface of the erosion control blanket or geotextile fabric shall be removed.

Sediment deposits shall be removed when the deposit is 1/3 the height of the gravel bag barrier or one half the height of the spillway; whichever is less.

Gravel-filled bags shall be replaced when the bag material ruptures or when the binding fails.

Split, torn, unraveling, sagging, or slumping fiber rolls shall be replaced or repaired.

Foam barriers shall be repaired or replaced when the geotextile fabric cover becomes split, torn, or unraveled. Foam barriers that become detached or dislodged shall be reattached to the pavement. Sediment deposits shall be removed when the deposit reaches 1/3 of the foam barrier height.

Sediment filter bags shall be emptied when the restraint cords are no longer visible. Sediment filter bags shall be emptied by placing 25 mm steel reinforcing bars through the lifting loops. The bag shall be emptied of its contents and rinsed before replacement in the drainage inlet.

REMOVAL

When the temporary drainage inlet protection is no longer required the protection materials shall be removed and disposed of in accordance with the provisions in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications.

Holes, depressions, or other ground disturbance caused by the removal of the temporary drainage inlet protection shall be backfilled and repaired in accordance with the provisions in Section 15-1.02, "Preservation of Property," of the Standard Specifications.

MEASUREMENT

Quantities of temporary drainage inlet protection will be determined from actual count in place. The protection will be measured one time only and no additional measurement will be recognized.

PAYMENT

The contract unit price paid for temporary drainage inlet protection shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in constructing the temporary drainage inlet protection, complete in place, including removal of materials, including cleanup and disposal of retained sediment and debris, and backfilling and repairing holes, depressions and other ground disturbance, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

No additional compensation will be made if the temporary drainage inlet protection changes during the course of construction.

The cost of maintaining temporary drainage inlet protection will be borne equally by the State and the Contractor. The division of cost will be made by determining the cost of maintaining temporary drainage inlet protection in accordance with the provisions in Section 9-1.03, "Force Account Payment," of the Standard Specifications and paying to the Contractor one-half of that cost.

Cleanup, repair, removal, disposal, or replacement due to improper installation, or as a result of the Contractor's negligence will not be considered as included in the cost for performing maintenance.

10-1.17 MATERIALS HAULING EQUIPMENT LOADING ON BRIDGES

The operation of materials hauling equipment on bridges shall conform to the provisions in Section 7-1.02, "Load Limitations," of the Standard Specifications and these special provisions.

A designated lane has been designed for crossing of materials hauling equipment on the following bridges:

A. Heritage Road Undercrossing, Bridge No. 57-1143L
B. Spring Canyon Bridge, Bridge No. 57-1155R

The Contractor will be permitted to cross the bridges listed with pneumatic-tired materials hauling equipment which exceeds the size and weight limitations specified in Section 7-1.02, but does not exceed the load limitations given in the "Materials Hauling Equipment Loading" diagram shown on the plans. The provisions in the last paragraph of Section 7-1.02 concerning increase of load carrying capacity of a structure or structures shall not apply to the above listed bridges, but the provisions in Section 7-1.02 shall apply to all other bridges to be constructed as a part of this contract.

The crossing of the above listed bridges with materials hauling equipment shall be in conformance with the following provisions:

A. Each bridge roadway shall be maintained in a smooth condition free of spillage when operating equipment over the bridge.
B. The approaches at each end of each bridge over which the equipment is to be operated shall be constructed to grades providing a smooth transition to the bridge roadway grades and shall be maintained in a smooth and uniform condition at all times during the operation of the equipment for a length of not less than 50 m measured from the bridge ends. There shall be no local depressions in the approaches in the vicinity of the bridge ends.
C. Equipment, either loaded or unloaded, shall be operated at all times at a speed and in a manner resulting in no jolting or bouncing of the equipment while crossing the bridge.
D. Equipment shall be confined to the materials hauling equipment lane shown on the plans by means of temporary railing (Type K).
E. Only one piece of equipment may be on the bridge at one time.

The mass of loaded materials hauling equipment shall be verified by weighing when required by the Engineer. Scales will be of the individual wheel or axle type as furnished by the State. The weighing will be done within the limits of the project and within the State highway right of way at a location accessible to the equipment and suitable for weighing operations. The exact location of the weighing shall be determined by the Contractor.

The work of installing and maintaining the scales, when ordered by the Engineer, will be paid for as extra work as provided in Section 4-1.03D of the Standard Specifications.

Upon completion of the Contractor's hauling operations over the bridges, the Contractor shall remove all stains from the bridge roadways, and shall leave the bridge roadways in a condition as good as when the Contractor entered upon the work, in conformance with the provisions in Section 7-1.11, "Preservation of Property," of the Standard Specifications.

Equipment and methods used to clean the bridge roadway shall not damage the structure. Any damage shall be repaired or replaced by the Contractor at the Contractor's expense.

Physical barriers used in connection with the materials hauling equipment lane shall be removed from the site of the work and shall be disposed of in conformance with the provisions in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications.

Full compensation for conforming to the requirements of this section, including all costs involved in the weighing of loaded materials hauling equipment not otherwise provided for herein, shall be considered as included in the contract prices paid per cubic meter for the items of earthwork involved and no additional compensation will be allowed therefor.

10-1.18 COOPERATION

It is anticipated that work by another contractor may be in progress adjacent to or within the limits of this project during progress of the work on this contract. The following table lists contracts anticipated to be in progress during this contract.

Contract No.	Co-Rte-KP	Location	Type of Work
091824	SD-905-R8.6/R11.6	In San Diego County in San Diego 0.6 KM East of Cactus Road to 0.3 KM West of the Mexico Border	Construct new freeway

Comply with Section 7-1.14, "Cooperation," of the Standard Specifications.

10-1.19 PROGRESS SCHEDULE (CRITICAL PATH METHOD)

GENERAL

Summary

Critical path method (CPM) progress schedules are required for this project. Whenever the term "schedule" is used in this section, it means CPM progress schedule.

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

Definitions

The following definitions apply to this section:

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.

baseline schedule: The initial schedule representing the Contractor's work plan on the first working day of the project.

contract completion date: The current extended date for completion of the contract shown on the weekly statement of working days furnished by the Engineer as specified in Section 8-1.06, "Time of Completion," of the Standard Specifications.

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.

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.

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."

early completion time: The difference in time between an early scheduled completion date and the contract completion date.

float: The difference between the earliest and latest allowable start or finish times for an activity.

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.

narrative report: A document submitted with each schedule that discusses topics related to project progress and scheduling.

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.

scheduled completion date: The planned project finish date shown on the current accepted schedule.

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.

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.

time-scaled network diagram: A graphic depiction of a CPM schedule comprised of activity bars with relationships for each activity represented by arrows. The tail of each arrow connects to the activity bar for the predecessor and points to the successor.

total float: The amount of time that an activity or chain of activities can be delayed before extending the scheduled completion date.

updated schedule: A current schedule developed from the baseline or subsequent schedule through regular monthly review to incorporate as-built progress and any planned changes.

Submittals

General Requirements

Submit to the Engineer baseline, monthly updated, and final updated schedules, each consistent in all respects with the time and order of work requirements of the contract. Work must be executed in the sequence indicated on the current accepted schedule.

Schedules must show the order in which you propose to prosecute the work with logical links between time-scaled work activities and calculations made using the critical path method to determine the controlling activities. You are responsible for assuring that all activity sequences are logical and that each schedule shows a coordinated plan for complete performance of the work.

Produce schedules using computer software and submit compatible software for the Engineer's exclusive possession and use. Submit network diagrams and schedule data as parts of each schedule submittal.

Schedule activities must include the following:

1. Project characteristics, salient features, or interfaces, including those with outside entities, that could affect time of completion
2. Project start date, scheduled completion date, and other milestones
3. Work performed by you, your subcontractors, and suppliers
4. Submittal development, delivery, review, and approval, including those from you, your subcontractors, and suppliers
5. Procurement, delivery, installation, and testing of materials, plants, and equipment

6. Testing and settlement periods
7. Utility notification and relocation
8. Erection and removal of falsework and shoring
9. Major traffic stage switches
10. Finishing roadway and final cleanup
11. State-owned float as the predecessor activity to the scheduled completion date

Schedules must have not less than 50 and not more than 2000 activities, unless otherwise authorized by the Engineer. The number of activities must 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 must include the following:

1. A clear and legible description.
2. Start and finish dates.
3. 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.
4. At least one predecessor and one successor activity, except for project start and finish milestones.
5. Required constraints. Constraints other than those required by the special provisions may be included only if authorized by the Engineer.
6. Codes for responsibility, stage, work shifts, location, and contract pay item numbers.

You may show early completion time on any schedule provided that the requirements of the contract are met. Early completion time is considered a resource for your exclusive use. You 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. You may also submit for approval a cost reduction incentive proposal as specified in Section 5-1.14, "Cost Reduction Incentive," of the Standard Specifications that will reduce time of construction.

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

State-owned float is 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. Prepare a time impact analysis, when requested by the Engineer, to determine the effect of the action as specified in "Time Impact Analysis." The Engineer documents State-owned float by directing you to update the State-owned float activity on the next updated schedule. 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 as specified in Section 4-1.03, "Changes," of the Standard Specifications. Prepare a time impact analysis to determine the effect of the change as specified in "Time Impact Analysis" and include the impacts acceptable to the Engineer in the next updated 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 does not waive any contract requirements and does not relieve you of any obligation or responsibility for submitting complete and accurate information. Correct rejected schedules and resubmit corrected schedules to the Engineer within 7 days of notification by the Engineer, at which time a new review period of 7 days will begin.

Errors or omissions on schedules do not relieve you 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 you or the Engineer discover that any aspect of the schedule has an error or omission, you must correct it on the next updated schedule.

Equipment and Software

Provide for the State's exclusive possession and use a complete computer system specifically capable of creating, storing, updating and producing CPM schedules utilizing the latest hardware and software technology. Before delivery and setup of the computer system, submit to the Engineer for approval a detailed list of all computer hardware and software you propose to furnish. The minimum software and computer system must include the following:

A. A complete computer system, including keyboard, mouse, 610-mm color SVGA flat LCD monitor (1,024x768 pixels), current Intel Pentium IV micro processor chip, or equivalent;

B. Computer operating system software, compatible with the selected processing unit for the latest version of Windows XP Pro, or equivalent;
C. Minimum one gigabyte (1000 MB) of random access memory (RAM), or equivalent;
D. A 160 gigabyte minimum hard disk drive, a 1.44 megabyte 90-mm floppy disk drive, 32x speed minimum CD/DVD-RW drive, Ethernet card, 2 UBCUSB ports, and 56K modem;
E. A color-ink-jet plotter with a minimum 256 MB RAM, capable of 2400 x 1200 optimized dpi color, 2400 x 1200 dpi monochrome, or equivalent. The plotter must be capable of printing fully legible, time scaled charts, and network diagrams, in four colors, with a minimum size of 914-mm by 1219-mm (E size) and must be compatible with the selected system. Provide plotter paper and ink cartridges throughout the contract. HP Designjet 1100ps 44-in Printer, or equivalent;
F. CPM software must be the latest version of Primavera Project Planner (P3) unless otherwise accepted by the Engineer;
G. Scheduler Analyzer Pro or equivalent – a suite of programs to assist in the schedule analysis, the latest version for Windows XP Pro;
H. Microsoft Office software, the latest version for Windows XP Pro, and McAfee Virus software or equivalent.

The computer hardware and software furnished must be compatible with that used by you for the production of the CPM progress schedule required by the Contract, and must include original instruction manuals and other documentation normally provided with the hardware, software and plotter.

Furnish, install, set up, provide licenses for the all software programs, maintain and repair the computer hardware and plotter, and provide software support ready for use at a location determined by the Engineer. Install the hardware and software ready for use by the first submission of the baseline schedule. Provide 24 hours of formal training for the Engineer and three other agents of the Department designated by the Engineer, in the use of the hardware and software to include schedule analysis, reporting and resource allocations. An authorized vendor of Primavera Project Planner is to perform the training.

The Department compensates you under Section 4-1.03, "Extra Work," of the Standard Specifications for replacement of software if the original software is damaged, lost or stolen after delivery to the Engineer.

All computer hardware, software (excluding schedule software) and plotter furnished shall remain the property of the Contractor and shall be removed by the Contractor upon acceptance of the contract when no claims involving contract progress are pending. When claims involving contract progress are pending, computer hardware or software shall not be removed until final estimate has been submitted to the Contractor.

Network Diagrams, Reports, and Data

Include the following with each schedule submittal:

1. Two sets of originally plotted, time-scaled network diagrams
2. Two copies of a narrative report
3. One read-only compact disk or floppy diskette containing the schedule data

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

1. Show a continuous flow of information from left to right
2. Be based on early start and early finish dates of activities
3. Clearly show the primary paths of criticality using graphical presentation
4. Be prepared on 860 mm x 1120 mm (34" x 44")
5. Include a title block and a timeline on each page

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

1. Transmittal letter
2. Work completed during the period
3. 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
4. Description of the current critical path
5. Changes to the critical path and scheduled completion date since the last schedule submittal
6. Description of problem areas
7. Current and anticipated delays:

7.1. Cause of delay
7.2. Impact of delay on other activities, milestones, and completion dates
7.3. Corrective action and schedule adjustments to correct the delay

8. Pending items and status thereof:

8.1. Permits
8.2. Change orders
8.3. Time adjustments
8.4. Noncompliance notices

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

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

Preconstruction Scheduling Conference

Schedule a preconstruction scheduling conference with your project manager and the Engineer within 15 days after contract approval. The Engineer will conduct the meeting and review the requirements of this section with you.

Submit a general time-scaled logic diagram displaying the major activities and sequence of planned operations and be prepared to discuss the proposed work plan and schedule methodology that comply with the requirements of this section. If you propose deviations to the construction staging, then the general time-scaled logic diagram must also display the deviations and resulting time impacts. Be prepared to discuss the proposal.

At this meeting, also submit the alphanumeric coding structure and activity identification system for labeling work activities. To easily identify relationships, each activity description must 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 reviews the logic diagram, coding structure, and activity identification system, and provide any required baseline schedule changes to you for implementation.

Baseline Schedule

Beginning the week following the preconstruction scheduling conference, meet with the Engineer weekly to discuss schedule development and resolve schedule issues until the baseline schedule is accepted.

Submit to the Engineer a baseline schedule within 20 days of approval of the contract. Allow 20 days for the Engineer's review after the baseline schedule and all support data are submitted. In addition, the baseline schedule submittal is not considered complete until the computer software is delivered and installed for use in review of the schedule.

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

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

If you submit an early completion baseline schedule that shows contract completion in less than 85 percent of the contract working days, the baseline schedule must be supplemented with resource allocations for every task activity and include time-scaled resource histograms. The resource allocations must be shown to a level of detail that facilitates report generation based on labor crafts and equipment classes for you and your subcontractors. Use average composite crews to display the labor loading of on-site construction activities. 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 must show labor crafts and equipment classes to be used. The Engineer may review the baseline schedule activity resource allocations using Means Productivity Standards or equivalent to determine if the schedule is practicable.

Updated Schedule

Submit an updated schedule and meet with the Engineer to review contract progress, on or before the 1st day of each month, beginning one month after the baseline schedule is accepted. Allow 15 days for the Engineer's review after the updated schedule and all support data are submitted, except that the review period will not start until the previous month's required schedule is accepted. Updated schedules that are not accepted or rejected within the review period are considered accepted by the Engineer.

The updated schedule must have a data date of the 21st day of the month or other date established by the Engineer. The updated schedule must 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 must be shown as applicable. Durations for work that has been completed must be shown on the updated schedule as the work actually occurred, including Engineer submittal review and your resubmittal times.

You 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. Justify 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 submit a time impact analysis as specified in this section.

DESIGN SEQUENCING

The dates specified in Section 1, "Specifications and Plans," of these special provisions, on which the Contractor will be provided the complete design of each project phase, shall be shown as milestones in the baseline schedule, and in subsequent updated and revised schedules.

At the completion of the design for each project phase, the schedule shall be updated showing the actual date the final plans, specifications and estimate of quantities for that phase were provided to the Contractor.

Time Impact Analysis

Submit a written time impact analysis (TIA) to the Engineer with each request for adjustment of contract time, or when you or the Engineer considers that an approved or anticipated change may impact the critical path or contract progress.

The TIA must illustrate the impacts of each change or delay on the current scheduled completion date or internal milestone, as appropriate. The analysis must use the accepted schedule that has a data date closest to and before the event. If the Engineer determines that the accepted schedule used does not appropriately represent the conditions before the event, the accepted schedule must be updated to the day before the event being analyzed. The TIA must 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 must be equal to the adjustment of contract time. The Engineer may construct and use an appropriate project schedule or other recognized method to determine adjustments in contract time until you provide the TIA.

Submit 2 copies of your TIA within 20 days of receiving a written request for a TIA from the Engineer. Allow the Engineer 15 days after receipt to review the submitted TIA. All approved TIA schedule changes must be shown on the next updated schedule.

If a TIA you submit is rejected, meet with the Engineer to discuss and resolve issues related to the TIA. If agreement is not reached, you are allowed 15 days from the meeting with the Engineer to give notice as specified in Section 9-1.04, "Notice of Potential Claim," of the Standard Specifications. Only show actual as-built work, not unapproved changes related to the TIA, in subsequent updated schedules. If agreement is reached at a later date, approved TIA schedule changes must be shown on the next updated schedule. The Engineer withholds remaining payment on the schedule contract item if a TIA is requested and not submitted within 20 days. The schedule item payment resumes on the next estimate after the requested TIA is submitted. No other contract payment is retained regarding TIA submittals.

Final Updated Schedule

Submit a final update, as-built schedule with actual start and finish dates for the activities, within 30 days after completion of contract work. Provide a written certificate with this submittal signed by your project manager or 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.

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) includes 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:

1. 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:

    1.1. Completion of 5 percent of all contract item work.
    1.2. Acceptance of all schedules and approval of all TIAs required to the time when 5 percent of all contract item work is complete.
    1.3. Delivery of schedule software to the Engineer.
    1.4. Completion of required schedule software training.

2. 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 approval of all TIAs required to the time when 25 percent of all contract item work is complete.
3. 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 approval of all TIAs required to the time when 50 percent of all contract item work is complete.
4. 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 approval of all TIAs required to the time when all contract item work is complete, and submittal of the certified final update schedule.

If you fail to complete any of the work or provide any of the schedules required by this section, the Engineer makes an adjustment in compensation as specified 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 submitting schedules.

10-1.20 TIME-RELATED OVERHEAD

The Contractor will be compensated for time-related overhead as described below and in conformance with "Force Account Payment" of these special provisions. The Contractor will not be compensated for time-related overhead for delays to the controlling operations caused by the Engineer that occur prior to the first working day, but will be compensated for actual overhead costs incurred, as determined by an independent Certified Public Accountant audit examination and report.

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

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

Time-related overhead shall consist of those overhead costs, including field and home office overhead, that are in proportion to the time required to complete the work. Time-related overhead shall not include costs that are not related to time, including but not limited to, mobilization, licenses, permits, and other charges incurred only once during the contract. Time-related overhead shall not apply to subcontractors of any tier, suppliers, fabricators, manufacturers, or other parties associated with the Contractor.

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

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

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

If the final increased quantity of time-related overhead exceeds 149 percent of the number of working days specified in the Engineer's Estimate, the Contractor shall, within 60 days of the Engineer's written request, submit to the Engineer an audit examination and report performed by an independent Certified Public Accountant of the Contractor's actual overhead costs. The audit examination and report shall depict the Contractor's project and company-wide financial records and shall specify the actual overall average daily rates for both field and home office overhead for the entire duration of the project, and whether the costs have been properly allocated. The rates of field and home office overhead shall exclude unallowable costs as determined in the Federal Acquisition Regulations, 48 CFR, Chapter 1, Part 31.

Independent Certified Public Accountant's audit examinations shall be performed in conformance with the requirements of the American Institute of Certified Public Accountants Attestation Standards. Audit examinations and reports shall determine if the rates of field office overhead and home office overhead are:

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

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

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

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

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

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

    1. Suspensions ordered due to weather conditions being unfavorable for the suitable prosecution of the controlling operation or operations.
    2. Suspensions ordered due to the failure on the part of the Contractor to carry out orders given, or to perform the provisions of the contract.
    3. Suspensions ordered due to factors beyond the control of and not caused by the State or the Contractor, for which the Contractor is granted extensions of time in conformance with the provisions of the third paragraph of Section 8-1.07, "Liquidated Damages," of the Standard Specifications.
    4. Other suspensions that mutually benefit the State and the Contractor.

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

Delays to the controlling operation are categorized as three types: nonexcusable, excusable, or compensable. An accepted progress schedule and approved time impact analysis, as submitted by the Contractor in conformance with "Progress Schedule (Critical Path Method)" of these special provisions, determine the types and durations of delays.

Nonexcusable delay is caused by the fault or performance deficiency of the Contractor, subcontractors at any tier, or suppliers, and no extension of time or additional compensation of loss is allowed. Excusable delay is caused by factors beyond the control and without the fault of the State or the Contractor, and the Contractor is only entitled to an extension of time and no compensation of loss. Compensable delay is caused by the error or omission of the State, and the Contractor is entitled to both an extension of time and compensation of loss. Concurrent delay occurs when two separate delays overlap partially or entirely. Nonexcusable delays concurrent with either excusable or compensable delays are nonexcusable delays. Excusable delays concurrent with compensable delays are excusable delays.

The quantity of time-related overhead will only be adjusted as a result of compensable delays and will not be adjusted as a result of either nonexcusable or excusable delays.

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

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

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

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

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

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

Overhead costs incurred by subcontractors of any tier, suppliers, fabricators, manufacturers, and other parties associated with the Contractor shall be considered as included in the various items of work and as specified in Section 9-1.03, "Force Account Payment," of the Standard Specifications.

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

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

After the work has been completed, except plant establishment work, as provided in Section 20-4.08, "Plant Establishment Work," of the Standard Specifications, the amount of the total contract item price for time-related overhead not yet paid will be included for payment in the first estimate made after completion of roadway construction work, in conformance with the provisions in Section 9-1.06, "Partial Payments," of the Standard Specifications.

10-1.21 OBSTRUCTIONS

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

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

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

The Contractor shall notify the Engineer and the appropriate regional notification center for operators of subsurface installations at least 2 business days, but not more than 14 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	811

The following utility facilities will be relocated during the progress of the contract. The Contractor shall notify the Engineer, in writing, prior to doing work in the vicinity of the facility. The utility facility will be relocated within the listed working days, as defined in Section 8-1.06, "Time of Completion," of the Standard Specifications, after the notification is received by the Engineer.

Installation of the following utility facilities will require coordination with the Contractor's operations. The Contractor shall make the necessary arrangements with the utility company, through the Engineer, and shall submit a schedule of work, verified by a representative of the utility company, to the Engineer. The schedule of work shall provide not less than the following number of working days, as defined in Section 8-1.06, "Time of Completion," of the Standard Specifications for the utility company to complete their work.

Utility Owner and Type of Facility	Location	Working Days
SDG&E Abandon/Relocate 250 mm Gas Main	"U-3, 4 & 20" Old Otay Mesa Rd./Airway Road./Caliente	50
SBC Relocate existing U/G lines to Temporary O/H	"U-3" Old Otay Mesa Rd.	50
SBC Relocate U/G Telephone Lines	"U-3" Old Otay Mesa Rd.	50
SBC Remove Temporary O/H cable and poles	"U-3" Old Otay Mesa Rd.	27
SDG&E Temporary O/H Electrical Lines	"U-5, 19 & 20" Caliente Avenue	55
SBC Temporary O/H	"U-5, 19 & 20" Caliente Avenue	45
Cox Communicatios Temporary O/H	"U-5, 19 & 20" Caliente Avenue	45
SBC Remove existing O/H poles and cable	"U-5, 19 & 20" Caliente Avenue	15
Cox Communicatios Remove existing O/H poles and cable	"U-5, 19 & 20" Caliente Avenue	15
SDG&E New U/G Electrical Lines	"U-5" Caliente Avenue	45
SDG&E Relocate 250 mm & Future 100 mm Gas Main	"U-5" Caliente Avenue	50
Cox Communications New U/G TV cable	"U-5" Caliente Avenue	50
SDG&E New U/G Electrical Lines	"U-5" Caliente Avenue	50
SDG&E Relocate 250 mm & Future 100 mm Gas Main	"U-5" Caliente Avenue	50
SBC New U/G System	"U-5" Caliente Avenue	20
Cox Communications New U/G TV cable	"U-5" Caliente Avenue	20
SDG&E New U/G Electrical Lines	"U-5, 29-30" Caliente Avenue	60
SDG&E Future 100 mm Gas Main	"U-5, 19-20" Caliente Avenue	50
SDG&E Relocate 250 mm Gas Main	"U-5, 19-20" Caliente Avenue	50
SBC New U/G System	"U-5, 19-20" Caliente Avenue	35
Cox Communications New U/G TV cable	"U-5, 19-20" Caliente Avenue	35
SDG&E Remove Temporary O/H Electrical Lines	"U-5, 19-20" Caliente Avenue	50
SBC Remove Temporary O/H cable and poles	"U-5, 19-20" Caliente Avenue	15
Cox Communications Remove Temporary O/H cable and poles	"U-5, 19-20" Caliente Avenue	15
SDG&E Underground	"U-14" Cactus Road	50
SDG&E Relocate/Remove O/H Electrical Lines	"U-14" Cactus Road	55
SBC Relocate existing O/H cable and poles	"U-14" Cactus Road	50

10-1.22 DUST CONTROL

Dust control shall conform to the provisions in Section 10, "Dust Control," of the Standard Specifications and these special provisions.

10-1.23 CONSTRUCTION AREA TRAFFIC CONTROL DEVICES

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

Category 1 temporary traffic control devices are defined as small and lightweight (less than 45 kg) devices. These devices shall be certified as crashworthy by crash testing, crash testing of similar devices, or years of demonstrable safe performance. Category 1 temporary traffic control devices include traffic cones, plastic drums, portable delineators, and channelizers.

If requested by the Engineer, the Contractor shall provide written self-certification for crashworthiness of Category 1 temporary traffic control devices at least 5 days before beginning any work using the devices or within 2 days after the request if the devices are already in use. Self-certification shall be provided by the manufacturer or Contractor and shall include the following:

A. Date,
B. Federal Aid number (if applicable),
C. Contract number, district, county, route and kilometer post of project limits,
D. Company name of certifying vendor, street address, city, state and zip code,
E. Printed name, signature and title of certifying person; and
F. Category 1 temporary traffic control devices that will be used on the project.

The Contractor may obtain a standard form for self-certification from the Engineer.

Category 2 temporary traffic control devices are defined as small and lightweight (less than 45 kg) devices that are not expected to produce significant vehicular velocity change, but may cause potential harm to impacting vehicles. Category 2 temporary traffic control devices include barricades and portable sign supports.

Category 2 temporary traffic control devices shall be on the Federal Highway Administration's (FHWA) list of Acceptable Crashworthy Category 2 Hardware for Work Zones. This list is maintained by FHWA and can be located at:

http://safety.fhwa.dot.gov/roadway_dept/road_hardware/listing.cfm?code=workzone

The Department also maintains this list at:

http://www.dot.ca.gov/hq/traffops/signtech/signdel/pdf/Category2.pdf

Category 2 temporary traffic control devices that have not received FHWA acceptance shall not be used. Category 2 temporary traffic control devices in use that have received FHWA acceptance shall be labeled with the FHWA acceptance letter number and the name of the manufacturer. The label shall be readable and permanently affixed by the manufacturer. Category 2 temporary traffic control devices without a label shall not be used.

If requested by the Engineer, the Contractor shall provide a written list of Category 2 temporary traffic control devices to be used on the project at least 5 days before beginning any work using the devices or within 2 days after the request if the devices are already in use.

Category 3 temporary traffic control devices consist of temporary traffic-handling equipment and devices that weigh 45 kg or more and are expected to produce significant vehicular velocity change to impacting vehicles. Temporary traffic-handling equipment and devices include crash cushions, truck-mounted attenuators, temporary railing, temporary barrier, and end treatments for temporary railing and barrier.

Type III barricades may be used as sign supports if the barricades have been successfully crash tested, meeting the NCHRP Report 350 criteria, as one unit with a construction area sign attached.

Category 3 temporary traffic control devices shall be shown on the plans or on the Department's Highway Safety Features list. This list is maintained by the Division of Engineering Services and can be found at:

http://www.dot.ca.gov/hq/esc/approved_products_list/HighwaySafe.htm

Category 3 temporary traffic control devices that are not shown on the plans or not listed on the Department's Highway Safety Features list shall not be used.

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

10-1.24 CONSTRUCTION AREA SIGNS

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

Attention is directed to "Furnish Sign" of these special provisions.

Attention is directed to the provisions in "Prequalified and Tested Signing and Delineation Materials" of these special provisions. Type II retroreflective sheeting shall not be used on construction area sign panels. Type III, IV, VII, VIII, or IX retroreflective sheeting shall be used for stationary mounted construction area sign panels.

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

Unless otherwise shown on the plans or specified in these special provisions, the color of construction area warning and guide signs shall have black legend and border on orange background, except W10-1 or W47(CA) (Highway-Rail Grade Crossing Advance Warning) sign shall have black legend and border on yellow background.

Orange background on construction area signs shall be fluorescent orange.

Repair to construction area sign panels will not be allowed, except when approved by the Engineer. At nighttime under vehicular headlight illumination, sign panels that exhibit irregular luminance, shadowing or dark blotches shall be immediately replaced at the Contractor's expense.

The Contractor shall notify the appropriate regional notification center for operators of subsurface installations at least 2 business days, but not more than 14 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	811

Excavations required to install construction area signs shall be performed by hand methods without the use of power equipment, except that power equipment may be used if it is determined there are no utility facilities in the area of the proposed post holes. The post hole diameter, if backfilled with portland cement concrete, shall be at least 100 mm greater than the longer dimension of the post cross-section.

Construction area signs placed within 4.6 m from the edge of the travel way shall be mounted on stationary mounted sign supports as specified in "Construction Area Traffic Control Devices" of these special provisions.

The Contractor shall maintain accurate information on construction area signs. Signs that are no longer required shall be immediately covered or removed. Signs that convey inaccurate information shall be immediately replaced or the information shall be corrected. Covers shall be replaced when they no longer cover the signs properly. The Contractor shall immediately restore to the original position and location any sign that is displaced or overturned, from any cause, during the progress of work.

10-1.25 MAINTAINING TRAFFIC

Maintaining traffic shall conform to the provisions in Sections 7-1.08, "Public Convenience," Section 7-1.09, "Public Safety," and Section 12, "Construction Area Traffic Control Devices," of the Standard Specifications, "Public Safety" of these special provisions and these special provisions.

Closure is defined as the closure of a traffic lane or lanes, including shoulder, ramp or connector lanes, within a single traffic control system.

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

At locations where falsework pavement lighting or pedestrian openings through falsework are designated, falsework lighting shall be installed in conformance with the provisions in Section 86-6.11, "Falsework Lighting," of the Standard Specifications.

Openings shall be provided through bridge falsework for the use of public traffic at each location where falsework is constructed over the streets or routes listed in the following table. The type, minimum width, height, and number of openings at each location, and the location and maximum spacing of falsework lighting, if required for each opening, shall conform to the requirements in the table. The width of vehicular openings shall be the clear width between temporary railings or other protective work. The spacing shown for falsework pavement lighting is the maximum distance center to center in meters between fixtures.

Heritage Road Undercrossing

	Number	Width	Height
Vehicle Openings	2	15.9	4.6
Pedestrian Openings	1	1.52	2.44

	Location	Spacing
Falsework Pavement Lighting	R & L	7

(Width and Height in meters)
(R = Right side of traffic. L = Left side of traffic)
(C = Centered overhead)

The exact location of openings will be determined by the Engineer.

Closures are only allowed during the hours shown in the lane requirement charts included in this section "Maintaining Traffic," except for work required under Sections 7-1.08, "Public Convenience," and Section 7-1.09, "Public Safety."

The full width of the traveled way shall be open for use by public traffic when construction operations are not actively in progress.

The Contractor shall furnish special portable freeway detour signs as shown on the plans to be used on the detour routes as directed by the Engineer.

C43(CA) (FRESH CONCRETE) sign shall be used at the beginning of the pavement slab replacement work area. The sign shall be in place during the entire curing period.

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

When work vehicles or equipment are parked on the shoulder within 1.8 m of a traffic lane, the shoulder area shall be closed with fluorescent orange traffic cones or portable delineators placed on a taper in advance of the parked vehicles or equipment and along the edge of the pavement at 7.5-m intervals to a point not less than 7.5 m past the last vehicle or piece of equipment. A minimum of 9 traffic cones or portable delineators shall be used for the taper. A W20-1 (ROAD WORK AHEAD) or W21-5b (RIGHT/LEFT SHOULDER CLOSED AHEAD) or C24(CA) (SHOULDER WORK AHEAD) sign shall be mounted on a crashworthy portable sign support with flags. The sign shall be placed where designated by the Engineer. The sign shall be a minimum of 1200 mm x 1200 mm in size. The Contractor shall immediately restore to the original position and location a traffic cone or delineator that is displaced or overturned, during the progress of work.

If minor deviations from the lane requirement charts are required, a written request shall be submitted to the Engineer at least 15 days before the proposed date of the closure. The Engineer may approve the deviations if there is no significant increase in the cost to the State and if the work can be expedited and better serve the public traffic.

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.

Full compensation for furnishing, erecting, maintaining, and removing and disposing of the detour 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.

(Night Closure) Lane Closure Restriction for Designated Legal Holidays										
Thu	Fri	Sat	Sun	Mon	Tues	Wed	Thu	Fri	Sat	Sun
x	**H** xx	xx	xx							
x	xx	**H** xx	xx							
	x	xx	**H** xx	xx						
	x	xx	xx	**H** xx						
				x	**H** xx					
					x	**H** xx				
						x	**H** xx	xx		xx

Legends:	
x	The full width of the traveled way shall be open for use by public traffic after 0500.
xx	The full width of the traveled way shall be open for use by public traffic.
H	Designated Legal Holiday

REMARKS: This table is to be used concurrently with charts. 1, 2, 4, 6, 7.

Pedestrian access facilities shall be provided through construction areas within the right of way as shown on the plans and as specified herein. Pedestrian walkways shall be surfaced with hot mix asphalt, portland cement concrete or timber. The surface shall be skid resistant and free of irregularities. Hand railings shall be provided on each side of pedestrian walkways as necessary to protect pedestrian traffic from hazards due to construction operations or adjacent vehicular traffic. Protective overhead covering shall be provided as necessary to insure protection from falling objects and drip from overhead structures.

In addition to the required openings through falsework, pedestrian facilities shall be provided during pile driving, footing, wall, and other bridge construction operations. At least one walkway shall be available at all times. If the Contractor's operations require the closure of one walkway, then another walkway shall be provided nearby, off the traveled roadway.

Railings shall be constructed of wood, S4S, and shall be painted white. Railings and walkways shall be maintained in good condition. Walkways shall be kept clear of obstructions.

Full compensation for providing pedestrian facilities shall be considered as included in the prices paid for the various contract items of work involved and no additional compensation will be allowed therefor.

Chart No. 1
Road Lane Requirements

County: SD	Direction: NB/SB "Heritage Rd."	KP:

Closure Description: At Rte. 905

FROM HOUR TO HOUR	24	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Mondays through Thursdays	R	R	R	R	R																	R	R	R	
Fridays	R	R	R	R	R																				
Saturdays																									
Sundays																						R	R	R	

Legend:

R	Provide at least one through traffic lane, not less than 3 m in width, for use by both directions of travel (Reversing Control)
	No work permitted.

REMARKS:

NOTE: When Reverse Traffic Control is used:
1. Close one traffic lane and stop public traffic for periods not to exceed ten minutes.
2. Maximum length of one-way control shall be 100 m.

Chart No. 2
Conventional Highway Lane Requirements

County: SD	Route/Direction: EB-WB/905	KP: 9.32 / 18.62

Closure Description: 0.8 km. E. of Jct. Rte. 805 to Otay Mesa Border Crossing

FROM HOUR TO HOUR	24	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Mondays through Thursdays	1	1	1	1	1																	1	1	1	
Fridays	1	1	1	1	1																				
Saturdays				1	1	1	1	1																	
Sundays				1	1	1	1	1	1													1	1	1	

Legend:

1	Provide at least one through traffic lane open in direction of travel
	Work permitted within project right of way where shoulder or lane closure is not required.

REMARKS:

Chart No. 3
Road Lane Requirements

County: SD	Direction: EB-WB/905	KP: 9.32 / 18.62

Closure Description: 0.8 km. of Jct. Rte. 805 to Otay Mesa Border Crossing

FROM HOUR TO HOUR	24	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Mondays through Thursdays	S	S	S	S	S				S	S	S	S	S	S	S	S						S	S	S	
Fridays	S	S	S	S	S				S	S	S	S	S	S	S	S									
Saturdays				S	S	S	S	S	S	S	S	S	S	S	S	S									
Sundays				S	S	S	S	S	S	S	S	S	S	S	S	S						S	S	S	

Legend:

S	Shoulder closure permitted
	No work permitted.

REMARKS:

Chart No. 4
Road Lane Requirements

County: SD	Direction: NB/SB "Caliente Ave."	KP:

Closure Description: Airway Rd. to Otay Mesa Rd.

FROM HOUR TO HOUR	24	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Mondays through Thursdays	R	R	R	R	R																	R	R	R	
Fridays	R	R	R	R	R																				
Saturdays																									
Sundays																						R	R	R	

Legend:

R	Provide at least one through traffic lane, not less than 3 m in width, for use by both directions of travel (Reversing Control)
	No work permitted.

REMARKS:

NOTE: When Reverse Traffic Control is used:
1. Close one traffic lane and stop public traffic for periods not to exceed ten minutes.
2. Maximum length of one-way control shall be 100 m.

Chart No. 5
Road Lane Requirements

County: SD	Direction: NB/SB "Caliente Ave."	KP:

Closure Description: Airway Rd. to Otay Mesa Rd.

FROM HOUR TO HOUR	24	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Mondays through Thursdays	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Fridays	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Saturdays	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Sundays	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

Legend:

X	Street may be closed

REMARKS: **This chart may be used no more than 30 consecutive times only.**

Detour NB / SB Caliente Ave.
Detour NB/SB Caliente Ave. traffic via two new temporary lanes constructed between Airway Rd. and Interim Rte. 905 during structure construction.

Chart No. 6
Road Lane Requirements

County: SD	Direction: NB/SB "Old Otay Mesa Rd." EB/WB "Airway Rd."	KP:

Closure Description: Airway Rd. to Rte. 905

Old Otay Mesa Rd. to Caliente Ave.

FROM HOUR TO HOUR	24	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Mondays through Thursdays	X	X	X	X	X																X	X	X	X	
Fridays	X	X	X	X	X																				
Saturdays																									
Sundays																					X	X	X	X	

Legend:

X	Street may be closed
	No work permitted.

REMARKS:
No other closure that conflicts with or shares any elements of the following detour will be permitted.
This chart may be used for five times only.

Detour NB Old Otay Mesa Rd.
Detour NB Old Otay Mesa Rd. traffic via southerly on Old Otay Mesa Rd. to WB Beyer Blvd. thence westerly on Beyer Blvd. to NB Smythe Ave. thence northerly on Smythe Ave. to EB 905.

Detour SB Old Otay Mesa Rd.
Detour SB Old Otay Mesa Rd. traffic via westerly on Rte. 905 to WB 905 Off-ramp to Picador Blvd. thence southerly on Picador Blvd. to SB Smythe Ave. thence southerly on Smythe Ave. to EB Beyer Blvd. thence easterly on Beyer Blvd. to Old Otay Mesa Rd./E. Beyer Blvd.

Detour EB Airway Rd.
Detour EB Airway Rd. traffic via southerly on Old Otay Mesa Rd. to WB Beyer Blvd. thence westerly on Beyer Blvd. to NB Smythe Ave. thence northerly on Smythe Ave. to EB 905 On-ramp from Smythe Ave. thence easterly on Rte. 905 to SB Caliente Ave. thence southerly on Caliente Ave. to Airway Rd.

Detour WB Airway Rd.
Detour WB Airway Rd. traffic via westerly on Rte. 905 to WB 905 Off-ramp to SB Picador Blvd. thence southerly on Picador Blvd. to SB Smythe Ave. thence southerly on Smythe Ave. to EB Beyer Blvd. thence easterly on Beyer Blvd. to NB Old Otay Mesa Rd. thence northerly on Old Otay Mesa Rd. to Airway Rd.

Chart No. 7
Road Lane Requirements

County: SD	Direction: EB/WB "Airway Rd."	KP:

Closure Description: Old Otay Mesa Rd. to Caliente Ave.

FROM HOUR TO HOUR	24	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Mondays through Thursdays	1	1	1	1	1																1	1	1	1	
Fridays	1	1	1	1	1																				
Saturdays																									
Sundays																					1	1	1	1	

Legend:

1	Provide at least one through traffic lane open in direction of travel
	No work permitted.

REMARKS: **This chart may be used two times only.**

Chart No. 8
Road Lane Requirements

County: SD	Direction: NB/SB "Old Otay Mesa Rd."	KP:

Closure Description: Rte. 905 to Airway Rd.

FROM HOUR TO HOUR	24	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Mondays through Thursdays	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Fridays	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Saturdays	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Sundays	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

Legend:

X	Street may be closed

REMARKS:
No other closure that conflicts with or shares any elements of the following detour will be permitted.

Detour NB Old Otay Mesa Rd. (day detour)
Detour NB Old Otay Mesa Rd. traffic via northerly on Old Otay Mesa Rd. to EB Airway Rd. thence easterly on Airway Rd. to NB Caliente Ave. thence northerly on Caliente Ave. to Rte. 905.

Detour NB Old Otay Mesa Rd. (night detour)
Detour NB Old Otay Mesa Rd. traffic via southerly on Old Otay Mesa Rd. to WB Beyer Blvd. thence westerly on Beyer Blvd. to NB Smythe Ave. thence northerly on Smythe Ave. to EB 905.

Detour SB Old Otay Mesa Rd. (day detour)
Detour SB Old Otay Mesa Rd. traffic via Rte. 905 to SB Caliente Ave. thence southerly on Caliente Ave. to WB Airway Rd. thence westerly on Airway Rd. to SB Old Otay Mesa Rd.

Detour SB Old Otay Mesa Rd. (night detour)
Detour SB Old Otay Mesa Rd. traffic via westerly on Rte. 905 to WB 905 Off-ramp to Picador Blvd. thence southerly on Picador Blvd. to SB Smythe Ave. thence southerly on Smythe Ave. to EB Beyer Blvd. thence easterly on Beyer Blvd. to Old Otay Mesa Rd./E. Beyer Blvd.

Erection and removal of falsework at locations where falsework openings are required shall be undertaken one location at a time. During falsework erection and removal, public traffic in the lanes over which falsework is being erected or removed shall be detoured or stopped as specified in this section, "Maintaining Traffic." Falsework erection shall include adjustments or removal of components that contribute to the horizontal stability of the falsework system**.** Falsework removal shall include lowering falsework, blowing sand from sand jacks, turning screws on screw jacks, and removing wedges.

The Contractor shall have necessary materials and equipment on the site to erect or remove the falsework over any one opening before detouring or stopping public traffic.

10-1.26 CLOSURE REQUIREMENTS AND CONDITIONS

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

CLOSURE SCHEDULE

By noon Monday, the Contractor shall submit a written schedule of planned closures for the following week period, defined as Sunday noon through the following Sunday noon. Closures involving work (temporary barrier placement and paving operations) that will reduce horizontal clearances, traveled way inclusive of shoulders, to 2 lanes or less shall be submitted not less than 25 days and not more than 125 days before the anticipated start of operation. Closures involving work (pavement overlay, overhead sign installation, falsework and girder erection) that will reduce the vertical clearances

available to the public, shall be submitted not less than 25 days and not more than 125 days before the anticipated start of operation.

The Closure Schedule shall show the locations and times of the proposed closures. The Closure Schedule request forms furnished by the Engineer shall be used. Closure Schedules submitted to the Engineer with incomplete or inaccurate information will be rejected and 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.

Closure Schedule amendments, including adding additional closures, shall be submitted by noon to the Engineer, in writing, at least 3 business days in advance of a planned closure. Approval of Closure Schedule amendments will be at the discretion of the Engineer.

The Engineer shall be notified of cancelled closures 2 business days before the date of closure.

Closures that are cancelled due to unsuitable weather may be rescheduled at the discretion of the Engineer.

CONTINGENCY PLAN

A detailed contingency plan shall be prepared for reopening closures to public traffic. If required by "Beginning of Work, Time of Completion and Liquidated Damages" of these special provisions, the contingency plan shall be submitted to the Engineer before work at the job site begins. Otherwise, the contingency plan shall be submitted to the Engineer within one business 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. No further closures are to be made 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 business days to accept or reject the Contractor's proposed work plan. The Contractor will not be entitled to compensation for the suspension of work resulting from the late reopening of closures.

COMPENSATION

The Engineer shall be notified of delays 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 and will be compensated in conformance with the provisions in Section 8-1.09, "Right of Way Delays," of the Standard Specifications:

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

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

10-1.27 IMPACT ATTENUATOR VEHICLE

GENERAL

Summary

Work includes protecting traffic and workers by using impact attenuator vehicle as a shadow vehicle when placing and removing components of a traffic control system, and when performing a moving lane closure.

Comply with Section 12-3.03, "Flashing Arrow Signs," of the Standard Specifications.

Impact attenuator vehicle must comply with the following test levels under National Cooperative Highway Research Program 350:

1. Test level 3 for pre-construction posted speed limit of 80 km/hr or more
2. Test levels 2 or 3 for pre-construction posted speed limit of 70 km/hr or less

Comply with the attenuator manufacturer's recommendations for:

1. Support truck
2. Trailer-mounted operation
3. Truck-mounted operation

Definitions

impact attenuator vehicle: Support truck towing a deployed attenuator mounted to a trailer or support truck with a deployed attenuator mounted to the support truck.

Submittals

Upon request, submit a Certificate of Compliance for attenuator to the Engineer under Section 6-1.07, "Certificates of Compliance," of the Standard Specifications.

Quality Control and Assurance

Attenuator must be a brand listed on the Department's pre-approved list at:

http://www.dot.ca.gov/hq/esc/approved_products_list/HighwaySafe.htm

MATERIALS

The combined mass of the support truck and the attenuator must be at least 9000 kg, except the mass of the support truck must not be less than 7300 kg or greater than 12000 kg.

If using the Trinity MPS-350 truck-mounted attenuator, the support truck must not have any underneath fuel tank mounted within 3.2 m of the rear of the support truck.

Each impact attenuator vehicle must:

1. Have standard brake lights, taillights, sidelights, and turn signals
2. Have an inverted "V" chevron pattern placed across the entire rear of the attenuator composed of alternating 100 mm wide non-reflective black stripes and 100 mm wide yellow retroreflective stripes sloping at 45 degrees
3. Have a Type II flashing arrow sign
4. Have a flashing or rotating amber light
5. Have an operable 2-way communication system for maintaining contact with workers

CONSTRUCTION

Use impact attenuator vehicle to follow behind equipment and workers who are placing and removing components of a traffic control system for a lane closure. Flashing arrow sign must be operating in arrow mode during this activity. Follow at a distance to prevent intrusion into the workspace from passing traffic.

After placing components of a traffic control system for a lane closure you may use impact attenuator vehicle in a closed lane and in advance of a work area to protect traffic and workers.

Use impact attenuator vehicle as a shadow vehicle under traffic control for a moving lane closure.

Secure objects including equipment, tools and ballast on impact attenuator vehicle to prevent loosening upon impact by an errant vehicle.

Do not use a damaged attenuator in the work. Replace, at your expense, an attenuator damaged from an impact during work.

MEASUREMENT AND PAYMENT

Full compensation for furnishing and operating impact attenuator vehicle is included in the contract lump sum price paid for traffic control system, and no additional compensation will be allowed therefor.

10-1.28 TRAFFIC CONTROL SYSTEM FOR LANE CLOSURE

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

The provisions in this section will not relieve the Contractor 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.

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

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

STATIONARY LANE CLOSURE

When lane closures are made for work periods only, at the end of each work period, 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.

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:

1. Hexfoam TMA Series 3000, Alpha 1000 TMA Series 1000, and Alpha 2001 TMA Series 2001, manufactured by Energy Absorption Systems, Inc., 35 East Wacker Drive, Suite 1100, Chicago, IL 60601:

    1.1. Northern California: Traffic Control Service, Inc., 8585 Thys Court, Sacramento, CA 95828, telephone (800) 884-8274, FAX (916) 387-9734
    1.2. Southern California: Traffic Control Service, Inc., 1818 E. Orangethorpe, Fullerton, CA 92831-5324, telephone (800) 222-8274, FAX (714) 526-9501

2. Cal T–001 Model 2 or Model 3, manufacturer and distributor: Hexcel Corporation, 11711 Dublin Boulevard, P.O. Box 2312, Dublin, CA 94568, telephone (925) 551–4900
3. 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 (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.

10-1.29 TEMPORARY PAVEMENT DELINEATION

Temporary pavement delineation shall be furnished, placed, maintained, and removed in conformance with the provisions in Section 12-3.01, "General," of the Standard Specifications and these special provisions. Nothing in these special provisions shall be construed as reducing the minimum standards specified in the California MUTCD or as relieving the Contractor from the responsibilities specified in Section 7-1.09, "Public Safety," of the Standard Specifications.

GENERAL

When the work causes obliteration of pavement delineation, temporary or permanent pavement delineation shall be in place before opening the traveled way to public traffic. Laneline or centerline pavement delineation shall be provided for traveled ways open to public traffic. On multilane roadways (freeways and expressways) edgeline delineation shall be provided for traveled ways open to public traffic.

The Contractor shall perform the work necessary to establish the alignment of temporary pavement delineation, including required lines or markers. Surfaces to receive application of paint or removable traffic tape temporary pavement delineation shall be dry and free of dirt and loose material. Temporary pavement delineation shall not be applied over existing pavement delineation or other temporary pavement delineation. Temporary pavement delineation shall be maintained until superseded or replaced with a new pattern of temporary pavement delineation or permanent pavement delineation, or as determined by the Engineer.

Temporary pavement markers, including underlying adhesive, and removable traffic tape that are applied to the final layer of surfacing or existing pavement to remain in place or that conflicts with a subsequent or new traffic pattern for the area shall be removed when no longer required for the direction of public traffic, as determined by the Engineer.

TEMPORARY LANELINE AND CENTERLINE DELINEATION

When lanelines or centerlines are obliterated and temporary pavement delineation to replace the lines is not shown on the plans, the minimum laneline and centerline delineation to be provided for that area shall be temporary pavement markers placed at longitudinal intervals of not more than 7.3 m. The temporary pavement markers shall be the same color as the laneline or centerline the pavement markers replace. Temporary pavement markers shall be, at the option of the Contractor, one of the temporary pavement markers listed for short term day/night use (14 days or less) or long term day/night use (180 days or less) in "Prequalified and Tested Signing and Delineation Materials" of these special provisions. The temporary pavement markers shall be placed in conformance with the manufacturer's instructions. Temporary pavement markers for long term day/night use (180 days or less) shall be cemented to the surfacing with the adhesive recommended by the manufacturer, except epoxy adhesive shall not be used to place the temporary pavement markers in areas where removal of the temporary pavement markers will be required.

Temporary laneline or centerline delineation consisting entirely of temporary pavement markers listed for short term day/night use (14 days or less), shall be placed on longitudinal intervals of not more than 7.3 m and shall be used for a maximum of 14 days on lanes opened to public traffic. Before the end of the 14 days the permanent pavement delineation shall be placed. If the permanent pavement delineation is not placed within the 14 days, the Contractor shall replace the temporary pavement markers and provide additional temporary pavement delineation and shall bear the cost thereof. The additional temporary pavement delineation to be provided shall be equivalent to the pattern specified for the permanent pavement delineation for the area, as determined by the Engineer.

TEMPORARY EDGELINE DELINEATION

On multilane roadways (freeways and expressways), when edgelines are obliterated and temporary pavement delineation to replace those edgelines is not shown on the plans, the edgeline delineation to be provided for those areas adjacent to lanes open to public traffic shall be as follows:

1. Temporary pavement delineation for right edgelines shall, at the option of the Contractor, consist of either paint or a solid 100-mm wide traffic stripe tape of the same color as the stripe it replaces, traffic cones, portable delineators or channelizers placed at longitudinal intervals not to exceed 30 m.
2. Temporary pavement delineation for left edgelines shall, at the option of the Contractor, consist of either paint or solid 100-mm wide traffic stripe tape of the same color as the stripe it replaces, traffic cones, portable delineators or channelizers placed at longitudinal intervals not to exceed 30 m or temporary pavement markers placed at longitudinal intervals of not more than 1.8 m.

The lateral offset for traffic cones, portable delineators or channelizers used for temporary edgeline delineation shall be as determined by the Engineer. If traffic cones or portable delineators are used as temporary pavement delineation for edgelines, the Contractor shall provide personnel to remain at the project site to maintain the cones or delineators during the hours of the day that the portable delineators are in use.

Channelizers used for temporary edgeline delineation shall be the surface mounted type and shall be orange in color. Channelizer bases shall be cemented to the pavement in the same manner provided for cementing pavement markers to pavement in "Pavement Markers" of these special provisions, except epoxy adhesive shall not be used to place channelizers on the top layer of pavement. Channelizers shall be, at the Contractor's option, one of the surface mount types (900 mm) listed in "Prequalified and Tested Signing and Delineation Materials" of these special provisions.

Temporary edgeline delineation shall be removed when no longer required for the direction of public traffic as determined by the Engineer.

TEMPORARY TRAFFIC STRIPE (TAPE)

If tape is used, placing the tape shall conform to the following:

A. The temporary traffic stripe tape shall be complete in place at the location shown before opening the traveled way to public traffic.
B. Removable traffic stripe tape shall be the temporary removable traffic stripe tape as listed in "Prequalified and Tested Signing and Delineation Materials" of these special provisions.
C. Removable traffic stripe tape shall be applied in conformance with the manufacturer's installation instructions and shall be rolled slowly with a rubber tired vehicle or roller to ensure complete contact with the pavement surface. Traffic stripe tape shall be applied straight on tangent alignment and on a true arc on curved alignment. Traffic stripe tape shall not be applied when the air or pavement temperature is less than 10°C, unless the installation procedures to be used are approved by the Engineer, before beginning installation of the tape.

TEMPORARY TRAFFIC STRIPE (PAINT)

The painted temporary traffic stripe shall be complete in place at the location shown before opening the traveled way to public traffic. Painted temporary traffic stripe delineation shall be removed when no longer required for the direction of public traffic as determined by the Engineer.

Temporary painted traffic stripe shall conform to the provisions in "Paint Traffic Stripe and Pavement Marking" of these special provisions,except for payment. At the option of the Contractor, either one or 2 coats shall be applied regardless of whether on new or existing pavement.

TEMPORARY PAVEMENT MARKING (PAINT)

Temporary pavement marking consisting of painted pavement marking shall be applied and maintained at the locations shown on the plans. The painted temporary pavement marking shall be complete in place at the location shown before opening the traveled way to public traffic. Removal of painted temporary pavement marking will not be required.

Temporary painted pavement marking shall conform to the provisions in "Paint Traffic Stripe and Pavement Marking" of these special provisions, except for payment. At the option of the Contractor, either one or 2 coats shall be applied regardless whether on new or existing pavement.

At the Contractor's option, temporary removable pavement marking tape or permanent pavement marking tape listed in "Prequalified and Tested Signing and Delineation Materials" of these special provisions may be used instead of painted temporary pavement markings. When pavement marking tape is used, regardless of which type of tape is placed, the tape will be measured and paid for by the square meter as temporary pavement marking (paint).

TEMPORARY PAVEMENT MARKERS

Temporary pavement markers shall be applied complete in place before opening the traveled way to public traffic.

Temporary pavement markers shall be, at the option of the Contractor, one of the temporary pavement markers for long term day/night use (180 days or less) listed in "Prequalified and Tested Signing and Delineation Materials" of these special provisions.

Temporary pavement markers shall be placed in conformance with the manufacturer's instructions and shall be cemented to the surfacing with the adhesive recommended by the manufacturer, except epoxy adhesive shall not be used in areas where removal of the pavement markers will be required.

Retroreflective pavement markers conforming to the provisions in "Pavement Markers" of these special provisions may be used in place of temporary pavement markers for long term day/night use (180 days or less) except to simulate patterns of broken traffic stripe. Placement of the retroreflective pavement markers used for temporary pavement markers shall conform to the provisions in "Pavement Markers" of these special provisions except the waiting period provisions before placing the pavement markers on new hot mix asphalt surfacing as specified in Section 85-1.06, "Placement," of the Standard Specifications shall not apply and epoxy adhesive shall not be used to place pavement markers in areas where removal of the pavement markers will be required.

MEASUREMENT AND PAYMENT

Temporary traffic stripe (paint) and temporary pavement marking (paint) shown on the plans will be measured and paid for in the same manner specified for paint traffic stripe and paint pavement marking in Section 84-3.06, "Measurement," and Section 84-3.07, "Payment," of the Standard Specifications.

Removal of temporary traffic stripe (paint) and temporary pavement marking (paint) will be measured and paid as remove traffic stripe and pavement marking conforming to Section 15, "Existing Highway Facilities," of the Standard Specifications.

Temporary pavement markers shown on the plans will be measured and paid for by the unit in the same manner specified for retroreflective pavement markers in Section 85-1.08, "Measurement," and Section 85-1.09, "Payment," of the Standard Specifications.

Removal of temporary pavement marker will be measured and paid for as remove pavement markers conforming to remove pavement markers, except for pavement markers not shown on the plans, of these special provisions.

Full compensation for furnishing, placing, maintaining, and removing the temporary pavement markers (including underlying adhesive, layout (dribble) lines to establish alignment of temporary pavement markers or used for temporary laneline and centerline delineation) for those areas where temporary laneline and centerline delineation is not shown on the plans and for providing equivalent patterns of permanent traffic lines for those areas when required, shall be considered as included in the contract prices paid for the items of work that obliterated the laneline and centerline pavement delineation and no separate payment will be made therefor.

Full compensation for furnishing, placing, maintaining, and removing temporary edgeline delineation not shown on the plans shall be considered as included in the contract prices paid for the items of work that obliterated the edgeline pavement delineation and no separate payment will be made therefor. The quantity of channelizers used as temporary edgeline delineation will not be included in the quantity of channelizer (surface mounted) to be paid for.

10-1.30 BARRICADE

Barricades shall be furnished, placed and maintained at the locations shown on the plans, specified in the Standard Specifications or in these special provisions or where designated by the Engineer. Barricades shall conform to the provisions in Section 12, "Construction Area Traffic Control Devices," of the Standard Specifications and these special provisions.

Attention is directed to "Prequalified and Tested Signing and Delineation Materials" of these special provisions regarding retroreflective sheeting for barricades.

At the time of completion of the project, certain barricades shall be left in place as directed by the Engineer. In addition to the contract unit price or prices paid for the type or types of barricades, the cost of leaving the barricades in place will be paid for at the contract unit price for barricade (left in place).

Construction area sign and marker panels conforming to the provisions in Section 12-3.06, "Construction Area Signs," of the Standard Specifications shall be installed on barricades in a manner determined by the Engineer at the locations shown on the plans.

Sign panels for construction area signs and marker panels installed on barricades shall conform to the provisions in Section 12-3.06A, "Stationary Mounted Signs," of the Standard Specifications.

Full compensation for furnishing, installing, maintaining, and removing construction area signs and marker panels on barricades shall be considered as included in the contract unit price paid for the type of barricade involved and no separate payment will be made therefor.

Barricades shown on the plans as part of a traffic control system will be paid for as provided in "Traffic Control System for Lane Closure" of these special provisions and will not be included in the count for payment of barricades.

10-1.31 PORTABLE CHANGEABLE MESSAGE SIGN

Portable changeable message signs shall be furnished, placed, operated, and maintained at locations shown on the plans or where designated 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. Messages displayed on the portable changeable message signs shall be as specified on the plans and shall conform to Section 12-3.12 "Portable Changeable Message Signs," of the Standard Specifications and "Maintaining Traffic" of these special provisions."

The Contractor shall have 10 portable changeable message signs on the project at all times.

A portable changeable message sign shall be placed in advance of the first warning sign for each stationary lane closure.

A portable changeable message sign shall be placed during speed zone reductions. When used in conjunction with a lane closure, use one portable changeable message sign, with both the speed zone reduction and the lane closure messages.

10-1.32 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.

Temporary railing (Type K) shall be secured in place before starting work for which the temporary railing is required.

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

10-1.33 CHANNELIZER (SURFACE MOUNTED)

Channelizers (surface mounted) 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.

10-1.34 CHANNELIZER (SURFACE MOUNTED) (LEFT IN PLACE)

Channelizers (surface mounted) (left in place), 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.

The contract unit price paid for channelizer (surface mounted) (left in place) shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in furnishing and installing channelizers, complete in place, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

10-1.35 TRAFFIC PLASTIC DRUMS

GENERAL

Summary

Work includes placing traffic plastic drums.

Comply with:

1. Section 12, "Construction Area Traffic Control Devices," of the Standard Specifications
2. Section 6F.62, "Drums," of the California Manual On Uniform Traffic Control Devices
3. Traffic plastic drum manufacturer's recommendations for weight and ballast

Definitions

orange-colored: Orange-colored may be either orange, red-orange, fluorescent orange or fluorescent red-orange in color.

Submittals

Upon request, submit a Certificate of Compliance for Traffic Plastic Drum under Section 6-1.07, "Certificates of Compliance," of the Standard Specifications.

Quality Control and Assurance

White and orange-colored retroreflective stripes must be a brand of retroreflective sheeting listed on the Department's "Prequalified and Tested Signing and Delineation Materials," of these special provisions. White and orange-colored stripe may be either Type III, Type IV, Type VI, Type VII, Type VIII, or Type IX retroreflective sheeting. Use the same type and brand of retroreflective sheeting for all traffic plastic drums.

MATERIALS

Traffic plastic drum must:

1. Be orange-colored low-density polyethylene
2. Be flexible and collapsible upon vehicle impact
3. Have a weighted-base to maintain an upright position and prevent displacement under passing traffic

Weighted-base must be:

1. Detachable
2. Shaped to prevent rolling upon impact
3. 970-mm maximum outside diameter
4. 100-mm maximum height above the ground surface

CONSTRUCTION

Place a traffic plastic drum on only one side of the traveled way, in a straight line on a tangent alignment, and in a true arc on a curved alignment.

Use only one type of traffic plastic drum on the job site. Do not intermix traffic plastic drums, portable delineators, tubular markers, traffic cones, and Type I and Type II barricades on the same alignment.

Do not use sandbags or comparable ballast.

Traffic plastic drum must be a minimum of 900 mm in height above the traveled way.

Immediately restore a displaced traffic plastic drum to its original location and upright position.

Upon completion of work, traffic plastic drums become your property and must be removed from the job site.

MEASUREMENT AND PAYMENT

Traffic plastic drum is measured by the unit from actual count designated on the plans or ordered by the Engineer.

After initial placement of traffic plastic drums, and if ordered by the Engineer, traffic plastic drums must be moved from location to location, the cost thereof will be paid for as extra work as specified in Section 4-1.03D, "Extra Work," of the Standard Specifications.

The contract unit price paid for traffic plastic drum includes full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in placing and maintaining traffic plastic drums, complete in place, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

10-1.36 TEMPORARY CRASH CUSHION MODULE

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

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

Temporary crash cushions shall be secured in place prior to commencing work for which the temporary crash cushions are required.

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.

Sand filled temporary crash cushion modules shall be one of the following, or equal, and be manufactured after March 31, 1997:

1. Energite III and Fitch Inertial Modules, manufactured by Energy Absorption Systems, Inc., 35 East Wacker Drive, Suite 1100, Chicago, IL 60601:

    1.1. Northern California: Traffic Control Service, Inc., 8585 Thys Court, Sacramento, CA 95828, telephone (800) 884-8274, FAX (916) 387-9734
    1.2. Southern California: Traffic Control Service, Inc., 1818 E. Orangethorpe, Fullerton, CA 92831-5324, telephone (800) 222-8274, FAX (714) 526-9501

2. TrafFix Sand Barrels, manufactured by TrafFix Devices, Inc., 220 Calle Pintoresco, San Clemente, CA 92672, telephone (949) 361-5663, FAX (949) 361-9205

    2.1. Northern California: United Rentals, Inc., 1533 Berger Drive, San Jose, CA 95112, telephone (408) 287-4303, FAX (408) 287-1929
    2.2. Southern California: Statewide Safety & Sign, Inc., P.O. Box 1440, Pismo Beach, CA 93448, telephone (800) 559-7080, FAX (805) 929-5786

3. CrashGard Model CC-48 Sand Barrels, manufactured by Plastic Safety Systems, Inc., 2444 Baldwin Road, Cleveland, OH 44104:

    3.1. Northern California:

        3.1.1. Capitol Barricade Safety & Sign, 6329 Elvas Ave, Sacramento, CA 95819, telephone (888) 868-5021, FAX (916) 451-5388
        3.1.2. Sierra Safety, Inc., 9093 Old State Highway, New Castle, CA 95658, telephone (916) 663-2026, FAX (916) 663-1858

    3.2. Southern California: Hi Way Safety Inc., 13310 5th Street, Chino, CA 91710, telephone (909) 591-1781, FAX (909) 627-0999

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

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

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

Temporary crash cushion modules will be measured by the unit as determined from the actual count of modules used in the work or ordered by the Engineer at each location. Temporary crash cushion modules placed in conformance with the provisions in "Public Safety" of these special provisions and modules placed in excess of the number specified or shown will not be measured nor paid for.

Repairing modules damaged by public traffic will be paid for as extra work as provided in Section 4-1.03D of the Standard Specifications. Modules damaged beyond repair by public traffic, when ordered by the Engineer, shall be removed and replaced immediately by the Contractor. Modules replaced due to damage by public traffic will be measured and paid for as temporary crash cushion module.

If the Engineer orders a lateral move of the sand filled temporary crash cushions and the repositioning is not shown on the plans, moving the sand filled temporary crash cushion will be paid for as extra work as provided in Section 4-1.03D of the Standard Specifications and these temporary crash cushion modules will not be counted for payment in the new position.

The contract unit price paid for temporary crash cushion module shall include full compensation for furnishing all labor, materials (including sand, pallets or frames and marker panels), tools, equipment, and incidentals, and for doing all the work involved in furnishing, installing, maintaining, moving, and resetting during a work period for access to the work, and removing from the site of the work when no longer required (including those damaged by public traffic) sand filled temporary crash cushion modules, complete in place, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

10-1.37 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.

ABANDON CULVERT

Existing culverts where shown on the plans to be abandoned, shall be abandoned in place or, at the option of the Contractor, the culverts shall be removed and disposed of. Resulting openings into existing structures that are to remain in place shall be plugged with concrete conforming to the provisions in Section 90-10 "Minor Concrete," of the Standard Specifications. The concrete shall contain not less than 300 kg of cementitious material per cubic meter.

Abandoning culverts in place shall conform to the following:

1. Culverts that intersect the side slopes shall be removed to a depth of not less than one meter measured normal to the plane of the finished side slope, before being abandoned.
2. Culverts 300 mm in diameter and larger, shall, at the Contractor's option, be backfilled with either sand, controlled low strength material or slurry cement backfill conforming to the provisions in Section 19-3.062, "Slurry Cement Backfill," of the Standard Specifications by any method acceptable to the Engineer that completely fills the pipe. Sand backfill material shall be clean, free draining, and free from roots and other deleterious substances.
3. The ends of culverts shall be securely closed by a 150 mm thick tight fitting plug or wall of commercial quality concrete.

Culverts shall not be abandoned until their use is no longer required. The Contractor shall notify the Engineer in advance of any intended culvert abandonment.

If the Contractor elects to remove and dispose of a culvert which is specified to be abandoned, as provided herein, backfill specified for the culvert will be measured and paid for in the same manner as if the culvert has been abandoned in place.

Backfill will be measured by the cubic meter determined from the dimensions of the culverts to be abandoned.

The contract price paid per cubic meter for sand backfill shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in backfilling culverts with sand, complete in place, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

Controlled low strength material and slurry cement backfill, if used at the Contractor's option, will be measured and paid for by the cubic meter as sand backfill.

Full compensation for concrete plugs, pipe removal, structure excavation, and backfill shall be considered as included in the contract unit price paid for abandon culvert and no additional compensation will be allowed therefor.

ABANDON INLET

Existing pipe inlets and concrete drainage inlets, where shown on the plans to be abandoned, shall be abandoned.

The top portion of the inlets shall be removed to a depth of 0.3 m below finished grade.

Removed frames and grates shall be disposed of.

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 PAVEMENT MARKER

Existing pavement markers, including underlying adhesive, and pavement markers, including underlying adhesive, shown on the stage construction and traffice handling plans when no longer required for traffic lane delineation as determined by the Engineer, shall be removed and disposed of.

Full compensation for removing and disposing of pavement markers and underlying adhesive including pavement markers and underlying adhesive shown on the stage construction and traffic handling plans, shall be considered as included in the contract price paid per tonne for hot mix asphalt and no separate payment will be made therefor.

REMOVE TRAFFIC STRIPE

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

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

Waste from removal of yellow painted traffic stripe contains lead chromate in average concentrations greater than or equal to 5 mg/L Soluble Lead or 1000 mg/kg Total Lead. Yellow paint traffic stripe exists from Station 14+80 to Station 19+79 "AW" and from Station 96+00 to Station 96+35 "CAL" and from Station 99+05 to Station 99+35 "CAL". Residue produced from the removal of yellow paintcontains heavy metals in concentrations that exceed thresholds established by the California Health and Safety Code and Title 22 of the California Code of Regulations. The Contractor shall assume that the residue is not regulated under the Federal Resource Conservation and Recovery Act (RCRA). Yellow paint may produce toxic fumes when heated.

The removed yellow paint shall be disposed of at a Class 1 disposal facility in conformance with the requirements of the disposal facility operator within 30 days after accumulating 100 kg of residue and dust. The Contractor shall make necessary arrangements to test the yellow paintresidue as required by the disposal facility and these special provisions. Testing shall include, at a minimum, (1) Total Lead by EPA Method 6010B and Chromium by EPA Method 7000 series, (2) Soluble Lead and Chromium by California Waste Extraction Test, and (3) Soluble Lead and Chromium by Toxicity Characteristic Leaching Procedure. From the first 840 L of waste or portion thereof, if less than 840 L of waste are produced, a minimum of four randomly selected samples shall be taken and analyzed individually. Samples shall not be composited. From each additional 3360 L of waste or portion thereof, if less than 3360 L are produced, a minimum of one additional random sample shall be taken and analyzed. Each sample shall be homogenized prior to analysis by the laboratory performing the analyses. A sample aliquot sufficient to cover the amount necessary for the total and the soluble analyses shall then be taken. This aliquot shall be homogenized a second time and the total and soluble (if necessary) run on this aliquot. The homogenization process shall not include grinding of the samples. The Contractor shall submit the name and location of the disposal facility and analytical laboratory along with the testing requirements to the Engineer not less than 5 days prior to the start of removal of yellow painted traffic stripe. The analytical laboratory shall be certified by the Department of Health Services Environmental Laboratory Accreditation Program for all analyses to be performed. Test results shall be provided to the Engineer for review prior to signing a waste profile as requested by the disposal facility, prior to issuing an EPA identification number, and prior to allowing removal of the waste from the site.

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

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

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

Personal protective equipment, training, and washing facilities required by the Contractor's Lead Compliance Plan shall be supplied to State personnel by the Contractor. The number of State personnel will be 3.

Where grinding or other methods approved by the Engineer are used to remove yellow painted traffic stripe, the removed residue, including dust, shall be contained and collected immediately. Collection shall be by a high efficiency particulate air (HEPA) filter equipped vacuum attachment operated concurrently with the removal operations or other equally effective methods approved by the Engineer. The Contractor shall submit a written work plan for the removal, storage, and disposal of yellow painted traffic to the Engineer for approval not less than 15 days prior to the start of the removal operations. Removal operations shall not be started until the Engineer has approved the work plan.

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

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

Additional disposal costs for removal residue regulated under RCRA, as determined by test results, will be paid for as extra work as provided in Section 4-1.03D, "Extra Work," of the Standard Specifications.

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

Attention is directed to "Material Containing Lead and Burn Ash Materials" of these special provisions regarding payment for the Lead Compliance Plan. One Lead Compliance Plan shall be prepared that addresses exposure to lead from traffic stripe and pavement marking and from burn ash material.

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

REMOVE ROADSIDE SIGN

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

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

RESET ROADSIDE SIGN

Existing roadside signs, where shown on the plans to be reset, shall be removed and reset.

Each roadside sign shall be reset on the same day that the sign is removed.

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

RELOCATE ROADSIDE SIGN

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

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

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

REMOVE BASE AND SURFACING

Existing base and bituminous surfacing shown on the plans to be removed, shall be removed to a depth of at least 150 mm below the grade of the existing surfacing. Resulting holes and depressions shall be backfilled with earthy material selected from excavation to the lines and grade established by the Engineer.

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

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

COLD PLANE ASPHALT CONCRETE PAVEMENT

Existing asphalt concrete pavement shall be cold planed at the locations and to the dimensions shown on the plans.

The Contractor shall schedule paving operations so that cold planed areas are paved with asphalt concrete within the same work shift.

Planing asphalt concrete pavement shall be performed by the cold planing method. Planing of the asphalt concrete pavement shall not be done by the heater planing method.

Cold planing machines shall be equipped with a cutter head not less than 750 mm in width and shall be operated so that no fumes or smoke will be produced. The cold planing machine shall plane the pavement without requiring the use of a heating device to soften the pavement during or prior to the planing operation.

The depth, width, and shape of the cut shall be as shown on the plans or as designated by the Engineer. The final cut shall result in a uniform surface conforming to the plans. The outside lines of the planed area shall be neat and uniform. Planing asphalt concrete pavement operations shall be performed without damage to the surfacing to remain in place.

Planed widths of pavement shall be continuous except for intersections at cross streets where the planing shall be carried around the corners and through the conform lines.

The material planed from the roadway surface, including material deposited in existing gutters or on the adjacent traveled way, 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. Removal operations of cold planed material shall be concurrent with planing operations and follow within 15 m of the planer, unless otherwise directed by the Engineer.

Cold plane asphalt concrete pavement will be measured by the square meter. The quantity to be paid for will be the actual area of surface cold planed irrespective of the number of passes required to obtain the depth shown on the plans.

The contract price paid per square meter for cold plane asphalt concrete pavement shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in cold planing asphalt concrete surfacing and disposing of planed material, including furnishing the HMA for and constructing, maintaining, removing, and disposing of temporary HMA tapers, as specified in the Standard Specifications and these special provisions and as directed by the Engineer.

REMOVE CONCRETE

Concrete, where shown on the plans to be removed, shall be removed.

The pay quantities of concrete to be removed, except concrete barrier (type K) will be measured by the cubic meter, measured before and during removal operations.

Removal of miscellaneous steel poles and other items attached to the surface of concrete to be removed will be paid for as extra work as provided in Section 4-l.03D of the Standard Specifications.

Removing concrete barrier (type K) will be measured by the meter, measured along the barrier before removal operations.

Concrete within construction limits, both inside and outside the highway right of way, shall be removed, except for curbs and sidewalks adjacent to frontage roads and through city streets.

Where no joint exists between concrete to be removed and concrete to remain in place, the concrete shall be cut on a neat line to a minimum depth of 50 mm with a power driven saw before the concrete is removed.

Where concrete has been removed outside the roadway prism, the backfilled areas shall be graded to drain and blend in with the surrounding terrain.

Concrete to be removed which has portions of the same structure both above and below ground will be considered as concrete above ground for compensation.

10-1.38 CLEARING AND GRUBBING

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

Vegetation shall be cleared and grubbed only within the excavation and embankment slope lines.

Attention is directed to "Migratory Birds" of these special provisions.

VEGETATION MOWING AND TREE REMOVAL PRIOR TO THE MIGRATORY BIRD NESTING PERIOD

All vegetation within the limits of clearing shall be mowed or cut to a minimum of 100 mm or a maximum of 200 mm from original ground. Soil and roots shall not be scraped or removed. All vegetation stems, branches, and leaves may be left in place as long as the debris does not exceed a height of 600 mm from the original grade when cutting is complete.

Vegetation may be chipped or recut after the initial cutting to achieve depth less than 600 mm.

Trees and plants within the limits of clearing shall be removed.

All trees shall be cut off not more than 600 mm above the natural ground at any point, or completely removed. All materials shall be left in a neat and finished appearance.

Full compensation for vegetation mowing and tree removal prior to the migratory bird nesting period shall be considered as included in the contract price paid for clearing and grubbing and no additional compensation will be allowed therefor.

10-1.39 WATERING

Developing a water supply and applying watering shall conform to the provisions in Section 17, "Watering," of the Standard Specifications and these special provisions.

Attention is directed to the source or sources of water for use on the project specified in the "Materials Information" handout available to the contractors.

10-1.40 EARTHWORK

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

Areas of embankment shall include foundation treatment. Foundation treatment shall include the removal of the top 600 mm of existing soil and replacement with excavated material as shown on the plans. Relative compaction of 90 percent shall be obtained. The existing material may be removed and recompacted provided that relative compaction of 90 percent is obtained.

Foundation treatment will be measured and paid for as roadway excavation.

The selected material shown on the plans shall conform to the following:

Quality Requirements

Test	Contract Compliance
Resistance Value (R-value)	10 Min.
Plasticity Index (PI)	12 Max.

Selected material with a Sand Equivalent of 15 or more will be accepted instead of the R-value and PI requirements.

Surplus excavated material shall become the property of the Contractor and shall be disposed of in conformance with the provisions in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications.

Where a portion of the existing surfacing is to be removed, the outline of the area to be removed shall be cut on a neat line with a power-driven saw to a minimum depth of 50 mm before removing the surfacing. Full compensation for cutting the existing surfacing shall be considered as included in the contract price paid per cubic meter for roadway excavation and no additional compensation will be allowed therefor.

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

Settlement periods are required at the bridges listed in the following table.

Bridge Name or Number	Abutment Number	Bent Number	Surcharge Height (meters)	Settlement Period (days)
Heritage Road UC	1	_____	___0.0*___	30

* At this location, the surcharge embankment shall be constructed by extending the grading plane (GP) in the "Elevation" view of the "Bridge Embankment Surcharge" detail of Standard Plan A62B horizontally to the centerline of abutment.

Attention is directed to "Clay Cap" of these special provisions.

Settlement periods are required for the roadway embankments at thelisted in the following table.

Surcharge embankments shall be constructed at or above the grading plane where listed in the following table.

Location	Surcharge Height (meters)	Settlement Period (days)
156+40 to 156+90 "E5" Line	3.3	60

The duration of the required settlement period at each location will be determined by the Engineer. The estimated duration of the settlement periods are listed in the tables of settlement data. The Engineer may order an increase or decrease in any settlement period. An ordered increase or decrease in any settlement period will result in an increase or decrease in the number of contract working days if the settlement period involved is considered to be the current controlling operation in conformance with the provisions in Section 8-1.06, "Time of Completion," of the Standard Specifications. Adjustments of contract time due to increases or decreases in settlement periods will be made by contract change order.

The removal of surplus embankment material placed as a settlement or surcharge embankment, including material removed to conform to the finished slope lines shown on the plans, will be paid for at the contract price per cubic meter for roadway excavation.

At the locations and to the limits shown on the plans, material below the bottom of bridge footings shall be removed and replaced with lean concrete or Class 3 concrete, as shown on the plans. Removal of the material will be measured and paid for by the cubic meter as structure excavation (bridge). Furnishing and placing lean concrete replacement material will be measured and paid for by the cubic meter as lean concrete backfill. Furnishing and placing Class 3 concrete replacement material will be measured and paid for by the cubic meter as Class 3 concrete (backfill).

Lean concrete backfill shall conform to the provisions for slurry cement backfill in Section 19-3.062, "Slurry Cement Backfill," of the Standard Specifications, except that aggregate shall be sand suitable for making commercial quality concrete.

The Contractor shall notify the Engineer in writing not less than 5 working days in advance of excavating below the bottom of bridge footings. The Contractor shall allow 5 working days for the Engineer to inspect and approve the excavation prior to lean concrete backfill.

In the event additional excavation and replacement material are deemed necessary by the Engineer, the extra work will be paid for as provided in Section 4-1.03D of the Standard Specifications.

Geocomposite drain shall conform to the details shown on the plans and the following:

A. Attention is directed to "Engineering Fabrics" under "Materials" of these special provisions.
B. Geocomposite drain shall consist of a manufactured core not less than 6.35 mm thick nor more than 50 mm thick with one or both sides covered with a layer of filter fabric that will provide a drainage void. The drain shall produce a flow rate, through the drainage void, of at least 25 liters per minute per meter of width at a hydraulic gradient of 1.0 and a minimum externally applied pressure of 168 kPa.
C. A Certificate of Compliance conforming to the provisions in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications shall be furnished for the geocomposite drain certifying that the drain produces the required flow rate and complies with these special provisions. The Certificate of Compliance shall be accompanied by a flow capability graph for the geocomposite drain showing flow rates for externally applied pressures and hydraulic gradients. The flow capability graph shall be stamped with the verification of an independent testing laboratory.
D. Filter fabric for the geocomposite drain shall conform to the provisions for fabric for underdrains in Section 88, "Engineering Fabrics," of the Standard Specifications.
E. The manufactured core shall be either a preformed grid of embossed plastic, a mat of random shapes of plastic fibers, a drainage net consisting of a uniform pattern of polymeric strands forming 2 sets of continuous flow channels, or a system of plastic pillars and interconnections forming a semirigid mat.
F. The core material and filter fabric shall be capable of maintaining the drainage void for the entire height of geocomposite drain. Filter fabric shall be integrally bonded to the side of the core material with the drainage void. Core material manufactured from impermeable plastic sheeting having nonconnecting corrugations shall be placed with the corrugations approximately perpendicular to the drainage collection system.
G. The geocomposite drain shall be installed with the drainage void and the filter fabric facing the embankment. The fabric facing the embankment side shall overlap a minimum of 75 mm at all joints and wrap around the exterior edges a minimum of 75 mm beyond the exterior edge. If additional fabric is needed to provide overlap at joints and wrap-around at edges, the added fabric shall overlap the fabric on the geocomposite drain at least 150 mm and be attached thereto.
H. Should the fabric on the geocomposite drain be torn or punctured, the damaged section shall be replaced completely or repaired by placing a piece of fabric that is large enough to cover the damaged area and provide a minimum 150-mm overlap.
I. Plastic pipe shall conform to the provisions for edge drain pipe and edge drain outlets in Section 68-3, "Edge Drains," of the Standard Specifications.
J. Treated permeable base to be placed around the slotted plastic pipe at the bottom of the geocomposite drain shall be cement treated permeable base conforming to the provisions for cement treated permeable base in Section 29, "Treated Permeable Bases," of the Standard Specifications and these special provisions.

K. The treated permeable base shall be enclosed with a high density polyethylene sheet or PVC geomembrane, not less than 250 µm thick, which is bonded with a suitable adhesive to the concrete and geocomposite drain. Surfaces to receive the polyethylene sheet shall be cleaned before applying the adhesive. The treated permeable base shall be compacted with a vibrating shoe type compactor.

If structure excavation or structure backfill for bridges is not otherwise designated by type and payment for the structure excavation or structure backfill has not otherwise been provided for in the Standard Specifications or these special provisions, the structure excavation or structure backfill will be measured and paid for as structure excavation (bridge) or structure backfill (bridge), respectively.

Full compensation for geocomposite drain shall be considered as included in the contract price paid per cubic meter for structure concrete (bridge) and no additional compensation will be allowed therefor.

10-1.41 GEOSYNTHETIC REINFORCED EMBANKMENT

This work shall consist of placing geosynthetic reinforcement between layers of compacted fill and placing reinforced concrete crib wall members on the embankment slope face in accordance with the details shown on the plans, as specified in Section 19 "Earthwork," of the Standard Specifications and these special provisions.

Drainage system and other facilities shall be constructed in the geosynthetic reinforced embankment in conformance with the details shown on the plans and these special provisions.

REINFORCED CONCRETE CRIB MEMBERS

Reinforced concrete crib members shall be constructed in conformance with Section 51, "Concrete Structures," of the Standard Specifications and these special provisions.

The crib wall members shall consist of a series of interlocking precast reinforced concrete headers and stretchers and shall be placed in accordance with the details shown on the plans and these special provisions.

Reinforcing steel shall conform to the requirements in ASTM Designation: A 615, Grade 60, or A 706 and reinforcing wire shall conform to the requirements in ASTM Designation: A 496.

Crib wall members shall be colored. The color shall closely resemble Davis manufacturer's color "Sandstone." The color shall be integral, chemically inert, fade resistant mineral oxide or synthetic type.

The provisions in Section 51-1.18, "Surface Finishes," of the Standard Specifications shall not apply to concrete crib members.

The members shall be handled in such a manner as to prevent breakage. Members that are damaged during handling and placing shall be removed and replaced with new members by the Contractor at the Contractor's expense.

GEOSYNTHETIC REINFORCEMENT

Only one type of geosynthetic reinforcement material shall be used for an entire embankment, except as shown on the plans.

Filter fabric, conforming to the provisions in Section 88, "Engineering Fabrics," of the Standard Specifications, shall be placed in the geosynthetic reinforced embankment at the locations shown on the plans.

Geosynthetic reinforcement materials shall consist of material designed for use in subsurface geotechnical slope reinforcement applications. Geosynthetic reinforcement shall be configured as either a geogrid or geotextile. Geogrid shall have a regular and defined open area. Geogrid shall provide pullout resistance from the soil by a combination of soils shearing friction on the plane surfaces parallel to the direction of shearing and soils bearing on transverse grid surfaces normal to the direction of grid movement. The percentage of the open area for geogrids shall range from 50 to 90 percent of the total projection of a section of the material. Geotextiles shall have an irregular or regular open area with the spacing of open areas being less than 6.3 millimeters in any direction.

Material Properties

Geosynthetic reinforcement shall meet the following requirements:

A. Geosynthetic reinforcement shall have Long Term Design Strength (LTDS) in the primary strength direction greater or equal to values shown on the plans or the following table:

Geosynthetic Reinforcement Type	LTDS (kN/m)
Type 1	50
Type 2	35

LTDS for geosynthetic reinforcement shall be determined by Standard Practice GRI GG4a for stiff geogrids and GRI GG4b for flexible geogrids, and GT7 for geotextiles, respectively. These values shall be minimum average roll values in the machine direction.

B. Reduction factors applied to the ultimate strength are determined in accordance with GRI GG4a, GRI GG4b, and GRI GT7. The product of the reduction factors of less than 1.30 is not allowed. The reduction factor for creep shall be determined for a 75-year design life as determined by GRI GG4a and GRI GG4b for geogrids and GRI GT7 for geotextiles.

C. In the absence of specific test data, the default values of reduction factors (installation damage, creep, chemical degradation, biological degradation, and joint) as indicated in the Standard Practice GRI GG4a and GRI GG4b and GRI GT7 shall be applied to the calculations of the LTDS.

All test results used in the calculations of the LTDS shall be submitted to the Engineer no less than 15 working days prior to placement of the geosynthetic reinforcement. The calculation shall itemize each reduction factors. Splice efficiency shall be accounted for in the calculations. All test results that contribute to the calculations of the LTDS shall be prepared and signed by a California-registered Civil Engineer.

Geosynthetic reinforcement shall consist of high density polyethylene, polypropylene, high density polypropylene sheets, high tenacity polyester yarn, or polyaramide.

Geosynthetic reinforcement consisting of high density polyethylene shall be manufactured from high density polyethylene (HDPE) which conforms to ASTM Designation: D 1248.

Geosynthetic reinforcement consisting of polypropylene or high-density polypropylene sheets shall meet the requirements of ASTM Designation: D 4101.

Geosynthetic reinforcement consisting of high tenacity polyester yarn shall be manufactured from high tenacity polyester yarn as determined by ASTM Designation: D 629. In addition to meeting the requirements for geosynthetic, geogrid shall be encapsulated in an acrylic latex, PVC, polymer or similar coating; shall be sheathed in polyethylene; or shall be polyvinyl chloride impregnated.

Geosynthetic reinforcement consisting of polyaramide shall be manufactured from high tenacity polyester yarn as determined by ASTM Designation: D 629.

A certificate of compliance shall be furnished to the Engineer in conformance with Section 6-1.07, "Certificate of Compliance," of the Standard Specifications a minimum of one week prior to placement of geosynthetic reinforcement. The Certificate of Compliance shall be prepared and signed by a representative of the manufacturer who is a California-registered Civil Engineer.

Delivery, Handling, and Storage

Geosynthetic reinforcement shall be furnished in an appropriate protective cover which shall protect it from ultraviolet radiation and from abrasion during shipping and handling or a protective cover shall be provided on site.

The Contractor shall check products upon delivery to assure that the Geosynthetic reinforcement received is dry and undamaged. Each roll shall be labeled with the manufacturer's name, production identification, roll dimensions, lot number, and date manufactured.

Geosynthetic reinforcement shall be handled and stored in accordance with the manufacturer’s recommendations.

Geosynthetic rolls shall be protected from construction equipment, chemicals, sparks and flames, temperatures in excess of 70°C (160°F), and any other environmental conditions that may degrade physical properties. To prevent geosynthetic material from being saturated, if stored outdoors, the rolls shall be elevated from the ground surface or placed on a sacrificial sheet of plastic in an area where water will not accumulate..

EMBANKMENT BACKFILL

The material shall be free from organic material and substantially free from shale or other soft, poor durability particles; shall not contain recycled materials, such as glass, shredded tires, Portland cement concrete rubble, asphaltic concrete rubble, or other unsuitable materials as determined by the Engineer; and shall conform to the following requirements:

PROPERTY	VALUE	CA TEST NO.
Sieve Size, mm	Percent Passing	202
37.5	100	202
19	75-100	202
4.75	20-100	202
0.42	0-60	202
0.075	0-50	202
Quality Requirements		
Test	Operating	
Plasticity Index	20 max	204
pH	5 to 9	643

Select Material

Backfill material within 1 meter of the slope face (measured parallel to slope gradient) shall conform to Section 19-2.07, 'Selected Material' and Section 20-2.01, "Topsoil', of the Standard specifications.

CONSTRUCTION

Subgrade Preparation

The Contractor shall prepare the grade that is to receive the layers of geosynthetic reinforcement to the compaction and elevation tolerances described in the Standard Specifications under Section 19-2.05, "Slopes," and these special provisions. The grade shall be smooth and free of loose or extraneous material and objects that may damage the geosynthetic reinforcement during installation. Relative compaction of not less than 95 percent shall be obtained in the embankment foundation for a minimum depth of 0.15 meters and as shown on the plans.

Geosynthetic Reinforcement Placement

Geosynthetic reinforcement shall be handled and placed in accordance with the manufacturer's recommendations and these special provisions. The geosynthetic reinforcement shall be placed wrinkle free, pulled taut, aligned, and secured before backfill placement to prevent the displacement during placement and compaction of fill.

The geosynthetic reinforcement material shall be placed with the direction of maximum strength perpendicular to the slope alignment. The Contractor shall verify correct orientation of the geosynthetic reinforcement. Each layer of geosynthetic reinforcement shall be placed onto the embankment material to form a continuous mat. Adjacent strips of geosynthetic reinforcement placed in this manner need not be overlapped.

Geosynthetic reinforcement shall be placed at the intervals, elevations, and for the minimum embedment length shown on the plans. Each layer of geosynthetic reinforcement shall not vary more than 0.15 meter from the theoretical horizontal plane established for that layer for the entire width and length of the reinforcement. All reinforcement shall be 100 percent covered by soil so that reinforcement panels do not contact in overlaps. Geosynthetic reinforcement shall be placed and covered with backfill in the same work shift.

During spreading and compacting of the backfill, a minimum fill thickness of 150 mm is required prior to operation of vehicles over the reinforcement. Sudden braking and sharp turning shall be avoided. Construction equipment shall not be operated or driven directly on the reinforcement.

During spreading and compacting of the backfill, at the option of the Engineer, rubber tired vehicles may be driven directly on the material, provided that such traffic is part of the placement operation, that the amount of traffic repetitions is minimized, that speeds of 9.6 kph or less are maintained, that turning or stopping movements of the vehicle are minimized, and no damage or displacement to the reinforcement is observed.

Geosynthetic reinforcement shall not extend into the pavement structural section.

At locations where guard railing posts will be placed at the top of the geosynthetic reinforced embankment and the geosynthetic reinforcement would interfere with placement of such posts, prior to backfilling the Contractor shall be allowed to precut the reinforcement material of the affected layers into a cross-shaped pattern at a depth of less than or equal to 0.3 meter to aid the later placement of the guard railing posts. The dimensions of the precutting shall not exceed the post dimensions by more than 750 mm. Reinforcement material located at a depth of greater than 0.3 meter does not require precutting.

Each layer of geosynthetic reinforcement shall be placed (unrolled) into the grade to form a continuous mat. A minimum of 75 mm of compacted fill material shall be required between geosynthetic reinforcement layers, unless shown otherwise on the plans.

For geotextiles, no splicing joints parallel to slope alignment shall be allowed. Geogrid reinforcement may be joined with mechanical connectors in accordance with Manufactures' recommendations. Joints shall not be placed vertically within 2 meters of the slope face, within 2 meters of the slope top, nor horizontally or vertically adjacent (within 1.2 meters) to another joint. Only one joint per length of geogrid shall be allowed. The joint shall be made for the full width of the strip by using a similar material with similar strength, and using a connection device supplied or recommended by the manufacturer. Documentation from the manufacturer showing that the joint strength meets or exceeds the LTDS shall be submitted prior to placement. Joints in geogrid shall be pulled and held taut during backfill placement.

If the geosynthetic reinforcement is damaged during construction operations, the damaged sections shall be repaired, at the Contractor's expense, by placing additional geosynthetic reinforcement to cover the damaged area and to meet the following overlap requirements:

A. Edges of geogrid perpendicular to slope alignment shall be overlapped for entire lengths by the smaller of: six aperture openings or 200 mm. Edges of geogrid parallel to slope alignment shall be joined using a mechanical connection described elsewhere in these special provisions.
B. Edges of geotextiles shall be overlapped a minimum of 500 mm on all sides.

Fill Placement

Backfill and select material shall be placed from the slope face back toward the fill area to ensure that the reinforcement remains taut. The maximum loose thickness of each lift of embankment material shall not exceed 0.3 meters and shall be compacted to 90% Relative Compaction.

At locations where compaction is accomplished with hand-operated equipment, fill shall be placed in horizontal layers not more than 150 mm in uncompacted thickness. Only hand-operated equipment shall be allowed within 1.0 m of the front limit of geosynthetic reinforcement and underground structures.

Control of moisture in the fill shall be maintained to provide acceptable compaction. Disking and plowing will not be allowed in the reinforced zone.

MEASUREMENT AND PAYMENT

Geosynthetic Reinforced Embankment will be measured and paid for by the square meter for the total area of geosynthetic reinforcement as shown on the plans and for any additional area as directed by the Engineer. Payment shall not include additional reinforcement required for overlaps. The contract price paid per square meter of geosynthetic reinforced embankment shall include full compensation for furnishing all labor and materials, including tools and equipment, reinforced concrete crib wall members, field tests and for doing all the work involved in placing the geosynthetic reinforcement material, select material and backfill material complete and in place, including placing reinforced concrete crib wall members, splicing, overlapping and anchoring as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

Full compensation for revisions to drainage systems or other facilities made necessary by the use of an alternative geosynthetic embankment material shall be considered as included in the contract price paid per square meter for geosynthetic reinforced embankment and no adjustment in compensation will be made therefor.

10-1.42 CONTROLLED LOW STRENGTH MATERIAL

Controlled low strength material shall consist of a workable mixture of aggregate, cementitious materials, and water and shall conform to the provisions for slurry cement backfill in Section 19-3.062, "Slurry Cement Backfill," of the Standard Specifications and these special provisions.

At the option of the Contractor, controlled low strength material may be used as structure backfill for pipe culverts, except that controlled low strength material shall not be used as structure backfill for culverts having a diameter or span greater than 6.1 m.

When controlled low strength material is used for structure backfill, the width of the excavation shown on the plans may be reduced so that the clear distance between the outside of the pipe and the side of the excavation, on each side of the pipe, is a minimum of 300 mm. This minimum may be reduced to 150 mm when the height of cover is less than or equal to 6.1 m or the pipe diameter or span is less than 1050 mm.

Controlled low strength material in new construction shall not be permanently placed higher than the basement soil. For trenches in existing pavements, permanent placement shall be no higher than the bottom of the existing pavement permeable drainage layer. If a drainage layer does not exist, permanent placement in existing pavements shall be no higher than 25 mm below the bottom of the existing asphalt concrete surfacing or no higher than the top of base below the existing portland cement concrete pavement. The minimum height that controlled low strength material shall be placed, relative to the culvert invert, is 0.5 diameter or 0.5 height for rigid culverts and 0.7 diameter or 0.7 height for flexible culverts.

When controlled low strength material is proposed for use, the Contractor shall submit a mix design and test data to the Engineer for approval prior to excavating the trench for which controlled low strength material is proposed for use. The test data and mix design shall provide for the following:

A. A 28-day compressive strength between 345 kPa and 690 kPa for pipe culverts having a height of cover of 6.1 m or less and a minimum 28-day compressive strength of 690 kPa for pipe culverts having a height of cover greater than 6.1 m. Compressive strength shall be determined in conformance with the requirements in ASTM Designation: D 4832.
B. Cement shall be any type of portland cement conforming to the requirements in ASTM Designation: C 150; or any type of blended hydraulic cement conforming to the requirements in ASTM Designation: C 595M or the physical requirements in ASTM Designation: C 1157M. Testing of cement will not be required.
C. Admixtures may be used in conformance with the provisions in Section 90-4, "Admixtures," of the Standard Specifications. Chemical admixtures containing chlorides as Cl in excess of one percent by mass of admixture, as determined in conformance with the requirements of California Test 415, shall not be used. If an air-entraining admixture is used, the maximum air content shall be limited to 20 percent. Mineral admixtures shall be used at the Contractor's option.

Materials for controlled low strength material shall be thoroughly machine-mixed in a pugmill, rotary drum or other approved mixer. Mixing shall continue until the cementitious material and water are thoroughly dispersed throughout the material. Controlled low strength material shall be placed in the work within 3 hours after introduction of the cement to the aggregates.

When controlled low strength material is to be placed within the traveled way or otherwise to be covered by paving or embankment materials, the material shall achieve a maximum indentation diameter of 76 mm prior to covering and opening to public traffic. Penetration resistance shall be measured in conformance with the requirements in ASTM Designation: D 6024.

Controlled low strength material used as structure backfill for pipe culverts will be considered structure backfill for compensation purposes.

10-1.43 CLAY CAP

This work consists of removing an asphalt concrete cap, and placing a clay cap (including surcharge embankment and settlement period) at the location shown on the plans and in accordance with the Standard Specifications and these special provisions.

The Contractor shall remove the existing asphalt concrete cap then place and compact a 450 mm thick clay cap. The clay cap shall be constructed in three equal layers and compacted to a relative compaction of not less than 90 percent.

At the end of the settlement period, and after removal of the surcharge embankment; the Engineer will be allowed 5 days to examine the surface of the clay cap for fissures. After evaluating the clay cap, the Engineer may direct the Contractor to place and additional 150 mm thick clay cap layer. Placing the additional clay cap layer, if required by the Engineer, will be paid for as provided in Section 4-1.03, "Extra Work," of the Standard Specifications.

MATERIAL

The clay material shall conform to the following requirements:

A. One hundred percent passing the 150 mm sieve.
B. PI shall be 25 or greater.

MEASUREMENT AND PAYMENT

The contract price paid per cubic meter for clay cap shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in placing the clay cap, complete in place, including removal of asphalt concrete cap, , as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

10-1.44 MOVE-IN/MOVE-OUT (EROSION CONTROL)

Move-in/move-out (erosion control) shall include moving onto the project when an area is ready to receive erosion control as determined by the Engineer, setting up all required personnel and equipment for the application of erosion control materials and moving out all personnel and equipment when erosion control in that area is completed.

When areas are ready to receive applications of erosion control (Type D), erosion control (Biofiltration), or erosion control (Hydraulic Matrix) as determined by the Engineer, the Contractor shall begin erosion control work in that area within 5 working days of the Engineer's notification to perform the erosion control work.

Attention is directed to the requirements of erosion control (Type D), erosion control (Biofiltration), and erosion control (Hydraulic Matrix) elsewhere in these special provisions.

Quantities of move-in/move-out (erosion control) will be determined as units from actual count as determined by the Engineer. For measurement purposes, a move-in followed by a move-out will be considered as one unit.

The contract unit price paid for move-in/move-out (erosion control) shall include full compensation for furnishing all labor, materials (excluding erosion control materials), tools, equipment, and incidentals and for doing all the work involved in moving in and removing from the project all personnel and equipment necessary for application of erosion control (Type D), erosion control (Biofiltration), or erosion control (Hydraulic Matrix), as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

No adjustment of compensation will be made for any increase or decrease in the quantities of move-in/move-out (erosion control) required, regardless of the reason for the increase or decrease. The provisions in Section 4-1.03B, "Increased or Decreased Quantities," of the Standard Specifications shall not apply to the item of move-in/move-out (erosion control).

10-1.45 EROSION CONTROL (TYPE D)

Erosion control (Type D) includes applying erosion control materials to disturbed areas shown on plans. Erosion control (Type D) must comply with Section 20-3, "Erosion Control," of the Standard Specifications and these special provisions.

Apply erosion control (Type D) when an area is ready to receive erosion control as determined by the Engineer and under "Move-in/Move-out (Erosion Control)" of these special provisions.

Before applying erosion control materials, prepare soil surface under Section 19-2.05, "Slopes," of the Standard Specifications, except that rills and gullies exceeding 50 mm in depth or width must be leveled. Remove vegetative growth, temporary erosion control materials, and other debris from areas to receive erosion control.

Before applying erosion control materials, the Engineer designates the ground location of erosion control (Type D) in increments of one hectare or smaller for smaller areas. Place stakes or other suitable markers at the locations designated by the Engineer. Furnish all tools, labor and materials required to adequately indicate the various locations.

MATERIALS

Materials must comply with Section 20-2, "Materials," of the Standard Specifications and these special provisions.

Seed

Seed must comply with Section 20-2.10, "Seed," of the Standard Specifications. Seed not required to be labeled under the California Food and Agricultural Code shall be tested for purity and germination by a seed laboratory certified by the Association of Official Seed Analysts or by a seed technologist certified by the Society of Commercial Seed Technologists. Measure and mix individual seed species in the presence of the Engineer.

Seed must contain at most 1.0 percent total weed seed by weight.

Deliver seed to the job site in unopened separate containers with the seed tag attached. Containers without a seed tag attached are not accepted. The Engineer takes a sample of approximately 30 g or 60 ml of seed for each seed lot greater than 1 kg.

Seed must comply with the following:

Seed (Type 1) - Disturbed Areas

Botanical Name (Common Name)	Percent Germination (Minimum)	Kilograms Pure Live Seed Per Hectare (Slope Measurement)
Ambrosia chenopodifolia* (San Diego Bur-Sage)	15	5
Artemisia californica* (California Sagebrush)	45	2
Encelia californica* (California Encelia)	45	8
Eriogonum fasciculatum* (California Buckwheat)	35	8
Eriophyllum confertiflorum* (Golden Yarrow)	35	1
Eschscholzia californica* California Poppy	60	10
Isomeris arborea* (Bladderpod)	35	5
Lasthenia californica* (Dwarf Goldfields)	35	1
Leymus triticoides* (Creeping Wildrye)	40	10
Lotus scoparius* (Deerweed)	35	5
Lupinus succulentus* (Arroyo Lupine)	50	45
Nassella pulchra* (Purple Needle Grass)	50	10

*Seed produced in California only.

Seed (Type 2) – Detention Basin Slopes

Botanical Name (Common Name)	Percent Germination (Minimum)	Kilograms Pure Live Seed Per Hectare (Slope Measurement)
Eschscholzia californica* California Poppy	60	10
Lasthenia californica* (Dwarf Goldfields)	35	1
Leymus triticoides* (Creeping Wildrye)	40	10
Lotus scoparius* (Deerweed)	35	5
Lupinus succulentus* (Arroyo Lupine)	50	45
Nassella pulchra* (Purple Needle Grass)	50	15

*Seed produced in California only.

Seed Sampling Supplies

At the time of seed sampling, provide the Engineer a glassine lined bag and custody seal tag for each seed lot sample.

Compost

The compost producer must be fully permitted as specified under the California Integrated Waste Management Board, Local Enforcement Agencies and any other State and Local Agencies that regulate Solid Waste Facilities. If exempt from State permitting requirements, the composting facility must certify that it follows guidelines and procedures for production of compost meeting the environmental health standards of Title 14, California Code of Regulations, Division 7, Chapter 3.1, Article 7.

The compost producer must be a participant in United States Composting Council's Seal of Testing Assurance program.

Compost may be derived from any single, or mixture of any of the following feedstock materials:

1. Green material consisting of chipped, shredded, or ground vegetation; or clean processed recycled wood products
2. Biosolids
3. Manure
4. Mixed food waste

Compost feedstock materials to reduce weed seeds, pathogens and deleterious materials as specified under Title 14, California Code of Regulations, Division 7, Chapter 3.1, Article 7, Section 17868.3

Compost must not be derived from mixed municipal solid waste and must be reasonably free of visible contaminates. Compost must not contain paint, petroleum products, pesticides or any other chemical residues harmful to animal life or plant growth. Compost must not possess objectionable odors.

Metal concentrations in compost must not exceed the maximum metal concentrations listed in Title 14, California Code of Regulations, Division 7, Chapter 3.1, Section 17868.2.

Compost must comply with the following:

Physical/Chemical Requirements

Property	Test Method	Requirement
pH	*TMECC 04.11-A, Elastometric pH 1:5 Slurry Method, pH Units	6.0–8.0
Soluble Salts	TMECC 04.10-A, Electrical Conductivity 1:5 Slurry Method dS/m (mmhos/cm)	0-10.0
Moisture Content	TMECC 03.09-A, Total Solids & Moisture at 70+/- 5 deg C, % Wet Weight Basis	N/A
Organic Matter Content	TMECC 05.07-A, Loss-On-Ignition Organic Matter Method (LOI), % Dry Weight Basis	30–65
Maturity	TMECC 05.05-A, Germination and Vigor Seed Emergence Seedling Vigor % Relative to Positive Control	 80 or Above 80 or Above
Stability	TMECC 05.08-B, Carbon Dioxide Evolution Rate mg CO_2-C/g OM per day	8 or below
Particle Size	TMECC 02.02-B Sample Sieving for Aggregate Size Classification % Dry Weight Basis	95% Passing 16 mm 70% Passing 9 mm
Pathogen	TMECC 07.01-B, Fecal Coliform Bacteria < 1000 MPN/gram dry wt.	Pass
Pathogen	TMECC 07.01-B, Salmonella < 3 MPN/4 grams dry wt.	Pass
Physical Contaminants	TMECC 02.02-C, Man Made Inert Removal and Classification: Plastic, Glass and Metal, % > 4mm fraction	Combined Total: < 1.0
Physical Contaminants	TMECC 02.02-C, Man Made Inert Removal and Classification: Sharps (Sewing needles, straight pins and hypodermic needles), % > 4mm fraction	None Detected

*TMECC refers to "Test Methods for the Examination of Composting and Compost," published by the United States Department of Agriculture and the United States Compost Council (USCC).

Before compost application, provide the Engineer with a copy of the compost producer's compost technical data sheet and a copy of the compost producers Seal of Testing Assurance certification. The compost technical data sheet includes:

1. Laboratory analytical test results
2. Directions for product use
3. List of product ingredients

Before compost application, provide the Engineer with a Certificate of Compliance under Section 6-1.07, "Certificates of Compliance," of the Standard Specifications.

Stabilizing Emulsion

Stabilizing emulsion must comply with Section 20-2.11, "Stabilizing Emulsion," of the Standard Specifications and these special provisions.

Stabilizing emulsion:

1. Must be in a dry powder form
2. Must be a processed organic adhesive used as a soil tackifier
3. May be reemulsifiable

APPLICATION

Apply erosion control materials in separate applications in the following sequence:

1. Apply the following mixture with hydroseeding equipment at the rates indicated within 60 minutes after the seed has been added to the mixture:

Application 1 - Seed (Type 1) – Disturbed Areas

Material	Kilograms Per Hectare (Slope Measurement)
Seed	110
Fiber	800

Material	Cubic Meter Per Hectare (Slope Measurement)
Compost	2

Application 1 - Seed (Type 2) – Detention Basin Slopes

Material	Kilograms Per Hectare (Slope Measurement)
Seed	86
Fiber	800

Material	Cubic Meter Per Hectare (Slope Measurement)
Compost	2

2. Compost may be dry applied at the total of the rates specified in the preceding table and the following table instead of including it as part of the hydro-seeding operations. In areas where the compost is dry applied, all compost for that area must be applied before the next operation.
3. Apply the following mixture with hydro-seeding equipment at the corresponding rates:

Application 2 – Seed (Type 1) – Disturbed Areas

Material	Kilograms Per Hectare (Slope Measurement)
Fiber	1200
Stabilizing Emulsion (Solids)	250

Material	Cubic Meter Per Hectare (Slope Measurement)
Compost	3

Seed (Type 2) – Detention Basin Slopes

Material	Kilograms Per Hectare (Slope Measurement)
Fiber	1200
Stabilizing Emulsion (Solids)	250

Material	Cubic Meter Per Hectare (Slope Measurement)
Compost	3

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

The Engineer may change the rates of erosion control materials to meet field conditions.

MEASUREMENT AND PAYMENT

Erosion control (Type D) will be measured by the square meter or by the hectare, whichever is designated in the Engineer's Estimate. The area will be calculated on the basis of actual or computed slope measurements.

The contract price paid per square meter or hectare for erosion control (Type D) includes full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in applying erosion control (Type D) complete in place, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

10-1.46 EROSION CONTROL (BIOFILTRATION)

Erosion control (Biofiltration) work includes cultivating soil, applying compost, seed, fiber, and erosion control blanket in swale and strip areas as shown on the plans. Erosion control (Biofiltration) work shall comply with Section 20-3, "Erosion Control," of the Standard Specifications and these special provisions.

Apply erosion control (Biofiltration) materials when an area is ready to receive erosion control as determined by the Engineer and in conformance with "Move-In/Move-Out (Erosion Control)" of these special provisions.

If the slope on which the erosion control (Biofiltration) is to be placed is finished during the rainy season as specified in "Water Pollution Control" of these special provisions, apply erosion control (Biofiltration) to the slope immediately.

Before applying erosion control (Biofiltration) materials, the Engineer will designate the ground location of erosion control (Biofiltration) areas. Place stakes or other suitable markers at the locations designated by the Engineer. Furnish all tools, labor and materials required to adequately indicate the various locations.

MATERIALS

Materials shall comply with Section 20-2, "Materials," of the Standard Specifications and these special provisions.

Seed for erosion control (Biofiltration) shall comply with Section 20-2.10, "Seed," of the Standard Specifications. Seed not required to be labeled under the California Food and Agricultural Code shall be tested for purity and germination by a seed laboratory certified by the Association of Official Seed Analysts or by a seed technologist certified by the Society of Commercial Seed Technologists. Measure and mix individual seed species in the presence of the Engineer.

Seed must contain at most 1.0 percent total weed seed by weight.

Deliver seed to the job site in unopened separate containers with the seed tag attached. Containers without a seed tag attached will not be accepted. The Engineer takes a sample of approximately 30 g or 60 ml of seed for each seed lot greater than 1 kg.

Seed must comply with the following:

Seed

Botanical Name (Common Name)	Percent Germination (Minimum)	Kilograms Pure Live Seed Per Hectare (Slope Measurement)
Achnatherum (Stipa) diegonens* (San Diego County Needle Grass)	30	3.0
Juncus mexicanus* (Mexican Rush)	25	0.5
Leymus triticoides* (Beardless Wild Ryegrass)	50	20.0
Nassella pulchra* (Purple Needle Grass)	35	15.0
Scirpus acutus var occientalis* (Bulrush)	30	5.0
Typha latifolia* (Common Cattail)	30	1.0

*Seed produced in California only.

Seed Sampling Supplies

At the time of seed sampling, provide the Engineer a glassine lined bag and custody seal tag for each seed lot sample.

Compost

The compost producer must be fully permitted as specified under the California Integrated Waste Management Board, Local Enforcement Agencies and any other State and Local Agencies that regulate Solid Waste Facilities. If exempt from State permitting requirements, the composting facility must certify that it follows guidelines and procedures for production of compost meeting the environmental health standards of Title 14, California Code of Regulations, Division 7, Chapter 3.1, Article 7.

The compost producer must be a participant in United States Composting Council's Seal of Testing Assurance program.

Compost may be derived from any single, or mixture of the following feedstock materials:

1. Green material consisting of chipped, shredded, or ground vegetation; or clean processed recycled wood products
2. Biosolids
3. Manure
4. Mixed food waste

Compost feedstock materials to reduce weed seeds, pathogens and deleterious materials as specified under Title 14, California Code of Regulations, Division 7, Chapter 3.1, Article 7, Section 17868.3.

Compost must not be derived from mixed municipal solid waste and must be reasonably free of visible contaminates. Compost must not contain paint, petroleum products, pesticides or any other chemical residues harmful to animal life or plant growth. Compost must not possess objectionable odors.

Metal concentrations in compost must not exceed the maximum metal concentrations listed under Title 14, California Code of Regulations, Division 7, Chapter 3.1, Section 17868.2.

Before compost application, provide the Engineer with a copy of the compost producer's compost technical data sheet and a copy of the compost producers Seal of Testing Assurance certification.

The compost technical data sheet must include:

1. Laboratory analytical test results
2. Directions for product use
3. List of product ingredients.

Before compost application, provide the Engineer with a Certificate of Compliance under Section 6-1.07, "Certificates of Compliance," of the Standard Specifications.

Erosion Control Blanket

Erosion control blanket must consist of straw and coconut fiber mats secured in place with wire staples and must conform to the following:

1. Erosion control blanket must be a premanufactured open weave mat consisting of minimum 30% coconut fiber and straw fiber.
2. Straw or combination straw/coconut fiber blankets must be machine produced mats with a lightweight degradable netting on the top and bottom surfaces of the blanket. The straw or coconut fiber must be adhered to the netting with degradable thread or glue strip. The erosion control blanket must have a maximum thickness of 6.35-mm, be of consistent thickness and the straw or coconut fiber must be evenly distributed over the entire area of the blanket. Erosion control blanket must be furnished in rolled strips with a minimum width of 2 m, minimum length of 25 m ±one m and a maximum mass of 0.27-kg/m^2.
3. Staples for erosion control blankets must be made of 11-gage minimum steel wire and must be U-shaped with 150-mm legs and 25-mm crown or 200-mm legs and 50-mm crown.

PREPARATION

Biofiltration areas must be prepared as follows before application of compost and erosion control materials:

1. Remove vegetative growth, temporary erosion control materials, and other debris from areas to receive erosion control (Biofiltration).
2. Biofiltration areas must be cultivated to a minimum depth of 150 mm immediately prior to applying compost. Cultivation must be done until the soil is in a loose condition. Soil clods must not be larger than 25 mm in maximum dimension after cultivation.
3. All rocks larger than 25 mm in maximum dimension on the surface must be removed and disposed of after cultivation.

Upon completion of cultivation, slopes must meet original grade within not more than 0.15 m measured at right angles to the slope.

APPLICATION

Erosion control (Biofiltration) materials must be placed in separate applications in the following order:

1. Apply compost uniformly to a thickness of 50 millimeters.

2. Apply the following mixture with hydroseeding equipment at the rates indicated within 60 minutes after the seed has been added to the mixture:

Material	Kilograms Per Hectare (Slope Measurement)
Seed	44.5
Fiber	1000

Erosion control (Biofiltration) work must extend to the edge of the biofiltration area, as shown on the plans.

ESTABLISHMENT

After placement of erosion control (Biofiltration), establish erosion control materials and provide enough water as needed in conformance with “Truck Watering” of these special provisions.

The Contractor shall perform work to establish erosion control (Biofiltration) areas as necessary to maintain the area in a neat appearance and to promote healthy plant growth. This work shall include the following:

1. Trash and debris shall be removed from erosion control (Biofiltration) areas. Removal limits shall extend 2 m beyond the outer limits of erosion control (Biofiltration) areas.
2. Areas of bare ground that fail to germinate after 30 days after application of erosion control materials shall be reseeded at the Contractor’s expense.
3. Biofiltration areas shall be mowed once during the plant establishment period. Mowing shall occur after the plants have set seed, when directed by the Engineer. Plants shall be mowed to a height of 150 mm.

Removed trash and debris, and mowed material shall be disposed of outside the highway right of way in conformance with the provisions in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications.

MEASUREMENT AND PAYMENT

The quantity of erosion control (Biofiltration) will be determined by the square meter. from actual measurement of the biofiltration area covered by the erosion control blanket, not including overlaps.

The contract price paid per square meter for erosion control (Biofiltration) includes full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in applying erosion control (Biofiltration), including cultivation, providing and applying seed, and erosion control blanket, and erosion control establishment work, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

10-1.47 EROSION CONTROL (HYDRAULIC MATRIX)

This work includes applying erosion control materials to embankment and excavation slopes and other areas disturbed by construction activities. Erosion control (hydraulic matrix) must comply with Section 20-3, "Erosion Control," of the Standard Specifications.

Once planting and irrigation work in the areas on which the erosion control to be placed is finished immediately apply erosion control.

Before applying erosion control materials, prepare soil surface under Section 19-2.05, "Slopes," of the Standard Specifications except that rills and gullies exceeding 50 mm in depth or width must be leveled. Remove vegetative growth, temporary erosion control materials, and other debris from areas to receive erosion control.

Before applying erosion control materials, the Engineer designates the ground location of erosion control in increments of 1 hectare or less for smaller areas. Place stakes or other suitable markers at the locations designated by the Engineer. Furnish tools, labor and materials required to adequately designate the various locations.

MATERIALS

Materials must comply with Section 20-2, "Materials," of the Standard Specifications and these special provisions.

Seed

Seed must comply with Section 20-2.10, "Seed," of the Standard Specifications. Seed not required to be labeled under the California Food and Agricultural Code must be tested for purity and germination by a seed laboratory certified by the Association of Official Seed Analysts or by a seed technologist certified by the Society of Commercial Seed Technologists. Measure and mix individual seed species in the presence of the Engineer.

Seed must not contain more than 1.0 percent total weed seed by weight.

Deliver seed to the job site in unopened separate containers with the seed tags attached. A container without a seed tag attached is not accepted. The Engineer takes a sample of approximately 30 g or 60 ml of seed for each seed lot greater than 1 kg.

Seed must comply with the following:

SEED

Botanical Name (Common Name)	Percent Germination (Minimum)	Kilograms Pure Live Seed Per Hectare (Slope Measurement)
Lotus scoparius* (Deerweed)	30	2.0
Lupinus succulentus* (Arroyo Lupine)	40	2.0
Artemisia californica* (California Sagebrush)	25	1.0
Deinandra fasciculata* (Fascicled Tarplant)	15	3.0
Encelia californica* (Bush Sunflower)	30	1.5
Eriogonum fasciculatum* (California Buckwheat)	30	3.0
Eriophyllum confertiflorum* (Golden Yarrow)	30	0.5
Eschscholzia californica* (California Poppy)	35	0.5
Nassella pulchra* (Purple Needle Grass) (deawned)	30	3.0
Salvia apiana* (White Sage)	25	0.5
Salvia mellifera* (Black Sage)	25	1.0
Viguiera laciniata* (San Diego Sunflower)	25	1.5

[a]Seed produced in CA only.

Seed Sampling Supplies

At the time of seed sampling, furnish a glassine lined bag and custody seal tag for each seed lot sample.

Commercial Fertilizer

Commercial fertilizer must comply with Section 20-2.02, "Commercial Fertilizer," of the Standard Specifications and have a guaranteed chemical analysis within 2 percent of 6 percent nitrogen, 20 percent phosphoric acid and 20 percent water soluble potash.

Compost

The compost producer must be fully permitted as specified under the California Integrated Waste Management Board, Local Enforcement Agencies and any other State and Local Agencies that regulate Solid Waste Facilities. If exempt from State permitting requirements, the composting facility must certify that it follows guidelines and procedures for production of compost meeting the environmental health standards of Title 14, California Code of Regulations, Division 7, Chapter 3.1, Article 7.

The compost producer must be a participant in United States Composting Council's Seal of Testing Assurance program.

Compost may be derived from any single, or mixture of any of the following feedstock materials:

1. Green material consisting of chipped, shredded, or ground vegetation; or clean processed recycled wood products
2. Biosolids
3. Manure
4. Mixed food waste

Compost feedstock materials to reduce weed seeds, pathogens and deleterious materials as specified under Title 14, California Code of Regulations, Division 7, Chapter 3.1, Article 7, Section 17868.3

Compost must not be derived from mixed municipal solid waste and must be reasonably free of visible contaminates. Compost must not contain paint, petroleum products, pesticides or any other chemical residues harmful to animal life or plant growth. Compost must not possess objectionable odors.

Metal concentrations in compost must not exceed the maximum metal concentrations listed in Title 14, California Code of Regulations, Division 7, Chapter 3.1, Section 17868.2.

Compost must comply with the following:

Physical/Chemical Requirements

Property	Test Method	Requirement
pH	*TMECC 04.11-A, Elastometric pH 1:5 Slurry Method, pH Units	6.0–8.0
Soluble Salts	TMECC 04.10-A, Electrical Conductivity 1:5 Slurry Method dS/m (mmhos/cm)	0-10.0
Moisture Content	TMECC 03.09-A, Total Solids & Moisture at 70+/- 5 deg C, % Wet Weight Basis	N/A
Organic Matter Content	TMECC 05.07-A, Loss-On-Ignition Organic Matter Method (LOI), % Dry Weight Basis	30–65
Maturity	TMECC 05.05-A, Germination and Vigor Seed Emergence Seedling Vigor % Relative to Positive Control	 80 or Above 80 or Above
Stability	TMECC 05.08-B, Carbon Dioxide Evolution Rate mg CO_2-C/g OM per day	8 or below
Particle Size	TMECC 02.02-B Sample Sieving for Aggregate Size Classification % Dry Weight Basis	95% Passing 16 mm 70% Passing 9 mm
Pathogen	TMECC 07.01-B, Fecal Coliform Bacteria < 1000 MPN/gram dry wt.	Pass
Pathogen	TMECC 07.01-B, Salmonella < 3 MPN/4 grams dry wt.	Pass
Physical Contaminants	TMECC 02.02-C, Man Made Inert Removal and Classification: Plastic, Glass and Metal, % > 4mm fraction	Combined Total: < 1.0
Physical Contaminants	TMECC 02.02-C, Man Made Inert Removal and Classification: Sharps (Sewing needles, straight pins and hypodermic needles), % > 4mm fraction	None Detected

*TMECC refers to "Test Methods for the Examination of Composting and Compost," published by the United States Department of Agriculture and the United States Compost Council (USCC).

Before compost application, provide the Engineer with a copy of the compost producer's compost technical data sheet and a copy of the compost producers Seal of Testing Assurance certification. The compost technical data sheet includes:

1. Laboratory analytical test results
2. Directions for product use
3. List of product ingredients

Before compost application, provide the Engineer with a Certificate of Compliance under Section 6-1.07, "Certificates of Compliance," of the Standard Specifications.

Hydraulic Matrix

Hydraulic matrix consists of a stabilizing emulsion combined with wood fiber and water. Each constituent is mixed in a mechanically agitated hydroseeding equipment and sprayed onto a disturbed soil area as a liquid slurry. Flocculant and tackifier must comply with the specifications in Section 20-2.11, "Stabilizing Emulsion," of the Standard Specifications and be nonflammable, non-toxic to plants and animals, and must have no germination or growth inhibiting factors.

Fiber must comply with Section 20-2.07, "Fiber," of the Standard Specifications and these special provisions. Fiber must be long strand, whole-wood fibers, thermo mechanically processed from clean, whole-wood chips, containing a minimum of 25 percent at 10 mm long, with a minimum of 50 percent retained on a 710 µm sieve. The wood chips must not contain lead paint, printing ink, varnish, petroleum products, seed germination inhibitors, or chlorine bleach. Fiber must not be produced from sawdust, cardboard, paper, or paper by-products.

Add a coloring agent to the fiber to contrast with the area on which it is applied. The coloring agent must not include copper, mercury, or arsenic and must be biodegradable and nontoxic.

The ratio of fiber to water must be as required to facilitate even application of the material.

Tackifier and flocculant must comply with and be labeled as 1 of the following:

1. Flocculant must be a liquid formulation having polyacrylamide (PAM) as the primary active ingredient and be available as a prepackaged product. The PAM must be a linear, anionic copolymer of acrylamide and sodium acrylate. The residual monomer content of the PAM must not exceed 0.05 percent by weight. Flocculant must be formulated as a water-in-oil emulsion. Flocculant must contain a minimum of 0.30 kg pure PAM per liter and the pure PAM must be a minimum of 30 percent active. The prepackaged product label must indicate that the PAM is registered and approved by the California Department of Food and Agriculture as an auxiliary soil and plant substance, and nonplant food ingredient. If requested provide certification of the percent of pure PAM present by weight; the percent activity, the average molecular weight, and the charge density of the PAM; and provide a material safety data sheet for the prepackaged product. PAM must be added at the following rates (if applicable):

Slope Gradient	Application Rate (Kilograms Fiber per Hectare)	PAM Application Rate (Liters per Hectare)
< 1V:4H	2250	74.8
> 1V:4H and ≤ 1V:3H	2800	84.1
> 1V:3H and ≤ 1V:2H	3400	93.5
> 1V:2H	4500	93.5

2. Tackifier must be a combination of a cross-linked polymer and an organic, high viscosity colloidal polysaccharide with activating agents or a blended hydrocolloid-based binder. The tackifier must be a minimum of 5 percent by weight of the fiber. The tackifier must not dissolve or disperse upon rewetting. Tackifier must be pre mixed and packaged with the wood fiber component.

Before application, submit a Certificate of Compliance for erosion control (hydraulic matrix) under in Section 6-1.07, "Certificates of Compliance" of the Standard Specifications. The Certificate of Compliance must include a list of pollutant indicators and potential pollutants not visually detectable as described under "Sampling and Analysis Plan for Non-Visible Pollutants" in the Storm Water Pollution Prevention Plan and Water Pollution Control Program Preparation Manual of the Storm Water Quality Handbooks issued by the Department.

APPLICATION

Use hydroseeding equipment to apply erosion control to all disturbed soil surfaces. Apply erosion control from 2 or more directions to avoid shadowing effects forming a continuous mat without gaps between the mat and the soil surface. Apply erosion control in layers to avoid slumping and to aid drying. Unless manufacturer guidelines allow for application during wet weather, apply materials during dry weather with a minimum of 24 hours of dry weather between completion of material application and predicted precipitation.

Apply erosion control materials in a single application.

Apply the following mixture at the specified rates within 60 minutes after adding seed to the mixture:

Material	Slope	Kilograms Per Hectare[a] (Slope Measurement)
Seed	N/A	As specifed above
Commercial Fertilizer	N/A	25
Hydraulic Matrix	Slopes < 1V:4H	2250
Hydraulic Matrix	Slopes > 1V:4H and ≤ 1V:3H	2800
Hydraulic Matrix	Slopes > 1V:3H and ≤ 1V:2H	3400
Hydraulic Matrix	Slopes > 1V:2H	4500

[a]Application rate shall be increased by 565 kg hydraulic matrix per hectare for surfaces roughened by techniques such as the following:
sheepsfoot-rolled, ripped, trackwalked, and imprinted.

Material	Slope	Cubic Meter Per Hectare (Slope Measurement)
Compost	N/A	1

The ratio of water to fiber and tackifier in the mixture must be as recommended by the manufacturer. The proportions of various erosion control materials may be changed by the Engineer to meet field conditions.

Submit written documentation certifying erosion control was applied in accordance with specified rates, including area of application, time of application, and quantities used.

MAINTENANCE

Reapply erosion control when the area treated exhibits visible erosion. Reapply erosion control within 24 hours of identifying visible erosion.

The General Construction NPDES Permit for soil amendments, including soil stabilization products, requires monitoring for pollutants not visually detectable in storm water.

Erosion control damaged during the progress of work or resulting from your vehicles, equipment, or operations must be repaired or replaced..

MEASUREMENT AND PAYMENT

The quantity of erosion control (hydraulic matrix) to be paid for will be measured by the square meter as determined from measurements along the slope of the actual areas covered by the erosion control (hydraulic matrix.)

The contract price paid per square meter for erosion control (hydraulic matrix) includes full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in applying erosion control (hydraulic matrix), complete in place, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

10-1.48 FIBER ROLLS

Fiber rolls shall be furnished and installed in conformance with details shown on the plans and these special provisions and as directed by the Engineer.

Fiber rolls shall be installed on excavation and embankment slopes and other disturbed soil areas.

At the option of the Contractor, fiber rolls shall be Type 1 or Type 2.

MATERIALS

Fiber Roll

Fiber roll shall be either:

1. Constructed with a premanufactured blanket consisting of either wood excelsior, rice or wheat straw, or coconut fibers or a combination of these materials. The blanket shall be between 2.0 m and 2.4 m in width and between 20 m and 29 m in length. Wood excelsior shall be individual fibers, of which 80 percent shall be 150 mm or longer in length. The blanket shall have a photodegradable plastic netting or biodegradable jute, sisal, or coir fiber netting on at least one side. The blanket shall be rolled along the width and secured with jute twine spaced 2 m apart along the full length of the roll and placed 150 mm from the ends of each roll. The finished roll shall be between 200 mm and 250 mm in diameter, a minimun of 6 m in length, and shall weigh at least 0.81-kg/m. More than one blanket may be required to achieve the finished roll diameter. When more than one blanket is required, blankets shall be jointed longitudinally with an overlap of 150 mm along the length of the blanket.
2. A premanufactured roll of rice or wheat straw, wood excelsior, or coconut fiber encapsulated within a photodegradable plastic or biodegradable jute, sisal, or coir fiber netting. The netting shall have a minimum durability of one year after installation. The netting shall be secured tightly at each end of the roll. Rolls shall be between 200 mm and 300 mm in diameter. Rolls between 200 mm and 250 mm in diameter shall have a minimum weight of 1.6 kg/m and a minimum length of 6 m. Rolls between 250 mm and 300 mm in diameter shall have a minimum weight of 4.5 kg/m and a minimum length of 3 m.
3. Where shown on the plans, a premanufactured roll of rice or wheat straw encapsulated within biodegradable jute, sisal, or coir fiber netting. The netting shall have a minimum durability of one year after installation. The netting shall be secured tightly at each end of the roll. Rolls shall be between 200 mm and 300 mm in diameter. Rolls between 200 mm and 250 mm in diameter shall have a minimum weight of 1.6 kg/m and a minimum length of 6 m. Rolls between 250 mm and 300 mm in diameter shall have a minimum weight of 4.5 kg/m and a minimum length of 3 m.

Stakes

Wood stakes shall be a minimum of 19 mm x 19 mm x 450 mm in size for Type 1 installation, or a minimum of 19 mm x 38 mm x 450 mm in size for Type 2 installation. Wood stakes shall be untreated fir, redwood, cedar, or pine and cut from sound timber. They shall be straight and free of loose or unsound knots and other defects which would render them unfit for the purpose intended. Metal stakes shall not be used.

Rope

Rope shall be biodegradable, such as sisal or manila, with a minimum diameter of 6.35 mm.

INSTALLATION

Fiber rolls shall be installed as follows:

1. Fiber rolls (Type 1): Furrows shall be constructed to a depth between 50 mm and 100 mm, and to a sufficient width to hold the fiber roll. Stakes shall be installed 600 mm apart along the length of the fiber rolls and stopped at 300 mm from each end of the rolls. Stakes shall be driven to a maximum of 50 mm above, or flush with the top of the roll.
2. Fiber rolls (Type 2): Rope and notched stakes shall be used to restrain the fiber rolls against the slope. Stakes shall be driven into the slope until the notch is even with the top of the fiber roll. Rope shall be knotted at each stake and laced between stakes. After installation of the rope, stakes shall be driven into the slope such that the rope will hold the fiber roll tightly to the slope. Furrows will not be required.
3. Fiber rolls shall be placed 3 m apart along the slope for slope inclination (vertical:horizontal) of 1:2 and steeper, 4.5 m apart along the slope for slope inclination between 1:2 and 1:4, 6.0 m apart along the slope for slope inclination between 1:4 and 1:10, and a maximum of 15 m apart along the slope for slope inclination of 1:10 and flatter.
4. The bedding area for the fiber rolls shall be cleared of obstructions including rocks, clods, and debris greater than 25 mm in diameter before installation.
5. Fiber rolls shall be installed approximately parallel to the slope contour.
6. Fiber rolls shall be installed before the application of other erosion control materials in the same area.

If the intended function of the fiber rolls to disperse concentrated water runoff and to reduce runoff velocities is impaired, the Contractor shall take action to repair or replace the fiber rolls. Split, torn, or unraveling rolls shall be repaired or replaced. Broken or split stakes shall be replaced. Sagging or slumping fiber rolls shall be repaired with additional stakes or replaced. Locations where rills and other evidence of concentrated runoff have occurred beneath the rolls shall be corrected. Fiber rolls shall be repaired or replaced within 24 hours of identifying the deficiency.

MEASUREMENT AND PAYMENT

Quantities of fiber rolls to be paid for will be determined by the meter measured along the centerline of the installed roll. Where fiber rolls are joined and overlapped, the overlap will be measured as a single installed roll.

The contract price paid per meter for fiber roll shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in installing fiber rolls, complete in place, including furrow excavation and backfill, repairing or replacing fiber rolls as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

Damage to fiber rolls resulting from the Contractor's vehicles, equipment, or operations shall be repaired at the Contractor's expense.

10-1.49 CHECK DAM

Check dams shall be furnished and installed in conformance with details shown on the plans and these special provisions and as directed by the Engineer.

Check dams shall be installed in swales to slow down flow.

Check dams shall be made of fiber roll.

MATERIALS

Fiber Roll

Fiber roll shall be a premanufactured roll of rice or wheat straw, wood excelsior, or coconut fiber encapsulated within a photodegradable plastic or biodegradable jute, sisal, or coir fiber netting. Rolls shall be between 200 mm and 250 mm in diameter, between 3 m and 6 m in length, and shall weigh at least 1.6 kg/m. The netting shall have a minimum durability of one year after installation. The netting shall be secured tightly at each end of the roll.

Wood Stakes

Wood stakes shall be a minimum of 19 mm x 38 mm x 450 mm. Wood stakes shall be untreated fir, redwood, cedar, or pine and cut from sound timber. They shall be straight and free of loose or unsound knots or other defects which would render them unfit for the purpose intended.

INSTALLATION

Check dams shall be installed as follows:

1. Check dam: Stakes shall be used to hold the fiber rolls against the surface of the unlined ditch or swale. Stakes shall be driven to a maximum of 50 mm above, or flush with the top of the roll.
2. Furrows shall be constructed to a depth between 50 mm and 100 mm, and to a sufficient width to hold the fiber roll.
3. The bedding area for the check dam shall be cleared of obstructions including, rocks, clods, and debris greater than 25 mm in diameter before installation.
4. The check dam shall be installed across and approximately perpendicular to the centerline of a ditch or drainage line.
5. The check dam shall be installed with sufficient spillway depth to prevent flanking of concentrated flow around the ends of the check dam.
6. The check dam shall be installed in an unlined swale before the application of erosion control (Type D) or (Biofiltration) material in the same unlined swale.

Details for an alternative check dam shall be submitted to the Engineer for approval at least 7 days before installation.

MEASUREMENT AND PAYMENT

Quantities of check dams to be paid for will be determined by the meter measured along the centerline of the installed check dam.

The contract price paid per meter for check dam shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in installing check dams, complete in place, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

10-1.50 DRAINAGE INLET PROTECTION

Drainage inlet protection shall be furnished and installed in conformance with details shown on the plans and these special provisions and as directed by the Engineer.

Drainage inlet protection shall be installed at drainage inlets in unpaved areas.

Drainage inlet protection shall be made of fiber roll.

MATERIALS

Erosion Control Blanket

The erosion control blanket shall be a rolled erosion control product (RECP) and shall be classified as temporary and degradable, and shall conform to one of the following:

A. Temporary and degradable:

1. Machine produced mats consisting of curled wood excelsior with 80 percent of the fiber 150 mm or longer. The excelsior blanket shall be of consistent thickness with wood fiber evenly distributed over the entire area of the blanket. The top surface of the blanket shall be covered with extruded photodegradable plastic netting or lightweight nonsynthetic netting. The blanket shall be smolder resistant without the use of chemical additives and shall be nontoxic and noninjurious to plant and animal life. The excelsior blanket shall be furnished in rolled strips with a minimum mass per unit area of 0.40-kg/m^2.
2. Machine produced mats consisting of 70 percent straw and 30 percent coconut fiber with extruded photodegradable plastic netting or lightweight nonsynthetic netting on the top and bottom surfaces of the blanket. The straw and coconut shall adhere to the netting using thread or glue strip. The straw and coconut blanket shall be of consistent thickness, and straw and coconut fiber shall be evenly distributed over the entire area of the blanket. The straw and coconut fiber blanket shall be furnished in rolled strips with a minimum mass per unit area of 0.27-kg/m^2.
3. Machine produced mats that are 100 percent coir consisting of coconut fiber with extruded photodegradable plastic netting or lightweight nonsynthetic netting on the top and bottom surfaces of the blanket. The coconut fiber shall adhere to the netting using thread or glue strip. The coconut blanket shall be of consistent thickness, with coconut fiber evenly distributed over the entire area of the blanket. The coconut fiber blanket shall be furnished in rolled strips with a minimum mass per unit area of 0.27-kg/m^2.
4. Machine woven netting that is 100 percent spun coir consisting of coconut fiber with an average open area of 63 percent to 70 percent. Coconut coir netting shall be furnished in rolled strips with a minimum mass per unit area of 0.40-kg/m^2.

Staples

Staples shall be as shown on the plans. An alternative attachment device such as geotextile pins or plastic pegs may be used instead of staples. The Contractor shall submit a sample of the alternative attachment device for the Engineer's approval before installation.

Fiber Roll

Fiber roll shall be a premanufactured roll of rice or wheat straw, wood excelsior, or coconut fiber encapsulated within a photodegradable plastic or biodegradable jute, sisal, or coir fiber netting. Rolls shall be between 200 mm and 250 mm in diameter, between 3 m and 6 m in length, and shall weigh at least 1.6 kg/m. The netting shall have a minimum durability of one year after installation. The netting shall be secured tightly at each end of the roll.

Wood Stakes

Wood stakes shall be a minimum of 19 mm x 19 mm x 450 mm. Wood stakes shall be untreated fir, redwood, cedar, or pine and cut from sound timber. They shall be straight and free of loose or unsound knots and other defects which would render them unfit for the purpose intended.

INSTALLATION

Drainage inlet protection shall be installed at drainage inlets in unpaved areas as follows:

A. Drainage inlet protection shall be installed such that ponded runoff does not encroach on the traveled way or overtop the curb or dike.
B. The bedding area for the drainage inlet protection shall be cleared of obstructions including rocks, clods, and debris greater than 25 mm in diameter before installation.
C. The erosion control blanket or geotextile fabric shall be secured to the surface of the excavated sediment trap with staples and embedded in a trench adjacent to the drainage inlet. The perimeter edge of the erosion control blanket or geotextile fabric shall be anchored in a trench.
D. Fiber rolls shall be placed over the erosion control blanket or geotextile fabric with the ends of the fiber roll abutted tightly together. Fiber rolls shall be secured with stakes installed along the length of the fiber rolls. Stakes shall not be installed within 300 mm of the end of the rolls.

MEASUREMENT

Quantities of drainage inlet protection will be determined from actual count in place. The protection will be measured one time only and no additional measurement will be recognized.

PAYMENT

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

10-1.51 TRUCK WATERING

Truck watering shall consist of watering erosion control (Biofiltration) areas, as shown on the plans, as specified in these special provisions and as directed by the Engineer.

Truck watering shall start on the day following application of erosion control (Biofiltration), and continue on for a minimum of 300 days, except during the rainy season, or as ordered by the Engineer. Watering during the rainy season, as directed by the Engineer, will be paid for as extra work as provided in Section 4-1.03D of the Standard Specifications.

Water shall be applied by hand (hose) in such a manner that the erosion control (Biofiltration) is not damaged during watering, and soil erosion and riling shall be prevented.

Water shall be applied in sufficient quantity to germinate and maintain active growth of the erosion control (Biofiltration) seed mix.

The contract lump sum price paid for truck watering shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in truck watering, (including water), as specified in these special provisions, and as directed by the Engineer.

10-1.52 IRRIGATION CROSSOVERS

Irrigation crossovers shall conform to the provisions in Section 20-5, "Irrigation Systems," of the Standard Specifications and these special provisions.

Conduits shall be placed in open trenches in conformance with the provisions in Section 20-5.03B, "Conduit for Irrigation Crossovers," of the Standard Specifications.

Conduits shall be corrugated high density polyethylene (CHDPE) pipe. Corrugated high density polyethylene pipe shall conform to the requirements in ASTM Designation: F 405 or F 667, or AASHTO Designation: M 252 or M 294 and shall be Type S. Couplings and fittings shall be as recommended by the pipe manufacturer.

Water line crossovers shall conform to the provisions in Section 20-5.03C, "Water Line Crossovers," of the Standard Specifications.

Sprinkler control crossovers shall conform to the provisions in Section 20-5.027D, "Sprinkler Control Crossovers," of the Standard Specifications.

Installation of pull boxes shall conform to the provisions in Section 20-5.027I, "Conductors, Electrical Conduit and Pull Boxes," of the Standard Specifications. When no conductors are installed in electrical conduits, pull boxes for irrigation crossovers shall be installed on a foundation of compacted soil.

10-1.53 IRRIGATION SLEEVE

Irrigation sleeves shall be polyvinyl chloride (PVC) plastic pipe and shall conform to the provisions in Section 20-2.15B(1), "Plastic Pipe Supply Line," of the Standard Specifications and these special provisions.

Irrigation sleeves 150 mm or larger in diameter shall be Schedule 40.

Fittings shall be Schedule 40.

Irrigation sleeves shall be installed where shown on the plans.

Irrigation sleeves shall be installed not less than 0.45-m below finished grade measured to the top of the sleeve. Sleeves shall extend 150 mm beyond paving. The ends of the sleeve shall be capped until use.

Quantities of irrigation sleeve to be paid for will be determined from the slope length designated by the Engineer. Irrigation sleeve placed in excess of the lengths designated will not be paid for.

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

10-1.54 WATER SUPPLY LINE (BRIDGE)

Water supply lines identified on the plans as supply line (bridge) shall be of the size shown and shall conform to the details shown on the plans, the provisions in Section 20-5, "Irrigation Systems," of the Standard Specifications, and these special provisions.

GENERAL

Unless otherwise shown on the plans, casings shall be installed at each abutment and shall be extended to the greater of: (1) 1.5 m beyond the approach slab, (2) 1.5 m beyond the end of the adjacent wingwall, or (3) 6 m beyond the abutment.

Working Drawings

The Contractor shall submit complete working drawings for the temporary support of the casing at the abutments to the Offices of Structure Design (OSD) in conformance with the provisions in Section 5-1.02, "Plans and Working Drawings," of the Standard Specifications.

For initial review, 5 sets of drawings shall be submitted. After review, between 6 and 12 sets, as requested by the Engineer, shall be submitted to the OSD for final approval and use during construction.

MATERIALS

Pipe and Fittings for Supply Lines Less Than NPS 4

Pipe and fittings for supply lines less than NPS 4 shall conform to the provisions in Section 20-2.15A, "Steel Pipe," of the Standard Specifications.

Air Release Valve Assemblies for Supply Lines Less Than NPS 4

Each air release valve assembly for supply lines less than NPS 4 shall consist of a threaded tee of the same diameter as the supply line or pipe saddle, an NPS 1 ball valve, an automatic air release valve, and a tank vent. The air release valve shall have a cast iron body with stainless steel trim and float, an NPS 1 inlet pipe connection, and a 4.8 mm orifice. The tank vent shall be the size of the air release valve outlet and shall have a double opening facing down with screen cover.

Casing Insulators for Supply Lines Less Than NPS 4

Casing insulators for supply lines less than NPS 4 shall be designed for the size of casing and the supply line shown on the plans. Casing insulators for supply lines shall be high density, injection molded polyethylene, 2-piece construction with cadmium plated nuts and bolts and shall have a nonconductive inner liner. Casing insulators shall be factory constructed to ensure the supply line is centered in the casing to avoid any pipe to pipe contact and shall have at least 2 runners seated on the bottom of the casing.

Pipe End Seals for Supply Lines Less Than NPS 4

Pipe end seals for supply lines less than NPS 4 shall cover the space between the supply line and the end of the casing. Pipe end seals shall be made with 50 mm thick construction grade redwood and cut to fit the supply line.

Expansion Assemblies for Supply Lines Less Than NPS 4

Expansion assemblies for supply lines less than NPS 4 shall be the hose type. Hose shall be medium or heavy weight, oil resistant, flexible, reinforced with a minimum of 2-ply synthetic yarn or steel wire, equipped with steel flanges, and shall have rubber or synthetic rubber cover and tube. The hose and flange assembly shall have the same nominal inside diameter as the supply line and shall be rated for a minimum working pressure of 1.4 MPa. Hoses carrying potable water shall meet Food and Drug Administration standards.

Insulated Flange Connections

Each insulated flange connection shall consist of a dielectric flange gasket, insulating washers, and sleeves held in place with steel bolts and nuts. The gasket shall have a minimum dielectric rating of 500 V/0.025 mm.

Casings

Casings shall be welded steel pipe and shall conform to the provisions in Section 70-1.02B, "Welded Steel Pipe," of the Standard Specifications and these special provisions. Prior to shipping, exterior surfaces of welded steel pipe shall be cleaned and coated in conformance with the requirements in ANSI/AWWA C213, or at the option of the Contractor, cleaned, primed, and coated in conformance with the requirements in ANSI/AWWA C214.

Pipe Wrapping Tape

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

Each pipe hanger assembly 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 casings and shall conform to the provisions in Section 75-1.03, "Miscellaneous Bridge Metal," of the Standard Specifications.

Pipe Anchorages for Supply Lines Less Than NPS 4

Each pipe anchorage located halfway between the hose assembly shall consist of a fabricated steel I beam, U bolts, L anchor bolts, and double nuts suitable for the type and size of pipe installed and shall conform to the details shown on the plans and the provisions in Section 75-1.03, "Miscellaneous Bridge Metal," of the Standard Specifications.

Concrete Pipe Supports

Each concrete pipe support shall consist of either a precast or cast-in-place concrete pipe cradle, a galvanized steel pipe clamp, 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 minor concrete and commercial quality wire mesh. Minor concrete shall conform to the provisions in Section 90-10, "Minor Concrete," of the Standard Specifications, except that it shall contain not less than 350 kilograms of cementitious material per cubic meter. The concrete for pipe supports and pipe stops shall be moist cured for not less than 3 days.

Steel anchor bolts, nuts, pipe clamps, pipe protection shields, and other fittings shall be suitable for the type and size of the supply line or casing and shall conform to the provisions in Section 75-1.03, "Miscellaneous Bridge Metal," of the Standard Specifications.

Epoxy Adhesive

Epoxy adhesive shall conform to the provisions in Section 95, "Epoxy," of the Standard Specifications and one of the following:

A. Section 95-2.01, "Binder (Adhesive), Epoxy Resin Base," for load bearing applications.
B. Section 95-2.04, "Rapid Set Epoxy Adhesive for Pavement Markers."
C. Section 95-2.05, "Standard Set Epoxy Adhesive for Pavement Markers."

INSTALLATION

Water supply lines in bridge structures shall be supported as shown on the plans and in conformance with these special provisions.

If a blockout is provided in the bridge abutment wall for casing, the space between the casing and bridge abutment wall shall be filled with mortar conforming to the provisions in Section 51-1.135, "Mortar," of the Standard Specifications.

When the bridge superstructure is to be prestressed, the space around supply lines through abutments shall not be filled until the prestressing has been completed.

Openings for supply lines through bridge superstructure concrete shall either be formed or shall consist of pipe sleeves.

Cleaning and Closing of Pipe

The interior of the pipe shall be cleaned before installation. Openings shall be capped or plugged as soon as the pipe is installed to prevent the entrance of foreign material. The caps or plugs shall remain in place until the adjacent pipe sections are to be installed.

Wrapping and Coating Pipe

Damaged coating on supply line pipe in contact with the earth shall be wrapped with tape as follows:

A. Pipe to be wrapped shall be thoroughly cleaned and primed as recommended by the tape manufacturer.
B. Tape shall be tightly applied with one-half uniform lap, free from wrinkles and voids to provide not less than a 2.5 mm thickness.
C. Field joints and fittings for wrapped pipe shall be covered by double wrapping 1.27 mm thick tape. Wrapping at joints shall extend a minimum of 150 mm over adjacent pipe coverings. Width of tape for wrapping fittings shall not exceed 50 mm. Adequate tension shall be applied so that the tape will conform closely to the contours of the joint.

TESTING

Water supply lines less than NPS 4 shall be tested in conformance with the provisions in Section 20-5.03H(1), "Method A," of the Standard Specifications, except that the testing period shall be 4 hours minimum with no leakage or pressure drop.

The Contractor shall furnish pipe anchorages to resist thrust forces occurring during testing. Leaks shall be repaired and defective materials shall be replaced by the Contractor at the Contractor's expense.

Pressure testing and necessary repairing of water lines shall be completed prior to backfilling, placing deck slabs over supply lines in box girder cells, or otherwise covering the supply lines.

Each end of the supply line shall be capped prior to and after the testing.

The supply line shall be tested as one unit. The limits of the unit shall be 1.5 m beyond the casing at each end of the bridge.

MEASUREMENT AND PAYMENT

Measurement and payment for NPS 3 supply line (bridge) shall be made in the same manner as galvanized steel pipe and plastic pipe supply lines in Section 20-5.04, "Measurement," and Section 20-5.05, "Payment," of the Standard Specifications.

Full compensation for furnishing and installing air release valve assemblies, steel hangers, steel brackets and other fittings, casings and casing insulators, pipe end seals, concrete supports, pipe anchorages, concrete pipe stops, pipe wrapping tape, epoxy adhesives, and expansion assemblies; for cleaning, closing, wrapping, and coating pipe; and for pressure testing shall be considered as included in the contract prices paid per meter for the sizes of water supply line (bridge) involved, and no additional compensation will be allowed therefor.

10-1.55 AGGREGATE SUBBASE

Aggregate subbase must comply with Section 25, "Aggregate Subbases," of the Standard Specifications and these special provisions.

Aggregate subbase must be Class 4.

Do not store reclaimed asphalt concrete or aggregate subbase with reclaimed asphalt concrete within 30 m measured horizontally of any culvert, watercourse, or bridge.

Class 4 aggregate subbase must comply with:

Grading (Percentage Passing)

Sieve Sizes	Operating Range	Contract Compliance
100-mm		
4.75-mm		
600-µm		
75-µm		

Quality

Test	Operating Range	Contract Compliance
Sand Equivalent	Min.	___Min.
Resistance (R-value)	----	___Min.

If tests show grading or sand equivalent does not comply with the "Operating Range" specifications but complies with the "Contract Compliance" specifications, you may place aggregate subbase for the remainder of that day. Do not start another day's work until tests or other information indicate the next day's material complies with the "Operating Range" specifications.

If tests show grading or sand equivalent does not comply with the "Contract Compliance" specifications, remove the aggregate subbase represented by the tests. If you request and the Engineer approves, that aggregate subbase may remain in place and the Department reduces payment by $3.00 per cubic meter for that aggregate subbase. If the subbase remains in place and both the grading and sand equivalent do not comply with "Contract Compliance" specifications, the Department only makes one payment reduction.

No single grading or sand equivalent test may represent more than the smaller of 400 m^3 or one day's production.

Instead of Class 4 aggregate subbase, you may place Class 2 aggregate subbase complying with the aggregate grading and quality requirements in Section 25-1.02A, "Class 1, Class 2, and Class 3 Aggregate Subbases," of the Standard Specifications. If you place Class 2 aggregate subbase, do not change back to Class 4 subbase without written approval from the Engineer.

Regardless of the aggregate subbase class supplied, the Department pays for aggregate subbase as Class 4 aggregate subbase.

10-1.56 AGGREGATE BASE

Aggregate base must comply with Section 26, "Aggregate Bases," of the Standard Specifications and these special provisions.

Aggregate base must be Class 2.

Do not store reclaimed asphalt concrete or aggregate base with reclaimed asphalt concrete within 30 m measured horizontally of any culvert, watercourse, or bridge.

10-1.57 HOT MIX ASPHALT

GENERAL

Summary

This work includes producing and placing hot mix asphalt (HMA) Type A using the Quality Control / Quality Assurance process.

Comply with Section 39, "Hot Mix Asphalt," of the Ammendments to July 1999 Standard Specifications updated May 2, 2008.

Submittals

With the job mix formula (JMF) submittal, submit:

1. California Test 204 plasticity index results
2. California Test 371 tensile strength ratio results for untreated HMA
3. California Test 371 tensile strength ratio results for treated HMA if untreated HMA tensile strength ratio is below 70

With the JMF submittal, submit to the Engineer and the Transportation Laboratory, Attention: Moisture Test, samples for California Test 371 split from your mix design samples of:

1. Aggregate
2. Supplemental fines
3. Asphalt binder
4. Antistrip treatment

On the first production day, submit samples split from your HMA production sample for California Test 371 to the Engineer and the Transportation Laboratory, Attention: Moisture Test.

Submit the California Test 371 test results for mix design and production to the Engineer and electronically to:

Moisture_Tests@dot.ca.gov

Quality Control and Assurance

For the mix design, determine the plasticity index of the aggregate blend under California Test 204. Choose an antistrip treatment and use the corresponding laboratory procedure for the mix design in compliance with:

Antistrip Treatment Lab Procedures for Mix Design

Antistrip Treatment	Lab Procedure
Plasticity index from 4 to 10 [a, b]	
Dry hydrated lime with marination	LP-6
Lime slurry with marination	LP-7
Plasticity index less than 4	
Liquid	LP-5
Dry hydrated lime without marination	LP-6
Dry hydrated lime with marination	LP-6
Lime slurry with marination	LP-7

Notes:
[a] If the plasticity index is greater than 10, do not use that aggregate blend.
[b] If the plasticity index is from 4 to 10, use dry hydrated lime with marination or lime slurry with marination.

For the mix design, determine tensile strength ratio under California Test 371 on untreated HMA. If the tensile strength ratio is less than 70:

1. Choose from the antistrip treatments specified based on plasticity index.
2. Test treated HMA under California Test 371.
3. Treat to a minimum tensile strength ratio of 70.

On the first production day and at least every 4,500 tonnes, sample HMA and test under California Test 371.

The Department does not use California Test 371 test results for JMF verification and production to determine specification compliance.

MATERIALS

Asphalt Binder

The grade of asphalt binder mixed with aggregate for HMA Type A, except for dikes must be 64-10.

The grade of asphalt binder to be mixed with aggregate for Type A hot mix asphalt dikes shall be Grade PG 70-10 conforming to the provisions in Section 92, "Asphalts," of the Standard Specifications.

Aggregate

The aggregate for HMA Type A must comply with the 19 mm grading.

CONSTRUCTION

Vertical Joints

Before opening the lane to public traffic, pave shoulders and median borders adjacent to a lane being paved.

Do not leave a vertical joint more than 45 mm high between adjacent lanes open to public traffic.

Widening

If widening existing pavement, construct new structural section on both sides of the existing pavement to match the elevation of the existing pavement's edge at each location before placing HMA over the existing pavement.

Conform Tapers

Place additional HMA along the pavement's edge to conform to road connections and private drives. Hand rake, if necessary, and compact the additional HMA to form a smooth conform taper.

10-1.58 HOT MIX ASPHALT (MISCELLANEOUS AREAS)

GENERAL

Summary

This work includes producing hot mix asphalt (HMA) and placing it on miscellaneous areas.

Comply with Section 39, "Hot Mix Asphalt," of the Standard Specifications.

MEASUREMENT AND PAYMENT

If there is a contract item for place hot mix asphalt (miscellaneous area) paid for by the square meter, this item is limited to the areas listed on the plans and is in addition to the contract items for the materials involved.

10-1.59 HOT MIX ASPHALT AGGREGATE LIME TREATMENT - SLURRY METHOD

GENERAL

Summary

This work includes treating hot mix asphalt (HMA) aggregate with lime using the slurry method and placing it in stockpiles to marinate.

Treat aggregate for HMA Type A with lime slurry.

Submittals

Determine the exact lime proportions for fine and coarse virgin aggregate and submit them as part of the proposed job mix formula (JMF) under Section 39, "Hot Mix Asphalt," of the Standard Specifications.

Submit the averaged aggregate quality test results to the Engineer within 24 hours of sampling.

Submit a treatment data log from the slurry proportioning device in the following order:

1. Treatment date
2. Time of day the data is captured
3. Aggregate size being treated
4. Wet aggregate flow rate collected directly from the aggregate weigh belt
5. Moisture content of the aggregate just before treatment, expressed as a percent of the dry aggregate mass
6. Dry aggregate flow rate calculated from the wet aggregate flow rate
7. Lime slurry flow rate measured by the slurry meter
8. Dry lime flow rate calculated from the slurry meter output
9. Approved lime ratio for each aggregate size being treated
10. Actual lime ratio calculated from the aggregate weigh belt and the slurry meter output, expressed as a percent of the dry aggregate mass
11. Calculated difference between the approved lime ratio and the actual lime ratio
12. Dry lime and water proportions at the slurry treatment time

Every day during lime treatment, submit the treatment data log on electronic media in tab delimited format on a removable CD-ROM storage disk. Each continuous treatment data set must be a separate record using a line feed carriage return to present the specified data on one line. The reported data must include data titles at least once per report.

Quality Control and Assurance

The quality control plan (QCP) specified in Section 39-2, "Standard," and Section 39-4, "Quality Control / Quality Assurance," of the Standard Specifications must include aggregate quality control sampling and testing during aggregate lime treatment. Perform sampling and testing in compliance with:

Aggregate Quality Control During Lime Treatment

Quality Characteristic	Test Method	Minimum sampling and testing frequency
Sand Equivalent	CT 217	Once per 900 tonnes of aggregate treated with lime
Percent of crushed particles	CT 205	As necessary and as designated in the QCP
Los Angeles Rattler	CT 211	
Fine aggregate angularity	AASHTO T 304, Method A	
Flat and elongated particles	ASTM D 4791	

Note: During lime treatment, sample coarse and fine aggregate from individual stockpiles. Combine aggregate in the JMF proportions. Run tests for aggregate quality in triplicate and report test results as the average of 3 tests.

The Engineer orders proportioning operations stopped for any of the following if you:

1. Do not submit the treatment data log.
2. Do not submit the aggregate quality control data.
3. Submit incomplete, untimely, or incorrectly formatted data.
4. Do not take corrective actions.
5. Take late or unsuccessful corrective actions.
6. Do not stop treatment when proportioning tolerances are exceeded.
7. Use malfunctioning or failed proportioning devices.

If you stop treatment, notify the Engineer of any corrective actions taken and conduct a successful 20-minute test run before resuming treatment.

For the aggregate to be treated, determine the moisture content at least once during each 2 hours of treatment. Calculate moisture content under California Test 226 or California Test 370 and report it as a percent of dry aggregate mass. Use the moisture content calculations as a set point for the proportioning process controller.

MATERIALS

High-calcium hydrated lime and water must comply with Section 24-1.02, "Materials," of the Standard Specifications.

Before aggregate is treated, it must comply with the aggregate quality specifications in Section 39, "Hot Mix Asphalt," of the Standard Specifications. Do not test treated aggregate for quality control except for gradation. The Engineer does not test treated aggregate for acceptance except for gradation.

The Engineer determines the combined aggregate gradation during HMA production after you have treated aggregate.

Treated aggregate must not have lime balls or clods.

CONSTRUCTION

General

Notify the Engineer at least 24 hours before the start of aggregate treatment.

Treat aggregate separate from HMA production.

Do not treat reclaimed asphalt pavement.

Add lime to the aggregate as slurry consisting of mixed dry lime and water at a ratio of 1 part lime to between 2 parts and 3 parts water by mass. The slurry must completely coat the aggregate.

Lime treat and marinate coarse and fine aggregates separately.

Immediately before mixing lime slurry with aggregate, water must not visibly separate from aggregate.

Treat aggregate and stockpile for marination only once.

The lime ratio is the kilograms (of dry hydrated lime per 100 kg) of dry aggregate expressed as a percent. Water content of slurry or untreated aggregate must not affect the lime ratio.

Lime ratio ranges are:

Aggregate Gradation	Lime Ratio
Coarse	0.4 to 1.0
Fine	1.5 to 2.0
Combined	0.8 to 1.5

The lime ratio for fine and coarse aggregate must be within ±0.2 percent of the lime ratio in the accepted JMF. The lime ratio must be within ±0.2 percent of the approved lime ratio when you combine the individual aggregate sizes in the JMF proportions.

If 3 consecutive sets of recorded treatment data indicate deviation more than 0.2 percent above or below the lime ratio in the accepted JMF, stop treatment.

If a set of recorded treatment data indicates a deviation of more than 0.4 percent above or below the lime ratio in the accepted JMF, stop treatment and do not use the material represented by that set of data in HMA.

If 20 percent or more of the total daily treatment indicates deviation of more than 0.2 percent above or below the lime ratio in the accepted JMF, stop treatment and do not use the day's total treatment in HMA.

If you stop treatment for noncompliance, you must implement corrective action and successfully treat aggregate for a 20-minute period. Notify the Engineer before beginning the 20-minute treatment period.

Lime Slurry Proportioning

Proportion lime and water with a continuous or batch operation.

The device controlling slurry proportioning must produce a treatment data log. The log consists of a series of data sets captured at 10-minute intervals throughout daily treatment. The data must be a treatment activity register and not a summation. The material represented by the data set is the amount produced 5 minutes before and 5 minutes after the capture time. For the contract's duration, collected data must be stored by the controller.

Proportioning and Mixing Lime Slurry Treated Aggregate

Treat HMA aggregate by proportioning lime slurry and aggregate by mass in a continuous operation.

Marinate treated aggregate in stockpiles from 24 hours to 60 days before using in HMA. Do not use aggregate marinated longer than 60 days.

MEASUREMENT AND PAYMENT

Full compensation for lime slurry treated aggregates shall be considered as included in the contract price paid per tonne for HMA as designated in the Engineer's Estimate and no separate payment will be made therefor.

10-1.60 HOT MIX ASPHALT AGGREGATE LIME TREATMENT - DRY LIME METHOD

GENERAL

Summary

This work includes treating hot mix asphalt (HMA) aggregate with lime using the dry lime method either with marination or without.

Treat aggregate for HMA Type A with dry lime.

Marinate aggregate if the plasticity index determined under California Test 204 is from 4 to 10.

Submittals

Determine the exact lime proportions for fine and coarse virgin aggregate and submit them as part of the proposed job mix formula (JMF) under Section 39, "Hot Mix Asphalt," of the Standard Specifications.

If marination is required, submit in writing the averaged aggregate quality test results to the Engineer within 24 hours of sampling.

Submit in writing a treatment data log from the dry lime and aggregate proportioning device in the following order:

1. Treatment date
2. Time of day the data is captured
3. Aggregate size being treated
4. HMA type and mix aggregate size
5. Wet aggregate flow rate collected directly from the aggregate weigh belt
6. Aggregate moisture content, expressed as a percent of the dry aggregate mass
7. Flow rate of dry aggregate calculated from the flow rate of wet aggregate
8. Dry lime flow rate
9. Lime ratio from the accepted JMF for each aggregate size being treated

10. Lime ratio from the accepted JMF for the combined aggregate
11. Actual lime ratio calculated from the aggregate weigh belt output, the aggregate moisture input, and the dry lime meter output, expressed as a percent of the dry aggregate mass
12. Calculated difference between the approved lime ratio and the actual lime ratio

Every day during lime treatment, submit the treatment data log on electronic media in tab delimited format on a removable CD-ROM storage disk. Each continuous treatment data set must be a separate record using a line feed carriage return to present the specified data on one line. The reported data must include data titles at least once per report.

Quality Control and Assurance

If marination is required, the quality control plan (QCP) specified in Section 39-2, "Standard," and Section 39-4, "Quality Control / Quality Assurance," must include aggregate quality control sampling and testing during lime treatment. Perform sampling and testing in compliance with:

Quality Characteristic	Test Method	Minimum sampling and testing frequency
Sand Equivalent	CT 217	Once per 900 tonnes of aggregate treated with lime
Percent of crushed particles	CT 205	As necessary and as designated in the QCP
Los Angeles Rattler	CT 211	
Fine aggregate angularity	AASHTO T 304, Method A	
Flat and elongated particles	ASTM D 4791	

Note: During lime treatment, sample coarse and fine aggregate from individual stockpiles. Combine aggregate in the JMF proportions. Run tests for aggregate quality in triplicate and report test results as the average of 3 tests.

The Engineer orders proportioning operations stopped for any of the following if you:

1. Do not submit the treatment data log
2. Do not submit the aggregate quality control data for marinated aggregate
3. Submit incomplete, untimely, or incorrectly formatted data
4. Do not take corrective actions
5. Take late or unsuccessful corrective actions
6. Do not stop treatment when proportioning tolerances are exceeded
7. Use malfunctioning or failed proportioning devices

If you stop treatment, notify the Engineer of any corrective actions taken and conduct a successful 20-minute test run before resuming treatment.

MATERIALS

Lime must be high-calcium hydrated lime. Lime and water must comply with Section 24-1.02, "Materials," of the Standard Specifications.

Before aggregate is treated, it must comply with the aggregate quality specifications in Section 39, "Hot Mix Asphalt," of the Standard Specifications. Do not test treated aggregate for quality control except for gradation. The Engineer does not test treated aggregate for acceptance except for gradation.

The Engineer determines the combined aggregate gradation during HMA production after you have treated aggregate.

Treated aggregate must not have lime balls or clods.

CONSTRUCTION

General

Notify the Engineer in writing at least 24 hours before the start of aggregate treatment.

Do not treat reclaimed asphalt pavement.

If marination is required:

1. Treat and marinate coarse and fine aggregates separately.
2. Treat aggregate and stockpile for marination only once.
3. Treat aggregate separate from HMA production.

The lime ratio is the kilograms of dry hydrated lime per 100 kg of dry aggregate expressed as a percent. Water content of untreated aggregate must not affect the lime ratio.

Lime ratio ranges are:

Aggregate Gradation	Lime Ratio
Coarse	0.4 to 1.0
Fine	1.5 to 2.0
Combined	0.8 to 1.5

The lime ratio for fine and coarse aggregate must be within ±0.2 percent of the lime ratio in the accepted JMF. The lime ratio must be within ±0.2 percent of the approved lime ratio when you combine the individual aggregate sizes in the JMF proportions.

Proportion dry lime by mass with a continuous operation.

The device controlling dry lime and aggregate proportioning must produce a treatment data log. The log consists of a series of data sets captured at 10-minute intervals throughout daily treatment. The data must be a treatment activity register and not a summation. The material represented by a data set is the amount produced 5 minutes before and 5 minutes after the capture time. For the duration of the contract, collected data must be stored by the controller.

If 3 consecutive sets of recorded treatment data indicate deviation more than 0.2 percent above or below the lime ratio in the accepted JMF, stop treatment of lime treated aggregates.

If a set of recorded treatment data indicates a deviation of more than 0.4 percent above or below the lime ratio in the accepted JMF, stop treatment of lime treated aggregates and do not use the material represented by that set of data in HMA.

If 20 percent or more of the total daily treatment indicates deviation of more than 0.2 percent above or below the lime ratio in the accepted JMF, stop treatment and do not use the day's treated aggregate in HMA.

If you stop treatment for noncompliance, you must implement corrective action and successfully treat aggregate for a 20-minute period. Notify the Engineer before beginning the 20-minute treatment period.

If you use a batch-type proportioning operation for HMA production, control proportioning in compliance with the specifications for continuous mixing plants. Use a separate dry lime aggregate treatment operation from HMA batching operations including:

1. Pugmill mixer
2. Controller
3. Weigh belt for the lime
4. Weigh belt for the aggregate

If using a continuous mixing operation for HMA without lime marinated aggregates, use a controller that measures the blended aggregate mass after any additional water is added to the mixture. The controller must determine the amount of lime added to the aggregate from the aggregate weigh belt input in connection with the manually input total aggregate moisture, the manually input target lime content, and the lime proportioning system output. Use a continuous aggregate weigh belt and pugmill mixer for the lime treatment operation in addition to the weigh belt for the aggregate proportioning to asphalt binder in the HMA plant. If you use a water meter for moisture control for lime treatment, the meter must comply with California Test 109.

At the time of mixing dry lime with aggregate, the aggregate moisture content must ensure complete lime coating. The aggregate moisture content must not cause aggregate to be lost between the point of weighing the combined aggregate continuous stream and the dryer. Add water for mixing and coating aggregate to the aggregate before dry lime addition. Immediately before mixing lime with aggregate, water must not visibly separate from aggregate.

The HMA plant must be equipped with a bag house dust system. Material collected in the dust system must be returned to the mix.

Mixing Dry Lime and Aggregate

Mix aggregate, water, and dry lime with a continuous pugmill mixer with twin shafts. Immediately before mixing lime with aggregate, water must not visibly separate from aggregate. Store dry lime in a uniform and free flowing condition. Introduce dry lime to the pugmill in a continuous operation. The introduction must occur after the aggregate cold feed and before the point of proportioning across a weigh belt and the aggregate dryer. Prevent loss of dry lime.

If marination is required, marinate treated aggregate in stockpiles between 24 hours and 60 days before using in HMA. Do not use aggregate marinated more than 60 days.

The pugmill must be equipped with paddles arranged to provide sufficient mixing action and mixture movement. The pugmill must produce a homogeneous mixture of uniformly coated aggregates at mixer discharge.

If the aggregate treatment operation is stopped longer than 1 hour, clean the equipment of partially treated aggregate and lime.

Aggregate must be completely treated before introduction into the mixing drum.

MEASUREMENT AND PAYMENT

Full compensation for dry lime treating HMA aggregate including marination shall be considered as included in the contract price paid per tonne for HMA as designated in the Engineer's Estimate and no separate payment will be made therefor.

10-1.61 LIQUID ANTISTRIP TREATMENT

GENERAL

Summary

This work includes treating asphalt binder with liquid antistrip (LAS) treatment to bond the asphalt binder to aggregate in hot mix asphalt (HMA).

Submittals

For LAS, submit with the job mix formula (JMF) submittal under Section 39, "Hot Mix Asphalt," of the Standard Specifications:

1. Materials Safety Data Sheet (MSDS)
2. One 1/2-L sample
3. Infrared analysis including copy of absorption spectra

Submit a certified copy of test results and a MSDS for each LAS lot.

Submit a Certificate of Compliance under Section 6-1.07, "Certificates of Compliance," of the Standard Specifications for each LAS shipment. With each certificate also submit:

1. Your signature and printed name
2. Shipment number
3. Material type
4. Material specific gravity
5. Refinery
6. Consignee
7. Destination
8. Quantity
9. Contact or purchase order number
10. Shipment Date

Submit proportions for LAS as part of the JMF submittal specified in Section 39-1.03, "Hot Mix Asphalt Mix Design Requirements," of the Standard Specifications. If you change the brand or type of LAS, submit a new JMF.

For each job site delivery of LAS, submit one 1/4-L sample to the Transportation Laboratory. Submit shipping documents to the Engineer. Label each LAS sampling container with:

1. LAS type
2. Application rate
3. Sample date
4. Contract number

At the end of each day's production shift, submit production data in electronic and printed media. Present data on electronic media in tab delimited format. Use line feed carriage return with one separate record per line for each production data set. Allow sufficient fields for the specified data. Include data titles at least once per report. For each mixing operation type, submit in order:

1. Batch Mixing:

    1.1. Production date
    1.2. Time of batch completion
    1.3. Mix size and type
    1.4. Each ingredient's mass
    1.5. Asphalt binder content as percentage of dry aggregate mass
    1.6. LAS content as percentage of asphalt binder mass

2. Continuous Mixing:

    2.1. Production date
    2.2. Data capture time
    2.3. Mix size and type
    2.4. Flow rate of wet aggregate collected directly from the aggregate weigh belt
    2.5. Aggregate moisture content as percentage of dry aggregate mass
    2.6. Flow rate of asphalt binder collected from the asphalt binder meter
    2.7. Flow rate of LAS collected from the LAS meter
    2.8. Asphalt binder content as percentage of dry aggregate mass calculated from:

        2.8.1. Aggregate weigh belt output
        2.8.2. Aggregate moisture input
        2.8.3. Asphalt binder meter output

    2.9. LAS content as percentage of asphalt binder mass calculated from:

        2.9.1. Asphalt binder meter output
        2.9.2. LAS meter output

Quality Control and Assurance

For continuous mixing and batch mixing operations, sample asphalt binder before adding LAS. For continuous mixing operations, sample combined asphalt binder and LAS after the static mixer.

The Engineer orders proportioning operations stopped for any of the following if you:

1. Do not submit data
2. Submit incomplete, untimely, or incorrectly formatted data
3. Do not take corrective actions
4. Take late or unsuccessful corrective actions
5. Do not stop production when proportioning tolerances are exceeded
6. Use malfunctioning or failed proportioning devices

If you stop production, notify the Engineer of any corrective actions taken before resuming.

MATERIALS

LAS-treated asphalt binder must comply with Section 39, "Hot Mix Asphalt," of the Standard Specifications. LAS does not substitute for asphalt binder.

LAS total amine value must be 325 minimum when tested under ASTM D 2074.

Use only 1 LAS type or brand at a time. Do not mix LAS types or brands.

Store and mix LAS under the manufacturer's recommendations.

CONSTRUCTION

LAS must be between 0.5 and 1.0 percent by mass of asphalt binder.

If 3 consecutive sets of recorded production data show actual delivered LAS mass is more than ±1 percent of the approved mix design LAS weight, stop production and take corrective action.

If a set of recorded production data shows actual delivered LAS mass is more than ±2 percent of the approved mix design LAS weight, stop production. If the LAS mass exceeds 1.2 percent of the asphalt binder mass, do not use the HMA represented by that data.

The continuous mixing plant controller proportioning the HMA must produce a production data log. The log consists of a series of data sets captured at 10-minute intervals throughout daily production. The data must be a production activity register and not a summation. The material represented by the data is the amount produced 5 minutes before and 5 minutes after the capture time. For the duration of the contract, collected data must be stored by the plant controller or a computer's memory at the plant.

MEASUREMENT AND PAYMENT

Full compensation for LAS is included in the contract price paid per tonne for HMA as designated in the Engineer's Estimate and no separate payment will be made therefor.

10-1.62 JOINTED PLAIN CONCRETE PAVEMENT

GENERAL

Jointed plain concrete pavement shall be constructed in conformance with the provisions in Section 40, "Portland Cement Concrete Pavement," of the Standard Specifications and these special provisions, and as shown on the plans.

Insert method for forming joints in pavement shall not be used.

PREPAVING CONFERENCE

Supervisory personnel of the Contractor and subcontractors who are to be involved in the concrete paving work shall meet with the Engineer at a prepaving conference, at a mutually agreed time, to discuss methods of accomplishing the paving work.

The Contractor shall provide a facility for the prepaving conference within 5 km of the construction site or at a nearby location agreed to by the Engineer. Attendance at the prepaving conference is mandatory for the Contractor's project superintendent, paving construction foreman, subcontractor's workers, including foremen and personnel performing saw cutting, joint sealing, concrete plant manager, and concrete plant operator. Conference attendees shall sign an attendance sheet provided by the Engineer. Production and placement shall not begin nor proceed unless the above-mentioned personnel have attended the mandatory prepaving conference.

TEST STRIP

At the beginning of paving operations, the Contractor shall construct a test strip of concrete pavement from 200 m to 300 m in length. The paving width for the test strip shall be the same as that intended by the Contractor for production work. The Contractor shall use the same equipment to construct the test strip for the remainder of the paving operations, except as specified in this section. The Contractor shall not begin paving operations until the test strip has been evaluated in conformance with the provisions in Section 40-1.10, "Final Finishing," of the Standard Specifications regarding surface straight edge requirements, and "Profile Index" in this section; for dowel and tie bar alignment verification; concrete quality (except modulus of rupture); and pavement thickness. Additional test strips will be required when:

1. A portion of a test strip fails to conform to the provisions in Section 40-1.10, "Final Finishing," of the Standard Specifications for straight edge requirements;
2. A portion of the test strip fails to conform to profile requirements;
3. The Contractor proposes different paving equipment, including a batch plant, paver, dowel bar inserter, tie bar inserter, tining, or curing equipment;
4. The dowel bar tolerances are not met;
5. The pavement thickness deficiency is greater than 15 mm after grinding; or
6. A change in concrete mix proportions has occurred.

The Contractor shall perform coring of the test strips as part of the dowel and tie bar placement tolerance verification, and pavement thickness verification. The Engineer will select a minimum of six dowel bars that will be cored for each test strip. The Engineer will have the option of selecting up to 6 tie bars that will be cored for each test strip. After removal of cores, voids in concrete pavement shall be cleaned and filled with hydraulic cement grout conforming to the provisions in "Core Drilling for Dowel Placement Alignment Assurance Testing" in this section.

Before mechanical dowel bar inserters are used, the Contractor shall demonstrate that the insertion equipment will not leave surface irregularities such as depressions, dips, or high areas adjacent to the dowel bar insertion point, or voids or segregation around dowel bars.

Before placement of the test strip, the Contractor shall submit a written procedure to locate transverse weakened plane joints that will coincide with the center of the dowel bars being placed and locating the tie bars along the longitudinal joints. This procedure shall be submitted prior to the prepaving conference, and shall describe the control of inadvertent covering of paint markings after applying curing compound, excessive paint spray producing too large a paint dot marking for the accuracy required, misalignment by transferring marking spots, and inadequate staking of joints.

Construction of concrete pavement shall not proceed until the Engineer has completed an evaluation of the test strip. The Engineer shall be allowed 3 business days to evaluate the test strip. If, in the opinion of the Engineer, the Contractor's controlling operation is delayed or interfered with by reason of the Engineer not completing the evaluation of the test strip within the time specified, the delay will be considered a right of way delay in conformance with the provisions in Section 8-1.09, "Right of Way Delays," of the Standard Specifications. Test strips failing to conform to the specifications for concrete pavement shall be removed. Additional test strips shall be constructed until the Contractor constructs a test strip that conforms to the specifications for concrete pavement. Additional test strips shall conform to the requirements in this section, except the test strip shall be 200 m in length.

Prior to constructing additional test strips, the Contractor shall change methods or equipment to construct a test strip that conforms to the provisions in Section 40-1.10, "Final Finishing," of the Standard Specifications, "Profile Index" of this section, and dowel bar alignment verification, without grinding or other corrective work.

The Engineer may waive the initial test strip if the Contractor proposes to use a batch plant mixer and paving equipment with the same personnel that were satisfactorily used on a Department project within the preceding 12 months. The personnel shall be individuals listed in the prepaving conference used on a preceding Department project.

Materials resulting from the construction and removal of rejected test strips shall become the property of the Contractor and shall be removed and disposed of in conformance with the provisions in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications.

MATERIALS

Concrete

Attention is directed to Section 90, "Portland Cement Concrete," of the Standard Specifications, regarding mix proportions for concrete being determined by the Contractor.

Primary aggregate gradings shall conform to the gradation requirements of Section 90-3, "Aggregate Gradings," of the Standard Specifications. When combined in the proportions determined by the Contractor, the percent passing the 9.5 mm sieve and retained on the 2.36 mm sieve shall not be less than 16 percent of the total aggregate.

The cementitious material content shall not exceed 400 kg/m^3.

Tie Bars

Tie bars shall be deformed reinforcing steel bars conforming to the requirements of ASTM Designation: A 615/A 615M, Grade 280 or 420; ASTM Designation: A 615/A 615M (Grade 280 or 420), A996/A996M or A706/A706M. Tie bars shall be epoxy-coated in conformance with the requirements in ASTM Designation: A 934/A 934M or A 775/A 775M and the provisions in Section 52-1.02B, "Epoxy-coated Reinforcement," of the Standard Specifications, except the epoxy-coating thickness after curing shall be between 175 micrometers to 400 micrometers (7 mils to 16 mils). Fabrication, sampling and jobsite handling shall conform to the requirements in ASTM Designation: D 3963 and the provisions in Section 52-1.02B, "Epoxy-coated Reinforcement," of the Standard Specifications, except the 2 samples shall be 750 mm long. Epoxy-coated tie bars shall not be bent.

Epoxy (Drill and Bond)

Epoxy for bonding tie bars and dowel bars to portland cement concrete shall be a two-component, epoxy-resin, conforming to the requirements of ASTM Designation: C 881, Type V, Grade 3 (Non-Sagging), Class A, B or C. The class used shall be dependent on the internal temperature of the hardened concrete at the time the epoxy is to be applied. Class A shall be used when the internal temperature is below 4°C, but not lower than recommended by the manufacturer. Class B shall be used when the internal temperature is from 4°C to 15°C. Class C shall be used when the internal temperature is above 15°C, but not higher than recommended by the manufacturer. A Certificate of Compliance in conformance with the provisions in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications shall be furnished with the epoxy. A copy of the manufacturer's recommended installation procedure shall be provided to the Engineer at least 7 days prior to the start of work. Epoxy shall be applied in conformance with the manufacturer's recommendations.

Dowel Bars

Dowel bars shall be plain round smooth, epoxy-coated steel conforming to the requirements in ASTM Designation: A 615/A 615M, Grade 280 or 420, the details shown on the plans and the provisions in Section 52-1.02B, "Epoxy-coated Reinforcement," of the Standard Specifications, except that the two samples required in ASTM Designation D 3963/D 3963M shall be 460 mm long. Epoxy coating of dowel bars shall conform to the provisions in ASTM Designation: A 884/A 884M, Class A, Type 1 or Type 2, except that the bend test shall not apply.

Dowel bars shall be free from burrs or other deformations detrimental to free movement of the bars in the concrete.

Bond Breaker

Dowel bars shall be lubricated with a bond breaker over the entire bar. A bond breaker application of petroleum paraffin based lubricant or white-pigmented curing compound shall be used to coat the dowel bars completely prior to placement. Oil and asphalt based bond breakers shall not be used. Paraffin based lubricant shall be Dayton Superior DSC BB-Coat or Valvoline Tectyl 506 or an approved equal. Paraffin based lubricant shall be factory applied. White pigmented curing compound shall conform to the requirements of ASTM Designation: C 309, Type 2, Class A, and shall contain 22 percent minimum nonvolatile vehicles consisting of at least 50 percent paraffin wax. Curing compound shall be applied in 2 separate applications, the last application not more than 8 hours prior to placement of the dowel bars. Each application of curing compound shall be applied at the approximate rate of one liter per 3.7 m^2.

Dowel Bar Baskets

Dowel bar baskets shall be manufactured with a minimum welded wire gage number of MW 65. Baskets shall be either U-frame or A-frame shape. J-frame shapes shall not be used. Baskets shall be fabricated in conformance with the requirements in ASTM Designation: A 82. Welding of baskets shall conform to the requirements in AASHTO Designation: M 254. A broken weld will be a cause for rejection of the basket. Baskets shall be Class A, Type 1 or Type 2 epoxy-coated in conformance with the requirements in ASTM Designation: A 884/A 884M. Fabrication and job-site handling shall conform to the requirements in ASTM Designation: D 3963 and the provisions in Section 52-1.02B, "Epoxy-coated Reinforcement," of the Standard Specifications, except that sampling of epoxy-coated wire reinforcement will not be required. A Certificate of Compliance conforming to the provisions in Section 6-1.07, "Certificates of Compliance," shall be furnished for each shipment of epoxy-coated wire reinforcement certifying that the coated bars conform to the requirements in ASTM Designation: A 884/A 884M and the provisions in Section 52-1.02B, "Epoxy-coated Bar Reinforcement," of the Standard Specifications. The Certificate of Compliance shall include the certifications specified in ASTM Designation: A 884/A 884M and a statement that the coating material has been pre-qualified by acceptance testing performed by the Valley Forge Laboratories, Inc., Devon, Pennsylvania.

Concrete fasteners shall be used for anchoring dowel bar baskets to lean concrete base, hot mix asphalt used as base, asphalt treated permeable base, or cement treated permeable base. Concrete fasteners shall be driven fasteners such as concrete nails, used specifically for fastening to hardened concrete, or hot mix asphalt used as base. Concrete fasteners shall conform to the requirements of ASTM Designation: F 1667. Concrete nails used as fasteners on lean concrete base or hot mix asphalt used as base shall have a minimum shank diameter of 4 mm with a minimum shank length of 64 mm. Concrete nails used as fasteners on asphalt treated or cement treated permeable base shall have a minimum shank diameter of 4 mm with a minimum shank length of 120 mm. Shank length shall be the distance from the point to the bottom of the nail head. Clips and washers shall be commercial quality manufactured for use with dowel bar baskets. The surface of concrete fasteners, clips, and washers shall be either zinc electroplated or galvanized with a minimum coating thickness of 0.005-mm.

Tie Bar Baskets

Tie bar baskets shall be manufactured with a minimum welded wire gage number of MW 65. Baskets shall be either U-frame or A-frame shape. J-frame shapes shall not be used. Tie bar baskets shall be fabricated in conformance with the requirements in ASTM Designation: A 82. Welding of baskets shall conform to the requirements in AASHTO Designation: M 254. A broken weld will be a cause for rejection of the basket. Baskets shall be Class A, Type 1 epoxy-coated in conformance with the requirements in ASTM Designation: A 884/A 884M. Fabrication and job-site handling shall conform to the requirements in ASTM Designation: D 3963 and the provisions in Section 52-1.02B, "Epoxy-coated Reinforcement," of the Standard Specifications, except that sampling of epoxy-coated wire reinforcement will not be required. A Certificate of Compliance conforming to the provisions in Section 6-1.07, "Certificates of Compliance," shall be furnished for each shipment of epoxy-coated wire reinforcement certifying that the coated bars conform to the requirements in ASTM Designation: A 884/A 884M and the provisions in Section 52-1.02B, "Epoxy-coated Bar Reinforcement," of the Standard Specifications. The Certificate of Compliance shall include the certifications specified in ASTM Designation: A 884/A 884M and a statement that the coating material has been pre-qualified by acceptance testing performed by the Valley Forge Laboratories, Inc., Devon, Pennsylvania.

Concrete fasteners shall be used for anchoring tie bar baskets to lean concrete base, hot mix asphalt used as base, asphalt treated permeable base, or cement treated permeable base. Concrete fasteners shall be driven fasteners such as concrete nails, used specifically for fastening to hardened concrete, or hot mix asphalt used as base. Concrete fasteners shall conform to the requirements of ASTM Designation: F 1667. Concrete nails used as fasteners on lean concrete base or hot mix asphalt used as base shall have a minimum shank diameter of 4 mm with a minimum shank length of 64 mm. Concrete nails used as fasteners on asphalt treated or cement treated permeable base shall have a minimum shank diameter of 4 mm with a minimum shank length of 120 mm. Shank length shall be the distance from the point to the bottom of the nail head. Clips and washers shall be commercial quality manufactured for use with tie bar baskets. The surface of concrete fasteners, clips, and washers shall be either zinc electroplated or galvanized with a minimum coating thickness of 0.005-mm.

Reinforcement

Reinforcement shall be epoxy coated and shall conform to the provisions in Section 52, "Reinforcement," of the Standard Specifications.

Silicone Joint Sealant

Low modulus silicone joint sealant shall be furnished in a one-part silicone formulation. Acid cure sealant shall not be used. The compound shall be compatible with the surface to which it is applied and shall conform to the following requirements:

Property	Test Method	Requirement
Tensile stress, 150% elongation, 7-day cure at 25°± 1°C and 45% to 55% R.H.[e]	ASTM D 412 (Die C)	310 kPa max.
Flow at 25° ± 1°C	ASTM C 639[a]	Shall not flow from channel
Extrusion Rate at 25° ± 1°C	ASTM C 603[b]	75-250 g/min.
Specific Gravity	ASTM D 792 Method A	1.01 to 1.51
Durometer Hardness, at –18°C, Shore A, cured 7 days at 25° ± 1°C	ASTM C 661	10 to 25
Ozone and Ultraviolet Resistance, after 5000 hours	ASTM C 793	No chalking, cracking or bond loss
Tack free at 25° ± 1°C and 45% to 55% R.H.[e]	ASTM C 679	Less than 75 minutes
Elongation, 7 day cure at 25° ± 1°C and 45% to 55% R.H.[e]	ASTM D 412 (Die C)	500 percent min.
Set to Touch, at 25° ± 1°C and 45% to 55% R.H.[e]	ASTM D 1640	Less than 75 minutes
Shelf Life, from date of shipment	—	6 months min.
Bond, to concrete mortar-concrete briquettes, air cured 7 days at 25° ± 1°C	AASHTO T 132[c]	345 kPa min.
Movement Capability and Adhesion, 100% extension at –18°C after, air cured 7 days at 25° ± 1°C, and followed by 7 days in water at 25° ± 1°C	ASTM C 719[d]	No adhesive or cohesive failure after 5 cycles

Notes:

a. ASTM Designation: C 639 Modified (15 percent slope channel A).

b. ASTM Designation: C 603, through 3-mm opening at 345 kPa.

c. Mold briquettes in conformance with AASHTO Designation: T 132, sawed in half and bonded with a 1.5 mm maximum thickness of sealant and tested in conformance with AASHTO Designation: T 132. Briquettes shall be dried to constant mass at 100 ± 5° C.

d. Movement Capability and Adhesion: Prepare 305 mm x 25 mm x 75 mm concrete blocks in conformance with ASTM Designation: C 719. A sawed face shall be used for bond surface. Seal 50 mm of block leaving 12.5 mm on each end of specimen unsealed. The depth of sealant shall be 9.5 mm and the width 12.5-mm.

e. R.H. equals relative humidity.

The silicone joint sealant shall be formulated to cure rapidly enough to prevent flow after application on grades of up to 15 percent.

A Certificate of Compliance for the silicone sealant shall be furnished to the Engineer in conformance with the provisions in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications. The Certificate shall also be accompanied with a certified test report of the results of the required tests performed on the sealant material within the previous 12 months prior to proposed use. The Certificate and accompanying test report shall be provided for each lot of silicone joint sealant prior to use on the project.

Foam Backer Rods

Foam backer rods shall be Type 1, conforming to the requirements of ASTM Designation: D 5249. Foam backer rods shall have a diameter prior to placement at least 25 percent greater than the width of the sawcut and shall be expanded, crosslinked, closed-cell polyethylene foam that is compatible with the joint sealant so that no bond or adverse reaction occurs between the rod and sealant. Hot applied sealant that will melt the foam backer rod shall not be used. The Contractor shall submit a manufacturer's data sheet verifying that the foam backer rod is compatible with the sealant to be used.

Joint Filler Material

Joint filler material shall be preformed expansion joint filler for concrete (bituminous type), conforming to the requirements of ASTM Designation: D 994.

A Certificate of Compliance for the joint filler material shall be furnished to the Engineer in conformance with the provisions in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications. The certificate shall be accompanied with a certified test report of the results of the required tests performed on the joint filler material within the previous 12 months prior to proposed use. The certificate and accompanying test report shall be provided for each lot of joint filler material prior to use on the project.

Hydraulic Cement Grout (non-shrink)

Hydraulic cement grout (non-shrink) shall conform to the requirements in ASTM Designation: C 1107. At the Contractor's option, clean, uniformly rounded aggregate filler may be used to extend the grout. The extension of grout shall not exceed 60 percent of the mass of the grout or the maximum amount of grout extension recommended by the manufacturer, whichever is less. The moisture content of the aggregate filler shall not exceed 0.5-percent. Grading of the aggregate filler shall conform to the following:

Sieve Size	Percentage Passing
12.5 mm	100
9.5 mm	85-100
4.75 mm	10-30
2.36 mm	0-10
1.10 mm	0-5

PAVEMENT CONCRETE MIX PROPORTIONS

The Contractor shall determine the mix proportions for pavement concrete. The laboratory used to develop the mix proportions shall meet the requirements of ASTM Designation: C 1077, and shall have current AASHTO accreditation for test methods AASHTO Designation: T 97 or ASTM Designation: C 78, and AASHTO Designation: T 126 or ASTM Designation: C 192.

The minimum cementitious materials content or the maximum water to cementitious materials ratio shall be determined in conformance with the requirements in California Test 559. Trial mixtures shall be made no more than 24 months before field qualification. The minimum cementitious materials content or the maximum water to cementitious materials ratio shall be that determined from the trial mixtures curve to produce a minimum modulus of rupture of 3.9 MPa at 28 days age and 4.5 MPa at 42 days age. To account for variances in materials, production of concrete, and modulus of rupture testing, the Contractor shall include as part of the proposed mix proportions an increase to the cementitious material content or a decrease to the water to cementitious materials ratio, determined from trial mixtures, to ensure that portland cement concrete produced during paving operations conforms to the requirements in "Modulus of Rupture," in this section.

At least 15 days prior to field qualification, the Contractor shall submit the proposed pavement concrete mix proportions with laboratory test reports. Laboratory test reports shall include modulus of rupture determined for each trial mixture at ages of 10, 21, 28 and 42 days in conformance with the applicable portions of California Test 559.

Field Qualification

Field qualification of proposed mix proportions will be required prior to placement of pavement concrete. The Contractor shall perform field qualification and submit certified test data to the Engineer. Field qualification data shall be based upon the proposed use of materials, mix proportions, mixing equipment, procedures and size of batch.

Proposed concrete mix proportions will be field qualified when the test results of five beams from a single batch of concrete indicate the average modulus of rupture is at least 3.9 MPa with no single beam lower than 3.8 MPa at an age of the Contractor's choice but not later than 28 days. Beams shall be tested for modulus of rupture at a minimum of 10, 21, and 28 days of age. Test specimens shall be made and tested in conformance with the requirements in California Test 523.

The certified field qualification test data reports shall include the following:

1. Date of mixing,
2. Mixing equipment and procedures used,
3. Volume of batch in cubic meters and the mass or volume,
4. Type and source of ingredients used,
5. Penetration and slump of the concrete,
6. The air content of the concrete, and
7. The age at time of testing and strength of concrete specimens tested.

Field qualification test data reports shall be signed by a certified representative in charge of the laboratory that performed the tests.

If the Contractor changes a source of supply or proportions, the Contractor shall submit a new proposed mix design and furnish samples from the new source, or sources, at least 60 days prior to their intended use. The new mix proportions shall be trial batched and field qualified, unless, the Engineer determines the change is not substantive. No extension of contract time will be allowed for the time required to perform the sampling, testing, preparing and qualifying new mix proportions for new aggregate sources proposed by the Contractor.

MODULUS OF RUPTURE

The Engineer will test portland cement concrete pavement for modulus of rupture in conformance with the requirements in California Test 523. Acceptance will be on a lot basis. Each lot shall not to exceed 750 m^3 of concrete pavement. The Engineer will determine sample locations. A minimum of six beam specimens shall be made from each sample. Beam specimens will be tested for modulus of rupture at 10, 21, and 28 days. The modulus of rupture for each lot will be calculated by averaging the results of two beams representing that lot tested at 28 days of age. The difference in modulus of rupture between each individual beam result shall not exceed 0.44-MPa.

The Contractor shall perform sampling and testing of beam specimens to determine if concrete pavement has achieved a modulus of rupture of 2.4 MPa when requesting early use of concrete pavement in conformance with the provisions in Section 90-8.03, "Protecting Concrete Pavement," of the Standard Specifications. Beam specimens shall be made and tested in conformance with the requirements in California Test 523.

INSTALLING TIE BARS

Tie bars shall be installed at longitudinal contact joints and longitudinal weakened plane joints as shown on the plans. Contiguous width of new portland cement concrete pavement tied together with tie bars shall not exceed 15 m. Tie bars shall not be installed at joints between portland cement concrete and hot mix asphalt pavements.

Tie bars shall be installed at longitudinal joints by one of the following methods:

1. Drilling and bonding tie bars with two-component, epoxy-resin that conforms to this section. Drilled holes shall be cleaned in conformance with the epoxy manufacturer's instructions and shall be dry at the time of placing the epoxy and tie bars. Tie bars will be rotated 180º while being inserted into the epoxy filled holes. Immediately after inserting the tie bars into the epoxy, the tie bars shall be supported as necessary to prevent movement during curing and shall remain undisturbed until the epoxy has cured as specified by the manufacturer instructions. Tie bars that are improperly placed or bonded, as determined by the Engineer, will be rejected. If rejected, new holes shall be drilled and new tie bars shall be placed and securely bonded to the concrete. Rejected tie bars shall be cut flush with the joint face. Exposed ends of tie bars shall be epoxy coated. The center of the new holes shall be offset 75 mm horizontally from the center of the rejected hole to maintain the minimum clearance to the dowel bar. Work necessary to correct improperly bonded tie bars shall be performed at the Contractor's expense.
2. Inserting tie bars into the plastic slipformed concrete before finishing the concrete. Inserted tie bars shall have full contact between the bar and the concrete. When tie bars are inserted through the pavement surface, the concrete over the tie bars shall be reworked and refinished so that there is no evidence on the surface of the completed pavement that there has been an insertion performed. Loose tie bars shall be replaced by drilling and bonding as described in A above, at the Contractor's expense.
3. Using threaded dowel splice couplers fabricated from deformed bar reinforcement material, free of external welding or machining. Threaded dowel splice couplers shall be accompanied by a Certificate of Compliance in conformance with the provisions in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications, and shall be accompanied with installation instructions. Installation of threaded dowel splice couplers shall conform to the requirements of the manufacturer's recommendations.
4. Using tie bar baskets that conform to these special provisions

Tie bars shall be oriented perpendicular to the pavement joint and parallel with the surface of the pavement at mid-slab depth. Tie bar alignment tolerances shall conform to the requirements for dowel bars except embedment length tolerance shall be ±50 mm.

If tie bar baskets are used, they shall be anchored to the base to hold the tie bars at the specified depth and alignment during concrete placement without displacement. A minimum of 8 alternating, equally spaced, concrete fasteners with clips shall be used to anchor each basket (4 per lower runner wire). Temporary spacer wires shall be cut or removed after the baskets are anchored into position before concrete placement. Concrete pavement shall not be placed if the baskets are not in place at least 60 m in advance of the concrete placement operation. The Engineer may waive this requirement upon written request by the Contractor in areas where access is restricted or other construction limitations are encountered. The Contractor shall demonstrate that the baskets are anchored and shall not shift during concrete placement. The Contractor shall provide longer concrete nails than the minimum lengths for the varying bases beneath the portland cement concrete when baskets demonstrate movement.

Full compensation for providing longer concrete nails shall be considered as included in the contract unit price paid per cubic meter for concrete pavement and no additional compensation will be allowed therefor.

DOWEL PLACEMENT

Dowel bars shall be centered on the joint within a tolerance of ±50 mm in the longitudinal direction directly over the contact joint or sawcut for the transverse weakened plane joints, as shown on the plans. Prior to placement of dowel bars, the Contractor shall submit to the Engineer a written procedure to identify the transverse weakened plane joint locations relative to the middle of the dowel bars and the procedure for consolidating concrete around the dowel bars.

Dowel bars shall be placed at transverse weakened plane joints within shoulder areas except at drainage inlets.

Dowel bars shall be placed at longitudinal joints as shown on the plans.

Dowel bars shall be placed as shown on the plans by using dowel bar baskets or by mechanical insertion.

When dowel bars are placed by mechanical insertion, the concrete over the dowel bars shall be reworked and refinished so that there is no evidence on the surface of the completed pavement that there has been any insertion performed. When drill and bonding of dowel bars is performed at contact joints, a grout retention ring shall be used.When dowel bar baskets are used, they shall be anchored to the base to hold the dowel bars at the specified depth and alignment during concrete placement without displacement. A minimum of 8 alternating, equally spaced, concrete fasteners with clips shall be used to anchor each 3.6 m dowel bar basket (4 per lower runner wire). At least 10 concrete fasteners shall be used for basket sections greater than 3.6 m and less than or equal to 4.9 m. Temporary spacer wires connecting dowel bar baskets shall be cut or removed after the dowel bar baskets are anchored into position prior to concrete placement. Paving shall be suspended when dowel bar baskets are not in place at least 60 m in advance of the concrete placement operation. The Engineer may waive this requirement upon written request by the Contractor, in areas, where access is restricted, or other construction limitations are encountered. The Contractor shall demonstrate to the Engineer's satisfaction that dowel bar baskets are adequately anchored and not shift during concrete placement. The Contractor shall provide longer concrete nails than the minimum lengths for the varying bases beneath the portland cement concrete when anchored dowel bar baskets demonstrate movement.

Full compensation for providing longer concrete nails shall be considered as included in the contract unit price paid per cubic meter for concrete pavement and no additional compensation will be allowed therefor.

Dowel bar placement at transverse and longitudinal weakened plane joints	
Horizontal offset	±25 mm
Longitudinal translation	±50 mm
Horizontal skew	9 mm
Vertical skew	9 mm
Vertical depth	(d/3 +12 mm) from pavement surface to top of dowel bar or –15 mm below planned placement

Note: d = pavement thickness in mm

CORE DRILLING FOR DOWEL BAR AND TIE BAR PLACEMENT ALIGNMENT ASSURANCE TESTING

Coring to confirm dowel bar and tie bar placement, alignment, and concrete consolidation shall be provided by the Contractor throughout the project, at locations determined by the Engineer. Each day's paving shall be cored within 2 days by performing a minimum of 2 and a maximum of 4 tests for dowel bar placement and position for every 1670 m^2 of doweled pavement or fraction thereof and one test for tie bar placement and position for every 3340 m^2 of pavement with tie bars. One test shall consist of drilling two cores, one on each end of a dowel bar to expose both ends and allow measurement for proper alignment. The minimum core hole diameter shall be 127 mm. If the cores indicate that dowel bars or tie bars are not within the allowable tolerances or if air voids exist surrounding the dowel bars or tie bars, additional cores will be required to determine the limits and severity of unacceptable work.

The holes shall be cored by methods that will not damage the concrete adjacent to the holes. Immediately after coring, the concrete cores shall be submitted to the Engineer for inspection, and the cores shall be identified by the Contractor with a location description.

After removal of cores, core hole voids in concrete pavement shall be cleaned and filled with hydraulic cement grout (non-shrink). After placement of hydraulic cement grout, the material while still plastic shall be finished and textured to match the adjacent pavement surface. The backfill material shall be the same level as the pavement surface.

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

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

Dowel bar and tie bar alignment shall be within the specified tolerances. If dowel bars or tie bars are found to be installed improperly, the paving operations shall not continue until the Contractor has demonstrated to the Engineer that the problem which caused the improper dowel bar or tie bar positioning has been corrected.

Dowel bars in rejected joints shall be replaced by the Contractor by saw cutting on each side of the rejected joint a minimum of 0.9-m, lifting out concrete to be removed, installing new dowel bars at the new transverse joints, installing dowel bars and preformed sponge rubber expansion joint filler along the longitudinal joints, placing concrete, and installing new joints. Preformed sponge rubber expansion joint filler shall conform to the requirements in ASTM Designation: D 1752. New dowel bar holes shall be drilled, not more than 3 mm greater than the dowel bar diameter, by the use of an automatic dowel-drilling rig for the dowels to be installed at the contact joints. Dowel bars shall be placed, as shown on the plans, for the 2 new transverse contact joints. Original exposed tie bars, located within the slab replacement area, shall be cut flush with the lane or pavement edge and dowel bars shall be installed to replace the tie bars at an offset of 75 mm, horizontally from the tie bar location. Holes for dowel bars to be placed along the longitudinal joint shall be drilled, not more than 3 mm greater than the dowel bar diameter, by the use of an automatic dowel-drilling rig for the dowel bars to be installed at the contact joints.

When requested by the Contractor and approved by the Engineer, dowel bars which are more than ±50 mm but less than ±75 mm from being centered directly over the sawcut for the transverse weakened plane joint, may remain in place, and the Contractor shall pay to the State the amount of $32.30 per square meter for the quantity of concrete pavement panels represented by the cores indicating incorrect dowel bar alignment or improper concrete consolidation around dowels. The quantity of concrete pavement area used to determine the amount of payment to the State will be calculated using the panel dimensions for panels adjacent to and inclusive of the joints with incorrect dowel bar alignment or improper concrete consolidation around dowel bars. The Department will reduce compensation from moneys due, or that may become due to the Contractor under the contract. This reduced compensation shall be in addition to other adjustments for incorrect tie bar alignment or improper concrete consolidation around tie bars as specified in these special provisions and for pavement thickness deficiency in conformance with the provisions in Section 40-1.135, "Pavement Thickness," of the Standard Specifications and in addition to other adjustments for deficient Cleanness Value and coarse aggregate grading; and for deficient Sand Equivalent and fine aggregate grading in conformance with the provisions in Section 90-2.02, "Aggregate," of the Standard Specifications.

Tie bars which are not within the specified tolerance for placement and position, as determined from inspection and measurements of cores, may remain in place when requested by the Contractor and approved by the Engineer. The Contractor shall pay to the State the amount of $16.15 per square meter for the quantity of concrete pavement panels represented by the cores indicating incorrect tie bar alignment or improper concrete consolidation around tie bars. The quantity of concrete pavement area used to determine the amount of payment to the State will be calculated using the panel dimensions for panels adjacent to and inclusive of the joints with incorrect tie bar alignment or improper concrete consolidation around tie bars. The Department will reduce compensation from moneys due, or that may become due to the Contractor under the contract. This reduced compensation will be in addition to other adjustments for incorrect dowel bar alignment or improper concrete consolidation around dowel bars as specified in these special provisions and for pavement thickness deficiency in conformance with the provisions in Section 40-1.135, "Pavement Thickness," of the Standard Specifications and in addition to other adjustments for deficient Cleanness Value and coarse aggregate grading; and for deficient Sand Equivalent and fine aggregate grading in conformance with the provisions in Section 90-2.02, "Aggregate," of the Standard Specifications.

LIQUID JOINT SEALANT INSTALLATION

The joint sealant detail for transverse and longitudinal joints, as shown on the plans, shall apply only to weakened plane joints. Weakened plane joints shall be constructed by the sawing method. Should grinding or grooving be required over or adjacent to joints after sealant has been placed, the joint materials shall be removed and disposed of in conformance with the provisions in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications, and replaced at the Contractor's expense. Immediately after sawing, a water wash using less than 0.7 MPa pressure shall be used to remove the slurry from the sawing operation.

Transverse weakened plane joints shall be Type B as shown on the plans. Longitudinal weakened plane joints shall be Type B as shown on the plans.

Seven days after the concrete pavement placement and not more than 4 hours before placing backer rods and joint sealant materials, the joint walls shall be cleaned by the dry sand blast method and other means as necessary to remove from the joint objectionable material such as soil, asphalt, curing compound, paint and rust. Sand blasting shall be performed in at least 2 passes, one for each side of the joint, with the nozzle held at an angle to the joint within 25 mm to 51 mm of the pavement. After cleaning the joint, traces of sand, dust and loose material shall be removed from and near the joint for a distance along the pavement surfaces of at least 50 mm on each side of the joint by the use of a vacuum device. Surface moisture or dampness shall be removed at the joints by means of compressed air or moderate hot compressed air or other means approved by the Engineer. Drying procedures that leave a residue or film on the joint wall shall not be used. Sandblasting equipment shall have a maximum nozzle diameter size of 6 ± 1-mm and a minimum pressure of 0.62-MPa.

Backer rods shall be installed when the temperature of the portland cement concrete pavement is above the dew point of the air and when the air temperature is 4°C or above. Backer rod shall be installed when the joints to be sealed have been properly patched, cleaned and dried, as determined by the Engineer. Methods of placing backer rod that leave a residue or film on joint walls shall not be used.

Immediately after placement of the backer rod, joint sealant shall be placed in the clean, dry, prepared joints as shown on the plans. The joint sealant shall be applied using a mechanical device with a nozzle shaped to fit inside the joint to introduce the sealant from inside the joint. Adequate pressure shall be applied to the sealant to ensure that the sealant material is extruded evenly and that full continuous contact is made with the joint walls. After application of the sealant, the surface of the sealant shall be recessed as shown on the plans.

Failure of the joint material in either adhesion or cohesion will be cause for rejection of the joint. The finished surface of joint sealant shall conform to the dimensions and allowable tolerances shown on the plans. Rejected joint materials or joint material whose finished surface does not conform to the dimensions shown on the plans, as determined by the Engineer, shall be repaired or replaced, at the Contractor's expense, with joint material that conforms to the requirements.

After each joint is sealed, surplus joint sealer on the pavement surface shall be removed. Traffic shall not be permitted over the sealed joints until the sealant is tack free and set sufficiently to prevent embedment of roadway debris into the sealant.

CONSTRUCTING TRANSVERSE CONTACT JOINTS

A transverse contact (construction) joint shall be constructed, including dowel bars, at the end of each day's work or where concrete placement is interrupted for more than 30 minutes, to coincide with the next weakened plane joint location.

If sufficient concrete has not been mixed to form a slab to match the next weakened plane joint, when an interruption occurs, the excess concrete shall be removed and disposed of back to the last preceding joint. The cost of removing and disposing of excess concrete shall be at the Contractor's expense. Excess material shall become the property of the Contractor and shall be disposed of in conformance with the provisions in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications.

A metal or wooden bulkhead (header) shall be used to form the joint. The bulkhead shall be designed to accommodate the installation of dowel bars.

CONSTRUCTING LONGITUDINAL ISOLATION JOINTS

Final alignment of perpendicular transverse weakened plane joints in pavement shall not be made to match the spacing or skew of the weakened plane joints in the existing parallel concrete pavement. Tie bars shall not be placed across longitudinal isolation joints. The edge of the existing pavement shall be saw cut a width 3 mm and to the full depth of the existing concrete pavement to produce a flat vertical face. Prior to placing concrete, joint filler material shall be placed as shown on the plans. The joint filler shall be secured to the face of the existing pavement joint face by a method that will hold the joint filler in place and prevent the new concrete from adhering to the existing concrete, during placement of concrete.

Sealant for longitudinal isolation joints shall be silicon and placed in conformance with the requirements for liquid joint sealant installation as specified above, except references to backer rods shall not apply.

CONSTRUCTING TRANSVERSE JOINT CONNECTIONS AND ANCHORS

Concrete pavement joints at transitions to hot mix asphalt pavement, pavement end anchors and bridge approach slabs shall conform to the details as shown on the plans. Paint binder shall be applied to the concrete surface that hot mix asphalt pavement will contact. Paint binder shall be applied in conformance with the provisions in Section 39, "Hot Mix Asphalt," of the Standard Specifications.

PROFILE INDEX

The pavement surface shall be profiled, by the Contractor not more than 10 days following concrete placement, in the presence of the Engineer, using a California Profilograph or equivalent in conformance with the requirements in California Test 526, except a blanking band of zero (null) shall be used to determine the Profile Index. Two profiles shall be made within each traffic lane, one meter from and parallel with each lane line.

Profiled pavement shall conform to the following Profile Index requirements:

1. Pavement on tangent alignment and pavement on horizontal curves having a centerline radius of curve 600 m or more shall have a Profile Index of 64 mm or less for each 0.1-km.
2. Pavement on horizontal curves having a centerline radius of curve 300 m or more but less than 600 m and pavement within the superelevation transition of those curves shall have a Profile Index of 128 mm or less for each 0.1-km.

Individual high points in excess of 7.5 mm, as determined by measurements of the profilogram in conformance with the requirements in California Test 526, except using a blanking band of zero (null), shall be reduced by grinding in conformance with the requirements in Section 40-1.10, "Final Finishing," of the Standard Specifications until the high points as indicated by reruns of the profilograph do not exceed 7.5 mm.

Pavement grinding shall not be performed before 10 days have elapsed after concrete placement, nor before the concrete has developed a modulus of rupture of at least 3.8 MPa.

CONSTRUCTING WEAKENED PLANE JOINTS (EARLY ENTRY SAW METHOD)

The Contractor may construct weakened plane joints using lighter weight concrete saws (early entry saws) specifically designed for sawing fresh concrete without the use of water. The early entry saws shall be capable of sawing joints within 2 hours of cure time after placement of the concrete pavement without ravelling or tearing, as defined in Section 40-1.08B(1), "Sawing Method," of the Standard Specifications. Joints sawed with early entry saws that develop random cracking shall be removed to the nearest controlled joint and replaced with concrete pavement containing dowel bars and tie bars in conformance with these special provisions and as shown on the plans. The removal and replacement work shall be at the Contractor's expense. Weakened plane joints not sawed within 2 hours of placing concrete pavement shall be sawed by conventional power driven wet-type concrete saws in conformance with the requirements of Section 40-1.08B(1), "Sawing Method," of the Standard Specifications.

Sawed grooves shall be cut to a maximum of 3 mm in width for longitudinal and transverse weakened plane joints made with early entry saws. The minimum depth of cut shall be calculated utilizing the formula in Section 40-1.08B(1), "Sawing Method," of the Standard Specifications except $d = t/4$.

TIE BARS ALONG LONGITUDINAL JOINT FOR SHORT RADIUS CURVES

When paving along short radius curves, the transverse joints shall be maintained in a single continuous straight line across lanes, through the radius point. Tie bars shall maintain minimum clearance from the transverse joint as shown on the plans. If the inside or outside curve of the panel does not allow equal uniform spacing of tie bars at 710 mm between tie bars, then the tie bars shall be equally spaced so that a minimum spacing of 375 mm to a maximum spacing of 710 mm is maintained between tie bars. Additional tie bars shall be considered as included in the contract price paid per cubic meter for concrete pavement and no additional compensation will be allowed therefor.

If dowel bars are specified along longitudinal joint for short radius curves, then dowel bars shall conform to the requirements of this special provision for tie bars spacing and tolerance.

MEASUREMENT AND PAYMENT

Sealing longitudinal and transverse weakened plane joints, and longitudinal isolation joints in portland cement concrete pavement will be measured by the meter. When a test strip conforms to the specifications for concrete pavement and remains a part of the project paving surface, the sealed pavement joints will be measured and paid for as seal pavement joint.

The contract price paid per meter for seal pavement joint shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in sealing pavement joints complete in place, including sawing, cleaning and preparing the joints in the concrete pavement, furnishing and installing backer rod, repairing and patching spalled or raveled sawed joints, and replacing or repairing rejected joints, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

The contract price paid per meter for seal longitudinal isolation joint shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in sealing longitudinal isolation joints complete in place, including sawing, cleaning and preparing the joints in the concrete pavement, furnishing and installing joint filler material, repairing and patching spalled or raveled sawed joints, and replacing or repairing rejected joints, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

Concrete pavement will be measured by the cubic meter in conformance with the provisions in Section 40-1.13, "Measurement," of the Standard Specifications. No deduction will be made for the volume of epoxy-coated dowel bars, epoxy-coated tie bars and, when used, tie bar baskets with fasteners and dowel bar baskets with fasteners, in the concrete pavement. When a test strip conforms to the specifications for concrete pavement and remains a part of the project paving surface, the concrete will be measured and paid for as concrete pavement.

The contract price paid per cubic meter for concrete pavement shall include full compensation for furnishing all labor, materials (including cementitious material in the amount determined by the Contractor), tools, equipment, and incidentals, and for doing all the work involved in constructing the portland cement concrete pavement complete in place, including furnishing and placing epoxy-coated dowel bars, epoxy-coated tie bars and, when used, any tie bar baskets and dowel bar baskets with fasteners, submittal to the Engineer all test data for determination of mix proportions of concrete for concrete pavement and for providing the facility, Contractor personnel and all the work involved in arranging and holding the prepaving conference, for constructing and repairing all joints; for performing all profile checks for Profile Index and furnishing final profilograms to the Engineer; for grooving and grinding required for final finishing; and for removing, and replacing pavement for deficient thickness, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

Full compensation for drilling holes and bonding tie bars with epoxy resin shall be considered as included in the contract price paid per cubic meter for concrete pavement and no additional compensation will be allowed therefor.

Full compensation for coring test strips for evaluation by the Engineer and for backfilling core holes with hydraulic cement grout when the test strip remains in place as part of the concrete pavement; and for constructing, coring and removing and disposing of test strips that are rejected shall be considered as included in the contract price paid per cubic meter for concrete pavement and no additional compensation will be allowed therefor.

Full compensation for core drilling for dowel bar or tie bar alignment and backfilling with hydraulic cement grout shall be considered as included in the contract price per cubic meter for concrete pavement and no additional compensation will be allowed therefor.

If the initial cores show that dowel bars or tie bars are out of alignment tolerances and the Engineer orders additional dowel bar or tie bar coring, full compensation for drilling the additional cores shall be considered as included in the contract price per cubic meter for concrete pavement and no additional compensation will be allowed therefor.

If the initial cores show that dowel bars or tie bars are within alignment tolerances and the Engineer orders more dowel bar coring the additional cores will be paid for as extra work in conformance with the provisions in Section 4-1.03D, "Extra Work," of the Standard Specifications.

Full compensation for drilling holes and bonding dowel bars with epoxy resin shall be considered as included in the contract price paid per cubic meter for concrete pavement and no additional compensation will be allowed therefor.

Full compensation for furnishing and placing epoxy coated reinforcement for transition end panel shall be considered as included in the contract price paid per cubic meter for concrete pavement and no additional compensation will be allowed therefor.

Full compensation for furnishing and placing paint binder (tack coat) for transition end panel shall be considered as included in the contract price paid per cubic meter for concrete pavement and no additional compensation will be allowed therefor.

Rigid Pavement Smoothness

Pavement smoothness will be determined by the Contractor on the final paved surface course and prior to placement of any surface treatment (if specified). Contractor shall profilograph the final paved surface in accordance with California Test 526, except a zero (null) blanking band shall be used for determining the Profile Index, PI_0. In addition, straightedge provisions in Section 40-1.10 "Final Finishing" of the Standard Specifications, shall apply as specified herein.

Traffic lanes as defined in Section 1-1.46 of the Standard Specifications shall be profiled. Two profiles shall be obtained within each traffic lane, one meter from and parallel to each lane line, as defined in Section 84-1.01, "Description" of the Standard Specifications.

Testing with the California Profilograph or equivalent will not be required for the following areas of the pavement surface, but these areas shall conform to the straightedge requirements in Section 40-1.10 "Final Finishing" of the Standard Specifications:

A. Pavement on horizontal curves with a centerline radius of curvature of less than 300 m and pavement within the superelevation transition on those curves.
B. Bridge decks and their approach slabs that are not part of the concrete paving contract.
C. Pavement for exit ramp termini, truck weigh stations, and ramps and connectors with steep grades or high rates of superelevation in excess of 6%.
D. Pavement sections of city or county streets and roads, turn lanes, collector lanes, and areas around manholes or drainage transitions.
E. Acceleration and deceleration lanes for at-grade intersections.
F. Shoulders and miscellaneous gore areas.

G. Pavement surface within one meter from and parallel to the joint between the pavement and the existing curbs, gutters, or existing pavement.
H. Pavement surface within 4 m of a transverse joint that separates the new pavement from a structure deck, an approach slab, or an existing pavement not constructed under the contract.
I. Non-monolithically paved shoulders.

The contractor shall correct all pavement surfaces noted above that do not meet the requirements of Section 40-1.10 "Final Finishing" of the Standard Specifications by means of grinding in accordance with Section 42-2, "Grinding," of the Standard Specifications.

Calibration and Certification

The Contractor shall provide and operate a California type profilograph or equivalent, to determine the pavement profile. If the contractor's profilograph utilizes a mechanical recorder, the Contractor shall provide an electronic scanner to reduce the profilogram.

The Contractor's operator shall be trained and certified to operate the profilograph equipment as required by CTM 526.

Profilograph Test Procedure

The profilograph operations shall be in consideration of the lane closure requirements specified in "Maintaining Traffic" of these special provisions. In the event that initial profiles are not made prior to opening the pavement to public traffic, the initial runs of the profilograph shall be made the next day that traffic control is permitted for the area to be profiled or as stated elsewhere in these special provision or the Standard Specifications. Each day that profilograph testing is performed, the Engineer and Contractor shall agree to the start location of the pavement sections to be tested and verify that the pavement surface is clean of any objects or foreign material prior to testing.

Pavement shall be profiled in the presence of the Engineer. The Contractor shall notify the Engineer 48 hours in advance of any profilograph testing. If the Engineer elects to not be present, the Contractor may perform the test with written approval of the Engineer, and the absence of the Engineer shall be noted on the profilogram.

Stationing shall be noted on the profilogram in increments not to exceed 100 meters. Station referencing will be used to accurately locate vertical deviations greater than 7.5 mm. All station references shall reflect the actual project stationing.

The profilogram shall be labeled with the following information:

A. Project number (District EA)
B. County and route number
C. Stationing
D. Operator's name
E. Test date
F Test number
G. Traffic direction
H. Traffic lane
I Test wheel path
J. Test direction
K Direction of paving

The Contractor shall submit profilograms and an electronic file of the profile data to the Engineer within two working days of the initial profiling of the final surface course. In addition, the Contractor shall provide the Engineer with a table of the profile index of the left wheel path, right wheel path and the average of the two wheel paths for each 0.1 km section. Any section where corrections are made will be retested to verify that the corrections met the pavement smoothness requirements in Table A. The Contractor shall also submit profilograms and an electronic file of the profile data to the Engineer within two days of any subsequent profiling for verification of corrections. All corrections and profiling shall be done prior to placement of surface treatment if specified.

Pavement Smoothness Evaluation

The Contractor shall determine a PI_0 for each section of the final pavement surface course. A pavement section is defined as 0.1 km in length of a traffic lane. The PI_0 for each section will be the average of the PI_0 values for the two wheel paths. A partial section, which is less than 0.1 km, as a result of an interruption of the continuous pavement surface (i.e. bridge approaches, cessation of daily operations, etc.), is subject to the same evaluation of the PI_0 as a whole section. The PI_0 for a partial section shall be adjusted to reflect a 0.1 km section.

The pavement sections so profiled shall conform to the Pavement Smoothness Requirements in Table A.

Table A Pavement Smoothness Requirements			
Average PI_0 for each 0.1 km Section			
Incentive Range	Acceptable Range	Disincentive Range	Correction Range
<30 mm	30.0–45.0 mm	45.1–60.0 mm	>60 mm

Evaluation for Quality Assurance

The Engineer will use the results of the profile testing for pavement smoothness to evaluate whether the paving methods and equipment used by the Contractor are meeting the smoothness requirements specified in Table A..

The Contractor shall submit profilograms and an electronic file to the Engineer within one working day of the initial profiling of the first 2 kilometers paved. If the initial value of PI_0 for this 2-km section of pavement is greater than 60 mm, the paving operation will be suspended until the Contractor develops a plan that is approved by the Engineer to improve the paving methods and equipment.

Corrective Actions

Each 0.1 km section of pavement will be evaluated using average PI_0 of the profilograms for both wheel paths to determine areas where corrective action is needed for pavement not meeting smoothness requirements in Table A.

All areas within each separate wheel path having individual deviations (high points) in excess of 7.5 mm in a length of 7.62 m or less shall be corrected regardless of the PI_0 value. After correction, the section shall be retested to verify compliance with this requirement.

Pavement profiles having an initial PI_0 which fall under the "Correction Range" of the Pavement Smoothness Requirements shall be corrected to the "Acceptable Range." For PI_0 indexes that fall in the "Disincentive Range" the contractor has the option of correcting to the "Acceptable Range" or taking the disincentive pay adjustment in Table B. The Contractor will not be allowed to make corrections to pavements for the purpose of gaining the incentive pay adjustment.

The Contractor shall furnish the Engineer with a proposed written corrective action plan for correction for any 0.1 km section in order to meet the Smoothness Criteria Requirements in Table A. The Contractor shall submit the proposed written corrective action plan to the Engineer within five working days from the submittal of the profilogram to the Engineer. Within three working days, the Engineer will review the submitted proposal and either accept or reject it and ask for a new proposal. If rejected, the Contractor shall prepare a new proposal for corrective work within 2 working days.

When profile corrective action is required, the Contractor shall use one or more of the following corrective methods:

A. Grinding in accordance with Section 42.02, "Grinding," of the Standard Specifications.
B. Removing and replacing the entire pavement thickness.

The corrective action performed by the Contractor shall be applied to the entire lane width. When completed, the entire lane width shall have uniform texture and appearance, with the beginning and ending of the corrected area squared normal to the centerline of the paved surface. Corrective action shall be at the Contractor's expense.

The Engineer may perform profilograph testing on the surface for monitoring and comparison purposes. If it is determined that the Contractor's certified test results are inaccurate, the Engineer may require the Contractor to recalibrate the profilograph equipment and retest the surface in question. Furthermore, furnishing inaccurate test results may result in decertification of the Contractor's certified operator.

The final profilograms that indicate the pavement surface is within the PI_0 specified and the electronic data for the final profilograms shall become the property of the State and shall be delivered to the Engineer prior to acceptance of the contract. The Contractor shall also provide to the Engineer a table showing the profile index for the left wheel path, the right wheel path and the average of both wheel paths for each 0.1 km section.

Payment

Payment for performing all profilograph tests for PI_0 and furnishing the final profilograms to the Engineer, for any applicable incentive or disincentive payment adjustments, and for performing all corrective work to the pavement surface, shall be included in the contract price paid per cubic meter for concrete pavement, and no separate payment shall be made therefor.

Any contract price adjustments (incentives or disincentives) shall be based on the initial PI_0 determined for each 0.1 km section of pavement prior to performing any diamond grinding corrective work. If the Contractor elects to remove and replace any sections, the Contractor shall be paid the price adjustment that corresponds to the initial PI_0 obtained on the pavement sections after removal and replacement.

Areas that are ineligible for pay adjustments or excluded from profilograph testing shall not be subject to pay adjustments.

Payment for pavement smoothness will be determined by the Engineer based solely on the average value of PI_0 for both wheel paths for each 0.1 km section of each traffic lane for the entire project length other than the excluded areas. Payment will be based on pay adjustments defined in Table B.

Table B Pay Adjustment for PCC Pavement Smoothness	
Avg PI_0 (mm) for each 0.1 km Section	**Pay Adjustment per 0.1 km Section**
<10.0	+$900
10.1-15.0	+$600
15.1 20.0	+$300
20.1-25.0	+$300
25.1-30.0	+$300
30.1-35.0	$0
35.1-40.0	$0
40.1-45.0	$0
45.1-50.0	-$200
50.1-55.0	-$200
55.1-60.0	-$200
60.1-65.0	-$400
65.1-70.0	-$400
70.1-75.0	-$400
75.1-80.0	-$400
80.1-85.0	-$400
85.1-90.0	-$400
>90	-$800

10-1.63 EXIT RAMP TERMINI

Portland cement concrete pavement at exit ramp termini shall be constructed as shown on the plans and as provided in Section 40, "Portland Cement Concrete Pavement," of the Standard Specifications and these special provisions.

10-1.64 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.

Difficult pile installation is anticipated due to the presence of surface and/or high ground water, very dense sand, gravel, very hard granitic cobbles and boulders, and subsurface concrete debris.

Unfilled pipe piles shall be driven closed-ended with a special driving tip consisting of either a flat plate, prefabricated flat plate, or prefabricated conical point welded to the base of the pile.

Jetting and Drilling

Jetting or drilling to obtain the specified penetration in conformance with the provisions in Section 49-1.05, "Driving Equipment," of the Standard Specifications shall not be used for driven type piles.

Predrilled Holes

Piles shall be driven in oversized drilled holes in conformance with the provisions in Section 49-1.06, "Predrilled Holes," of the Standard Specifications at the locations and to the corresponding bottom of hole elevations listed in the following table:

Bridge Name or Number	Abutment Number	Bent Number	Elevation of Bottom of Hole
Heritage Road UC	1 Left		138.0 m
Heritage Road UC	1 Curtain Wall		133.5 m
Heritage Road UC	1 Right		129.0 m
Heritage Road UC	1 Right Side Retaining Wall Segments on Piles		129.0 m
Spring Canyon Bridge	1 Left		137.8 m
Spring Canyon Bridge	3 Left		137.8 m
Spring Canyon Bridge	1 Right		135.58 m
Spring Canyon Bridge	3 Right		135.58 m

STEEL PIPE PILING

General

Steel pipe piling shall consist of unfilled steel pipe piling. Steel pipe piling shall conform to the provisions in Section 49-5, "Steel Piles," of the Standard Specifications and these special provisions.

Wherever reference is made to the American Petroleum Institute (API) specification 5L in the Standard Specifications, on the project plans, or in these special provisions, the year of adoption shall be 2000. All requirements of that code shall apply unless specified otherwise in the Standard Specifications, on the plans, or in these special provisions.

Only longitudinal and spiral seam welds in steel pipe piles may be made by the electric resistance welding method. Those welds shall be welded in conformance with the requirements in API 5L and any amendments to API 5L in the Standard Specifications or these special provisions.

Steel Pipe piling shall either conform to the requirements in API 5L or AWS D1.1, and the provisions specified in Section 49-5, "Steel Piles," of the Standard Specifications and these special provisions.

Handling devices may be attached to steel pipe piling. Welds attaching these devices shall be aligned parallel to the axis of the pile and shall conform to the requirements for field welding specified herein. Permanent bolted connections shall be corrosion resistant. Prior to making attachments, the Contractor shall submit a plan to the Engineer that includes the locations, handling and fitting device details, and connection details. Attachments shall not be made to the steel pipe piling until the plan is approved in writing by the Engineer. The Contractor shall allow the Engineer 7 days for the review of the plan. 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.

For steel pipe piling, including bar reinforcement in the piling, the Contractor shall allow the Engineer 48 hours to review the Welding Report, specified in "Welding Quality Control" of these special provisions, and respond in writing after the required items have been received. No field welded steel pipe piling shall be installed, and no reinforcement in the piling shall be encased in concrete until the Engineer has approved the above requirements in writing. In the event the Engineer fails to complete the review and provide 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.

Steel Pipe in Conformance with API 5L

Steel pipe piling conforming to the requirements in API 5L shall conform to the following additional requirements:

A. Each length of steel pipe piling shall be marked with the API monogram.
B. The product shall be capable of meeting the fit-up requirements of AWS D1.1, Section 5.22.3.1, "Girth Weld Alignment (Tubular)," when the project requires the material to be spliced utilizing a girth weld.
C. Welds made at a permanent facility shall be made by submerged arc welding or an electric resistance welding process.
D. Except for tack welding, the gas metal arc welding process (GMAW) shall not be used for welding of pipe pile material. When GMAW is used for tacking, the electrode shall not be deposited by short circuiting transfer.
E. The joining of pipe sections in a permanent facility utilizing a circumferential or jointer weld shall conform to the requirements in AWS D1.1.

Steel Pipe in Conformance with AWS D1.1

Steel pipe piling conforming to the requirements in AWS D1.1 shall conform to the following additional requirements:

A. Weld filler metal shall conform to the requirements in AWS D1.5 for the welding of ASTM Designation: A709/A709M, Grade 345 steel, except that the qualification, pretest, and verification test requirements need not be conducted if certified test reports are provided for the consumables to be used.
B. Except for tack welding, GMAW shall not be used for welding of pipe pile material. When GMAW is used for tacking, the electrode shall not be deposited by short circuiting transfer.
C. Pipe piling designated as ASTM Designation A252, which has a yield strength of less than or equal to 450 MPa, shall be treated as ASTM Designation A572/A572M, Grade 345 material for the purpose of welding and pre-qualification of base metal, in conformance with the requirements in AWS D1.1.
D. Each length of steel pipe piling shall be marked in conformance with the requirements in ASTM Designation: A252.
E. The outside circumference of the steel pipe piling end shall not vary by more than 10 mm from that corresponding to the diameter shown on the plans.

Field Welding

Field welding of steel piling is defined as welding performed after the certificate of compliance has been furnished by the manufacturer or fabricator and shall conform to the following requirements:

A. Match marking of pipe ends at the manufacturing or fabrication facility is recommended for piling to ensure weld joint fit-up. Prior to positioning any 2 sections of steel pipe to be spliced by field welding, including those that have been match marked at the manufacturing or fabrication facility, the Contractor shall equalize the offsets of the pipe ends to be joined and match mark the pipe ends.
B. Welds made in the flat position or vertical position (where the longitudinal pipe axis is horizontal) shall be single-vee or double-vee groove welds. Welds made in the horizontal position (where the longitudinal pipe axis is vertical) shall be single-bevel groove welds. Joint fit-ups shall conform to the requirements in AWS D1.1, Section 5.22.3.1, "Girth Weld Alignment (Tubular)," and these special provisions.
C. The minimum thickness of the backing ring shall be 6 mm, and the ring shall be continuous. Splices in the backing ring shall be made by complete penetration welds. These welds shall be completed, including visual inspection and any required nondestructive testing (NDT), prior to final insertion into a pipe end. The attachment of backing rings to pipe ends shall be done using the minimum size and spacing of tack welds that will securely hold the backing ring in place. Tack welding shall be done in the root area of the weld splice. Cracked tack welds shall be removed and replaced prior to subsequent weld passes. The gap between the backing ring and the steel pipe piling wall shall be no greater than 2 mm. One localized portion of the backing ring fit-up, that is equal to or less than a length that is 20 percent of the outside circumference of the pipe, as determined by the Engineer, may be offset by a gap equal to or less than 6 mm provided that this localized portion is first seal welded using shielded metal arc E7016 or E7018 electrodes. The Contractor shall mark this localized portion so that it can be referenced during any required NDT. Backing rings shall have a minimum width of 1 1/2 times the thickness of the pile to be welded or 65 mm, whichever is greater, so that the backing ring will not interfere with the interpretation of the NDT.
D. For steel pipe with an outside diameter greater than 1.1 m, and with a wall thickness greater than 25.4 mm, the root opening tolerances may be increased to a maximum of 5 mm over the specified tolerances.
E. Weld filler metal shall conform to the requirements shown in AWS D1.5 for the welding of ASTM Designation: A709/A709M, Grade 345 steel, except that the qualification, pretest, and verification test requirements need not be conducted if certified test reports are provided for the consumables to be used.
F. For field welding limited to attaching backing rings and handling devices, the preheat and interpass temperature shall be in conformance with the requirements in AWS D1.1, Section 3.5, "Minimum Preheat and Interpass Temperature Requirements," and with Table 3.2, Category C.
G. The minimum preheat and interpass temperature for production splice welding and for making repairs shall be 66°C, regardless of the pipe pile wall thickness or steel grade. In the event welding is disrupted, preheating to 66°C must occur before welding is resumed.
H. Welds shall not be water quenched. Welds shall be allowed to cool unassisted to ambient temperature.
I. Pipe piling designated as ASTM Designation A252, which has a yield strength of less than or equal to 450 MPa, shall be treated as ASTM Designation A572/A572M, Grade 345 material for the purposes of welding and prequalification of base metal, in conformance with the requirements in AWS D1.1.

At the Contractor's option, a steel pipe pile may be re-tapped to prevent pile set-up provided the field welded splice remains at least one meter above the work platform until that splice is approved in writing by the Engineer.

NONDESTRUCTIVE TESTING FOR STEEL PIPE PILING

Steel pipe piling shall receive nondestructive testing (NDT) in conformance with these special provisions.

Nondestructive Testing of Welds made at a Permanent Facility

Nondestructive testing of welding performed in conformance with the requirements of API 5L shall conform to the following criteria:

A. The manufacturer shall provide to the Engineer a VHS videocassette recording of the actual product testing, when radiological testing is utilized, or the actual radiographic film when film radiography is utilized. This videocassette or film submittal shall be provided to the Engineer for review prior to shipment of the product from the manufacturing facility.
B. Ultrasonic testing of seam welds produced by the electric resistance welding process (ERW) shall comply with API 5L, SR17 utilizing a type V10 notch, N10 notch, or a 3.2 mm drilled hole.
C. The ultrasonic equipment shall utilize transducers oscillating at frequencies between 2 and 5 megahertz.
D. When the pipe ends of seam welds produced by the submerged arc welding process (SAW) are inspected by ultrasonic methods in accordance with API 5L Paragraph 9.7.4, the acceptance criteria shall be based on a type N5 notch or a 1.6 mm drilled hole.
E. When film radiography is utilized to inspect pipe ends or repairs, the transmitted film density shall be 2.0 to 4.0 in the area of interest (weld, base metal, and IQI).
F. Repaired defects shall be re-inspected utilizing the NDT method that originally detected the defect, except that film radiography may be utilized for inspection of repairs when the defect was originally detected utilizing real time imaging or radiological testing.

Nondestructive testing of welding performed in conformance with AWS D1.1 shall be in conformance with the following criteria:

A. Twenty-five percent of each longitudinal, circumferential, or spiral weld made at a permanent fabrication facility shall receive NDT. If repairs are required in a portion of the tested weld, the repaired portion shall receive NDT, and additional NDT shall be performed on untested portions of the weld. The additional NDT shall be made on both sides of the repair area for a length equal to 10 percent of the length of the pipe's outside circumference. After this additional 20 percent of NDT is performed, and if more repairs are required, the total cumulative repair lengths from all NDT shall be determined and documented. If the cumulative weld repair length is determined to be equal to or more than 10 percent of the length of the pipe outside circumference, then the entire weld shall receive NDT.
B. Circumferential or longitudinal welds shall receive NDT by either radiographic, real time imaging systems, or ultrasonic methods that are in conformance with the requirements in AWS D1.1.
C. The acceptance and repair criteria for ultrasonic testing (UT) shall conform to the requirements in AWS D1.1, Section 6, Table 6.3 for cyclically loaded nontubular connections. The acceptance and repair criteria for radiographic or real time image testing shall conform to the requirements of AWS D1.1 for tensile stress welds.

Nondestructive Testing of Field Welds

Nondestructive testing of field welds shall be in conformance with these special provisions.

Personnel performing ultrasonic testing (UT) for field welds will be required to verify their qualifications prior to performing nondestructive testing by both written and practical exams. Information regarding these exams is available at the Transportation Laboratory.

At the option of the Contractor, either ultrasonic testing (UT) or radiographic testing (RT) shall be used as the method of NDT for splices made by field welding steel pipe piling. This NDT shall be used for each field weld, including welds that are made onto a portion of the steel pipe piling that has been installed and any repair made to a splice weld. Testing shall be done at locations selected by the Engineer. The length of a splice weld, not including repairs, where NDT is to be performed, shall have a cumulative weld length that is equal to 25 percent of the pipe outside circumference. The Engineer may select several locations on a given splice for NDT. The cover pass shall be ground smooth at the locations to be tested. The acceptance and repair criteria for UT shall conform to the requirements in AWS D1.1, Section 6, Table 6.3 for cyclically loaded nontubular connections. The acceptance and repair criteria for radiographic or real time image testing shall conform to the requirements of AWS D1.1 for tensile stress welds. If repairs are required in a portion of the tested weld, the repaired portion shall receive NDT, and additional NDT shall be performed on untested portions of the weld. The additional NDT shall be made on both sides of the repair area for a length equal to 10 percent of the length of the pipe's outside circumference. After this additional 20 percent of NDT is performed, and if more repairs are required, the total cumulative repair lengths from all NDT shall be determined and documented. If the cumulative weld repair length is determined to be equal to or more than 10 percent of the length of the pipe outside circumference, then the entire weld shall receive NDT.

When backing rings are used, the backing ring complete joint penetration splice welds shall be inspected by RT or UT for material of thickness equal to or greater than 8 mm, or by RT for material of thickness less than 8 mm. The acceptance criteria for splice welds in backing rings shall be AWS D1.1, Section 6 and Figure 6.5 for RT, or Table 6.3 for UT.

MEASUREMENT AND PAYMENT (PILING)

Measurement and payment for the various types and classes of piles shall conform to the provisions in Sections 49-6.01, "Measurement," and 49-6.02, "Payment," of the Standard Specifications and these special provisions.

Full compensation for conforming to the provisions in "Steel Pipe Piling" and "Nondestructive Testing" of these special provisions 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.

10-1.65 PRESTRESSING CONCRETE

Prestressing concrete shall conform to the provisions in Section 50, "Prestressing Concrete," of the Standard Specifications and these special provisions.

The details shown on the plans for cast-in-place prestressed box girder bridges are based on a bonded full length draped tendon prestressing system. For these bridges the Contractor may, in conformance with the provisions in Section 5-1.14, "Cost Reduction Incentive," of the Standard Specifications, propose an alternative prestressing system utilizing bonded partial length tendons provided the proposed system and associated details meet the following requirements:

A. The proposed system and details shall provide moment and shear resistances at least equal to those used for the design of the structure shown on the plans.
B. The concrete strength shall not be less than that shown on the plans.
C. Not less than 35 percent of the total prestressing force at any section shall be provided by full length draped tendons.
D. Anchorage blocks for partial length tendons shall be located so that the blocks will not interfere with the placement of the utility facilities shown on the plans or of any future utilities to be placed through openings shown on the plans.
E. Temporary prestressing tendons, if used, shall be detensioned, and the temporary ducts shall be filled with grout before completion of the work. Temporary tendons shall be either removed or fully encased in grout before completion of the work.
F. All details of the proposed system, including supporting checked calculations, shall be included in the drawings submitted in conformance with the provisions in Section 50-1.02, "Drawings," of the Standard Specifications.

Moments and shears for loads used in the design shown on the plans will be made available to the Contractor upon written request to the Engineer.

10-1.66 CONCRETE STRUCTURES

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

Shotcrete shall not be used as an alternative construction method for reinforced concrete members unless otherwise specified.

Neoprene strip shall be furnished and installed at abutment backwall joint protection in conformance with the details shown on the plans, the provisions in the Standard Specifications, and these special provisions.

Furnishing and installing neoprene strip shall conform to the requirements for strip waterstops as provided in Section 51-1.145, "Strip Waterstops," of the Standard Specifications, except that the protective board will not be required.

Forms used to support the deck of cast-in-place box girders or to form the voids of precast members for the following structures may remain in place, provided the portions of the forms that obstruct access openings or conflict with utility facilities are removed, the forming system employed leaves no sharp projections into the cells or voids, and forms between hinges and 1.5 m beyond access openings adjacent to hinges are removed:

Caliente Avenue Overcrossing, (Bridge Number 57-1142)
Spring Canyon Bridge (Bridge Number 57-1155R)

Materials for access opening covers in soffits of new cast-in-place concrete box girder bridges shall conform to the provisions for materials in Section 75-1.03, "Miscellaneous Bridge Metal," of the Standard Specifications.

Plastic pipe located at vertical drains used behind retaining walls, including horizontal or sloping drains down slopes and across sidewalk areas, shall be polyvinyl chloride (PVC) plastic pipe, Schedule 80, conforming to the provisions for pipe for edge drains and edge drain outlets in Section 68-3.02, "Materials," of the Standard Specifications. The vertical drain pipe shall be rigidly supported in place during backfilling operations.

DECK CRACK TREATMENT

When methacrylate resin work is to be conducted within 31 meters of a residence, business, or public space, including sidewalks under a structure, the Contractor shall notify the public at least 7 days before starting work and monitor airborne emissions during the work. Public notification and monitoring of airborne emissions shall conform to the following:

A. The public safety plan required in Section 51-1.17A, "Deck Crack Treatment," of the Standard Specifications shall include a copy of the notification letter and a list of addresses and locations where the letter will be delivered and posted. The letter shall state the methacrylate resin work locations, dates, times, and what to expect. The letter shall be delivered to each residence and each business within 31 meters of the methacrylate resin work. The letter shall be delivered to local fire and police responders, and it shall be posted at the job site.
B. The public safety plan shall include an airborne emissions monitoring plan prepared by a certified industrial hygienist and a copy of the hygienist's certification. Airborne emissions shall be monitored at a minimum of 4 points including the point of mixing, the point of application, and the point of nearest public contact, as determined by the Engineer. At the completion of methacrylate resin work, a report by the certified industrial hygienist with results of the airborne emissions monitoring plan shall be submitted to the Engineer.

FALSEWORK

Falsework shall conform to the provisions in Section 51, "Concrete Structures," of the Standard Specifications and these special provisions.

In addition to the provisions in Section 51-1.06A, "Falsework Design and Drawings," of the Standard Specifications, the time to be provided for the Engineer's review of the working drawings for specific structures, or portions thereof, shall be as follows:

Structure or Portion of Structure	Total Review Time - Weeks
Spring Canyon Bridge (Bridge No. 57-1155L/R)	4

Temporary crash cushion modules, as shown on the plans and conforming to the provisions in "Temporary Crash Cushion Module" of these special provisions, shall be installed at the approach end of temporary railings which are located less than 4.6 m from the edge of a traffic lane. For 2-way traffic openings, temporary crash cushion modules shall be installed at the departing end of temporary railings which are located less than 1.8 m from the edge of a traffic lane.

The Contractor's engineer who signs the falsework drawings shall also certify in writing that the falsework is constructed in conformance with the approved drawings and the contract specifications prior to placing concrete. This certification shall include performing any testing necessary to verify the ability of the falsework members to sustain the stresses required by the falsework design. The engineer who signs the drawings may designate a representative to perform this certification. Where falsework contains openings for railroads, vehicular traffic, or pedestrians, the designated representative shall be qualified to perform this work, shall have at least three years of combined experience in falsework design or supervising falsework construction, and shall be registered as a Civil Engineer in the State of California. For other falsework, the designated representative shall be qualified to perform this work and shall have at least three years of combined experience in falsework design or supervising falsework construction. The Contractor shall certify the experience of the designated representative in writing and provide supporting documentation demonstrating the required experience if requested by the Engineer.

Welding and Nondestructive Testing

Welding of steel members, except for previously welded splices and except for when fillet welds are used where load demands are less than or equal to 175 N/mm for each 3 mm of fillet weld, shall conform to AWS D1.1 or other recognized welding standard. The welding standard to be utilized shall be specified by the Contractor on the working drawings. Previously welded splices for falsework members are defined as splices made prior to the member being shipped to the project site.

Splices made by field welding of steel beams at the project site shall undergo nondestructive testing (NDT). At the option of the Contractor, either ultrasonic testing (UT) or radiographic testing (RT) shall be used as the method of NDT for each field weld and any repair made to a previously welded splice in a steel beam. Testing shall be performed at locations selected by the Contractor. The length of a splice weld where NDT is to be performed, shall be a cumulative weld length equal to 25 percent of the original splice weld length. The cover pass shall be ground smooth at the locations to be tested. The acceptance criteria shall conform to the requirements of AWS D1.1, Section 6, for cyclically loaded nontubular connections subject to tensile stress. If repairs are required in a portion of the weld, additional NDT shall be performed on the repaired sections. The NDT method chosen shall be used for an entire splice evaluation including any required repairs.

For all field welded splices, the Contractor shall furnish to the Engineer a letter of certification which certifies that all welding and NDT, including visual inspection, are in conformance with the specifications and the welding standard shown on the approved working drawings. This letter of certification shall be signed by an engineer who is registered as a Civil Engineer in the State of California and shall be provided prior to placing any concrete for which the falsework is being erected to support.

For previously welded splices, the Contractor shall determine and perform all necessary testing and inspection required to certify the ability of the falsework members to sustain the stresses required by the falsework design. This welding certification shall (1) itemize the testing and inspection methods used, (2) include the tracking and identifying documents for previously welded members, (3) be signed by an engineer who is registered as a Civil Engineer in the State of California, (4) and shall be provided prior to erecting the members.

COST REDUCTION INCENTIVE PROPOSALS FOR CAST-IN-PLACE PRESTRESSED BOX GIRDER BRIDGES

Except as provided herein, cast-in-place prestressed box girder bridges shall be constructed in conformance with the details shown on the plans and the provisions in Section 50, "Prestressing Concrete," and Section 51, "Concrete Structures," of the Standard Specifications.

If the Contractor submits cost reduction incentive proposals for cast-in-place prestressed box girder bridges, the proposals shall be in conformance with the provisions in Section 5-1.14, "Cost Reduction Incentive," of the Standard Specifications and these special provisions.

The Engineer may reject any proposal which, in the Engineer's judgment, may not produce a structure which is at least equivalent to the planned structure.

At the time the cost reduction incentive proposal (CRIP) is submitted to the Engineer, the Contractor shall also submit 4 sets of the proposed revisions to the contract plans, design calculations, and calculations from an independent checker for all changes involved in the proposal, including revisions in camber, predicted deck profile at each construction stage, and falsework requirements to the Office of Structure Design, Documents Unit, P.O. Box 942874, Sacramento, CA 94274-0001 (1801 30th Street, Sacramento, CA 95816), telephone (916) 227-8230. When notified in writing by the Engineer, the Contractor shall submit 12 sets of the CRIP plan revisions and calculations to the Office of Structure Design for final approval and use during construction. The calculations shall verify that all requirements are satisfied. The CRIP plans and calculations shall be signed by an engineer who is registered as a Civil Engineer in the State of California.

The CRIP plans shall be either 279 mm x 432 mm, or 559 mm x 864 mm in size. Each CRIP plan sheet and calculation sheet shall include the State assigned designations for the contract number, bridge number, full name of the structure as shown on the contract plans, and District-County-Route-Kilometer Post. Each CRIP plan sheet shall be numbered in the lower right hand corner and shall contain a blank space in the upper right hand corner for future contract sheet numbers.

Within 3 weeks after final approval of the CRIP plan sheets, one set of the corrected good quality prints on 75-g/m^2 (minimum) bond paper, 559 mm x 864 mm in size, of all CRIP plan sheets prepared by the Contractor for each CRIP shall be furnished to the Office of Structure Design, Documents Unit.

Each CRIP shall be submitted prior to completion of 25 percent of the contract working days and sufficiently in advance of the start of the work that is proposed to be revised by the CRIP to allow time for review by the Engineer and correction by the Contractor of the CRIP plans and calculations without delaying the work. The Contractor shall allow a minimum of 8 weeks for the review of a CRIP. In the event that several CRIPs are submitted simultaneously, or an additional CRIP is submitted for review before the review of a previously submitted CRIP has been completed, the Contractor shall designate the sequence in which the CRIPs are to be reviewed. In this event, the time to be provided for the review of any proposal in the sequence shall be not less than the review time specified herein for that proposal, plus 2 weeks for each CRIP of higher priority which is still under review.

Should the review not be complete by the date specified in the Contractor's CRIP, or such other date as the Engineer and Contractor may subsequently have agreed to in writing and if, in the opinion of the Engineer, the Contractor's controlling operation is delayed or interfered with by reason of the delay in review of CRIP plans and calculations, an extension of time commensurate with the delay in completion of the work thus caused will be granted as provided in Section 8-1.07, "Liquidated Damages," of the Standard Specifications except that the provisions in Section 8-1.09, "Right of Way Delays," of the Standard Specifications shall not apply.

Permits and approvals required of the State have been obtained for the structures shown on the plans. Proposals which result in a deviation in configuration may require new permits or approvals. The Contractor shall be responsible for obtaining the new permits and approvals before the Engineer will reach a decision on the proposal. Delays in obtaining permits and approvals will not be reason for granting an extension of contract time.

All proposed modifications shall be designed in conformance with the bridge design specifications and procedures currently employed by the Department. The proposal shall include all related, dependent or incidental changes to the structure and other work affected by the proposal. The proposal will be considered only when all aspects of the design changes are included for the entire structure. Changes, such as but not limited to, additional reinforcement and changes in location of reinforcement, necessary to implement the CRIP after approval by the Engineer, shall be made at the Contractor's expense.

Modifications may be proposed in (1) the thickness of girder stems and deck slabs, (2) the number of girders, (3) the deck overhang dimensions as specified herein, (4) the amount and location of reinforcing steel, (5) the amount and location of prestressing force in the superstructure, and (6) the number of hinges, except that the number of hinges shall not be increased. The strength of the concrete used may be increased but the strength employed for design or analysis shall not exceed 42 MPa.

Modifications proposed to the minimum amount of prestressing force which must be provided by full length draped tendons are subject to the provisions in "Prestressing Concrete" of these special provisions.

No modifications will be permitted in (1) the foundation type, (2) the span lengths or (3) the exterior dimensions of columns or bridge superstructure, except that the overhang dimension from face of exterior girder to the outside edge of roadway deck may be uniformly increased or decreased by 25 percent on each side of the box girder section. Fixed connections at the tops and bottoms of columns shown on the plans shall not be eliminated.

The Contractor shall be responsible for determining construction camber and obtaining the final profile grade as shown on the plans.

The Contractor shall reimburse the State for the actual cost of investigating CRIPs for cast-in-place prestressed box girder bridges submitted by the Contractor. The Department will deduct this cost from any moneys due, or that may become due the Contractor under the contract, regardless of whether or not the proposal is approved or rejected.

SLIDING BEARINGS

Sliding bearings consisting of elastomeric bearing pads lubricated with grease and covered with sheet metal shall conform to the following requirements:

A. Grease shall conform to the requirements of Society of Automotive Engineers AS 8660. A uniform film of grease shall be applied to the upper surface of the pads prior to placing the sheet metal.
B. Sheet metal shall be commercial quality galvanized sheet steel. The sheet metal shall be smooth and free of kinks, bends, or burrs.
C. Construction methods and procedures shall prevent grout or concrete seepage into the sliding bearing assembly.

ELASTOMERIC BEARING PADS

Elastomeric bearing pads shall conform to the provisions in Section 51-1.12H, "Elastomeric Bearing Pads," of the Standard Specifications.

MEASUREMENT AND PAYMENT

Measurement and payment for concrete in structures shall conform to 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 and installing access opening covers and grates in soffits of new cast-in-place box girder bridges shall be considered as included in the contract price paid per cubic meter for structural concrete, bridge and no separate payment will be made therefor.

Full compensation for public notification and airborne monitoring for deck crack treatment shall be considered as included in the contract price paid per cubic meter for structural concrete, bridge, and no additional compensation will be allowed therefor.

10-1.67 REINFORCED CONCRETE CRIB WALL

Reinforced concrete crib walls shall be constructed as shown on the plans and in conformance with the provisions in Section 51, "Concrete Structures," of the Standard Specifications and these special provisions.

Crib walls shall consist of a series of rectangular cells composed of interlocking, precast, reinforced concrete headers, stretchers, and blocks.

Reinforcing steel shall conform to the requirements in ASTM Designation: A 706/A 706M, and reinforcing wire shall conform to the requirements in ASTM Designation: A 496/A 496M.

Hoops or stirrups may be reinforcing wire or deformed steel welded wire fabric of the size equivalent to the reinforcing steel shown on the plans. Deformed steel welded wire fabric shall conform to the requirements in ASTM Designation: A 497/A 497M.

Pads shown on the plans to be placed between bearing surfaces shall either be neoprene conforming to the provisions for strip waterstops as provided in Section 51-1.145, "Strip Waterstops," of the Standard Specifications or shall be commercial quality No. 30 asphalt felt. The protective board will not be required for neoprene pads.

External vibration resulting in adequate consolidation may be used, at the option of the Contractor.

Concrete test cylinders shall conform to the provisions in Section 90-9, "Compressive Strength," of the Standard Specifications, except that when the penetration of fresh concrete is less than 25 mm, the concrete in the test mold shall be consolidated by vibrating the mold equivalent to the consolidating effort being used to consolidate the concrete in the members.

Crib members used at walls 123 and 125 and at the Geosynthetic Reinforced Embankment No. 146 shall be cured in conformance with the provisions for piles in a corrosive environment in Section 90-7.05, "Curing Precast Prestressed Concrete Piles," of the Standard Specifications.

The provisions in Section 51-1.18, "Surface Finishes," of the Standard Specifications shall not apply to concrete crib members.

When removed from the forms, the members shall present a true surface of even texture free from honeycombs and voids larger than 25 mm in diameter and 8 mm in depth.

All pockets larger than the voids described above shall be cleaned and filled with mortar as directed by the Engineer. Mortar shall conform to the provisions in Section 51-1.135, "Mortar," of the Standard Specifications.

If rock pockets are of the extent or character as to affect the strength of the member materially or to endanger the life of the steel reinforcement, as determined by the Engineer, the member shall be replaced by the Contractor at the Contractor's expense.

The members shall be handled in such a manner as to prevent breakage. Members damaged during handling and placing shall be removed and replaced with new members by the Contractor at the Contractor's expense.

Crib walls shall be placed to the lines and grades established by the Engineer. The foundation for crib walls shall be excavated as shown on the plans and in conformance with the provisions in Section 19, "Earthwork," of the Standard Specifications. The foundation shall be approved by the Engineer before any crib members are placed.

Structure backfill for crib walls shall conform to the provisions in Section 19-3.06, "Structure Backfill," of the Standard Specifications.

Reinforced concrete crib walls will be measured by the square meter for the type or types shown in the Engineer's Estimate. The square meter area will be measured on the batter at the outer face for the height from the bottom of the bottom stretcher to the top of the top stretcher and for a length measured from end to end of each section of wall.

The contract price paid per square meter for reinforced concrete crib wall shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in constructing crib walls, except excavation and 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.

Excavation and backfill for the crib walls will be measured and paid for by the cubic meter as structure excavation (crib wall) and structure backfill (crib wall), respectively.

10-1.68 STRUCTURE APPROACH SLABS (TYPE N)

This work shall consist of constructing reinforced concrete approach slabs, structure approach drainage system, and treated permeable base at structure approaches in conformance with the details shown on the plans, the provisions in Section 51, "Concrete Structures," of the Standard Specifications, and these special provisions.

GENERAL

Attention is directed to "Engineering Fabrics" of these special provisions.

STRUCTURE APPROACH DRAINAGE SYSTEM

Geocomposite Drain

Geocomposite drain shall consist of a manufactured core not less than 6.35 mm thick nor more than 50 mm thick with one or both sides covered with a layer of filter fabric that will provide a drainage void. The drain shall produce a flow rate through the drainage void of at least 25 liters per minute per meter of width at a hydraulic gradient of 1.0 and a minimum externally applied pressure of 168 kPa.A Certificate of Compliance conforming to the provisions in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications shall be furnished for the geocomposite drain certifying that the drain complies with these special provisions. The Certificate of Compliance shall be accompanied by a flow capability graph for the geocomposite drain showing flow rates and the externally applied pressures and hydraulic gradients. The flow capability graph shall be stamped with the verification of an independent testing laboratory.

Filter fabric for the geocomposite drain shall conform to the provisions for filter fabric for underdrains in Section 88, "Engineering Fabrics," of the Standard Specifications.

The manufactured core shall be either a preformed grid of embossed plastic, a mat of random shapes of plastic fibers, a drainage net consisting of a uniform pattern of polymeric strands forming 2 sets of continuous flow channels, or a system of plastic pillars and interconnections forming a semirigid mat.

The core material and filter fabric shall be capable of maintaining the drainage void for the entire height of geocomposite drain. Filter fabric shall be integrally bonded to the side of the core material with the drainage void. Core material manufactured from impermeable plastic sheeting having non-connecting corrugations shall be placed with the corrugations approximately perpendicular to the drainage collection system.

The geocomposite drain shall be installed with the drainage void and the filter fabric facing the embankment. The fabric facing the embankment side shall overlap a minimum of 75 mm at all joints and wrap around the exterior edges a minimum of 75 mm beyond the exterior edge. If additional fabric is needed to provide overlap at joints and wraparound at edges, the added fabric shall overlap the fabric on the geocomposite drain at least 150 mm and be attached thereto.

Should the fabric on the geocomposite drain be torn or punctured, the damaged section shall be replaced completely or repaired by placing a piece of fabric that is large enough to cover the damaged area and provide a 150 mm overlap.

Plastic Pipe

Plastic pipe shall conform to the provisions for pipe for edge drains and edge drain outlets in Section 68-3, "Edge Drains," of the Standard Specifications.

Drainage Pads

Concrete for use in drainage pads shall be minor concrete, except the concrete shall contain not less than 300 kilograms of cementitious material per cubic meter.

Treated Permeable Base At Bottom Of Geocomposite Drains

Treated permeable base to be placed around the slotted plastic pipe at the bottom of geocomposite drains shall conform to the provisions in "Treated Permeable Base Under Approach Slab." If asphalt treated permeable base is used, it shall be placed at a temperature of not less than 82°C nor more than 110°C.

The filter fabric to be placed over the treated permeable base at the bottom of geocomposite drains shall conform to the provisions for filter fabric for edge drains in Section 88, "Engineering Fabrics," of the Standard Specifications.

ENGINEERING FABRICS

Filter fabric to be placed between the structure approach embankment material and the treated permeable base shall conform to the provisions for filter fabric for edge drains in Section 88, "Engineering Fabrics," of the Standard Specifications and these special provisions.

The subgrade to receive the filter fabric, immediately prior to placing, shall conform to the compaction and elevation tolerance specified for the material involved.

Filter fabric shall be aligned, handled, and placed in a wrinkle-free manner in conformance with the manufacturer's recommendations.

Adjacent borders of the filter fabric shall be overlapped from 300 to 450 mm or stitched. The preceding roll shall overlap the following roll in the direction the material is being spread or shall be stitched. When the fabric is joined by stitching, it shall be stitched with yarn of a contrasting color. The size and composition of the yarn shall be as recommended by the fabric manufacturer. The number of stitches per 25 mm of seam shall be 5 to 7.

Equipment or vehicles shall not be operated or driven directly on the filter fabric.

TREATED PERMEABLE BASE UNDER APPROACH SLAB

Treated permeable base under structure approach slabs shall consist of constructing either an asphalt treated permeable base or a cement treated permeable base in accordance with Section 29, "Treated Permeable Bases," of the Standard Specifications and these special provisions.

The type of treatment to be used shall be at the option of the Contractor.

The Contractor shall notify the Engineer in writing, not less than 30 days prior to the start of placing the treated permeable base, which type of treated permeable base will be furnished. Once the Contractor has notified the Engineer of the selection, the type to be furnished shall not be changed without a prior written request to do so and approval thereof in writing by the Engineer.

Asphalt treated permeable base shall be placed at a temperature of not less than 93°C nor more than 121°C. Material stored in excess of 2 hours shall not be used in the work.

Asphalt treated permeable base material may be spread in one layer. The base material shall be compacted with a vibrating shoe type compactor or rolled with a roller weighing at least 1.3 tonnes but no more than 4.5 tonnes. Rolling shall begin as soon as the mixture has cooled sufficiently to support the weight of the rolling equipment without undue displacement.

Cement treated permeable base material may be spread in one layer. The base material shall be compacted with either a vibrating shoe type compactor or with a steel-drum roller weighing at least 1.3 tonnes but no more than 4.5 tonnes. Compaction shall begin within one-half hour after the spreading operation and shall consist of 2 complete coverages of the treated material.

APPROACH SLABS

Concrete for use in approach slabs shall contain not less than 400 kilograms of cementitious material per cubic meter.

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

Structure approach slabs shall be cured for not less than 5 days prior to opening to public traffic, unless, at the option of the Contractor, the structure approach slabs and sleeper slabs are constructed using concrete with a nonchloride Type C chemical admixture conforming to these special provisions.

Portland cement for use in concrete using a nonchloride Type C chemical admixture shall be Type II or Type III conforming to the provisions in Section 90-2.01, "Cementitious Materials," of the Standard Specifications. Mortar containing the Type II portland cement to be used and Ottawa sand shall not contract in air more than 0.053 percent when tested in conformance with California Test 527.

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

The concrete with nonchloride 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°C ± 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. Not more than 2 test cylinders shall have a strength of less than 5.5 MPa.

The top surface of approach slabs shall be finished and treated in conformance with the provisions for decks in Section 51-1.17, "Finishing Bridge Decks," of the Standard Specifications. Edges of slabs shall be edger finished.

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.

Structure approach slabs constructed using concrete with a nonchloride Type C chemical admixture shall be cured for not less than 6 hours prior to opening to public traffic. The curing period shall be considered to begin at the start of discharge of the last truckload of concrete to be used in the slab.

If the ambient temperature is below 18°C during the curing period for approach slabs using concrete with a nonchloride Type C chemical admixture, an insulating layer or blanket shall be used to cover the surface. The insulating 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

JOINTS

Hardboard and expanded polystyrene shall conform to the provisions in Section 51-1.12D, "Sheet Packing, Preformed Pads, and Board Fillers," of the Standard Specifications.

Type AL joint seals shall conform to the provisions in Section 51-1.12F, "Sealed Joints" of the Standard Specifications. The sealant may be mixed by hand-held, power-driven agitators and placed by hand methods.

The pourable seal between the steel angle and concrete barrier shall conform to the requirements for Type A and AL seals in Section 51-1.12F(3), "Materials and Installation," of the Standard Specifications. The sealant may be mixed by hand-held, power-driven agitators and placed by hand methods. Immediately prior to placing the seal, the joint shall be thoroughly cleaned, including abrasive blast cleaning of the concrete surfaces, so that all foreign material and concrete spillage are removed from all joint surfaces. Joint surfaces shall be dry at the time the seal is placed.

MEASUREMENT AND PAYMENT

Structural concrete, approach slab (Type N) 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 the structure approach drainage system including geocomposite drain, plastic pipe, and drainage pads, treated permeable base, filter fabric, miscellaneous metal, and pourable seals shall be considered as included in the contract price paid per cubic meter for structural concrete, approach slab of the type shown in the Engineer's Estimate, and no additional compensation will be allowed therefor.

10-1.69 SOUND WALL

DESCRIPTION

This work shall consist of constructing sound walls of masonry block. Sound walls shall be supported on concrete barriers, retaining walls, or footings 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 Section 19, "Earthwork," Section 52, "Reinforcement," and Section 90, "Portland Cement Concrete," of the Standard Specifications and these special provisions.

Sound wall masonry unit stems shall be constructed with joints of 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, lightweight or medium weight class units conforming to the requirements in ASTM Designation: C 90. 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 closely resemble Davis manufacturer's color "Sandstone." The color shall be integral, chemically inert, fade resistant mineral oxide or synthetic type.

When high strength concrete masonry units with f'm=17.24 MPa are shown on the plans, the high strength masonry units shall have a minimum compressive strength of 25.86 MPa based on net area. When high strength concrete masonry units with f'm=13.79 MPa are shown on the plans, the high strength masonry units shall have a minimum compressive strength of 19.31 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. When regular strength concrete masonry units with f'm=10.34 MPa are shown on the plans, the regular strength masonry units shall have a minimum compressive strength of 13.1 MPa based on net area.

Expansion joint filler shall conform to the requirements in ASTM Designation: D 1751 or ASTM Designation: D 2000 M2AA 805.

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

Cementitious material for wall stems shall conform to the provisions in Section 90-2.01, "Cementitious Materials," 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 cementitious material, zero 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 or more than 0.25 percent soluble sulfates, as SO_4, when tested in conformance with California Test 417.

Before 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 that 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 cementitious material for regular strength masonry. The maximum amount of free water shall not exceed 0.6 times the mass of the cementitious material for high strength masonry.

Grout proportioned by volume for regular strength masonry shall consist of at least one part cementitious material and 4.5 parts aggregate. Grout proportioned by volume for high strength masonry shall consist of at least one part cementitious material 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 cementitious material per cubic meter. Grout proportioned by mass for high strength masonry shall contain not less than 400 kilograms of cementitious material per cubic meter.

Reinforced concrete masonry unit wall stems shall be constructed with 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 before 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 before 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 of the types designated in the Engineer's Estimate will be measured by the square meter of the area of wall projected on a vertical plane between the elevation lines shown on the plans and length of wall (including the exposed posts, back up wall for access openings, and access gates).

Sound wall footings, pile caps, and grade beams will be measured and paid for as minor concrete (sound wall).

The contract price paid per cubic meter for minor concrete (sound wall) shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in constructing the footings, pile caps, and grade beams, complete in place, including 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.

10-1.70 SEALING JOINTS

Joints in concrete bridge decks and joints between concrete structures and concrete approach slabs must be sealed in conformance with the details shown on the plans, the provisions in Section 51, "Concrete Structures," of the Standard Specifications, and these special provisions.

When ordered by the Engineer, a joint seal larger than called for by the Movement Rating shown on the plans must be furnished and installed. Payment to the Contractor for furnishing the larger seal and for saw cutting the increment of additional depth of groove required will be determined as provided in Section 4-1.03, "Changes," of the Standard Specifications.

10-1.71 JOINT SEAL ASSEMBLIES (MAXIMUM MOVEMENT RATING, 100 mm)

Joint seal assemblies shall conform to the details shown on the plans, the provisions in Section 51, "Concrete Structures," of the Standard Specifications, and these special provisions.

All metal parts of the joint seal assembly shall conform to the provisions in Section 75-1.03, "Miscellaneous Bridge Metal," of the Standard Specifications. Bolts, nuts, and washers shall conform to the requirements in ASTM Designation: A 325 or A 325M.

At the Contractor's option, cleaning and painting of all new metal surfaces of the joint seal assembly, except stainless steel and anchorages embedded in concrete, may be substituted for galvanizing. Cleaning and painting shall be in conformance with the provisions in "Clean and Paint Structural Steel" of these special provisions.

Certification in conformance with the requirements in SSPC-QP 1, SSPC-QP 2, and SSPC-QP 3 of the "SSPC: The Society for Protective Coatings" will not be required for cleaning and painting joint seal assemblies.

Finish coats will not be required on joint seal assemblies.

Sheet neoprene shall conform to the provisions for neoprene in Section 51-1.14, "Waterstops," of the Standard Specifications. The sheet neoprene shall be fabricated to fit the joint seal assembly accurately.

Metal parts of the joint seal assembly shall be pre-assembled before installation to verify the geometry of the completed seal.

The bridge deck surface shall conform to the provisions in Section 51-1.17, "Finishing Bridge Decks," of the Standard Specifications prior to placing and anchoring the joint seal assembly.

The assembly shall be placed in a blocked out recess in the concrete deck surface. The depth and width of the recess shall permit the installation of the assembly anchorage components or anchorage bearing surface to the lines and grades shown on the plans.

Sheet neoprene shall be installed at such time and in such manner that the sheet neoprene will not be damaged by construction operations. The joint shall be cleaned of all dirt, debris and other foreign material immediately prior to installation of the sheet neoprene.

ALTERNATIVE JOINT SEAL ASSEMBLY

At the Contractor's option, an alternative joint seal assembly may be furnished and installed provided: (1) that the quality of the alternative and its suitability for the intended application are at least equal to that of the joint seal assembly shown on the plans, (2) that acceptable working drawings and a Certificate of Compliance are furnished as specified herein and (3) that the alternative conforms to the following requirements:

A. The determination as to the quality and suitability of a joint seal assembly will be made in the same manner as provided in Section 6-1.05, "Trade Names and Alternatives," of the Standard Specifications. The factors to be considered will include: the ability of the assembly to resist the intrusion of foreign material and water throughout the full range of movement for the application, and the ability to function without distress to any component.
B. Joint seal assemblies will not be considered for approval unless it can be proven that the assembly has had at least one year of satisfactory service under conditions similar to this application.
C. The Contractor shall submit complete working drawings for each joint seal assembly to the Division of Structure Design (DSD) in conformance with the provisions in Section 5-1.02, "Plans and Working Drawings," of the Standard Specifications. The working drawings shall show complete details of the joint seal assembly and anchorage components and the method of installation to be followed, including concrete blockout details and additions or rearrangements of the reinforcing steel from that shown on the plans. For initial review, 5 sets of working drawings shall be submitted. After review, between 6 and 12 sets of working drawings, as requested by the Engineer, shall be submitted to DSD for final approval and use during construction.

D. The working drawings shall be supplemented with calculations for each proposed joint seal assembly, as requested by the Engineer. Working drawings shall be either 279 mm x 432 mm or 559 mm x 864 mm in size. Each drawing and calculation sheet shall include the State assigned designations for the contract number, bridge number, full name of the structure as shown on the contract plans, and District-County-Route-Kilometer Post. The design firm's name, address, and telephone number shall be shown on the working drawings. Each sheet shall be numbered in the lower right hand corner and shall contain a blank space in the upper right hand corner for future contract sheet numbers.

E. Calculations, when requested, and working drawings, shall be stamped and signed by an engineer who is registered as a Civil Engineer. The Contractor shall allow the Engineer 4 weeks to review the drawings after a complete set has been received.

F. Within 3 weeks after final working drawing approval, one set of the corrected good quality prints on 75 g/m^2 (minimum) bond paper (559 mm x 864 mm in size) of all working drawings prepared by the Contractor for each joint seal assembly shall be furnished to DSD.

G. Each shipment of joint seal materials shall be accompanied by a Certificate of Compliance in conformance with the provisions in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications. The certificate shall state that the materials and fabrication involved comply in all respects to the specifications and data submitted in obtaining the approval.

H. The elastomer portion of the joint seal assembly shall be neoprene conforming to the requirements in Table 1 of ASTM Designation: D 2628 and the following, except that no recovery tests or compression-deflection tests will be required:

PROPERTY	TEST METHOD	REQUIREMENT
Hardness, Type A Durometer, points	ASTM D 2240 (Modified)	55-70
Compression set, 70 hours at 100°C, maximum, percent	ASTM D 395 (Modified)	40

I. All metal parts of an alternative joint seal assembly shall conform to the requirements above for the joint seal assembly shown on the plans. At the Contractor's option, metal parts may conform to the requirements in ASTM Designation: A 572/A 572M.

J. The assembly and its components shall be designed to support the AASHTO HS20-44 loading with 100 percent impact. The tire contact area used to distribute the tire loads shall be 244 mm, measured normal to the longitudinal axis of the assembly, by 508 mm wide. The assembly shall provide a smooth riding joint without slapping of components or wheel tire rumble.

K. The Movement Rating of the assembly shall be measured normal to the longitudinal axis of the assembly. The dimensions for positioning the assembly within the Movement Rating during installation shall be measured normal to the longitudinal axis, disregarding any skew of the deck expansion joint.

L. The assembly shall have cast-in-place anchorage components forming a mechanical connection between the joint components and the concrete deck.

M. The maximum depth and width of the recess shall be such that the primary reinforcement to provide the necessary strength of the structural members is outside the recess. The maximum depth of the recess at abutments and at hinges shall be 250 mm. The maximum width of the recess on each side of the expansion joint shall be 300 mm.

N. All reinforcement other than the primary reinforcement shall continue through the recess construction joint into the recess and engage the anchorage components of the assembly.

O. Horizontal angle points and vertical corners at curbs in assemblies shall consist of either pre-molded sections or standard sections of the joint seal assembly that have been specially miter cut or bent to fit the structure.

P. The elastomer portion of the assembly shall be installed in conformance with the manufacturer's recommendations at such time and in such a manner that the elastomer portion will not be damaged by construction operations. The joint and blockout shall be cleaned of all dirt, debris, and other foreign material immediately prior to the installation of the elastomer.

Full compensation for additional materials or work required because of the application of the optional cleaning and painting or the use of an alternative type joint seal assembly, shall be considered as included in the contract price paid per meter for the joint seal assembly involved and no additional compensation will be allowed therefor.

10-1.72 PRE-MANUFACTURED BAT HOUSE

This work shall consist of furnishing and installing pre-manufactured bat houses as shown on the plans, as specified in these special provisions, as instructed by the manufacturer, and as directed by the Engineer.

Each bat house shall be designed to house up to 150 bats and shall not be fabricated with wood products.

Bat houses shall be from one of the following manufacturers or equivalent;

a.) Bat Conservation International - Plastic Insulated Bat House with Stucco Finish (BH-7);
b.) Maberry Centre Bat Homes - PI Multi-Chamber Bat House;
c.) Rubicon – Four Chambered Bat House (RUB-BTH100G).

Bat houses shall be measured by the unit in place for furnishing and installing the bat house.

The contract unit price paid for bat house shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals (including fasteners and hardware), and for doing all the work involved in furnishing, and installing pre-manufactured bat house complete in place, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

10-1.73 ARCHITECTURAL SURFACE (TEXTURED CONCRETE)

Architectural texture for concrete surfaces shall conform to the details shown on the plans and the provisions in Section 51, "Concrete Structures," of the Standard Specifications and these special provisions.

Architectural textures listed below are required at concrete surfaces shown on the plans:

A. Fractured rib texture
B. Architectural texture (stamped concrete)

The fractured rib texture shall be an architectural texture simulating the appearance of straight ribs of concrete with a fractured concrete texture imparted to the raised surface between the ribs. Grooves between ribs shall be continuous with no apparent curves or discontinuities. Variation of the groove from straightness shall not exceed 6 mm for each 3 m of groove. The architectural texture shall have random shadow patterns. Broken concrete at adjoining ribs and groups of ribs shall have a random pattern. The architectural texture shall not have secondary patterns imparted by shadows or repetitive fractured surfaces.

The architectural texture (stamped concrete) shall simulate a formed relief constructed to the dimensions and shapes shown on the plans. Corners at the intersection of plane surfaces shall be sharp and crisp without easing or rounding. A Class 1 surface finish shall be applied to the architectural texture.

TEST PANEL

A test panel at least 1.25 m x 1.25 m in size shall be successfully completed at a location approved by the Engineer before beginning work on architectural textures. The test panel shall be constructed and finished with the materials, tools, equipment and methods to be used in constructing the architectural texture. If ordered by the Engineer, additional test panels shall be constructed and finished until the specified finish, texture and color are obtained, as determined by the Engineer.

The test panel approved by the Engineer shall be used as the standard of comparison in determining acceptability of architectural texture for concrete surfaces.

FORM LINERS

Form liners shall be used for textured concrete surfaces and shall be installed in conformance with the manufacturer's recommendations, unless other methods of forming textured concrete surfaces are approved by the Engineer. Form liners shall be manufactured from an elastomeric material or a semi-elastomeric polyurethane material by a manufacturer of commercially available concrete form liners. No substitution of other types of formliner material will be allowed. Form liners shall leave crisp, sharp definition of the architectural surface. Recurring textural configurations exhibited by repeating, recognizable shadow patterns shall be prevented by proper casting of form liner patterns. Textured concrete surfaces with such recurring textural configurations shall be reworked to remove such patterns as approved by the Engineer or the concrete shall be replaced.

Form liners shall have the following properties:

Description	ASTM Designation:	Range
Elastomeric material		
Shore A hardness	D 2240	20 to 65
Tensile strength (MPa)	D 412	0.9 to 6.2
Semi-elastomeric polyurethane		
Shore D hardness	D 2240	55 to 65
Tensile strength (MPa)	D 2370	18 minimum

Cuts and tears in form liners shall be sealed and repaired in conformance with the manufacturer's recommendations. Form liners that are delaminated from the form shall not be used. Form liners with deformations to the manufactured surface caused by improper storage practices or any other reason shall not be used.

Form liners shall extend the full length of texturing with transverse joints at 2.5 m minimum spacing. Small pieces of form liners shall not be used. Grooves shall be aligned straight and true. Grooves shall match at joints between form liners. Joints in the direction of grooves in grooved patterns shall be located only in the depressed portion of the textured concrete. Adjoining liners shall be butted together without distortion, open cracks or offsets at the joints. Joints between liners shall be cleaned before each use to remove any mortar in the joint.

Adhesives shall be compatible with the form liner material and with concrete. Adhesives shall be approved by the liner manufacturer. Adhesives shall not cause swelling of the liner material.

RELEASING FORM LINERS

Products and application procedures for form release agents shall be approved by the form liner manufacturer. Release agents shall not cause swelling of the liner material or delamination from the forms. Release agents shall not stain the concrete or react with the liner material. For reliefs simulating fractured concrete or wood grain surfaces the application method shall include the scrubbing method using a natural bristle scrub brush in the direction of grooves or grain The release agent shall coat the liner with a thin film. Following application of form release agent, the liner surfaces shall be cleaned of excess amounts of agent using compressed air. Buildup of form release agent caused by the reuse of a liner shall be removed at least every 5 uses.

Form liners shall release without leaving particles or pieces of liner material on the concrete and without pulling or breaking concrete from the textured surface. The concrete surfaces exposed by removing forms shall be protected from damage.

CURING

Concrete surfaces with architectural texture shall be cured only by the forms-in-place or water methods. Seals and curing compounds shall not be used.

MEASUREMENT AND PAYMENT

Architectural texture will be measured and paid for by the square meter.

The contract price paid per square meter for fracture rib texture shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals and for doing all the work involved in fractured rib texture, complete in place, including test panels, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

Full compensation for architectural texture (stamped concrete) shall be considered as included in the contract price paid per square meter for slope paving (stamped concrete) and no separate payment will be made therefor.

10-1.74 REINFORCEMENT

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

The Department's mechanical splices prequalified list can be found at the following internet site:

http://www.dot.ca.gov/hq/esc/approved_products_list/

Installing threaded couplers, as shown on the plans, will conform to the provisions in Section 52-1.08B(1), "Mechanical Splices." Testing of threaded couplers will conform to the provisions in Section 52-1.08C, "Service Splice and Ultimate Butt Splice Testing Requirements," for testing service splices. The samples for production tests and quality assurance tests shall have threaded bars in both ends of the coupler.

The provisions of "Welding Quality Control" of these special provisions shall not apply to resistance butt welding.

Reinforcement shown on the plans to be galvanized shall be galvanized in conformance with the provisions in Section 75-1.05,"Galvanizing," of the Standard Specifications.

MEASUREMENT AND PAYMENT

Measurement and payment for reinforcement in structures shall conform to the provisions in Section 52-1.10, "Measurement," and Section 52-1.11, "Payment," of the Standard Specifications and these special provisions.

Full compensation for galvanizing steel reinforcement shall be considered as included in the prices paid for the various items of work involved and no additional compensation will be allowed therefor.

10-1.75 HEADED BAR REINFORCEMENT

GENERAL

Headed bar reinforcement shall consist of bar reinforcement with heads attached to one or both ends and shall conform to the provisions of Section 52, "Reinforcement," of the Standard Specifications, the details shown on the plans, and these special provisions. The type of headed bar reinforcement to be used on this project shall be selected from the Department's Pre-Qualified Products List at:

http://www.dot.ca.gov/hq/esc/approved_products_list

The provisions of "Welding Quality Control" of these special provisions shall not apply to headed bar reinforcement.

The Contractor shall perform inspection and testing before, during, and after manufacturing headed bar reinforcement and as necessary to ensure that materials and workmanship conform to the requirements of the specifications.

A daily production log for the manufacture of headed bar reinforcement shall be maintained by the manufacturer for each production lot. The log shall clearly indicate the production lot numbers, the heats of bar material and head material used in the manufacture of each production lot, the number of bars in each production lot, and manufacturing records, including tracking and production parameters for welds or forgings. The data from the daily production log shall be available to the Engineer on request.

A production lot of headed bar reinforcement is defined as 150 reinforcing bars, or fraction thereof, of the same bar size, with heads of the same size and type, and manufactured by the same method, produced from bar material of a single heat number and head material of a single heat number. If one reinforcing bar has a head on both ends, it will be counted as 2 reinforcing bars for the purposes of establishing and testing production lots. A new production lot shall be started if the heat number of either the bar material or the head material changes before the maximum production lot size of 150 units is reached.

The Contractor shall furnish Certificates of Compliance accompanied by a copy of the mill test report, the Production Tests Reports specified herein, and the corresponding daily production logs to the Engineer in conformance with the provisions in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications for each shipment of headed bar reinforcement delivered to the jobsite.

Welding, welder qualifications, and inspection of welding shall conform to the requirements for friction welding in ANSI/AWS C6.1.

Equipment used to perform friction welding shall be fitted with an effective in-process monitoring system to record essential production parameters that describe the process of welding the head onto the reinforcement. The parameters to be recorded shall include friction welding force, forge force, rotational speed, friction upset distance and time, and forge upset distance and time. The data from this monitoring shall be recorded and preserved by the manufacturer until acceptance of the contract and shall be provided to the Engineer upon request.

PRODUCTION TESTS

Production tests shall be performed at the Contractor's expense, at an independent qualified testing laboratory. The independent qualified testing laboratory used to perform the testing of headed bar reinforcement samples shall not be employed or compensated by any subcontractor, or by other persons or entities hired by subcontractors who will provide other services or materials for the project, and shall have the following:

1. A tensile testing machine capable of breaking the largest size of reinforcing bar to be tested.
2. Operators who have received formal training for performing the testing requirements of ASTM A 970/A 970M.
3. A record of annual calibration of testing equipment performed by an independent third party that has 1) standards that are traceable to the National Institute of Standards and Technology, and 2) a formal reporting procedure, including published test forms.

The Engineer shall be notified in writing when any lots of headed bar reinforcement are ready for testing. The notification shall include the number of lots to be tested and the location where the tests are to be conducted. After notification has been received, test samples will be randomly selected by the Engineer from each production lot of headed bar reinforcement that is ready for shipment to the jobsite. If epoxy coating is required, test samples will be taken after the headed bar reinforcement has been prepared for epoxy coating.

A minimum of 3 samples from each production lot shall be tested. One tensile test shall be conducted on each sample.

Tensile tests shall conform to the requirements specified in ASTM A 970/A 970M, Section 6, Class A, except that at rupture, there shall be visible signs of necking in the reinforcing bar 1) at a minimum distance of one bar diameter away from the head to bar connection for friction welded headed bar reinforcement, or 2) outside the affected zone for integrally forged headed bar reinforcement.

The affected zone for integrally forged headed bar reinforcement is the portion of the reinforcing bar where any properties of the bar, including the physical, metallurgical, or material characteristics, have been altered during the manufacturing process.

If one of the test specimens fails to meet the specified requirements, one retest shall be performed on one additional sample, selected by the Engineer, from the same production lot. If the additional test specimen, or if more than one of the original test specimens fail to meet these requirements, all headed bar reinforcement in the lot represented by the tests will be rejected in conformance with the provisions in Section 6-1.04, "Defective Materials," of the Standard Specifications.

A Production Test Report for all testing performed on each lot shall be prepared by the independent testing laboratory and submitted to the Engineer as specified herein. The report shall be signed by an engineer who represents the laboratory and is registered as a Civil Engineer in the State of California. The report shall include the following information for each set of samples: contract number, bridge number, lot number, bar size, type of headed bar reinforcement, physical condition of test sample, any notable defects, limits of affected zone, location of visible necking area, and the ultimate strength of each headed bar.

Each unit of headed bar reinforcement in a production lot to be shipped to the site shall be tagged in a manner such that production lots can be accurately identified at the jobsite. All unidentified headed bar reinforcement received at the jobsite will be rejected.

MEASUREMENT AND PAYMENT

Quantities of headed bar reinforcement will be measured as units determined from the number of heads shown on the plans or as directed by the Engineer.

The contract unit price paid for headed bar reinforcement shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in furnishing headed bar reinforcement, including conforming to all testing requirements, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

Bar reinforcement to be used in the manufacture of headed bar reinforcement and placing the completed headed bar reinforcement into the work will be measured and paid for as specified in Section 52, "Reinforcement," of the Standard Specifications, except that the lengths to be used in the computation of calculated mass of bar reinforcement shall be the entire length of the completed headed bar, including heads.

10-1.76 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))	ASTM Designation: A 325 (Nominal bolt diameter (inch))
13, 12.70, or M12	1/2
16, 15.88, or M16	5/8
19, 19.05, or M20	3/4
22, 22.22, or M22	7/8
24, 25, 25.40, or M24	1
29, 28.58, or M27	1 1/8
32, 31.75, or M30	1 1/4
38, 38.10, or M36	1 1/2

MATERIALS

High-strength fastener assemblies and other bolts attached to structural steel with nuts and washers shall be zinc-coated. When direct tension indicators are used in these assemblies, the direct tension indicator and all components of the fastener assembly shall be zinc-coated by the mechanical deposition process.

ROTATIONAL CAPACITY TESTING PRIOR TO SHIPMENT TO JOB SITE

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

The requirements of this section do not apply to high-strength cap screws or high-strength bolts used for slip base plates.

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

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

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

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

A. Long Bolt Test Equipment:

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

B. Long Bolt Test Procedure:

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

Table A

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

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

Table B

Required Nut Rotation for Rotational Capacity Tests[a,b]	
Bolt Length (measured in Step 1)	Required Rotation (turn)
4 bolt diameters or less	2/3
Greater than 4 bolt diameters but no more than 8 bolt diameters	1
Greater than 8 bolt diameters, but no more than 12 bolt diameters[c]	1 1/3
(a) Nut rotation is relative to bolt, regardless of the element (nut or bolt) being turned. For bolts installed by 1/2 turn and less, the tolerance shall be plus or minus 30 degrees; for bolts installed by 2/3 turn and more, the tolerance shall be plus or minus 45 degrees. (b) Applicable only to connections in which all material within grip of the bolt is steel. (c) When bolt length exceeds 12 diameters, the required rotation shall be determined by actual tests in a suitable tension device simulating the actual conditions.	

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

Table C

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

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

C. Long Bolt Acceptance Criteria:

1. An assembly shall pass the following requirements to be acceptable: 1) the measured moving torque (Step 6) shall be less than or equal to the calculated value, T (Step 6), 2) the bolt tension measured in Step 7 shall be greater than or equal to the applicable turn test tension value listed in Table D, 3) the nut shall be able to be removed from the bolt without signs of thread stripping or galling after the required rotation in Step 7 has been achieved, 4) the bolt does not shear from torsion or fail during the test, and 5) the assembly does not seize before the final rotation in Step 7 is reached. Elongation of the bolt in the threaded region between the bearing face of the nut and the underside of the bolt head is expected and will not be considered a failure. Both fastener assemblies tested from one rotational capacity lot shall pass for the rotational capacity lot to be acceptable.

Table D

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

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

A. Short Bolt Test Equipment:

1. Calibrated dial or digital torque wrench. Other suitable tools will be required for performing Steps 7 and 8 of the Short Bolt Test Procedure. A torque multiplier may be required for large diameter bolts.
2. Spud wrench or equivalent.
3. Spacer washers or bushings. When spacer washers or bushings are required, they shall have the same inside diameter and equal or larger outside diameter as the appropriate hardened washers conforming to the requirements in ASTM Designation: F436.

4. Steel plate or girder with a hole to install bolt. The hole size shall be 1.6 mm greater than the nominal diameter of the bolt to be tested. The grip length, including any plates, washers, and additional spacers as needed, shall provide the proper number of threads within the grip, as required in Step 2 of the Short Bolt Test Procedure.

B. Short Bolt Test Procedure:

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

Table E

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

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

Table F

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

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

Table G

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

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

C. Short Bolt Acceptance Criteria:

1. An assembly shall pass the following requirements to be acceptable: 1) the measured moving torque from Step 6 shall be less than or equal to the maximum allowable torque from Table E, 2) the nut shall be able to be removed from the bolt without signs of thread stripping or galling after the required rotation in Step 7 has been achieved, 3) the bolt does not shear from torsion or fail during the test, and 4) the assembly shall not seize before the final rotation in Step 7 is reached. Elongation of the bolt in the threaded region between the bearing face of the nut and the underside of the bolt head will not be considered a failure. Both fastener assemblies tested from one rotational capacity lot shall pass for the rotational capacity lot to be acceptable.

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

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

The requirements of this section do not apply to high-strength cap screws or high-strength bolts used for slip base plates.

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

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

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

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

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

SURFACE PREPARATION

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

SEALING

The perimeter around all direct tension indicator gaps shall be completely sealed with non-silicone type sealing compound conforming to the provisions in Federal Specification TT-S-230, Type II. The sealant shall be gray in color and have a minimum thickness of 1.3 mm. If painting is required, the sealing compound shall be applied prior to painting.

When zinc-coated tension control bolts are used, the sheared end of each fastener shall be completely sealed with non-silicone type sealing compound conforming to the provisions in Federal Specification TT-S-230, Type II. The sealant shall be gray in color and shall have a minimum thickness of 1.3 mm. The sealant shall be applied to a clean sheared surface on the same day that the splined end is sheared off.

WELDING

Table 2.2 of AWS D1.5 is superseded by the following table:

Base Metal Thickness of the Thicker Part Joined, mm	Minimum Effective Partial Joint Penetration Groove Weld Size, * mm
Over 6 to 13 inclusive	5
Over 13 to 19 inclusive	6
Over 19 to 38 inclusive	8
Over 38 to 57 inclusive	10
Over 57 to 150 inclusive	13
Over 150	16

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

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

The requirement of conformance with AWS D1.5 shall not apply to work conforming to Section 56-1, "Overhead Sign Structures," or Section 86-2.04, "Standards, Steel Pedestals and Posts," of the Standard Specifications.

10-1.77 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, "Steel Structures" of these special provisions, and the following requirements.

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.

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 sign structure type and reference as shown on the contract plans, District-County-Route-Kilometer Post, and contract number.

The Engineer shall have 30 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.

Steel bolts not designated on the plans as high strength (HS) or stainless steel shall be for general applications and shall conform to the requirements in ASTM Designation: A 307.

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.

Flatness of surfaces for the following shall conform to the requirements in ASTM Designation: A 6/A 6M:

1. Base plates that are to come in contact with concrete, grout, or washers and leveling nuts
2. Plates in high-strength bolted connections

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

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

Steel members used for overhead sign structures shall receive nondestructive testing (NDT) in conformance with AWS D1.1 and the following:

1.

Weld Location	Weld Type	Minimum Required NDT
Splice welds around the perimeter of tubular sections, poles, and arms.	CJP groove weld with backing ring	100% UT[a] or RT[b]
Longitudinal seam welds	CJP or PJP[c] groove weld	Random 25% MT[d]
Longitudinal seam welds within 150 mm of a circumferential splice.	CJP groove weld	100% UT or RT
Welds attaching base plates, flange plates, or pole or mast arm plates, to poles or arm tubes.	CJP groove weld with backing ring and reinforcing fillet	t> 4.5 mm: 100%UT and MT t< 4.5 mm: 100% MT after root weld pass & final weld pass t = pole or arm thickness
	External (top) fillet weld for socket-type connections	100% MT

[a] ultrasonic testing
[b] radiographic testing
[c] partial joint penetration
[d] magnetic particle testing

2. The acceptance and repair criteria for UT of welded joints where any of the members are less than 8 mm thick or where tubular sections are less than 325 mm in diameter shall conform to the requirements in AWS D1.1, Section 6.13.3.1. A written procedure approved by the Engineer shall be used when performing this UT. These written procedures shall conform to the requirements in AWS D1.1, Annex K. The acceptance and repair criteria for other welded joints receiving UT shall conform to the requirements in AWS D1.1, Section 6, Table 6.3 for cyclically loaded nontubular connections.
3. The acceptance and repair criteria for radiographic or real time image testing shall conform to the requirements of AWS D1.1 for tensile stress welds.
4. For longitudinal seam welds, the random locations for NDT will be selected by the Engineer. The cover pass shall be ground smooth at the locations to be tested. If repairs are required in a portion of a tested weld, the repaired portion shall receive NDT, and additional NDT shall be performed on untested portions of the weld. The additional NDT shall be performed on 25 percent of that longitudinal seam weld. After this additional NDT is performed and if more repairs are required, then that entire longitudinal seam weld shall receive NDT.

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

All ferrous metal parts of tubular sign structures shall be galvanized and shall not be painted.

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.

10-1.78 CLEAN AND PAINT SIGN STRUCTURES

Sign structures shall be cleaned and painted in conformance with the provisions in Section 56-1.05, "Surface Finish," and Section 91, "Paint," of the Standard Specifications and these special provisions.

Prior to performing any painting or paint removal, 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 Painting Quality Work Plan (PQWP) for each item of work for which painting or paint removal is to be performed. As a minimum, each PQWP shall include the following:

A. The name of each Contractor or subcontractor to be used.
B. One copy each of all current ASTM and "SSPC: The Society for Protective Coatings" specifications or qualification procedures applicable to the painting or paint removal to be performed. These documents shall become the permanent property of the Department.
C. A copy of the coating manufacturer's guidelines and recommendations for surface preparation, painting, drying, curing, handling, shipping, and storage of painted structural steel, including testing methods and maximum allowable levels for soluble salts.
D. Proposed methods and equipment to be used for any paint application.
E. Proof of each of any required certifications, SSPC-QP 1, SSPC-QP 2, SSPC-QP 3. Where SSPC-QP 3 certification is required, an enclosed shop facility shall be required. Certification of AISC Sophisticated Paint Endorsement Quality Program, P-1 Enclosed endorsement, will be considered equivalent to SSPC-QP 3.

    1. In lieu of certification in conformance with the requirements in SSPC-QP 1 for this project, the Contractor may submit written documentation showing conformance with the requirements in Section 3, "General Qualification Requirements," of SSPC-QP 1.
    2. In lieu of certification in conformance with the requirements in SSPC-QP 2 for this project, the Contractor may submit written documentation showing conformance with the requirements in Sections 4.2 through 4.6 of SSPC-QP 2.
    3. In lieu of certification in conformance with the requirements in SSPC-QP 3 for this project, the Contractor may submit written documentation showing conformance with the requirements in Section 3, "General Qualification Requirements," of SSPC-QP 3.

F. Proposed methods to control environmental conditions in accordance with the manufacturer's recommendations and these special provisions.
G. Proposed methods to protect the coating during curing, shipping, handling, and storage.
H. Proposed rinse water collection plan.
I. A detailed paint repair plan for the repair of damaged areas.
J. Procedures for containing blast media and water during application of coatings and coating repair of erected steel.
K. Examples of proposed daily reports for all testing to be performed, including type of testing, location, lot size, time, weather conditions, test personnel, and results.

The Engineer shall have 3 weeks to approve the PQWP submittal after a complete plan has been received. No painting or paint removal shall be performed until the PQWP for that work is approved by the Engineer. Should the Engineer fail to complete the review within this 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 approving the PQWP, 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.

It is understood that the Engineer's approval of the Contractor's PQWP shall not relieve the Contractor of any responsibility under the contract for the successful completion of the work in conformity with the requirements of the plans and specifications.

CLEAN AND PAINT UNGALVANIZED SURFACES

Ungalvanized steel surfaces to be cleaned and painted shall be dry blast cleaned in conformance with the requirements of SSPC-SP 10, "Near White Blast Cleaning," of the "SSPC: The Society for Protective Coatings." Blast cleaning shall leave surfaces with a dense, uniform, angular anchor pattern of no less than 40 µm nor more than 86 µm as measured in conformance with the requirements in ASTM Designation: D 4417.

Mineral and slag abrasives used for blast cleaning steel surfaces shall conform to the requirements for Class A, Grade 2 to 3 abrasives contained in SSPC-AB 1, "Mineral and Slag Abrasives," of the "SSPC: The Society for Protective Coatings," and shall not contain hazardous material.

Steel abrasives used for blast cleaning steel surfaces shall comply with the requirements of SSPC-AB 3, "Ferrous Metallic Abrasive," of the "SSPC: The Society for Protective Coatings." If steel abrasive is recycled through shop or field abrasive blast cleaning units, the recycled abrasive shall conform to the requirements of SSPC-AB 2, "Specification for Cleanliness of Recycled Ferrous Metallic Abrasive," of the "SSPC: The Society for Protective Coatings."

A Certificate of Compliance conforming to the provisions in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications and a Material Safety Data Sheet shall be furnished prior to use for each shipment of blast cleaning material for steel.

Abrasive blast cleaned surfaces shall be tested by the Contractor for soluble salts using a Class A or B retrieval method as described in Technology Guide 15, "Field Methods for Retrieval and Analysis of Soluble Salts on Steel and Other Nonporous Substrates," of the "SSPC: The Society for Protective Coatings," and cleaned so the maximum level of soluble salts does not exceed the lesser of the coating manufacturer's written recommendations or 10 micrograms per square centimeter. Areas of abrasive blast cleaned steel shall be tested at the rate of 3 tests for the first 100 square meters prepared per day, and one test for each additional 100 square meters or portion thereof, at locations selected by the Engineer. When less than 100 square meters of surface area is prepared in a shift, at least 2 tests shall be performed. If levels of soluble salts exceed the maximum allowed by these special provisions, the entire area represented by the testing will be rejected. The Contractor shall perform additional cleaning and testing of rejected areas until soluble salt levels conform to these requirements.

Blast cleaned surfaces shall receive a single undercoat consisting of an inorganic zinc coating conforming to the requirements in AASHTO Designation: M 300, Type I or Type II, except that: 1) the first 3 sentences of Section 5.6, "Primer Field Performance Requirements," shall not apply for Type II coatings, and 2) the entire Section 5.6.1 shall not apply for either type of inorganic zinc coating.

If the Contractor proposes to use a Type I coating, the Contractor shall furnish to the Engineer for review documentation as required in Section 5.6 of AASHTO Designation: M 300. The Contractor shall allow the Engineer 4 weeks to review the proposal.

If the Contractor proposes to use a Type II coating, the coating shall be selected from the qualified products list, which may be obtained from the Transportation Laboratory.

Inorganic zinc coating shall be used within 12 hours of initial mixing.

Application of inorganic zinc coating shall conform to the provisions for applying zinc-rich coating in Section 59-2.13, "Application of Zinc-Rich Primer," of the Standard Specifications.

The single undercoat of inorganic zinc coating shall be applied to the required dry film thickness in 2 or more applications within 8 hours of the start of blast cleaning. Abrasive blast cleaned steel shall not be exposed to relative humidity exceeding 85 percent prior to application of inorganic zinc coating.

The total dry film thickness of all applications of the inorganic zinc undercoat, including the surfaces of outside existing members within the grip under bolt heads, nuts, and washers, shall be not less than 100 µm nor more than 200 µm, except that the total dry film thickness on each faying (contact) surface of high strength bolted connections shall be between 25 µm and the maximum allowable dry film thickness for Class B coatings as determined by certified testing in conformance with Appendix A of the "Specification for Structural Joints Using ASTM A325 or A490 Bolts" of the Research Council on Structural Connections (RCSC Specification). Unless otherwise stated, all inorganic zinc coatings used on faying surfaces shall meet the slip coefficient requirements for a Class B coating on blast-cleaned steel, as specified in the RCSC Specification. The Contractor shall provide results of certified testing showing the maximum allowable dry film thickness for the Class B coating from the qualifying tests for the coating chosen, and shall maintain the coating thickness on actual faying surfaces of the structure at or below this maximum allowable coating thickness.

Areas where mudcracking occurs in the inorganic zinc coating shall be blast cleaned and repainted with inorganic zinc coating to the specified thickness.

Steel surfaces coated with Type II inorganic zinc coating shall be protected from conditions that may cause the coating film to dissolve. The Contractor, at the Contractor's expense, shall repair areas where the coating has dissolved by blast cleaning and repainting with inorganic zinc coating to the specified thickness.

Dry spray, or overspray, as defined in the Steel Structures Painting Manual, Volume 1, "Good Painting Practice," of the "SSPC: The Society for Protective Coatings," shall be removed prior to application of subsequent coats or final acceptance. Removal of dry spray shall be by screening or other methods that minimize polishing of the inorganic zinc surface. The dry film thickness of the coating after removal of dry spray shall be in conformance with the provisions for applying the single undercoat, as specified herein.

The Contractor shall test the inorganic zinc coating prior to application of finish coats. The locations of the tests will be determined by the Engineer. The Contractor shall determine the sequence of the testing operations. The testing for adhesion and hardness will be performed no sooner than 72 hours after application of the single undercoat of inorganic zinc coating. At the Contractor's expense, satisfactory access shall be provided to allow the Engineer to determine the location of the tests.

The inorganic zinc coating shall pass the following tests:

A. The inorganic zinc coating shall have a minimum adhesion to steel of 4 MPa when measured using a self-aligning adhesion tester in conformance with the requirements in ASTM Designation: D 4541. The Engineer will select 3 locations per girder or 100 square meters of painted surface, whichever is less, for adhesion testing. If less than 100 square meters of steel is painted in a work shift, the Engineer will select 3 areas painted during the work shift for testing. If 2 or more of the locations tested fail to meet adhesion requirements, the entire area represented by the tests will be rejected. If one of the locations tested fails to meet adhesion requirements, an additional 3 locations shall be tested. Should any of the additional locations fail to meet adhesion requirements, the entire area represented by the tests will be rejected. The Contractor, at the Contractor's expense, shall repair the rejected area by blast cleaning and repainting with inorganic zinc to the specified thickness. Test locations for areas of inorganic zinc meeting adhesion testing requirements shall be repaired by application of organic zinc primer as specified in Section 91-1.04, "Materials," of the Standard Specifications to the specified minimum dry film thickness.
B. Areas of inorganic zinc coating where finish coats are to be applied shall be tested by the Contractor for soluble salts using a Class A or B retrieval method as described in Technology Guide 15, "Field Methods for Retrieval and Analysis of Soluble Salts on Steel and Other Nonporous Substrates," of the "SSPC: The Society for Protective Coatings," and cleaned so the maximum level of soluble salts does not exceed the lesser of the manufacturer's written recommendations or 10 micrograms per square centimeter. Areas of inorganic zinc coating shall be tested at the rate of 3 tests for the first 100 square meters to be painted per day and one test for each additional 100 square meters or portion thereof at locations selected by the Engineer. When less than 100 square meters of surface area is painted in a shift, at least 2 tests shall be performed. If levels of soluble salts exceed the maximum allowed by these special provisions, the entire area represented by the testing will be rejected. The Contractor shall perform additional cleaning and testing of rejected areas until soluble salt levels conform to these requirements.
C. Prior to application of finish coats, the inorganic zinc coating shall exhibit a solid, hard, and polished metal surface when firmly scraped with the knurled edge of a quarter. Inorganic zinc coating that is powdery, soft, or does not exhibit a polished metal surface, as determined by the Engineer, shall be repaired by the Contractor, at the Contractor's expense, by blast cleaning and repainting with inorganic zinc coating to the specified thickness.

Additional Requirements for Water Borne Inorganic Zinc Primers

A. The surface pH of the inorganic zinc primer shall be tested by wetting the surface with de-ionized water for a minimum of 15 minutes but no longer than 30 minutes and applying pH paper with a capability of measuring in increments of 0.5 pH units. At least 2 surface pH readings shall be taken for every 50 square meters or portion thereof. If less than 50 square meters of steel is coated in a single shift or day, at least 2 surface pH readings shall be taken for primer applied during that period. Application of finish coats will not be permitted until the surface pH is less than or equal to 7.
B. Dry to solvent insolubility for water borne inorganic zinc primers shall be determined in conformance with the requirements in ASTM Designation: D 4752, except that water shall be the solvent. The resistance rating shall be not less than 4. Areas of inorganic zinc coating shall be tested for solvent insolubility at the rate of one test per 50 square meters or portion thereof. Inorganic zinc coating represented by the tested area that does not meet the solvent insolubility requirements will be rejected. The Contractor, at the Contractor's expense, shall repair rejected areas by blast cleaning and repainting with inorganic zinc coating to the specified thickness.

Additional Requirements for Solvent Borne Inorganic Zinc Primers

A. Dry to solvent insolubility for solvent borne inorganic zinc primers shall be determined in conformance with the requirements in ASTM Designation: D 4752. The resistance rating shall be not less than 4. Areas of inorganic zinc coating shall be tested for solvent insolubility at the rate of one test per 50 square meters or portion thereof. Inorganic zinc coating represented by the tested area that does not meet the solvent insolubility requirements will be rejected. The Contractor, at the Contractor's expense, shall repair rejected areas by blast cleaning and repainting with inorganic zinc coating to the specified thickness.
B. Surface hardness of solvent borne inorganic zinc shall be a minimum 2H when measured in conformance with the requirements in ASTM Designation: D 3363. Areas of inorganic zinc coating shall be tested at the rate of one test per 50 square meters or portion thereof. Inorganic zinc coating that fails to meet the surface hardness requirements shall be repaired by the Contractor, at the Contractor's expense, by blast cleaning and repainting with inorganic zinc coating to the specified thickness.

The Contractor, at the Contractor's expense, shall retest all rejected areas of inorganic zinc coating after repairs have been completed.

All areas of inorganic zinc coating shall be water rinsed in conformance with the requirements in Section 59-1.03, "Application," of the Standard Specifications and these special provisions. Areas of the coating removed by water rinsing shall be reapplied in conformance with the provisions for applying zinc-rich coating in Section 59-2.13, "Application of Zinc-Rich Primer," of the Standard Specifications and these special provisions. Except as approved by the Engineer, a minimum time of 72 hours shall be allowed between application of inorganic zinc coating and water rinsing.

Exposed area of inorganic zinc coating shall receive a minimum of 2 finish coats of an exterior grade latex paint supplied by the manufacturer of the inorganic zinc coating.

The first finish coat shall be applied within 48 hours following water rinsing and passing the soluble salt testing requirements herein.

The finish coat paint shall be formulated for application to inorganic zinc coating, shall meet the requirements for SSPC-Paint 24, "Latex Semi-Gloss Exterior Topcoat," of the "SSPC: The Society for Protective Coatings," and shall conform to the following:

A. No visible color change in the finish coats shall occur when tested in conformance with the requirements of ASTM Designation: G 53 using FS 40 UV-B bulbs for a minimum of 38 cycles. The cycle shall be 4 hours of ultraviolet (UV) exposure at 60°C and 4 hours of condensate exposure at 40°C.
B. The vehicle shall be an acrylic or modified acrylic copolymer with a minimum of necessary additives.

The first finish coat shall be applied in 2 applications. The first application shall consist of a spray applied mist application. The second application shall be applied after the mist application has dried to a set to touch condition as determined by the procedure described in Section 7 of ASTM Designation: D1640. The total dry film thickness of both applications of the first finish coat shall be not less than 50 µm.

Except as approved by the Engineer, a minimum drying time of 12 hours shall be allowed between finish coats.

The second finish coat color shall match Federal Standard 595B, No. 24491. The total dry film thickness of the applications of the second finish coat shall be not less than 50 µm.

The 2 finish coats shall be applied in 3 or more applications to a total dry film thickness of not less than 100 µm nor more than 200 µm.

The total dry film thickness of all applications of inorganic zinc coating and finish coat paint shall be not less than 200 µm nor more than 350 µm.

PAYMENT

Full compensation for water rinsing shall be considered as included in the contract price paid per kilogram for furnish sign structure of the type involved and no additional compensation will be allowed therefor.

Full compensation for conforming to the requirements in SSPC-QP 1, SSPC-QP 2, and SSPC-QP 3 of the "SSPC: The Society for Protective Coatings" shall be considered as included in the contract lump sum price paid per kilogram for furnish sign structure of the type involved, and no additional compensation will be allowed therefor.

PAINT GALVANIZED SURFACES

Galvanized steel surfaces shall be prepared and painted in conformance with Section 56-1.05, "Surface Finish," and Section 59-3, "Painting Galvanized Surfaces," of the Standard Specifications and these special provisions.

Galvanized steel surfaces shall receive a minimum of 2 finish coats of paint conforming to the provisions for finish coat paint on ungalvanized surfaces in "Clean and Paint Ungalvanized Surfaces" of these special provisions.

Paint shall be applied to galvanized steel surfaces to the thicknesses and in conformance with the provisions for finish coats on ungalvanized surfaces in "Clean and Paint Ungalvanized Surfaces" of these special provisions.

The total dry film thickness of all applications on galvanized steel surfaces shall be not less than 100 µm nor more than 200 µm, except that the total dry film thickness on each contact surface of high strength bolted connections shall be between 25 µm and 100 µm and may be applied in one application.

10-1.79 ROADSIDE SIGNS

Roadside signs shall be furnished and installed at the locations shown on the plans or where designated by the Engineer and in conformance with the provisions in Section 56-2, "Roadside Signs," of the Standard Specifications and these special provisions.

The Contractor shall furnish roadside sign panels in conformance with the provisions in "Furnish Sign" of these special provisions.

Wood posts shall be pressure treated after fabrication in conformance with the provisions in Section 58, "Preservative Treatment of Lumber, Timber and Piling," of the Standard Specifications and AWPA Use Category System: UC4A, Commodity Specification A or B.

10-1.80 WEED CONTROL MAT (RUBBER)

Weed control mat (rubber) work shall consist of furnishing and placing rubber weed control mat, in conformance with the Standard Specifications, these special provisions, as shown on the plans, and as directed by the Engineer.

MATERIALS

Weed Control Mat

Weed control mat shall conform to the following:

A. Mat shall be made from 100% California derived recycled tire rubber. Mat shall not include metal, but may include polyester based tire fiber.
B. Mat shall near black in color. Mat shall be a uniform color without variation between tiles or lots. Variations in color may be submitted for review and approval by the Engineer.
C. Mat shall prevent sunlight and water from reaching the soil. Mat shall contain no hole or gap openings within the mat surface.. Mat shall be flame resistant.
D. Mat shall have overall dimensions as shown on the plans with a minimum thickness of 12.5. Mat shall have a minimum weight of 20 kilograms per square meter of material.
E. Mat shall be pre-cut for a snug fit around post, as shown on the plans. Mat may contain scribe lines to serve as cutting guide of mat at posts, or have cut-out in-place before delivery.

The Contractor shall furnish the Engineer with a Certificate of Compliance for the rubber mat in accordance with the provisions in Section 6-1.07, "Certificates of Compliance" of the Standard Specifications.

Adhesive Caulking

Adhesive caulking shall be as specified by the manufacturer.

SITE PREPARATION

Prior to weed control mat application, the areas shall be cleared as specified under " Clearing and Grubbing" in these special provisions.

Prior to placement of weed control mat, the subgrade surface shall be smooth, firm, stable and free of rocks, clods, foliage, roots or other material greater than 25 mm in diameter.

PLACEMENT

General

Weed control mat shall be placed beneath roadside signs in paved gore areas as shown on the plans, as recommended by the manufacturer, and as specified in these special provisions. Prior to the installation of the mat a written copy of the manufacturer's installation recommendations shall be provided to the Engineer

Placement Under Roadside Signs

Mats placed around roadside signposts in paved gore areas shall be the size shown on the plans.

Openings for signposts may be either prefabricated or fabricated in the field. Cuts shall be made in the mat and joined as recommended by the manufacturer. No cuts other than those required to install mat around signpost will be permitted for mat placed under signs.

Mats shall be joined in accordance with the manufacturer's recommendations and as directed by the Engineer.

Joints between mats and adjacent posts shall be sealed with adhesive caulking. After sealing, there shall be no openings between the mat and adjacent post.

Following completion of mat placement and sealing, the mat surface shall be flat, smooth, and in uniform contact with the soil surface, without bulges or wrinkles.

PAYMENT

Full compensation for weed control mat (rubber) shall be considered as included in the contract unit price paid for roadside sign – one post (Weed Control Mat Rubber) and no separate payment will be made therefor.

10-1.81 HABITAT RESTORATION SIGN

Habitat restoration signs shall be furnished and installed at the locations shown, in conformance with the details shown on the plans and as directed by the Engineer.

Habitat restoration signs shall consist of sign panels, and sign panel mounting hardware.

Habitat restoration signs shall conform to Section 56-2, "Roadside Signs," of the Standard Specifications and these special provisions.

Habitat restoration signs shall be measured by the unit, as determined from the actual count in place.

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

10-1.82 FURNISH SIGN

Signs shall be fabricated and furnished in accordance with details shown on the plans, the Traffic Sign Specifications, and these special provisions.

Traffic Sign Specifications for California sign codes are available for review at:

http://www.dot.ca.gov/hq/traffops/signtech/signdel/specs.htm

Traffic Sign Specifications for signs referenced with Federal MUTCD sign codes can be found in Standard Highway Signs Book, administered by the Federal Highway Administration, which is available for review at:

http://mutcd.fhwa.dot.gov/ser-shs_millennium.htm

Information on cross-referencing California sign codes with the Federal MUTCD sign codes is available at:

http://www.dot.ca.gov/hq/traffops/signtech/signdel/specs.htm

Temporary or permanent signs shall be free from blemishes that may affect the serviceability and detract from the general sign color and appearance when viewing during daytime and nighttime from a distance of 8 m. The face of each finished sign shall be uniform, flat, smooth, and free of defects, scratches, wrinkles, gel, hard spots, streaks, extrusion marks, and air bubbles. The front, back, and edges of the sign panels shall be free of router chatter marks, burns, sharp edges, loose rivets, delaminated skins, excessive adhesive over spray and aluminum marks.

QUALITY CONTROL FOR SIGNS

The requirements of "Quality Control for Signs" in this section shall not apply to construction area signs.

No later than 14 days before sign fabrication, the Contractor shall submit a written copy of the quality control plan for signs to the Engineer for review. The Engineer will have 10 days to review the quality control plan. Sign fabrication shall not begin until the Engineer approves the Contractor's quality control plan in writing. The Contractor shall submit to the Engineer at least 3 copies of the approved quality control plan. The quality control plan shall include, but not be limited to the following requirements:

A. Identification of the party responsible for quality control of signs,
B. Basis of acceptance for incoming raw materials at the fabrication facility,
C. Type, method and frequency of quality control testing at the fabrication facility,
D. List (by manufacturer and product name) of process colors, protective overlay film, retroreflective sheeting and black non-reflective film,
E. Recommended cleaning procedure for each product, and
F. Method of packaging, transport and storage for signs.

No legend shall be installed at the project site. Legend shall include letters, numerals, tildes, bars, arrows, route shields, symbols, logos, borders, artwork, and miscellaneous characters. The style, font, size, and spacing of the legend shall conform to the Standard Alphabets published in the FHWA Standard Highway Signs Book. The legend shall be oriented in the same direction in accordance with the manufacturer's orientation marks found on the retroreflective sheeting.

On multiple panel signs, legend shall be placed across joints without affecting the size, shape, spacing, and appearance of the legend. Background and legend shall be wrapped around interior edges of formed panel signs as shown on plans to prevent delamination.

The following notation shall be placed on the lower right side of the back of each sign where the notation will not be blocked by the sign post or frame:

A. PROPERTY OF STATE OF CALIFORNIA,
B. Name of the sign manufacturer,
C. Month and year of fabrication,
D. Type of retroreflective sheeting, and
E. Manufacturer's identification and lot number of retroreflective sheeting.

The above notation shall be applied directly to the aluminum sign panels in 6-mm upper case letters and numerals by die-stamp and applied by similar method to the fiberglass reinforced plastic signs. Painting, screening, or engraving the notation will not be allowed. The notation shall be applied without damaging the finish of the sign.

Signs with a protective overlay film shall be marked with a dot of 10 mm diameter. The dot placed on white border shall be black, while the dot placed on black border shall be white. The dot shall be placed on the lower border of the sign before application of the protective overlay film and shall not be placed over the legend and bolt holes. The application method and exact location of the dot shall be determined by the manufacturer of the signs.

For sign panels that have a minor dimension of 1220 mm or less, no splice will be allowed in the retroreflective sheet except for the splice produced during the manufacturing of the retroreflective sheeting. For sign panels that have a minor dimension greater than 1220 mm, only one horizontal splice will be allowed in the retroreflective sheeting.

Unless specified by the manufacturer of the retroreflective sheeting, splices in retroreflective sheeting shall overlap by a minimum of 25 mm. Splices shall not be placed within 50 mm from edges of the panels. Except at the horizontal borders, the splices shall overlap in the direction from top to bottom of the sign to prevent moisture penetration. The retroreflective sheeting at the overlap shall not exhibit a color difference under the incident and reflected light.

Signs exhibiting a significant color difference between daytime and nighttime shall be replaced immediately.

Repairing sign panels will not be allowed except when approved by the Engineer.

The Department will inspect signs at the Contractor's facility and delivery location, and in accordance with Section 6, "Control of Materials," of the Standard Specifications. The Engineer will inspect signs for damage and defects before and after installation.

Regardless of kind, size, type, or whether delivered by the Contractor or by a common carrier, signs shall be protected by thorough wrapping, tarping, or other methods to ensure that signs are not damaged by weather conditions and during transit. Signs shall be dry during transit and shipped on palettes, in crates, or tier racks. Padding and protective materials shall be placed between signs as appropriate. Finished sign panels shall be transported and stored by method that protects the face of signs from damage. The Contractor shall replace wet, damaged, and defective signs.

Signs shall be stored in dry environment at all times. Signs shall not rest directly on the ground or become wet during storage. Signs, whether stored indoor or outdoor, shall be free standing. In areas of high heat and humidity, signs shall be stored in enclosed climate-controlled trailers or containers. Signs shall be stored indoor if duration of the storage will exceed 30 days.

Screen processed signs shall be protected, transported and stored as recommended by the manufacturer of the retroreflective sheeting.

When requested, the Contractor shall provide the Engineer test samples of signs and materials used at various stages of production. Sign samples shall be 300 mm x 300 mm in size with applied background, letter or numeral, and border strip.

The Contractor shall assume the costs and responsibilities resulting from the use of patented materials, equipment, devices, and processes for the Contractor's work.

SHEET ALUMINUM

Alloy and temper designations for sheet aluminum shall be in accordance with ASTM Designation: B209.

The Contractor shall furnish the Engineer a Certificate of Compliance in accordance to Section 6-1.07, "Certificates of Compliance," of the Standard Specifications for the sheet aluminum.

Sheet aluminum shall be pretreated in accordance to ASTM Designation: B449. Surface of the sheet aluminum shall be cleaned, deoxidized, and coated with a light and tightly adherent chromate conversion coating free of powdery residue. The conversion coating shall be Class 2 with a mass between 108 mg/m^2 and 377 mg/m^2, and an average mass of 269 mg/m^2. Following the cleaning and coating process, the sheet aluminum shall be protected from exposure to grease, oils, dust, and contaminants.

Sheet aluminum shall be free of buckles, warps, dents, cockles, burrs, and defects resulting from fabrication.

Base plate for standard route marker shall be die cut.

RETROREFLECTIVE SHEETING

The Contractor shall furnish retroreflective sheeting for sign background and legend in accordance with ASTM Designation: D4956 and "Prequalified and Tested Signing and Delineation Materials" of these special provisions.

Retroreflective sheeting shall be applied to sign panels as recommended by the retroreflective sheeting manufacturer without stretching, tearing, and damage.

Class 1, 3, or 4 adhesive backing shall be used for Type II, III, IV, VII, VIII, and IX retroreflective sheeting. Class 2 adhesive backing may also be used for Type II retroreflective sheeting. The adhesive backing shall be pressure sensitive and fungus resistant.

When the color of the retroreflective sheeting determined from instrumental testing is in dispute, the Engineer's visual test will govern.

PROCESS COLOR AND FILM

The Contractor shall furnish and apply screened process color, non-reflective opaque black film, and protective overlay film of the type, kind, and product that are approved by the manufacturer of the retroreflective sheeting.

The Contractor shall furnish the Engineer a Certificate of Compliance in accordance to Section 6-1.07, "Certificates of Compliance," of the Standard Specifications for the screened process color, non-reflective opaque black film, and protective overlay film.

The surface of the screened process color shall be flat and smooth. When the screened process colors determined from the instrumental testing in accordance to ASTM Designation: D4956 are in dispute, the Engineer's visual test will govern.

The Contractor shall provide patterns, layouts, and set-ups necessary for the screened process.

The Contractor may use green, red, blue, and brown reverse-screened process colors for background and non-reflective opaque black film or black screened process color for legend. The coefficient of retroreflection for reverse-screened process colors on white retroreflective sheeting shall not be less than 70 percent of the coefficient of retroreflection specified in ASTM Designation: D4956.

The screened process colors and non-reflective opaque black film shall have the same outdoor weatherability as that of the retroreflective sheeting.

After curing, screened process colors shall withstand removal when tested by applying 3M Company Scotch Brand Cellophane Tape No. 600 or equivalent tape over the color and removing with one quick motion at 90°angle.

SINGLE SHEET ALUMINUM SIGN

Single sheet aluminum signs shall be fabricated and furnished with or without frame. The Contractor shall furnish the sheet aluminum in accordance to "Sheet Aluminum" of these special provisions. Single sheet aluminum signs shall be fabricated from sheet aluminum alloy 6061-T6 or 5052-H38.

Single sheet aluminum signs shall not have a vertical splice in the sheet aluminum. For signs with depth greater than 1220 mm, one horizontal splice will be allowed in the sheet aluminum.

Framing for single sheet aluminum sign shall consist of aluminum channel or rectangular aluminum tubing. The framing shall have a length tolerance of +3 mm. The face sheet shall be affixed to the frame with rivets of 5-mm diameter. Rivets shall be placed within the web of channels and shall not be placed less than 13 mm from edges of the sign panels. Rivets shall be made of aluminum alloy 5052 and shall be anodized or treated with conversion coating to prevent corrosion. The exposed portion of rivets on the face of signs shall be the same color as the background or legend where the rivets are placed.

Finished signs shall be flat within a tolerance of +3 mm per meter when measured across the plane of the sign in all directions. The finished signs shall have an overall tolerance within ±3 mm of the detailed dimensions.

Aluminum channels or rectangular aluminum tubings shall be welded together with the inert gas shielded-arc welding process using E4043 aluminum electrode filler wires as shown on the plans. Width of the filler shall be equal to wall thickness of smallest welded channel or tubing.

LAMINATED PANEL SIGN

Laminated panel signs shall consist of two sheet aluminum laminated to a honeycomb core and extruded aluminum frame to produce flat and rigid panels of 25.4-mm or 63.5-mm nominal thickness.

The face of laminated panel signs shall be fabricated from sheet aluminum alloy 6061-T6 or 5052-H32 of 1.6-mm thickness. The back of laminated panel signs shall be fabricated from sheet aluminum alloy 3003-H14 of 1.0-mm thickness. The Contractor shall furnish sheet aluminum as provided in "Sheet Aluminum" of these special provisions.

The core material shall be phenolic impregnated kraft paper honeycomb and fungus resistant in accordance to Military Specification MIL-D-5272. The honeycomb cell size shall be 13 mm. Weight of the kraft paper shall be 300 g/m^2 and impregnated minimum 18 percent by weight.

A laminating adhesive that can produce a resilient oil and water-resistant bond shall be used to adhere the extruded aluminum frame and the honeycomb core to the sheet aluminum. Edge and interior delamination occur when a 0.25-mm thick feeler gauge of 13 mm in length can be inserted into a depth of more than 13 mm between the extruded aluminum frame and the sheet aluminum. Laminated panel sign with delamination will be rejected.

Laminated panels shall be able to resist a wind load of 161 kg/m^2 for the following simple span lengths with a bending safety factor of 1.25:

Panel Type	Nominal Panel Thickness	Simple Span Length
A	25.4 mm	2.7 m
B	25.4 mm	2.7 m
	63.5 mm	4.42 m
H	63.5 mm	4.42 m

The tensile strength of laminated panels shall be at least 138 kPa when tested in accordance with the following modification and with ASTM Designations: C297 and C481, Cycle B after aging. Instead of spraying with hot water, the specimen shall be totally immersed in 70°C hot water. When requested by the Engineer or the Transportation Laboratory, at least one test sample of 300 mm x 300 mm in size shall be taken for every 186 m^2 of the panel production cycle or of the total factory production order, whichever occurs first.

Rivets used to secure the sheet aluminum to the perimeter frame shall be fabricated from aluminum alloy 5052 and annodized or treated with a conversion coating to prevent corrosion. Size of the aluminum rivets shall be 5 mm in diameter and placed at the corners of the laminated panels. Color of the exposed portion of the rivets shall be the same color as the sign background or legend on which the rivets are placed. Rivets or stainless steel screws shall be placed in holes drilled during fabrication in the perimeter frame.

On laminated multiple panel signs, a closure H-Section shall be placed in the top channel of the bottom panel. Perimeter frame of adjoining panel shall accommodate the closure H-Section in the closed position.

For signs with a depth of 1524 mm or less, the laminated panels shall be fabricated with no horizontal joints, splices or seams. For signs with a depth of greater than 1524 mm, the laminated panels may be fabricated in two panels.

The face of laminated panels shall be flat with a tolerance of +8 mm per meter when measured across the plane of each panel in all directions. Where laminated panels adjoin, the gap between adjoining edges from one corner to the other corner shall not deviate by more than 1 mm. Non-adjoining edges from one corner to the other corner shall not deviate by more than 3 mm from a straight plane. The front and back sheet aluminum shall be flush with the perimeter frame. The panel edges shall be smooth.

Laminated panel signs shall be within +3 mm or -13 mm of the detailed dimensions. The difference in length between adjoining panels of multiple panel signs shall not be greater than 13 mm.

Roadside laminated panel signs shall be Type B. Type B panels shall have a nominal thickness of 25.4 mm or 63.5 mm.

The perimeter frame of Type B panels shall consist of extruded channel edges. The interior and exterior sides of the channels, except the sides touching the face and back sheet aluminum, shall be welded at the joint. Sealant shall be placed at the corners of the perimeter frame to prevent moisture penetration.

Each side of the vertical tube spacers of Type B panels shall be welded to the perimeter frame, except the sides touching the front and back sheet aluminum.

The Contractor shall furnish mounting hardware for roadside laminated panel signs, such as closure H-sections, lags, bolts, nuts, and washers.

Overhead laminated panel signs shall be Type A and have a nominal thickness of 25.4 mm.

For overhead laminated signs with a length of 7315 mm or less, the laminated panels shall be fabricated with no vertical joints, splices or seams. For signs with a length of greater than 7315 mm, the length of each adjoining panel shall be as determined by the Engineer or as shown on the plans.

The perimeter frame of Type A overhead laminated panels shall be connected by self-tapping hex head stainless steel screws. Sealant shall be placed at the corners of the perimeter frame to prevent moisture penetration. The perimeter frame of Type A panels shall consist of extruded channel edges on the vertical sides and consist of modified "H" section extrusion on the horizontal sides. The modified "H" section extrusion acts as an integral retainer track for affixing the bolts to provide blind fastening of panels to the structure support.

The Contractor shall furnish mounting hardware for overhead laminated panel signs, such as closure H-sections, clamps, bolts, nuts, and washers. The clamps shall be cast aluminum alloy with a minimum tensile strength of 170 MPa. Bolt torque used for installing clamps shall not exceed 12 N-m.

MEASUREMENT AND PAYMENT

Furnishing signs (except for construction area signs) will be measured by the square meter to the nearest 0.10-m2, of the sign panel types installed in place.

Installation of sign panels will be measured and paid for as per Sections 56-2.05, "Measurement," and 56-2.06, "Payment," of the Standard Specifications except all references to State-furnished materials is deleted.

The contract price paid per square meter for furnish sign of the types specified in the Engineer's estimate shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in fabricating and furnishing the signs, including removable sign panel frame and fastening hardware, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

10-1.83 CLEAN AND PAINT STRUCTURAL STEEL

New metal surfaces shall be cleaned and painted in conformance with the provisions in Section 59-2, "Painting Structural Steel," Section 59-3, "Painting Galvanized Surfaces," and Section 91, "Paint," of the Standard Specifications and these special provisions.

GENERAL

Before performing any painting or paint removal, 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 Painting Quality Work Plan (PQWP) for each item of work for which painting or paint removal is to be performed. As a minimum, each PQWP shall include the following:

A. The name of each Contractor or subcontractor to be used.
B. One copy each of all current ASTM and "SSPC: The Society for Protective Coatings" specifications or qualification procedures applicable to the painting or paint removal to be performed. These documents shall become the permanent property of the Department.
C. A copy of the coating manufacturer's guidelines and recommendations for surface preparation, painting, drying, curing, handling, shipping, and storage of painted structural steel, including testing methods and maximum allowable levels for soluble salts.
D. Proposed materials, methods, and equipment to be used for any paint application.
E. Proof of each of any required certifications, SSPC-QP 1, SSPC-QP 2, SSPC-QP 3. Where SSPC-QP 3 certification is required, an enclosed shop facility shall be required. Certification of AISC Sophisticated Paint Endorsement Quality Program, P-1 Enclosed endorsement, will be considered equivalent to SSPC-QP 3.
F. Proposed methods to control environmental conditions in accordance with the manufacturer's recommendations and these special provisions.
G. Proposed methods to protect the coating during curing, shipping, handling, and storage.
H. Proposed rinse water collection plan.
I. A detailed paint repair plan for the repair of damaged areas.
J. Procedures for containing blast media and water during application of coatings and coating repair of erected steel.
K. Examples of proposed daily reports for all testing to be performed, including type of testing, location, lot size, time, weather conditions, test personnel, and results.

Before submitting the PQWP, a prepainting meeting between the Engineer, the Contractor, and a representative from each entity performing painting for this project shall be held to discuss the requirements for the PQWP.

The Engineer shall have 20 days to review the PQWP submittal after a complete plan has been received. No painting or paint removal shall be performed until the PQWP for that work is approved by the Engineer. Should the Engineer fail to complete the review within this 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 PQWP, 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 Engineer's approval of the Contractor's PQWP shall not relieve the Contractor of any responsibility under the contract for the successful completion of the work in conformity with the requirements of the plans and specifications.

The Contractor shall provide enclosures to permit cleaning and painting during inclement weather. Provisions shall be made to control atmospheric conditions inside the enclosures within specified limits during cleaning and painting operations, drying to solvent insolubility, and throughout the curing period in accordance with the manufacturer's recommendations and these special provisions. Full compensation for providing and maintaining such enclosures shall be considered as included in the prices paid for the various contract items of work requiring paint and no additional compensation will be allowed therefor.

Fresh, potable water with a maximum chloride content of 75 mg/L and a maximum sulfate content of 200 mg/L shall be used for water rinsing or pressure washing operations. No continuous recycling of rinse water will be permitted. If rinse water is collected into a tank and subsequent testing determines the collected water conforms to the specified requirements, reuse may be permitted by the Engineer if no collected water is added to the tank after sample collection for determination of conformance to specified requirements.

CLEANING

New metal surfaces, except where galvanized, shall be dry blast cleaned in conformance with the requirements in SSPC-SP 10, "Near White Blast Cleaning," of the "SSPC: The Society for Protective Coatings." Blast cleaning shall leave surfaces with a dense, uniform, angular anchor pattern of not less than 40 µm nor more than 86 µm as measured in conformance with the requirements in ASTM Designation: D 4417.

Mineral and slag abrasives used for blast cleaning steel surfaces shall conform to the requirements for Class A, Grade 2 to 3 abrasives contained in SSPC-AB 1, "Mineral and Slag Abrasives," of the "SSPC: The Society for Protective Coatings," and shall not contain hazardous material.

Steel abrasives used for blast cleaning steel surfaces shall comply with the requirements of SSPC-AB 3, "Ferrous Metallic Abrasive," of the "SSPC: The Society for Protective Coatings." If steel abrasive is recycled through shop or field abrasive blast cleaning units, the recycled abrasive shall conform to the requirements of SSPC-AB 2, "Specification for Cleanliness of Recycled Ferrous Metallic Abrasive," of the "SSPC: The Society for Protective Coatings."

A Certificate of Compliance conforming to the provisions in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications and a Material Safety Data Sheet shall be furnished before use for each shipment of blast cleaning material for steel.

Abrasive blast cleaned surfaces shall be tested by the Contractor for soluble salts using a Class A or B retrieval method as described in Technology Guide 15, "Field Methods for Retrieval and Analysis of Soluble Salts on Steel and Other Nonporous Substrates," of the "SSPC: The Society for Protective Coatings," and cleaned so the maximum level of soluble salts does not exceed the lesser of the coating manufacturer's written recommendations or 10 micrograms per square centimeter. Areas of abrasive blast cleaned steel shall be tested at the rate of 3 tests for the first 100 square meters prepared per day, and one test for each additional 100 square meters or portion thereof, at locations selected by the Engineer. When less than 100 square meters of surface area is prepared in a shift, at least 2 tests shall be performed. If levels of soluble salts exceed the maximum allowed by these special provisions, the entire area represented by the testing will be rejected. The Contractor shall perform additional cleaning and testing of rejected areas until soluble salt levels conform to these requirements.

Corners shall be chamfered to remove sharp edges.

Thermal cut edges (TCEs) to be painted shall be conditioned before blast cleaning by shallow grinding or other method approved by the Engineer to remove the thin, hardened layer of material resulting from resolidification during cooling.

Visually evident base metal surface irregularities and defects shall be removed in accordance with ASTM Designation: A 6 or AASHTO Designation: M 160 before blast cleaning steel. When material defects exposed by blast cleaning are removed, the blast profile shall be restored by either blast cleaning or by using mechanical tools in accordance with SSPC-SP 11, "Power Tool Cleaning to Bare Metal," of the "SSPC: The Society for Protective Coatings."

PAINTING

Blast cleaned surfaces shall receive a single undercoat, and a final coat where specified, consisting of an inorganic zinc coating conforming to the requirements in AASHTO Designation: M 300, Type I or Type II, except that: 1) the first 3 sentences of Section 5.6, "Primer Field Performance Requirements," shall not apply for Type II coatings, and 2) the entire Section 5.6.1 shall not apply for either type of inorganic zinc coating.

If the Contractor proposes to use a Type I coating, the Contractor shall furnish to the Engineer for review documentation as required in Section 5.6 of AASHTO Designation: M 300. The Contractor shall allow the Engineer 30 days to review the proposal. Type I coatings selected for use shall meet the current applicable volatile organic compound limits for the air quality district in which the project is located.

If the Contractor proposes to use a Type II coating, the coating shall be selected from the qualified products list, which may be obtained from the Transportation Laboratory.

The color of the final application of inorganic zinc coating shall match Federal Standard 595B No. 36373.

Inorganic zinc coating shall be used within 12 hours of initial mixing.

Application of inorganic zinc coating shall conform to the provisions for applying zinc-rich coating in Section 59-2.13, "Application of Zinc-Rich Primer," of the Standard Specifications.

The single undercoat of inorganic zinc coating shall be applied to the required dry film thickness in 2 or more applications within 8 hours of the start of blast cleaning. Abrasive blast cleaned steel shall not be exposed to relative humidity exceeding 85 percent before application of inorganic zinc coating.

The total dry film thickness of all applications of the inorganic zinc undercoat, including the surfaces of outside existing members within the grip under bolt heads, nuts, and washers, shall be not less than 100 µm nor more than 200 µm, except that the total dry film thickness on each faying (contact) surface of high strength bolted connections shall be between 25 µm and the maximum allowable dry film thickness for Class B coatings as determined by certified testing in conformance with Appendix A of the "Specification for Structural Joints Using ASTM A325 or A490 Bolts" of the Research Council on Structural Connections (RCSC Specification). Unless otherwise stated, all inorganic zinc coatings used on faying surfaces shall meet the slip coefficient requirements for a Class B coating on blast-cleaned steel, as specified in the RCSC Specification. The Contractor shall provide results of certified testing showing the maximum allowable dry film thickness for the Class B coating from the qualifying tests for the coating chosen, and shall maintain the coating thickness on actual faying surfaces of the structure at or below this maximum allowable coating thickness.

Areas where mudcracking occurs in the inorganic zinc coating shall be blast cleaned and repainted with inorganic zinc coating to the specified thickness.

Steel surfaces coated with Type II inorganic zinc coating shall be protected from conditions that may cause the coating film to dissolve. The Contractor, at the Contractor's expense, shall repair areas where the coating has dissolved by blast cleaning and repainting with inorganic zinc coating to the specified thickness.

Dry spray, or overspray, as defined in the Steel Structures Painting Manual, Volume 1, "Good Painting Practice," of the "SSPC: The Society for Protective Coatings," shall be removed before application of subsequent coats or final acceptance. Removal of dry spray shall be by screening or other methods that minimize polishing of the inorganic zinc surface. The dry film thickness of the coating after removal of dry spray shall be in conformance with the provisions for applying the single undercoat, as specified herein.

The Contractor shall test the inorganic zinc coating before application of final coats. The locations of the tests will be determined by the Engineer, with no more than 6 locations per joint seal assembly. The Contractor shall determine the sequence of the testing operations. The testing for adhesion and hardness shall be performed no sooner than 72 hours after application of the single undercoat of inorganic zinc coating. Satisfactory access shall be provided to allow the Engineer to determine the location of the tests.

The inorganic zinc coating shall pass the following tests:

A. The inorganic zinc coating shall have a minimum adhesion to steel of 4 MPa when measured using a self-aligning adhesion tester in conformance with the requirements in ASTM Designation: D 4541. The Engineer will select 3 locations per girder or 100 square meters of painted surface, whichever is less, for adhesion testing. If less than 100 square meters of steel is painted in a work shift, the Engineer will select 3 areas painted during the work shift for testing. If 2 or more of the locations tested fail to meet adhesion requirements, the entire area represented by the tests will be rejected. If one of the locations tested fails to meet adhesion requirements, an additional 3 locations shall be tested. Should any of the additional locations fail to meet adhesion requirements, the entire area represented by the tests will be rejected. The Contractor, at the Contractor's expense, shall repair the rejected area by blast cleaning and repainting with inorganic zinc to the specified thickness. Test locations for areas of inorganic zinc meeting adhesion testing requirements shall be repaired by application of organic zinc primer as specified in Section 91-1.04, "Materials," of the Standard Specifications to the specified minimum dry film thickness.

B. Areas of inorganic zinc coating where finish coats are to be applied shall be tested by the Contractor for soluble salts using a Class A or B retrieval method as described in Technology Guide 15, "Field Methods for Retrieval and Analysis of Soluble Salts on Steel and Other Nonporous Substrates," of the "SSPC: The Society for Protective Coatings," and cleaned so the maximum level of soluble salts does not exceed the lesser of the manufacturer's written recommendations or 10 micrograms per square centimeter. Areas of inorganic zinc coating shall be tested at the rate of 3 tests for the first 100 square meters to be painted per day and one test for each additional 100 square meters or portion thereof at locations selected by the Engineer. When less than 100 square meters of surface area is painted in a shift, at least 2 tests shall be performed. If levels of soluble salts exceed the maximum allowed by these special provisions, the entire area represented by the testing will be rejected. The Contractor shall perform additional cleaning and testing of rejected areas until soluble salt levels conform to these requirements.

C. Before application of final coats, the inorganic zinc coating shall exhibit a solid, hard, and polished metal surface when firmly scraped with the knurled edge of a quarter. Inorganic zinc coating that is powdery, soft, or does not exhibit a polished metal surface, as determined by the Engineer, shall be repaired by the Contractor, at the Contractor's expense, by blast cleaning and repainting with inorganic zinc coating to the specified thickness.

Additional Requirements for Water Borne Inorganic Zinc Primers

A. The surface pH of the inorganic zinc primer shall be tested by wetting the surface with de-ionized water for a minimum of 15 minutes but no longer than 30 minutes and applying pH paper with a capability of measuring in increments of 0.5 pH units. At least 2 surface pH readings shall be taken for every 50 square meters or portion thereof. If less than 50 square meters of steel is coated in a single shift or day, at least 2 surface pH readings shall be taken for primer applied during that period. Application of finish coats will not be permitted until the surface pH is less than or equal to 7.
B. Dry to solvent insolubility for water borne inorganic zinc primers shall be determined in conformance with the requirements in ASTM Designation: D 4752, except that water shall be the solvent. The resistance rating shall be not less than 4. Areas of inorganic zinc coating shall be tested for solvent insolubility at the rate of one test per 50 square meters or portion thereof. Inorganic zinc coating represented by the tested area that does not meet the solvent insolubility requirements will be rejected. The Contractor, at the Contractor's expense, shall repair rejected areas by blast cleaning and repainting with inorganic zinc coating to the specified thickness.

Additional Requirements for Solvent Borne Inorganic Zinc Primers

A. Dry to solvent insolubility for solvent borne inorganic zinc primers shall be determined in conformance with the requirements in ASTM Designation: D 4752. The resistance rating shall be not less than 4. Areas of inorganic zinc coating shall be tested for solvent insolubility at the rate of one test per 50 square meters or portion thereof. Inorganic zinc coating represented by the tested area that does not meet the solvent insolubility requirements will be rejected. The Contractor, at the Contractor's expense, shall repair rejected areas by blast cleaning and repainting with inorganic zinc coating to the specified thickness.
B. Surface hardness of solvent borne inorganic zinc shall be a minimum 2H when measured in conformance with the requirements in ASTM Designation: D 3363. Areas of inorganic zinc coating shall be tested at the rate of one test per 50 square meters or portion thereof. Inorganic zinc coating that fails to meet the surface hardness requirements shall be repaired by the Contractor, at the Contractor's expense, by blast cleaning and repainting with inorganic zinc coating to the specified thickness.

The Contractor, at the Contractor's expense, shall retest all rejected areas of inorganic zinc coating after repairs have been completed.

The final coat of inorganic zinc coating shall be applied after testing and completion of all operations that may damage or discolor the steel surface, including correction of runs, sags, thin and excessively thick areas in the paint film, skips and holidays, dry spray, or areas of non-uniform appearance.

The area to receive the final coat of inorganic zinc coating shall be lightly roughened by abrasive blasting using an abrasive no larger than 600 µm. Abrasive blasting shall remove no more than 15 µm of inorganic zinc. The surface to be lightly roughened shall be free from moisture, dust, grease, or deleterious material. The undercoated areas of the under surfaces of bottom flanges shall be protected from abrasive blast cleaning operations.

The final coat of inorganic zinc coating shall be applied to the required dry film thickness in one uniform application within 24 hours after light roughening. The dry film thickness of the final coat shall be not less than 25 µm nor more than 75 µm.

Except at bolted connections, the total dry film thickness of all applications of the single undercoat and final coat of inorganic zinc coating shall be not less than 125 µm nor more than 275 µm.

Finish coats will not be required.

10-1.84 PREPARE AND PAINT CONCRETE

This work shall consist of preparing and painting concrete barrier and slope paving color band surfaces, where shown on the plans, and in conformance with these special provisions.

Materials

The paint shall be a light-stable, alkali-resistant, acrylic latex or acrylic latex copolymer emulsion, commercially manufactured for use as an exterior concrete coating. The paint shall conform to the provisions in Section 91-4.05, "Paint: Acrylic Emulsion, Exterior White and Light and Medium Tints," of the Standard Specifications.

The paint shall be formulated and applied so that the color of the coated concrete matches the following, or equivalent:

LOCATION	Company	Color	Color Number
Caliente Avenue OC, 57-1142	Frazee Or ICI Master Pallette	Wright Red Cherry Red	AC120R K-16 00YR-15/510-120
Heritage Road UC, 57-1143R	Frazee	Carribean Waters	7104m
Heritage Road UC, 57-1143L	ICI Master Pallette	Pacific Coast	18BG 47/282-1279

Test Panel

A test panel at least 1.25 m x 1.25 m in size shall be successfully completed at each location and approved by the Engineer before beginning work on painting concrete. Test panels shall be constructed, finished, and painted with the materials, tools, equipment, personnel, and methods to be used in constructing, finishing, and painting the concrete surfaces. If ordered by the Engineer, additional test panels shall be constructed and finished until the specified finish, texture, and color are obtained, as determined by the Engineer.

Test panels approved by the Engineer shall be used as the standard for comparison in determining acceptability of painting for concrete surfaces.

The Contractor shall submit to the Engineer, not less than one week prior to initial application of the concrete coating to a test panel, a copy of the manufacturer's recommendations and written application instructions.

Surface Preparation

New concrete surfaces to be painted shall be cured in conformance with the provisions in Section 90-7.03, "Curing Structures," of the Standard Specifications.

Concrete surfaces to be painted shall be prepared in conformance with the requirements of SSPC-SP 13, "Surface Preparation of Concrete," of the Structural Steel Painting Council. After concrete surface preparation is complete, the Contractor shall clean all concrete surfaces to be painted by water rinsing as defined in Section 59-1.03, "Application," of the Standard Specifications.

Painting Concrete

The coating shall be applied per the manufacturer's recommendations and in conformance with the requirements of SSPC-SP 11,"Guide for Coating Concrete," of the Structural Steel Painting Council.

Any damaged areas shall be repaired in the same manner as the original surface preparation and paint application.

Measurement and Payment

Concrete surfaces to be prepared and painted will be measured by the square meter. Measurement will be determined along the surface of the actual areas painted.

The contract price paid per square meter for prepare and paint concrete shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in preparing of and applying paint to concrete surfaces, complete in place, including construction of test panels and repairing damaged areas, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

10-1.85 ALTERNATIVE PIPE

Alternative pipe culverts must comply with Section 62, "Alternative Culverts," of the Standard Specifications.

Concrete backfill for alternative culverts shall be constructed in conformance with the provisions in Section 66-1.045, "Concrete Backfill," of the Standard Specifications and will be measured and paid for in conformance with the provisions in Section 66-4, "Measurement and Payment," of the Standard Specifications and the following:

A. The quantity of concrete backfill to be paid for, regardless of the kind of culvert and wall thickness of the culvert installed, will be based on the dimensions shown on the plans and the installation of reinforced concrete pipe with the least wall thickness shown in AASHTO Designation: M 170M for the Class of pipe designated.

10-1.86 PLASTIC PIPE

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

CORRUGATED POLYVINYL CHLORIDE (PVC) PIPE WITH SMOOTH INTERIOR

GENERAL

Corrugated polyvinyl chloride (PVC) pipe must have smooth interior and comply with Section 64, "Plastic Pipe," of the Standard Specifications and these special provisions.

Corrugated PVC pipe with smooth interior must be manufactured as a single extrusion of the smooth interior and the corrugated outer walls. Corrugated exterior profile must be annular and seamless. Pipe dimensions, wall thickness, socket sizes, and fitting tolerances must comply with ASTM F 949.

Corrugated PVC pipe diameters must be as shown on the plans.

Minimum Corrugated PVC pipe wall thickness when measured in accordance with ASTM D 2122 must be as specified in Table 1 of ASTM F 949.

Minimum Corrugated PVC pipe stiffness must be 0.44 MPa when tested in accordance with ASTM D 2412.

MATERIALS

Manufacture corrugated PVC pipe and fittings from PVC virgin compounds except clean reworked recycled PVC materials generated from the manufacturer's own pipe or fitting fabrication may be reused.

Corrugated PVC pipe must comply with ASTM F 949 with a cell classification of 12454 per ASTM D 1784. Fillers that lower the tensile strength of the compound or change the minimum cell classification are not allowed. PVC compounds must contain a minimum of 0.5 percent by weight rutile titanium dioxide, or as recommended by the pipe manufacturer.

Corrugated PVC pipe and fittings chemical resistance must comply with ASTM D 5260, with a cell classification of S47552.

Single or double elastomeric gaskets must comply with ASTM F 477 for low-head applications. Use extruded or molded gaskets cured in such a manner that any cross section will be dense, homogeneous and free of porosity, blisters, pitting or other imperfections. Double gasket must be a single piece gasket that fits into the first two full corrugation valleys on the spigot end. Ship gaskets in containers that prevent damage from UV exposure and handling.

Wyes, tees, reducers, elbows, couplings, laterals and other fittings must be molded or fabricated and comply with ASTM F 949 with a cell classification of 12454 or 13343, as defined in ASTM D1784.

Lubricant must not have detrimental effect on the gaskets or pipe and must be one recommended by the pipe manufacturer.

Corrugated PVC pipe joints must conform to the integral joint provisions in Section 61-1.02, "Performance Requirements for Culvert and Drainage Pipe Joints", of the Standard Specifications, except that joint overlap requirements must be as shown on the plans. Pipe joints must be bell and spigot type with gaskets ready for field assembly. Install joints so that when assembled, the elastomeric gasket will be compressed radially between the pipe bell and spigot to form a tight seal.

Clearly mark each standard and random length of pipe in permanent letters not less than 6 mm high at intervals of 127 mm or less with at least the following:

1. Manufacturer's code and name or trademark
2. ASTM F 949 (0.32 MPa), Cell Classification
3. PVC
4. Nominal pipe size
5. Factory marked insertion line on spigot end of pipe

Clearly mark fittings with permanent letters not less than 6 mm high with at least the following:

1. Manufacturer's code and name or trademark
2. ASTM F 949, Cell Classification
3. PVC
4. Nominal size
5. Factory marked insertion line on spigot end of fittings

Manufacturer's code must include day, month, year, shift and plant of manufacture.

Pipe and fittings must be homogenous throughout and uniform in color, opacity, density and other properties. Inside and outside surfaces must be semi-matte or glossy in appearance and free of chalky, sticky or tacky material. Pipe walls must be free of cracks, holes, blisters, voids, foreign inclusions, or other defects that are visible to the naked eye or that may affect the pipe wall's integrity. Pipe or fittings with abrasions or scratches deeper than 10 percent of the wall thickness must not be used. Joint surfaces, upon which the gasket may bear, must be smooth and free of imperfections, ridges, fractures or cracks that could adversely affect joint seal.

CONSTRUCTION

Store pipe in unit packages. Protect bell ends of pipe from compression, deformation or damage. Support unit packages with racks or dunnage to prevent damage and bending. When unit packages of pipe are stacked, measures must be taken to ensure that weight of upper units do not cause deformation to pipe in lower units. Pipe must not be stored next to heat sources such as boilers, steam lines, electrical equipment or engine exhausts. Pipe must not be allowed to overhang vehicles or storage areas unsupported for more than 76 mm.

Do not expose pipe to direct sunlight for a total length of time that will exceed 30 days. Provide temporary sun block protection by covering the pipe racks or dunnage. Ensure adequate air circulation around covered pipe racks or dunnage to reduce excessive heat accumulation. Protect gaskets from excessive exposure to heat, ozone, oil, grease and sunlight for any time period that exceeds 48 hours. Do not store gaskets near electrical or exhaust heat sources.

Protect pipe and fittings from damage when handling and installing. Do not throw or drag pipe and fittings. Ensure placed pipe is not damaged by mishandling. When installing at temperatures of 4.4°C or less, demonstrate to the Engineer that the bar and block method, or any other mechanical assistance method to assemble the pipe, will not damage pipe before proceeding with pipe assembly. Damaged pipe and fittings that are cracked or chipped must not be used.

Install gasket on pipe spigot after pipe is placed into the trench ready for connection of joint. Place single or double gaskets on the spigot end in accordance to the manufacturer's installation instructions. When using a double gasket, leading edge of gasket must point in direction of the spigot end. Both spigot and bell ends must be free of debris prior to connection. Apply pipe manufacturer's recommended lubricant to the inside of the bell and over the gasket. Insert the spigot end of pipe into the bell end until the factory provided insertion line on the spigot end is lined up with the edge of the bell.

When spigot end of pipe is shortened, cut the end square and bevel to the same angle as provided on factory-finished pipe spigot end so that there are no visible burrs. Remark the shortened pipe with a new insertion line on the spigot using a factory-marked spigot insertion line as a guide.

During installation at the end of each day cover ends of installed corrugated PVC pipe that have not been backfilled.

After completion of backfilling operations, to a minimum of 1.5 meters above the top of the pipe, or to finish grade, whichever is less, the pipe must not exhibit deflection, measured as a percent deviation from original inside diameter, in excess of 5 percent at any location.

10-1.87 REINFORCED CONCRETE PIPE

Reinforced concrete pipe shall conform to the provisions in Section 65, "Reinforced Concrete Pipe," of the Standard Specifications and these special provisions.

GENERAL

Where embankment will not be placed over the top of the pipe, a relative compaction of not less than 85 percent shall be required below the pipe spring line for pipe installed using Method 1 backfill in trench, as shown on Standard Plan A62D. Where the pipe is to be placed under the traveled way, a relative compaction of not less than 90 percent shall be required unless the minimum distance between the top of the pipe and the pavement surface is the greater of 1.2 meters or one half of the outside diameter of the pipe.

Except as otherwise designated by classification on the plans or in the specifications, joints for culvert and drainage pipes shall conform to the plans or specifications for standard joints.

MATERIALS

The concrete for reinforced concrete pipe must contain not less than 280 kg of cementitious material per cubic meter with a water–cementitious material ratio not to exceed 0.35 by weight. Supplementary cementitious material is optional. Reinforcement shall have a minimum cover of 25 mm.

10-1.88 CORRUGATED METAL PIPE

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

Polymeric sheet coating shall be placed on the outside and inside surfaces of the pipe.

Corrugated steel pipe shall be fabricated from zinc-coated steel sheet.

COMPOSITE STEEL SPIRAL RIB PIPE WITH SMOOTH INTERIOR

GENERAL

Manufactured composite steel spiral rib pipe must comply with Section 66, "Corrugated Metal Pipe," of the Standard Specifications, except for profile and fabrication requirements.

Pre-coated exterior of composite steel spiral rib pipe with polymeric sheet coating must comply with Section 66-1.03, "Protective Coatings, Linings and Pavings," of the Standard Specifications. Line pipe interior with polyethylene (polyolefin plastomer). Pipe dimensions, wall thickness, and fitting tolerances must comply with ASTM A 978.

At each location, the plans show the pipe diameter to be used in the work. Fabricated pipe with continuous helical lock seam must comply with Section 66-3.03C(1), "Fabrication by Continuous Lock Seam," of the Standard Specifications. Use three rectangular ribs spaced midway between seams with ribs 19 mm wide x 19 mm high at a maximum rib pitch of 190 mm on center to fabricate pipe. Rib pitch measured at right angles to the direction of the ribs may vary +/- 13 mm.

MATERIALS

Formed pipe from polymer pre-coated sheets must comply with ASTM A 742 (Grade 10), except the sheet side for interior of pipe must have additives that will enhance the bond of the sheet to the extruded polyethylene liner. The galvanized sheet must be cleaned utilizing an alkaline cleaner followed by chrome pretreatment prior to application of any protective coatings.

Coated steel sheet with zinc metallic coating must comply with ASTM A 929.

Polyethylene for filling ribs and internal liner must be a virgin resin with the following properties:

Property	ASTM Test Method	Requirement
Melt Index	D 1238	I_2+ 7.5g/10 min (+/- 1.5)
Flow Rate Ratio	D 1238	I_{10}/I_2=7-8
Density	D 792	0.902 g/cc (+/- .002)
Hardness	D 2240	Shore D = 45 (+/- 5)
Ash Content	D 5630	< 1.0%

Fabricated joint coupling bands from the steel sheets used in pipe manufacture except coating on both sides of steel sheets with polymeric sheet coating must comply with Section 66-1.03, "Protective Coatings, Linings and Pavings," and Section 66-1.07, "Coupling Bands" of the Standard Specifications. Coupling bands must be 300 mm wide except for pipe diameters 1.5 meters and greater the coupling band must be 610 mm wide.

Galvanized nuts, bolts and washers must comply with Sections 75-1.02, "Miscellaneous Iron and Steel," and 75-1.05, "Galvanizing," of the Standard Specifications.

Expanded rubber gaskets must comply with ASTM D 1056, Type 2, Class C, and Grade 1. Protect gaskets from excessive exposure to heat, direct sunlight, ozone, oil or grease. Gaskets placed over the spiral ribs must have a groove routed to match the pipe's ribs depth and width prior to installation. Do not use o-rings in place of gaskets.

Gasket adhesive must be one part urethane elastomeric joint sealant complying with ASTM C 920, type S, grade NS, class 25, use NT, A and M. Use sealant within 9 months from date of manufacture. Store adhesive at ambient temperature of 27 °C or below. Do not use adhesive stored at temperatures exceeding 27 °C.

JOINTS

Manufactured pipe joints must comply with the sleeve joint specifications in Section 61-1.02, "Performance Requirements for Culvert and Drainage Pipe Joints," of the Standard Specifications.

PIPE AND COUPLING BAND MARKING

Mark each standard and random length of pipe clearly in permanent letters not less than 6 mm high at intervals of 1.5 meter or less with at least the following:

1. Manufacturer's code and name or trademark
2. ASTM A 978
3. Nominal pipe size

Mark coupling bands clearly with at least the following:

1. Manufacturer's code and name or trademark
2. ASTM A 978
3. Nominal size

Manufacturer's code must include day, month, year, shift and plant of manufacture.

FIELD STORAGE

Store pipe in unit packages with ends of pipe protected from compression, deformation or damage. Support unit packages with racks or dunnage to prevent damage and bending. Stack unit packages of pipe to ensure that weight of upper units do not cause deformation to pipe in lower units. Do not store pipe next to heat sources, steam lines, electrical equipment or engine exhausts.

Provide sun block protection by covering pipe racks or dunnage with an opaque sheeting material to protect pipe from exposure to direct sunlight for lengths of time that exceed 30 days. Arrange sheeting material to reduce excessive heat accumulation so adequate air circulation is provided around pipe racks or dunnage. Ship gaskets in container to prevent damage from UV exposure and handling. Do not store gaskets near electrical or exhaust heat sources or exposed to sunlight for periods that exceeds 48 hours.

CONSTRUCTION

Install composite steel spiral rib pipe as specified for laying helical corrugated pipe in Section 66-1.05, "Laying Pipe," of the Standard Specifications, except the gap between the pipe sections must not be more than 13 mm. Install gasket adhesive and gasket to clean pipe ends prior to installing coupling band.

During installation at the end of each day cover installed pipe ends that have not been backfilled.

REPAIR OF DAMAGED EXTERIOR COATINGS

Repair damaged polymeric coatings of pipe or pipe-fittings. Repair breaks or scuffs in polymeric coating less than 230 square centimeters in area under the manufacturer's recommended repair procedures. Do not use pipe when individual breaks or the total area of breaks exceed 230 square centimeters in area or when the total area of breaks exceeds 0.5 percent of the total surface area of the pipe.

Polymer repair material must be one of the following:

1. Denflex Coating – Dennis Chemical Company, St. Louis, MO.
2. Scotch-Clad 1706 Protective Coating – 3M Company, St. Paul, MN.
3. Ranbar Trispec TPC-515-7 Black Synthetic Coating - P.D. George Company, Manor, PA.

Surfaces to be coated must be clean and dry. The repair coating must be at least 0.25 mm thick after hardening and must bond securely and permanently to the pipe. If the repair coating thickness is not measured, six coats must be applied allowing 30 minutes drying time between coats.

10-1.89 OVERSIDE DRAIN

Hot mix asphalt overside drains shall conform to the provisions in Section 69, "Overside Drains," of the Standard Specifications.

10-1.90 ALTERNATIVE PIPE DOWNDRAIN

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

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

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

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

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

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

10-1.91 MISCELLANEOUS FACILITIES

Pipe risers, pipe inlets, pipe manholes and flared end sections shall conform to the provisions in Section 70, "Miscellaneous Facilities," of the Standard Specifications and these special provisions.

10-1.92 GRATED LINE DRAIN

This work shall consist of furnishing and installing precast grated line drain, with necessary fittings, coupling systems, frames, grates and associated items as shown on the plans and in conformance with these special provisions.

The interior surface of the grated line drain, below the level of the frame and grate and associated connections, shall be smooth. Grated line drain channel sections shall be manufactured of monolithic polymer concrete with no side extensions.

Monolithic polymer concrete shall be made from a composition of aggregate and polyester resin or vinylester resin and shall have the following properties when tested as follows:

PROPERTY	ASTM TEST METHOD	VALUE
Tensile Strength, MPa	C 307	10 min.
Compressive Strength, MPa	C 579	80 min.
Bending Strength, MPa	C 580	20 min.
Moisture Absorption, %	C 140	0.5 max.
Chemical Resistance	C 267	Pass
Freeze/Thaw, number of cycles w/o weight loss	C 666	1600 min.

The manufacturer of the grated line drain shall furnish the Engineer a Certificate of Compliance in conformance with the provisions in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications.

Grated line drain frames and grates shall be manufactured of ductile iron conforming to the provisions in Section 75-1.02, "Miscellaneous Iron and Steel," of the Standard Specifications. The frames and grates need not be galvanized or coated with asphalt paint. Bolts, nuts, frame anchors, and other connecting hardware shall conform to the provisions in Section 75-1.02, "Miscellaneous Iron and Steel," of the Standard Specifications.

Frames and grates, when installed in conformance with the manufacturer's recommendations and these special provisions, shall be classified as heavy duty (112 kN proof load) when tested in accordance with Commercial Item Description A-A-60005 for "Frames, Covers, Gratings, Steps, Manhole, Sump and Catch Basin." Frames and grates shall be matchmarked in pairs before delivery to the work and grates shall fit into the frames without rocking.

Frames shall be secured to the surrounding concrete backfill with steel anchoring rods as shown on the plans. Other methods may be used to secure the frame to the concrete backfill or grated line drain wall provided that a minimum pullout resistance of 10 kN per meter of length of grated line drain frame is maintained.

Grates and frames shall be one piece or the grates shall be removable. Removable grates shall be held in place by locking devices that are tamper resistant. Removable grates shall provide a minimum repetitive pullout resistance of 5 kN per meter of length after completion of 1000 hours of salt spray testing in conformance with the requirements in ASTM Designation: B 117. When a combination of one piece frame and grate and removable grates are used, the locations of the removable grates shall be shown on the plans.

Except for grates installed within designated pedestrian paths of travel, grates shall accept inflow of runoff through openings. The openings shall consist of a minimum of 60 percent of the total top surface area of the grate, with individual openings or slots having a dimension not greater than 50 mm measured in the direction of the grated line drain flow line. Grates installed within designated pedestrian paths of travel shall be certified as conforming to the requirements of the "Americans with Disabilities Act."

Grated line drains shall be installed in trenches excavated to the lines and grades established by the Engineer. The bottom of the trench shall be graded and prepared to provide a firm and uniform bearing throughout the entire length of the grated line drain.

Grated line drains shall be installed and jointed in conformance with the manufacturer's recommendations.

Grated line drains shall be installed to the lines and grades with sections closely jointed and secured to ensure that no separation of the line drains occurs during backfilling.

The frame or grate of the grated line drain shall not extend above the level of the surrounding concrete backfill.

Grated line drains shall be connected to new or existing drainage facilities as shown on the plans.

Excavation and backfill shall conform to the provisions in Section 19-3, "Structure Excavation and Backfill," of the Standard Specifications.

Backfill for the grated line drains shall be either minor concrete or Class 3 concrete conforming to the provisions in Section 90, "Portland Cement Concrete," of the Standard Specifications. Minor concrete shall contain not less than 300 kg of cementitious material per cubic meter.

Concrete backfill shall be placed in the trench as shown on the plans. Concrete backfill shall be placed against undisturbed material at the sides and bottom of the trench and in a manner that will prevent floating or shifting of the grated line drain and voids in, or segregation of, the concrete. Foreign material which falls into the trench, before or during placement of the concrete, shall be immediately removed. Where necessary, earth plugs shall be constructed and compacted at the ends of the planned concrete backfill to contain the concrete within the trench.

Concrete backfill shall be finished flush with the adjacent surfacing.

The surface of the concrete shall be textured with a broom or burlap drag to produce a durable skid-resistant surface.

The length the grated line drain to be paid for will be the length measured by the meter along the pavement surface as designated by the Engineer. No payment will be made for grated line drain placed in excess of the designated length.

The contract price paid per meter for grated line drain shall include full compensation for furnishing all labor, materials (including frames and grates), tools, equipment, and incidentals, and for doing all the work involved in installing grated line drains, complete in place, including excavation and backfill, connecting grated line drains to new or existing facilities, concrete collars, reinforcement, and other connecting devices, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

10-1.93 SLOPE PROTECTION

Slope protection shall be placed or constructed in conformance with the provisions in Section 72, "Slope Protection," of the Standard Specifications and these special provisions.

Rock slope protection fabric shall be woven or nonwoven type fabric, Type A or Type B, at the option of the Contractor.

10-1.94 SLOPE PAVING (STAMPED CONCRETE)

Slopes under the ends of bridges, where shown on the plans, shall be paved in conformance with the provisions in Section 72-6, "Slope Paving," of the Standard Specifications and these special provisions.

Shotcrete shall not be used as an alternative construction method for slope paving.

Attention is directed to the "Prepare and Paint Concrete," elsewhere in these special provisions.

Stamped concrete texture shall conform to "Architectural Surface (Textured Concrete)" of these special provisions.

Full compensation for stamped concrete texture of slope paving shall be considered as included in the contract price paid per square meter for slope paving (stamped concrete) and no separate payment will be allowed therefor.

Prior to placing the permanent slope paving, the Contractor shall construct a test panel at least 1.2 m by 1.8 m at the site for approval by the Engineer. The test panel shall be constructed of the same materials as are proposed for the permanent work and shall be finished and cured as specified for the permanent work. Additional test panels shall be constructed as necessary until a panel is produced which conforms to the requirements herein, before constructing other slope paving.

10-1.95 MISCELLANEOUS CONCRETE CONSTRUCTION

Minor concrete (miscellaneous construction), minor concrete (gore paving), and minor concrete (textured paving) shall conform to the details shown on the plans, the provisions in Section 73, "Concrete Curbs and Sidewalks," of the Standard Specifications and these special provisions, and as directed by the Engineer.

Where shown on the plans, minor concrete (textured paving) will be required for minor concrete (miscellaneous construction) and minor concrete (gore paving) work.

Minor concrete (gore paving), shall have reinforcing bar of the size and type shown on the plans and conforming to the provisions in Section 52, "Reinforcement," of the Standard Specifications, shall be placed in the textured paving areas as shown on the plans.

Curb ramp detectable warning surface shall consist of raised truncated domes constructed or installed on curb ramps in conformance with the details shown on the plans and these special provisions. At the option of the Contractor, the detectable warning surface shall be prefabricated, cast-in-place, or stamped into the surface of the curb ramp. The color of the detectable warning surface shall be yellow conforming to Federal Standard 595B, Color No. 33538.

Prefabricated detectable warning surface shall be in conformance with the requirements established by the Department of General Services, Division of State Architect and be attached in conformance with the manufacturer's recommendations.

Cast-in-place and stamped detectable warning surfaces shall be painted in conformance with the provisions in Section 59-6, "Painting Concrete," of the Standard Specifications.

The finished surfaces of the detectable warning surface shall be free from blemishes.

Prior to constructing the cast-in-place or stamping the detectable warning surface, the Contractor shall demonstrate the ability to produce a detectable warning surface conforming to the details shown on the plans and these special provisions by constructing a 600-mm by 600-mm test panel.

The manufacturer shall provide a written 5-year warranty for prefabricated detectable warning surfaces, guaranteeing replacement when there is defect in the dome shape, color fastness, sound-on-cane acoustic quality, resilience, or attachment. The warranty period shall begin upon acceptance of the contract.

Full compensation for constructing or furnishing and installing curb ramp detectable warning surfaces shall be considered as included in the contract price paid per cubic meter for minor concrete (miscellaneous construction) and no separate payment will be made therefor.

Minor concrete (gore paving) will be measured and paid for in the same manner specified for minor concrete (miscellaneous construction) in Section 73, "Concrete Curbs and Sidewalks," of the Standard Specifications.

If the Contractor elects to use the curing compound method for curing concrete for minor concrete (miscellaneous construction), the curing compound shall be curing compound (6) conforming to the provisions in Section 90-7.01B, "Curing Compound Method," of the Standard Specifications.

The curing compound shall be applied in a manner that will provide a complete coating of all exposed faces of the concrete surface.

MINOR CONCRETE (TEXTURED PAVING)

Minor concrete (textured paving) shall consist of coloring the concrete and stamping a pattern into the surface of the concrete at the locations shown on the plans. The color shall closely resemble Davis manufacturer's color "Sandstone." The color shall be integral, chemically inert, fade resistant mineral oxide or synthetic type.

Samples of the colors specified for textured paving are available for review by prospective bidders at the office of the Department of Transportation, District 11 4050 Taylor Street, San Diego, CA 92110.

A test panel at least 1.25 m x 1.25 m in size shall be successfully completed at a location approved by the Engineer before beginning work for minor concrete (textured paving) to demonstrate the textured paving, including curing and finishing compounds and shall be submitted to the Engineer for written approval.

Minor concrete (textured paving) shall not be placed on the project prior to approval by the Engineer of the samples prepared and submitted by the Contractor. In the event more than one test panel of textured paving to be placed is required by the Engineer, each additional test panel will be paid for as extra work as provided in Section 4-1.03D of the Standard Specifications.

The pattern type and color of concrete for minor concrete (textured paving) shall be placed at the locations shown on the plans, struck off and compacted until a layer of mortar is brought to the surface. The concrete shall be screeded to the required grade and cross section and floated to a uniform surface.

The forming tools for the minor concrete (textured paving) shall be applied to form the patterned surfaces while the concrete is still in the plastic stage of set.

Minor concrete (textured paving) areas shall be cured by the curing compound method. The curing compound shall be curing compound (6) conforming to the provisions in Section 90-7.01B, "Curing Compound Method," of the Standard Specifications.

For payment purposes, the area in square meters of minor concrete (textured paving) will be determined from horizontal measurements of the finished textured paving.

The contract price paid per square meter for minor concrete (textured paving) shall include full compensation for furnishing all labor, materials (including color but excluding concrete), tools, equipment, and incidentals, and for doing all the work involved in constructing textured paving, complete in place, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

10-1.96 MISCELLANEOUS IRON AND STEEL

Miscellaneous iron and steel shall conform to the provisions in Section 75, "Miscellaneous Metal," of the Standard Specifications and these special provisions.

10-1.97 MISCELLANEOUS METAL (BRIDGE)

Miscellaneous metal (bridge) shall conform to the provisions for miscellaneous bridge metal in Section 75, "Miscellaneous Metal," of the Standard Specifications and these special provisions.

Miscellaneous metal (bridge) shall consist of the miscellaneous bridge metal items listed in Section 75-1.03, "Miscellaneous Bridge Metal," of the Standard Specifications, and the following:

A. Curtain wall cover plates

10-1.98 BRIDGE DECK DRAINAGE SYSTEM

Bridge deck drainage systems shall conform to the provisions for miscellaneous bridge metal in Section 75, "Miscellaneous Metal," of the Standard Specifications and these special provisions.

Self-tapping screws used for sleeve connections shall be hex-head stainless steel, installed in holes drilled to fit the self-tapping screws, conforming to the requirements of ASTM Designation: A 276, Type 304.

At the Contractor's option, fiberglass pipes and fittings with the same diameter and minimum bend radius as those shown on the plans, may be substituted for welded steel pipe in deck drain systems.

Fiberglass pipe and fittings shall conform to the requirements in ASTM Designation: D 2996, and shall have a minimum short-term rupture strength of 207 MPa. The adhesive type recommended by the manufacturer shall be used for joining pipe and fittings. Fiberglass pipe not enclosed in a box girder cell or encased in concrete shall be manufactured from ultraviolet-resistant resin pigmented with concrete-gray color, or be coated with a concrete-gray resin-rich exterior coating. Paint shall not be used. Fiberglass pipe treated with ultraviolet protection shall withstand a minimum of 2500 hours of accelerated weathering when tested in conformance with the requirements in ASTM Designation: G 154. Lamps shall be UV-B (313 nm wavelength). The resting cycle shall be 4 hours of ultraviolet exposure at 60°C, and then 4 hours of condensate

exposure at 50°C. After testing, the surface of the pipe shall exhibit no fiber exposure, crazing, or checking, and only a slight chalking or color change.

Support spacing for fiberglass pipe shall be the same as shown on the plans for welded steel pipe. Pipe supports shall have a width of not less than 38 mm.

A Certificate of Compliance for fiberglass pipe and fittings shall be furnished to the Engineer in conformance with the provisions in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications. The Certificate of Compliance shall include all laboratory test results conforming to the provisions specified herein.

For drainage piping NPS 8 or smaller, which is: (1) enclosed in a box girder cell and exposed for a length not greater than 6 m within the cell, or (2) encased in concrete, the Contractor shall have the option of substituting polyvinyl chloride (PVC) plastic pipe and fittings, with the same diameter and minimum bend radius as shown on the plans, for welded steel pipe.

The PVC plastic pipe and fittings shall be Schedule 40 conforming to the requirements of ASTM Designations: D 1785. The maximum support spacing for PVC plastic pipe shall be 2 m.

Couplings used to connect fiberglass pipe to steel shall be threaded or flanged. The sleeve connections shown on the plans shall not be used for fiberglass pipe.

If fiberglass pipe is substituted for welded steel pipe, the quantity of drainage piping will be computed on the basis of the dimensions and details shown on the plans, and no change in the quantities to be paid for will be made because of the use of fiberglass pipe.

Bridge deck drainage systems will be measured and paid for by the kilogram in the same manner specified for miscellaneous metal (bridge) in Section 75-1.06, "Measurement," and Section 75-1.07, "Payment," of the Standard Specifications.

10-1.99 CHAIN LINK FENCE

Chain link fence shall be Type CL – 1.8 and shall conform to the provisions in Section 80, "Fences," of the Standard Specifications and these special provisions.

Chain link fence fabric shall be woven into approximately 25 mm mesh.

10-1.100 WILDLIFE FENCE

Wildlife fence shall be Type CL – 2.4 and shall conform to the provisions in Section 80, "Fences," of the Standard Specifications and these special provisions.

The chain link fabric shall be 9-gage (3.76 mm), Type IV, Class B bonded vinyl coated fabric (black), conforming to the requirements in AASHTO Designation: M 181.

The bottom 0.6 meter of the chain link fence fabric used for wildlife fence shall be buried as shown on the plans.

The contract unit price paid per meter for wildlife fence shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in constructing wildlife fence, complete in place, including excavation and backfill of the bottom 0.6 meter of chain link fence fabric, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

10-1.101 POLE BARRIER

Pole barriers shall be furnished and installed at the locations shown on the plans, as specified in these special provisions and as directed by the Engineer.

Pole barriers shall consist of horizontal and vertical utility pole members with reinforcement bars conforming to the Standard Specifications, these special provisions and as directed by the Engineer.

Utility poles shall conform to the provisions in Section 86-2.12, "Wood Poles," of the Standard Specifications. Utility poles shall be new or used. Used utility poles shall be in good condition, with no rotted sections.

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

The quantity of pole barrier to be paid for will be measured by the meter along the top of the barrier, without deductions for gaps in the barrier.

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

10-1.102 MARKERS AND DELINEATORS

Markers and delineators shall conform to the provisions in Section 82, "Markers and Delineators," of the Standard Specifications and these special provisions.

Markers and delineators on flexible posts shall conform to the provisions in "Prequalified and Tested Signing and Delineation Materials" of these special provisions. Flexible posts shall be made from a flexible white plastic which shall be resistant to impact, ultraviolet light, ozone, and hydrocarbons. Flexible posts shall resist stiffening with age and shall be free of burns, discoloration, contamination, and other objectionable marks or defects which affect appearance or serviceability.

Retroreflective sheeting for metal and flexible target plates shall be the retroreflective sheeting designated for channelizers, markers, and delineators conforming to the requirements in ASTM Designation: D 4956-95 and in conformance with the provisions in "Prequalified and Tested Signing and Delineation Materials" of these special provisions.

Guard railing delineators shall be installed as shown on the plans.

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

Guard railing delineators will be measured by the unit determined from actual count of delineators used in the work or ordered by the Engineer.

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

At those locations shown on the plans, concrete barrier markers shall be cemented to the barrier in conformance with the manufacturer's recommendations. Concrete barrier markers shall conform to the provisions in "Prequalified and Tested Signing and Delineation Materials" of these special provisions.

Full compensation for concrete barrier markers shall be considered as included in the contract unit price paid per meter for concrete barrier of the type shown and no separate payment/additional compensation will be made/allowed therefor.

10-1.103 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 shall be wood, steel, or plastic. Blocks shall be wood or plastic.

The exposed bolt threads, on metal beam barrier beyond the nut, that are more than 12.5 mm are to be cut off.

ALTERNATIVE FLARED TERMINAL SYSTEM

Alternative flared terminal system shall be furnished and installed as shown on the plans and in conformance with these special provisions.

The allowable alternatives for a flared terminal system shall consist of one of the following or a Department approved equal.

(1) TERMINAL SYSTEM (TYPE FLEAT) - Terminal system (Type FLEAT) shall be a Flared Energy Absorbing Terminal 350 manufactured by Road Systems, Inc., located in Big Spring, Texas, and shall include items detailed for terminal system (Type FLEAT) shown on the plans. The Flared Energy Absorbing Terminal 350 can be obtained from the distributor, Universal Industrial Sales, P.O. Box 699, Pleasant Grove, UT 84062, Telephone (801) 785–0505 or from the distributor, Gregory Highway Products, 4100 13th Street, S.W., Canton, OH 44708, Telephone (330) 477–4800.

(2) TERMINAL SYSTEM (TYPE SRT) - Terminal system (Type SRT) shall be an SRT-350 Slotted Rail Terminal (8-post system) as manufactured by Trinity Industries, Inc., and shall include items detailed for terminal system (Type SRT) shown on the plans. The SRT-350 Slotted Rail Terminal (8-post system) can be obtained from the manufacturer, Trinity Industries, Inc., P.O. Box 99, 950 West 400S, Centerville, UT 84014, Telephone (800) 772–7976.

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 furnished 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.

Terminal systems shall be installed in conformance with the manufacturer's installation instructions and these requirements. Each terminal system installed shall be identified by painting the type of terminal system in neat black letters and figures 60 mm high on the backside of the rail element between system posts numbers 4 and 5.

For terminal system (Type SRT), 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.

For terminal system (Type FLEAT), the soil tubes shall be, at the Contractor's option, 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 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 posts may be slightly rounded to facilitate insertion of the post into the steel foundation tubes.

Surplus excavated material remaining after the terminal system has been installed shall be disposed of in a uniform manner along the adjacent roadway where designated by the Engineer.

The contract unit price paid for alternative flared terminal system shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in furnishing and installing alternative flared terminal system, complete in place, including excavation, backfill and disposal of surplus material, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

10-1.104 CHAIN LINK RAILING

Chain link railing shall conform to the provisions in Section 83-l, "Railings," of the Standard Specifications and these special provisions.

The chain link fabric shall be 9-gage (3.76 mm), Type IV, Class B, bonded vinyl coated fabric, conforming to the requirements in AASHTO Designation: M 181.

The strength of the bond between the coating material and steel of the bonded vinyl coated chain link fabric shall be equal to or greater than the cohesive strength of the polyvinyl chloride (PVC) coating material.

10-1.105 CABLE RAILING

Cable railing shall conform to the provisions in Section 83-1, "Railings," of the Standard Specifications.

10-1.106 CONCRETE BARRIER

Concrete barriers shall conform to the provisions in Section 83-2, "Barriers," of the Standard Specifications and these special provisions.

Attention is directed to "Prepare and Paint Concrete" elsewhere in these Special Provisions.

At those locations shown on the plans, concrete barrier markers shall be cemented to the barrier in conformance with the manufacturer's recommendations. Concrete barrier markers shall conform to the provisions in "Prequalified and Tested Signing and Delineation Materials" of these special provisions. Reflective material shall conform to reflective sheeting for delineators as shown on the plans.

Full compensation for concrete barrier markers shall be considered as included in the contract unit price paid per meter for concrete barrier of the type shown and no separate additional compensation will be allowed therefor.

Forms for Type 80 concrete barrier railing shall remain in place for a minimum of 36 hours after the concrete has been placed.

Concrete barrier (Type 26A Modified) will be measured and paid for as concrete barrier (Type 26 Modified).

Concrete barrier (Type 736A) will be measured and paid for as concrete barrier (Type 736).

Concrete barrier (Type 736A Modified) will be measured and paid for as concrete barrier (Type 736 Modified).

Concrete barrier (Type 80A) will be measured and paid for as concrete barrier (Type 80).

10-1.107 THRIE BEAM BARRIER

Thrie beam barrier shall conform to the provisions in Section 83-2, "Barriers," of the Standard Specifications and these special provisions.

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

10-1.108 TRANSITION RAILING (TYPE WB)

Transition railing (Type WB) shall be furnished and installed in conformance with details shown on the plans, the provisions in Section 83-2, "Barriers," of the Standard Specifications and these special provisions.

The 10-gage rail elements shall conform to the requirements of Class B, Type 1 thrie beam guard railing as shown in AASHTO Designation: M 180. End caps shall conform to the requirements of Class A, Type 1 thrie beam guard railing as shown in AASHTO Designation: M 180.

Surplus excavated material remaining after the transitional railing (Type WB) has been constructed shall be disposed of in a uniform manner along the adjacent roadway where designated by the Engineer.

The contract unit price paid for transition railing (Type WB) shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in furnishing and installing transition railing (Type WB), complete in place, including drilling holes for wood posts, driving posts, backfill, and disposal of surplus material, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

10-1.109 TRANSITION RAILING (TYPE DTB)

Transition railing (Type DTB) shall be furnished and installed in conformance with details shown on the plans, the provisions in Section 83-2, "Barriers," of the Standard Specifications and these special provisions.

The 10-gage rail elements shall conform to the requirements of Class B, Type 1 thrie beam guard railing as shown in AASHTO Designation: M 180. End caps shall conform to the requirements of Class A, Type 1 thrie beam guard railing as shown in AASHTO Designation: M 180.

Surplus excavated material remaining after the transitional railing (Type DTB) has been constructed shall be disposed of in a uniform manner along the adjacent roadway where designated by the Engineer.

The contract unit price paid for transition railing (Type DTB) shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in furnishing and installing transition railing (Type DTB), complete in place, including drilling holes for wood posts, driving posts, backfill, and disposal of surplus material, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

10-1.110 CRASH CUSHION (TYPE CAT)

Crash cushion (Type CAT) and crash cushion (Type CAT) backup shall be furnished and installed as shown on the plans and in conformance with these special provisions.

Crash cushion (Type CAT) shall be a CAT-350 Crash Cushion Attenuating Terminal as manufactured by Trinity Industries, Inc., and shall include all the items detailed for crash cushion (Type CAT) shown on the plans.

Crash cushion (Type CAT) backup shall consist of items detailed for crash cushion (Type CAT) backup shown on the plans and shall conform to the provisions in Section 83-1.02B, "Metal Beam Guard Railing," of the Standard Specifications.

Excluding the crash cushion (Type CAT) backup, arrangements have been made to ensure that any successful bidder can obtain the CAT-350 Crash Cushion Attenuating 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 CAT-350 Crash Cushion Attenuating Terminal, FOB Centerville, Utah is $2,850, not including sales tax.

The above price will be firm for orders placed on or before July 29, 2005, 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 crash cushion (Type CAT) conforms with the contract plans and specifications, conforms to the prequalified design and material requirements, and was manufactured in conformance with the approved quality control program.

The crash cushion (Type CAT) 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 posts shall be inserted into the steel foundation tubes by hand. Before the wood 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 posts may be slightly rounded to facilitate insertion of the post into the steel foundation tubes.

Surplus excavated material remaining after the crash cushion (Type CAT) and backup have been constructed shall be disposed of in a uniform manner along the adjacent roadway where designated by the Engineer.

Crash cushion (Type CAT) and crash cushion (Type CAT) backup will be measured as units determined from actual count in place in the completed work.

The contract unit prices paid for crash cushion (Type CAT) and for crash cushion (Type CAT) backup shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in furnishing and installing crash cushion (Type CAT) and crash cushion (Type CAT) backup, complete in place, including excavation, backfill, and disposal of surplus material, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

10-1.111 CRASH CUSHION (REACT)

Crash cushion (REACT) shall be furnished and installed as shown on the plans and in conformance with the provisions in the Standard Specifications and these special provisions.

Crash cushion (REACT) shall be a multiple recoverable type, manufactured by Energy Absorption Systems, Inc. Crash cushion (REACT) and additional components shall conform to the descriptions as follows:

Contract Item Description	Manufacturer's Product Description
Crash Cushion (REACT 9CBB)	REACT 350.9 Concrete Side Mount

The successful bidder can obtain from the following distributors the crash cushion (REACT) manufactured by Energy Absorption Systems, Inc. at 35 East Wacker Drive, Suite 1100, Chicago, IL 60601:

1. Northern California: Traffic Control Service, Inc., 8585 Thys Court, Sacramento, CA 95828, telephone (800) 884-8274, FAX (916) 387-9734
2. Southern California: Traffic Control Service, Inc., 1818 E. Orangethorpe, Fullerton, CA 92831-5324, telephone (800) 222-8274, FAX (714) 526-9501

The price quoted by the manufacturer for Crash Cushion (REACT 9CBB), FOB Pell City, Alabama is $35,502, not including sales tax.

The above prices will be firm for orders placed within 30 days of contract award, and provided delivery is accepted within 90 days after the order is placed.

The price quoted for crash cushion (REACT 9CBB) includes the concrete anchorage devices, but does not include the concrete anchor slab or the concrete backup block.

Crash cushion shall be installed in conformance with the manufacturer's recommendations.

Concrete anchorage devices used for attaching the crash cushion to the base slab shall be limited to those which have been provided by the manufacturer.

The concrete anchor slab and backup block shall conform to the provisions in Section 51, "Concrete Structures," and Section 52, "Reinforcement," of the Standard Specifications and these special provisions.

The concrete anchor slab and backup block shall be constructed of concrete containing not less than 350 kg of cementitious material per cubic meter.

The Contractor shall furnish the Engineer one copy of the manufacturer's plan and parts list for each model installed.

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 crash cushion conforms with the contract plans and specifications, and conforms to the prequalified design and material requirements.

Crash cushion will be measured by the unit as determined from actual count in place in the completed work.

The contract unit prices paid for crash cushion (REACT 9CBB) shall include full compensation for furnishing all labor, materials (including anchor bolts, nuts, washers, and marker panels), tools, equipment, and incidentals, and for doing all the work involved in furnishing and installing the crash cushions, complete in place, including structure excavation, structure backfill, and concrete anchor slab and backup block with bar reinforcing steel, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

10-1.112 THERMOPLASTIC TRAFFIC STRIPE AND PAVEMENT MARKING

Thermoplastic traffic stripes (traffic lines) and pavement markings shall be applied in conformance with the provisions in Section 84, "Traffic Stripes and Pavement Markings," of the Standard Specifications and these special provisions.

Thermoplastic material shall be free of lead and chromium, and shall conform to the requirements in State Specification PTH-02ALKYD.

Retroreflectivity of the thermoplastic traffic stripes and pavement markings shall conform to the requirements in ASTM Designation: D 6359-99. White thermoplastic traffic stripes and pavement markings shall have a minimum initial retroreflectivity of 250 $mcd \cdot m^{-2} \cdot lx^{-1}$. Yellow thermoplastic traffic stripes and pavement markings shall have a minimum initial retroreflectivity of 150 $mcd \cdot m^{-2} \cdot lx^{-1}$.

Where striping joins existing striping, as shown on the plans, the Contractor shall begin and end the transition from the existing striping pattern into or from the new striping pattern a sufficient distance to ensure continuity of the striping pattern.

Thermoplastic traffic stripes shall be applied at the minimum thickness and application rate as specified below. The minimum application rate is based on a solid stripe of 100 mm in width.

Minimum StripeThickness (mm)	Minimum Application Rate (kg/m)
2.5	0.5

Thermoplastic traffic stripes and pavement markings shall be free of runs, bubbles, craters, drag marks, stretch marks, and debris.

At the option of the Contractor, permanent traffic striping and pavement marking tape conforming to the provisions in "Prequalified and Tested Signing and Delineation Materials" of these special provisions may be placed instead of the thermoplastic traffic stripes and pavement markings specified herein. Permanent tape, if used, shall be installed in conformance with the manufacturer's specifications.

If permanent tape is placed instead of thermoplastic traffic stripes and pavement markings, the tape will be measured and paid for by the meter as thermoplastic traffic stripe and by the square meter as thermoplastic pavement marking.

10-1.113 PAINT TRAFFIC STRIPE

Painted traffic stripes (traffic lines), including traffic stripes shown on the stage construction and traffic handling sheets of the plans, shall be applied in conformance with the provisions in Section 84, "Traffic Stripes and Pavement Markings," of the Standard Specifications and these special provisions.

Attention is directed to "Order Of Work" and "Remove Traffic Stripes and Pavement Markings" of these special provisions

Traffic stripe placed as shown on the stage construction and traffic handling sheets of the plans shall be removed when no longer required for traffic handling as determined by the Engineer

Traffic stripe paint shall conform to the requirements in State Specification No. PTWB-01.

The color of the painted traffic stripes shall conform to the requirements in ASTM Designation: D 6628-01.

Retroreflectivity of the paint traffic stripes shall conform to the requirements in ASTM Designation: D 6359-99. White painted traffic stripes shall have a minimum initial retroreflectivity of 250 $mcd \cdot m^{-2} \cdot lx^{-1}$. Yellow painted traffic stripes shall have a minimum initial retroreflectivity of 150 $mcd \cdot m^{-2} \cdot lx^{-1}$.

At the option of the Contractor, permanent traffic striping tape conforming to the provisions in "Prequalified and Tested Signing and Delineation Materials" of these special provisions may be placed instead of painted traffic stripes. Permanent tape, if used, shall be placed in conformance with the manufacturer's specifications.

If permanent tape is placed instead of painted traffic stripes, the tape will be measured and paid for by the meter as paint traffic stripe of the number of coats designated in the Engineer's Estimate.

Where striping joins existing striping, as shown on the plans, the Contractor shall begin and end the transition from the existing striping pattern into or from the new striping pattern a sufficient distance to ensure continuity of the striping pattern.

Double traffic stripes, consisting of one 100-mm wide yellow or white stripe adjacent to one 100-mm wide black stripe, will be measured as one traffic stripe.

10-1.114 PARKING BUMPER

Parking bumpers shall be furnished and installed at the locations and in the manner shown on the plans.

Parking bumpers shall be precast with concrete and reinforcing steel as shown on the plans. Concrete shall be minor concrete conforming to the provisions in Section 90-10, "Minor Concrete," of the Standard Specifications. Concrete shall contain not less than 280 kg of cementitious material per cubic meter. Parking bumpers may be commercially available precast concrete bumpers conforming to the details shown on the plans. Minor variations in cross section dimensions will be acceptable in commercially available units.

Dowels shall be commercial quality reinforcing steel or mild steel rods.

Parking bumpers will be measured by the unit as determined from actual count in place.

The contract unit price paid for parking bumper (precast concrete) shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in installing precast concrete parking bumpers, complete in place, as shown on the plans, as specified in the Standard Specifications and these special provisions and as directed by the Engineer.

10-1.115 PAVEMENT MARKERS

Pavement markers, including pavement markers shown on the stage construction and traffic handling sheets of the plans, shall be placed in conformance with the provisions in Section 85, "Pavement Markers," of the Standard Specifications and these special provisions.

Attention is directed to "Remove Pavement Marker" of these special provisions regarding removal of pavement markers shown on the stage construction sheets and traffic handling of the plans.

The sixth paragraph of Section 85-1.06, "Placement," of the Standard Specifciations shall not apply to the pavement markers shown on the stage construction and traffic handling sheets of the plans.

Epoxy adhesive shall not be used to place pavement markers as shown on the stage construction and traffic handling sheets in areas where removal of the markers will be required.

Attention is directed to "Traffic Control System For Lane Closure" of these special provisions regarding the use of moving lane closures during placement of pavement markers with bituminous adhesive.

The Contractor shall furnish the Engineer certificates of compliance for the pavement markers in conformance with the provisions in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications.

Retroreflective pavement markers shall be marked as abrasion resistant on the body of the markers.

10-1.116 BICYCLE PARKING RACK

Bicycle parking racks shall consist of furnishing and installing bicycle parking racks as shown on the plans, as specified in these special provisions and as directed by the Engineer.

Bicycle parking racks shall be commercially available, of tubular steel construction, of the type shown on the plans. All steel items shall be galvanized in conformance with the provisions in Section 75-1.05, "Galvanizing," of the Standard Specifications.

Bicycle parking racks shall be installed as shown on the plans and as per the manufacturer's recommendations.

Foundations for the lockers shall be constructed as shown on the plans and as directed by the Engineer. Portland cement concrete shall conform to Section 90-10, "Minor Concrete," of the Standard Specifications and shall contain not less than 350 kg of cement per cubic meter. Reinforcement shall conform to Section 52, "Reinforcement," of the Standard Specifications.

Bicycle parking racks will be measured by the unit from the actual count in place.

The contract unit price paid for bicycle parking rack shall include full compensation for furnishing all labor, materials (including concrete and reinforcement for the foundations), tools, equipment, and incidentals, and for doing all the work involved in constructing concrete foundation and bicycle parking racks, complete in place, including all structure excavation and backfill, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

10-1.117 BICYCLE LOCKER

Bicycle lockers shall be furnished and installed as shown on the plans, in conformance with the manufacturers recommendations and as specified in these special provisions.

Bicycle lockers shall be installed at the locations shown on the plans.

At the Contractor's option, bicycle lockers shall be constructed of either molded fiberglass reinforced plastic or steel. Lockers shall be obtained from one of the following manufacturers or a Department approved equal:

Molded Fiberglass Reinforced Plastic

2-door, 2-Bikes (ProPark Bicycle System)

Manufacturer:
Cycle-Safe
4630 Ada Drive SE, Suite B
Ada, Michigan 49301
Telephone (405) 360-6999
Fax (616) 954-0290
888-950-6531

or 2-door, 2-Bikes (Model 302)

Manufacturer:
American Bicycle Security Co.
P.O. Box 7359
Ventura, CA, 93006
Telephone (805) 933-3688
Fax (805) 933-1865

Steel

2-door, 2-Bikes (DL100-2-P-F)

Manufacturer:
Hannan Specialties, Inc.
4019 Leos Lane unit #3
Carmichael, CA 95608
Telephone 800-722-2453
Fax: 916-488-7256
www.duralocker.com

or 2-door, 2-Bikes (BTWL02M)

Manufacturer:
Palmer Group
1072 Folsom St., #328
San Francisco, CA 94103
Telephone:888-764-2453
Fax: 415-333-2032
www.bikeparking.com

General

Each unit is to be a two door, two bike capacity locker.
The walls, roofs, and doors of the bicycle lockers shall be waterproof.
The color of the lockers shall generally match the color tan or beige.
The door shall be manufacturer equipped with following:

1. Locking mechanism shall be chrome plated vending machine type pop-out T-handle assembly with a removable high security inner cylinder with three duplicate keys per cylinder, each lock keyed different.
2. Contract restricted key system.
3. Identification Number Plates: Manufacturer's standard etched, embossed, or stamped aluminum plates, concealed mounting, sequentially numbered with numbers and letters at least 9 mm high.

Hardware, including screws and ground anchoring attachments shall be internal.

The lockers shall exhibit good workmanship free from structural flaws and objectionable surface defects. The lockers shall come with a minimum one-year manufacturer warranty

The Contractor shall provide the Engineer with a Certificate of Compliance from the manufacturer in accordance with the provisions of Section 6-1.07, "Certificates of Compliance," of the Standard Specifications. Said certificate shall certify that the lockers comply with the contract plans and specifications, conform to the design and material requirements, and were manufactured in accordance with the manufacturer's quality control program.

Foundations for the lockers shall be constructed as shown on the plans and as directed by the Engineer. Portland cement concrete shall conform to Section 90-10, "Minor Concrete," of the Standard Specifications and shall contain not less than 350 kg of cement per cubic meter. Reinforcement shall conform to Section 52, "Reinforcement," of the Standard Specifications.

Anchoring attachments shall be furnished by the Contractor and shall be placed in accordance with the manufacturer's recommendations. It shall be the Contractors responsibility to verify the hole pattern to be installed before setting anchor attachments in foundations.

Measurement and Payment

Bicycle lockers will be measured and paid for by the unit from actual count of the units in place in the completed work.

The contract unit price paid for bicycle locker shall include full compensation for furnishing all labor, materials (including concrete and reinforcement for the foundations), tools, equipment and incidentals, and for doing all the work involved in constructing concrete foundations and installing the bicycle lockers, complete in place, including all structure excavation and backfill, as shown on the plans, as specified in these special provisions, and as directed by the Engineer.

SECTION 10-2 HIGHWAY PLANTING AND IRRIGATION SYSTEMS

10-2.01 GENERAL

The work performed in connection with highway planting and irrigation systems shall conform to the provisions in Section 20, "Erosion Control and Highway Planting," of the Standard Specifications and these special provisions.

COST BREAK-DOWN

The Contractor shall furnish the Engineer a cost break-down for the contract lump sum items of highway planting and irrigation system. Cost break-down tables shall be submitted to the Engineer for approval within 15 working days after the contract has been approved. Cost break-down tables will be approved, in writing, by the Engineer before any partial payment will be made for the applicable items of highway planting and irrigation system involved.

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

Cost break-downs shall be completed and furnished in the format shown in the samples of the cost break-downs included in this section. Line item descriptions of work shown in the samples are the minimum to be submitted. Additional line item descriptions of work may be designated by the Contractor. If the Contractor elects to designate additional line item descriptions of work, the quantity, value and amount for those line items shall be completed in the same manner as for the unit descriptions shown in the samples. The line items and quantities given in the samples are to show the manner of preparing the cost break-downs to be furnished by the Contractor.

The Contractor shall determine the quantities required to complete the work shown on the plans. The quantities and their values shall be included in the cost break-downs submitted to the Engineer for approval. The Contractor shall be responsible for the accuracy of the quantities and values used in the cost break-downs submitted for approval.

The sum of the amounts for the line items of work listed in each cost break-down table for highway planting and for irrigation system work shall be equal to the contract lump sum price bid for Highway Planting and Irrigation System, respectively. Overhead and profit, except for time-related overhead, shall be included in each individual line item of work listed in a cost break-down table.

No adjustment in compensation will be made in the contract lump sum prices paid for highway planting and irrigation system due to differences between the quantities shown in the cost break-downs furnished by the Contractor and the quantities required to complete the work as shown on the plans and as specified in these special provisions.

Individual line item values in the approved cost break-down tables will be used to determine partial payments during the progress of the work and as the basis for calculating an adjustment in compensation for the contract lump sum items of highway planting and irrigation system due to changes in line items of work ordered by the Engineer. When the total of ordered changes to line items of work increases or decreases the lump sum price bid for either Highway Planting or Irrigation System by more than 25 percent, the adjustment in compensation for the applicable lump sum item will be determined in the same manner specified for increases and decreases in the total pay quantity of an item of work in Section 4-1.03B, "Increased or Decreased Quantities," of the Standard Specifications.

HIGHWAY PLANTING COST BREAK-DOWN

Contract No. 11-288804

UNIT DESCRIPTION	UNIT	APPROXIMATE QUANTITY	VALUE	AMOUNT
ROADSIDE CLEARING	LS	LUMP SUM		
PLANT (GROUP A)	EA	4195		
COMMERCIAL FERTILIZER (PACKETS)	EA	4195		
MULCH	M3	298		

TOTAL _____

IRRIGATION SYSTEM COST BREAK-DOWN

Contract No 11-288804

UNIT DESCRIPTION	UNIT	APPROXIMATE QUANTITY	VALUE	AMOUNT
12 STATION SOLAR IRRIGATION CONTROLLER	EA	1		
IRRIGATION CONTROLLER ENCLOSURE	EA	1		
CONTROL AND NEUTRAL CONDUCTORS	LS	LUMP SUM		
50 MM BACK FLOW PREVENTER ASSEMBLY	EA	1		
BACKFLOW PREVENTER ASSEMBLY ENCLOSURE	EA	1		
20 MM QUICK COUPLER VALVE	EA	4		
50 MM PRESSURE REDUCING VALVE	EA	4		
40 MM REMOTE CONTROL VALVE	EA	10		
50 MM GATE VALVE	EA	4		
50 MM COPPER PIPE (TYPE K) HARD DRAWN	M	10		
25 MM PLASTIC PIPE (SUPPLY LINE) (PR-200)	M	589		
32 MM PLASTIC PIPE (SUPPLY LINE) (PR-200)	M	160		
40 MM PLASTIC PIPE (SUPPLY LINE) (PR-200)	M	9		
50 MM PLASTIC PIPE (SUPPLY LINE) (PR-200)	M	403		
75 MM PLASTIC PIPE (SUPPLY LINE) (PR-200)	M	84		
100 MM PLASTIC PIPE (SUPPLY LINE) (PR-200)	M	1355		
50 MM SPRINKLER CONTROL CONDUIT	M	520		
NO. 5 PULL BOX (PIPE TERMINATION)	EA	4		
SPRINKLER (TYPE A-7)	EA	63		

TOTAL _____

CONTROL AND NEUTRAL CONDUCTORS COST BREAK-DOWN

Submit to the Engineer a cost break-down for control and neutral conductors work for review after the working drawings for the electrical components of the irrigation system (except electrical service) have been reviewed. Allow 20 days for review of each submittal or re-submittal.

Furnish the completed cost break-down in the format shown in the sample of the cost break-down included in this section. Line item descriptions of work shown in the sample are the minimum. You may designate additional line item descriptions of work. If you designate additional line item descriptions of work, the quantity, value, and amount for those line items must be completed in the same manner as for the line item descriptions shown in the sample.

Determine quantities required to complete the work as shown on the approved working drawings.

The sum of the amounts for the line items of work listed in the cost break-down for control and neutral conductors work must be equal to the contract lump sum price bid for control and neutral conductors. Include overhead and profit in each individual line item of work listed in the cost break-down table.

No adjustment in compensation is made in the contract lump sum price paid for control and neutral conductors work due to differences between the quantities shown in the cost break-down for control and neutral conductors work and the quantities required to complete the work.

The Engineer approves in writing the cost break-down for control and neutral conductors work before any progress payments are made for the item.

Individual line item values in the approved cost break-down tables will be used to determine partial payments during the progress of the work and as the basis for calculating an adjustment in compensation for the contract lump sum items of highway planting and irrigation system due to changes in line items of work ordered by the Engineer.

CONTROL AND NEUTRAL CONDUCTORS COST BREAK-DOWN

Contract No. 11-288804

UNIT DESCRIPTION	UNIT	APPROXIMATE QUANTITY	VALUE	AMOUNT
__ AWG (UF)Conductors (provide size)	M			
__ AWG (UF) Conductors	M			
__ AWG (UF) Conductors	M			
No. 5 or larger Pull Box	EA			
Splices	EA			
__ Sprinkler Control conduit	M			
__ Sprinkler Control conduit	M			
__ Sprinkler Control conduit	M			

TOTAL _____

10-2.02 (BLANK)

10-2.03 (BLANK)

10-2.04 HIGHWAY PLANTING

The work performed in connection with highway planting shall conform to the provisions in Section 20-4, "Highway Planting," of the Standard Specifications and these special provisions.

HIGHWAY PLANTING MATERIALS

Mulch

Mulch must be wood chips.

Commercial Fertilizer (Packets)

Commercial fertilizer (packet) shall be slow or controlled release and shall be in a biodegradable packet form. The packet shall gradually release nutrients over a 12-month period. Each packet shall have a mass of 10 g ± 1 g and shall have the following guaranteed chemical analysis:

Ingredient	Percentage
Nitrogen	20
Phosphoric Acid	10
Water Soluble Potash	5

ROADSIDE CLEARING

Prior to preparing planting areas, or commencing irrigation trenching operations for planting areas, trash and debris shall be removed from the entire highway right of way within the planting limits.

In addition to removing trash and debris, the project area shall be cleared as specified herein:

A. All non-native plant species shall be killed and removed within the entire highway right of way, within the planting limits. The non-native plant species to be killed and removed include but are not limited to, castor bean, fennel, pampas grass, tamarisk, mustard, and erodium.

Non-native plants shall be killed and removed as follows:

A. All seed stalks and flower heads shall be bagged for disposal immediately after being removed and before transport through the project limits.
B. All above ground plant mass shall be cut and removed prior to removal of stumps, roots or rhizomes.
C. Plant stumps, roots or rhizomes may be removed by chemical or mechanical means. Chemical and mechanical removal shall be performed as follows:

    1. Chemical removal shall include cutting plants off 50 mm above the ground and applying pesticide immediately (within one minute) to the cut.
    2. Mechanical removal shall include removing the entire root crown or mass and rhizomes. Plant or root pieces shall not be left in or on the soil following removal.

D. Removed material shall be disposed of outside the highway right of way in conformance with the provisions in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications.

After the initial roadside clearing is complete, additional roadside clearing work shall be performed as necessary to maintain the areas, as specified above, in a neat appearance until the start of the plant establishment period. This work shall include the following:

A. Trash and debris shall be removed.
B. Rodents shall be controlled.

C. Weed growth and non-native plants shall be killed before they reach the seed stage of growth or exceed 150 mm in length, whichever occurs first.
D. Weeds in plant basins, including basin walls, shall be removed by hand pulling, after the plants have been planted.

Weed Control

Weed control shall also conform to the following:

A. All weeds and non-native plants shall be killed with glyphosate.
B. Tumbleweeds shall be removed by hand pulling before the tumbleweeds reach a height of 150 mm.
C. Removed weeds and non-native plants shall be disposed of outside the highway right of way in conformance with the provisions in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications.

Roadside clearing work shall not include work required to be performed as clearing and grubbing as specified in Section 16, "Clearing and Grubbing," of the Standard Specifications.

PESTICIDES

Pesticides used to control weeds shall conform to the provisions in Section 20-4.026, "Pesticides," of the Standard Specifications. Except as otherwise provided in these special provisions, pesticide use shall be limited to the following materials:

Glyphosate
Oxadiazon - 50 percent WP (Preemergent)

Granular preemergents may be used when applied to areas that will be covered with mulch, excluding plant basins. Granular preemergents shall be limited to the following materials:

Dichlobenil (Preemergent)
Oxadiazon (Preemergent)

Granular preemergents shall be applied prior to the application of mulch. Mulch applications shall be completed in these areas on the same working day. Photosensitive dye will not be required.

Glyphosate shall be used to kill all weeds.

Oxadiazon shall be of the emulsifiable concentration or wettable powder type, except when Oxadiazon is used under mulch in conformance with these special provisions.

If the Contractor elects to request the use of other pesticides on this project, the request shall be submitted, in writing, to the Engineer not less than 15 days prior to the intended use of the other pesticides. Except for the pesticides listed in these special provisions, no pesticides shall be used or applied without prior written approval of the Engineer.

Pesticides shall not be applied within the limits of the plant basins. Pesticides shall not be applied in a manner that allows the pesticides to come in contact with the foliage and woody parts of the plants.

PLANTING

Commercial fertilizer packets shall be placed in the backfill of each plant at the time of planting and at the rate shown on the Plant List to within 150 to 200 mm of the soil surface and approximately 25 mm from the roots. When more than one fertilizer packet is required per plant, the packets shall be distributed evenly around the root ball.

A granular preemergent shall be applied to areas to be covered with mulch outside of plant basins in conformance with the provisions in "Pesticides" of these special provisions.

Mulch placed in the Otay Mesa Road Park and Ride lot areas shall be spread to a uniform depth of 75 mm.

Attention is directed to "Irrigation Systems Functional Test" of these special provisions regarding functional tests of the irrigation systems. Planting shall not be performed in an area until the functional test has been completed for the irrigation system serving that area.

PLANT ESTABLISHMENT WORK

The plant establishment period shall be Type 2 and shall not be less than 250 working days.

Attention is directed to "Relief From Maintenance and Responsibility" in these special provisions regarding relief from maintenance and protection.

During the plant establishment period, the Engineer and the Contractor or his supervisory representative shall hold monthly meetings at the project site to evaluate the plant establishment work.

A seasonal watering schedule shall be submitted to the Engineer in writing during the first week of March, June, September and November for use during the plant establishment period. The seasonal watering schedules shall be entered into the controllers by the Contractor.

Weeds within plant basins, including basin walls, shall be controlled by hand pulling.

Weeds within mulched areas shall be controlled by killing.

Weeds outside of plant basins, and within the entire limits of the planting area shall be controlled by killing and removing. Weeds shall be killed and removed before they reach the seed stage of growth or exceed 150 mm in height, whichever occurs first. Removed weeds, trash and debris shall be disposed of in conformance with the provisions in Section 7-1.13, "Disposal of Materials Outside the Highway Right of Way," of the Standard Specifications.

At the option of the Contractor, plants of a larger container size than those originally specified may be used for replacement plants during the first 125 working days of the plant establishment period.

After 125 working days of the plant establishment period have been completed, replacement of plants, shall be No. 5 size for No. 1 size plants.

Wye strainers on backflow preventers shall be cleaned at least 15 days prior to the completion of the plant establishment period.

The final inspection shall be performed in conformance with the provisions in Section 5-1.13, "Final Inspection," of the Standard Specifications and shall be completed a minimum of 20 working days before the estimated completion of the contract.

10-2.05 IRRIGATION SYSTEMS

Irrigation systems shall be furnished and installed in conformance with the provisions in Section 20-5, "Irrigation Systems," of the Standard Specifications, except materials containing asbestos fibers shall not be used.

Attention is directed to the provisions in "Obstructions" of these special provisions, regarding work over or adjacent to existing underground facilities. Excavation for proposed irrigation facilities shall not be started until the existing underground facilities have been located.

Method A pressure testing shall conform to the provisions in Section 20-5.03H(1), "Method A", of the Standard Specifications, except leaks that develop in the tested portion of the system shall be located and repaired after each test period when a drop of more than 35 kPa is indicated by the pressure gage. After the leaks have been repaired, the one hour pressure test shall be repeated and additional repairs made until the drop in pressure is 35 kPa or less.

Pipe supply lines shall be pressure tested in conformance with the provisions in Section 20-5.03H, "Pressure Testing," of the Standard Specifications, except the pipe (supply line) on the discharge side of the control valve shall be tested by Method B as specified in Section 20-5.03H(2), "Method B," of the Standard Specifications.

VALVE BOXES

Valve boxes shall conform to the provisions in Section 20-2.24, "Valve Boxes," of the Standard Specifications, except as otherwise provided herein.

Covers for concrete valve boxes shall be glass fiber reinforced plastic, plastic, or concrete, .

Covers for plastic valve boxes shall be glass fiber reinforced plastic or plastic.

Valve box covers shall be equipped with a locking mechanism.

Valve boxes with plastic covers shall be identified on the top surface of the covers by branding the appropriate abbreviations for the irrigation facilities contained in the valve boxes as shown on the plans. Valve boxes that contain remote control valves shall be identified by the appropriate letters and numbers (controller and station numbers). The letters and numbers shall be 50 mm in height.

Valve boxes with concrete or glass fiber reinforced plastic covers shall be identified on the top surface of the covers by labels containing the appropriate abbreviation for the irrigation facility contained in the valve box as shown on the plans. Valve boxes that contain remote control valves shall be identified by the appropriate letters and numbers (controller and station numbers). Labels for valve boxes shall conform to the provisions in Section 20-5.03F, "Valves and Valve Boxes," of the Standard Specifications.

Label material shall be plate plastic or polyurethane.

GATE VALVES

Gate valves shall be as shown on the plans and in conformance with the provisions in Section 20-2.28, "Gate Valves," of the Standard Specifications and these special provisions.

Gate valves shall have a solid bronze or brass wedge.

ELECTRIC AUTOMATIC IRRIGATION COMPONENTS

Irrigation Controllers

Irrigation controllers shall be solar automatic irrigation controllers conforming to the following:

A. Photovoltaic 12-station irrigation controller, photovoltaic power system, computer with lockable, waterproof, vandal resistant case, shall be manufactured as one complete unit.
B. All power will be provided by an internal photovoltaic system. Power shall be available for continuous 24-hour operation under the minimum light equivalent to 25 percent of ambient light at 55 degrees latitude.
C. The computer liquid-crystal display will be powered by a 9-volt battery key mechanism.
D. The irrigation controller shall have an output digital control pulse at 3.5-volts, which will operate a valve solenoid actuator within 300 meter distance.
E. Irrigation controller shall be fully automatic and capable of operating a complete one day to 39 day cycle, scheduling up to 16 totally independent programs, each having its own start time, day cycle, assigned stations, duration, and program time. Each station shall be capable of 1 minute to 5 hours and 59 minutes increments with separate setting for hours and minutes.
F. Irrigation controller shall have an emergency program backup system with a user-defined fail-safe program and system parameters that are stored in non-erasable memory.
G. Irrigation controller shall be installed on a vertical mounting tube, mounted as shown on the plans and in conformance with the manufacturer's recommendations.
H. Low voltage control and neutral conductors and splice connectors shall be manufactured by the same company.
I. The watering time of each station shall be displayed on the face of the control panel.

Electric Remote Control Valves

Electric remote control valves shall conform to the provisions in Section 20-2.23, "Control Valves," of the Standard Specifications and the following:

A. Valves shall be glass filled nylon, brass, or bronze construction.
B. Valves shall be angle pattern (bottom inlet) or straight pattern (side inlet) as shown on the plans.
C. Valves shall be equipped with a self-flushing feature manufactured to be used with recycled water. Valves shall not have external tubing.
D. Electric remote control valves shall have manual external and internal bleed capability.
E. Valve solenoids for (solar) controller shall be DC latching and operate on 3.5 V.
F. Valve solenoids shall be one piece with plunger and spring secured to the solenoid

Pull Boxes

Pull box installations shall conform to the provisions in Section 20-5.027I, "Conductors, Electrical Conduits and Pull Boxes," of the Standard Specifications.

Conductors

Low voltage, as used in this section "Conductors," shall mean 36 V or less.

Low voltage control and neutral conductors in pull boxes and valve boxes, at irrigation controller terminals, and at splices shall be marked as follows:

A. Conductor terminations and splices shall be marked with adhesive backed paper markers or adhesive cloth wrap-around markers, with clear, heat-shrinkable sleeves sealed over the markers.
B. Non-spliced conductors in pull boxes and valve boxes shall be marked with clip-on, "C" shaped, white extruded polyvinyl chloride sleeves. Marker sleeves shall have black, indented legends of uniform depth with transparent overlays over the legends and "chevron" cuts for alignment of 2 or more sleeves.

Markers for the control conductors shall be identified with the appropriate number or letter designations of irrigation controllers and station numbers. Markers for neutral conductors shall be identified with the appropriate number or letter designations of the irrigation controllers.

The color of low voltage neutral and control conductor insulation, except for the striped portions, shall be homogeneous throughout the entire thickness of the insulation.

Insulation for conductors may be UL listed polyethylene conforming to UL44 test standards with a minimum insulation thickness of 1.05 mm for wire sizes 10AWG and smaller.

Relief from maintenance and responsibility for electric automatic irrigation components will be granted in conformance with "Relief from Maintenance and Responsibility" of these special provisions. Before the Engineer grants relief from maintenance and responsibility, the functional test specified in Section 20-5.027J, "Testing," of the Standard Specifications shall be satisfactorily completed, and the manufacturer's written instructions shall be provided to the Engineer on the use and adjustment of the installed irrigation controllers.

IRRIGATION SYSTEMS FUNCTIONAL TEST

Functional tests for the irrigation controllers and associated automatic irrigation systems shall conform to the provisions in Section 20-5.027J, "Testing," of the Standard Specifications and these special provisions.

Tests shall demonstrate to the Engineer, through one complete cycle of the irrigation controllers in the automatic mode, that the associated automatic components of the irrigation systems operate properly. If automatic components of the irrigation systems fail a functional test, these components shall be repaired at the Contractor's expense and the testing repeated until satisfactory operation is obtained.

Associated automatic components shall include, but not be limited to, remote control valves.

Upon completion of work on an irrigation system, including correction of deficiencies and satisfactory functional tests for the systems involved, the plants to be planted in the area watered by the irrigation system may be planted provided the planting areas have been prepared as specified in these special provisions.

PIPE

Copper Pipe

Copper pipe shall be seamless, Type K, hard drawn tubing.

Copper pipe supply lines installed between water meters and backflow preventer assemblies shall be installed not less than 450 mm below finished grade, measured to the top of the pipe.

Plastic Pipe

Plastic pipe supply lines shall be polyvinyl chloride (PVC) 1120 or 1220 pressure rated pipe with the minimum pressure rating (PR) shown on the plans.

Plastic pipe supply lines and fittings that are 75 mm or larger in diameter on the supply side of control valves shall be the rubber ring gasket type, except when pressure rating (PR) 315 plastic pipe supply line is required.

Plastic pipe supply lines less than 75 mm in diameter shall have solvent cemented type joints. Primers shall be used on the solvent cemented type joints.

Plastic pipe supply lines (main) shall have a minimum cover of 0.45 m.

Fittings for plastic pipe supply lines with a pressure rating (PR) of 315 shall be Schedule 80.

THRUST BLOCK

Thrust blocks shall be installed in accordance with the plans and these special provisions. Thrust blocks shall be installed on the main supply line at all changes in direction and terminus run.

Concrete shall conform to the special provision in Section 20-2.26, "Concrete," of the Standard Specifications.

WATER METER

Water meters for the irrigation systems will be furnished and installed by the serving utility at the locations shown on the plans.

The Contractor shall make the arrangements and pay the costs and fees required by the serving utility.

The City of San Diego Municipal Water District has established a fee of $34,000.00 for furnishing and installing a water meter. If, at the time of installation, this fee has been changed, the State will take a credit for the reduction in the fee, or the State will pay the difference for the increase in the fee. The credit or payment will be taken or paid on the first monthly progress payment made after the meter is installed. The Contractor shall furnish the Engineer with a copy of the invoice for the installation fee.

Attention is directed to Section 20-4.06, "Watering," of the Standard Specifications. The Contractor shall make the arrangements for furnishing and applying water until the water meters have been installed by the serving utility.

The quantity of water meters will be measured by the unit as determined from actual count in place.

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

BACKFLOW PREVENTER ASSEMBLIES

Backflow preventers shall conform to the provisions in Section 20-2.25, "Backflow Preventers," of the Standard Specifications and these special provisions.

Backflow preventers shall have current approval from the University of Southern California Foundation for Cross-Connection Control and Hydraulic Research (USC Foundation).

Before backflow preventer assembly installation, the Contractor shall provide the Engineer with the portion of the USC Foundation "List of Approved Backflow Prevention Assemblies" showing type of assembly, manufacturer's name, model number, edition of the manual under which the assembly was approved, approval date and the last renewal date.

The "List of Approved Backflow Prevention Assemblies" is available to Foundation Members. Membership information to join the USC Foundation is available at:

http://www.usc.edu/dept/fccchr/membership.html

Questions concerning the USC Foundation "List of Approved Backflow Prevention Assemblies" can be answered by calling the Foundation at toll free (866) 545-6340.

Pressure loss through the backflow preventers shall not exceed the following:

BACKFLOW PREVENTER SIZE (millimeters)	FLOW RATE (Liters per minute)	PRESSURE LOSS (kPa)
50	257	83

Backflow preventer assemblies shall be painted with a minimum of 2 applications of a commercial quality enamel paint. The color of the paint shall be light brown.

BACKFLOW PREVENTER ASSEMBLY ENCLOSURE

Enclosures shall be fabricated of structural steel angles and flattened expanded metal and shall be installed over backflow preventer assemblies on a portland cement concrete pad as shown on the plans and in conformance with these special provisions.

Metal for sides, ends and top panels shall be fabricated from No. 9 expanded metal. The flattened expanded metal openings shall be approximately 20 mm by 45 mm in size.

Expanded metal panels shall be attached to the steel frames by a series of welds, not less than 6.4 mm in length and spaced not more than 100 mm on centers, along the edges of the enclosure.

Padlocks will be State-furnished in accordance with "State-furnished Materials" of these special provisions.

Enclosures shall be galvanized, after fabrication, in conformance with the provisions in Section 75-1.05, "Galvanizing," of the Standard Specifications.

Concrete for the concrete pad shall conform to Section 90-10, "Minor Concrete," of the Standard Specifications.

Hold down bolt assemblies shall be galvanized and shall be installed when the portland cement concrete pad is still plastic. Nuts shall be hexagonal and washers shall be the lock type.

Enclosures shall be painted with one application of a commercial quality pre-treatment, vinyl wash primer and a minimum of one application of a commercial quality, exterior enamel for metal. The finish color shall be light brown.

All parts of the backflow preventer assembly enclosure, including hold down assemblies, may be constructed of stainless steel instead of standard steel materials specified above. Stainless steel enclosures shall conform to the provisions herein except galvanizing, priming and painting shall not be required. Stainless steel enclosures shall be powder coated a light brown color by the manufacturer.

The minimum clearance between the backflow preventer assembly and the backflow preventer assembly enclosure shall be 50 mm.

IRRIGATION CONTROLLER ENCLOSURE

Enclosures shall be fabricated of structural steel angles and flattened expanded metal and shall be installed over irrigation controllers on a portland cement concrete pad as shown on the plans and in conformance with these special provisions.

Metal for sides, ends and top panels shall be fabricated from No. 9 expanded metal. The flattened expanded metal openings shall be approximately 20 mm by 45 mm in size.

Expanded metal panels shall be attached to the steel frames by a series of welds, not less than 6.4 mm in length and spaced not more than 100 mm on centers, along the edges of the enclosure.

Padlocks will be State-furnished in accordance with "State-furnished Materials" of these special provisions.

Enclosures shall be galvanized, after fabrication, in conformance with the provisions in Section 75-1.05, "Galvanizing," of the Standard Specifications.

Concrete for the concrete pad shall conform to Section 90-10, "Minor Concrete," of the Standard Specifications.

Hold down bolt assemblies shall be galvanized and shall be installed when the portland cement concrete pad is still plastic. Nuts shall be hexagonal and washers shall be the lock type.

Enclosures shall be painted with one application of a commercial quality pre-treatment, vinyl wash primer and a minimum of one application of a commercial quality, exterior enamel for metal. The finish color shall be light brown.

All parts of the irrigation controller enclosure, including hold down assemblies, may be constructed of stainless steel instead of standard steel materials specified above. Stainless steel enclosures shall conform to the provisions herein except galvanizing, priming and painting shall not be required. Stainless steel enclosures shall be powder coated a light brown color by the manufacturer.

The minimum clearance between the irrigation controller and the irrigation controller enclosure shall be 50 mm.

TESTING NEW BACKFLOW PREVENTERS

New backflow preventers shall be tested for proper operation in conformance with the provisions in Section 20-5.03J, "Check and Test Backflow Preventers," of the Standard Specifications and these special provisions.

Tests for new backflow preventers shall be satisfactorily completed after installation and before operation of the irrigation systems.

New backflow preventers shall be retested one year after the satisfactory completion of the previous test, and each year thereafter until the plant establishment period is completed. An additional test shall be provided not more than 10 days prior to acceptance of the contract.

SPRINKLERS

Sprinklers shall conform to the type, pattern, material, and operating characteristics listed in the "Sprinkler Schedule" shown on the plans.

PRESSURE REDUCING VALVE

Pressure reducing valves shall consist of pressure reducing valves, pressure gages, valve boxes with wire mesh and gravel or crushed rock, fittings ,and pipe as shown on plans.

Pressure reducing valves shall be the spring diaphragm type, manufactured of bronze or cast iron construction, hydraulically operated and pilot controlled, and shall have flanged or threaded pipe connections. Pressure reducing valves with threaded connections shall be installed with unions on the inlet side of the valves. Pressure reducing valves shall not have internal filter screens.

Pressure gages for pressure reducing valves shall be hermetically sealed with neoprene and shall have watertight polycarbonate cases and covers with molded clear polycarbonate windows. Gages shall be 50 mm in diameter, calibrated from 0 kPa to 1103 kPa, and have black aluminum pointers that contrast with gage faces and have brass stems. Internal gage parts shall be brass and phosphor bronze.

Pressure reducing valves shall have an adjustable discharge pressure range of 172 kPa to 517 kPa.

FINAL IRRIGATION SYSTEM CHECK

A final check of new irrigation facilities shall be performed not more than 40 working days and not less than 30 working days prior to acceptance of the contract.

The length of watering cycles using potable water measured by water meters for the final check of irrigation facilities will be determined by the Engineer.

Remote control valves connected to new irrigation controllers shall be checked for automatic performance when the controllers are in automatic mode.

Unsatisfactory performance of irrigation facilities installed or modified by the Contractor shall be repaired and rechecked at the Contractor's expense until satisfactory performance is obtained, as determined by the Engineer.

Nothing in this section "Final Irrigation System Check" shall relieve the Contractor of full responsibility for making good or repairing defective work or materials found before the formal written acceptance of the entire contract by the Director.

Full compensation for checking the irrigation systems prior to the acceptance of the contract shall be considered as included in the contract lump sum price paid for plant establishment work and no additional compensation will be allowed therefor.

SECTION 10-3. SIGNALS, LIGHTING AND ELECTRICAL SYSTEMS

10-3.01 DESCRIPTION

Traffic signals and lighting, changeable message sign system, lighting and sign illumination, ramp metering systems, traffic monitoring stations, fiber optic communication system, sprinkler control conduit (bridge), and maintaining existing traffic management system elements during construction shall conform to the provisions in Section 86, "Signals, Lighting and Electrical Systems," of the Standard Specifications and these special provisions.

Traffic monitoring stations shall be installed at the following approximate locations:

A. Location 1- Westbound and eastbound Route 905 "E5", between Station 144+60 to Station 145+20.
B. Location 2- Westbound and eastbound Route 905 "E5", between Station 157+80 to Station 158+40.

Lighting equipment is included in the following structures:

A. Caliente Avenue Overcrossing – Bridge No. 57-1142.
B. Spring Canyon Bridge – Bridge No. 57-1155L/R.
C. Heritage Road Undercrossing – Bridge No. 57-1143L/R.

Fiber optic communication conduit is included in the following structures:

A. Spring Canyon Bridge – Bridge No. 57-1155L.
B. Heritage Road Undercrossing – Bridge No. 57-1143L.

Sprinkler control conduit is included in the following structures:

A. Spring Canyon Bridge – Bridge No. 57-1155L/R.
B. Heritage Road Undercrossing – Bridge No. 57-1143L/R.

Traffic signal work shall be performed at the following locations:
A. Location 1 - Eastbound Route 905 on ramp and Caliente Ave.
B. Location 2 - Westbound Route 905 on ramp and Caliente Ave.
C. Location 3 - Eastbound Route 905 on ramp and Britannia Blvd.
D. Location 4 - Westbound Route 905 on ramp and Britannia Blvd.
E. Location 5 - Otay Mesa Road and Caliente Ave.

Ramp metering system shall be performed at the following locations:

A. Location 1 – Westbound Route 905 on ramp from Caliente Avenue.
B. Location 2 – Eastbound Route 905 on ramp from Caliente Avenue.
C. Location 3 – Westbound Route 905 on ramp from Britannia Blvd.

10-3.02 COST BREAK-DOWN

Cost break-downs shall conform to the provisions in Section 86-1.03, "Cost Break-Down," of the Standard Specifications and these special provisions.

The Engineer shall be furnished a cost break-down for each contract lump sum item of work described in this Section 10-3.

The cost break-down shall be submitted to the Engineer for approval within 30 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:

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

Cost break-downs shall be completed and furnished in the format shown in the samples of the cost break-downs included in this section.

The sum of the amounts for the line items of work listed in each cost break-down table below for electrical work shall be equal to the contract lump sum price bid for each lump sum electrical item. Overhead and profit, except for time-related overhead, shall be included in each individual line item of work listed in a cost break-down table.

Individual line item values in the approved cost break-down tables will be used to determine partial payments during the progress of the work and as the basis for calculating an adjustment in compensation for the items within the cost breakdowns of for each lump sum electrical item due to changes ordered by the Engineer. When the ordered changes to line items of work increases or decreases by more than 25 percent, the adjustment in compensation for the applicable cost breakdown item will be determined in the same manner specified for increases and decreases in the total pay quantity of an item of work in Section 4-1.03B, "Increased or Decreased Quantities," of the Standard Specifications.

The following are the quantity break-down for the contract lump sum items of electrical system. The quantity break-downs are included in these special provisions for the Contractor to use for bidding purposes in the absence of signed electrical plans. Preparation of electrical plans will be completed after approval of the project.

The following quantity break-downs for contract lump sum items for electrical systems shall be provided by the Contractor:

1. Signal and lighting (Location 1) shall be for the Eastbound Route 905 on ramp and Caliente Ave. Signed electrical plans will be provided to the Contractor detailing the location of measurable components as detailed in the following table:

SIGNAL AND LIGHTING (LOCATION 1)	UNIT DESCRIPTION	UNIT	QUANTITY	PRICE	AMOUNT
Signal Heads	SV-1-T	EA	2		
	TV-3-T	EA	1		
	SV-2-T	EA	1		
	TV-1-T	EA	1		
	MAS	EA	2		
	MAT	EA	1		
	SP-1-T	EA	4		
	PPB	EA	4		
Signal and Lighting Standards	1-A (2.4 m OR 3 m)	EA	3		
	61	EA	1		
	19	EA	1		
	15TS	EA	1		
Pull Box	No. 5 or 6	EA	14		
Detectors	Loops	EA	7		
	Preformed	EA	6		
Video Detection	VDU	EA	3		
	VIS	EA	3		
	Video Display	EA	1		
	Ethernet Communication Card	EA	1		
Conduits	Size 53	M	300		
	Size 103	M	200		
Conductors	#8	M	480		
Cables	DLC	M	1,500		
	3CSC	M	200		
	12CSC	M	600		
	OCC	M	100		
	EVC	M	200		
	Video Cable	M	200		
Install Controller Cabinet and Foundation	SF Type 332	EA	1		
Battery Back-up System	Cabinet and Batteries	EA	1		
Luminaires	200W HPS	EA	3		
Miscellaneous					
	Install Sign	EA	3		
			TOTAL		

2. Signal and lighting (Location 2) shall be for the Westbound Route 905 on ramp and Caliente Ave. Signed electrical plans will be provided to the Contractor detailing the location of measurable components as detailed in the following table:

SIGNAL AND LIGHTING (LOCATION 2)	UNIT DESCRIPTION	UNIT	QUANTITY	PRICE	AMOUNT
Signal Heads	SV-1-T	EA	1		
	SV-2-T	EA	2		
	TV-1-T	EA	1		
	TP-1T	EA	1		
	MAS	EA	2		
	MAT	EA	3		
	SP-1-T	EA	3		
	PPB	EA	4		
Signal and Lighting Standards	1-A (2.4 m OR 3 m)	EA	2		
	29	EA	1		
	26	EA	1		
	24	EA	1		
Pull Box	No. 5 or 6	EA	14		
Detectors	Loops	EA	7		
	Preformed	EA	6		
Video Detection	VDU	EA	3		
	VIS	EA	3		
	Video Display	EA	1		
	Ethernet Communication Card	EA	1		
Conduits (m)	Size 53	M	300		
	Size 103	M	200		
Conductors (m)	#8	M	480		
	#14	M	200		
Cables	DLC	M	1,500		
	3CSC	M	200		
	12CSC	M	600		
	OCC	M	100		
	EVC	M	200		
	Video Cable	M	200		
Install ControllerCabinet and Foundation	SF Type 332	EA	1		
Battery Back-up System	Cabinet and Batteries	EA	1		
Luminaires	200W HPS	EA	3		
Miscellaneous	PEU	EA	1		
	Install Sign	EA	3		
			TOTAL		

3. Signal and lighting (Location 3) shall be for the Eastbound Route 905 on ramp and Britannia Blvd. Signed electrical plans will be provided to the Contractor detailing the location of measurable components as detailed in the following table:

SIGNAL AND LIGHTING (LOCATION 3)	UNIT DESCRIPTION	UNIT	QUANTITY	PRICE	AMOUNT
Signal Heads	SV-2-T	EA	2		
	TV-1-T	EA	1		
	MAS	EA	2		
	SP-1-T	EA	4		
	PPB	EA	4		
	TV-2-T	EA	1		
	SV-1-T	EA	2		
Signal and Lighting Standards	1-A (2.4 m OR 3 m)	EA	2		
	19	EA	1		
	15TS	EA	1		
Pull Box	No. 5 or 6	EA	8		
Detectors	Loops	EA	3		
Video Detection	VDU	EA	1		
	VIS	EA	1		
Conduits	Size 53	M	200		
Conductors	#8	M	480		
Cables	DLC	M	600		
	3CSC	M	200		
	12CSC	M	600		
	EVC	M	200		
	Video Cable	M	70		
Luminaires	310W HPS	EA	2		
Miscellaneous					
	Install Sign	EA	1		
			TOTAL		

4. Signal and lighting (Location 4) shall be for the Westbound Route 905 on ramp and Britannia Blvd. Signed electrical plans will be provided to the Contractor detailing the location of measurable components as detailed in the following table:

SIGNAL AND LIGHTING (LOCATION 4)	UNIT DESCRIPTION	UNIT	QUANTITY	PRICE	AMOUNT
Signal Heads	SV-1-T	EA	1		
	TV-1-T	EA	1		
	MAT	EA	1		
	SP-1-T	EA	2		
	PPB	EA	2		
Signal and Lighting Standards	1-A (2.4 m OR 3 m)	EA	1		
	15TS	EA	1		
Pull Box	No. 5 or 6	EA	4		
Conduits	Size 53	M	100		
Conductors	#8	M	100		
Cables	DLC	M	1,500		
	3CSC	M	200		
	12CSC	M	600		
Miscellaneous					
	Install Sign	EA	1		
			TOTAL		

5. Signal and lighting (Location 5) shall be located at Otay Mesa Rd and Caliente Ave. Signed electrical plans will be provided to the Contractor detailing the location of measurable components as detailed in the following table.

SIGNAL AND LIGHTING (Location 5)	UNIT DESCRIPTION	UNIT	QUANTITY	PRICE	AMOUNT
Pull Box	No. 5 or 6	EA	4		
	RC	EA	2		
Detectors	Loops	EA	6		
Conduits	Size 53	M	400		
Cables	DLC [RR]	M	600		
	OCC	M	200		
			TOTAL		

6. Lighting (City Street) shall be installed on Bridge No.57-1142-Caliente Avenue Overcrossing, Bridge No.57-1143 – Heritage Road Undercrossing, Caliente Avenue, Heritage Road, Britannia Blvd., Airway Road. Signed electrical plans will be provided to the Contractor detailing the location of measurable components as detailed in the following table:

LIGHTING (CITY STREET)	**DESCRIPTION**	**UNIT**	**QUANTITY**	**PRICE**	**AMOUNT**
Lighting Standards					
Type A	Decorative Electrolier (2.4m)	EA	4		
Type B	Decorative Electrolier (3.0m)	EA	6		
	Type 15	EA	6		
Relocate Poles	Type 15	EA	3		
Luminaires	150W HPS	EA	20		
	200W HPS	EA	9		
Soffit Fixtures	100W HPS	EA	4		
Pull Boxes	No. 5 or 6	EA	30		
	9 or 9A	EA	14		
	Junction Boxes (NEMA 4)	EA	4		
Conduit	Size 53	M	1,000		
	Size 27	M	200		
Conductors	#6	M	1,000		
	#8	M	5,000		
	#10	M	1,000		
	#14	M	200		
Service Equipment Enclosure	Type III-BF	EA	2		
Miscellaneous	PEU	EA	1		
			TOTAL		

7. Lighting (Parking Lot) shall be installed on Otay Mesa Road approximately at station 129+00 "OTM". Signed electrical plans will be provided to the Contractor detailing the location of measurable components as detailed in the following table:

LIGHTING (PARKING LOT)	DESCRIPTION	UNIT	QUANTITY	PRICE	AMOUNT
Lighting Standards	15	EA	7		
Luminaires	200W HPS	EA	7		
Pull Boxes	No. 5 or 6	EA	12		
Conduit	Size 53	M	500		
Conductors	#8	M	1,200		
	#14	M	400		
Service Equipment Enclosure	Type III-BF	EA	1		
Miscellaneous	PEU	EA	1		
			TOTAL		

8. Lighting and sign illumination shall be installed along Route 905 between stations 120+00 "E5" and 166+01 "E4". Signed electrical plans will be provided to the Contractor detailing the location of measurable components as detailed in the following table:

LIGHTING AND SIGN ILLUMINATION	UNIT DESCRIPTION	UNIT	QUANTITY	PRICE	AMOUNT
Lighting Standards	30	EA	20		
	31	EA	1		
Relocate Poles	30	EA	2		
Luminaires	ISL (85W) Sign	EA	50		
	310W-HPS	EA	23		
Pull Boxes	No. 5 or 6	EA	140		
	No. 5(T) or 6(T)	EA	30		
	9A	EA	30		
Conduit	Size 53	M	8,000		
	Size 78	M	500		
Conductors	#6	M	15,000		
	#8	M	7,000		
	#10	M	1,000		
	#4	M	1,000		
	#14	M	1,000		
Service Equipment Enclosure	Type III-B	EA	5		
	Type III-C	EA	3		
Sign Control		EA	20		
Expansion Fitting	Type X	EA	30		
Miscellaneous	PEU	EA	2		
			TOTAL		

9. Ramp metering system (Location 1) shall be for the westbound Route 905 on ramp at Caliente Avenue. Signed electrical plans will be provided to the Contractor detailing the location of measurable components as detailed in the following table:

RAMP METERING SYSTEM (LOCATION 1)	DESCRIPTION	UNIT	QUANTITY	PRICE	AMOUNT
Signal Heads	TV-1-T	EA	2		
	SV-1-T	EA	3		
	TV-2-T	EA	1		
Signal and Lighting Standards	15	EA	1		
	1-A (3m)	EA	3		
Pull Boxes	No. 5 or 6	EA	11		
	No. 5(T) or 6(T)	EA	13		
Detectors	Loops	EA	26		
Conduit	Size 53	M	540		
	Size 78	M	140		
Conductors	#8	M	1200		
	#14	M	600		
Cables	DLC	M	2500		
	9CSC	M	40		
	OCC	M	600		
Install Controller Cabinet	SF Type 334	EA	1		
Controller Foundations	Type 334	EA	1		
Luminaires	200W HPS	EA	1		
			TOTAL		

10. Ramp metering system (Location 2) shall be for the eastbound Route 905 on ramp at Caliente Avenue. Signed electrical plans will be provided to the Contractor detailing the location of measurable components as detailed in the following table:

RAMP METERING SYSTEM (LOCATION 2)	DESCRIPTION	UNIT	QUANTITY	PRICE	AMOUNT
Signal and Lighting Standards	1-A (3 m)	EA	3		
	15	EA	1		
Signal Heads	SV-1-T	EA	3		
	TV-1-T	EA	2		
	TV-2-T	EA	1		
Pull Boxes	No. 5 or 6	EA	12		
	No. 5(T) or 6(T)	EA	13		
Detectors	Loops	EA	26		
Conduit	Size 53	M	640		
	Size 78	M	120		
Conductors	#8	M	1200		
	#14	M	700		
Cables	DLC	M	2700		
	9CSC	M	80		
	OCC	M	600		
Controller Foundations	Type 334	EA	1		
Install Controller Cabinet	SF Type 334	EA	1		
Luminaires	200W HPS	EA	1		
			TOTAL		

11. Ramp metering system (Location 3) shall be for the westbound Route 905 on ramp at Britannia Blvd. Signed electrical plans will be provided to the Contractor detailing the location of measurable components as detailed in the following table:

RAMP METERING SYSTEM (LOCATION 3)	DESCRIPTION	UNIT	QUANTITY	PRICE	AMOUNT
Signal and Lighting Standards	1-A (2.4 m OR 3 m)	EA	4		
	26	EA	1		
Signal Heads	SV-1-T	EA	2		
	TV-1-T	EA	3		
	MAS	EA	3		
	TV-2-T	EA	1		
Pull Boxes	No. 5 or 6	EA	12		
	No. 5(T) or 6(T)	EA	13		
Detectors	Loops	EA	32		
Conduit	Size 53	M	680		
	Size 78	M	160		
Conductors	#8	M	1200		
	#14	M	700		
Cables	DLC	M	3100		
	12CSC	M	60		
	9CSC	M	100		
	OCC	M	600		
Controller Foundations	Type 334	EA	1		
Install Controller Cabinet	SF Type 334	EA	1		
Luminaires	310W HPS	EA	1		
			TOTAL		

12. Traffic Monitoring Station (Location 1) shall be installed on eastbound and westbound Route 905 "E5" from station 144+60 to station 145+20. Signed electrical plans will be provided to the Contractor detailing the location of measurable components as detailed in the following table:

TRAFFIC MONITORING STATION (LOCATION 1)	DESCRIPTION	UNIT	QUANTITY	PRICE	AMOUNT
Pull Boxes	No. 5 or 6	EA	2		
	No. 5(T) or 6(T)	EA	4		
Detectors	Loops	EA	12		
Conduit	Size 53	M	40		
	Size 78	M	80		
Conductors	#8	M	100		
Cables	DLC	M	1,000		
Install Controller Cabinet	SF Type 332	EA	1		
Controller Foundation	Type 332	EA	1		
			TOTAL		

13. Traffic Monitoring Station (Location 2) shall be installed on westbound and eastbound Route 905 "E5" from station 157+80 to station 158+40. Signed electrical plans will be provided to the Contractor detailing the location of measurable components as detailed in the following table:

TRAFFIC MONITORING STATION (LOATION 2)	DESCRIPTION	UNIT	QUANTITY	PRICE	AMOUNT
Pull Boxes	No. 5 or 6	EA	2		
	No. 5(T) or 6(T)	EA	4		
Detectors	Loops	EA	12		
Conduit	Size 53	M	40		
	Size 78		80		
Conductors	#8	M	100		
Cables	DLC	M	1,000		
Install Controller Cabinet	Type 332	EA	1		
Controller Foundation		EA	1		
			TOTAL		

14. Fiber optic communication system shall be installed along Route 905 approximately between stations 120+00 "E5" and 167+00 "E4". Signed electrical plans will be provided to the Contractor detailing the location of measurable components as detailed in the following table:

FIBER OPTIC COMMUNICATION SYSTEM	UNIT DESCRIPTION	UNIT	QUANTITY	PRICE	AMOUNT
Poles (foundation included)	CCTV 40	EA	3		
Pull Box	6(E)(T)	EA	10		
	Vaults	EA	12		
Conduits	MDCS(8)	M	5,000		
	MDCS(8)-(Bridge-Fiberglass)	M	400		
	27	M	3,000		
Conductors	FO12	M	3,500		
	FO84	M	12,000		
	OCC	M	3,000		
	Camera cable	M	140		
FO Pigtail	SMFO SC pigtails	EA	180		
FO Jumper	Simplex SMFO SC/SC jumper	EA	20		
CU Jumper	CAT 5e Patch Cable	EA	33		
CU Cable	Serial Data Cable	EA	10		
Controller Cabinet (foundation included)	Type 334 (CCTV)	EA	3		
	Type G	EA	1		
Miscellaneous	Fiber Optic Splices	EA	300		
	Fiber Optic Splice Closures	EA	8		
	FDU	EA	9		
	Delineators	EA	20		
	Ethernet Switch	EA	1		
	SECU	EA	30		
	Ethernet Extender Provider	EA	2		
	Ethernet Extender Subscriber	EA	2		
	Ethernet HUB	EA	2		
	Media Converter	EA	7		
	Media Converter (14 port Multipoint)	EA	1		
	Video Encoder	EA	3		
	Cabinet shelves (for S/F cabinets) Camera (CCTV) DS3 Router	EA EA EA	9 3 1		
			TOTAL		

15. Changeable Message Sign System shall be installed on Bridge No.57-1142 Caliente Avenue Overcrossing. Signed electrical plans will be provided to the Contractor detailing the location of measurable components as detailed in the following table:

CHANGEABLE MESSAGE SIGN SYSTEM	UNIT DESCRIPTION	UNIT	QUANTITY	PRICE	AMOUNT
Install CMS Module	S/F Model 500 CMS	EA	1		
Install Cabinet	S/F 334 Cabinet	EA	1		
Controller Foundation	S/F 334 Cabinet	EA	1		
Pull Boxes	No. 5 or 6	EA	8		
Conduit	53C	M	100		
	78C	M	50		
Conductors	#6	M	200		
	#4	M	200		
Install Cables	S/F CMS Cable Harness	M	120		
			TOTAL		

10-3.03 MAINTAINING EXISTING AND TEMPORARY ELECTRICAL SYSTEMS

Traffic signal system shutdowns shall be limited to periods allowed for lane closures listed or specified in "Maintaining Traffic" of these special provisions.

10-3.04 MAINTAINING EXISTING TRAFFIC MANAGEMENT SYSTEM ELEMENTS DURING CONSTRUCTION

Traffic Management System (TMS) elements include, but are not limited to ramp metering (RM) system, communication system, traffic monitoring stations, video image vehicle detection system (VIVDS), microwave vehicle detection system (MVDS), loop detection system, changeable message sign (CMS) system, extinguishable message sign (EMS) system, highway advisory radio (HAR) system, closed circuit television (CCTV) camera system, roadway weather information system (RWIS), visibility sensor, and fiber optic system.

Existing TMS elements, including detection systems, identified on the plans and located within the project limits shall remain in place, and be protected from damage. If the construction activities require existing TMS elements to be nonoperational or off line, and if temporary or portable TMS elements are not shown on the plans, the Contractor shall provide for temporary or portable TMS elements. The Contractor shall receive the Engineer's approval on the type of temporary or portable TMS elements and installation method.

Before work is performed, the Engineer, the Contractor, and the Department's Traffic Operations Electrical representatives shall jointly conduct a pre-construction operational status check of all existing TMS elements and each element's communication status with the Traffic Management Center (TMC), including existing TMS elements that are not shown on the plans and elements that may not be impacted by the Contractor's activities. The Department's Traffic Operations Electrical representatives will certify the TMS elements' location and status, and provide a copy of the certified list of the existing TMS elements within the project limits to the Contractor. The status list will include the operational, defined as having full functionality, and the nonoperational components.

The Contractor shall obtain written approval from the Engineer, at least 72 hours before interrupting existing TMS elements' communication with the TMC that will result in the elements being nonoperational or off line. The Contractor shall notify the Engineer at least 72 hours before starting excavation activities.

Traffic monitoring stations and their associated communication systems which were verified to be operational during the pre-construction operational status check, shall remain operational on freeway/highway mainline at all times, except:

1. for a duration of up to 15 days on any continuous segment of the freeway/highway longer than 4.8 kilometers
2. for a duration of up to 60 days on any continuous segment of the freeway/highway shorter than 4.8 kilometers

If the construction activities require existing detection systems to be nonoperational or off line for a longer time period or the spacing between traffic monitoring stations is more than the specified criteria above, and temporary or portable detection operations are not shown on the plans, the Contractor shall provide provisions for temporary or portable detection operations. The Contractor shall receive the Engineer's approval on the type of detection and installation before installing the temporary or portable detection.

If existing TMS elements shown on the plans or identified during the pre-construction operational status check, except traffic monitoring stations, are damaged or fail due to the Contractor's activity, where the elements are not fully functional, the Engineer shall be notified immediately. If the Contractor is notified by the Engineer that existing TMS elements have been damaged, have failed or are not fully functional due to the Contractor's activity, the damaged or failed TMS elements, excluding Structure-related elements, shall be repaired or replaced, at the Contractor's expense, within 24 hours. For a Structure-related elements, the Contractor shall install temporary or portable TMS elements within 24 hours. For nonstructure-related TMS elements, the Engineer may approve temporary or portable TMS elements for use during the construction activities.

If fiber optic cables are damaged due to the Contractor's activities, the Contractor shall install new fiber optic cables from an original splice point or termination to an original splice point or termination, unless otherwise authorized in writing by the Engineer. Fiber optic cable shall be spliced at the splice vaults if available. The amount of new fiber optic cable slack in splice vaults and the number of new fiber optic cable splices shall be equivalent to the amount of slack and number of splices existing before the damage or as directed by the Engineer. Fusion splicing will be required.

The Contractor shall demonstrate that repaired or replaced elements operate in a manner equal to or better than the replaced equipment or as directed by the Engineer. If the Contractor fails to perform required repairs or replacement work, as determined by the Engineer, the State may perform the repair or replacement work and the cost will be deducted from monies due to the Contractor.

A TMS element shall be considered nonoperational or off line for the duration of time that active communications with the TMC is disrupted, resulting in messages and commands not transmitted from or to the TMS element.

The Contractor shall provide provisions for replacing existing TMS elements within the project limits, including detection systems, that were not identified on the plans or during the pre-construction operational status check that became damaged due to Contractor's activities.

If the pre-construction operational status check identified existing TMS elements, then the Contractor, the Engineer, and the Department's Traffic Operations Electrical representatives shall jointly conduct a post construction operational status check of all existing TMS elements and each element's communication status with the TMC. The Department's Traffic Operations Electrical representatives will certify the TMS elements' status and provide a copy of the certified list of the existing TMS elements within the project limits to the Contractor. The status list will include the operational, defined as having full functionality, and the nonoperational components. TMS elements that cease to be functional between pre and post construction status checks shall be repaired at the Contractor's expense and as directed by the Engineer.

The Engineer will approve, in writing, the schedule for final replacement, the replacement methods and the replacement elements, including element types and installation methods before repair or replacement work is performed. The final TMS elements shall be new and of equal or better quality than the existing TMS elements.

10-3.05 FOUNDATIONS

Reinforced cast-in-drilled-hole concrete pile foundations for traffic signal and lighting standards shall conform to the provisions in "Piling" of these special provisions, except for payment.

Where cast-in-drilled-hole concrete pile foundations are to be constructed in slag aggregate embankments, the diameter of the pile shall be increased to provide a minimum of 75 mm of concrete cover over the reinforcing steel.

Full compensation for the increased diameter of cast-in-drilled-hole concrete pile foundations in slag aggregate embankments, including additional portland cement concrete, and increased drilling and placement costs shall be considered as included in the contract lump sum price paid for the item requiring the cast-in-drilled-hole concrete pile foundation and no additional compensation will be allowed therefor.

10-3.06 STANDARDS, STEEL PEDESTALS, AND POSTS

Standards, steel pedestals, and posts for traffic signal and lighting standards shall conform to the provisions in Section 86-2.04, "Standards, Steel Pedestals and Posts," of the Standard Specifications, "Steel Structures" of these special provisions, and the following requirements.

Steel bolts not designated on the plans as high-strength (HS) or stainless steel shall be for general applications and shall conform to the requirements in ASTM Designation: A 307.

The sign mounting hardware shall be installed at the locations shown on the plans.

Handhole reinforcement rings for standards, steel pedestals, and posts shall be continuous around the handholes.

Type 1 standards shall be assembled and set with the handhole on the downstream side of the pole in relation to traffic or as shown on the plans.

10-3.07 CONDUIT

Conduit to be installed underground shall be Type 3 unless otherwise specified.

Pull ropes for empty conduits for future use shall be a soft fiber type of not less than 12 mm diameter.

Conduit sizes shown on the plans and specified in the Standard Specifications and these special provisions are referenced to metallic type conduit. When rigid non-metallic conduit is required or allowed, the nominal equivalent industry size shall be used as shown in the following table:

Size Designation for Metallic Type Conduit	Equivalent Size for Rigid Non-metallic Conduit
21	20
27	25
41	40
53	50
63	65
78	75
103	100

When Type 3 conduit is placed in a trench (not in pavement or under portland cement concrete sidewalk), after the bedding material is placed and the conduit is installed, the trench shall be backfilled to not less than 100 mm above the conduit with minor concrete conforming to the provisions in Section 90-10, "Minor Concrete," of the Standard Specifications. The concrete shall contain not less than 250 kg of cementitious material per cubic meter. The remaining trench shall be backfilled to finished grade with backfill material.

After conductors have been installed, the ends of conduits terminating in pull boxes, vaults, service equipment enclosures, and in controller cabinets shall be sealed with an approved type of sealing compound.

At those locations where conduit is required to be installed under pavement and existing underground facilities require special precautions in conformance with the provisions in "Obstructions" of these special provisions, conduit shall be placed by the "Trenching in Pavement Method" in conformance with the provisions in Section 86-2.05C, "Installation," of the Standard Specifications and with the details shown for "T" trench on ES-5D.

At the option of the Contractor, the final 0.6-m of conduit entering a pull box in a reinforced concrete structure may be Type 4.

10-3.08 MULTIDUCT CONDUIT SYSTEM

Where multiduct conduit system (MDCS) is shown on the plans or on the cost break down of these special provisions, the system shall be :

Size 32 (nominal) high density polyethylene conduits grouped in quantities of not less than four conduits. Requirements for high density polyethylene conduits are described in "High Density Polyethylene Conduit," in these special provisions.

All new MDCS conduits shall be cleaned with a mandrel or cylindrical soft bristled brush and blown out with compressed air until all foreign material is removed immediately prior to sealing empty conduits or installing cables. Cleaning shall be performed in the presence of the Engineer. The ends of conduits shall be sealed with an approved sealing compound. The ends of multiduct conduit system shall be sealed with sealing plugs as described in these special provisions.

Size 103 conduit on bridge structures shall be fiberglass unless otherwise shown on the plans except that the conduit contained within size 103 conduits may be Type 3.

Size 103 conduits (and conduits contained within) and Size 32 conduits shall be either all individually factory color coded or all orange. Straight segments of Type 3 multiduct conduit shall be nominal 6 m lengths.

Joints shall be solvent welded or sealed with a gasket as recommended by the manufacturer. Joints shall lock together or be provided with a seating mark to verify proper assembly.

Bends in Type 3 conduits shall be rigid factory assembled sections designed to fit the system.

The minimum conduit bend radius in Type 3 conduits shall not be less than 1.8 meters.

Multiduct conduit system (MDCS) trench and backfill requirements shall be as shown on the plans and as described in these special provisions.

10-3.09 COMMUNICATION CONDUIT

At locations shown on plans, where communication conduit is to be installed on bridges, fiberglass conduit shall be used and shall conform to the details shown on the plans, and in these special provisions.

Fiberglass Conduit

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 delaminations, 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 conduit and other fiberglass conduit system components from the same manufacturer to insure component to component compatibility.

Fiberglass conduit shall be manufactured in 6 m minimum lengths.

Fiberglass conduit components shall include compatible fittings, adapters, expansion joints, and factory bends at nominal radii of 600 mm, 900 mm, 1200 mm.

All fiberglass conduit system components shall be produced from heat cured, corrosion resistant epoxy resin and continuous fiberglass rovings. 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.

Joints shall be water tight and withstand a minimum 4450 N of pullout tension.

For all sizes of fiberglass conduit, under a load of 400 N/m of conduit, the deflection of the inside diameter shall not exceed 5 percent.

The minimum impact resistance values for the fiberglass conduit shall be as follows when measured as described in ASTM D2444-70, using a 9 kg tup "B" with a 50 mm radius nose:

Size 53 conduit	133 N
Size 78 conduit	222 N
Size 103 conduit	356 N

10-3.10 HIGH DENSITY POLYETHYLENE CONDUIT

GENERAL

High density polyethylene (HDPE) conduit for communications applications shall conform to the details shown on the plans, these special provisions, and as directed by the Engineer.

MATERIAL

High density polyethylene conduit shall be manufactured from high density polyethylene virgin compounds.

High density polyethylene compounds used in the manufacture of communication conduit shall conform to the following Cell Classifications specified in ASTM Designation: D 3350:

Property	Cell Classification
Density	3
Melt Index	3 or 4
Flexural modulus	4 or 5
Tensile strength	4
Environmental stress crack resistance	3
Hydrostatic design basis	0, 1, 2, 3 or 4
Ultraviolet stabilizer	C[b]

b - HDPE Resin shall contain not less than 2 ± 0.5 percent carbon black ultraviolet stabilizer

CONDUIT

High density polyethylene conduit size (nominal trade inside diameter) and location shall be as shown on the plans. Conduit shall be the smooth interior wall type.

High density polyethylene conduit shall be suitable for cable and conductor installation methods as described in Section 86 of the Standard Specifications, in these special provisions, and in "Air Blown Method" as described elsewhere in these special provisions.

High density polyethylene conduit color shall be black with orange colored stripe. Orange colored stripe shall consist of not less than 2 stripes, with longitudinal orientation, evenly spaced.

Conduit shall contain carbon black ultraviolet shielding suitable for the conduit to sustain unprotected outdoor exposure for at least one year.

Conduit shall be continuously marked with clear, distinctive and permanent markings at intervals not greater than 2 meters. The marking shall be in a contrasting color to the conduit color. The height of the marking shall be approximately 2.5 mm or larger. Conduit marking information shall include, as a minimum, the following information:

A. Nominal Size
B. Dimension Ratio (DR)
C. Manufacturer Name and Product/Model Number
D. Material Code
E. Plant Identification
F. Production Date
G. Cell Classification

Coils and reels shall have sequential measurement markings every meter.

High density polyethylene conduit shall be DR 9 per ASTM D 3035 for controlled outside diameter.

High density polyethylene conduit shall be IPS outside diameter controlled in accordance with the manufacturer's production tolerances. The wall thickness of DR or SDR sized conduit shall be in accordance with the manufacturer's production tolerances.

High density polyethylene conduit shall meet or exceed the following:

PROPERTY	TEST METHOD (ASTM unless shown otherwise)	UNIT	VALUE (Nominal)
Material Classification	D 3350		PE33 or PE34
Density	D 1505	g/cm^3	0.941
Flow Rate	D 1238	g/10 Min.	0.40
Flexural Modulus	D 790	MPa	552
Tensile Strength	D 638	MPa	20.6
Environmental Stress Crack Resistance	D 1693	Hours	Meet Cell Classification 3
HDB @ 23°C	D 2837	MPa	Meet Cell Classification 0, 1, 2, 3 or 4
UV Stabilizer	D 1603	%C	not less than 2
Hardness	D 2240	Shore D	60-68
Elongation	D 638 (50.8 mm/Min)	%, minimum	750
Brittleness Temperature	D 746	°C	<-75
Vicat Softening Temperature	D 1525	°C	123

JOINING OF CONDUIT

Conduit shall be joined by heat fusion. Heat fusion (includes electrofusion) of high density polyethylene conduit shall be by methods recommended by the conduit manufacturer, and with equipment approved for the purpose. Equipment shall not expose conduit to direct flame. Heat fusion shall be performed by conduit manufacturer certified or authorized personnel. A minimum of 2 test fusions, by each fusion operator, shall be demonstrated to the Engineer prior to performing fusion operations on any high density polyethylene conduit to be installed.

Where high density polyethylene conduit is shown on the plans to join Type 3 conduit, mechanical fittings designed for joining polyethylene conduit to another material may be used. Mechanical fittings shall be pressure rated at not less than 400 kPa, and fully thrust restrained such that the fitting does not disjoin under longitudinal load of up to 35 kg.

INSTALLATION

High density polyethylene conduit shall be installed at underground locations only.

In addition to the conduit installation methods for Type 3 Conduit, as described in Section 86 of the Standard Specifications and in these special provisions, high density polyethylene conduit may be installed by Horizontal Directional Drilling (HDD) (per ASTM F1962 "Standard Guide for Use of Maxi-Horizontal Directional Drilling for Placement of Polyethylene Pipe or Conduit Under Obstacle, Including River Crossings") or "Directional Boring Method" as described elsewhere in these special provisions. Where there is a difference or conflict between requirements, the higher of the two standards shall apply.

Conduit bends, except factory bends, shall have a radius of not less than the manufacturer's recommended minimum bend radius. Where factory bends are not used, conduit shall be bent, without crimping or flattening, using the longest radius practicable.

Bending of high density polyethylene conduit shall be by methods recommended by the conduit manufacturer, and with equipment approved for the purpose. Equipment shall not expose conduit to direct flame.

Attention is directed to "Conduit" elsewhere in these special provisions regarding cleaning and sealing conduit.

The ends of high density polyethylene conduit shall be capped until the installation of cable is started.

A pull rope, conforming to Section 86-2.05C, "Installation," of the Standard Specifications shall be installed in conduits which are to receive future conductors.

CERTIFICATES OF COMPLIANCE, MATERIALS RECEIVING INSPECTION AND MANUFACTURER'S DATA

In conformance with the provisions in Section 6-1.07, "Certificates of Compliance," a Certificate of Compliance shall be furnished to the Engineer for each type of high density polyethylene conduit furnished. The certificate shall also certify that the high density polyethylene conduit complies with the requirements of these special provisions, and shall include the resin material Cell Classification, unit mass of pipe, average pipe stiffness and date of manufacture.

Conduit, when delivered to the site, which exhibits damage in excess of 10% of the conduit wall thickness may be rejected by the Engineer. Conduit exhibiting damage which does not meet the manufacturer's recommendations for usable conduit may also be rejected by the Engineer. Conduit sections may be repaired if approved by the Engineer. Replacement or repair of rejected conduit shall be at the Contractor's expense.

Two copies of the manufacturer's product technical specification information shall be furnished to the Engineer at least two weeks subsequent to the start of the scheduled delivery.

Two copies of the manufacturer's test data for the delivered shipment shall be furnished to the Engineer at the time of the delivery.

10-3.11 AIR BLOWN METHOD

At the Contractor's option, installation of cable into conduit, ducts or subducts may be performed using an "Air Blown Method."

The "Air Blown Method" shall be an installation method that uses a mechanical device combined with a high speed flow of compressed air to place cables into conduits, ducts or subducts.

The "Air Blown Method" shall conform to the following:

The method shall install cable without exceeding the cable manufacturers' tensile and compressive strength ratings.

The mechanical device shall be used to provide a pushing force on the cable into the conduit.

The cable installation equipment shall also have, at minimum, the following features:

1) Controls to regulate the flow rate of compressed air entering the conduit, duct or subduct, and any hydraulic or pneumatic pressure applied to the cable.
2) Safety shutoff valves to disable the system in the event of sudden changes in pneumatic or hydraulic pressure.
3) Measuring device to determine the speed of the cable during installation and the length of the cable installed.

Information on the proposed "Air Blown Method" shall be submitted to the Engineer. The submittal shall include, but not be limited to, the following items:

1. Project description;
2. List or plan sheet marked to identify the conduits and cables involved;
3. Equipment description and specifications;
4. Manufacturer's test data covering the performance of the equipment and cable stress in a typical installation using cable equivalent to cable to be installed on this project; and
5. User/Installer Manual for the equipment and installation procedures.

Within 30 days after the approval of the contract, the Contractor shall submit 2 copies of the proposed "Air Blown Method" to the Engineer. The Contractor shall allow 7 days for the Engineer to review the proposed "Air Blown Method". If revisions are required, as determined by the Engineer, the Contractor shall revise and resubmit the proposed "Air Blown Method" within 5 days of receipt of the Engineer's comments and shall allow 5 days for the Engineer to review the revisions. Upon the Engineer's approval of the proposed "Air Blown Method," 2 additional copies of the proposed "Air Blown Method" 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 proposed "Air Blown Method." In order to allow construction activities to proceed, the Engineer may conditionally approve, in writing, the proposed "Air Blown Method" while minor revisions or amendments are being completed.

The submitted "Air Blown Method" shall not be used until it has been approved in writing by the Engineer.

10-3.12 SEALING PLUG

Except as otherwise noted, multiduct conduit system and Size 103 conduits shall have their ends sealed with commercial preformed plugs which prevent the passage of gas, dust and water into the multiduct conduit system and Size 103 conduits.

Sealing plugs shall be removable and reusable. Plugs sealing conduit, conductor or cable shall be the split type that permits installation or removal without removing conductors or cables. Sealing plugs shall be capable of withstanding a pressure of 34.5 kPa.

Sealing plugs that seal MDCS (Size 103) shall seal the conduit and all enclosed conduits simultaneously with one self contained assembly having an adjustable resilient filler of neoprene or silicone rubber clamped between backing ends and compressed with stainless steel hardware.

Sealing plugs that seal the Size 32 conduits of MDCS shall seal each conduit individually with appropriate sizes and configuration to accommodate either empty conduit or those containing cable. Suitable sealing between the varying size cables and the plugs shall be provided by inserting split neoprene or silicone adapting sleeves, used singularly or in multiples, within the body of the plugs, or an equivalent method approved by the Engineer.

A sealing plug that seals an empty conduit shall have an eye or other type of capturing device (on the side of the plug that enters the conduit) to attach onto the pull rope so the pull rope will be easily accessible when the plug is removed.

10-3.13 TRACER WIRE

Tracer wire shall be provided and placed inside the MDCS conduit. The wire shall be placed in the uppermost conduit.

Tracer wire shall be No. 8 stranded, minimum, copper conductor with Type TW, THW, RHW, or USE insulation. The tracer wire shall form a mechanically and electrically continuous line throughout the length of the trench. A minimum of 1.5 m of slack shall be extended into each pull box and fiber optic vault from each direction.

Tracer wire may be spliced at intervals of not less than 150 m.

10-3.14 WARNING TAPE

Warning tape shall be provided and placed in the trench over conduits as shown on the plans. The warning tape shall be not less than 0.10 mm thick, and 75 mm 150 mm not less than 75 mm or greater than 150 mm wide with bold printed black letters of approximately 19-mm height on bright orange color background, and contain the printed warning "CAUTION CALTRANS FIBER OPTIC LINE BURIED BELOW", repeated at not greater than 1-meter intervals.

The printed warning shall not be removed by the normal handling and burial of the tape, and shall be rated to last for the service life of the tape.

The construction of the warning tape shall be such that it will not delaminate when it is wet. It shall be resistant to insects, acid, alkaline and other corrosive elements in the soil. It shall have a minimum of 18.6 MPa tensile strength and shall have a minimum of 500 percent elongation before breakage.

10-3.15 SLURRY CEMENT BACKFILL

The slurry cement backfill for the installation of multiduct conduit system or other conduit as shown on the plans shall conform to the provisions in Section 19, "Earthwork," of the Standard Specifications and these special provisions.

The size of the aggregate shall not be larger than 9.5 mm.

The concrete shall be pigmented a medium to dark, red or orange color 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.

Full compensation for furnishing and incorporating the cement pigment to achieve the color required shall be considered as included in the contract price or prices paid per meter for the conduit involved and no separate payment will be made therefor.

10-3.16 DIRECTIONAL BORING METHOD

Where jacking and drilling is shown on the plans as the required installation method, conduits may be installed by the directional boring method. Directional boring shall not be used at other locations unless approved by the Engineer. All pull boxes or vaults shall be located at the locations shown on the plans.

Minimum depth of conduit below finished grade in pavement areas shall be 2.5 m.

A listing of materials (composition and strength) and methods used in directional boring shall be submitted for the Engineer’s review.

The diameter of the boring tool shall not exceed 1.5 times the outside diameter of the conduit. Mineral slurry or wetting solution shall only be used to lubricate the boring tool and to stabilize the soil surrounding the boring path. Mineral slurry or wetting solution shall be water based and environmentally safe.

Residue from directional boring operations shall be handled in the same manner as residue from slot cutting operations described in Section 86-5.01A(5), "Installation Details," of the Standard Specifications.

The directional boring equipment shall have directional control of the boring tool and have an electronic boring tool location detection system. During operation, the directional boring equipment shall be able to determine the location of the tool both horizontally and vertically.

The directional boring equipment shall be equipped with a tension measuring device that indicates the amount of tension exerted on conduit during conduit pulling operations.

Slurry cement backfill and warning tape, as shown on the plans for trench installations of conduit, are not required where the directional boring method is used. Tracer wire shall be attached to the uppermost conduit prior to conduit installation.

A representative of the Contractor must be in direct charge and control of the directional boring operation at all times.

The Engineer shall be notified in writing 2 working days in advance of starting directional boring operations. The location and equipment to be used in the boring operation shall be included in the advance notice to the Engineer. Directional boring shall only be performed in the presence of the Engineer unless otherwise notified in writing by the Engineer.

Full compensation for directional boring shall be considered as included in the contract unit price paid for the conduit involved and no additional compensation will be allowed therefor.

10-3.17 TRENCH DELINEATOR

Trench delineator shall consist of a flexible post conforming to the provisions in Section 82, "Markers and Delineators," of the Standard Specifications and these special provisions.

Delineators on flexible posts shall be as specified 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.

Flexible posts shall be installed at locations shown on the plans directly above fiber optic conduit (in the same trench) offset enough to not hit the warning tape.

The flexible post may be installed by placing it in the trench prior to backfilling and compacting or by placing it in a 450 mm steel anchor sleeve that is driven into the ground prior to installing the flexible post. The flexible post and anchor shall have locking tabs that prevent the removal of the flexible post from the anchor sleeve.

Flexible posts shall extend a minimum of 0.9 m and a maximum of 1.2 m above ground and a minimum of 450 mm and a maximum of 600 mm below ground.

The message on the flexible post shall be black text on orange non-reflective background, shall be located at the top of the post, and shall face approaching traffic. The message shall read: "WARNING, FIBER OPTIC CABLE". Below this message shall be a smaller message that reads: "BEFORE EXCAVATING OR IN AN EMERGENCY CALL CALTRANS, SAN DIEGO, CA (619) 688-6785".

10-3.18 PULL BOXES

Grout shall not be placed in the bottom of pull boxes.

10-3.19 FIBER OPTIC VAULT

Fiber optic vault, cover and extensions (if required) shall be of the sizes and details shown on the plans and shall be precast of non-PCC material. Non-PCC material shall be resistant to fire , chemicals and ultraviolet exposure. The non-PCC material shall show no appreciable change in physical properties with exposure to the weather. Non-PCC material shall be dense and free of voids or porosity.

Covers shall be the non-skid type. Cover marking shall be "CALTRANS FIBER OPTICS" on each cover. Each cover shall have inset lifting pull slots. Cover hold down bolts or cap screws and nuts shall be of brass, stainless steel, or other non-corroding metal material.

A reinforced concrete encasement ring shall be poured around the collar of the fiber optic vault as shown on the plans. The concrete for encasement ring shall contain not less than 325 kg of cement per cubic meter.

Fiber optic vaults and covers shall be rated for AASHTO HS 20-44 loads and be installed as detailed and where shown on the plans.

Hanger assemblies shall consist of not less than 3 hangers evenly distributed. Hangers shall be made of a non-corroding material and be free of any sharp edges. Hanger assembly shall be provided for a minimum of eight fiber optic cables and be securely fastened to the side wall with the slack fiber optic cable neatly coiled.

The Contractor shall not install additional fiber optic vaults over those shown on the plans without the Engineer's written approval.

10-3.20 CONDUCTORS AND WIRING

Splices of conductors shall be insulated with heat-shrink tubing of the appropriate size after thoroughly painting the spliced conductors with electrical insulating coating.

Heat-shrink tubing shall be heated as recommended by the manufacturer.

The color code for the conductors in the nine-conductor cable shall be as noted on the plans.

OPTICAL DETECTOR CABLE

Optical detector cable (EVC) shall meet the requirements of IPCEA-S-61-402/NEMA WC 5, Section 7.4, 600-V (ac) control cable, 75°C, Type B, and the following:

A. The cable shall contain 3 conductors, each of which shall be No. 20 (7 x 28) stranded, tinned copper with low-density polyethylene insulation. Minimum average insulation thickness shall be 0.63-mm. Insulation of individual conductors shall be color coded: 1-yellow, 1-blue, 1-orange.
B. The shield shall be either tinned copper braid or aluminized polyester film with a nominal 20 percent overlap. Where film is used, a No. 20 (7 x 28) stranded, tinned, bare drain wire shall be placed between the insulated conductors and the shield and in contact with the conductive surface of the shield.
C. The jacket shall be black polyvinyl chloride with minimum ratings of 600 V (ac) and 80°C and a minimum average thickness of 1.1 mm. The jacket shall be marked as required by IPCEA/NEMA.

D. The finished outside diameter of the cable shall not exceed 8.9 mm.
E. The capacitance, as measured between any conductor and the other conductors and the shield, shall not exceed 157 pf per meter at 1000 Hz.
F. The cable run between each detector and the controller cabinet shall be continuous without splices or shall be spliced only as directed by the detector manufacturer.

10-3.21 CATEGORY 5E CABLE

Category 5E cable shall be the unshielded, outdoor rated, non-gel filled type, and shall meet the requirements of TIA/EIA 568B.2, Category 5E Cable, and the following:

A. The cable shall contain 8 conductors, each of which shall be No. 24 , minimum, solid bare copper conductors. Each conductor shall be insulated with polyolefin, polyethylene, polyvinyl chloride or fluorinated ethylene propylene material. Conductors shall be in twisted pairs. Color coding shall distinguish each pair: blue, blue/white; brown, brown/white; green, green/white; orange, orange/white.
B. The cable jacket shall be rated for a minimum of 300 V and 60°C and shall be polyvinyl chloride, polyethylene, polyolefin or fluorinated ethylene propylene. The jacket shall be black, gray, or blue. The jacket shall be marked as required by NEMA. The jacket shall be marked at not more than every meter with the cable identification: manufacturer's name, product identification, number of conductors and conductor size, and voltage and temperature ratings. Cable length markings may be sequentially alternated with the cable identification markings at not more than every other meter.
C. The finished outside diameter of the cable shall not exceed 13 mm.
D. The cable run between components shall be continuous without splices. A minimum of one meter of slack shall be provided at each pull box, junction box or vault, and a minimum of 3 m at each cabinet. The ends of category 5E cable shall be terminated with appropriate RJ-type connectors as necessary to connect the equipment shown on the plans, or shall be terminated with crimped and soldered spade type terminals at terminal blocks where shown on the plans.
E. Category 5E Certified installations are required for installed lengths of less than 100 m of finished cable.

10-3.22 FIBER OPTIC COMMUNICATION CABLE PLANT

FIBER OPTICS GLOSSARY

Breakout.--The cable "breakout" is produced by; (1) removing the jacket just beyond the last tie-wrap point, (2) exposing 1 to 2 meters 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.

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).

Connectorized.--The termination point of a fiber after connectors have been affixed.

Couplers.--Couplers are devices which mate fiber optic connectors to facilitate the transition of optical light signals from one connector into another. They are normally located within FDFs mounted in panels. They may also be used unmounted, to join two simplex fiber runs.

Fiber Distribution Frame (FDF).--A rack mounted system that consists of a standard equipment rack, fiber routing guides, horizontal jumper troughs and Fiber Distribution Unit (FDU).

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 or rack-mountable unit containing both a patch panel with couplers and a splice tray(s).

F/O.--Fiber optic.

FOIP.--Fiber optic inside plant cable.

FOP.--Fiber optic outside plant cable.

FOTP.--Fiber optic test procedure(s) as defined by EIA/TIA standards.

Jumper.--A short fiber optic cable that has connectors installed on both ends, and is typically used for connection within a FDF.

Light Source.--Portable 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).

Link Loss Budget.--A calculation of the overall permissable attenuation from the fiber optic transmitter (source) to the fiber optic receiver (detector).

Loose Tube Cable.--Type of cable construction in which fibers are placed in filled buffer tubes to isolate them from outside forces (stress). A flooding compound is applied to the interstitial cable core to prevent water migration and penetration. This type of cable is primarily for outdoor applications.

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 the losses that are attributed to each component or defect in the fiber.

Patchcord.--A short jumper used to join two Connector Module Housing (CMH) couplers or a CMH and an active device (electronics).

Pigtail.--Short fiber optic cable that has a connector installed on only one end.

Plenum Cable.--NEC approved cable installed in air plenums (the area between a drop ceiling and the floor above it) without the use of conduit.

Power Meter.--Portable 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.

Riser Cable.--NEC approved cable installed in a riser (a vertical shaft in a building connecting one floor to another).

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.--The permanent joining of fiber ends to matching fibers.

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.

Storage Cabinet.--Designed for holding excess cable slack for protection. The storage cabinet allows the user flexibility in equipment location and the ability to pull cable back for resplicing.

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). Increased buffering is desirable over loose tube cables because of its resulting ease of handling and connectorization (increased physical flexibility, smaller bend radius requirements), and ability to meet NEC flammability requirements.

10-3.23 FIBER OPTIC LABELING

GENERAL

All fiber optic cables shall be labeled in a permanent and consistent manner. All labels shall be made of a material designed for permanent labeling. All labels shall be mechanically marked with permanent ink on non-metal type labels, or embossed lettering on metal type labels; hand written labels using pencil shall not be used except as noted below. Metal tags shall be constructed of stainless steel. Metal tags are required for use on fiber optic cables. Use of non-metal label materials shall be only as approved by the Engineer. At vaults and other underground locations, all labels and imprinting shall be weatherproof. Labels shall be affixed per the manufacturer's recommendations in a manner that will not cause damage to the cable, or fiber.

CABLE IDENTIFICATION

Identification used for labeling of the fiber optic and copper cables will be provided to the Contractor by the Engineer. The quantity of characters will not be more than 40 for cables and not more than 20 for individual or fibers.

LABEL PLACEMENT

Fiber Optic Cables.--All cables shall be labeled at all terminations, even if no connections or splices are made, and at all splice vault entrance and exit points.

Cable to Cable Splices.--The cable shall be labeled at entry to splice enclosure.

Cable to Fiber Distribution Units.--The cable shall be labeled at entry to the FDU. Only one cable shall be terminated in each FDU. The FDU shall be labeled on the face of the FDU. Individual connections shall be clearly marked in pencil on the face of the FDU in the designated area as directed by the Engineer.

Fibers.--Fiber labels shall be placed next to the connectors of the individual fibers.

Jumpers.--Equipment to FDU Jumpers shall be labeled at both ends. FDU to FDU jumpers shall be labeled at each end.

Pigtails.--Pigtails shall be labeled at the connector.

10-3.24 FIBER OPTIC CABLE INSTALLATION

Installation procedures shall be in conformance with the procedures specified by the cable manufacturer for the specific cable being installed. Mechanical aids may be used, provided that a tension measuring device is placed in tension to the end of the cable, and the allowable tension does not exceed the manufacturers recommended pulling tension. A calibrated break-away feature shall be employed to work in tandem with the tension measuring device and limit excessive tension by disengaging when a set tension is exceeded.

When mechanical aids are proposed for use in pulling fiber optic cable, submit information on the proposed methods and the conditions for use. The submittal must conform to the information submittal requirements, including the time frames for review and approval, as described in "Air Blown Method," elsewhere in these special provisions.

Except when the "Air Blown Method" is used, F/O cable shall be installed using a cable pulling lubricant recommended by the F/O cable or the conduit manufacturer and a non-abrasive pull tape conforming to the provisions described under "MDCS" elsewhere in these special provisions.

Splices shall be limited to locations as shown on the plans and as directed by the Engineer.

During cable installation, the bend radius shall be maintained at not less than twenty times the outside diameter of the cable. The stress relief component shall be installed at the entrance to the FDU as recommended by the manufacturer.

F/O cable shall be installed without splices except where specifically allowed on the plans or described in these special provisions. A minimum of 15 m of slack shall be provided at each vault without a cable splice. At fiber optic splice closures, a minimum of 9 m of each cable exiting the closure shall be stored in the vault.

Unless shown or provided otherwise, only one F/O cable shall be installed in each conduit.

10-3.25 SPLICING

Unless otherwise allowed, F/O cable splices shall be 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.

The field splices shall connect the fibers of the two F/O cable lengths together. These splices shall be placed in a splice tray and these splice tray(s) shall then be placed in the splice closure.

Fibers of the same buffer tube, but not being spliced shall be placed in a splice tray along side spliced fibers. Buffer tubes that do not require enclosed fibers to be spliced shall not be disturbed and placed in the splice closure.

The termination splices shall connect the F/O cable span ends with pigtails. The termination splices shall be placed in a splice tray and the splice tray(s) shall then be placed in the fiber distribution unit (FDU). The individual fibers shall be looped one full turn within the splice tray to avoid micro bending. A 50 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 discernible tensile force on the optical fiber.

All splices shall be protected with a metal reinforced thermal shrink sleeve.

All fiber optic cables shall be labeled in the splice tray. Pigtail ends shall also be labeled to identify the destination of the fiber.

10-3.26 FIBER OPTIC SPLICE CLOSURE

The fiber optic field splices shall be enclosed in splice closures which shall be complete with splice organizer trays, brackets, clips, cable ties, and sealant, as needed. The splice closure shall be suitable for a direct burial or pull box application. Manufacturer's installations 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:

Non-filled thermoplastic case
Rodent proof, water proof, re-enterable and moisture proof
Expandable from 2 cables per end to 8 cables per end by using adapter plates
Cable entry ports shall accommodate 10 mm to 25 mm diameter cables
Multiple grounding straps
Accommodate up to 8 splice trays
Suitable for "butt" or "through" cable entry configurations
Place no stress on finished splices within the splice trays.

The fiber optic splice closure shall be suitable for a temperature range of 0ºC to 40ºC.

Each splice shall be individually mounted and mechanically protected in the splice tray.

The Contractor shall install the fiber splice closure in the fiber optic vaults where splicing is required. The fiber optic splice closures shall be securely fastened to the fiber optic vault or wall using standard hardware as recommended by the closure manufacturer.

The Contractor shall provide all mounting hardware required to securely mount the closures to the splice vault.

The fiber splice closure shall be mounted horizontally in a manner that allows the cables to enter at the end of the closure. Not less than 9 m of each cable shall be coiled in the vault to allow the fiber splice closure to be removed for future splicing.

10-3.27 SPLICE TRAY

Each splice tray shall conform to the following:

Accommodate the quantity of fusion splices as shown on the plans but not less than 12 fusion splices per tray.
Place no stress on completed splices within the tray.
Accommodate "butt" or "feed through" splicing applications.
Be stackable with a transparent snap-on hinge cover.
Accommodate buffer tubes securable with channel straps.
Contain fiber retention strips.

10-3.28 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. All components or assemblies of the same type shall be from the same manufacturer.

10-3.29 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 and, (3) after installation. 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.

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 identify the tests to be performed 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.

Documentation of all test results shall be provided to the Engineer within 2 working days after the test is completed.

FACTORY TESTING

Documentation of compliance with the fiber specifications as listed in the fiber characteristics table shall be supplied by the original fiber 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 attached to the cable reel in a waterproof pouch and submitted to the Contractor and to the Engineer.

ARRIVAL ON SITE

The cable and reel shall be physically inspected on delivery and the attenuation shall be measured for 100 percent of the fibers. 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 weather proof envelope. Attenuation deviations from the shipping records of greater than 5 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 fiber optic 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

After the fiber optic cable has been pulled but before breakout and termination, 100 percent of all the fibers shall be tested with an OTDR 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 will 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 shall then be tested to demonstrate acceptability. Copies of the test results shall be submitted to the Engineer.

Singlemode fibers shall be tested at 1310 nm and 1550 nm after arrival on site and after cable installation. Attenuation readings in one direction after arrival on site and for each direction after installation shall be recorded on the cable data sheet. The Engineer will review and notify the Contractor of the results in writing in five working days of "arrival on site test" and in ten working days of "after cable installation test".

OUTDOOR SPLICES

At the conclusion of all outdoor splices at one location, and before they are enclosed and sealed, all splices shall be tested with the OTDR, in both directions. Splices in segments shall be tested at 1310 nm and at 1550 nm. Individual fusion splice losses shall not exceed 0.07 dB. Measurement results shall be recorded, dated, validated by the OTDR trace printout and filed with the records of the respective cable runs. Copies of traces and test results shall be submitted to the Engineer. If the OTDR test results are unsatisfactory, the splice shall be unacceptable. The unsatisfactory splice shall be replaced at the Contractor's expense. The new splice shall then be tested to demonstrate acceptability. Copies of the test results shall be submitted to the Engineer.

DISTRIBUTION INTERCONNECT PACKAGE TESTING AND DOCUMENTATION

All the components of the passive interconnect package (FDUs, pigtails, jumpers, couplers and splice trays as shown on the plans and in these special provisions) shall comprise a unit from a manufacturer who is regularly engaged in the production of the fiber optic components.

In developing the distribution interconnect package, each SC termination (pigtail or jumper) shall be tested for insertion attenuation loss with the use of an optical power meter and light 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 assembly is complete, the manufacturer shall visually verify that all tagging, including loss values, is complete. Then as a final quality control measure, the manufacturer shall do an "end to end" optical power meter/light source test from pigtail end to jumper lead end to assure continuity and overall attenuation loss values.

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 be also be maintained on file by the manufacturer or supplier.

SYSTEM VERIFICATION AT COMPLETION

OTDR Testing.--Once the passive cabling system has been installed and is ready for activation, 100 percent of the fiber links shall be tested with the OTDR for attenuation. Print out shall include at least link number, fiber color, buffer color and cable number. Test results shall be recorded, dated, compared and filed with previous copies. A hard copy printout and a electronic copy of the traces and test results along with a licensed copy of the associated software on a DOS based 89 mm disk shall be submitted to the Engineer. If the OTDR test results are unsatisfactory the link shall be replaced at the Contractor's expense. The new link shall then be tested to demonstrate acceptability. Copies of the test results shall be submitted to the Engineer.

Power Meter and Light Source.--At the conclusion of the final OTDR testing, 100 percent of all 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 both directions. Test results shall be recorded, compared and proven to be within the design link loss budgets, and filed with the other recordings of the same links. Test results shall be submitted to the Engineer.

Link Loss Worksheet.--The Link Loss Worksheet shown in Appendix A shall be completed for 100 percent of 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.

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 Link Loss 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, two connectors or one splice and one connector. The removal of only the small section containing the failure and therefore introducing new unplanned splices, will not be allowed.

APPENDIX A

Link Loss Budget Worksheet

Contract No. _____

Contractor: _____

Approved by Caltrans: _____

Date: _____ Operator:_____

Link Number: _____ Fiber Color: _____

Buffer Color: _____ Cable No.: _____

Test Wavelength (Circle one): 1310 1550

Expected Location of fiber ends:
End 1: _____ End 2: _____

OTDR Test Results:

Forward Loss:	_____ dB		1
Reverse Loss:	_____ dB	A	
Average Loss:	_____ dB		1
		B	
			1
		C	

Power Meter and Light Source Test Results:

Forward Loss:	_____ dB		2
Reverse Loss:	_____ dB	A	
Average Loss [(2A + 2B)/2]:	_____ dB		2
		B	
			2
		C	

Calculated Fiber Loss:		
Length of the link (from OTDR):	_____ km	3
Allowed loss per km of fiber:	0.4 dB/km	A
Total Allowed Loss due to the fiber (3A * 3B):	_____ dB	3
		B
		3
		C
Calculated Splice Loss:		
Number of Splices in the Link:	_____	4
Allowed Link Loss per Splice:	0.07 dB	A
Total Allowed Loss due to Splices (4A * 4B):	_____ dB	4
		B
		4
		C
Calculated Link Loss:		
Connector Loss:	0.9 dB	5
Total Link Loss (5A + 3C + 4C):	_____ dB	A
		5
		B
Cable Verification:		
Compare Power Meter Average Loss to Calculated Link Loss (2C - 5B):	_____ dB	6
If the value of 6A is greater than zero, the link has failed the Test. See Test Failures elsewhere in these special provisions.		A

To Be Completed by Caltrans:

Resident Engineer's Signature: _____

Cable Link Accepted: _____

10-3.30 FIBER DISTRIBUTION UNIT

The Contractor shall furnish and install all related equipment to interface the fiber distribution unit (FDU) to the incoming fiber optic communication cables.

The units shall accommodate the fiber optic cable described elsewhere in these special provisions.

Type A FDU shall accommodate termination of not less than 84 individual fibers.

Type C FDU shall accommodate termination of 12 individual fibers.

The FDU shall provide interconnect capability and shall include the following:

1. A patch panel to terminate singlemode fiber with SC type connector feed through adapters.
2. Storage for splice trays.

The patch panel shall be hinged to provide easy access and maintenance. Brackets shall be provided to spool the incoming fiber a minimum of three turns, each turn of not less than 250 mm in length, before separating out individual fibers to the splice tray. Strain relief shall be provided for the incoming fiber optic cable. All fibers shall be terminated and identified in the FDU.

The FDU (Type A) shall be 475 mm rack mountable and not to exceed 435 mm (W) x 500 mm (H) x 375 mm (D).

The FDU (Type C) shall be 475 mm rack mountable and not to exceed 435 mm (W) x 50 mm (H) x 305 mm (D).

10-3.31 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 only combinations of loop lead-in cable, fiber optic cable, or Category 5E cable. A No. 8 minimum, bare copper wire shall run continuously in circuits. 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.

10-3.32 SERVICE

Continuous welding of exterior seams in service equipment enclosures is not required.

Service equipment enclosures shall be the aluminum type.

Circuit breakers shall be the cable-in/cable-out type, mounted on non-energized clips. All circuit breakers shall be mounted vertically with the up position of the handle being the "ON" position.

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.

Circuit breakers used as service disconnect equipment shall have a minimum interrupting capacity of 42 000 A, rms, for 120/240 V(ac) services.

10-3.33 NUMBERING ELECTRICAL EQUIPMENT

Self-adhesive numbers (with reflective sheet background) shall be Contractor-furnished. A reference sample is available from the Engineer, or the Engineer may identify an existing installation as a reference.

The numbers shall be placed on the equipment where designated by the Engineer.

Where new numbers are to be placed on existing or relocated equipment, the existing numbers shall be removed.

Numbers shall be applied to a clean surface.

Where shown on the plans, 5-digit, self-adhesive equipment numbers shall be placed for all electroliers, soffit lighting, sign lighting, and service equipment enclosures. On service equipment enclosures, the numbers shall be placed on the front door. On electroliers, the numbers shall be placed as shown on the plans except that the numbers shall be placed on the side nearest the roadway facing approaching traffic at a height up to 2.5-m above the base plate.

Numbers for illuminated signs mounted on overcrossings or for soffit luminaires shall be placed on the nearest adjacent bent or abutment at approximately the same station as the sign or soffit luminaire. Where no bent or abutment exists near the sign or soffit luminaire, the number shall be placed on the underside of the structure adjacent to the sign or soffit luminaire. Arrangement of numbers shall be the same as those used for electroliers.

Numbers for overhead sign bridges shall be placed on both posts.

10-3.34 CONTROLLER CABINETS

The CCTV (Type 334) cabinets 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.

Cabinets shall be Type 1 and shall consist of a Type 1 housing (A), a mounting cage 1, and the following listed equipment. The equipment shall conform to the provisions of Chapter 6 of the Traffic Signal Control Equipment Specifications (TSCES).

A. Service panel No. 1
B. Power distribution assembly
C. Input file No. 3, upper part
D. Police door with on/off control switches
E. C1 harness
F. Controller and equipment shelves
G. Dual fan assembly with thermostatic control
H. Mechanical armature-type relays

Police panels will not be required.

Prior to shipping to the project site, each CCTV cabinet shall be submitted to the Transportation Laboratory for acceptance testing.

Foundations for Type 1 housing shall conform to the details in the plans for Model 332 and 334 cabinets.

The Engineer shall be notified when each CCTV cabinet is ready for the functional test. The functional test will be conducted by State forces.

Terminal blocks shall conform to the requirements in Chapter 6, Section 5, Subsection 6.5.3, Paragraph 5.3.1 of the TSCES, except that the screw size shall be 8-32.

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	184 V
Energy Rating (Minimum)	20 J
Power Dissipation, Average	0.85 W
Peak Current for pulses less than 7 microseconds	1250 A
Stand-by Current for 60 Hz Sinusoidal	1 mA or less

The thermostatically controlled fan shall provide 4.25 cubic meter per minute of ventilation. The fan shall be activated when the temperature inside the cabinet exceeds 24 ^{o}C and shut off when the temperature is less than 18 ^{o}C.

Door locks for the CCTV cabinets shall be a removable-core mortise cam cylinder door lock that receives the State's lock core. The State's lock core is a "Best" construction core. Keys shall be removable from the locks in the locked position only. Door locks shall be installed in conformance with the manufacturer's written instructions and recommendations. Two keys for each door lock shall be delivered to the Engineer.

10-3.35 STATE-FURNISHED CONTROLLER ASSEMBLIES

The Model 170 controller assemblies, with battery backup system (without batteries), excluding anchor bolts, will be State-furnished as provided under "Materials" of these special provisions.

The Contractor shall construct each controller cabinet foundation as shown on the plans for Model 332A and 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.

10-3.36 TELEPHONE DEMARCATION CABINET (TYPE G)

Duplex convenience receptacles shall have ground-fault circuit interruption as defined by the Code. Circuit interruption shall occur on 6 mA of ground-fault current and shall not occur on less than 4 mA.

A listing of field conductor terminations, in each telephone demarcation cabinet (type G), will be furnished free of charge to the Contractor at the site of the work.

10-3.37 VEHICLE SIGNAL FACES AND SIGNAL HEADS

Type SV-2-TD mountings shall be bolted to the standard through the upper pipe fitting in the same manner shown for bolting the terminal compartment.

Pipe fittings shall not be the aluminum type.

10-3.38 LIGHT EMITTING DIODE SIGNAL MODULE

GENERAL

Summary

This work includes installing LED signal module. Comply with Section 86, "Signals, Lighting and Electrical Systems," of the Standard Specifications.

Location of LED signal module is shown on the plans. The Engineer will approve exact location.

Use LED signal module as the light source for the following traffic signal faces:

1. 300-mm section
2. 200-mm section
3. 300-mm arrow section
4. 300-mm U-turn section
5. 300-mm bicycle section
6. 300-mm programmed visibility (PV) section
7. 300-mm lane control section

Submittals

Before shipping LED signal modules to job site, submit the following to the Transportation Laboratory:

1. Delivery form including district number, EA, and contact information
2. List containing all LED signal module serial numbers anticipated for use
3. LED signal modules

Quality Control and Assurance

Module must be one listed on the Pre-Qualified Products List for LED traffic signals at:

http://www.dot.ca.gov/hq/esc/approved_products_list

The State will test LED signal module shipments as specified in ANSI/ASQ Z1.4.. Testing will be completed within 30 days of delivery to the Transportation Laboratory. LED signal modules tested or submitted for testing must be representative of typical production units. LED and circular LED signal modules will be tested as specified in California Test 604. Arrow, U-turn, and bicycle LED signal modules will be tested as specified in California Test 3001. All parameters of the specification may be tested on the modules. LEDs must be spread evenly across the module. LED arrow indication must provide the minimum initial luminous intensity listed. Measurements will be performed at the rated operating voltage of 120 V(ac).

Delays resulting from submittal of non-compliant materials do not relieve you from executing the contract within the allotted time. Non-compliant materials will be rejected. You must resubmit new LED for retesting and pick up the failed units within 7 days of notification. You must provide new LED signal modules and allow a minimum of 30 days for the retest. You must pay for all shipping and handling costs related to testing and retesting. Delays resulting from resubmittal and retesting are your responsibility and no extra time will be allowed.

After testing, you must pick up the tested LED signal modules from the Transportation Laboratory and deliver to the job site.

Warranty

The manufacturer must provide a written warranty against defects in materials and workmanship for LED signal modules for a minimum period of 48 months after installation of LED signal modules. Replacement LED signal modules must be provided within 15 days after receipt of failed LED modules at your expense. The State pays for shipping the failed modules to you. All warranty documentation must be submitted to the Engineer before installation. Replacement LED signal modules must be delivered to State Maintenance Electrical Shop at the Caltrans District 11 Signal Laboratory, 7181 Opportunity Road, San Diego, CA 92111.

MATERIALS

Minimum power consumption for LED signal module must be 5 W.

LED signal module must have an operational lifecycle rating of 48 months. During the operational lifecycle, LED signal module must meet all parameters of this specification.

LED signal module must be designed for installation in the door frame of standard traffic signal housing.

LED signal module must:

1. Be 1.8 kg maximum mass
2. Be manufactured for 300-mm circular, 200-mm circular, arrow, U-turn, bicycle, and lane control section
3. Be from the same manufacturer
4. Be the same model for each size
5. Be sealed units with:

    5.1. 2 color-coded conductors for power connection, except for lane control LED signal modules use 3 color-coded conductors.

    5.2. Printed circuit board and power supply contained inside and complying with Chapter 1, Section 6 of TEES published by the Department.

    5.3. Lens that is:

        5.3.1. Integral to the units

        5.3.2. Convex or flat with a smooth outer surface

        5.3.3. Made of UV stabilized plastic or glass, and withstands UV exposure from direct sunlight for 48 months without exhibiting evidence of deterioration

    5.4. 1-piece EPDM gasket

6. Include 1-meter long conductors with quick disconnect terminals attached as specified in Section 86-4.01C, "Electrical Components," of the Standard Specifications
7. Be sealed in door frames
8. Fit into existing traffic signal section housing and comply with ITE publication, Equipment and Material Standards, Chapter 2, "Vehicle Traffic Control Signal Heads"

Individual LEDs must be wired so catastrophic loss or failure of 1 LED will not result in loss of more than 5 percent of the signal module light output. Failure of an individual LED in a string must not result in loss of entire string or other indication.

No special tools for installation are allowed.

300-mm Arrow

Comply with Section 9.01 of ITE publication, Equipment and Material Standards, Chapter 2, "Vehicle Traffic Control Signal Heads" for arrow indications.

300-mm U-turn

Symbol is an inverted "U" with arrow on left end and is 24 mm wide. Approximate shape and size for the U-turn face is shown on the plans.

300-mm Bicycle

Approximate shape and size for the bicycle signal face is shown on the plans.

300-mm Lane Control

Combination module with a red X and green arrow. Approximate shape and size for lane control modules is shown on the plans. Conductor function and color code must be as follows:

Conductor Function and Color Code

Function	Color
Neutral	White
Red X	Red
Green Arrow	Brown

LED signal module must:

1. Be weather tight and connect directly to electrical wiring.
2. Be capable of optical unit replacement.
3. Be a single, self-contained device, ready for installation into traffic signal housing.
4. Have manufacturer's name, trademark, model number, serial number, lot number, month and year of manufacture, and required operating characteristics, including rated voltage, power consumption, and volt-ampere, permanently marked on the back of the module.
5. Have a symbol of module type and color. Symbol must be 25 mm in diameter. Color must be written out in 13 mm high letters next to the symbol.
6. Be AlInGaP technology for red and yellow indications and gallium nitride technology for green indications.
7. Be ultra bright type rated for 100,000 hours of continuous operation from -40 °C to +74 °C.
8. Have a maximum power consumption as follows:

Power Consumption Requirements

LED Signal Module Type	Power Consumption (Watts)					
	Red		Yellow		Green	
	25 °C	74 °C	25 °C	74 °C	25 °C	74 °C
300-mm circular	11	17	22	25	15	15
200-mm circular	8	13	13	16	12	12
300-mm arrow	9	12	10	12	11	11
300-mm U-turn	9	12	10	12	11	11
Bicycle	11	17	22	25	15	15
Programmed Visibility	11	17	22	25	15	15
Lane Control (X)	9	12	--	--	--	--
Lane Control (Arrow)	--	--	--	--	11	11

Lens may be tinted, or may use transparent film or materials with similar characteristics to enhance "ON/OFF" contrasts. Tinting or other materials to enhance "ON/OFF" contrast must not affect chromaticity and must be uniform across the face of the lens.

If polymeric lens is used, surface coating or chemical surface treatment must be applied for front surface abrasion resistance.

Power supply must be integral to the module.

Internal components must be adequately supported to withstand mechanical shock and vibration from high winds and other sources.

Lens and LED signal module material must comply with the ASTM specifications for that material.

Enclosures containing either the power supply or electronic components of LED signal module, except lenses, must be made of UL94VO flame-retardant material.

If a specific mounting orientation is required, the LED signal module must have prominent and permanent vertical markings for accurate indexing and orientation within the signal housing. Markings must include an up arrow, or the word "UP" or "TOP."

LED signal module must meet or exceed the following values when operating at 25 °C:

Minimum Initial Intensities for Circular Indications (cd)

Angle (v,h)	200-mm			300-mm		
	Red	Yellow	Green	Red	Yellow	Green
2.5, ±2.5	157	314	314	399	798	798
2.5, ±7.5	114	228	228	295	589	589
2.5, ±12.5	67	133	133	166	333	333
2.5, ±17.5	29	57	57	90	181	181
7.5, ±2.5	119	238	238	266	532	532
7.5, ±7.5	105	209	209	238	475	475
7.5, ±12.5	76	152	152	171	342	342
7.5, ±17.5	48	95	95	105	209	209
7.5, ±22.5	21	43	43	45	90	90
7.5, ±27.5	12	24	24	19	38	38
12.5, ±2.5	43	86	86	59	119	119
12.5, ±7.5	38	76	76	57	114	114
12.5, ±12.5	33	67	67	52	105	105
12.5, ±17.5	24	48	48	40	81	81
12.5, ±22.5	14	29	29	26	52	52
12.5, ±27.5	10	19	19	19	38	38
17.5, ±2.5	19	38	38	26	52	52
17.5, ±7.5	17	33	33	26	52	52
17.5, ±12.5	12	24	24	26	52	52
17.5, ±17.5	10	19	19	26	52	52
17.5, ±22.5	7	14	14	24	48	48
17.5, ±27.5	5	10	10	19	38	38

Minimum Luminance for Arrows, U-turn, Bicycle, Lane Control, and PV Indications (cd/m2)

	Red	Yellow	Green
Arrow Indication	5,500	11,000	11,000
U-turn Indication	5,500	11,000	11,000
Bicycle Indication	5,500	5,500	5,500
Lane Control Indication (X)	5,500	--	--
Lane Control Indication (Arrow)	--	--	5,500
PV Indication (cd at 2.5°±2.5°)	314	314	314

LED signal module must meet or exceed the following illumination values for 48 months when operating over a temperature range of -40 °C to + 74 °C. Yellow LED signal module must meet or exceed the following illumination values for 48 months, when operating at 25 °C:

Minimum Maintained Intensities for Circular Indications (cd)

Angle (v,h)	200-mm			300-mm		
	Red	Yellow	Green	Red	Yellow	Green
2.5, ±2.5	133	267	267	339	678	678
2.5, ±7.5	97	194	194	251	501	501
2.5, ±12.5	57	113	113	141	283	283
2.5, ±17.5	25	48	48	77	154	154
7.5, ±2.5	101	202	202	226	452	452
7.5, ±7.5	89	178	178	202	404	404
7.5, ±12.5	65	129	129	145	291	291
7.5, ±17.5	41	81	81	89	178	178
7.5, ±22.5	18	37	37	38	77	77
7.5, ±27.5	10	20	20	16	32	32
12.5, ±2.5	37	73	73	50	101	101
12.5, ±7.5	32	65	65	48	97	97
12.5, ±12.5	28	57	57	44	89	89
12.5, ±17.5	20	41	41	34	69	69
12.5, ±22.5	12	25	25	22	44	44
12.5, ±27.5	9	16	16	16	32	32
17.5, ±2.5	16	32	32	22	44	44
17.5, ±7.5	14	28	28	22	44	44
17.5, ±12.5	10	20	20	22	44	44
17.5, ±17.5	9	16	16	22	44	44
17.5, ±22.5	6	12	12	20	41	41
17.5, ±27.5	4	9	9	16	32	32

Minimum Maintained Luminance for Arrow, U-turn, Bicycle, Lane Control, and PV Indications (cd/m2)

	Red	Yellow	Green
Arrow Indication	5,500	11,000	11,000
U-turn Indication	5,500	11,000	11,000
Bicycle Indication	5,500	5,500	5,500
Lane Control Indication (X)	5,500	--	--
Lane Control Indication (Arrow)	--	--	5,500
PV Indication (at 2.5°±2.5°)	314	314	314

LED signal module must comply with the following chromaticity requirements for 48 months when operating over a temperature range of -40 °C to +74 °C.

Chromaticity Standards (CIE Chart)

Red	Y: not greater than 0.308, or less than 0.998 -x
Yellow	Y: not less than 0.411, nor less than 0.995 - x, nor greater than 0.452
Green	Y: not less than 0.506 - 0.519x, nor less than 0.150 + 1.068x, nor more than 0.730 - x

LED signal module must operate:

1. At a frequency of 60 Hz ± 3 Hz, over a voltage range from 95 V(ac) to 135 V(ac), without perceptible flicker to the unaided eye. Fluctuations of line voltage must have no visible effect on luminous intensity of the indications. Rated voltage for measurements must be 120 V(ac).
2. Compatible with currently used controller assemblies, including solid state load switches, flashers, and conflict monitors. Comply with TEES Chapters 3 and 6. If a 20 mA alternating current or less is applied to the unit, the voltage read across the 2 leads must be 15 V(ac) or less.

Wiring and terminal block must comply with Section 13.02 of ITE publication, Equipment and Material Standards, Chapter 2, "Vehicle Traffic Control Signal Heads." Electrical connection for each Type 1 LED signal module must be 2 secured, color-coded, 1-meter long, 600 V(ac), 20 AWG minimum stranded jacketed copper wires. Wires must comply with NEC, rated for service at +105 °C. Three wires must be used for lane control LED signal module.

LED signal module on-board circuitry must:

1. Include voltage surge protection to withstand high-repetition noise transients. The voltage surge protection must comply with NEMA Standard TS2, Section 2.1.6.
2. Comply with FCC, Title 47, SubPart B, Section 15 regulations for Class A emission limits for electronic noise.

LED signal module must provide a power factor of 0.90 or greater.

Total harmonic distortion from current and voltage induced into an alternating current power line by LED signal module must not exceed 20 percent at an operating temperature of 25 °C.

When power is applied to LED signal module, light emission must occur within 90 ms.

Red and Yellow Flashing LED Signal Module

No external circuitry to flash the LED signal module is allowed. Use 12 V(dc) or 120 V(ac).

Flashing LED signal module circuitry must prevent perceptible light emission to the unaided eye when a voltage, 50 V(ac) or less for alternating current or 5 V(dc) for 12 V(dc) flasher units, is applied to the unit.

Electrical connection for each flashing LED signal module must be 4 secured, color-coded, 600 V(ac), 20 AWG minimum stranded jacketed copper wires. Wire must comply with NEC, rated for service at +105 °C. Conductors for flashing LED signal module must be 1 meter in length, with quick disconnect terminals attached, and must comply with Section 86-4.01C, "Electrical Components," of the Standard Specifications. The color code is as follows:

Color Code Requirements

Function	Color
Neutral/DC common	white
Steady On	red
Flash On	brown
Flash Out	orange

Flashing LED signal module must include all necessary electronics to:

1. Operate in a "Steady On" mode
2. Perform, in "Flash On" mode, 50 to 60 flashes per minute with a 50 percent ± 5 duty cycle
3. Allow alternating flashing operation, wig-wag, if the "Steady On" input of another flashing LED signal module is connected

When power is applied to the "Flash On" control conductor, the control output must allow a 12 V(dc) or 120 V(ac) signal that is switched opposite of the flash state of the module. Output must be able to source a maximum of 2.5 A for 12 V(dc), or 0.3 A for 120 V(ac).

Do not use the power consumption from "Flash Out" output of the flashing LED signal module when determining maximum power consumption.

The flashing LED Signal module must be clearly marked on the back, as "DC FLASHER" or "AC FLASHER", in 13-mm letters.

10-3.39 BATTERY BACKUP SYSTEM

GENERAL

Summary

This work includes installing battery backup system (BBS). Comply with Section 86, "Signals, Lighting and Electrical Systems," of the Standard Specifications and TEES.

The State will furnish BBS components as listed in "Materials" of these special provisions.

You must furnish the external cabinet and batteries.

Submittals

Before shipping external cabinets to the jobsite, submit material list including contract number, cabinet serial numbers, and contact information to the Transportation Laboratory.

Submit a Certificate of Compliance for each external cabinet and batteries to the Engineer under Section 6-1.07, "Certificates of Compliance," of the Standard Specifications.

Quality Control and Assurance

The State may test the cabinets.

Functional Testing

After complete installation, BBS functional test must be performed. Test for 30 minutes of continuous, satisfactory operation with utility power turned off. Perform test in the presence of the Engineer.

Warranty

Batteries must be warranted by the manufacturer to operate within a temperature range of -25 °C to +74 °C for 2 years.

Batteries must have a written warranty against defects in materials and workmanship from the manufacturer prorated for a period of 60 months after installation. You must provide the Engineer with all warranty documentation before installation. Replacement batteries must be available within 5 business days after receipt of failed batteries at no cost to the State except the cost of shipping the failed batteries. Replacement batteries must be delivered to Caltrans Maintenance Electrical Shop at the Caltrans District 11 Signal Laboratory, 7181 Opportunity Road, San Diego, CA 92111.

MATERIALS

Batteries must:

1. Be deep cycle, sealed prismatic, lead-calcium-based, absorbed-glass mat and valve-regulated lead acid (AGM/VRLA) type
2. Have voltage rating of 12 V
3. Be group size 24
4. Be commercially available and stocked locally
5. Have a carrying handle
6. Be marked with date code, maximum recharge data, and recharge cycles
7. Have 2 top-mounted, threaded, stud posts that include all washers and nuts required for attaching 9.5-mm ring lugs of a State-furnished BBS battery harness
8. Include rubber insulating protective covers for protecting the lugs, posts, and wiring - red for positive terminal and black for negative terminal
9. Be new and fully-charged when furnished
10. Be free from damage or deformities

External cabinet must be one listed on the Pre-Qualified Products List at:

http://www.dot.ca.gov/hq/esc/approved_products_list/

External cabinet must be capable of housing:

1. 8 batteries
2. Inverter/charger unit
3. Power transfer relay
4. Manually-operated bypass switch
5. Required control panels
6. Wiring and harnesses

Dimensions and details for the external cabinet, for attaching the external cabinet to the Model 332A cabinet, and for wiring the State-furnished equipment will be available in an information handout as described in "Project Information" of these special provisions.

The following details must comply with Section 86-3.04, "Controller Cabinets," of the Standard Specifications and TEES:

1. Door construction, including material, thickness, coating, and welds
2. Frame
3. Door seals
4. Continuous stainless steel piano hinge or 4 leaves with 2 bolts on each side of each leaf, used to connect the door to external cabinet
5. Padlock clasp or latch and lock mechanism

The external cabinet must be ventilated by using louvered vents, filter, and a thermostatically controlled fan. Fan must be AC-operated from the same line output as the Model 332A cabinet. A 2-position terminal block must be provided on the fan panel, along with 3 meters of connected hookup wire.

The external cabinet surface must be anodized aluminum. Anti-graffiti paint must not be used.

The external cabinet must include all bolts, washers, nuts, and cabinet-to-cabinet coupler fittings necessary for mounting it to the Model 332A cabinet.

Fasteners for the external cabinet must include:

1. 8 cabinet mounting bolts that are 18-8 stainless steel hex head, fully-threaded, and 9.5 mm – 16 x 25.4 mm
2. 2 washers per bolt designed for 9.5-mm bolt and are 18-8 stainless steel 25.4-mm OD round flat type
3. K-lock nut per bolt: K-lock washer that is 18-8 stainless steel and hex-nut

External cabinet to Model 332A cabinet couplings must include a conduit for power connections between the 2 cabinets. Couplings must include:

1. 51-mm nylon-insulated steel chase nipple, T & B 1947 or equivalent
2. 51-mm sealing, steel locknut, T & B 146SL or equivalent
3. 51-mm nylon-insulated steel bushing, T & B 1227 or equivalent

CONSTRUCTION

Mount external cabinet to either the left or right side of Model 332A cabinet. The typical side-mounting location of external cabinet is flush with the bottom of the Model 332A cabinet and approximately equidistant from the front and rear door edges.

10-3.40 LIGHT EMITTING DIODE PEDESTRIAN SIGNAL FACE MODULES

GENERAL

Summary

This work includes installing LED pedestrian signal face (PSF) module into standard Type A pedestrian signal housing. Comply with Section 86, "Signals, Lighting and Electrical Systems," of the Standard Specifications.

Submittals

Before shipping LED PSF modules to job site, submit the following to the Transportation Laboratory:

1. Delivery form including district number, EA, and contact information
2. List containing all LED PSF module serial numbers anticipated for use
3. LED PSF modules

Quality Control and Assurance

Module must be one listed on the Pre-Qualified Products List for LED traffic signals at:

http://www.dot.ca.gov/hq/esc/approved_products_list

The State will test LED PSF module shipments as specified in ANSI/ASQ Z1.4.. Testing will be completed within 30 days of delivery to the Transportation Laboratory. LED PSF modules tested or submitted for testing must be representative of typical production units. LED PSF modules will be tested as specified in California Test 606. All parameters of the specification may be tested on the modules.

Delays resulting from submittal of non-compliant materials do not relieve you from executing the contract within the allotted time. Non-compliant materials will be rejected. You must resubmit new LED for retesting and pick up the failed units within 7 days of notification. You must provide new LED PSF modules and allow a minimum of 30 days for the retest. You must pay for all shipping and handling costs related to testing and retesting. Delays resulting from resubmittal and retesting are your responsibility and no extra time will be allowed.

After successful testing, you must pick up the tested LED PSF modules from the Transportation Laboratory and deliver to the job site.

Warranty

The manufacturer must provide a written warranty against defects in materials and workmanship for LED PSF modules for a minimum period of 48 months after installation of LED PSF modules. Replacement LED PSF modules must be provided within 15 days after receipt of failed LED PSF modules at your expense. The State pays for shipping the failed modules to you. All warranty documentation must be submitted to the Engineer before installation. Replacement LED PSF modules must be delivered to State Maintenance Electrical Shop at the Caltrans District 11 Signal Laboratory, 7181 Opportunity Road, San Diego, CA 92111.

MATERIALS

LED PSF module must:

1. Be from the same manufacturer.
2. Be installed in standard Type A pedestrian signal housing, "UPRAISED HAND" and "WALKING PERSON." Do not include reflectors.
3. Use LED as the light source.
4. Be designed to mount behind or replace face plates of standard Type A housing as specified in ITE publication, Equipment and Material Standards, Chapter 3, "Pedestrian Traffic Control Signal Indications" and the "California MUTCD."
5. Have a minimum power consumption of 10 W.
6. Use required color and be ultra bright type rated for 100,000 hours of continuous operation from -40 °C to +74 °C.
7. Be able to replace signal lamp optical units and pedestrian signal faces with both LED and incandescent light sources.
8. Fit into pedestrian signal section housings without modifications to the housing. The housing must comply with ITE publication, Equipment and Materials Standards, Chapter 3, "Pedestrian Traffic Control Signal Heads."
9. Be a single, self-contained device, not requiring on-site assembly for installation into standard Type A housing.
10. Have the following information permanently marked on the back of module:

    10.1. Manufacturer's name
    10.2. Trademark
    10.3. Model number
    10.4. Serial number
    10.5. Lot number
    10.6. Month and year of manufacture
    10.7. Required operating characteristics, as follows:

        10.7.1. Rated voltage
        10.7.2. Power consumption
        10.7.3. Volt-ampere (VA)
        10.7.4. Power factor

11. Have prominent and permanent vertical markings for accurate indexing and orientation within the signal housing if a specific mounting orientation is required. Markings must include an up arrow, or the word "UP" or "TOP." Marking must be a minimum of 25-mm diameter.

Circuit board and power supply must be contained inside the LED PSF modules. Circuit board must comply with Chapter 1, Section 6 of TEES published by the Department.

Individual LEDs must be wired so catastrophic loss or failure of 1 LED will not result in loss of more than 5 percent of the PSF module light output. Failure of an individual LED in a string must not result in the loss of entire string or other indication.

LEDs must be evenly distributed in each indication. Do not use outline forms.

No special tools for installation are allowed.

Power supply for LED PSF module must be integral to the module. Power supply for each symbol must be isolated to avoid turn-on conflict.

Assembly and manufacturing processes for LED PSF module must assure that all internal components are adequately supported to withstand mechanical shock and vibration from high winds and other sources.

Material used for LED PSF module must comply with ASTM D 3935.

Enclosures containing either the power supply or electronic components of LED PSF module, except lenses, must be made of UL94VO flame-retardant material.

Color of "UPRAISED HAND" symbol must be portland orange.

Color of "WALKING PERSON" symbol must be lunar white.

Each symbol must not be less than 250 mm high and 165 mm wide. Uniformity ratio of illuminated symbols must not exceed 4 to 1 between highest and lowest luminance areas. Symbols must comply with ITE publication, Equipment and Material Standards, Chapter 3, "Pedestrian Traffic Control Signal Indications," and the "California MUTCD."

LED PSF module must maintain an average luminance value over 48 months of continuous use in signal operation for a temperature range of -40 °C to +74 °C. In addition, LED PSF modules must meet or exceed the following luminance values upon initial testing at 25 °C.

Luminance Values

PSF module	Luminance
UPRAISED HAND	3,750 cd/m2
WALKING PERSON	5,300 cd/m2

Color output of LED PSF module must comply with chromaticity requirements in Section 5.3 of ITE publication, Equipment and Material Standards, Chapter 3, "Pedestrian Traffic Control Signal Indications."

Measured chromaticity coordinates of LED PSF module must comply with the following chromaticity requirements for 48 months when operating over a temperature range of -40 °C to +74 °C.

Chromaticity Standards (CIE Chart)

UPRAISED HAND (portland orange)	Not greater then 0.390, nor less than 0.331, nor less than 0.997-X
WALKING PERSON (lunar white)	X: not less than 0.280, nor greater than 0.320 Y: not less than 1.055*X - 0.0128, nor greater than 1.055*X + 0.0072

LED PSF module maximum power consumption must not exceed the following values:

Power Consumption Requirements

PSF module	Power Consumption @ 24ºC	Power Consumption @ 74ºC
UPRAISED HAND	10.0 W	12.0 W
WALKING PERSON	9.0 W	12.0 W

Wiring and terminal block must comply with Section 13.02 of ITE publication, Equipment and Material Standards, Chapter 2, "Vehicle Traffic Control Signal Heads." The LED PSF module must be supplied with spade lugs and 3 secured, color-coded, 1 meter long, 600 V(ac), 20 AWG minimum stranded jacketed copper wires. Wires must comply with NEC, rated for service at +105 °C.

LED PSF module must operate:

1. At a frequency of 60 Hz ± 3 Hz over a voltage range from 95 V(ac) to 135 V(ac) without perceptible flicker to the unaided eye. Fluctuations of line voltage must have no visible effect on luminous intensity of the indications. Rated voltage for measurements must be 120 V(ac).
2. Compatible with currently used State controller assemblies including solid state load switches, flashers, and conflict monitors. Comply with TEES Chapters 3 and 6. If a 20 ma alternating current or less is applied to the unit, the voltage read across the 2 leads must be 15 V(ac) or less.

LED PSF module on-board circuitry must:

1. Include voltage surge protection to withstand high-repetition noise transients. The voltage surge protection must comply with NEMA Standard TS2, Section 2.1.6.
2. Comply with FCC, Title 47, SubPart B, Section 15 regulations for Class A emission limits for electronic noise.

LED PSF module must provide a power factor of 0.90 or greater.

Total harmonic distortion from current and voltage induced into an alternating current power line by LED PSF module must not exceed 20 percent at an operating temperature of 25 °C.

The LED PSF module circuitry must prevent perceptible light emission to the unaided eye when a voltage, 50 V(ac) or less is applied to the unit.

When power is applied to LED PSF module, light emission must occur within 90 ms.

The "UPRAISED HAND" and "WALKING PERSON" symbol indications must be electrically isolated from each other. Sharing a power supply or interconnect circuitry between the 2 indications is not allowed.

10-3.41 SERIAL TO ETHERNET CONVERSION UNIT

Serial to ethernet conversion unit (SECU) shall conform to the details shown on the plans and shall be in conformance with these special provisions.

Serial to ethernet conversion unit (SECU) shall have the following features:

SERIAL TO ETHERNET CONVERSION UNIT (SECU)	
FEATURE	PARAMETER/REMARKS
Support Protocols	ARP, UDP, TCP, Telnet, ICMP
Serial Device Support	Asynchronous, 7 or 8 bit with or without parity
Network Interface	Ethernet, 10BaseT
Network Connector	RJ45
Serial Interface	RS232 DCE Configuration
Serial Interface Connector	170 Controller, Single slot male edge connector
Data Rates	300 bps to 115 Kbps, Must transmit and receive 3600 bytes of serial data without interruption
Control Lines	RTS, CTS, DSR, DCD, DTR
DCD Control Line	Must frame data on receive line
Software Flow Control	XON, XOFF
Hardware Flow Control	CTS/RTS
Management	SNMP, Local console port log in or Telnet log in, Menu driven user selection
Indicators	Good Link, Network transmit/receive data, RS232, Transmit/Receive Data
Indicator Type	LED
Addressing	IP Addressable
Dimensions (nominal) (HxWxD)	Model 400 modem form factor
Operating Temperature	5 to 50˚C
Maximum Power	+12 Vdc, 3 Watts

10-3.42 ETHERNET SWITCH

Ethernet switch unit shall conform to the details shown on the plans and shall be in conformance with these special provisions.

Ethernet switch shall have the following features:

ETHERNET SWITCH	
FEATURE	**PARAMETER/REMARKS**
Unit Designation	Ethernet Switch
Number of Network Ports	12
Network Port type	10/100BaseT
Number of Uplink Ports	2
Type of Uplink Port	10/100/1000BaseT
Network Port Connector	RJ45
Network Interface	Auto sensing 10/100BaseT, Full Duplex/Half Duplex
	IEE 802.3 10BaseT Compliant
	IEE 802.3u 100BaseT Compliant
	IEE 802.3ab 1000BaseT Compliant
MAC Address	Configurable to at least 1000 MAC Addresses
Protocol Support	TCP/IP, UDP/IP, TELNET, SNMP v1/v2, VLAN, Spanning Tree
Standards Support	IEEE 802.1d Spanning Tree, IEEE 802.1p Class of Service Prioritization, IEEE 802.1Q VLAN Tagging, IEEE 802.1s Multiple Spanning Tree, IEEE 802.1w Rapid Spanning Tree, IEEE 802.1x Port Based Network Access Control, IEEE 802.3, IEEE 802.3u Fast Ethernet, IEEE 802.x Full Duplex and Flow Control, IEEE 802.ab Gigabit Ethernet, 802.3ad Link aggregation, RFC 854 Telnet
Indicators	Power, “Good Ethernet Link”, Ethernet Traffic
Indicator Type	LED
Dimensions (nominal) (HxWxD)	(available cabinet space as shown on plans)
Operating Temperature	0 to 60° C
Operation Voltage	110v
Operating Current	Less than 1.3A at 110v
Weight	0.3 kg
Relative Humidity	5 to 95% relative humidity
Regulatory Compliance	EN 60950, EN 55024, FCC part 15, CSA 22.2 No. 60950
Warranty	Three Years

10-3.43 ETHERNET EXTENDER PROVIDER

Ethernet extender provider (EEP) shall conform to the details shown on plans and shall be in conformance with these special provisions.

Ethernet extender provider (EEP) unit shall operate as a pair with ethernet extender subscriber (EES) unit to extend 10/100Base T ethernet network signaling over a single twisted pair of conductors as shown on plans and shall have the following features:

ETHERNET EXTENDER PROVIDER	
FEATURE	**PARAMETER/REMARKS**
Unit Designation	Ethernet Extender Provider
Unit Operability	Must work with Ethernet Extender Subscriber
Line Coding Standard	G.SHDSL
Minimum Line Rate	2300 kbit/s at 1.7Km, AWG24 cat 5 cable
Data Rate Selection	DIP switch
G.SHDSL ports	1 minimum
G.SHDSL connector	RJ11, RJ12 or RJ45
G.SHDSL protocol	ITU G.991.2
Network Ports	10/100 Base-TX
Network Connector	RJ45 for 10/100 Base-TX Ethernet
Network Interface	Full Duplex/Half Duplex
	IEE 802.3 10BaseT Compliant
	IEE 802.3u 10BaseT Compliant
Protocol Support	TCP/IP, UDP/IP
Indicators	Power, “Good Ethernet Link”, Ethernet Traffic, “Good SHDSL Link”, “SHDSL connection initiation”
Indicator Type	LED
Dimensions (nominal) (HxWxD)	35mm x 121mm x 119mm
Operating Temperature	0 to 50° C
Operation Voltage	110V
Operating Current	Less than 1.0A at 110V
Weight	0.3 kg
Relative Humidity	5 to 95% relative humidity
Regulatory Compliance	EN 60950, EN 55024, FCC part 15, CSA 22.2 No. 60950
Warranty	Three years

10-3.44 ETHERNET EXTENDER SUBSCRIBER

Ethernet extender subscriber (EES) shall conform to the details shown on plans and shall be in conformance with these special provisions.

Ethernet extender subscriber (EES) unit shall operate as a pair with ethernet extender provider (EEP) unit to extend 10/100Base T ethernet network signaling over a single twisted pair of conductors as shown on plans and shall have the following features:

ETHERNET EXTENDER SUBSCRIBER	
FEATURE	**PARAMETER/REMARKS**
Unit Designation	Ethernet Extender Provider
Unit Operability	Must work with Ethernet Extender Provider
Line Coding Standard	G.SHDSL
Minimum Line Rate	2300 kbit/s at 1.7Km, AWG24 cat 5 cable
Data Rate Selection	DIP switch
G.SHDSL ports	1 minimum
G.SHDSL connector	RJ11, RJ12 or RJ45
G.SHDSL protocol	ITU G.991.2
Network Ports	10/100 Base-TX
Network Connector	RJ45 for 10/100 Base-TX Ethernet
Network Interface	Full Duplex/Half Duplex
	IEE 802.3 10BaseT Compliant
	IEE 802.3u 10BaseT Compliant
Protocol Support	TCP/IP, UDP/IP
Indicators	Power, “Good Ethernet Link”, Ethernet Traffic, “Good SHDSL Link”, “SHDSL connection initiation”
Indicator Type	LED
Dimensions (nominal) (HxWxD)	35mm x 121mm x 119mm
Operating Temperature	0 to 50° C
Operation Voltage	110V
Operating Current	Less than 1.0A at 110V
Weight	0.3 kg
Relative Humidity	5 to 95% relative humidity
Regulatory Compliance	EN 60950, EN 55024, FCC part 15, CSA 22.2 No. 60950
Warranty	Three years

10-3.45 ETHERNET HUB

Ethernet Hub shall conform to the details shown on plans and shall be in conformance with these special provisions.
2
Ethernet Hub shall have the following features:

ETHERNET HUB	
FEATURE	**PARAMETER/REMARKS**
Unit Designation	Ethernet Hub
Number of Network Ports	4
Network Port type	10/100BaseT
Number of Uplink Ports	2
Type of Uplink Port	10/100BaseT
Network Port Connector	RJ45
Network Interface	Auto sensing 10/100BaseT, Full Duplex/Half Duplex
	IEE 802.3 10BaseT Compliant
	IEE 802.3u 100BaseT Compliant
	IEE 802.3ab 1000BaseT Compliant
MAC Address	Configurable to at least 1000 MAC Addresses
Protocol Support	TCP/IP, UDP/IP, TELNET, SNMP v1/v2
Indicators	Power, “Good Ethernet Link”, Ethernet Traffic
Indicator Type	LED
Dimensions (nominal) (HxWxD)	(available cabinet space as shown on plans)
Operating Temperature	0 to 60° C
Operation Voltage	110v
Operating Current	Less than 1.3A at 110v
Weight	0.3 kg
Relative Humidity	5 to 95% relative humidity
Regulatory Compliance	EN 60950, EN 55024, FCC part 15, CSA 22.2 No. 60950
Warranty	Three Years

10-3.46 MEDIA CONVERTER

Media converter shall conform to the details shown on the plans and shall be in conformance with these special provisions.

Media converter optical link range shall be suitable for the operational distances shown on the plan sheets.

Media converter shall have the following features:

MEDIA CONVERTER	
FEATURE	PARAMETER/REMARKS
Ports	Two RJ-45 (10/100Base-TX)
	100 Mbps duplex fiber port with SC-Type connector (singlemode required)
10/100Base-TX port	Automatically senses 10 Mbps or 100 Mbps connection speed, Auto-negotiates half- or full-duplex mode, Auto-selects MDI/MDI-X media type
Fiber port	Half /full-duplex mode selector
Network media	100Base-TX and 100Base-FX: Singlemode fiber optic cable 8/125 µm or 9/125 µm, full-duplex to 20 km
Serial Console Port	RS232
Protocol	SNMP manageable through SNMP-enabled networking management system via console or add-on module
Data Transfer Rate	100Mbps (Half-Duplex), 200Mbps (Full-Duplex)
Status LED indicators	power, copper link/activity, fiber optic link/activity, half/full duplex mode
Mounting	Slot/Chassis Configuration
Power Supply	Supply voltage range 100 V to 135 V at 60 Hz. Maximum power consumption 18 W) Chassis units: only one power supply permitted
Power Adapter	Temperature: Operating: 0 to 35˚C
	Humidity: Operating: up to 85 % (non-condensing)
Standards Compliance	IEEE 802.3; FCC: Class A or Class B, 10/100Base-TX, 100Base-FX
Warranty	not less than 5 years for media and chassis (excludes power supplies, fans and lasers)

10-3.47 MEDIA CONVERTER (MULTIPOINT MEDIA CONVERTER)

Media converter shall conform to the details shown on the plans and shall be in conformance with these special provisions.

Media converter optical link range shall be suitable for the operational distances shown on the plan sheets.

Media converter shall have the following features:

MEDIA CONVERTER (Multipoint Media Converter)	
FEATURE	**PARAMETER/REMARKS**
Ports	RJ-45 (10/100Base-TX)
	100 Mbps duplex fiber port with SC-Type connector (singlemode required)
10/100Base-TX port	Automatically senses 10 Mbps or 100 Mbps connection speed, Auto-negotiates half- or full-duplex mode, Auto-selects MDI/MDI-X media type
Fiber port	Half /full-duplex mode selector
Number of Fiber to Ethernet Conversion Ports	14 fiber to 14 ethernet
Network media	100Base-TX and 100Base-FX: Singlemode fiber optic cable 8/125 µm or 9/125 µm, full-duplex to 20 km
Serial Console Port	RS232
Protocol	SNMP manageable through SNMP-enabled networking management system via console or add-on module
Data Transfer Rate	100Mbps (Half-Duplex), 200Mbps (Full-Duplex)
Status LED indicators	power, copper link/activity, fiber optic link/activity, half/full duplex mode
Mounting	Rack mounted or Slot/Chassis Configuration as required
Power Supply	Supply voltage range 100 V to 135 V at 60 Hz. Standalone units: Internal power supply (maximum power consumption 6 W) or external power supply (maximum power consumption 14 W) Chassis units: only one power supply permitted
Power Adapter	Temperature: Operating: 0 to 35˚C
	Humidity: Operating: up to 85 % (non-condensing)
Standards Compliance	IEEE 802.3; FCC: Class A or Class B, 10/100Base-TX, 100Base-FX
Warranty	not less than 5 years for media and chassis (excludes power supplies, fans and lasers)

10-3.48 ROUTER

Router shall conform to the details shown on plans and shall be in conformance with these special provisions.

Router shall have the following features:

DS3 ROUTER PERFORMANCE	
FEATURE	**PARAMETER/REMARKS**
DS3 Interface	2B1Q Modulation
	Data Rates (symmetrical): up to 45Mbs
Bridging	Transparent bridging including Spanning Tree protocol (IEEE802.ID)
Routing	TCP/IP, RIP
Configuration Management	SNMP
DS3 Connector	RJ45
LAN Connector	RJ45 10BaseT Ehternet
PPP	(( ))
Security	User Authentication
	Password control via Manager
Unit Designation	Router
Unit Operability	(( ))
Serial Console Port	RS232 connectivity
Identification	IP Addressable
Memory	Internal Flush, 1 MB minimum
Indicators	Power, “Good Link”, Transmit/Receive Data
Indicator Type	LED
Software Updates	Via Serial Port or Network Port
Configuration	Via Serial Port or Network Port
Dimentions (nominal, maximum)	(6H x 25W x 20D) (cm)
Operating Temperature	5 to 40 degree C
Operating Voltage	110V (ac)

10-3.49 DETECTORS

Loop detector sensor units will be State-furnished in conformance with the provisions in "Materials" of these special provisions.

Loop wire shall be Type 2.

Loop detector lead-in cable shall be Type B.

Slots shall be filled with elastomeric sealant or hot-melt rubberized asphalt sealant.

At the Contractor's option, where a Type A or a Type B loop is designated on the plans, a Type E loop may be substituted.

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 16 mm. Loop wire for circular loops shall be Type 2. Slots of circular loops shall be filled with elastomeric sealant or hot melt rubberized asphalt sealant.

The depth of loop sealant above the top of the uppermost loop wire in the sawed slots shall be 50 mm, minimum.

PREFORMED INDUCTIVE LOOPS

Preformed inductive loops shall be the type shown on the plans.

The loop shall be 1.8 m square unless otherwise shown. The loop shall consist of 4 turns of No. 16, or larger, wire with Type THWN or TFFN insulation.

The loop wires shall be encased in Size 10, minimum, Schedule 40 or Schedule 80 PVC or polypropylene conduit. The conduit shall be sealed to prevent the entrance of water and the movement of wires within the conduit.

The loop wires from the preformed loop to the adjacent pull box shall be twisted together into a pair (at least 7 turns per meter) and encased in Schedule 40 or Schedule 80 PVC or polypropylene conduit between the preformed loop and the adjacent pull box or detector handhole. The lead-in conduit shall be sealed to prevent the entrance of water at the pull box or handhole end.

In new reinforced concrete structure decks, the preformed loops shall be secured to the top of the uppermost layer of reinforcing steel using nylon wire ties. The loop shall be held parallel to the structure deck by using PVC or polypropylene spacers where necessary. Conduit for lead-in conductors shall be placed between the uppermost 2 layers of reinforcing steel.

Preformed inductive loops shall not be installed in existing structure decks.

10-3.50 VIDEO IMAGE VEHICLE DETECTION SYSTEM

GENERAL

Summary

This work includes installing video image vehicle detection system (VIVDS) for traffic signals.
Comply with Section 86, "Signals, Lighting and Electrical Systems," of the Standard Specifications.

Submittals

Submit proposed list of materials before starting work. Submit drawings and other data before the completion of the contract. Submittals include:

Submittals

Item	Description
Certificate of compliance	For VIVDS as specified in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications.
Site analysis report	Written analysis for each detection site, recommending the optimum video sensor placement approved by the manufacturer.
Lane configuration	Shop drawing showing detection zone setback, detection zone size, camera elevation, selected lens viewing angle, illustration of detection zone mapping to reporting contact output, and illustration of output connector pin or wire terminal for lane assignment.
Configuration record	Windows XP or later version of PC compatible CD containing the final zone designs and calibration settings to allow reinstallation.
Mounting and wiring information	Approved wiring and service connection diagrams wrapped in clear self-adhesive plastic, placed in a heavy duty plastic envelope, and secured to the inside of the cabinet door.
Communication protocol	Industry standard available in public domain. Document defining message structure organization, data packet length, message usability, and necessary information to operate a system from a remote Windows based personal computer.
Programming software	CD containing set up and calibration software that observes and detects the vehicular traffic, including bicycles and motorcycles, with overlay of detection zones and allows adjustment of the detection sensitivity from a traffic signal application.
Detector performance DVD recordings and analysis	Performance analysis based on 24-hour DVD recording of contiguous activity for each approach. Include 2 contiguous hours of sunny condition, with visible shadows projected a minimum of 6 feet into the adjacent lanes, and two 1-hour night periods with vehicle headlights present.
Preventative maintenance parts documentation	Documentation containing equipment replacement parts list for preventative maintenance, including electrical parts, mechanical parts, and assemblies.
Acceptance testing schedule	Submit schedule for approval 15 days before acceptance testing of VIVDS. Acceptance testing is separate from detector performance and analysis.
Acceptance testing documentation	Documentation for using support equipment to perform acceptance testing without assistance.
Training	
Warranty	Manufacturer's written warranty against defects in material and workmanship for VIS assemblies and VDU, for 24-month period after VIVDS installation.

Quality Control and Assurance

Training

Warranty

After final acceptance of VIVDS, provide replacement video image sensor assembly (VIS) and video detection unit (VDU) within 10 days after receipt of failed units at no cost to the State, except the cost of shipping failed VIS and VDU. Deliver replacement VIS and VDU to State Maintenance Electrical Shop at the Caltrans District 11 Signal Laboratory, 7181 Opportunity Road, San Diego, CA 92111.

MATERIALS

Functional Requirements

VIVDS must include a VIS and mounting hardware assembly installed on a pole or mast-arm. Use a clamping device as mounting hardware on standards. Include VDU, image processor, extension module and communication card, power supply, surge suppression, cables, connectors, and wiring for connecting to the State-furnished Model 332A traffic controller cabinet.

VIS and zoom lens must be housed in an environmentally sealed enclosure, watertight and protected from dust, and must comply with NEMA 4 standards. Enclosure must include a thermostat controlled heater to prevent condensation and to ensure proper lens operation at low temperatures. Adjustable sun shield that diverts water from the camera's field of view must be included. Assembly must have waterproof connections for power, control and video signal cables, and wiring.

VIVDS must include necessary firmware, hardware, and software for designing the detection patterns or zones at the intersection or approach. Detection zones must be created with a graphic user interface designed to allow trained State employee to configure and calibrate a lane in less than 15 minutes. System must support normal operation of existing detection zones while a zone is being added or modified. Zone must flash or change color on a viewing monitor when vehicular traffic is detected.

Software and firmware must detect vehicular traffic presence, provide vehicle counts, set up detection zones, test VIVDS performance, and allow video scene and system operation viewing from a remote location. VIVDS must support a minimum of 2 separate detection patterns or zones that can be enacted by a operator.

VIVDS detection zone must detect vehicles by providing an output for presence and pulse. At least 1 detection output must be provided for each detection zone. One spare detection output must be provided for each approach. Detection performance must be achieved for each detection zone with a maximum of 8 user-defined zones for every camera's field of view.

VIVDS must detect the presence of vehicles under all types of adverse weather and environmental conditions, including snow, hail, fog, dirt, dust or contaminant buildup on the lens or faceplate, minor camera motion, and excessive vibration. If less than 95 percent detection accuracy results from low visibility conditions, the VIVDS must respond by selecting a fail-safe default pattern, placing a constant call mode for all approaches. VIVDS outputs must assume a fail-safe "on" or "call" pattern for presence detection if video signal or power failure is not available and must recover from a power failure by restoring normal operations within 3 minutes without manual intervention. If powered off for more than 90 days, system must maintain the configuration and calibration information in memory.

Detection algorithm must be designed to accommodate naturally occurring lighting and environment changes, specifically the slow moving shadows cast by buildings, trees, and other objects. These changes must not result in a false detection or mask a true detection. VIVDS must not require manual interventions for day-night transition or for reflections from poles, vehicles or pavement during rain and weather changes. VIVDS must suppress blooming effects from vehicle headlights and bright objects at night.

Vehicle detection must call service to a phase only if a demand exists and extend green service to the phase until the demand is taken care of or until the flow rates have reduced to levels for phase termination. VIVDS must detect the presence of vehicular traffic at the detection zone positions and provide the call contact outputs to the Model 170E or Model 2070 with the following performance:

Detector Performance

Requirements	Performance during AMBER and RED interval	Performance during GREEN interval
Average response time after vehicle enters 3' into detection zone or after departing 3' past detection zone	≤ 1 Sec	≤ 100 ms
Maximum number of MISSED CALLS in 24-hour duration, where MISSED CALLS are greater than 5 sec. during AMBER and RED intervals and greater than 1 sec. during GREEN intervals (upon entering 3' of detection zone or after departing 3' past detection zone).	0	10
Maximum number of FALSE CALLS in 24-hour duration (calls greater than 500ms without a vehicle present)	20	20

Each camera and its mounting system must be less than 10 pounds and less than 1 square foot equivalent pressure area. Only 1 VIVDS camera must be mounted on a traffic signal or luminaire arm. Top of camera must not be more than 12 inches above top of arm.

VIVDS must be able to locally store, for each lane, vehicle count data in 5, 15, 30, and 60 minute intervals for a minimum period of 7 days and be remotely retrievable. VIVDS must count vehicular traffic in detection zone with a 95 percent accuracy or better over a 1-day period with a minimum range of 50 feet to the limit line for each approach.

VDU front panel must have indicators for power, communication, and presence of video input for each video sensor, and a real time detector output operation. Hardware or software test switch must be included to allow the user to place either a constant or momentary call for each approach. Indicators must be visible in daylight from 5 feet away.

A flat panel video display with a minimum 8-inch screen and that supports National Television Standards Committee (NTSC) video output must be furnished and installed in the Model 332A cabinet for viewing video detector images and for performing diagnostic testing. Display must be viewable in direct sunlight. Each VIVDS must have video system connections that support the NTSC video output format, can be seen in each camera's field of view, and has a program to allow the user to switch to any video signal at an intersection. A metal shelf or pull-out document tray with metal top capable of supporting the VDU and monitor must be furnished and placed on an EIA 19 inch rack with 10-32 "Universal Spacing" threaded holes in the Model 332A cabinet. System must allow independent viewing of a scene while video recording other scenes without interfering with the operation of the system's output.

VIVDS must have a serial communication port that supports sensor unit setup, diagnostics, and operation from a local PC compatible laptop with Windows XP or later version operating system. VIVDS must have an ethernet communication environment, including ethernet communication card. VIVDS must include central and field software to support remote real-time viewing and diagnostics for operational capabilities through wide area network (WAN) or wireless.

Technical Requirements

System elements must be designed to operate continuously in an outdoor traffic monitoring and control environment, all day, every day. Manufactured electronic components must support a minimum mean time between failures (MTBF) value of 10 years.

Video sensor must use a charge-coupled device (CCD) element and support NTSC and RS170 video output formats with resolution of not less than 360 horizontal lines. Video sensor must include an auto gain control (AGC) circuit, have a minimum sensitivity to scene luminance from 0.1 lux to 10,000 lux, and produce a usable video image of vehicular traffic, under all roadway lighting conditions and regardless of the time of day. Video sensor must have a motorized lens with variable focus and zoom control with an aperture of f/1.4 or better. Focal length must allow ± 50 percent adjustment of the viewed detection scene.

Enclosed VIS must operate between –37 ^{o}C to +74 ^{o}C and zero percent to 95 percent relative humidity.

Sensor unit mounting hardware must be powder-coated aluminum, stainless steel, or treated to withstand 250 hours of salt fog exposure as specified in ASTM B 117 without any visible corrosion damage.

VDU, image processors, extension modules, and video output assemblies must be inserted into the controller input file slots using the edge connector to obtain limited 24V DC power and to provide contact closure outputs. Cabling the output file to a "D" connector on the front of the VDU is acceptable. No rewiring to the standard Model 332A cabinet is allowed. Controller cabinet resident modules must comply with the requirements in Chapter 1 and Sections 5.2.8, 5.2.8.1, 5.2.8.2, 5.4.1, 5.4.5, 5.5.1, 5.5.5, and 5.5.6 of TEES.

VIVDS must operate between 90 to 135 VAC service as specified in NEMA TS-1. VIS, excluding the heater circuit, must draw less than 10 watts of power**.** Power supply or transformer for the VIVDS must meet the following minimum requirements:

Minimum Requirements for Power Supply and Transformers

Item	Power Supply	Transformer
Power Cord	Standard 120VAC, 3 prong cord, 3 ft minimum length (may be added by Contractor)	Standard 120VAC, 3 prong cord, 3 ft minimum length (may be added by Contractor)
Type	Switching mode type	Class 2
Rated Power	Two times (2x) full system load	Two times (2x) full system load
Operating Temperature	-37 °C to 74 °C	-37 °C to 74 °C
Operating Humidity Range	From 5 percent to 95 percent	From 5 percent to 95 percent
Input Voltage	From 90 V to 135 V AC	From 90 V to 135 V AC
Input Frequency	60 Hz ± 3 Hz	60 Hz ± 3 Hz
Inrush Current	Cold start, 25 A max. at 115 V	N/A
Output Voltage	As required by VIVDS	As required by VIVDS
Overload Protection	From 105 percent to 150 percent in output pulsing mode	Power limited at >150 percent
Over Voltage Protection	From 115 percent to 135 percent of rated output voltage	N/A
Setup, Rise, Hold Up	800ms, 50ms,15ms at 115V AC	N/A
Withstand Voltage	I/P-0/P:3kV, I/P-FG:1.5kV, for 60 sec.	I/P-0/P:3kV, I/P-FG:1.5kV, for 60 sec
Working Temperature	Not to exceed 70°C@30% load	Not to exceed 70 °C@ 30 percent load
Safety Standards	UL 1012, TUV EN60950	UL 1585
EMC Standards	EN55022 Class B, EN61000-4-2, 3, 4, 5	N/A

Field terminated circuits must include transient protection as specified in IEEE Standard 587-1980, Category C. Video connections must be isolated from ground.

Wiring must be routed through end caps or existing holes. New holes for mounting or wiring must be shop-drilled.

VIVDS and support equipment required for acceptance testing must be new and as specified in the manufacturer's recommendations. Date of manufacture, as shown by date codes or serial numbers of electronic circuit assemblies, must not be older than 12 months from the scheduled installation start date. Material substitutions must not deviate from the material list approved by the Engineer.

CONSTRUCTION

For materials and installation comply with the manufacturer's recommendations. All equipment, cables, and hardware must be part of an engineered system that is designed by the manufacturer to fully inter-operate with all other system components. Mounting assemblies must be corrosion resistant. Connectors installed outside the cabinets and enclosures must be corrosion resistant, weather proof, and watertight. Exposed cables must be sunlight and weather resistant. Label cables with permanent cable labels at each end.

Install VDU in a State-furnished Model 170E or Model 2070 controller assembly. Install VIS power supply or transformer on a standard DIN rail using standard mounting hardware and power conductors wired to DIN rail mounted terminal blocks in the controller cabinet.

Wire each VIS sensor assembly to the controller cabinet with a wiring harness that includes all power, control wiring, and coaxial video cable. Attach harness with standard Mil type and rated plugs. Cable type and wire characteristics must comply with manufacturer's recommendations for the VIS to cabinet distance of the project. Wiring and cables must be continuous (without splices) between the VIS sensor and controller cabinet. Coil a minimum of 7 feet of slack in the bottom of the controller cabinet. For setup and diagnostic access, terminate serial data communication output conductors at TB-0 and continue for a minimum of 10 feet to a DB9F connector. Tape ends of unused and spare conductors to prevent accidental contact to other circuits. Label conductors inside the cabinet for the functions depicted the approved detailed diagrams.

Adjust the lens to view 110 percent of the largest detection area dimension. Zones or elements must be logically combined into reporting contact outputs that are equivalent to the detection loops and with the detection accuracy required.

Verify the performance of each unit, individually, and submit the recorded average and necessary material at the conclusion of the performance test. Determine and document the accuracy of each unit, individually, so that each unit may be approved or rejected separately. Failure to submit necessary material at the conclusion of testing invalidates the test. The recorded media serves as acceptance evidence and must not be used for calibration. Calibration must have been completed before testing and verification.

Verify the detection accuracy by observing the VIVDS performance and recorded video images for a contiguous 24-hour period. The recorded video images must show the viewed detection scene, the detector call operation, the signal phase status for each approach, the vehicular traffic count, and time-stamp to 1/100 of a second, all overlaid on the recorded video. Transfer the 24-hour analysis to DVD.

VIVDS must meet the detection acceptance criterion specified in table titled "Detector Performance."

Calculate the VIVDS's vehicular traffic count accuracy as 100[1-(|TC-DC|/TC)], where DC = detector's vehicular traffic count and TC = observed media-recorded vehicular traffic count.

The Engineer will review the data findings and accept or reject the results within 7 days. Vehicle anomalies or unusual occurrences will be decided by the Engineer. Data or counts not agreed by the Engineer will be considered errors and count against the unit's calibration. If the Engineer determines that the VIVDS does not meet the performance requirements, you must re-calibrate and retest the unit, and resubmit new test data within 7 days. After 3 failed attempts, you must replace the VIVDS with a new unit.

Notify the Engineer 20 days before the unit is ready for acceptance testing. Acceptance testing must be scheduled to be completed before the end of a normal work shift. You must demonstrate that all VIS cameras and VDUs satisfy the functional requirements.

10-3.51 CLOSED CIRCUIT TELEVISION CAMERA ASSEMBLY

Closed circuit television (CCTV) camera assembly shall conform to the provisions in Section 86, "Signals, Lighting and Electrical Systems," of the Standard Specifications and these special provisions.

GENERAL

Prototype equipment will not be allowed. All equipment shall be current standard production units.

The CCTV camera assembly shall consist of the following components:

A. Camera
B. Motorized zoom lens
C. Environmental enclosure with sun shield or shroud
D. Pan/tilt drive unit
E. Iris control circuit devices
F. AC step-down transformer
G. Wiper

The CCTV camera assembly shall have all necessary wiring, cables, and connectors. All CCTV camera assemblies shall be plug compatible, interchangeable and suitable for use with the CCTV camera cable assembly described in these special provisions.

CAMERA

All cameras supplied shall meet the following specifications.

Performance

PARAMETER	SPECIFICATION
Optical Device	CCD, Color, interline transfer
Optical Ccd Format Size	6.3 mm format
Horizontal Resolution	460 television lines (minimum)
Sensitivity	1 lux @ 1/60 s shutter speed (measured with fl.6 lens)
Scanning System	525 lines 2:1 interlace

Closed circuit television camera assembly components shall be rated for NEMA 4X, IP 66 or IP 67.

The camera shall be equipped with an electronic shutter with adjustable speeds ranging from 1/60 second to 1/30,000 second.

Electrical

PARAMETER	SPECIFICATION
Operating Voltage	120 V(ac) ± 10% (external adapter allowed)
Power Consumption	50 W (Maximum)
Video Output Signal	Standard NTSC color TV
Video Output Connector	Standard BNC bulkhead on rear of camera
Signal To Noise Ratio	>48 dB
Synchronization	Internal sync or phase adjustable line lock
Video Output Level	1.0 V p-p (75 Ω composite)
Gain Control	Automatic
Automatic Back Focus (Automatic White Balance)	Required

Programming shall be stored non-volatile memory and the CCTV assembly firmware shall be updateable via serial communication.

Environmental

PARAMETER	SPECIFICATION
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

CLOSED CIRCUIT TELEVISION CAMERA LENS

The CCTV camera lens shall meet the following specifications.

PARAMETER	SPECIFICATION
Format	6.3 mm format
Iris	Motorized , with automatic and manual adjust modes
Operating temperature	-10°C to +50°C
Focal Length	Maximum not less than 80 mm (Optical power not less than 21X)
Lens Aperture	F1.6 - F3.6
Horizontal angle of view at Maximum Focal Length	Not less than 2.2° for 6.3 mm format camera

The lens shall have motors for zoom, focus and iris.

The lens shall have capability for focus and zoom preset positions. A telescopic converter or extender shall not be used to achieve required focal length range.

Electrical

When the power is removed from the lens, the lens iris shall automatically close.

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

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 shall not optically "oscillate" (i.e., produce an image that alternates from too light to too dark) or otherwise be unstable.

Each lens shall have an automatic, motor-driven iris with manual override.

The lens shall include mechanical or electrical means to protect the motors from over running in the extreme position.

The iris shall be controlled directly through the camera in automatic mode and from any keyboard connected into the camera system in the manual mode. The automatic iris shall provide continuous aperture adjustments of the lens as determined by the amount of light reaching the camera imager. The power supply and electronics for iris motor shall be contained within the environmental housing.

Environmental

PARAMETER	SPECIFICATION
Operating Temperature	-25.6˚C to 50˚C (minimum range).
Storage Temperature	-40˚C to -10˚C
Operating Humidity	20 to 80% non-condensing
Storage Humidity	20 to 90% non-condensing

Installation

The Contractor shall make all the necessary adjustments on different components of the CCTV camera assembly. This includes the back-focus and tracking adjustments on the lens and color balancing of the camera.

The Contractor shall ensure the back-focus adjustment on the camera is 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.

ENVIRONMENTAL ENCLOSURE

The environmental enclosure shall be the sealed, pressurized type, designed to withstand exposure to sand, dust, fungus, and salt atmosphere, and house the assembled camera, motorized zoom lens and all internal wiring. It shall operate on a voltage range of 120 V(ac) ±10 percent power source. The enclosure shall include an internal thermostatically controlled heater assembly to minimize external faceplate condensation. The Contractor has the option of providing a sealed, pressurized Integrated Optics Cartridge (IOC) housed in a NEMA 4X rated enclosure.

The enclosure shall include a sun shield or shroud to provide protection from direct solar radiation.

The enclosure or IOC shall be pressurized with 34 kPa dry nitrogen. The enclosure shall have a valve for pressurizing. In addition, a pressure relief valve with a 137 kPa rating shall be provided to protect the enclosure from overcharging.

The notation "CAUTION - PRESSURIZED" shall be printed on the enclosure. The letter height shall be at least 6.3 mm.

Performance

The housing unit shall have lens preset capabilities.

The housing shall not interfere with the widest viewing angle of the motorized zoom lens.

Physical

PARAMETER	SPECIFICATION
Construction	All aluminum
Finish	White, light beige or gray baked enamel or polyester powder coat
Weight	Less than 21 kg excluding heater
Camera Mounting	Platform mount with adjustment fore and aft

The camera lens shall be positioned in the center of the housing window.

Any enclosure supplied shall include a sun shield or shroud to protect the housing from the direct rays of the sun. The sun shroud shall be made specifically for the model of enclosure that is selected.

Shock And Vibration

The camera enclosure shall not incur any physical damage after a shock, return to normal operation immediately and operate within the specified vibration (see Note 1 below table).

PARAMETER	SPECIFICATION
Shock	Up to 5 G while in non-operation mode
Vibration	5-60 Hz with 2.1 mm total excursion, and 5 G rms vibration from 60 to 1000 Hz.

Note 1: Where the manufacturer's cut sheet or specification data does not contain shock and vibration data a listing of at least 2 project sites with identical equipment, with similar installation conditions and similar traffic patterns showing continuous functional performance of at least 2 years may be substituted.

Installation

The Contractor shall apply an approved weather-resistant spray to the inside of the connectors before engaging the connectors.

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 to perform the functions specified. The pan and tilt unit shall be designed to operate under a full range of environmental conditions.

Performance

PARAMETER	SPECIFICATION
Braking: Pan And Tilt	Mechanical or Electrical to limit coast
Overload Protection	Motors: Impedance protected
Angular Travel	Pan: 0 to 355° Horizontal, Continuous Tilt: +30° Up to -80° Down
Pan Speed	0.1°/s to 40°/s variable-speed
Tilt Speed	0.1°/s to 20°/s variable-speed
Pan And Tilt Position Preset	Positions camera to a predetermined azimuth, elevation and lens position (Minimum of 64 Presets)

Physical Specifications

PARAMETER	SPECIFICATION
Pan & Tilt Worms	Ground and polished Stainless Steel
Pan & Tilt Worm Gears	Non-metallic material
Mounting (Base)	178 mm ± 0.32 mm diameter bolt circle Check Plans
Camera Mount	Compatible with camera housing
Bearings on Rotating Surfaces	Heavy duty roller type
Overload Protection	Provided - internal
OPERATING TEMPERATURE	-23.3°C to 60° C
CONSTRUCTION	Corrosion resistant steel or aluminum
FINISH	Weather resistant paint or polyurethane
SEALS	“O” ring or gaskets for all weather protection of pan and tilt unit and cables.

The pan and tilt unit with camera assembly mounted shall withstand a wind load of 129 km/h.

The cable connector shall be fully weather protected.

Access into pan/tilt for routine maintenance or adjustments shall not require removal of the pan and tilt from the installation site, nor removal of the camera enclosure from the pan/tilt unit. Access cover shall be readily removable regardless of the tilt position.

External body components shall be manufactured from aluminum that have been anodized, painted or coated to prevent oxidation and corrosion.

Pan And Tilt Stops

The pan and tilt unit shall have pan and tilt stops. The settings of these pan and tilt stops shall be determined by the Engineer.

Installation

The Engineer will notify the Contractor of the pan and tilt presets and stops for the pan and tilt unit for the Contractor to set prior to camera assembly installation check. Installation check shall be done by the Contractor in the presence of the Engineer. The test of the operation (zoom, iris, etc.) of the pan and tilt unit may be performed at the CCTV Cabinet adjacent to the camera or by remote keyboard location at the Contractor's option. The Contractor shall furnish a color video monitor, for testing only, to view the actual camera image. Upon completion of the installation, the Engineer will verify operation of the pan and tilt unit. Any additional adjustments necessary to restore the presets and stops to acceptable parameters shall be at the Contractor's expense.

The Contractor shall provide five copies of the operation and maintenance manuals for the pan and tilt unit.

OVERALL REQUIREMENTS

The complete unit, including the pan/tilt unit shall not exceed 199 mm wide x 442 mm high x 381 mm deep. Any external cables shall not interfere with or limit the continuous pan and tilt operation. The camera control protocol used by the camera assembly shall be either an open public domain protocol, Pelco D, or other protocol convertible to Pelco D via translator. All functions described shall be available using the described protocol. If a protocol other than Pelco D is proposed, the Contractor shall provide a version of Baxall's camera control software "PC Control" or latest equivalent version that includes the new protocol as a choice for the new camera locations. The version of camera control software shall not interfere with the operation of any other camera locations that use Pelco D. All camera control functions shall be through the RS-422 communications interface.

OPERATOR FUNCTIONS
Pan Right
Pan Left
Tilt Up
Tilt Down
Zoom In
Zoom Out
Focus Near
Focus Far
Iris Open
Iris Close
Iris Manual
Iris Auto
Pan Stop
Tilt Stop
Zoom Stop
Focus Stop
Iris Stop
ADMINISTRATIVE FUNCTIONS
Status Query
Set Char. Display
Activate Char. Display
Blank Char. Display
Set Preset Position
Go to Preset Position
Set Relay
Reset Relay
Turn on Camera
Turn off Camera
Wiper on
Wiper off
Heater Control

Camera Control and Configuration

The existing system keyboard is a BAXALL Keyboard Part Number ZKX3-J. A copy of the keyboard manual is available for review upon request.

Pan and Tilt Position Presets shall be programmable via the system keyboard.
The following operator basic functions shall be controlled via the system keyboard:

Pan Left, Pan Right and Pan Stop controlled by Joystick.
Tilt Up, Tilt Down and Tilt Stop controlled by Joystick.
Zoom In, Zoom Out and Zoom Stop controlled by Zoom In and Zoom Out button.
Focus Near, Focus Far and Focus Stop controlled by Near Focus and Far Focus button.
Iris Open, Iris Close and Iris Stop controlled by Open Iris and Close Iris button.
Camera selections made by numeric keypad on system keyboard.
Monitor selections made by numeric keypad on system keyboard.

The Stop actions for all Pan, Tilt, Zoom, Focus and Iris features will be issued once the Joystick, Zoom, Focus and Iris buttons are released.

The camera administrative functions shall be accessible via system keyboard or by software installed on a personal computer. If the software method is used, the camera manufacturers menu system may be used.

SYSTEM TESTING AND DOCUMENTATION

The Contractor shall be responsible for all testing and documentation required for approval and acceptance of the production, installation, and operation of these materials and equipment. The following identifies the specific quality control requirements for testing and documentation.

The Contractor shall test all cables after installation with connectors attached for continuity and shorts or grounds.

The Contractor shall adjust and set limit stops to the pan/tilt unit at each camera site to prevent the view of the areas outside of the roadway system. The final settings shall be approved by the Engineer.

The Contractor shall perform a local functional test at each of the CCTV locations. At the Contractor's option the test may be performed directly at the CCTV cabinet or remotely via keyboard or keyboard and personal computer. The Contractor shall demonstrate to the Engineer all the CCTV features. The Contractor shall provide all the test equipment.

The Contractor shall arrange to have a technician, qualified to work on the closed circuit television assembly and employed by the closed circuit television assembly manufacturer or the manufacturer's representative, present at the time the equipment is turned on.

The Contractor shall provide four sets of documentation containing complete specifications and operation details of each of the components of the CCTV camera assembly. The documentation shall also include wiring diagrams showing wire colors, functions, and pin assignments for connecting these components to each other and to the encoder.

PRE-ACCEPTANCE TESTING

Each closed circuit television system shall be subjected to tests as outlined herein. All testing will be performed by Department personnel, arranged by the Engineer, and in the presence of the Contractor. The Contractor shall notify the Engineer in writing fifteen days prior to the scheduled testing. The Contractor shall provide all necessary equipment required to access the CCTV equipment for testing.

CERTIFICATE OF COMPLIANCE

The Contractor shall provide the Engineer a Certificate of Compliance from the manufacturer, in conformance with the provisions of Section 6-1.07, "Certificates of Compliance," of the Standard Specifications. The certificate shall certify that the closed circuit television camera assembly complies with the requirements of these specifications. The certificate shall also include a copy of all applicable test reports on the closed circuit television camera assembly.

10-3.52 SIGN LIGHTING FIXTURES-INDUCTION

Induction sign lighting fixtures shall conform to the provisions for mercury sign lighting fixtures in Section 86-6.05, "Sign Lighting Fixtures-Mercury," of the Standard Specifications and these special provisions.

Each fixture shall consist of a housing with door, a reflector, refractor or a lens, a lamp, a power coupler, a high frequency generator and a fuse block.

Fixtures shall have a minimum average rating of 60 000 hours. Fixtures shall be for a wattage of 87 W, 120/240 V(ac). The power factor of the fixtures shall be greater than 90 percent and the total harmonic distortion shall be less than 10 percent. Fixtures shall be Underwriter’s Laboratories (UL) approved for wet locations and be Federal Communications Commission (FCC) Class A listed.

The mass of the fixture shall not exceed 20 kg. The manufacturer's brand name, trademark, model number, serial number and date of manufacture shall be located on the packaged assembly and permanently marked on the outside and inside of the housing.

MATERIALS

Mounting Assembly

The mounting assembly may be either cast aluminum, hot-dip galvanized steel plate or steel plate that has been galvanized and finished with a polymeric coating system or the same finish that is used for the housing.

Housing

Housings shall have a door designed to hold a refractor or lens. Housing doors shall be designed to be opened without the use of special tools. Housings and doors shall have a powder coat or polyester paint finish of a gray color resembling unfinished fabricated aluminum.

The maximum height of the fixture shall not be greater than 325 mm above the top of the mounting channels.

Reflector

Reflectors may be designed to be removed as a unit that includes the lamp and power coupler.

Refractor

Refractors or lenses shall have smooth exteriors. Lenses shall be flat or convex. Convex lenses shall be made from heat resistant, high-impact resistant, tempered glass.

Convex lenses shall be designed or shielded so that no fixture luminance is visible when the fixture is approached directly from the rear and the viewing level is the bottom of the fixture. When a shield is used it shall be an integral part of the door casting.

Lamp

Each fixture shall be furnished with a 85-W induction lamp. Interior lamp walls shall be fluorescent phosphor coated. Lamp light output shall be at least 70 percent at 60 000 hours. Lamps shall have a minimum color-rendering index of 80. Lamps shall be rated at a color temperature of 4000 K. Lamps shall be removable without the use of tools.

Power Coupler

Power couplers shall consist of a construction base with antenna, heat sink and electrical connection cable.

The power coupler shall be designed so that it can be removed with common hand tools.

High Frequency Generator

High frequency generators shall start and operate lamps at an ambient temperature of -25 °C or greater for the rated life of the lamp.

Generator output frequency shall be 2.65 MHz ± 10 percent. The generator radio frequency interference shall meet the requirements of the Federal Communications Commission Title 47, Part 18, regulations concerning harmful interference.

High frequency generators shall operate continuously at ambient air temperatures from -25 °C to +25 °C without reduction in generator life. High frequency generators shall have a design life of at least 100 000 hours at 55 °C.

High frequency generators shall be capable of being replaced with common hand tools. Conductor terminals shall be identified as to the component terminal to which they connect.

High frequency generators shall be mounted to use the fixture upon which they are mounted as a heat sink.

A Certificate of Compliance conforming to the provisions in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications, and a copy of the high frequency generator test methods and results shall be submitted by the manufacturer with each lot of fixtures. The certificate shall state that the high frequency generators meet the requirements of this section and the generator specifications of the lamp manufacturer.

10-3.53 PHOTOELECTRIC CONTROLS

Contactors shall be the mechanical armature type.

10-3.54 MODEL 500 CHANGEABLE MESSAGE SIGN SYSTEM

Model 500 changeable message sign (CMS) systems consist of a Model 500 changeable message sign, a Model 170 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 Model 170 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.

Model 500 changeable message sign system components will conform to the requirements in "Specifications for Changeable Message Sign System," issued by the State of California, Department of Transportation, and to the addendums thereto current at the time of project advertising. Model 170 controller assemblies will conform to the requirements in "Traffic Signal Control Equipment Specifications," issued by the State of California, Department of Transportation, and to the addendums thereto current at the time of project advertising.

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 Model 334 cabinets (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 location of the foundation for each 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.

10-3.55 PAYMENT

The contract lump sum price or prices paid for signal and lighting shall include highway lighting at intersections in connection with signals only.

The contract lump sum price or prices paid for ramp metering shall include highway lighting at ramps in connection with ramp metering only.

Other roadway lighting on the project shall be considered as included in the contract lump sum price paid for lighting and sign illumination.

If any of the fabrication sites for the materials listed are located 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 impractical and difficult to determine the actual increase in these expenses, it is agreed that payment to the Contractor for furnishing these listed materials from each fabrication site located more than 480 air line kilometers from both Sacramento and Los Angeles will be reduced $2000:

1. Changeable message signs
2. Service equipment enclosures
3. Telephone demarcation cabinets
4. Closed circuit television cabinets furnished by the Contractor

Full compensation for assembling and installing battery backup system is included in the contract lump sum price paid for the item of work involved, and no separate payment will be made therefor.

The contract lump sum price paid for fiber optic communication system shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in installing the fiber optic communication system complete in place, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

Full compensation for video image vehicle detection system, shall be considered as included in the contract lump sum price paid for the signal and lighting item involved and no separate payment will be made therefor.

The contract lump sum price paid for changeable message sign system shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in changeable message sign system 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 maintaining existing traffic management system elements during construction shall include full compensation for furnishing all labor, materials, tools, equipment and incidentals, and for doing all the work involved in maintaining existing traffic management system elements as shown on the plans, specified in the Standard specifications and these special provisions, and as directed by the Engineer.

If no electrical work exists on the project and no TMS elements are identified within the project limits, the pre-construction operational status check will be paid for as extra work as provided in Section 4-l.03D, "Extra Work," of the Standard Specifications.

Furnishing and installing temporary or portable TMS elements that are not shown on the plans, but are required when an existing TMS element becomes nonoperational or off line due to construction activities, will be paid for as extra work as provided in Section 4-l.03D, "Extra Work," of the Standard Specifications.

Furnishing and installing temporary or portable TMS elements and replacing TMS elements that are not shown on the plans nor identified during the pre-construction operational status check and were damaged by construction activities will be paid for as extra work as provided in Section 4-l.03D, "Extra Work," of the Standard Specifications.

If the Contractor is required to submit provisions for the replacement of TMS elements that were not identified, the provisions will be paid for as extra work as provided in Section 4-l.03D, "Extra Work," of the Standard Specifications.

SECTION 10-4. RELOCATION OF UTILITY FACILITIES

10-4.01 GENERAL DESCRIPTION

Relocating the utility facilities shall consist of modifying the existing utility facilities and constructing or installing new facilities in accordance with the provisions of the following publications: "Greenbook" Standard Specifications for Public Works Construction, 2006 edition, herein known as the "Utility Standard Specifications", 2006 Regional Supplement to "Greenbook" Standard Specifications for Public Works Construction, 2006 edition, the Standard Specifications; Sections 1 through 9, Section 15, "Existing Highway Facilities", and Section 70, "Miscellaneous Facilities"; as shown on the plans, these Special Provisions and as directed by the Engineer.

Except for Sections 15 and 70, Sections 10 through 95 of the Standard Specifications shall not apply to the work in this Section 10-4 except when specific reference is made thereto.

If parking is to be restricted during construction, the Contractor shall post "Tow-Away/No Parking" signs 24 hours in advance after receiving approval from the Engineer. The sign shall contain "days/hours" information and be posted so as to be reasonably seen by the public.

The Contractor shall notify the Engineer 3 working days in advance of any lane, street or alley closures or implementing any construction detour.

The Contractor shall keep the streets in and adjacent to the construction area clean at all times. Streets shall be swept before washing.

EXCAVATION

Excavation shall conform to the provisions in Section 19.3, "Structure Excavation and Backfill", of the State Standard Specifications and to the lines and grades shown on the plans and as directed by the Engineer.

TRENCH EXCAVATION

Whenever work involves trench excavation, the Contractor shall provide all necessary shoring, bracing, sloping, or other provisions to be made for worker protection from hazard of caving ground during the excavation. If such plan varies from the shoring system standards established by the Construction Safety Orders of the Division of Industrial Safety, a Civil Engineer or Structural Engineer registered in the State of California shall prepare the plans.

Contractor shall comply with the Safety Orders of California, Code of Regulations: Title 8, Section 1539 (Excavation, Trenches, Earthwork).

Trench excavation shall conform to the provisions in Sections 5-1.02A, "Trench Excavation Safety Plans," and Section 19-1.02 "Preservation of Property," of the State Standard Specifications, the contract plans, and these Special Provisions.

The narrowest practicable trench width at top of pipe which will allow proper densification of pipe zone bedding and backfill materials shall be maintained regardless of the type of soil or the method of densification. The width of trench at bottom of pipe shall be determined by the space required for proper and effective use of tamping equipment, but not less than pipe OD plus 600 millimeters.

TRENCH EXCAVATION AND PLACEMENT OF BEDDING

Excavate the trench to the lines and grades shown on the plans with allowance for 150 mm of pipe bedding material. The trench section shall be as shown on the plans.

The maximum length of open trench shall be 152 m except by permission of the Engineer. The distance is the collective length at any location, including open excavation and pipe laying, which has not been backfilled to the elevation of the surrounding grade.

Trench walls shall be sloped or shored per the requirements of CAL-OSHA.

The trench bottom shall be graded to provide a smooth, firm, and stable foundation that is free from rocks and other obstructions.

Place the specified thickness of bedding material over the full width of the trench. Grade the top of the pipe base ahead of the pipe laying to provide a firm, uniform support along the full length of pipe.

Excavate bell holes at each joint to permit proper assembly and inspection of the entire joint.

Trenches for main pipelines and all appurtenances shall be backfilled with the materials and methods as specified for the Pipe Zone, Trench Zone and Pavement Zone.

Trench widths shall be in accordance with the plans.

Trench depth shall be as required to install pipelines in accordance with the plans and these Specifications. Unless shown otherwise in the plans, the minimum cover for pipelines shall be as follows:

Pipeline Application	Minimum Cover Required
Potable Water	0.91 m
Recycled Water	1.22 m
Sewer	1.52 m

Safe and suitable ladders, which project 600 millimeters above the top of the trench, shall be provided for all trenches over 1.2 meter in depth. One ladder shall be provided for each 15 meters of open trench or fraction thereof, and be so located that workers in the trench need not move more than 7.6 meters to a ladder.

The Contractor's design and installation of shoring shall be consistent with the rules, orders, and regulations of CAL-OSHA.

Excavations shall be shored, sheeted, and supported such that the walls of the excavation will not slide or settle and all existing improvements of any kind, either on public or private property, will be fully protected from damage.

The sheeting and shoring shall be arranged so as not to place any stress on portions of the completed work until the general construction has proceeded far enough to provide ample strength.

Care shall be exercised in the moving or removal of trench shields, sheeting, and shoring to prevent the caving or collapse of the excavation faces being supported.

Protection of workers within trenches shall be as required by the California Labor Code and in accordance with these Special Provisions.

All excavations shall be performed in a safe manner and shall be protected and supported in accordance with CAL-OSHA regulations.

Barriers and traffic delineators shall be placed in accordance with the requirements of the agency having jurisdiction.

Shoring is considered to be adequate sheeting, shoring, bracing, or equivalent method for:

A. Protection of life and limb, which shall conform to applicable safety orders.
B. Protection of existing underground and aboveground private and public improvements;
C. The remedy of any and all conditions encountered, regardless of depth, (including, but not limited to trench sloughing, pavement separation, etc,) during the construction of the project.

Should a bracing system utilize steel H-beams or piles or other similar vertical supports, driving of said vertical supports will not be permitted except for the last 1.2 meter above the bottom of pile, except where this procedure is impracticable. The vertical support may then be driven to the required depth, not to exceed 1.2 meter. During the drilling and driving operations the Contractor shall take care to avoid damage to utilities.

At locations where the drilling of such holes is impracticable because of the existence of rocks, running sand, or other similar conditions, and provided said impracticability is demonstrated to the satisfaction of the Engineer by actual drilling operations by the Contractor, the Engineer may, upon request of the Contractor, approve the use of means other than drilling for the purpose of placing the vertical support. Such other means, however, must be of a nature, which will accomplish, as nearly as possible, the purpose of the drilling, namely, the prevention of damage to existing surface or subsurface improvements, both public and private.

FOUNDATION STABILIZATION

When unsuitable soil materials are encountered, the unsuitable material shall be removed to the depth determined necessary in the field by the Engineer, and as acceptable to the Engineer. The sub-grade shall be restored with compacted Imported Granular Material or crushed rock as recommended by the Engineer. Place the appropriate bedding or base material on this restored foundation.

When rock encroachment is encountered, the rock shall be removed to a point below the intended trench or excavation sub-grade as determined necessary in the field by the Engineer, and as acceptable to the Engineer. The sub-grade shall be restored with compacted Imported Granular Material as recommended by the Engineer. Place the appropriate bedding or base material on this restored foundation.

When excessively wet, soft, spongy, or similarly unstable material is encountered at the surface upon which the bedding or base material is to be placed, the unsuitable material shall be removed to the depth determined necessary in the field by the Engineer, and as acceptable to the Engineer. Restore the trench with crushed rock enclosed in filter fabric as directed by the Engineer. Larger size rocks, up to 75 mm, with appropriate gradation, may be used if recommended by the Engineer. Place the appropriate bedding or base material on this restored foundation.

DEWATERING

The Caltrans inspector shall be present for all dewatering.

The Contractor shall abide by all applicable local, state and federal regulations, and by the conditions of the Regional Water Quality Control Board. The Contractor shall provide effective measures where necessary to prevent operations from producing dust in an amount damaging to property or causing a nuisance as determined by the Engineer. The Contractor shall be responsible for any damage due to dust originating from its operations.

The Contractor shall anticipate and correct any erosion problem arising from its operations. The Contractor shall abide by the conditions of the Regional Water Quality Control Board, General Construction Activity Storm Water Permit and the project Storm Water Pollution Prevention Plan (SWPPP).

WATER IN TRENCH

The Contractor shall provide and maintain at all times during construction ample means and devices to promptly remove and dispose of all water from any source entering excavations or other parts of the work. Dewatering shall be performed by methods that will ensure a dry excavation and preservation of the final lines and grades of the bottoms of excavations. Dewatering methods may include well points, sump points, suitable rock or gravel placed as pipe bedding for drainage and pumping, temporary pipelines, or other means, all subject to the approval of the Engineer. The cost of all dewatering activities shall be borne by the Contractor.

In no case shall the sewers be used as drains for water without the approval of the Engineer. Sewer systems shall not be used as drains for dewatering trenches or excavations, nor for disposal of collected or accumulated groundwater, without the approval of the agency of jurisdiction.

Concrete shall not be poured in water, nor shall water be allowed to rise around concrete or mortar until it has set at least four hours.

The Contractor is responsible for meeting all Federal, State, and local laws, rules and regulations regarding the treatment and disposal of water from dewatering operations at the construction site.

The Contractor shall keep the excavation free from water during construction. Where groundwater is encountered, the static water level shall be drawn down a minimum of 300 millimeters below the bottom of the excavation to maintain the undisturbed state of the native soils to prevent softening of the bottom of the excavation, and to allow the placement of any fill to the specified density. Disposal of the water shall not damage property or create a public nuisance. The Contractor shall have on hand pumping equipment and machinery in good working condition for emergencies. Dewatering systems shall operate continuously until the backfill has been completed to 300 millimeters above the normal static groundwater level. Water may be discharged into an existing storm drain, channel, or street gutter only with the approval of the Engineer.

Dewatering systems shall not remove natural soils.

Release of the ground water to its static level shall be controlled to prevent the disturbance of the natural foundation soils or compacted fill and to prevent flotation or movement of structures or pipes.

Crushed rock shall be used for drainage when required by the Engineer. When crushed rock is used, filter fabric shall be installed between the rock and backfill material. Crushed rock shall be the 25 millimeters crushed rock gradation as specified in Section 200-1.2, "Crushed Rock and Rock Dust", of the Utility Standard Specifications.

When crushed rock for drainage is so ordered by the Engineer, crushed rock will be paid for as extra work as provided in Section 4-1.03D of the State Standard Specifications.

Full compensation for dewatering, shall be considered as included in the contract prices paid for the various items of work, and no additional compensation shall be allowed therefore.

EXCESS TRENCH EXCAVATION

Wherever the Contractor over-excavates the bottom of a trench, the bottom of the trench for water mains shall be backfilled with "Bedding For Water Pipes" listed elsewhere in these Special Provisions.

Overexcavations shall be corrected by backfilling with approved imported granular material or crushed rock, compacted to 90 percent relative compaction, as directed by the Engineer.

The Contractor shall remove and legally dispose of all excess excavated material and demolition debris.

It is the intent of these specifications that all surplus material shall be legally disposed of by the Contractor. Before acceptance of the work by the Engineer, the Contractor shall provide the Engineer with written releases signed by all property owners with whom the Contractor has entered into agreements for disposing of excess excavated material, absolving the Engineer from any liability connected therewith.

Over excavation and associated bedding not ordered by the Engineer shall be at the Contractor’s expense.

ADDITIONAL BEDDING

When so ordered by the Engineer, additional bedding required below sub grade to replace soft or unstable material will be paid for as extra work as provided in Section 4-1.03D of the State Standard Specifications.

Material for additional bedding shall be the 25 millimeters crushed rock gradation as specified in Section 200-1.2, "Crushed Rock and Rock Dust", of the Utility Standard Specifications.

IMPORTED BACKFILL

The densification method for imported backfill material shall be the same as the method for non-imported backfill.

A minimum relative compaction of 90 percent shall be achieved.

Separate payment for imported backfill will be made only when the excavation is done in heavy clay, highly expansive or other deleterious material, and imported backfill is ordered by the Engineer. The Engineer will be responsible for decisions whether or not the excavated material is suitable for backfill and when separate payment is made for imported backfill.

TRENCH RESURFACING

Trench resurfacing where required shall consist of asphalt concrete or Portland cement concrete as per Section 39, "Asphalt Concrete" or Section 90, "Portland Cement Concrete", of the State Standard Specifications and these Special Provisions, as shown on the plans, and as directed by the Engineer.

Whenever excavation is made through pavement, sidewalk, driveway or drainage ditch, temporary bituminous resurfacing 50 millimeter thick shall be placed and maintained according to Section 306-1.5.1, "Temporary Resurfacing", of the Utility Standard Specifications unless permanent pavement is placed within 24 hours after backfill of trench.

COORDINATION

The Contractor shall notify the Engineer at least 10 working days in advance of his intent to begin work on the steel water pipe.

The Contractor shall provide for a safe 1.2 m wide pedestrian walkway to all places of business, and for all residences during construction.

The Contractor shall not allow sewage to be discharged onto the ground or into any stream, creek or storm drain.

The Contractor shall distribute printed notices of proposed utility work to all occupants along streets where construction work is to be performed at least one week before starting such work.

The Contractor shall notify the owner or occupant (if not owner occupied) of the closure of the driveways to be closed more than one 8-hour day at least 3 working days prior to the closure. The Contractor shall minimize the inconvenience and minimize the time period that the driveways will be closed. The Contractor shall fully explain to the owner/occupant how long the work will take and when closure is to start.

The Contractor shall perform his work in such a manner that existing private and/or public utilities will not be disturbed for a period of time in excess of 4 hours. Utility service shall not be interrupted prior to 8:00 a.m. or after 4:00 p.m. unless otherwise approved in writing by the Engineer.

The Contractor shall cooperate with the utility owner's personnel in order to facilitate their inspection work and shall allow them access to the site of the work.

Approvals and instructions from the utility owner's personnel will be transmitted to the Contractor through the Engineer.

STORAGE OF MATERIALS

All materials for use in the work shall be stored by the Contractor in such manner as to prevent damage from exposure to the elements, admixture of foreign materials, or from any other cause. The Contractor shall be entirely responsible for damage or loss by weather or other causes. The Material Safety Data Sheets (MSDS) for all products to be used in the work shall be kept on-site by the Contractor, and the material manufacturer's recommendations for proper storage of its products shall be strictly followed.

Materials shall not be stored without the written permission of the Engineer. The Contractor shall be responsible to provide its own storage area or property. Materials for use on the work shall be stored on private property only as allowed by law and with the written permission of the property owner, and a copy of such permission shall be provided to the Engineer. In addition, a release letter signed by said property owner and stating that materials are no longer stored on the property and that Contractor has restored the area to original condition is required prior to the filing of the Notice of Completion.

EXISTING UTILITIES

The Contractor's attention is directed to the possible existence of pipe and other underground improvements that may or may not be shown on the plans. The horizontal and vertical locations shown for the existing underground utilities are approximate. It will be the responsibility of the Contractor to locate all utility lines in the construction area prior to excavation. Once discovered, the Contractor shall preserve and protect all such improvements whether shown on the plans or not. The Contractor shall provide and install suitable safeguards, and shall be responsible for the care and protection of all existing sewer and water pipe, telephone conduit, gas mains, culverts, or other above-ground or below-ground facilities or structures which may be encountered in or near the area of work. It shall be the responsibility of the Contractor to notify each agency of jurisdiction and utility company and to make arrangements for location of facilities prior to beginning construction. In the event of damage to existing facilities during the progress of the work, such facilities shall be replaced or restored to original condition, as determined by the Engineer, at the Contractor's expense. The Contractor's attention is directed to Section 7-1.11, "Preservation of Property," of the State Standard Specifications.

Where a possible at-grade conflict with existing underground utilities appears on the plans, unless prior pothole information is shown, the Contractor shall determine its location a minimum of 150 meters ahead of the work prior to trenching. Grade and alignment changes shall be made only if approved by the Engineer.

The horizontal and vertical locations shown for the existing underground utilities are approximate. It will be the responsibility of the Contractor to locate all utility lines in the construction area prior to excavation. Any damage to existing utility, structure, or service, whether or not indicated on the plans shall be repaired at the Contractor's expense in a manner approved by the Engineer.

Attention is directed to "Obstructions" elsewhere in these Special Provisions.

All existing services must remain in service during construction. Contractor to provide and install all high -lines as needed to provide constant service.

The Contractor shall be responsible for determining in advance the location, elevation, alignment and pipe type and size of all existing pipelines to which connections are to be made. Potholing to determine location will be allowed only after providing the Engineer with three (3) day's advance notice. The Contractor is required to contact Underground Service Alert (USA) at 1-800-227-2600 or 1-800-422-4133 for mark-out of all utilities in the area of the work.

Any pot holing required will be paid for as extra work as provided in Section 4-1.03D of the State Standard Specifications.

Where a water distribution main is shown on the plans, it shall be assumed that every property is served by that water main.

Where existing underground utilities are undercut, particular care shall be exercised in selecting, placing, and compacting the backfill material under and around such utility to assure firm support. For at least 300 millimeters all around the undercut utility, the backfill material shall have a sand equivalent of 50 and a relative compaction of 95 percent.

Where, in the opinion of the Engineer, the native soil is unsuitable for supporting the undercut utility; the material shall be removed. The resulting depression shall be backfilled with suitable backfill material. Such excavation and backfill below the planned elevation of the bottom of the trench will be paid for as extra work as provided in Section 4-1.03D of the State Standard Specifications.

Where a 25 mm or smaller water service is damaged during trenching operation, a minimum of 1.2 meter section of such service shall be removed and replaced with two 45 degrees elbows and new copper tubing bent to a 300 millimeters minimum radius.

The Contractor's attention is directed to Section 7-1.11, "Preservation of Property", of the State Standard Specifications. The Contractor shall be careful to avoid damage to water services, sewer laterals, water and sewer mains during trenching operations. In the event damage is done requiring new service connections and water main repairs, the Contractor shall pay for work required to be done by the utility owner if requested by the Contractor and approved by the Engineer, the Contractor may perform said repairs. The Contractor shall make every effort to provide continuous service to the utility customers.

The Contractor shall alter, relocate or reconstruct portions of existing utility service connections, such as water, which may or may not have been shown on the plans, or not accurately shown on the plans, but which are found to interfere with the work. Such work will be paid for at the unit prices for the various contract items of work involved, except for the following:

A. The service connection is not shown on the plans or marked in the field.
B. The service connection will conflict with the plan elevation of the new force main or gravity sewer.

Upon discovery of service connections not shown on the plans or marked in the field that conflict with the plan elevation of the new main, the Contractor shall immediately notify the Engineer. When so ordered by the Engineer, protection or relocation of the items listed above will be paid for as extra work as provided in Section 4-1.03D of the State Standard Specifications.

If the Contractor, either before commencing work or during the course of the work, finds any discrepancy between the specifications or plans and the physical conditions at the site of the work, Contractor shall promptly notify the Engineer in writing of such discrepancy.

WATER FOR CONSTRUCTION PURPOSES

The Contractor shall furnish all water required for construction, including water for flushing. The water and meter shall be paid for by the Contractor in accordance with the water district's, city's, or county's rates and rules.

Only the 62 mm port shall be used for water available from fire hydrants along the job site. The 100 mm port shall be free for use in the event of a fire.

No compensation shall be paid the Contractor for water for the initial filling or refilling, for testing or re-testing, and for re-flushing the pipeline.

The size and location of temporary meters shall be determined by the Contractor and approved by the Engineer.

BURIED WATER LINE WARNING AND IDENTIFICATION TAPE

Warning/identification tape shall be used to identify location of underground utilities and to act as a warning against accidental dig-ins of buried utilities. Warning/identification tape shall be used on all underground water and recycled water mains, potable and recycled water irrigation systems, sewer mains, and all related appurtenances. Warning/identification tape shall also be used on cathodic protection wiring systems and tracer wire brought into and out of access ports.

Warning/identification tape shall be as indicated below and in accordance with the Approved Materials List.

Tape shall be an inert plastic film (non-metallic) formulated for prolonged underground use that will not degrade when exposed to alkalies, acids and other destructive substances commonly found in soil.

Tape shall be puncture-resistant and shall have an elongation of two times its original length before parting.

Tape shall be colored to identify the type of utility intended for identification. Printed message and tape color shall be as follows:

Printed Message	Tape Color
Caution: Waterline Buried Below	Blue
Caution: Recycled Waterline Buried Below	Purple
Caution: Sewer line Buried Below	Green
Caution: Cathodic Protection Cable Buried Below	Red
Caution: Electric Line Buried Below	Red

Ink used to print messages shall be permanently fixed to tape and shall be black in color with message printed continuously throughout.

Tape shall be minimum 0.102 mm thick x 150 mm wide with a printed message on one side. Tape used with the installation of onsite potable and recycled water irrigation systems shall be a minimum of 75 mm wide.

Warning/Identification Tape shall be installed as described below in accordance with these Special Provisions.

Tape shall be placed at the top of the pipe zone 300 mm above and centered over the utility intended for identification. Tape used with onsite potable and recycled water irrigation systems shall be installed at 150 mm above the pipe.

Tape shall be installed with the printed side up and run continuously along the entire length of the utility intended for identification. Tape shall be installed on the main piping and all appurtenant laterals, including blowoffs, air valve assemblies, fire hydrants, and services. Tape splices shall overlap a minimum of 600 mm for continuous coverage.

Tape shall be installed prior to placement of the Trench Zone Backfill.

BURIED WATER LINE IDENTIFICATION TRACER WIRE

Tracer wire shall be used on all buried water and recycled water mains for the purpose of providing a continuous signal path used to determine pipe alignment after installation. Tracer wire is not required in installation of sewer mains.

Tracer wire shall be as indicated below and shall be selected from the Approved Materials List.

Tracer wire shall be Number 14 AWG solid copper UF type wire with cross-linked polyethylene insulation. The insulation shall be white or yellow in color.

Wire splices (at pipe tees, crosses and laterals) shall be accomplished using a direct bury silicone-filled capsule tube with standard wire nut or silicone-filled wire nut connectors of the appropriate size selected from the Approved Materials List.

Tracer wire shall be installed as described below in accordance with these Special Provisions.

Tracer wire shall be installed with all water and recycled water mains.

Wire shall be placed on the top centerline of the pipeline and shall run continuously along the entire length of pipe prior to placement of trench backfill. Wire shall be mechanically and electrically continuous throughout the pipeline, including within pipe casings.

Tracer wire shall be secured to the pipe at 1.8 m intervals with plastic adhesive tape, duct tape or plastic tie straps. The wire may alternately be secured to the pipe by looping the tracer wire around itself such that tracer wire remains continuous atop the pipe during backfill operations.

Tracer wire access ports shall be installed in accordance with the plans within the concrete splash pad of all fire hydrants installed as a part of the work. Tracer may terminate within meter boxes, blow off boxes, CP test boxes or air valve enclosures only as directed by the Engineer at intervals of not more than 305 m. Locations of all tracer wire access ports installed shall be noted on the As-Built drawings.

Wire shall extend into the access port and terminate with a coiled 600 mm length of wire. All tracer wire not located atop pipe shall be installed within a conduit at a minimum depth of 600 mm in accordance with the plans.

Splices shall be installed only when necessary and shall be made using a wire connector selected from the Approved Materials List.

The Contractor shall test tracer wire for electrical continuity in the presence of the Engineer prior to the installation of any paving over atop pipelines or appurtenances. Testing shall be accomplished using a Progressive Electronics 77M tone generator, or similar device, and a testing telephone handset.

POLYETHYLENE ENCASEMENT

Polyethylene encasement shall be used for all ferrous metal materials not otherwise protectively coated.

Polyethylene wrap shall be used for the protection of buried ductile-iron fittings and valves.

Polyethylene sleeves shall be used for the protection of buried ductile iron pipe.

Polyethylene encasement shall be as indicated below and shall be selected from the Approved Materials List. Polyethylene materials shall be kept out of direct sunlight exposure.

Polyethylene sleeves shall be a minimum 0.305 mm thick polyethylene plastic in accordance with AWWA C105.

Polyethylene wrap shall be a minimum 0.203 mm thick polyethylene plastic in accordance with AWWA C105.

Polyethylene wrap and sleeves shall be clear for use with potable water and purple for use with recycled water.

Polyethylene or vinyl adhesive tape a minimum of 50 mm wide or plastic tie straps shall be used to secure polyethylene encasement.

Polyethylene encasement shall completely encase and cover all metal surfaces.

Pipe: All ductile-iron pipe shall be encased with polyethylene sleeves in accordance with Method A described in AWWA C105, or with polyethylene wrap in accordance with Method C described in AWWA C105.

Fittings: Fittings such as tees, bends and reducers shall be encased with polyethylene wrap in accordance with AWWA C105.

Valves: Valves shall have only the stem and operating nut exposed and the wrap shall be attached so that valve operation will not disturb the wrapping or break the seal.

Polyethylene sleeves shall be secured with polyethylene or vinyl adhesive tape or plastic tie straps at the ends and quarter points along the sleeve in a manner that will hold the sleeve securely in place during backfill. Polyethylene wrap shall be secured with polyethylene or vinyl adhesive tape in a manner that will hold the wrap securely in place during backfill. The polyethylene wrap shall extend at least 300 mm into adjacent polyethylene wrap before taping. Any damage that occurs during installation shall be repaired with polyethylene or vinyl adhesive tape prior to backfilling.

CURB IDENTIFICATION

The Contractor shall mark the location of all potable water, recycled water and sewer laterals at the curb crossing by stamping the face of the curb in 50 mm high letters as described below:

A. Potable water laterals shall be stamped with a letter "W".
B. Recycled water laterals shall be stamped with a letter "RW".
C. Sewer laterals shall be stamped with a letter "S".

CONCRETE FOR ANCHOR, VALVE, AND THRUST BLOCKS

Concrete thrust and anchor blocks shall be used, at all unrestrained fittings or as required for hydrostatic testing, and shall conform to Section 90-10, "Minor Concrete," of the State Standard Specifications.

Concrete thrust and anchor blocks shall be poured against wetted, undisturbed soil in accordance with the plans and as directed by the Engineer. The concrete shall be placed so that fittings and valves will be accessible for repairs or replacement. Prior to filling the pipeline with water, the concrete for thrust and anchor blocks shall cure for the following number of days:

A. Thrust Blocks 3 days minimum (unless approved by Engineer)
B. Anchor Blocks 7 days minimum

Pipe Thrust

The following table lists the resulting thrust, in pounds, from the noted fitting for each pipe size. The thrust amount shown is for each 70,307 Kg/m2 of test pressure. (For instance, if the test pressure is required to be 90,000 Kg/m2, multiply the value in the table by (90,000/70,307).

Pipe Size	Tees and Dead Ends	90 Degree Bend	45 Degree Bend	22-1/2 Degree Bend	11-1/4 Degree Bend
100 mm	839 Kg	1,184 Kg	644 Kg	327 Kg	177 Kg
150 mm	1,724 Kg	2,436 Kg	1,320 Kg	667 Kg	363 Kg
200 mm	2,985 Kg	4,218 Kg	2,286 Kg	1,157 Kg	626 Kg
250 mm	4,876 Kg	6,895 Kg	3,738 Kg	1,891 Kg	1,025 Kg
300 mm	6,945 Kg	9,816 Kg	5,316 Kg	2,694 Kg	1,461 Kg
400 mm	12,193 Kg	17,241 Kg	9,340 Kg	4,731 Kg	2,563 Kg

Safe Soil Bearing Load

Soil	SAFE BEARING LOAD
Muck, peat, etc.***	0 Kg/m
Soft Clay	2,441 Kg/m 2
Fine Sand	4,882 Kg/m 2
Decomposed Granite (D.G.)	7,324 Kg/m 2
Sandy Gravel	9,765 Kg/m 2
Cemented Sandy Gravel	9.765 Kg/m 2
Hard Shale	12,206 Kg/m 2
Granite	48,824 Kg/m 2

***In muck or peat soils, competent resistance shall be achieved by removal and replacement with a ballast of sufficient stability to resist the intended thrusts. Consult the Engineer.

Thrust Block Placement and Sizing

Thrust blocks shall be located at all unrestrained pipe fittings and bear against firm, undisturbed soil. The thrust blocks shall be centered on the fitting so that the bearing area is exactly opposite the resultant direction of the thrust, refer to the plans. Care shall be taken to prevent the placed thrust block concrete from eliminating maintenance access to the valve operators. The shape and location of all thrust block excavations shall be approved by the Engineer prior to pouring concrete. The size, in sq. ft., of the thrust block can be calculated by dividing the thrust by the safe bearing load. For instance, use a 300 mm pipe, 45 Degree bend, at 140,614 Kg/m2 test pressure, with a D.G. trench the value of 5,316 Kg of thrust can be obtained from the upper chart and 7,324 Kg/m2. safe bearing load from the lower chart as follows:

5,316 Kg x (140,614 / 70,307) / 7,324 Kg/m2 = 1.45 m2

Therefore, for this example, the trench wall adjacent to the fitting shall be excavated to the dimensions of 1.22 m x 1.22 m or 1.07 m x 1.52m or some closely approximate multipliers to achieve the minimum required 1.45 m2. bearing area.

Anchor Block Placement and Sizing

A. For all vertical bends in pipelines (downward bends) that do not have restrained joints, the fittings shall be retained in place by means of an anchor block. The block shall be sized to withstand the thrust exerted for the particular deflection angle at the required test pressure plus 10 percent (Do not rely on the restraining benefit from the soil). The Engineer shall verify the size chosen and the reinforcing steel required.
B. The size, m3. of the anchor block can be calculated by dividing the thrust by the unit weight of concrete (i.e. one m3 of concrete weighs approximately 2322 Kg). For instance, use the same mm pipe, 45 Degree bend, at 140,614 Kg/m2 test pressure - the value of 5,316 Kg of thrust can be obtained from the upper chart:

5,316 Kg x 2 / 2322 Kg = 4.58 m3 (plus 10 percent) = 5.04 m3

Therefore, for this example, the anchor block shall be 1.68 m x 1.68 m x 1.83 m or 1.83 m x 1.83 m x 1.52 m , or some closely approximate multipliers to achieve a minimum of 5.04 m3 of concrete.

Valve support blocks shall be installed as described below and in accordance with the plans:

A. Support blocks below valves shall be cut into the side of the trench a minimum of 300 mm.
B. Support blocks shall extend up to the height of adjoining pipe and shall have a minimum depth below the valve of 300 mm.
C. Support blocks shall be installed so that the valves will be accessible for repairs.

Unless otherwise directed, blocking shall be placed so that joints of pipe and fitting will be accessible for repair. Refer to the project plans for the sizes of the various anchors and thrust blocks. Additional concrete required for thrust blocks, due to soil conditions, will be paid for as extra work as provided in Section 4-1.03D of the State Standard Specifications.

HYDROSTATIC TESTING OF MAINS

The Contractor shall notify the Engineer at least 3 working days in advance of performing any pressure test. No pressure test shall be made on Saturdays, Sundays or designated legal holidays as per Section "Maintaining Traffic" elsewhere in these Special Provisions unless approved in writing by the Engineer.

The pipeline shall be hydrostatically tested by the Contractor in the presence of the Engineer, after all pipe and appurtenances have been installed as shown on the staging plans. All permanent thrust blocks and anchors shall be in place and shall have set the required period of time prior to testing. Testing shall not begin until the pipe trench has been backfilled and compacted a minimum of 750 millimeters above the top of pipe and the anchor, thrust, and supporting concrete has attained a compressive strength of 1 400 kPa.

Steel pipelines shall not be tested before the mortar lining and coating on all of the pipe lengths in the line have attained an age of 14 days. Cement mortar lined pipe shall not be filled with water until a minimum of 8 hours has elapsed after the last joint has been mortared.

Potable water shall be used for hydrostatic testing when such testing is performed separately from disinfecting operations. Make up water for testing shall also be potable water. Temporary blocking during the tests will be permitted only at temporary plugs, caps or where directed by the Engineer.

All valves and appurtenances shall be operated during the test period. The test shall be conducted with the valves in the open position.

All valves, air vacuum assemblies, blow-offs, and services shall be monitored during the test for possible leakage and repairs made if necessary before the test proceeds.

For pipelines with a porous lining such as cement mortar the pipe shall be filled with water and placed under a 35 kPa pressure for a minimum of 48 hours prior to the actual hydrostatic test.

Before applying the specified test pressure, care shall be taken to release all air within the pipe and appurtenances to be tested. Air shall be released through services, fire hydrants, air release valves, or other approved methods.

The Contractor shall furnish all materials including water, equipment, bracing, connections, labor and expense required for testing of pipeline. He shall be responsible for the result of any failure under test, which is attributable to defective material and/or workmanship furnished by him or to his negligence or improper conduct of the test.

Hydrostatic testing of pipelines shall be performed prior to or concurrently with the disinfection operations. In the event repairs are necessary, as indicated by the hydrostatic test, the Engineer may require additional disinfection in accordance.

Hydrostatic testing shall be performed prior to connections to existing mains. Authorization for connection to the existing system shall be given only on the basis of acceptable hydrostatic, disinfection and bacteriological test results.

Potable water shall be used for hydrostatic testing of potable and recycled water mains when such testing is performed separately from disinfection operations.

Potable water shall be supplied by a source as approved by the Engineer. Make-up water for testing shall also be potable water.

A chlorinated water solution shall be used to charge the line and for make-up water when hydrostatic testing and disinfection operations are combined.

Well water shall not be used for hydrostatic testing or any other purposes in new or existing pipelines.

Testing water shall be supplied through a metered connection equipped with a backflow prevention device at the point of connection to the potable water source used.

The Contractor shall provide any temporary piping needed to deliver potable water to the piping that is to be tested.

At the onset of testing, all valves, air vacuum assemblies, blowoffs, and services shall be monitored for possible leakage and repairs made, if necessary, before the test proceeds. The appurtenances shall be monitored through the duration of the testing.

Before applying the specified test pressure, care shall be taken to release all air within the pipe and appurtenances to be tested. Air shall be released through services, fire hydrants, air release valves, or other approved locations.

A five (5) hour hydrostatic pressure test shall be performed after the pipe and all appurtenances have been installed and after any trench backfill compaction with heavy-duty compaction equipment has been completed. The hydrostatic test pressure shall be 345 kPa above the class rating of the pipe at the lowest point in the section being tested, or as directed by the Engineer, and shall be at least equal to the design class of the pipe at the highest point in the line.

The test pressure shall be applied and continuously maintained by pumping for a period of four (4) hours. During the pumping phase of the test, the test pressure shall be maintained at not less than 95 percent of the specified test pressure at all times.

At the end of the fourth (4th) hour, the pressure shall meet the requirements stated above. Pumping shall then be discontinued for one hour and the drop in pressure shall be recorded. Pumping shall then be resumed to restore the initial test pressure, and the quantity of water pumped into the line shall be accurately measured. This measured quantity shall not exceed that which would result from leakage at the following rates:

A. The allowable leakage for steel (flanged or welded) and ductile iron (flanged) pipe shall be zero.

B. The leakage for polyvinyl chloride (PVC) pipe, and for steel or ductile- iron pipes with rubber joints shall be considered as the total amount of water pumped into the pipe system after the fifth (5th) hour of testing. Allowable leakage during the fifth (5th) hour shall be in accordance with the plans, calculated using the following formula:

0.4625 liters x nominal diameter of pipe (mm) x length of pipe (m) /
[24 (hrs) x 1000 (m)]

If the leakage exceeds the allowable loss, the leak points shall be located and repaired as required by the Engineer. All defective pipe, fittings, valves and other appurtenances discovered shall be removed and replaced with sound material. Additional disinfection shall be performed as necessary. The hydrostatic test shall be repeated until the leakage does not exceed the rate specified above. All visible leaks shall be similarly repaired.

DISINFECTION OF PIPING

All water mains and appurtenances taken out of service for inspection, repairs, or other activity that might lead to contamination shall be disinfected before they are returned to service.

All new water mains and temporary high lines shall be disinfected prior to connection to the existing system.

All components incorporated into a connection to the existing system shall be disinfected prior to installation.

A written disinfection and dechlorination plan signed by a certified chlorinator shall be submitted to the Engineer for review and approval prior to starting disinfection operations.

Chlorination and dechlorination shall be performed by competent individuals knowledgeable and experienced in the operation of the necessary application and safety equipment in accordance with applicable Federal, State and Local laws and regulations. The transport, storage and handling of these materials shall be performed in accordance with Code of Federal Regulations (CFR) 1910.120 Hazardous Waste Operations and Emergency Response, CFR 49.172 Hazardous Materials Regulations, and the General Industry Safety Orders of the California Code of Regulations, Title 8, Section 5194.

The specified disinfection of the pipelines may be performed concurrently with the hydrostatic testing. In the event repairs are necessary, as indicated by the hydrostatic test, additional disinfection may be required by the Engineer in accordance with this specification.

Prior to connection to existing mains, disinfection and bacteriological testing shall be performed in accordance with this specification, and hydrostatic testing shall be performed. Authorization for connection to the existing system shall be given only on the basis of acceptable hydrostatic, disinfection and bacteriological test results.

Liquid chlorine contains 100 percent available chlorine and is packaged in steel containers in net weights of 68.1 kg or 907.2 kg.

Liquid chlorine shall be used with appropriate gas flow chlorinators, heaters, and injectors to provide a controlled, high-concentration solution feed to the water. The chlorinators and injectors shall be the vacuum-operated type.

Sodium hypochlorite is available in liquid form in glass or plastic containers, ranging in size from 0.95 L to 18.93 L. The solution contains approximately 10 percent to 15 percent available chlorine.

Tablet or granular hypochlorite shall not be used at any time.

Disinfections of pipelines shall not proceed until all appurtenances and any necessary sample ports have been installed and the Engineer provides authorization.

Every effort shall be made to keep the water main and its appurtenances clean and dry during the installation process.

All piping, valves, fittings, and appurtenances which become contaminated during installation shall be cleaned, rinsed with potable water, and then sprayed or swabbed with a 5 percent sodium hypochlorite disinfecting solution prior to installation.

Water mains under construction that become flooded by storm water, runoff, or ground water shall be cleaned by draining and flushing with metered potable water until clear water is evident. Upon completion, the entire main shall be disinfected using a method approved by the Engineer.

Liquid Chorine (Gas)

A. Only vacuum-operated equipment shall be used. Direct-feed chlorinators, which operate solely from gas pressure in the chlorine cylinder, shall not be permitted. The equipment shall incorporate a backflow prevention device at the point of connection to the potable water source used to fill the line being tested.
B. The chlorinating agent shall be applied at the beginning of the system to be chlorinated and shall be injected through a corporation stop, a hydrant, or other approved connection to ensure treatment of the entire system being disinfected.
C. Only a certified, licensed chlorination and testing contractor shall perform gas chlorination work. The chlorination contractor must also possess a Grade II Treatment Plant Operator Certification from the State of California if required by the Engineer.

Sodium Hypochlorite Solution (Liquid)

A. Sodium hypochlorite solution shall be used for cleaning and swabbing piping and appurtenances immediately prior to installation and for disinfecting all components of connections to the existing system.
B. Sodium hypochlorite solution may be used for the initial disinfection of newly installed water mains. The solution shall be applied at a terminus of the system to be chlorinated using an injector, which can adjust the amount of solution being injected into the piping system. The solution shall be injected in the appropriate concentration to achieve the specified concentration range of chlorine throughout the entire piping system. Where pumping equipment is used in conjunction with an injector, an integral backflow prevention device shall be installed and connected to the potable water supply.
C. Water trucks, pumping equipment, piping, appurtenances and all other equipment in contact with potable water shall be disinfected prior to use.
D. Sodium hypochlorite solution may also be used to increase the total chlorine residual if the concentration from the initial chlorination of the system is found to be low. The solution shall be added to the system in sufficient amounts at appropriate locations to insure that the disinfecting solution is present at a concentration within the specified range throughout the piping system.

The pipeline shall be filled at a rate not to exceed 1,135 liters per minute, or a velocity of 0.3 m per second, whichever is less.

Disinfections shall result in an initial total chlorine concentration of 25-mg/l. This concentration shall be evenly distributed throughout the system to be disinfected.

All valves shall be operated with the disinfection solution present in the pipeline. All appurtenances such as air-vacuum relief valves, blowoffs, hydrants, backflow prevention devices, and water service laterals shall be flushed with the treated water a sufficient length of time to insure a chlorine concentration within the specified range in all components of each appurtenance. (Note the limitations for discharge of chlorinated water outlined below.)

The Engineer will verify the presence of the disinfection solution throughout the system by sampling and testing for acceptable chlorine concentrations at the various appurtenances and/or at the test ports provided by the Contractor. Areas of the system found to be below the specified chlorine concentration level shall receive additional flushing as noted above and/or additional disinfection solution as necessary. (Note the limitations for discharge of chlorinated water outlined below.) Addition of disinfection solution after the initial charging of the line shall be made by either the liquid chlorine (gas) method, or the sodium hypochlorite method as directed by the Engineer.

The chlorinated water shall be retained in the system for a minimum of 24 hours. The Engineer will test the total chlorine residual. The system shall contain a total chlorine residual of not less than 80 percent of the initial total chlorine residual before the 24-hour soaking period began. If the total chlorine residual has decreased more than 20percent, the system shall be soaked for an additional 24-hour period. If the total chlorine residual has not decreased after this additional 24-hour period, the system shall be flushed in accordance with the procedure detailed herein. If the total chlorine residual has decreased, the system shall be flushed in accordance with the procedure detailed herein, and shall be re-disinfected.

Following a successful retention period as determined by the Engineer, the chlorinated water shall be flushed from the system at its extremities and at each appurtenance, using potable water from a source designated by the Engineer. The minimum water velocity during flushing shall be 0.9 meters per second or as directed by the Engineer. Flushing shall continue until the replacement water in the new system is equal in chlorine residual to the potable source of supply as verified by the Engineer. (Note the limitations for discharge of chlorinated water outlined below.)

The Engineer will perform bacteriological sampling and testing as specified herein.

Indiscriminate onsite disposal or discharge to sewer systems, storm drains, drainage courses or surface waters of chlorinated water is prohibited.

The environment, which the chlorinated water is to be discharged, shall be examined by the Engineer. Where necessary, federal, state and local regulatory agencies should be contacted to determine Special Provisions for the disposal of chlorinated water. Any indication that the discharge of chlorinated water may cause damage to the environment shall require the neutralizing of the chlorine residual by means of a reducing agent in accordance with AWWA C651 and the requirements of this specification.

In locations where chlorine neutralization is required, the reducing agent shall be applied to the water as it exits the piping system. The Contractor shall monitor the chlorine residual during the discharge operations. Total residual chlorine limits in these locations, and for the discharge of chlorinated water from the testing of pipelines to surface waters of the San Diego Region are as follows:

Total Residual Chlorine Effluent Limitations	
30-Day Average	0.002 mg/l
Average Daily Maximum	0.008 mg/l
Instantaneous Maximum	0.02 mg/l

The various methods of dechlorination available can remove residual chlorine to concentrations below standard analytical methods of detection, 0.02 mg/l, which will assure compliance with the effluent limit. The Contractor will perform all necessary tests to ensure that the total residual chlorine effluent limitations listed above are met.

In locations where no hazard to the environment is evident based on the joint examination described above, the chlorinated water may be broadcast for dust control on the surface of the immediate site. Care shall be exercised in broadcasting the water to prevent runoff.

The Engineer will perform bacteriological sampling and testing of all new system installations. The testing methodology employed by the Engineer shall be as set forth in "Standard Methods for the Examination of Water and Waste Water" (current edition). Testing requirements are as set forth in the California Domestic Water Quality and Monitoring Regulations and commensurate with current requirements for surface water testing. The Engineer will analyze the samples for the presence of coliform bacteria and heterotrophic-type bacteria (heterotrophic plate count). The evaluation criteria employed by the Engineer for a passing test sample is as follows:

A. Coliform bacteria: no positive sample, and
B. Heterotrophic plate count (HPC): 500 colony forming units/ml or less.

If the initial disinfection fails to produce satisfactory bacteriological test results, the pipeline system shall be re-flushed and re-sampled. If the second set of samples does not produce satisfactory results, the pipeline system shall be re-chlorinated, flushed, and re-sampled. The chlorination, flushing, and sampling procedure shall continue until satisfactory results are obtained. Re-disinfection and retesting shall be at the Contractor's expense.

Pipes, fittings, valves and all other components incorporated into connections with the existing system shall be spray disinfected or swabbed with a liquid chlorine solution in accordance with AWWA C651 and as specified herein. Upon connection to the main, the line shall be flushed as directed by the Engineer. Disinfection by this method is generally limited to assemblies of 6 m or less in length. Alternate methods such as "predisinfection" prior to installation in accordance with AWWA C651 may be required at the discretion of the Engineer.

VALVE TESTING PROCEDURES

Manufacturer Factory Testing Requirements

The manufacturer shall test each butterfly valve in accordance with AWWA C504 and each resilient wedge gate valve in accordance with AWWA C509 or AWWA C515, and these Special Provisions, prior to shipping the valve.

Each butterfly valve and resilient wedge gate valve shall be hydrotested by the manufacturer after the interior and exterior coatings have been applied and cured.

Each butterfly valve shall be hydrotested by the manufacturer after the actuator has been mounted and adjusted.

Each butterfly valve and resilient wedge gate valve shall be dry film thickness tested and holiday detection tested by the manufacturer prior to the valve being shipped.

Each butterfly valve and resilient wedge gate valve shall be operated from the fully closed to fully open to fully closed positions prior to the completed valve being shipped.

Prior to shipment, the manufacturer shall provide notarized certification that each butterfly valve and resilient wedge gate valve supplied has successfully completed the tests required by AWWA, ANSI, ASTM and these Special Provisions.

Each valve shall be shipped with end seals and wrapped in shipping plastic.

Testing Requirements Prior to Installation

Valve testing, shall be provided by either the supplier or the Contractor at no cost to the Engineer. Valves failing to pass the testing regimen specified shall be either replaced or repaired at no cost to the Engineer. Replaced or repaired valves shall be tested as specified in these Special Provisions.

Testing of valves shall not be scheduled until a submittal has been processed and approved by the Engineer.

Valves shall be tested within a 80-km radius of the Engineer's office.

Valves shall be tested in the presence of the Engineer. It is the responsibility of the either the supplier or the Contractor to schedule the witnessing of the testing with the Engineer assigned to the project. Requests for valve testing shall be made to the Engineer 5 working days in advance of the desired testing date.

All butterfly valves shall be mil thickness tested, holiday detection tested and hydrotested by either the supplier or the Contractor prior to installation in the field. Generally, the valves will be tested at the supplier's facility prior to shipment to the field.

A representative sample of resilient wedge gate valves on a project may be selected for testing by the Engineer. The Engineer shall indicate on the approved submittal when resilient wedge gate valves have been selected for testing.

The procedures and requirements for the testing of valves shall be as described in these Special Provisions. Butterfly valves shall be required to pass all tests prior to being incorporated into the project. When selected for testing, resilient wedge gate valves shall be required to pass the Hydrotesting phase in accordance with these Special Provisions.

Valves not passing the tests required shall be replaced or repaired at the discretion of the Engineer. Replaced valves shall be in accordance with these Special Provisions. Repaired valves shall repeat the phase of the required testing, which was failed in addition to the phases not yet completed. Repaired valves, may be rejected and required to be replaced if it repeatedly fails any phase of the testing.

Testing Media

The testing media for hydrostatic testing shall be an approved source of potable water. Testing with a gaseous media shall be prohibited.

Testing Equipment Furnished by the Supplier or Contractor

The supplier or the Contractor shall furnish all necessary manpower and hydrotesting equipment, including test pump, hoses, gages, blind flanges and a safe means of turning the valves over. Insufficient manpower, substandard or unsafe equipment shall be ground for the Engineer to cancel the testing until adequate manpower and acceptable equipment have been provided.

Testing of valves shall be in the following order:

A. Pre-Test Inspection
B. Hydrostatic Test
C. Dry Film Thickness Test
D. Holiday Detection Test

Pre-Testing Inspection

On the date and time agreed the Engineer shall travel to the testing site. The testing site must be within a 80-km radius of the Engineer's office.

The Engineer responsible for the project will receive one copy of the valve submittal. The Engineer shall take the submittal to the testing site to verify the valves to be tested correspond to those on the approved submittal.

Upon arrival at the testing site, the Engineer shall assess the readiness of the tester's personnel to perform the testing. If there is not sufficient manpower and equipment present to perform the tests in a timely manner, the Engineer is to cancel the testing scheduled for that day. The Engineer is to inform the tester of the reason(s) for canceling the test and instruct the tester to reschedule the testing.

Visually inspect each valve (class and configuration), operation of valve, and it's actuator for compliance with the submittal. Valves not in compliance with the approved submittal shall be rejected.

Visually inspect each valve for obvious damage or substandard construction. Valves found to be damaged or of substandard construction shall be rejected. Record the model and serial number of each valve and its actuator on the Valve Inspection Record Sheet.

Hydrostatic Testing Procedures

Each valve shall be tested on both sides at its rated pressure. During the hydrostatic test, there shall be no leakage through the valve body, end joints, or shaft seals, nor shall any part of the valve be permanently deformed.

The testing medium shall be water. Under no circumstances is a gas to be used as the test medium.

The test duration on each side of the valve is 15 minutes. The test equipment will be disconnected during this time.

Valves require careful handling when turning them over. The Engineer shall stop the testing activity if the manner used by the tester to handle the valves is unsafe or will result in damage to the valve. The flange faces are especially susceptible to damage if the valve is not properly handled.

Valves exhibiting no visible leakage, no decrease in the initial test pressure or no deformation shall be considered passed.

Valves exhibiting visible leakage a decrease in the initial test pressure or deformation shall be considered rejected. Valves, which fail the hydrotest test, shall be either repaired or replaced at the Engineer's discretion.

Personnel authorized by the valve manufacturer shall only repair valves permitted by the Engineer to be repaired. Unless the valve manufacturer has authorized them, supplier or contractor personnel shall not be permitted to perform repairs.

Indicate on the Valve Testing Sheet the results of the hydro test.

Dry Film Thickness Testing Procedure

The dry film thickness gage shall be calibrated prior to beginning the taking of the mil readings and periodically during the testing. Use plastic shims or standardized plates and follow the instructions provided with the instrument.

A minimum of four readings should be taken on each side of the disc and a minimum of three reading on each side of the interior of the valve body. Some readings should be taken near edges and around intricate assemblies are where the coating is likely to be thin.

Mark the spot and mil reading at each location where the reading were taken with a felt tip pen. More readings many be taken at the discretion of the Engineer.

The minimum dry film thickness of any reading shall be a minimum 0.2 mm. Mark with felt pen any location where the coating thickness is less than minimum dry film thickness required.

Valves with adequate coating thickness shall be considered passed and the results indicated on the valve testing form. Proceed to the Holiday Detection phase of the testing.

Valves with inadequate coating thickness in any location shall be rejected. Qualified personnel approved by the valve manufacturer shall repair valves with unacceptable coating in accordance with the valve manufacturer's recommendations in a facility.

Holiday Detection Testing Procedure

The interior surface of each valve shall be tested in accordance with NACE Standard RPO490-90, (Holiday Detection of Fusion-Bonded Coatings) and NACE Standard RPO274-98, (High Voltage Electrical Inspection of Pipeline Coatings) using a high voltage as described above.

Assure the instruments to be used are properly calibrated, batteries charged, and in proper working order prior to use.

High-Voltage Holiday Detector set-up:

A. Select output voltage (on the detector) to the desired setting. Use 100 volts per mil thickness. The 8-mil thickness specified requires a setting of 800 volts.
B. Connect the ground wire to the valve to be tested. Assure a sound metallic contact is achieved. Plug the ground wire into the detector.
C. Select the appropriate powerpack, wand length, and electrode (stainless brush or rubber paddle) to be used. Assemble the powerpack, wand electrode and plug the assembly into the high voltage port on the detector.
D. Turn the detector switch on. An audible tone will be heard if the instrument is ready to use. Verify the working of the instrument by running wand across the ground bare metallic surface of the valve. A buzz tone will be heard.

The surface to detected should be dry. A wet surface will "carry over" a holiday in an area.

Cover all surface area with the electrode in a slow thorough motion, testing all interior coated surfaces. Most holidays are found on or around casting numbers, nuts, bolts, and sharp edges. When a holiday is detected, circle area with a black permanent felt pen.

Valves with no holidays in the coating shall be considered passed and the results indicated on the Valve Testing Sheet. Proceed to the Hydrotesting phase of the testing.

Valves with holiday(s) in the coating in any location shall be rejected. Qualified personnel approved by the valve manufacturer shall repair valves with unacceptable coating in accordance with the valve manufacturer's recommendations in a facility. Indicate on the Valve Testing Form that the valve failed this portion of the test.

Reporting and Marking

The Engineer shall record the results of each phase of the testing of each valve on the Valve Testing Sheet.

The Engineer shall mark the flange of each side of the valve to indicate the results of the test. The required marking convention is shown on the Valve Testing Sheet.

Marking shall be made using a white metal marker.

The markings should be made on the portion of the valve flange that will be readily visible in the field. For valves to be used in buried service, the markings should be oriented toward the top of the trench.

The Engineer shall visually check each valve in the field for proper markings prior to installation. Any valve not displaying the proper markings shall be immediately rejected and the contractor instructed to remove it from the site.

CLOSED CIRCUIT TELEVISION (CCTV) INSPECTIONS

CCTV inspections on newly constructed water and sewer mains shall be conducted after all utilities have been installed and backfill compaction has been certified, but prior to final pavement.

The Contractor shall notify the Engineer two (2) working days in advance of the anticipated date of televising so that the Engineer may observe CCTV inspection operations. Schedule shall also include time for pre-cleaning operations, when necessary.

CCTV inspections shall be performed by the Contractor as follows:

Inspection of steel water mains 900 mm and smaller for the purpose of documenting the physical condition and cleanliness of the pipe and inspection of mortared joints.

The Contractor shall furnish all equipment and materials required for inspection. Equipment shall be in accordance with SSPWC Section 500, SSPWC Regional Supplement Amendments Section 306 and as noted below:

The video equipment utilized shall be specifically designed and constructed to be operative in one hundred percent humidity conditions. Lighting for the camera shall minimize reflective glare. Lighting and camera quality shall be suitable to provide a clear, continuously in-focus picture of the entire inside periphery of the pipe for all conditions encountered during the inspection. A reflector in front of the camera may be required to enhance lighting in large diameter pipe.

Video equipment utilized for inspection of water mains shall be certified for domestic water main inspection only, shall also be certified to never have been utilized in non-potable systems.

Videotape shall be high-quality color VHS format. The capacity of the videotape shall be adequate to record inspection of at least one (1) complete pipe segment. Recording of a single segment shall not extend to more than one (1) videotape.

Recording shall be performed using a four (4) head VHS format VCR recorded in SP or LP modes only.

CCTV inspections may be recorded onto digital media such as DVD with the prior permission of the Engineer.

Procedures for CCTV inspections shall be in accordance with SSPWC Section 500, SSPWC Regional Supplement Amendments Section 306 and as noted below:

The camera operator shall slow or stop the camera at potential or actual imperfections in the new main to obtain a high quality video image. Each location where a potential obstruction or structural deficiency exists shall be identified with accurate distance measurements above ground from the manhole or access hole.

For CCTV inspections on water mains the Contractor shall examine the main to insure the passage of the camera through all valves and fittings prior to any televising. Mains with fittings that would obstruct the camera, such as butterfly valves, shall be televised either prior to the installation of those fittings or from access holes immediately adjacent to the obstructing fitting, if available.

Documentation of CCTV inspections shall be in accordance with Section 500 of the Utility Standard Specifications, Section 306 of the 2003 Regional Supplement Amendments to the "Greenbook" Standard Specifications for Public Works Construction, 2003 edition, and as noted below:

Audio and written documentation shall accompany all videotape(s) submitted to the Engineer.

If voice recording is used on the videotape the recording shall have brief informative comments on unusual conditions, type and size of connection and fitting, collapsed sections, the presence of scale and corrosion, location and description of each defect, and other significant data.

The Contractor shall prepare an inspection report, which shall be a complete written log of pipe conditions, indexed to the footage counter. The Contractor shall turn over the original videotape and written reports to the Engineer at completion of the inspection.

SECTION 10-4. 02 WATER SYSTEM RELOCATION

GENERAL

The relocations of a 600 mm CML&TC water main at Old Otay Mesa Road and 2-400 mm CML&TC water mains along Caliente Avenue belonging to the City of San Diego with new CML&TC water mains along Airway Way Road and Caliente Avenue. The 400 mm water pipe will split into two smaller 300 mm water pipes in the Caliente Avenue Bridge that will span SR 905. One of the existing 400 mm CML&TC water main at Caliente Avenue will be temporarily relocated during the construction of the bridge. The other 400 mm CML&TC water main will be put out of service by the City of San Diego Forces. The existing 400 mm Otay Water District water line on Airway Road between Cactus Road and Britannia Blvd. will be protected in place as shown on plans.

DRAWINGS AND DATA REQUIRED

Attention is directed to Section 5-1.02, "Plans and Working Drawings", of the State Standard Specifications.

Where pipe and supports are fabricated for this project, the Contractor shall submit complete erection and fabrication drawings to the Engineer for approval as follows:

An affidavit of compliance with AWWA C200, C203, C205, or C214 as applicable.

A tabulated schedule including:

A. Order of installation and closures.
B. Pipe station and bottom of pipe elevation at each change of grade and alignment.
C. Elements of curves and bends, both in horizontal and vertical alignment.
D. Pipe internal diameter, wall thickness, and internal design pressure.
E. Locations of bulkheads for field hydrostatic testing. (Testing against valves will not be permitted).
F. Locations of closures, including cut-to-fit allowances, for length adjustments and for construction convenience.
G. Locations of valves, flanges, and other mechanical equipment
H. Fabrication details for pipe supports.
I. Typical details of all specials and fittings, joints, and linings and coating, and butt straps.
J. Calculations supporting the sizing of reinforcing collars, wrapper plates or crotch plates.
K. Calculations supporting selected wall thickness of the pipe and specials.
L. Calculations supporting welded joint design.
M. Current shop welder and field welder certification.
N. Mill test reports on each heat from which steel is rolled.
O. Certification of dye-penetration shop weld testing.
P. Details and description of exterior pipe coatings including repair and testing procedures.
Q. Cathodic protection design and installation details.

Materials

A. Manufacturer's catalog data including model or figure number and dimensions for each type of coupling and for each type of pipe material and which the couplings are used. Include bolting and gasket data.
B. Manufacturer's recommended installation or instructions.
C. Materials of construction by ASTM reference grade.
D. Shop coating data including surface preparation, coating material, number of coats, and dry film thickness applied shall be described.

A layout schedule shall include the station, elevation and piece identification of each pipe special, fitting and appurtenance, and the station and elevation of each pipe joint.

Before preparing the schedule and fabrication drawings, the Contractor shall determine the precise locations and alignment of the new pipe relative to the alignment of the new pipe as shown on the plans. The Contractor shall furnish the Engineer with tracings or transparencies of the approved schedule and drawings, from which the Engineer can obtain the required prints.

CONNECTIONS TO EXISTING WATER MAINS

Unless otherwise indicated on the plans or specifically directed by the Engineer, all connections to existing facilities, including wet taps on active pipelines and cut-in installations, shall be performed by Utility Owner personnel. When the plans indicate wet taps or cut-in installations are to be performed by Contractor, or when Contractor has the specific written permission of the Engineer to perform wet taps or cut-in installations, such work shall be performed in strict accordance with the following procedures. The Engineer must approve all work performed by Contractor prior to allowing access to the work site by Utility Owner personnel.

The Contractor shall furnish the tapping sleeve or tee, valves and all other materials as called for on the plans or as required for completion of the work and in accordance with the Approved Materials List. The Contractor shall provide all equipment and labor required for the excavation and installation of the connection including but not limited to thrust blocks, backfill and pavement replacement. In certain circumstances the Contractor may be required to provide a water truck, high line, and fittings as part of the equipment for making the connections. In addition, the Contractor shall assist the Utility Owner in alleviating any hardship incurred during a shutdown for connections. Emergency standby equipment or materials may be required of the Contractor by the Engineer.

The tapping machine shall have the ability to positively flush all shavings and other residue created when installing tapped outlets of 100 mm or larger.

The shell cutter bell on the tapping machine shall be tapped with a 50 mm minimum outlet.

A ball valve shall be installed on the outlet to regulate flow.

A hose and filter shall be connected to the ball valve to retrieve shavings and residue generated during the tapping process.

A multi-toothed shell cutter is required to minimize the size of shavings generated when tapping PVC pipe. The shell cutter pilot tool shall be designed to capture the coupon generated by performing the wet tap.

The tapping machine shall be filled with water prior to commencing the tapping procedure.

Wet taps or cut-in tee and valve installations shall be performed as follows:

Prior to construction, Contractor shall pothole the existing pipe at the location of the proposed connection. The Engineer shall inspect the pothole prior to Contractor's repair of trench. Contractor shall record the following information on As-Built drawings:

A. Pipe size, outside diameter.
B. Pipe type such as ACP, PVC, Ductile-Iron or Steel.
C. Pipe class and/or pressure rating.
D. Elevation, grade, and alignment.
E. Location of collars, pipe bells, fittings or couplings, if found.
F. Potential conflicts with existing utilities.

To facilitate the proposed connection and allow for slight adjustments in alignment, the Contractor shall leave a minimum 3.0 m gap between the new pipe installation and the proposed connection point at the existing water main. The Contractor shall leave a gap longer than 3.0 m if conditions warrant, or if directed by the Engineer.

The new pipeline shall have successfully passed pressure testing, disinfection, and bacteriological testing in accordance with these Special Provisions prior to proceeding with the connection to the existing pipeline.

After the Engineer has given approval to proceed with the connection, the Contractor shall schedule with the Engineer for the wet tap or cut-in installation.

A. Shutdowns will be scheduled at the convenience of the Utility Owner. Shutdowns may be scheduled for nights or weekends if required.
B. The Contractor shall give the Engineer a minimum of five (5) working days notice prior to any proposed excavation or shutdown of existing mains or services. Scheduling shall be subject to approval by the Engineer.
C. The Engineer may postpone or reschedule any shutdown operation if, for any reason, the Engineer believes that the Contractor is improperly prepared with competent personnel, equipment, or materials to proceed with the connection.
D. If progress in completing the connection within the time specified is inadequate, the Engineer may order necessary corrective measures. Corrective measures may consist of directing Utility Owner personnel or another contractor to complete the work. All costs for corrective measures shall be borne by the Contractor.

Contractor may proceed with excavation only when pothole has been completed, materials have been approved and delivered, wet tap or cut-in installation has been scheduled and a copy of the approved traffic control plan has been supplied to the Engineer.

A. The Contractor shall saw-cut pavement, excavate and provide and install shoring and steel plating, when necessary, one day prior to the wet tap or cut-in installation.
B. The Contractor shall provide lights, barricades and traffic control in accordance with the agency of jurisdiction and as deemed necessary for the excavation by the Engineer.
C. The Contractor shall de-water existing mains where cut-in installations are required in the presence of the Engineer. The Contractor shall be prepared to deal with leaking valves and water from those valves to complete the shutdown. Only Utility Owner personnel are authorized to operate existing valves. The Contractor shall be responsible for any and all damage resulting from unauthorized operation of existing facilities.

D. In areas where cut-ins are to be performed the Contractor shall line the bottom of the trench with 300 to 450 mm of 19 mm rock and install a 300 to 400 mm deep sump for dewatering the trench bottom.
E. The Utility Owner shall perform the following work for wet taps and cut-in installations:

1. Wet taps: Disinfect and install the tapping saddle and tapping valve and perform tapping operations in accordance with these Special Provisions.
2. Cut-ins: Cut and remove portions of existing mains, and disinfect and install tees, valves, couplings, and appurtenances required to complete the closure. The Contractor shall discard pipe and appurtenances removed from service in accordance with the Special Provisions.

F. After the Utility Owner has performed tapping or cut-in operations, and the Engineer has given approval to proceed, the Contractor shall complete the installation as shown on the plans in accordance with the Special Provisions including, but not limited to:

1. Disinfecting and installing the pipe section(s) necessary to make the closure to the new system.
2. Installing and setting the valve gate well(s) in accordance with the plans.
3. Installing thrust and anchor blocks.
4. Completing all backfill and compaction of the trench.
5. Repairing or replacing pavement as necessary in accordance with agency of jurisdiction requirements.

BEDDING FOR WATER PIPE

Bedding to the spring line shall be placed at approximately the same elevation on each side of the pipe to prevent unequal loading and displacement of the pipe. Bedding shall be a minimum of 150 millimeters below the bottom of the water pipe.

Bedding material shall be the same as "Sand Bedding" listed elsewhere in these Special Provisions.

BACKFILL

The trench backfill shall be placed and mechanically compacted. Compaction shall conform to the Section 19-5, "Compaction," of the State Standard Specifications, as shown on the plans and these Special Provisions.

Compaction shall be accomplished by mechanical means. Consolidation by water settling methods such as jetting or flooding is prohibited.

If the backfill fails to meet the specified relative compaction requirements; the backfill shall be reworked until the requirements are met. All necessary excavations for density tests shall be made as directed by the Engineer, and as acceptable to the Engineer. The requirements of the Agency having jurisdiction shall prevail on all public roads.

Compaction tests shall be performed at random depths, and at random intervals not to exceed 45 m, as directed by the Engineer.

Relative compaction shall be determined by the impact or field compaction test made in accordance with ASTM D 1557 Procedure C.

Unless otherwise shown on the plans or otherwise described in the specifications for the particular type of pipe installed, relative compaction in pipe trenches shall be as follows:

A. Pipe zone – 90 percent relative compaction.
B. Trench zone – 90 percent relative compaction.
C. Structural section in paved areas - per agency requirements, 95 percent minimum.
D. Imported Granular Material for over excavation or foundation stabilization – 90 percent relative density.

All excavations are subject to compaction tests.

Imported Granular Material, Sand Bedding:

Imported granular material shall be used within the Pipe Zone for installations of PVC Pressure Pipe, Ductile-Iron Pipe, Cement-Mortar Coated Steel Pipe, Tape-Wrapped Steel Pipe, and Paint-Coated Pipe.

Crushed Rock shall be used in the Pipe Zone on PVC Gravity Sewer Pipe. Crushed rock shall be clean, crushed stone free of organic matter. Crushed rock shall be certified to contain less than 1 percent asbestos by weight or volume and shall conform to the following gradation and requirements:

Sieve Size	Percent Passing
25 mm	100
19 mm	90-100
12.5 mm	30-60
9.5 mm	0-20
4.75 mm	0-5
2.36 mm	0

Tests	California Test	Requirements
Loss in Los Angeles Rattler (after 500 revolutions	211	
100 Revolutions		15 % Max
500 revolutions		52 % Max

Native materials may not be used in lieu of Imported Granular Material within the trench zone unless such materials meet all of the requirements specified for Imported Granular Material within the pipe zone.

Sand-cement slurry shall consist of two sacks, 85.3 kg of Portland cement per 0.76 cubic meter of sand and sufficient moisture for workability. Approval from the Engineer is required for use of slurry as a backfill material.

Filter fabric shall be manufactured from polyester, nylon, or polypropylene. Material shall be of non-woven construction and shall meet the following requirements:

Grab tensile strength (ASTM D 4632)	45.4 kg minimum for a 25 mm raveled strip
Weight (ASTM D 3776)	152.6 kg/m^2
Apparent opening size (ASTM D 4751)	0.150 mm

Imported granular material shall be free of organic material. The coefficient of uniformity shall be 3 or greater. The material shall be quarry waste or sand. Material shall have a sand equivalent of not less than 30 per ASTM D 2419 and shall conform to the following gradation:

Sieve Size	Percent Passing by Weight
13 mm	100
1 mm	90-100
No. 4	50-100
No. 8	10-60
No. 30	25-60
No. 100	5-20
No. 200	0-12

Sand bedding material shall be placed along the length of the pipe to 150 millimeters above the top of pipe. The Contractor shall use mechanical vibration of the bedding to obtain 90 percent relative density.

Backfill

The trench backfill shall not contain more than 15 percent by volume of clay or adobe. A maximum of 15 percent shall pass a No. 200 sieve. The material shall be at optimum moisture content and shall be compacted in maximum 150 millimeters deep uniform layers on each side of the pipe. Backfill shall be complete prior to hydrostatic tests on the water mains and casings unless otherwise specified or permitted by the Engineer.

Trench backfill shall be compacted to obtain 90 percent relative compaction. For areas within roadways, the top 300 mm shall be compacted to 95 percent relative compaction.

Water consolidation shall not be used.

The use of a backhoe mounted compaction wheel is prohibited within the sand bedding.

Should evidence of pipe settlement be observed during any stage of backfilling by mechanical means, such operations shall be immediately discontinued and the remainder of backfilling in the affected portions of the trench shall be backfilled by methods as approved by the Engineer.

WATER MAIN REMOVAL AND DISPOSAL OF ABANDONED WATERLINE

Existing water mains to be removed shall be removed and disposed of. Attention is directed to "Disposal of Friable Asbestos" and "Disposal of Non-Friable Asbestos" elsewhere in these Special Provisions. All resulting openings shall be plugged with minor concrete.

Before excavating for new mains that are to replace existing pipes or services, the Contractor shall make provisions for the continuation and maintenance of service to customers as directed by the Engineer.

Abandonment or removal from service of existing mains, appurtenances or water services shown on the plans or as called for by the Engineer shall be as indicated below and in accordance with the Special Provisions. All materials removed during construction operations shall be salvaged or disposed of.

Existing pipe 100 mm and smaller that are to be abandoned in place shall have a short section of pipe removed and pipe ends encased in concrete.

Existing pipe 150 mm through 250 mm that are to be abandoned in place shall be cut and plugged with concrete or shall be pressure-grouted at intervals of 60 m.

Existing pipe 300 mm and larger that are to be abandoned in place shall be entirely filled by pressure-grouting or by blown sand.

Existing pipe ends shall be filled with concrete in accordance with the plans.

All valves shall be turned to the closed position.

Gate wells shall be cut 600 mm below grade and filled with concrete or removed and replaced with compacted backfill.

Water service corporation stops shall be closed. Meter boxes and curb stops shall be removed.

Water services to be abandoned that are connected to pipelines that will remain in service shall be abandoned in-place in accordance with the plans.

Pipelines shall not be abandoned until their use is no longer required. The Contractor shall notify the Engineer in advance of any intended pipeline abandonment.

If the Contractor elects to remove and dispose of a pipeline which is specified to be abandon, as provided herein, backfill specified for the pipe will be measured and paid for in the same manner as if the pipeline has been abandon in place.

The contract price paid per cubic meter for sand backfill shall include full compensation for furnishing all labor, material, tools, equipment, and incidentals, and for doing all the work involved in backfilling pipelines with sand, complete in place, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

Controlled low strength material and slurry cement backfill, if used at the Contractor's option, will be measured and paid for by the cubic meter as sand backfill.

Full compensation for concrete plugs, pipe removal, structure excavation, shall be considered as included in the contract price paid per meter for abandon pipeline and no additional compensation will be allowed.

Sewer laterals shall be cut and plugged with concrete at the main as directed by the Engineer for the specific circumstance and material type identified.

Sewer manholes shall have the cover and frame, concrete ring, grade rings and cone section removed. Inlet and outlet piping shall be plugged with concrete, manhole void shall be filled with sand, and a 300 mm thick reinforced concrete slab shall be poured over the top of remaining manhole. The Contractor shall backfill hole to ground surface with compacted select fill.

Existing pipe and appurtenances to be removed by excavation shall be removed from the ground as indicated on the plans or as directed by the Engineer. All materials removed during construction operations shall be salvaged or disposed of.

Contractor shall provide measures that allow for the removal of existing sewer mains and appurtenances with no leakage of raw sewage. Transportation of sewer mains and appurtenances removed from service shall be in waterproof trucks to prevent raw sewage from leaking on public streets.

Removal of asbestos-cement pipe (ACP) and sewer mains and appurtenances shall be in accordance with all applicable State and Federal requirements.

Backfill, compaction, and surface repair of all excavations for removal of pipe and appurtenances shall be made in accordance with the plans and the Special Provisions.

When the Contractor is required to remove existing pipe and appurtenances, or portions thereof from the ground, such materials may at the discretion of the Engineer, be considered salvage. All valves shall be salvaged and returned to the Utility Owner. All materials identified as salvage are considered property of the Utility Owner.

The Contractor shall remove and temporarily stockpile all materials identified as salvage in a safe location that will not disrupt traffic or shall deliver salvage to the Utility Owner's Field Operations Yard as directed by the Engineer.

The Contractor shall legally dispose of all other materials in an appropriate manner. Disposal is the responsibility of the Contractor. Obtain concurrence from the agency having disposal jurisdiction with respect to disposal sites and transportation methods.

Removal of water mains shall include valves with valve box and cover. Valves to be removed shall be removed entirely with the valve box and cover.

All material from the removed water mains and its appurtenances, except valves, shall become the property of the Contractor at the time of its removal from the trench, unless otherwise specified or shown on the plans. Such material shall not be allowed to accumulate along the line of work, but shall be removed from the area at the earliest practical time.

PIPE LAYING-GENERAL

Pipe laying shall conform to the State Standard Specifications and these Special Provisions. The pipe shall be laid in accordance with the manufacturer's recommendations, and shall be laid to the lines and grades shown on the plans except as amended and supplemented by the manufacturer's tabulated layout schedule and approved by the Engineer. Internal bracing installed at fabrication shall be maintained until pipe zone compaction is complete.

Necessary facilities, including slings, shall be provided by the Contractor for lowering and properly placing the pipe sections and fittings in the trench without damage.

Trenches shall be in a reasonable dry condition when pipe is laid. The Contractor shall take all necessary precautions to prevent the pipe from floating due to water entering the trench from any source, and he shall assume full responsibility for any damage due to this cause.

When the exterior joint weld is less than a complete circumferential weld extreme caution shall be exercised to assure that there is no damage to the rubber gasket in the pipe joint. The Engineer reserves the right to limit the size of welding rod and the thickness of pass as well as control of amperage used for making the welds. Where joints on the existing pipe are to be field welded, the mortar on the entire joint shall be removed, cleaned and refilled with mortar after welding is completed.

Bedding shall provide uniform and adequate longitudinal support under the full length of pipe. Bell holes at each joint shall be provided to permit the joint to be assembled properly while maintaining uniform pipe support.

All connecting parts of the pipe, rings, couplings, and fittings shall be cleaned before assembly, shall be tightly fitted together and care taken to secure true alignment and grade.

The rubber gasket joint shall be made by properly lubricating the rubber gasket with a suitable vegetable compound soap before it is placed in the groove at the spigot end. The gasket shall be stretched over the spigot end of the pipe and carefully seated in the groove, with care taken to equalize the stress in the gasket around the circumference of the joint. The gasket shall not be twisted, rolled, cut, crimped, or otherwise injured or forced out of position during the closure of the joint. A "feeler" gage shall be used to check the position of the rubber gasket after the joint has been telescoped.

The Contractor shall keep the pipe and appurtenances clean during the progress of the work. Dirt, rocks, or other foreign materials shall be removed from the interior of the pipe before and during installation. All openings in the pipeline shall be closed at the end of each day's operations or whenever the workmen are to be absent from the work area. This may require the use of a plywood or steel bulkhead. All surface or groundwater shall be prevented from entering the pipe and shall be removed from the trench.

Each section of pipe shall be carefully lowered into the trench using slings in such a way that the coating and lining are not damaged by flexure or abrasion. The spigot shall be entered into the bell or collar and forced home. The joint shall be made carefully to avoid undue stressing of, or impact damage to, the pipe and gasket, and stabbing as a method of installation will not be permitted. Unless otherwise detailed on the plans, pipe shall not be set on blocks of any kind (including wood) in the trench bottom. If blocking becomes necessary, bags filled with sand may be placed under the pipe. These bags shall be broken after the haunches are packed.

The pipe shall not be dragged along the bottom of the trench, but shall be securely supported by the slings until the joint is assembled. Each spigot shall be inserted into the bell or collar the distance shown on the approved fabrication drawings so as to avoid cumulative gain or loss of laying length.

Suitable excavations shall be provided in the bedding material for removal of the slings, without damaging the coating, after assembly of the joint. These sling removal holes shall be filled, the pipe length securely blocked in its proper alignment, and the pipe barrel partially backfilled.

Unless the sheeting or shoring is to be cut off and left in place, densification of bedding for pipe shall be accomplished after the sheeting or shoring has been removed from the bedding zone. Alternate methods of pipe bedding, which are recommended by the pipe manufacturer, may be used if approved by the Engineer.

All joints shall be cleaned with a wire brush and welded before coating repair. All jetting locations shall be sufficient to thoroughly saturate the bedding material around the pipe.

DISPOSAL OF ASBESTOS

Disposal of Non-Friable Asbestos

Disposal of non-friable asbestos-containing materials shall be in accordance with the County of San Diego Guidelines. Guidelines may be obtained at the Solid Waste Division, County of San Diego, Public Works Division, Building 2, 5555 Overland Avenue, San Diego, CA 92123.

Full compensation for the disposal of non-friable asbestos containing materials shall be considered as included in the contract unit price paid for "Remove Pipeline" and no separate payment will be made therefore.

Disposal of Friable Asbestos

All friable asbestos containing materials (materials that can be crumbled, pulverized, or reduced to powder in hand) are regulated as a hazardous waste and shall be transported by a licensed hazardous waste hauler and disposed of in an appropriate landfill.

Full compensation for the disposal of friable asbestos-containing materials shall be considered as included in the contract unit price paid for "Remove Pipeline" and no separate payment will be made therefore.

DELIVERY, STORAGE, AND HANDLING OF CEMENT MORTAR LINED AND COATED STEEL PIPE AND SPECIALS

Delivery, storage, and handling of the pipe and specials shall be as follows:

Pipe and fittings shall be carefully handled and shall be protected against damage to linings and coatings due to impact shocks. Pipe shall not be placed directly on rough ground but shall be supported in a manner, which will protect the pipe against injury whenever stored at the site or elsewhere. Pipe shall be handled and stored per these requirements and in accordance with the Manufacturer's recommendations.

Temporary internal bracing shall be installed in all pipe 400 mm and larger prior to shipment to the job site. Temporary internal bracing shall be 100 mm x 100 mm wooden stulls installed in both the horizontal and vertical directions. Each set of stulls shall be nailed together as a unit. Wooden wedges may be used to maintain the proper tight fit of the internal bracing. The bracing shall be located 300 mm in from each end of the pipe section for all pipe, and additionally at the mid-point for piping 600 mm and larger. Maintain internal bracing as specified under Pipe Installation.

Transport pipe to the job site on padded bunks with nylon tie-down straps or padded bonding to protect the pipe.

Pipes and specials shall only be handled with appropriate spreader bars and wide nylon slings. Chains or wire rope slings shall not be used. Under no circumstances shall pipe or specials be pushed or dragged along the ground. All pipe sections over 6 m in length shall be lifted at the quarter points from each end.

Store pipe on earth berms or timber cradles adjacent to the trench in the numerical order of installation. Place the supports at about the one-quarter point from the pipe ends.

Maintain plastic end caps on all pipe and specials in good condition until the pipe is ready to be installed in the trench. Periodically open the plastic end caps and spray potable water inside the pipe for moisture control.

DELIVERY, STORAGE, AND HANDLING OF POLYVINYL CHLORIDE (PVC) WATER PIPE

Polyvinyl chloride pressure pipe shall be stored in the field by supporting the pipe uniformly as specified in AWWA Manual M23. Do not stack pipe higher than11.2 m or stack the pipe with weight on the bell ends. Cover stored PVC pipe to protect it from the sun's ultraviolet radiation.

Overly faded pipe, which is determined by the Engineer to be of suspect quality shall not be used and shall be removed from the project site immediately. PVC pipe, which has been gouged, shall not be used. PVC pipe, which has received minor scratches during handling, may be used solely at the discretion of the Engineer. Pipe which has been contaminated with any petroleum products (inside or outside) shall not be installed.

PVC pipe shall be installed in the trench using bell holes at each joint to prevent the pipe from being supported by the bell end or coupling. The identification strip marking shall be continuously aligned on the top of the installed pipe.

A 2 m section of PVC pipe shall be used into and out of all fittings and valves.

Where pipe sections less than the standard pipe lengths are required, the pipe sections shall be installed in accordance with the manufacturer's installation guide.

Installation of pipe shall not vary more than 30 mm vertically or 35 mm horizontally from the alignment shown on the approved plans.

Cutting and milling shall be accomplished with tools intended for such use to create a machined end equal in workmanship to the milled ends of the pipe as furnished by the manufacturer. Milling shall not result in undercutting the wall thickness and must be approved by the Engineer prior to installation.

A cleaning tool approved by the Engineer shall be pulled through the pipe during installation to remove dirt, rocks, or foreign materials. The tool shall be designed to fit closely without damaging the pipe during the cleaning operation. The tool shall be examined as it is pulled up to the end of each joint of pipe and any foreign material shall be removed. All openings in the pipeline shall be sealed to protect the pipe from the intrusion of groundwater or any other foreign material at all times.

All connecting parts of pipe, rings, coupling and castings shall be clean before assembly. Assembly of the couplings and rings shall be in accordance with the manufacturer's recommendations. Lubricant and rubber rings shall be supplied by the pipe manufacturer. The use of excessive lubricant will not be permitted.

After the spigot end has been inserted into the bell or coupling to the proper insertion mark the elastomeric ring shall be checked for grooving or improper assembly by passing a feeler gauge around the completed joint.

Bronze saddles shall be used on all 25 mm and 50 mm services or appurtenance connections. Saddles shall be located a minimum of 0.6 m from any pipe joint, and from other saddles or fittings. Multiple saddles installed on the same side of a single pipe length shall be staggered 30 degrees so as not to form a weak line in the pipe. Tapping tools and shell cutters of the kind and type recommended by the manufacturer shall be used. Saddles shall be installed to manufacturers' specified torque.

Tapping saddles shall be installed a minimum of 0.6 m from the edge of the saddle to any other saddle, pipe joint or other fitting. Multiple taps of 150 mm or larger shall not be made in the same joint of pipe without the approval of the Engineer.

The entire exterior surface area of valves and fittings shall be coated with 20 mils of lap cement and wrapped in 8 mils thick polyethylene sheet plastic.

DELIVERY, STORAGE AND HANDLING OF VALVES

Valves shall be delivered and stored in accordance with AWWA C550. The port openings shall be covered with plastic, cardboard, or wood while in transit and during storage in the field. These shall remain in place until the valve is ready to be installed. Valves shall not be stored in contact with the ground. Valves shall not be stacked.

INSTALLATION OF VALVES

Valves shall be installed with the bolt holes straddling the centerline of the pipe and the operating nut in the vertical position. Joints shall be cleaned as listed elsewhere in these Special Provisions. Valves shall be installed in accordance with the manufacturer's recommendations and in accordance with applicable specifications for the pipe material and joint type being used for the valve and water mains.

HI-LINE

All hi-line, fittings and service connections shall be furnished, installed and connections made by the Contractor.

The Contractor shall be responsible for disinfecting all hi-line, connections, flushing and assisting in taking water samples for bacteriological tests. Refer to disinfection and bacteriological test procedures listed elsewhere in these special provisions.

Following disinfection and acceptance of the hi-line as a potable water system, the Contractor shall maintain continuous service through the hi-line piping to all consumers normally served, both directly and indirectly, by the pipeline. Upon completion of the work, the hi-line piping shall be removed or abandoned by the Contractor.

The hi-line shall be installed in such a manner that it will not present a hazard to traffic and will not interfere with access to homes and driveways along its route.

All pipe, valves, fittings, hose and connections furnished by the Contractor shall be of good quality, suitable for conveying potable water. Only hot dipped galvanized pipe and fittings or Schedule 80 polyvinyl chloride (PVC) pipe shall be used for hi-line piping. All polyvinyl chloride piping must be labeled "N.S.F." tested for a potable water system.

FLEXIBLE EXPANSION JOINTS

Flexible expansion joints shall be installed in the locations indicated on the plans and shall be manufactured of 65-45-12 ductile iron conforming to the material requirements of ASTM A536 and ANSI/AWWA C153/A21.53. Foundry certification of material shall be readily available upon request.

Each flexible expansion joint shall be pressure tested prior to shipment against its own restraint to a minimum of 24.61 Kg/cm2 (17.58 Kg/cm2 for flexible expansion joints 750 mm diameter and larger.). A minimum 2:1 safety factor, determined from the published pressure rating, shall apply. Factory Mutual Approval for the 300 mm and smaller sizes is required.

Each flexible expansion joint shall consist of an expansion joint designed and cast as an integral part of a ball and socket type flexible joint, having a minimum per ball deflection of: 20 degree and 100 mm minimum expansion. Additional expansion sleeves shall be available and easily added or removed at the factory or in the field. Both standardized mechanical joint and flange end connections shall be available.

All internal surfaces (wetted parts) shall be lined with a minimum of 15 mils of fusion bonded epoxy conforming to the applicable requirements of ANSI/AWWA C213 and shall be holiday tested with a 1500 volt spark test conforming to said specification. Sealing gaskets shall be constructed of EPDM. The coating and gaskets shall meet ANSI/NSF-61.

All external surfaces shall be coated with a catalyzed coal tar epoxy conforming to the material requirements of AWWA C210. Appropriately sized polyethylene sleeves, meeting ANSI/AWWA C105/A21.5, shall be included for direct buried applications.

FLANGED CONNECTIONS

Flanged connections shall be installed where indicated on the plans.

Bolt holes shall straddle the horizontal and vertical centerlines.

The bolts, nuts and flange faces shall be thoroughly cleaned by wire brush prior to assembly.

Bolts and nuts shall be lubricated with an approved anti-seize compound.

Nuts shall be tightened in an alternating "star" pattern to the manufacturer's recommended torque.

Slip-on type flanges intended for field fit-up and welding shall be welded inside and outside in accordance with AWWA C207.

BUTT STRAP JOINTS

Butt strap closure joints shall be installed where shown on the plans in accordance with AWWA C206.

Butt straps shall be field welded to the outside plain end of the pipe along both edges with a full circumferential weld. A minimum of two weld passes shall be used.

The interior of the joints shall be filled with a rapid-set mortar and finished off smoothly to match the pipe interior diameter.

Clean the butt strap with a wire brush and apply a cement and water wash coat prior to applying cement mortar.

Galvanized wire mesh, 50 mm x 100 mm x No. 13 gauge shall be installed to the exterior of the joint prior to applying the mortar coating.

Coat the exterior of the closure assemblies with mortar to cover all steel with a minimum of 32 mm.

Seal weld the steel plug to the hand hole after the interior of the joint has been inspected and approved by the Engineer.

Following grouting, the joint shall then be wrapped with two layers of polyethylene encasement.

TEMPORARY BLOW-OFFS

The Contractor shall install temporary caps, plugs, thrust blocks, and temporary blow-offs for testing water mains**.** Caps and plugs installed by the Contractor to temporarily close the ends of new mains adjacent to points of connections shall contain 50 mm outlets with corporation stops. Corporation stops shall protrude free from thrust blocks and be available for use in relieving pressure in the mains prior to connecting. Caps and outlets will be the property of the Contractor and may be claimed after connections are made.

After testing, the Contractor shall supply and install the connections and equipment necessary to convey the discharge water to a storm drain adequate for the discharge volume.

If the new water main is to be installed and tested in sections, caps and plugs installed by the Contractor to temporarily close the ends of each section of new water main shall contain 50 millimeters outlets with gate valves. Valves shall protrude free from thrust blocks and be used for testing and relieving pressure. Valves, outlets and thrust blocks used for the temporary blow-off shall remain the property of the Contractor and be entirely removed before connecting the pipeline to an adjacent section.

GASKETS

Rubber-ring gaskets shall comply with AWWA C200 according to the applicable joint type and pressure rating of the piping system and shall be suitable for potable water service.

Flange gaskets shall comply with AWWA C207. Flange gaskets shall be 3.18 mm thick acrylic or aramid fibers bound with nitrile for all sizes of pipe. Gaskets shall be full-face type with pre-punched holes or ring-type extending to the inner edge of the bolt circumference of the flange.

In the event of encountering organic solvents or petroleum products during the course of the work, alternate gasket materials or joint treatment will be required as directed by the Engineer.

All rubber gaskets shall be bonded along the entire buried length of metallic pipe.

BOLTS AND NUTS

Bolts and nuts shall be as indicated below and shall be selected from the Approved Materials List.

Cadmium-plated, zinc-plated or fluoropolymer coated bolts and nuts shall be used for the installation of pipelines up to 500 mm diameter and shall be carbon steel conforming to ASTM A307, Grade A, unless otherwise indicated on the plans. Bolts shall be standard ANSI B1.1, Class A coarse threads. Nuts shall be standard ANSI B1.1, Class 2H coarse threads.

Stainless steel bolts and nuts shall be used for the installation of pipelines 600 mm diameter and larger and for submerged flanges. Bolts and nuts shall be Type 316 stainless steel conforming to ASTM A193, Grade B8M for bolts, and Grade 8M for nuts.

All bolt heads and nuts shall be hexagonal, except where special shapes are required. Bolts shall be of such length that not less than 6.4 mm or more than 12.7 mm shall project past the nut in tightened position.

All bolts and nuts shall be new and unused. Bolts and nuts shall be cleaned, if needed, by wire brushing and lubricated prior to assembly.

Tighten nuts uniformly and progressively.

Buried bolts and nuts shall receive a heavy coat of protective grease coating selected from the Approved Materials List prior to being wrapped with polyethylene.

All stainless steel bolts shall be coated with an anti-seize compound selected from the Approved Materials List.

Bolts and nuts shall not be reused once tightened. Used bolts and nuts shall be discarded and removed from the job.

INTERIOR JOINT FINISH FOR PIPES LESS THAN 600 MILLIMETERS IN DIAMETER

Complete interior mortar joints for pipe sizes less than 600 mm by drawing through a tight-fitting swab or squeegee. Coat the face of the cement mortar lining at the bell with a sufficient amount of stiff cement mortar to fill the gap. Immediately after joining the pipes, draw the swab through the pipe to remove all excess mortar and expel it from the open pipe end. Do not move the pipe after the swab has been pulled past the joint. See requirements under "Field Welded Joints" for these joints requiring welding.

INTERIOR JOINT FINISH FOR PIPES 600 MILLIMETERS DIAMETER AND LARGER

Complete interior mortar joints for pipe sizes 600 mm and larger by the trowel method. Prior to applying interior mortar at the joints all backfill in the area shall be completed. After cleaning the interior joint, pack cement mortar into each joint. Finish the surface with a steel trowel to a smooth finish and equal thickness to match the adjoining pipe mortar.

Where more than a 100 mm joint strip of mortar is required, place galvanized welded wire mesh reinforcement in 50 mm x 100 mm pattern of No. 13 gauge over the exposed steel. Install the mesh so that the wires on the 50 mm spacing direction run circumferentially around the pipe. Crimp the wires on the 100 mm spacing to support the mesh 9.5 mm from the metal surface. Steel-trowel finish the interior mortar to match adjoining mortar-lined pipe sections.

EXTERIOR JOINT FINISH

The outside annular space between pipe sections shall be completely filled with grout formed by the use of polyethylene foam-lined fabric bands. The grout space shall be flushed with water prior to filling so that the surfaces of the joint to be in contact with the grout will be thoroughly moistened when the grout is poured. The joint shall be filled with grout by pouring from one side only. Grout shall be rodded with a wire or other flexible rod or vibrated so that the grout completely fills the joint recess by moving down one side of the pipe, around the bottom of the pipe and up the opposite side. Pouring and rodding the grout shall be continued to allow completion of the filling of the entire joint recess in one operation. Care shall be taken to leave no unfilled space. Grouting of the outside joint spaces shall be kept as close behind the laying of the pipe as possible except that in no case shall grouting be closer than three joints of the pipe being laid.

The grout bands or heavy-duty diapers shall be polyethylene foam-lined fabric with steel strapping of sufficient strength to hold the fresh mortar, resist nodding of the mortar, and allow excess water to escape. The foam plastic shall be 100 percent closed cell, chemically inert, insoluble in water and resistant to acids, alkalis and solvents. Foam Plastic shall be Dow Chemical Company, Ethafoam 222, or equal. The fabric backing shall be cut and sewn into 224 mm wide strips with slots for the steel strapping on the outer edges. The polyethylene foam shall be cut into strips 150 mm wide and slit to a thickness of 6.35 mm that will expose a hollow or open-cell surface on one side. The foam liner shall be attached to the fabric backing with the open or hollow cells facing towards the pipe. The foam strip shall cover the full interior circumference of the grout band with sufficient length to permit a 200 mm overlap of the foam at or near the top of the pipe joint. Splices to provide continuity of the material will be permitted. The polyethylene foam material shall be protected from direct sunlight. The polyethylene foam-lined grout band shall be centered over the joint space with approximately equal widths extending over each pipe end and securely attached to the pipe with the steel straps. After filling the exterior joint space with grout, the flaps shall be closed and overlapped in a manner that fully encloses the grout with polyethylene foam. The grout band shall remain in position on the pipe joint.

Following grouting, the joint shall be wrapped with two layers of polyethylene encasement.

FIELD PAINTING AND COATING

The Contractor shall provide notice 3 working days in advance of field operations involving surface preparation and coating application.

The Engineer will determine compliance of the preparation of the shop and field prepared surface.

Notify the Engineer 48 hours in advance of field operations involving surface preparation and coating application.

The Engineer will inspect shop-and field-prepared surfaces. The Contractor shall not proceed with paint application until the surface preparation has been approved by the Engineer.

The Engineer will inspect application of all prime, intermediate, finish, and touch-up coatings to verify the integrity of the coating and compliance with the specifications. Each coating application will be checked and deficiencies marked. Items exhibiting an improper finish or color, or insufficient surface preparation or dry film thickness shall be prepared as necessary and corrected, utilizing the specified paint materials to obtain compliance.

In addition to touch up painting and coating, all metallic appurtenances of the elements not protected from corrosion by another system shall be painted with a two part coating. The Engineer will inspect application of all touch up, primer, intermediate and finish coatings to determine the integrity of the coating and compliance with the required dry film thickness. Each coating application will be checked and deficiencies marked. Items exhibiting an improper finish or color, or insufficient surface preparation or dry film thickness, shall be prepared as necessary and corrected, utilizing the specified paint materials to obtain compliance.

Under no circumstances shall the specified paint materials be used where they may come in contact with the public water supply or for buried installations. Those products are intended for exposed exterior use only.

The publication listed below forms a part of this specification to the extent referenced and are referred to in the text by the basic designation only.

A. AWWA C 210 - Liquid Epoxy Coating Systems For Interior And Exterior Of Steel Water Pipes.
B. AWWA C 218 - Coating the Exterior of above ground steel Water Pipelines and Fittings SSPC Steel Structures Painting Council.

All colors and shades of colors of all coats of paints and protective coating material shall be as selected by the Engineer. Each coat shall be of a slightly different shade, as directed by the Engineer, to facilitate inspection of surface coverage of each coat.

Color Schedule

The following tables designate the color coding and type of paint which shall be used to identify potable and recycled facilities. A description of specific paint types to be used can be found in the Approved Materials List.

ITEM	COLOR	PAINT TYPE
Fire Hydrant	Safety Yellow	Silicone Alkyd
Blow Off Box Lids	Safety Yellow	Silicone Alkyd
Gate Well Lids- Potable Valves Acrylic Latex	Safety Yellow	Waterbase
Gate Well Lids- Fire Hydrant Valves Acrylic Latex	White	Waterbase
Air/Vac Assemblies	Safety Yellow	Silicone Alkyd
Air/Vac Enclosures	Chocolate Brown	Fusion
Water Test Station Enclosures Bonded Polyester	Chocolate Brown	Fusion
Protector Posts	Safety Yellow	Silicone Alkyd
Vault Piping Machine	Gray	Silicone Alkyd
Above Ground Piping Machine	Gray	Silicone Alkyd
Normally Closed Valve	Safety Red	Silicone Alkyd

The following items or materials are not to be field painted unless specifically required elsewhere in the Special Provisions:

A. Buried mortar-coated pipe and fittings
B. Stainless steel
C. Interior surfaces of valves, fittings and pipe
D. Nameplates
E. Grease fittings
F. Brass, copper or bronze, except as required for reclaimed water system identification.
G. Buried pipe and appurtenances, except as required in the piping specifications.

Painting:

Paint, coating products and color selections shall be selected from the table above and the Approved Materials List.

All materials of a specified painting system, including primer, intermediate and finish coats, shall be produced by the same manufacturer.

Additives shall be used only as recommended by the paint manufacturer and as permitted by the Engineer.

Deliver all paint products to the job site in the original, unopened containers.

Coating systems shall be as follows:

Silicone-Alkyd Enamel Paint System:

All materials of a specified system including prime, intermediate, finish, and touch-up coats shall be provided by the same manufacturer in accordance with the Approved Materials List. Thinners, cleaners, driers, and other additives shall be as recommended by the coating manufacturer for the specified system.

Primer: Field-applied, single-component, VOC-compliant, solvent-curing primer. The primer shall be as recommended by the manufacturer for the substrate to be painted with the silicone alkyd enamel finish paint. Intermediate primer coats may be required by the manufacturer of the painting system.

Intermediate and Finish Coats: The silicone alkyd finish paint shall be an industrial-type single-component, high-solids, high-gloss, VOC-compliant, lead-free alkyd enamel. The silicone alkyd paint shall contain 30 percent silicone and a minimum 47 percent solids by volume. The silicone alkyd paint system to be used shall be easily applied by brush, roller or spray. The silicone alkyd enamel system shall be used as a protective coating and for applying color code identification to the exterior of potable and recycled water facilities.

Waterborne Acrylic Latex Painting System:

All materials of a specified system including prime, intermediate, finish, and touch-up coats shall be provided by the same manufacturer selected from the Approved Materials List. No solvent-based thinners, cleaners, driers and other additives are required for this painting system.

The water facility items requiring color code identification with this paint system can be found under Color Schedule shown above.

100 percent waterborne acrylic latex paint shall be a rapid-drying paint, resistant to weather and abrasion, containing a minimum of 100 percent solids by volume. The waterborne acrylic latex painting system shall be used to apply color code identification to fire hydrant valve gate well lids.

If any of the following minimum conditions are present, the application of coatings shall be delayed or postponed until conditions are favorable.

A. During rain, fog, or mist, or when the relative humidity exceeds 80 percent.
B. When the surface to be coated is wet, moist, or contaminated with any foreign matter.
C. When the surrounding air temperature or the temperature of the surface to be coated is below 4 ˚C.
D. When the temperature of the surface to be coated is more than 13˚ C below the air temperature or when the surface temperature is 50˚ C or above.
E. When the surface temperature is less than 13˚ C above the dew point or is expected to be within 4 hours after application of coating.
F. If a change in weather conditions results in damage to a newly-applied coating, the affected coatings shall be restored to their specified condition as directed by the Engineer.

Surfaces not to be painted shall be protected as follows:

A. Remove, mask, or otherwise protect hardware, switch plates, aluminum surfaces, machined surfaces, couplings, shafts, nameplates and other surfaces not intended to be painted. Provide drop cloths to prevent paint materials from falling on or marring adjacent surfaces. Protect working parts of mechanical and electrical equipment from damage during surface preparation and the painting process.

Prior to field touch up of shop applied prime coat, prepare the surface per manufacturer's recommendations and as directed by the Engineer. Reapply primer as required to cover all scratched, abraded, or deficient areas.

Do not prepare more surface area than can be coated in the same work day. Surface preparation shall conform to the Steel Structures Painting Council specifications as follows:

Item	Specification
Solvent Cleaning	SP 1
Hand Tool Cleaning	SP 2
Power Tool Cleaning	SP 3
White Metal Blast Cleaning	SP 5
Commercial Blast Cleaning	SP 6
Brush-off Blast Cleaning	SP 7
Picking	SP 8
Near-White Blast Cleaning	SP 10

Wherever the words "solvent cleaning", "hand tool cleaning", "wire brushing", or "blast cleaning" or similar words are used in these Special Provisions or in paint manufacturer's specifications, they shall be understood to refer to the applicable Surface Preparation Specifications of Steel Structures Painting Council listed above.

Surface preparation shall be as recommended by the product manufacturer or as directed by the Engineer in the field. In general, surface preparation shall be either SP1, SP2, or SP3. Water blasting or sandblasting may be utilized as required by field conditions or as directed by the Engineer.

Unless otherwise directed by the Engineer, do not sandblast items that have previously been factory primed or painted.

Application shall be as follows:

A. Work shall conform to the requirements of Steel Structures Painting Council PA-1, "Shop, Field, and Maintenance Painting" unless the recommendations of the coating manufacturer are more restrictive, including the selection of spray equipment, brushes, rollers, mixing, drying time, temperature and humidity limitations during application, and safety precautions. Procedures for the application of coatings will be reviewed by the Engineer.
B. Stir, strain, and keep coating materials at a uniform consistency during application. Where thinning is permitted by the Engineer, do not reduce the coating material more than is necessary to obtain the proper application characteristics and to obtain the specified dry film thickness. Do not exceed the maximum rate allowed by the manufacturer. Do not flood the coating material surface with thinner prior to mixing. Stir coating materials at all times when adding thinner.
C. Apply each coating evenly, free of brush marks, sags, runs, bridges, shiners, laps or other imperfections and evidence of poor workmanship. Visible areas of chipped, peeled, or abraded paint shall be hand or power sanded, feathering the edges. The areas shall then be primed and finish coated in accordance with the specifications. Finished surfaces shall be free from defects and blemishes prior to final acceptance.

The following items shall be field painted using a silicone-alkyd system and shall be color coded in accord with the specifications utilizing appropriate pigments added to the coating by the manufacturer:

The following items shall be field painted using the silicone alkyd enamel paint system.

A. All recycled water ferrous metal piping and appurtenances, including meters, blowoff-piping, backflow preventers, where located above ground, exposed, or in vaults.
B. All potable water ferrous metal piping and appurtenances where located above ground, exposed, or in vaults.
C. All potable water fire hydrant bodies, blowoff box lids, the exterior of air/vacuum assemblies and protector posts around potable water facilities.
D. All recycled water gate well lids and frames, the exterior of air/vacuum assemblies and protector posts around recycled water facilities.
E. Normally closed valves.

The silicone alkyd enamel painting system shall consist of a prime coat, an intermediate coat (if required) and sufficient finish coats to provide a total dry film thickness of 0.152 mm to 0.203 mm. Apply the coatings in accordance with the manufacturer's recommended film thickness, adding finish coats as necessary to meet the minimum total dry film thickness specified above.

Observe minimum and maximum re-coat times as specified by the manufacturer. If these times are exceeded, the surface shall be prepared as recommended by the manufacturer and as directed by the Engineer prior to receiving additional coats.

The following items shall be field painted using the waterborne acrylic latex system:

A. Potable water fire hydrant valve gate well lids and frames.

The waterborne acrylic latex paint system shall consist of two coats of paint to provide a total dry film thickness of 0.203 mm to 0.305 mm. Apply the paint system in accordance with the manufacturer’s recommendations. Add finish coats as necessary to achieve the mil thickness specified above.

FIELD WELDED JOINTS

Field welders shall be certified under Section IX, Part A of the ASME Boiler and Pressure Vessel Code or in accordance with AWWA C206, Section 3. Welders shall present a copy of their certification to the Engineer prior to performing any field welding.

Welded joints shall be completed in the trench per AWWA C206.

Both the bell and spigot ends shall be cleaned of foreign matter prior to welding.

For pipe diameters less than 600 mm the exterior of the joint shall be welded. For pipe diameter 600 mm and larger, the joint shall be welded in accordance with the approved submittal. All welded joints shall remain exposed until inspection has been performed.

Welding electrodes shall be as recommended by the pipe manufacturer. Typically, electrodes shall be E6010 for root passes and E7018 for additional passes. Do not deposit more than 3.2 mm of throat thickness per pass.

Weld material shall be deposited in successive layers. Complete and clean each pass around the entire circumference of the pipe before commencing the next pass.

The minimum number of passes in the completed weld shall be as follows:

Steel Cylinder Thickness mm	Fillet Weld Minimum Number of Passes
6.35 or less	2
Greater than 6.35	3

To minimize longitudinal stresses due to temperature variations, it is necessary to leave unwelded one joint per each 120 m of pipeline. This joint shall be left unwelded until all the joints on both sides of it are welded, and it shall be welded at the coolest time of the working day. The Engineer shall decide if and when this procedure is warranted.

Tack-welding the joint may be permitted to hold the pipe in place. If the joint is to be circumferentially welded, sufficient time shall elapse to allow for an initial set of interior joint lining prior to proceeding with joint welding. Rapid-setting mortar may be used in accordance with these Special Provisions. In some cases, the Engineer may require hand holes.

Field welders shall be certified in accordance with ASME Section 9 (pipe welders) or AWS D1.1 (plate welders). Welders shall present a copy of their certification to the Engineer prior to performing any field welding.

Prior to butt-strap welding, the pipe and pipe joint shall be properly positioned in the trench using line-up damps so that, in the finished joint, the abutting pipe sections shall not be misaligned by more than 1.59 mm.

The pipe ends shall be cut straight on joints where butt straps are used for realignment, adjustment, or deflection, and fillet welds shall be made as indicated.

Inspection of Field Welded Joints:

A. The Engineer shall arrange for the welds to be inspected. Inspection of welds shall take place as soon as possible following the completion of the welds.
B. The Contractor shall coordinate and supply ventilation, lighting, and other equipment deemed necessary for inspection. The Contractor shall be responsible for providing safe entry into and out of the trench, safety of inspection personal, traffic control and other safety precautions deemed necessary for the inspections.

CATHODIC PROTECTION SYSTEM

The publications listed below form part of this specification to the extent referenced and are referred to in the text by the basic designation only. Reference shall be made to the latest edition of said standards unless otherwise called for.

AWWA C217 - Cold-Applied Petrolatum Tape and Petroleum Wax Tape Coatings for the exterior of special sections, connections, and fittings for buried steel water pipelines

ASTM D 1248 - Standard Specification for Polyethylene Plastics Molding and Extrusion Materials for Wire and Cable

NACE RP0286 - The Electrical Isolation of Cathodically Protected Pipelines

NACE RP0375 - Application and Handling of Wax-Type Protective Coatings and Wrapper Systems for Underground Pipelines

The Contractor shall submit manufacturer's catalog data on wire and cable, copper sulfate reference electrodes, test stations, conduit, exothermic weld molds and charges, pipe flange insulation kits, pipe flange internal coating, wax tape system, plastic warning tape and any other required materials.

All materials furnished under this specification shall be standard products from manufacturers regularly engaged in the manufacture of such products and shall be the manufacturer’s latest design that complies with the specification requirements.

Prepackaged Magnesium Anodes

Prepackaged magnesium anodes shall be used in low current demand applications. The amount and size of magnesium anodes shall be as shown on the plans. Prepackaged magnesium anodes shall have galvanized steel rod cores encased in magnesium ingots. The ingot portion of anodes shall be of the weight as required on the plans. Provide magnesium anodes with minimum No. 8 AWG HMW/PE insulated wire. Each lead wire shall be long enough to extend to the corrosion monitoring test box plus 450 mm of slack without splices. Magnesium anodes shall be prepackaged in a permeable cloth bag with low resistivity backfill mixture selected from the Approved Materials List. Prepackaged magnesium anodes shall be placed a minimum of 1.5 m below the pipe in the trench or an augured hole. Soaking of the anode is not required. Backfill material around the prepackaged anodes shall be as specified for the pipeline trench. Installation shall be in accordance with the plans.

Anodes shall be installed at the locations indicated, with 6 anodes being installed at each of the designated locations. Plastic or paper wrap shall be removed from the anode prior to lowering the anode into the hole. Anodes shall not be suspended by the lead wires. When compacted soil is required and has been placed to the top of the anode and prior to the filling of the hole with soil, a minimum of 37.9 liters of water shall be poured into the hole to saturate the anode backfill and surrounding soil.

The Contractor shall notify the Engineer and the Utility Owner at least 5 working days in advance of his intent to begin work on the installation of anodes.

Backfilling with native soil shall proceed in 150 mm lifts, compacting the soil around the anode during each lift until the backfill has reached grade. Damage to the canvas bag, anode to wire connection, copper wire, or wire insulation will require replacement of entire assembly.

Prepackaged Copper Sulfate Reference Electrodes

Copper sulfate reference electrodes shall be constructed with an ion trap to prevent contamination. The reference electrode shall have a design life of 15 years and a stability of +/- 5 millivolts under a 3.0 microampere load. Provide reference electrodes with minimum No. 10 AWG HMW/PE insulated wire. Each lead wire shall be long enough to extend to the corrosion monitoring test box plus 450 mm of slack without splices. Reference electrodes shall be prepackaged in a permeable cotton cloth bag with low resistivity backfill mixture to protect against the "drying out" type of failure. The backfill mixture shall be composed of 50 percent Gypsum and 50 percent Powdered Bentonite. Reference electrodes shall be placed 300 mm away from the pipe at spring line. Electrodes shall be placed opposite side of the pipe from anodes. Saturate packaged electrode in 18.9 liters of water prior to installation. Backfill material around the electrode shall be as specified for the pipeline trench. Installation shall be in accordance with the plans.

Pipe Joint Bonding Cables

Electrical continuity bonding cables shall be installed across all buried or submerged metallic inline valves, flexible couplings, grooved couplings, pipe joints that are not circumferentially welded, and all other pipe joints except flange joints equipped with insulation gaskets. Where shown on the plans, bonding cables shall be installed in vaults.

Galvanic Isolation

All threaded outlets shall incorporate the use of an insulated ball valve for galvanic isolation of stray current. Threaded outlets may incorporate the use of a nylon isolation bushing for galvanic isolation only with the approval of the Engineer. Where the use of nylon bushings is required, the threaded outlet shall be increased in size to accept the bushing.

Warning/Identification Tape

All cathodic protection test wires, cables and conduit shall include Warning/Identification Tape. Warning/Identification tape materials shall be as referenced elsewhere in these Special Provisions and in accordance with the Approved Materials List.

Test Cable And Bonding Cable

All test cable and bonding cable shall be stranded copper wire with insulation rated at 600 volts. Cable with cut or damaged insulation is not acceptable. All cable shall be of sufficient length to extend from the point of connection to the appropriate corrosion monitoring test box without splices. The cable shall have a 2.8 mm thick, high molecular weight polyethylene (HMW/PE) insulation specifically designed for cathodic protection service and suitable for direct burial in corrosive soil or water, conforming to ASTM D 1248, Type I, Class C, Category 5 (HMW/PE Type CP) Grade E-5 or J-1. Test cable shall have at least 450 mm of slack in the test box. Cable size shall be in accordance with the plans.

Pipe Flange Insulating Kits

All pipe flange-insulating materials shall be of the type designated by the manufacturer as suitable for service at the operating temperatures and pressures of the pipeline.

A. Insulating gaskets shall be full-face dielectric neoprene-faced phenolic.
B. Insulating sleeves shall be full-length phenolic.
C. Insulating washers shall be phenolic.

Pipe flange insulating kits shall be installed at the locations shown on the plans and in accordance with the manufacturer's recommendations. Insulation shall also conform to the National Association of Corrosion Engineer's Recommended Practice RP0286 "Electrical Isolation of Cathodically Protected Pipelines". Particular attention shall be paid to properly align the pipe flanges prior to inserting the bolts with insulating sleeves to prevent cutting of the sleeves and creating an electrical path when the bolts are tightened. Care shall be taken to prevent any moisture, soil, or other foreign matter from contacting any portion of the two mating pipe flanges or gaskets prior to or during installation. If any foreign matter contacts any portion of the insulated pipe flange, the entire pipe joint shall be disassembled, cleaned with a suitable solvent and dried prior to reassembly. Strictly follow the manufacturer's recommendations regarding the torque pattern of the bolts and the amount of torque to be used when installing the pipe flange insulating kit. Conductive grease shall not be used on the flange bolts or any other flange components under any circumstances. Refer to Field Testing below for testing of the flange insulation kits.

Additional Smooth Epoxy Lining At Insulated Pipe Flanges

In addition to the cement mortar lining, at all insulated pipe flanges the interior of the pipe shall be coated with an additional two-part smooth white liquid epoxy lining consisting of 100 percent solids. The interior of the pipe and flanges shall be coated with the two-part smooth epoxy for a distance of two pipe diameters in each direction away from the insulated pipe flange.

A. Surface Preparation: The surface preparation shall consist of wire brushing to remove all rust and scale and to provide a suitable surface for adhesion of the coating in accordance with the manufacturer's recommendations.
B. Mixing the Coating: The two-part epoxy paint shall be mixed per the manufacturer's recommendations. The two-part epoxy shall be mixed thoroughly for at least two minutes by hand or with a mechanical mixer before being applied by brush.
C. Applying the Coating: The application of the undiluted coating shall be made by brushing until a minimum dry film thickness (DFT) of 0.51 mm is achieved. Each subsequent coat shall be applied before the preceding coat cures, which is normally within 3-6 hours. The application of the coating shall be per the guidelines and at the rate recommended by the coating manufacturer.

Tape Wrap For Aboveground Insulated Pipe Flanges

All aboveground-insulated pipe flanges shall be wrapped with minimum 0.36 mm thick general utility pipeline tape in accordance with the Approved Materials List.

Wax Tape Coating For Buried Insulated Pipe Flanges

All buried insulated pipe flanges shall be coated with a three-part, cold-applied wax tape coating system as described by NACE RP0375 and AWWA C217 in accordance with the Materials List. Wax tape is also required where indicated on the plans.

A. Primer: Primer shall be a blend of petrolatums, plasticizers and corrosion inhibitors having a paste-like consistency. The primer shall have the following properties:

Color Brown	
Pour Point	37.8º C - 43.3º C
Flash Point	176.7º C
Coverage	0.41 liter/m2

B. Wax Tape: Wax tape shall consist of a plastic-fiber felt, saturated with a blend of petrolatums, plasticizers, and corrosion inhibitors, forming a tape coating that is easily form-able over irregular surfaces. The tape shall have the following properties:

Color Brown	
Saturant Pour Point	46.1º C - 48.9º C
Thickness	1.27 - 1.78 mm
Tape Width	150 mm
Dielectric Strength	170 volts/mil

C. Tape Outerwrap: Wrapper shall be a polyvinylidene chloride plastic with three 50-gauge plies wound together as a single sheet. The wrapper shall have the following properties:

Color Clear	
Thickness	0.0381 mm
Dielectric Strength	2000 volts/mil
Tape Width	150 mm
Water Absorption	Negligible

After continuity testing, all flange and pipe surfaces shall be clean and free of all dirt, grease, water or other foreign material prior to the application of the primer, wax tape, and tape outerwrap.

A. Apply primer by hand or brush to all surfaces of the flanges. Work the primer into all crevices, around bolts and nuts, and completely cover all exposed metal surfaces. Extend the primer a minimum of 75 mm onto adjacent surfaces of the pipe or valve.
B. Apply the wax tape immediately after the primer application. Cut short lengths of tape and place completely around each bolt head and nut. Work the tape into the crevices around the bolts and nuts. Wrap the wax tape spirally around the pipe and across the flanges to the other pipe or valve. Cover the entire primed area with wax tape using a minimum overlap of 55 percent of the tape width. Work the tape into the crevices and contours of the irregular shaped surfaces and smooth out so that there is a continuous protective layer with no voids or spaces under the tape.
C. Apply the tape outerwrap to the completed wax tape installation. Wrap spirally around the pipe and across the flanges. Extend the plastic wrap 75 mm past the wax tape using a minimum overlap of 55 percent of the plastic material width to apply two layers of overwrap.

Exothermic Weld Molds And Weld Charges

Wire-to-pipe connections shall be made using exothermic welds. Weld charges and mold sizes for various surface configurations and materials shall be in accordance with the manufacturer's recommendations.

A. Preparation of Cable: Cut cable with a wire cutter to prevent deforming the cable ends. Remove only enough insulation from the cable to allow the weld connection to be made.
B. Preparation of Pipe: The surface of the steel or ductile-iron pipe shall be ground or filed to a bright, shiny, clean and dry surface before welding the cable connection. For cement mortar coated pipe, a nominal 75 mm x 75 mm area of cement mortar shall be chipped off.
C. Attachment of Cable to Structure: The attachment of the cable to the structure shall be made using an exothermic weld. The cable shall be held at a 300 degree to 450 degree angle to the surface when welding. Only one cable shall be attached with each weld. All cable-to-pipe welds shall be a minimum of 75 mm apart. All weld slag shall be removed from the weldment with a wire brush.
D. Weldment Test: After the exothermic weld has cooled, the weld shall be tested by the Contractor for strength, in the presence of the Engineer, by striking the weldment a sharp blow with a 0.91 kg hammer while pulling firmly on the cable. All unsound welds shall be rewelded and retested.
E. Repair Grout: The area to be repaired shall be thoroughly clean and dry. Cement-mortar coating shall be repaired or replaced to original condition by hand-placing cement-mortar repair grout as directed by the Engineer.

Brass Identification Tags

All wires terminating in CP Test Boxes shall be identified with brass tags securely attached to the wires with nylon fasteners. The tags shall be 38 mm in diameter, 1.6 mm thick, and shall be die-stamped with identifying letters and numbers 6.4 mm high.

Care shall be taken to accurately maintain the wire identities. The tags for all test cables shall be stamped with the District or Agency name, the pipeline size, the contents of the pipeline, and the direction of the connection point along the pipe, in accordance with the plans. Copper sulfate reference electrode tags at cathodic test boxes shall be stamped "CuSO4". The tags shall be securely attached to each wire with nylon fasteners prior to pipe backfilling operations.

Corrosion Monitoring Test Stations

Cathodic test station boxes shall be circular precast concrete boxes with ductile-iron covers selected from the Approved Materials List.

All test stations shall be installed behind existing or proposed curbs or otherwise and out of traffic lanes to allow safe access for personnel during testing. Test boxes shall be set and centered in a 600 mm x 600 mm x 150 mm thick concrete slab. A utility marker post shall be installed when indicated in accordance with the plans.

Test Cable

All buried test cable requiring trenching to the test station box location shall be installed, without splices, in a conduit in the trench at a minimum depth of 600 mm. Trenches shall be compacted as specified elsewhere in these Special Provisions. Care shall be taken when installing wire and backfilling trench to prevent damage to the installation. Damaged wire shall be replaced in entirety.

Field Testing

The Contractor shall test the cathodic protection installations in the presence of the Engineer. Contractor shall notify Engineer of proposed test dates and times a minimum of 48 hours in advance. As a practical approach, the Contractor may choose to verify pipe continuity and flange isolation (described in Items A and B below) prior to backfilling as an unofficial test. Official testing shall occur after the backfilling and installation of the test boxes.

A. Pipeline Electrical Continuity Testing: Test the electrical continuity of all sections of pipe to be monitored between each pair of adjacent corrosion monitoring test stations or between the ends of pipe sections less than 152.4 m apart. Each pipe section shall be considered electrically continuous when the measured longitudinal resistance of each pipe section is no greater than 20 percent higher than the theoretical resistance of that section of pipe. If testing indicates inadequate electrical continuity, the Contractor shall excavate to investigate and locate improperly bonded pipe joints and make repairs until electrical continuity is accomplished to the satisfaction of the Engineer.
B. Insulated Pipe Flange Testing: Each insulated pipe flange will be tested for effective electrical isolation of the two mating pipe flanges. The insulated pipe flange shall be judged for effectiveness in accordance with NACE RP0286, Section 7, "Field Testing and Maintenance." The Contractor shall replace or repair any insulated pipe flange assembly until electrical discontinuity is accomplished.
C. Initial Reference CP Potential Measurements: The entire metallic piping system shall be tested to establish the base CP Potential measurement readings. The base data will be used for comparative purposes with future monitoring data. The baseline data shall include voltage measurements (+/- 1mV) between any permanent copper sulfate reference electrodes (+ voltmeter correction) and a reliable portable copper sulfate reference electrode (- voltmeter correction) placed directly in the CP test box.

Cathodic Testing Report

At the completion of the testing, a report of the results will be prepared and presented to the Engineer. The report shall be typed and shall include, at a minimum, test locations, date of tests, name of technician, testing methods, voltage measurements, and theoretical and calculated resistance.

SECTION 10-4.03 MATERIALS FOR WATER SYSTEM WORK

GENERAL

Waterlines shall consist of PVC pressure pipe, Cement Mortar Lined and Coated (CML&C) steel pipe, steel pipe casings, fittings, closure pieces, supports, bolts, nuts, gaskets, jointing materials, fire hydrants, valves, and appurtenances as required for a complete and operable system.

Pressure rating of pipe and fittings used in connections shall meet of exceed the pressure rating of the mainline pipe.

All piping and above grade appurtenances for the recycled water system installed shall be colored purple, Pantone Color No.522.]

Unless otherwise required in these special provisions or shown on the plans, materials for this project shall be those included on the latest City of San Diego and Otay Water District Approved Materials List.

WATER MAIN

All water pipe and fittings installed as water main shall be Polyvinyl Chloride Pipe (PVC), or Welded Steel Pipe (WS) as shown on the plans.

CEMENT MOTAR LINED AND COATED STEEL PIPE AND SPECIALS

All steel used for pipe or specials shall have a 248 MPa minimum yield point unless otherwise directed by the Engineer. See material information concerning steel designation below.

Design stress in steel cylinders shall not exceed 50 percent of the specified minimum yield strength of the steel used. The internal operating pressure used for design shall be a minimum of 1.38 MPa or as called for on the plans, whichever is greater. If no specific surge analysis has been performed, the internal operating pressure used in circumferential stress calculations shall include at least a 10 percent increase for surge conditions. No allowance shall be made for the tensile strength of the cement mortar lining and coating.

Specials shall be designed per AWWA M11 and as a minimum shall conform to the pressure rating, grade of steel and cylinder thickness of the adjoining standard pipe sections. Fitting dimensions shall conform to AWWA C208. Reinforcing collars, wrappers, crotch plates, and anchor rings shall be designed and fabricated per AWWA M11.

A. Outlets may be built into the wall of the pipe or may be fabricated as steel plate specials. Outlets to be installed on straight pipe lengths shall be welded to the steel cylinder of the pipe prior to application of mortar coating to the cylinder. Outlets of size 50 mm and smaller in piping 100 mm and larger shall be of the threadolet type or shall be extra-heavy half couplings to fit the pipe in accordance with AWWA M11. Outlets shall be 1360 kg WOG forged steel per ASTM A105. Threads shall comply with ANSI B1.20.1. Outlets larger than 50 mm shall use a tee or nozzle with a flanged outlet. All outlets larger than 50 mm in diameter shall be provided with steel reinforcing collars, wrapper plates, or crotch plates per AWWA M11. At the option of the manufacturer, wrappers may be used in place of collars, and crotch plates may be used in place of collars or wrappers.
B. On 50 mm and smaller outlets where nylon insulation bushings are to be used, the outlet shall be increased in size to accept the bushing.
C. Tees, wyes, and crosses shall be dimensioned in accordance with AWWA C208, Table 1, or as modified on the plans.
D. Bends shall have a minimum radius of not less than 2½ times the pipe diameter unless otherwise approved by the Engineer. The maximum deflection at mitered girth seams shall be 22½ degree. At the option of the Contractor, a bend may be welded to the adjacent pipe section.
E. All specials shall be marked at both ends of the fitting with "Field Top" indicators.

Minimum cylinder thickness for pipe and specials shall be 6.35 mm or as directed by the Engineer.

The wall thickness tolerances for steel pipe 300 mm diameter and larger shall be governed by the requirements of the ASTM specifications to which the plates or sheets are ordered, but in no case shall the thickness be less than 6.35 mm or as directed by the Engineer.

Standard pipe sections shall not be less than 6 m nor more than 12 m in length, except where shorter lengths are required to fit horizontal and vertical alignment or are otherwise shown on the plans.

Pipe ends shall be as follows:

A. Bell and Spigot with Rubber Gasket: In accordance with AWWA C200 and AWWA M11. Bell ends that are pressed or rolled shall be limited to maximum pipe diameter of 525 mm nominal.
B. Lap Welded Joints: Use expanded bell with matching spigot end.
C. Flanges: Flanges for use in construction of Steel Pipe shall be as described below.

    1. AWWA C207, Class D flanges (matching ANSI/ASME B16.1, Class 125 flanges for bolt hole size and drilling) shall be used for pressures up to 1.03 Pa.
    2. AWWA C207, Class E flanges (matching ANSI/ASME B16.1, Class 125 flanges for bolt hole size and drilling) shall be used for pressures between 1.03 MPa and 1.72 Map.
    3. AWWA C207, Class F flanges (matching ANSI/ASME B16.1, Class 250 flanges for bolt hole size and drilling) shall be used for pressures between 1.72 MPa and 2.07 MPa or when Class 250 butterfly valves or other appurtenances using flanges corresponding to AWWA C207 Class F are required.
    4. Flanges shall be flat-faced type only. Segmented flanges shall not be used.

D. Butt Straps: Use two-piece rolled steel straps with a minimum thickness of 6.35 mm, and a minimum width of 250 mm. Straps shall be fabricated to snugly fit over the plain pipe ends, and shall be centered over the ends of the pipe sections to be joined. Weld one or more standard 125 mm, 1361 kg threaded half-couplings to the butt strap section as shown on the plans. Provide a threaded steel plug for each half-coupling.
E. Grooved-End or Shouldered Couplings: Use square-cut shouldered or grooved ends per AWWA C606. Grooved-end couplings shall be malleable iron per ASTM A 47, or ductile-iron per ASTM A 536. Gaskets shall be per ASTM D 2000. Nuts and bolts in exposed service shall conform to ASTM A 183, 758.43 MPa tensile strength.
F. Flexible Pipe Couplings: Use plain-end pipe with flexible pipe couplings per AWWA C200. Provide joint harnesses per AWWA M11 where indicated on the plans.

Hand holes shall be provided at each joint to apply mortar to line the inside joint. The liner shall be applied to the joints only after full penetration welds are complete and cooled to ambient temperature.

The Contractor shall tap the outlets for standard pipe thread, weld to the pipe, and weld close after use with solid forged steel plugs.

The plugs shall not project beyond the inner surface of the pipe shell. Retap the pipe thread in the outlet to correct any distortion caused by welding. Apply a seal weld made by at least two passes around the inside or outside of the plug after it has been inserted in final position in the field.

The Contractor shall place 50 mm x 100 mm 18 gage wire mesh reinforcement all around pipe.

The Contractor shall coat outlets, plugs, and closures inside and outside to match the adjacent coated surfaces in the same manner as specified for outlets and as required at field joints in the pipe.

Angles or Curves in Alignment:

Minor changes of direction in the grade or alignment may be made by a deflection in the joint up to a maximum of 19 mm on one side of the joint. For greater angular deflections, pipe with ends beveled up to a maximum of 5 degrees measured from a plane perpendicular to the pipe's axis may be used. The short point on the bevel shall be so marked on the pipe. Pipe length shorter than 6 m may be used on curves. Where curves that have a shorter radius than can be accommodated by beveled pipe are required, or where indicated on the plans, special short-radius bends shall be provided.

Mortar Coating and Lining:

Use coatings and linings conforming to AWWA C205, except as noted below or indicated on the plans. All exterior metal surfaces intended for direct buried service shall be coated. Epoxy exterior coating shall comply with the requirements of subsection 207-10.4.2 of the Utility Standard Specifications and these special provisions.

A. Minimum Coating Thickness shall be as follows:

Coating Thickness	Tolerance
31.8 mm	-1.59 mm, + 3.18 mm

B. Minimum Lining Thickness shall be as follows:

Lining Thickness	Tolerance
19.05 mm	-1.59 mm, + 3.18 mm

All buried cement-mortar coated steel pipes, fittings, and appurtenances associated with the waterlines shall be provided with a shop applied coal tar epoxy overcoat per AWWA C-203 and C-205. The 100 percent solids epoxy shall be applied over the cement-mortar coating to a minimum thickness of 16 mils per AWWA standards.

The exterior surfaces of areas of pipes and fittings that are not mortar coated, such as flanges, grooved ends, or plain ends for butt-straps or flexible couplings, uncoated pipelines installed within the Britannia Blvd. bridge shall be sandblasted in accordance with Steel Structures Painting Council SP10, "Near White Blast Cleaning," and coated in accordance with these Special Provisions.

The term "diameter of pipe" as used in these specifications or as shown on the plans shall mean the net inside diameter of the mortar lining.

Cement-mortar lined and coated steel pipe shall be inspected at the supplier's manufacturing plant by the Engineer. Contractor shall be responsible for Engineer's expenses, including travel, time, meals and overnight accommodations. Overnight accommodations and air travel may be required, at the discretion of the Engineer, if the manufacturing plant is more than 160 km from the Engineer's office.

In addition to the shop hydrostatic testing performed on pipe cylinders required per AWWA C200, all welds of specials and attachments (i.e. joint rings and nozzles) shall be tested by a dye-penetrate process. Certification of such testing shall be submitted to the Engineer.

Plainly mark each length of straight pipe and each special at the bell end to identify the proper location of the pipe item by reference to the layout schedule.

The top of all pipe and specials shall be clearly identified by marking the top with "T.O.P." for easy identification in the field.

Steel pipe and specials shall conform to the requirements of the AWWA C200 and C205, and AWWA M11, except as modified herein.

Steel for fabricated cylinders shall conform to ASTM A 36/A 36M, ASTM A 283/ A 283M, Grade D, or ASTM A 570/A 570M, Grade 36. Other steel grades may be used only upon approval of the Engineer.

Cement used in mortar lining and coating shall be Portland Cement per ASTM C 150, Type V for coating and Type II or Type V for lining.

Cement-mortar coating shall be reinforced in accordance with AWWA C205.

Cement mortar grout for field joints shall consist of a mixture of 1½ to 2 parts sand to 1 part Type II or Type V Portland Cement with enough clean, potable water to permit packing and troweling without crumbling. The sand shall be washed, well-graded sand such that all will pass a No. 8 sieve. The quantity of water to be used in the preparation of grout shall be the minimum required to produce a mixture sufficiently workable for the purpose intended. Grout shall attain a minimum compressive strength of 12.4 MPa in 28 days.

In certain circumstances, rapid-setting mortar may be required. Acceleration admixtures may be used in the mix as permitted by the Engineer. Calcium chloride shall not be used in the mix.

When the work requires and the size of the pipe allows entry of personnel into the pipe, the Contractor shall comply with all Federal and State regulations for confined space entry. Work inside pipelines shall not be undertaken until all the tests and safety provisions of the Code of Federal Regulations 1910.146, and the General Industry Safety Orders of the California Code of Regulations, Title 8, Section 5159 for confined space entry have been performed and the area is verified as safe to enter. Generally, the aforementioned safety provisions apply to pipe 600 mm and larger. Note that for pipe less than 600 mm diameter, more stringent safety procedures apply.

The Contractor shall furnish and install all pipe, specials, fittings, closure pieces, valves, supports, bolts, nuts, gaskets, jointing materials, and all other appurtenances as shown on the plans and as required to provide a complete and workable installation. Pipe installation shall be as shown on the plans and in accordance with the following:

No pipe shall be installed where the linings or coatings show cracks that may be harmful as determined by the Engineer. Such damaged linings and coatings shall be repaired or new, undamaged pipe sections shall be provided.

Pipe damaged prior to Substantial Completion shall be repaired or replaced by the Contractor.

The Contractor shall inspect each pipe and fitting to insure that there are no damaged portions of the pipe. The Contractor shall remove or smooth out any burrs, gouges, weld splatter, or other small defects prior to laying the pipe.

Before placement of pipe in the trench, each pipe or fitting shall be thoroughly cleaned of any foreign substance which may have collected thereon and shall be kept clean at all times thereafter. For this purpose, the openings of all pipes and fittings in the trench shall be closed during any interruption to the work as noted above.

Pipe shall be laid directly on the bedding material. No blocking will be permitted, and the bedding shall be such that it forms a continuous, solid bearing for the full length of the pipe. Excavations shall be made as needed to facilitate removal of handling devices after the pipe is laid. Bell holes shall be formed at the ends of the pipe to prevent point loading at the bells or couplings and to permit visual inspection of the joint. Excavation shall be made as needed outside the normal trench section at field joints to permit adequate access to the joints for field connection operations and for application of coatings on field joints.

Installation Tolerances: Each section of pipe shall be laid in the order and position shown on the approved layout schedule to the proper lines and grades in accordance with the following:

A. Each section of pipe having a nominal diameter less than 1200 mm shall be laid not to vary more than 50 mm horizontally or 25 mm vertically from the alignment and elevations shown on the plans.
B. Each section of pipe having nominal diameter 1200 mm and larger shall be laid not to vary more than five percent of the pipe diameter horizontally or two and one half percent of the pipe diameter vertically.
C. In addition to the horizontal and vertical tolerances above, lay the pipe so that no high or low points occur along the pipeline other than those shown on the approved layout schedule.

Where necessary to raise or lower the pipe due to unforeseen obstructions or other causes, the Engineer may change the alignment and/or the grades. Such change shall be made by the deflection of joints, by the use of bevel adapters, or by the use of additional fittings. However, in no case shall the deflection in the joint exceed seventy five percent of the maximum deflection recommended by the pipe manufacturer. No joint shall be deflected any amount that will be detrimental to the strength and water tightness of the finished joint. In all cases the joint opening, before finishing with the protective mortar inside the pipe, shall be the controlling factor.

Pipes shall be laid uphill on grades exceeding 10 percent. Pipe that is laid on a downhill grade shall be blocked and held in place until the following pipe section has been installed to provide sufficient support to prevent movement.

Temporary internal pipe bracing shall be left in place in pipe sizes larger than 600 mm until pipe zone compaction has have been completed. Bracing in pipe smaller than 600 mm may be removed immediately after the pipe has been laid into the trench. The Contractor shall employ a laboratory to monitor pipe deflection by measuring pipe inside diameter before bracing is removed and 24 hours after struts are removed. Pipe deflection shall not exceed 3 percent in 24 hours after the bracing has been removed.

After the backfill has been placed, the struts shall be removed.

Cold Weather Protection: No pipe shall be installed upon a foundation onto which frost has penetrated or at any time that there is a danger of the formation of ice or penetration of frost at the bottom of the excavation. No pipe shall be laid unless it can be established that the trench will be backfilled prior to formation of ice and frost.

Pipe and Specials Protection: The openings of all pipe and specials where the pipe and specials have been mortar-lined in the shop shall be protected with suitable bulkheads to maintain a moist atmosphere and to prevent unauthorized access by persons, animals, water, or any undesirable substance. The bulkheads shall be designed to prevent drying out of the interior of the pipe. The Contractor shall introduce water into the pipe to keep the mortar moist where moisture has been lost due to damaged bulkheads.

TAPE COATING AND ROCK SHIELD

Tape coated steel pipe shall have a 19 mm cement mortar rock shield conforming to AWA C-209. The coating system for straight line pipe shall be in accordance with AWWA Standard C-214. The tape system shall consist of at least three layers consisting of the following:

A. Primer Layer.
B. Inner Layer Tape - Corrosion Protective Tape (0.5 mm) with (black) exterior.
C. Outer Layer Tape - Mechanical Protective Tape (0.75 mm) with (gray) exterior.
D. Outer Layer Tape - Mechanical Protective Tape (0.75 mm) with (white) exterior.

The total thickness of the tape coating shall be at least 80 mils. The coated pipe shall be tested and inspected in accordance with AWWA C214, certified reports of the testing and inspection shall be submitted to the ENGINEER. The CONTRACTOR and/or manufacturer shall submit a list of the tape coating materials to be used which indicates manufacturer, product numbers, and manufacturer recommended thickness of material. For each material, technical data sheets shall be submitted which indicate technical and performance information per AWWA C214.

POLYVINYL CHLORIDE (PVC) PRESSURE PIPE

Polyvinyl chloride pressure pipe shall conform to the Utility Standard Specifications and these special provisions.

PVC pipe shall conform to AWWA C900 and C905 pipe with rubber ring bell end or plain end with rubber ring coupling. Couplings for plain pipe shall be furnished with two elastomeric gaskets. Solvent welded joints are not permitted. Provide pipe with cast iron equivalent outside diameter and class SDR 18 and SDR 14 pressure rating as shown on the plans. For 100 mm thru 300 mm PVC, deflections at the joints shall not be permitted. Curves and deflections shall be made only with the use of high deflections C900 PVC couplings or the approved ductile iron fittings. The maximum deflection per coupling shall be per the manufacturer's recommendation. The working/shop plans shall clearly indicate the location of the couplings and the pipe lengths. Minimum allowable radius for PVC pipe, using deflector couplings shall be per the manufacturer's recommendation. Less than 3 m pipe length shall not be permitted within the radius.

Pipe Length	Minimum Allowable Radius
7 m	75 m
3 m	35 m

The minimum SDR rating shall be 35

Mechanical joint fittings shall be used and shall conform to AWWA: C 153 and AWWA: C 111 of the latest edition. Bolt holes in the flanges of the mechanical joint fitting shall straddle the vertical centerline of the fitting. The fitting shall be cement-mortar lined in accordance with AWWA C 104. The outside shall be polyethylene-encased in accordance with the requirements of AWWA C 105. Gland shall be made of ductile iron and shall be factory-stamped. Ductile iron from which the glands are cast shall have a minimum elongation of 5 percent. Bolts shall be tee heads made of high-strength low-alloy steel or ductile iron per AWWA C 111.

Installation of mechanical joints shall conform to Appendix A of AWWA: C 111. Bolts and nuts shall be coated with rust-preventative grease.

Solvent cement joints or push or push-on fittings shall not be used.

STEEL PIPE CASING

Steel pipe casing shall be butt-welded sheets conforming to ASTM A36/A 36M, ASTM A 283/A 283M, Grade D or ASTM A 570/A570M, Grade 33. Pipe casing shall not be spiral welded.

The thickness of the pipe casing shall be as specified on the contract plans.

Pipe casing shall be lined and coated with hot applied coal tar enamel per AWWA C203, Type II. Coating and lining thickness shall be 2.3 mm minimum in the interior. Casing shall be 18.8 mm cement mortar coated on the exterior.

Casing end seals shall be a standard one piece pull-on S-shaped seal for easy installation to provide a barrier for backfill material and seepage. The end seals shall be of a synthetic rubber material with band locating ribs on the exterior and sealing ribs on the inside under the bands to prevent leakage. Stainless steel band clamps shall be used to attach the end seals to the casing and carrier pipe.

FLANGED COUPLING ADAPTORS

Flanged coupling adapters shall be installed in accordance with the manufacturer's recommendations. Bolts shall be tightened with a torque wrench in the presence of the Engineer to the torque recommended by the manufacturer.

FLEXIBLE PIPE COUPLINGS

Flexible pipe couplings shall be in accordance with the Approved Materials List and as described below:

A. Steel Couplings shall have middle rings made of steel conforming to ASTM A 36/A 36M, A 53 (Type E or S), or A 512 having a minimum yield strength of 207 MPa. Follower rings shall be ductile-iron per ASTM A 536, or steel per ASTM A 108, Grade 1018 or ASTM A 510, Grade 1018. Minimum middle ring length shall be 175 mm for pipe sized 150 mm through 600 mm.
B. Sleeve bolts shall be made of stainless steel per ASTM A193 and shall have a minimum yield strength of 276 MPa, an ultimate yield strength of 414, and shall conform to AWWA C111.
C. Flexible pipe couplings shall be installed in accordance with the manufacturers recommendations and as described below:

    1. Use plain-end pipe with flexible couplings per AWWA C200. Provide joint harnesses per AWWA M11 for aboveground applications or where indicated on the plans.
    2. Flexible couplings may be used only where indicated on the plans.
    3. Clean oil, scale, rust, and dirt from the pipe ends and touch-up the epoxy coating and allow time for curing before installing the coupling. Clean the gaskets before installing.
    4. Follow the manufacturer's recommendations for installation and bolt torque using a properly calibrated torque wrench.
    5. Lubricate the bolt threads with graphite prior to installation.
    6. All flexible couplings shall be bonded along the entire buried length of metallic pipe.

GROOVED END OR SHOULDERED COUPLINGS FOR DUCTILE IRON OR STEEL PIPE

Grooved end or shouldered couplings shall be in accordance with the Approved Materials List and as described below:

Use square-cut shouldered or grooved ends per AWWA C606. Grooved-end couplings shall be malleable iron per ASTM A 47, or ductile iron per ASTM A 536. Gaskets shall be per ASTM D 2000.

Bolts in exposed service shall conform to ASTM A 183, 69 MPa tensile strength.

Grooved-end or shouldered couplings shall be installed in accordance with the manufacturer’s recommendations and as described below:

A. Grooved-end or shouldered joint couplings shall be installed per AWWA C606 and the manufacturer's recommendations.
B. Clean loose scale, rust, oil, grease, and dirt from the pipe or fitting groove and touch-up the epoxy coating as necessary, allowing time for curing before installing the coupling.
C. Clean the gasket before installation. Apply a lubricant selected from the Approved Materials List to the gasket exterior including lips, pipe ends, and housing interiors.
D. Fasten the coupling alternately and evenly until the coupling halves are seated. Follow the manufacturer's recommendations for bolt torque using a properly calibrated torque wrench.

BLOWOFF ASSEMBLIES

Blowoff assemblies shall be installed on potable and recycled water mains.

Blowoff assemblies shall be sized and located as shown on the plans. In general, blowoff assemblies will be installed at the ends and at low points of pipelines as shown below:

A. 50 mm blowoff assemblies will be required on pipelines for temporary use or as otherwise directed by the Engineer.
B. 100 mm blowoff assemblies will be required on pipeline sizes 400 mm and smaller.
C. 150 mm blowoff assembly will be required on pipeline sizes 450 mm and larger.

All blowoff assemblies shall be installed in accordance with the plans at locations noted on the plans and at such additional locations as required by the Engineer for the removal of water or sediment from the pipeline.

All materials shall conform to the applicable requirements of "Approved Materials List" specified elsewhere is these Special Provisions.

Blow-off assemblies shall be installed within a section of the pipe no closer than 600 mm to a bell, coupling, joint, or lining. Blow-off assemblies shall be installed at the end of all pipe lines, regardless of the length, and at low points of the pipe line as shown in the contract plans.

Blow-off assemblies shall be disinfected, hydrostatically tested and coated in accordance with requirements listed elsewhere in these Special Provisions.

AIR RELEASE VALVE, AIR VACUUM VALVE

Combination air valves are generally installed on all potable and recycled water mains where shown on the plans.

Unless otherwise directed by the Engineer, combination air valves will be required as indicated below:

A. 50 mm combination air valve assemblies shall be installed on pipeline sizes 150 mm through 300 mm.
B. 100 mm combination air valve assemblies shall be installed on pipeline sizes 400 mm through 500 mm.
C. 150 mm combination air valve assemblies shall be installed on pipeline sizes 600 mm through 900 mm

Air release valves and air and vacuum valves shall be installed in accordance with the plans or as directed by the Engineer.

Combination air valves and appurtenant components and materials suitable for the system pressure shall be as manufactured by Apco or Val-Matic selected from the Approved Materials List.

Combination air valves shall comply with AWWA C512 except as modified herein.

50 mm combination air valves shall be the single-body type incorporating stainless steel internal components and National Pipe Threaded (NPT) inlet and outlet configurations.

100 mm and 150 mm Combination Air Valves shall be the single-body type. Valves shall incorporate stainless steel internal components, protective hood and flanged inlet.

Internal protective epoxy coatings shall be provided in accordance with AWWA C550.

Air release valves and air and vacuum valves shall be provided only as specifically shown on the plans. Air release valves, and air and vacuum valves and appurtenant components and materials suitable for the system pressure, shall be selected from the Approved Materials List.

Air release valves and air and vacuum valves shall comply with AWWA C512 except as modified herein.

50 mm air release valves and air and vacuum valves shall be the single-body type incorporating stainless steel internal components and National Pipe Threaded (NPT) inlet and outlet configurations.

100 mm and 150 mm air release valves and air and vacuum valves shall be the single-body style. Valves shall incorporate stainless steel internal components, protective hood and flanged inlet.

Epoxy linings and coatings for valves shall be provided in accordance with AWWA C550.

A. Liquid epoxy lining and coating materials shall be listed in the NSF Listing for Drinking Water Additives, Standard 61, certified for use in contact with potable water.
B. The minimum dry film thickness for epoxy linings shall be 0.203. Liquid epoxy lining shall be applied in two (2) coats in accordance with AWWA C210.

Combination air valves, air release valves and air and vacuum valves sized 100 mm and larger shall be installed with break-away bolts in accordance with the plans and selected from the Approved Materials List.

Air valve assemblies shall be provided as shown on the plans. Additional air valve assemblies may be required in areas of potential air entrapment, at the discretion of the Engineer.

Air valve assemblies shall be installed relative to street improvements in accordance with the plans.

Connections for the air valve assemblies shall be made within a section of the main line no closer than 600 mm to a bell, coupling, joint or fitting.

Air valve assemblies shall be disinfected in conjunction with disinfecting the main to which it is connected. The assembly valves shall be operated and the assembly flushed to completely disinfect all internal parts.

Air valve assemblies shall be hydrostatically tested in conjunction with the pipeline to which they are connected.

MANHOLE FRAMES AND COVERS

Manhole frames shall be 900 mm in diameter with two concentric covers made of cast-iron in accordance with ASTM A 48, Class 30, the Standard Plans and the Approved Materials List. Locking frames and covers, in accordance with the Standard Plans, may be required as determined by the District Engineer.

Frames and covers shall be designed for H-20 highway wheel loading.

Covers shall have the words "OTAY WATER DISTRICT" or "CITY OF SAN DIEGO" and "WATER" or "RECYCLED WATER" cast into the cover as appropriate by the application. No other lettering will be permitted on the top portion of the cover.

Castings shall be smooth, clean, and free from blisters, blowholes, and shrinkage. Mating surfaces of the frame and cover shall be machined to prevent movement of the lid. Frames and covers shall be match marked in sets before shipping to the site.

All castings shall be dipped twice in a preparation of asphalt of coal tar and oil applied at a temperature of not less than 143.3 degrees C nor more than 154.4 degrees C and in such a manner as to form a firm and tenacious coating.

VALVE BOX AND EXTENSION STEMS

Valve Stem Extensions shall be installed when the valve operating nut is more than 1.5 m below grade. Stem extensions shall be of sufficient length to bring the operating nut to a point between 300 mm and 450 mm below the gate well lid.

Stem extensions shall be complete with operating nut, location ring, and lower socket to fit valve-operating nut. The configuration of the extension stem nut shall match that of the valve it operates.

Stem extensions shall be square fiberglass tubing glued together to make a continuous one-piece unit used to a maximum length of 2.4 m.

Steel stem extensions shall be used where the maximum length of the extension exceeds 2.4 m or at the request of the Engineer. Steel stem extensions may be round or square hot-dipped galvanized steel tubing of solid design (no pinned couplings permitted) with guides.

GATE WELLS

Gate wells shall be installed as shown on the plans and as described below.

Gate wells shall be installed with lids flush with the final surface. No more than two 25 mm adjustment rings shall be used. Gate wells and adjustment rings shall be accurately cut perpendicular to the length of the piping used.

Gate wells shall be color coated to identify the type and use of the valve installed.

A. The inside portion of the gate well lid and interior portion of PVC gate well shall be identified with a minimum 50 mm diameter painted identification marking.
B. Paint color shall be as follows:

Color Gate Well Lid and PVC Gate Well for:

Red	Normally Closed System Valves (NCV)
White	Resilient Wedge Gate Valves (RWGV)
Green	Butterfly Valves (BFV)

C. The top exterior portion of the gate well lid and ring shall be coated in accordance with these Special Provisions.

GATE VALVES – RESILIENT WEDGE

Resilient wedge gate valves (RWGV's) shall be installed on potable and recycled water mains and appurtenances in accordance with the plans.

Resilient wedge gate valves shall be used for open/closed operations, throttling service and frequent operation after long periods of inactivity.

In general, resilient wedge gate valves shall be used when valves are required on pipelines and appurtenances 100 mm through 300 mm

Valves for pipelines sized 400 mm and larger generally require the use of butterfly valves (BFV) in accordance with these Special Provisions.

The following items shall be submitted for review and approval by the Engineer prior to ordering or delivery of resilient wedge gate valves:

An affidavit from the valve manufacture stating that valves have successfully passed hydrostatic tests in accordance with AWWA C509 and manufacturer's own coatings tests.

The valve manufacturer's catalog data showing the size to be used, valve dimensions, pressure rating and materials of construction.

Manufacturer's catalog data and proof of NSF certification for the lining materials to be used.

Valves shall be the same size as the line in which they are installed unless otherwise noted on the plans.

Valve ends shall be compatible with the piping system in which they are being installed in accordance with the plans or directed by the Engineer.

Resilient wedge gate valves shall be hydrostatically tested and valve coatings shall be holiday detected prior to shipment to the field in accordance with the testing procedures described elsewhere in these Special Provisions. Valves delivered to the site prior to successful hydrostatic testing and holiday detection shall be subject to rejection.

Valves shall be delivered and stored in accordance with AWWA C550. The port openings shall be covered with plastic, cardboard or wood while in transit and during storage in the field. These covers shall remain in place until valves are ready to be installed. Valves shall not be stored in contact with bare ground. Valves shall not be stacked.

Polyethylene wrap shall be used for the buried installation of resilient wedge gate valves.

Resilient wedge gate valves and appurtenant components and materials shall be selected from the Approved Materials List.

RWGV's shall be ductile-iron in accordance with AWWA C509 and C515 except as modified herein.

Each valve shall have a smooth unobstructed waterway free from any sediment pockets.

All RWGV's shall be leak-tight at their rated pressure.

RWGV's shall have a non-rising low-zinc bronze or stainless steel stem, opened by turning left (counterclockwise).

Stem seals shall be the O-ring type incorporating a minimum of two rings as required by AWWA C509.

Low-friction torque-reduction thrust washers or bearings shall be provided on the stem collar.

Wedge (gate) shall be fully encapsulated with a bonded-in-place Nitrile elastomer covering. Minimum thickness of the rubber seating area shall be 6.35 mm.

Valves for buried applications shall be provided with a 50 mm square operating nut, and valves located above ground or in structures shall be equipped with a hand wheel in accordance with AWWA C509 unless otherwise indicated on the plans.

RWGV interior and exterior surfaces (except for the encapsulated disc) shall be coated as described below:

A. All bolts and nuts used in the construction of RWGV's shall be Type 316 stainless steel.
B. Epoxy linings and coatings for valves shall be provided in accordance with AWWA C210, C213 and C550, with the following modifications:

    1. Epoxy lining and coating of valve surfaces shall be performed by the manufacturer in a facility with qualified personnel, where the environment can be controlled. Epoxy lining and coating of valves in the field is prohibited.
    2. Repairs made to manufactures applied coatings shall be performed in a facility with qualified personnel, where the environment can be controlled. The facility shall be approved by the valve manufacturer.
    3. Surface preparation shall be in conformance with the requirements in Surface Preparation Specification No. 5, "White-Metal Blast Cleaning," of the Steel Structures Painting Council.
    4. Liquid epoxy lining and coating materials shall be listed in the NSF Listing for Drinking Water Additives, Standard 61, certified for use in contact with potable water.
    5. The minimum dry film thickness for epoxy linings shall be 0.203 mm Liquid epoxy lining shall be applied in two (2) coats in accordance AWWA C210.
    6. Powder epoxy coating materials shall contain one hundred percent solids, in accordance with AWWA C213.

Gate wells and extension stems for buried valves shall be selected from the Approved Materials List.

Polyethylene wrap shall be in accordance with and selected from the Approved Materials List.

Install valves with the bolt holes straddling the vertical centerline of pipe and the operating nut in the vertical position unless otherwise noted on the plans.

Valves shall be installed in accordance with the manufacturer's recommendations and the applicable section of these specifications for the piping material and joint type being used.

Installation of polyethylene wrap for buried valves shall be in accordance with the plans.

Concrete thrust, anchor, and support blocks shall be installed in accordance with the plans. The concrete shall be placed so that valves and valve operators will be accessible for repairs or replacement.

Gate wells and extension stems for buried valves shall be installed in accordance with the plans.

Disinfections and flushing of valves shall be completed as part of the process of disinfecting the main pipeline. The valves shall be operated during the disinfection period to completely disinfect all internal parts.

Valves shall be hydrostatically tested in conjunction with the pipeline in which they are installed.

The exterior of valves installed above ground or exposed in vaults or enclosures shall be field painted in accordance with these Special Provisions.

BUTTERFLY VALVES

Butterfly valves (BFV) shall be installed on potable and recycled water mains and appurtenances where shown on the plans.

Butterfly valves shall be used for open/closed operations and throttling service and frequent operation after long periods of inactivity.

In general butterfly valves shall be used when valves are required on pipelines 400 mm and larger and where the use of a motor-operated valve is required as shown on the plans. Butterfly valves smaller than 400 mm shall only be used as indicated on the plans or with the prior approval of the Engineer.

Valves for pipelines sized 300 mm and smaller generally require resilient wedge gate valves (RWGV's).

Valve ends shall be flanged ductile-iron unless otherwise called for on the plans or as directed by the Engineer. Ductile-iron flanges shall generally be in accordance with AWWA C115, rated at a working pressure of 1,724 kPa. When Class 250 butterfly valves are shown on the plans or are otherwise required, ductile-iron flanges shall be compatible with AWWA C207, Class "F".

Maximum working pressure of the flange shall as specified in AWWA or ASME/ANSI. Flanges shall be integrally cast per AWWA C110.

Butterfly valves shall be hydrostatically tested and coatings holiday detected prior to shipment to the field per testing procedures described elsewhere in these Special Provisions. Valves delivered to the site prior to successful hydrostatic testing and holiday detection will be subject to rejection.

Butterfly valves and appurtenant components and materials shall be selected from the Approved Materials List.

Butterfly valves shall be short body, leak-tight closing, and rubber-seated in accordance with AWWA C504 except as modified herein.

Except as modified below, BFV's shall be Class 150B in accordance with AWWA C504, rated for a flow velocity of 4.9 m/s.

Where the static pressure of the pipeline in which the BFV is to be installed exceeds 1.03 MPa, a Class 250B butterfly valve in general conformance with AWWA C504 shall be required. Class 250B butterfly valves shall be submitted to the Engineer for approval prior to ordering or delivery.

Butterfly valves shall open by turning left (counterclockwise). Valve disc shall rotate ninety degrees from the full open position to the tight shut position.

Butterfly valve interior and exterior surfaces shall be coated as described below:

Manual Valve Actuators:

A. All valve actuators shall be watertight, designed for buried or submerged uses. Actuators shall be fully gasketed, sealed, and factory packed with grease.
B. As directed by the Engineer, actuators for valves located above ground or in vaults and structures may have hand wheels or chain wheels. Minimum hand wheel diameter shall be 300 mm. The actuator shall be equipped with a dial indicator, which shows the position of the valve disc. The Engineer may require the use of a 50 mm square operating nuts in some cases.
C. Actuators for valves shall be provided with a 50 mm square-operating nut when buried or when indicated on the plans.
D. Actuators shall have travel stops, which can be adjusted in the field without having to remove the actuator from the valve.
E. Actuators shall be sized for opening and closing the valve at the valve's full rated working pressure and at a flow velocity of 4.9 m/s.
F. Actuators shall accept a minimum of 407 Nm of input torque at the full open and full closed positions without damage to the actuator or the valve.
G. Actuators equipped with 50 mm operator nuts shall require a maximum input torque of 203 Nm to operate the valve. A maximum input torque of 108 Nm shall be required to operate valves with hand wheels.
H. Actuators shall be of the same manufacturer as the valve where possible or as directed by the Engineer.
I. Actuators shall be installed, adjusted, tested and certified by the valve manufacture prior to shipping.
J. Actuators shall require a maximum of one hundred (100) input turns for the complete ninety-degree movement of the disc.
K. Actuators shall receive an epoxy coating on the exterior surface as described below.

Traveling nut actuators:

A. Actuators for butterfly valves sizes 400 mm through 600 mm may be the manual traveling nut type. Traveling nut actuators shall not be used on valves requiring motor driven actuators or where the Engineer has specified a worm gear type actuator.

B. Actuators shall be capable of producing the below listed output torque at the closed position:

Valve Size in mm	Output Torque Nm
400	2779
450	3729
500	3729
600	6372

Worm Gear Type Actuators:

A. Actuators for butterfly valves 750 mm or larger shall be the worm gear type. In addition, worm gear type actuators shall be used on butterfly valves requiring motor driven actuators or where the Engineer has specified a worm gear actuator.

B. Worm gear actuators shall be totally enclosed and self-locking.

Epoxy linings and coatings for valves and actuators shall be provided in accordance with AWWA C210, C213 and C550, with the following modifications:

Epoxy lining and coating of valve surfaces shall be performed by the manufacturer in a facility with qualified personnel, where the environment can be controlled. Epoxy lining and coating of valves in the field is prohibited.

Repairs made to shop-applied coatings shall be performed in a facility with qualified personnel, where the environment can be controlled. The facility shall be one that is approved by the valve manufacturer.

Surface preparation shall be as detailed in Steel Structures Painting Council SP5, "White Metal Blast Cleaning."

Liquid epoxy lining and coating materials shall be listed in the NSF Listing for Drinking Water Additives, Standard 61, certified for use in contact with potable water.

The minimum dry film thickness for epoxy linings shall be 0.203 mm. Liquid epoxy lining shall be applied in two (2) coats in accordance AWWA C210.

Powder epoxy coating materials shall contain one hundred percent solids, in accordance with AWWA 213.

METER BOXES

Meter boxes shall be used for 25 mm and 50 mm water meters and blowoff assemblies for water and recycled water systems.

Meter boxes shall be sized for the specific meter size or size of blowoff assembly as indicated on the plans.

Meter boxes shall be polymer-type boxes with lids selected from the Approved Materials List.

Meter box sizes shall be as follows:

Meter Box Size	Meter Box Uses
250 mm x 500 mm	25 mm water services
425 mm x 750 mm	50 mm water services and 50 mm through 150 mm blow-off assemblies

Meter box lids for use in potable water system applications shall be gray.

Meter box lids for use in recycled water system applications shall be purple.

Meter boxes shall be installed at the elevations and locations shown on the plans and in accordance with the plans. Near the completion of the project, a final meter box adjustment to finish grade may be required. Water meters shall not be installed until final adjustments are made to the meter box and approved by the Engineer.

50 MM COPPER PIPE FOR SERVICES LINES

50 mm copper pipe for future water meter as shown on the plans shall be furnished and installed in conformance with the provisions in Section 20-5, "Irrigation System," of the Standard Specifications and shall conform to the requirements of ASTM B 88 or ASTM B 88 M (Metric), Type A seamless water tube. Copper tubing shall be soft or rigid. Components shall be selected from the proper Approved Materials List in accordance with the plan details.

SECTION 10-4.04 WATER MEASUREMENT AND PAYMENT

MEASUREMENT

Water system work performed under these Special Provisions will be designated in the contract item by size, type, thickness, quality, or whatever information is necessary for identification.

The lengths of the various sizes and types of water pipe and welded steel pipe casing to be paid for will be determined by the meter from actual measurements along the centerline of the pipe in place in the completed work. Pipe placed in excess of the length designated by the Engineer will not be paid for. When pipes are cut to fit a structure, the quantity to be paid for will be the length of pipe placed before cutting, measured in one meter increments.

Fittings, including double ball joints and flexible couplings which increase the length of the water pipe and for which no separate contract item is provided, will be measured by the meter for the size of water pipe involved. Fittings will be measured along centerlines to the point of intersections.

Quantities of the various sizes and types of valve, valve assemblies, flexible expansion joints, cathotic and anode cathodic stations, couplings, blow off assemblies (including enclosure), and combination air vacuum assemblies, (including enclosure), fire hydrant assembly, to be paid for will be determined as units from actual count in the completed work.

PAYMENT

Items of work measured as provided in these Special Provisions will be paid for at the contract prices per meter for the various sizes and types of water pipe and casing, at the contract prices per unit for the various sizes and types of valve assemblies, flexible expansion joints, cathotic and anode cathodic stations, blowoff assemblies (including enclosure), and combination air vacuum assemblies (including enclosure), fire hydrant assembly.

Full compensation for reconnect existing fire hydrant, modify fire hydrant, salvage fire hydrant, reconnect air valve, reconnect 50 mm water service, connect new mains to existing mains, cut off walls, temporary blow-off assemblies, flexible couplings and double ball joints, disinfect water mains and water pressure test, remove water mains for installation of new water pipe, casing end seal, and salvage materials involved in constructing the water main shall be considered as included in the contract prices paid for the various sizes and types of water and no separate payment will be made therefore.

Abandon water pipe, and abandon water services will be measured and paid for as abandon pipe lines.

Full compensation for the various sizes and types of anchor blocks, thrust blocks, and support blocks, adapters, services and disposal of friable and non-friable material involved in constructing the water mains shall be considered as included in the contract prices paid for the various items of water mains and no separate payment will be made therefore.

When imported backfill is ordered by the Engineer, it will be paid for as extra work as specified in Section 4-1.03D of the Standard Specifications.

Full compensation for furnishing all labor, materials (including metallic tape locator for non-metallic water pipe), tools, equipment, and incidentals, and for doing all the work involved in relocating the water system, complete and in place shall be considered as included in the prices paid for the various contract items of water systems relocation involved, and no additional compensation will be allowed therefore.

Full compensation for protective work operations required to accommodate or safeguard public traffic or existing facilities (including fencing) and for all trenching and shoring, control of water in and outside the excavations and trenches, shall be considered as included in the prices paid for the various contract items of water systems relocation involved, and no additional compensation will be allowed therefore.

SECTION 10-4.05 INSTALLATION AND RELOCATION OF SEWER FACILITIES

GENERAL DESCRIPTION

Installing force main, gravity sewer, pipe casings, and appurtenances, shall consist of constructing and installing new facilities and relocation of existing facilities, owned by the City of San Diego, in accordance with the provisions of the following publications: "Greenbook" Standard Specifications for Public Works Construction, 2003 edition, herein known as the "Utility Standard Specifications"; Regional Supplement to "Greenbook" Standard Specifications for Public Works Construction, 2003 edition; Sections 1 through 9, Section 15, "Existing Highway Facilities", and Section 70, "Miscellaneous Facilities", of the State Standard Specifications; the details as shown on the plans; these Special Provisions; and as directed by the Engineer.

Except for Sections 15 and 70, Sections 10 through 95 of the State Standard Specifications shall not apply to the work in this Section 10-4 except when specific reference is made thereto.

If parking is to be restricted during construction, the Contractor shall post "Tow-Away/No Parking" signs 24 hours in advance after receiving approval from the Engineer. The sign shall contain "days/hours" information and be posted so as to be reasonably seen by the public.

The Contractor shall notify the Engineer 3 working days in advance of any lane, street or alley closures or implementing any construction detour.

The Contractor shall keep the streets in and adjacent to the construction area clean at all times. Streets shall be swept before washing.

The Contractor shall take the necessary precautionary measures to prevent dust or other nuisances which might be created by reason of his activities. The necessary precautionary measures shall be in accordance with Section 10 of the State Standard Specifications.

Areas to be excavated, filled, graded, and to be occupied by permanent construction or embankments shall be prepared by clearing and grubbing. Clearing and grubbing shall be in accordance with Section 16 of the State Standard Specifications.

COORDINATION

The Contractor shall notify the Engineer at least 10 working days in advance of his intent to begin work on the force main and gravity sewer.

The Contractor shall provide for a safe 1.2 m wide pedestrian walkway to all places of business, and for all residences during construction.

The Contractor shall not allow sewage to be discharged onto the ground or into any stream, creek or storm drain.

The Contractor shall distribute printed notices of proposed utility work to all occupants along streets where construction work is to be performed at least one week before starting such work. For all work on private property, the Contractor shall contact each owner individually a minimum of thirty (30) days prior to the work. In the event the work has been delayed, the Contractor shall notify residents of the new schedule of work.

The Contractor shall notify the owner or occupant (if not owner occupied) of the closure of driveways to be closed more than one 8-hour day at least 3 working days prior to the closure. The Contractor shall minimize the inconvenience and minimize the time period that the driveways will be closed. The Contractor shall fully explain to the owner/occupant how long the work will take and when closure is to start.

The Contractor shall perform his work in such a manner that existing private and/or public utilities will not be disturbed for a period of time in excess of 4 hours. Utilities service shall not be interrupted prior to 8:00 a.m. nor after 4:00 p.m. unless otherwise approved in writing by the Engineer.

The Contractor shall cooperate with the utility owner's personnel in order to facilitate their inspection work and shall allow them access to the site of the work.

Approvals and instructions from the utility owner's personnel will be transmitted to the Contractor through the Engineer.

DELIVERY, HANDLING, AND STORAGE OF MATERIALS

Pipe and materials shall be delivered, handled, and stored per these requirements and in accordance with the manufacturer's recommendations. All pipe and materials shall be delivered to the job site from the factory and stored in a manner that will prevent unnecessary deflection or damage prior to installation. The Contractor shall be entirely responsible for damage or loss by weather or other causes. The Material Safety Data Sheets (MSDS) for all products to be used in the work shall be kept on-site by the Contractor, and the manufacturer's recommendations for proper storage of its products shall be strictly followed.

Transport pipe to the job site on padded bunks with nylon tie-down straps or padded bonding to protect the pipe. Care shall be taken during the transporting of the pipe to insure that the binding and the tie down methods do not damage, deflect, or crack the pipe in any manner. Pipe that is bent, deflected, cracked, or otherwise damaged during shipping shall be rejected and replaced by the Contractor.

Under no circumstances shall pipe be pushed or dragged along the ground. All pipe sections over 6 m in length shall be lifted at the quarter points from each end.

Pipe shall not be placed directly on rough ground but shall be supported in a manner which will protect the pipe against injury whenever stored at the site or elsewhere.

Polyvinyl chloride (PVC) pipe shall be stored out of direct sunlight. Any discoloration of the pipe shall be an indication of a possible reduction in impact strength. Discoloration may be sufficient reason for rejection of the pipe materials.

For steel pipe (casing), temporary internal bracing shall be installed in all pipe 400 mm and larger prior to shipment to the job site. Temporary internal bracing shall be 100 mm x 100 mm wooden stulls installed in both the horizontal and vertical directions. Each set of stulls shall be nailed together as a unit. Wooden wedges may be used to maintain the proper tight fit of the internal bracing. The bracing shall be located 300 mm in from each end of the pipe section for all pipe, and additionally at the mid-point for piping 600 mm and larger. Maintain internal bracing as specified in these Special Provisions. Maintain plastic end caps on all steel pipe in good condition until the pipe is ready to be installed in the trench.

Prior to installation, store pipe on earth berms or timber cradles adjacent to the trench in the numerical order of installation. Place the supports at about the one-quarter point from the pipe ends.

Any pipe section, including coatings and linings, that becomes damaged as a result of handling or stockpiling shall be replaced with a new unit or repaired at the discretion of the Engineer at no additional cost to the Owner.

HAZARDOUS WASTE AND UNKNOWN PHYSICAL CONDITIONS

If conditions listed below are found during construction, or if any other conditions are found during construction that may be detrimental to the existing facilities being constructed, or to the health and safety of the public, the Contractor shall promptly notify the Engineer.

A. Material that the Contractor or Engineer believes may be hazardous waste, as defined in Section 25117 of the Health and Safety Code, and is thus required to be removed to a Class I, Class II, or Class III disposal site in accordance with the provisions of existing law. If such material is discovered, Contractor shall immediately cease work and shall not disturb the job site except as required to protect public safety.
B. Subsurface or latent physical conditions at the site differing from those indicated.
C. Unknown physical conditions at the site of any unusual nature, different materially from those ordinarily encountered and generally recognized as inherent in work of the character provided in the Contract.

The Contractor shall promptly inform the Engineer of any such conditions found during construction. The Engineer shall investigate the conditions, and if it finds that the conditions do materially differ from those shown or expected, or do involve material that may be hazardous waste, Contractor shall cease work in the impacted area. If material that may be hazardous waste is discovered, the Contractor shall insure that the appropriate government agencies are contacted prior to any further work being performed and that a solution is implemented.

WATER FOR CONSTRUCTION PURPOSES

The Contractor shall furnish all water required for construction, including water for flushing and testing. A meter shall be installed whenever water is required by the Contractor. The water and meter shall be paid for by the Contractor in accordance with the water district's, city's, or county's rates and rules.

Only the 62 mm port shall be used for water available from fire hydrants along the job site. The 100 mm port shall be free for use in the event of a fire.

No compensation shall be paid the Contractor for water for the initial filling or refilling, for testing or re-testing, and for re-flushing the pipeline. Water for the initial filling, refilling after dewatering for locating leaks or correcting workmanship, and final flushing shall be paid by the Contractor.

The size and location of temporary meters shall be determined by the Contractor and approved by the Engineer.

COST OF WATER WITHIN CITY OF SAN DIEGO

All water obtained from the City of San Diego shall be metered through a temporary meter. The temporary meter may be rented for a fee from the Meter Shop Supervisor at Chollas Operations, 2797 Caminito Chollas, San Diego, CA or the Contractor may, if desired, use the Contractor's own meter. The water and meter obtained from the City of San Diego shall be paid for by the Contractor in accordance with the City of San Diego rates and rules.

GENERAL SEWER SYSTEM REQUIREMENTS:

A. The existence and location of sewer facilities shown on these plans were obtained from available records. The Engineer shall not be held responsible for any error in the location and elevation of the existing sewer facilities.
B. All sewer mains will pass a deflection test and air pressure test prior to street paving, but after all other utilities have been completed and compaction testing approved.
C. Pipe shall be stored on a flat surface so the barrel is evenly supported. Pipe shall not be stacked higher than 1.2 m. Gaskets shall be stored in a cool, dark place out of contact with oil and grease.
D. New sewer mains will not be connected to the City's sewer system until accepted by the Engineer. Flows will be retained within the newly constructed system by means of plugging the new system, with a mixture of Plaster of Paris and Portland Cement (know as Dynamiting) in a place that will not impair the function of the City's sewer system. Prior to releasing sewer into the City's sewer system, the Contractor will perform the air pressure test and deflection test on lines as specified in these Special Provisions.
E. Existing sewer mains shall not be used for discharge of storm waters, drainage, or other similar uses.
F. All sewer lines shall be cleaned of foreign material, prior to connection to the City's sewer system.

SEQUENCE OF WORK

The Contractor shall comply with the following sequence of construction, unless directed otherwise by the Engineer:

A. Install all sewer facilities in Airway Road, and in the crossing of SR-905 to Station 2+71.00 as shown on the Contract Plans.

B. Install the remaining portion of the SR-905 crossing segment (Station 2+71.00 to Station 3+53.125) when traffic on Otay Mesa Road is transferred to the completed SR-905, and when Otay Mesa Road can be closed. This work shall be completed prior to construction of the "Park and Ride" facilities work of SR-905.

C. There is no dependency between the 400 mm sewer installation in Cactus Road and the other segments, two 1500 mm casings, one with a 600 mm force main shown as existing on the Contract Plans. Depending on the actual construction schedule, the Contractor shall be aware that those "existing" facilities may not be in place. If the 600 mm force main is not in place, the Contractor shall be responsible for bypass pumping when installing the 400 mm force main as part of this Contract.

SECTION 10-4.06 METHODS OF CONSTRUCTION

GENERAL DESCRIPTION

The work consists of constructing various size sewer mains, lateral connections, concrete encasement, steel casing, concrete manholes and appurtenances, abandonment of existing sewer pipe, replacement of pavement, by-passing sewage, and all related work required to complete the sewer installation work belonging to the City of San Diego in accordance with the plans, State Standard Specifications, Utility Standard Specifications, and these Special Provisions.

Construction and installation of a 1050 mm gravity sewer main crossing the proposed SR-905 near Old Otay Mesa Road; a 450 mm gravity sewer main in Airway Road; and a 400 mm sewer force main in Cactus Road; and all appurtenances, all belonging to the City of San Diego.

DRAWINGS AND DATA REQUIRED

Attention is directed to Section 5-1.02, "Plans and Working Drawings", of the State Standard Specifications. The Engineer's maximum review period shall be fifteen working days and the Contractor shall make five copies of each submittal within five days after issuance of Notice to Proceed. Upon completion of the sewer facilities installation, the Contractor shall provide a complete set of record As-Built drawings, showing all work performed, to the Engineer.

A. Pipe and Appurtenances: The Contractor shall submit to the Engineer for review and approval, prior to the fabrication of any pipe, joints, and gaskets, the following items:

1. Line layout and marking diagrams which indicate the specific number of each pipe and fitting and the location of each pipe and the direction of each fitting in the completed line. In addition, the line layouts shall include: the pipe station and invert elevation at all changes in grade or horizontal alignment; the station and invert elevation to which the bell end of each pipe will be laid; all elements of curves and bends, both in horizontal and vertical alignment; and the limits of each reach of retrained and/or welded joints, or of concrete encasement.
2. Manufacturer's product literature and technical data, including pipe material data and pipe installation instructions. For HDPE pipe, include pipe joining instruction and manufacture recommendations.
3. Typical cross sections and joint, fitting, and appurtenance details.
4. Connection details for tie into existing sewer system.
5. Hydrostatic Test Reports (All Pipe)
6. Sustained Pressure Testing Reports (PVC Pressure Pipe)
7. Burst Strength Testing Reports (PVC Pressure Pipe)
8. Three-Edge Bearing Strength Test Reports (VCP)
9. List of large diameter high density polyethylene pipe installations using thermal butt-welded pipe, from the last five years, from the HDPE installer, including the linear meter, diameters, and owner telephone number and address for each installations.

B. Steel Casing: The Contractor shall submit to the Engineer for review and approval, prior to manufacture and installation of steel casings, the following items:

1. Casing installation schedules which include schedules of excavation, pipeline installation, backfill operations, and welding details.
2. Material list including diameter, thickness, and class of steel casing.
3. Shop drawings of casing insulators (spacers) and end seals including manufacturers' catalog information.
4. Certification of compliance for all steel casing pipe and other products or materials for the installation of steel casings. The certification of compliance shall include the physical and chemical properties of all steel supplied.
5. Description and manufacturers product data for the cathodic protection system to be installed.

C. Manholes and Appurtenances: The Contractor shall submit to the Engineer for review and approval, prior to the installation of any manhole and appurtenances, the following items:

1. Design calculations and detailed drawings of manhole component sections.
2. Shop drawings of cast iron frames and covers, and all appurtenances.
3. Manufacturer's product literature and technical data for the plastic lining, including complete data indicating the physical properties and chemical resistance properties of the plastic lining in accordance with Section 210-2 of Utility Standard Specifications, and all details and dimensions in accordance with Section 210-2.4 of the Utility Standard Specifications.
4. Shop drawings indicating the installation procedures and dimensions and location of all joints or weld strips for PVC liners.
5. Results of all tests made on plastic liner material.

D. Sewer Bypass Plan: The Contractor shall submit to the Engineer for review and approval, the sewage bypass plan, prior to installation and operation of sewage bypass system.

E. Excavation: The Contractor shall submit to the Engineer for review and approval, prior to any excavation, the following items:

1. Excavation support system specified elsewhere in these Special Provisions.
2. Copy of the excavation permit issued by the California Department of Industrial Safety.
3. Samples of imported material. Samples shall be submitted in accordance with Section 306-1.3.5 of the Utility Standard Specifications.

F. Excavation Support Systems: The Contractor shall submit to the Engineer for review and approval, prior to the installation of any excavation support systems, the following items:

1. Drawings and supporting calculations for the proposed excavation support systems, stamped and signed by a Professional Engineer, licensed to practice in the State of California, and experienced in the design of excavation support systems.
2. The proposed method of installing sheet piling including sequence of installation, template, and equipment description.
3. Contingency plan for alternative procedures to be implemented if the excavation support system is found to perform unfavorably.
4. Arrangement and details for each excavation support system, supporting design calculations, and construction methods to be used for the installation of each system.
5. Soldier pile installation methods, connection details, bracing preloading, and jacking procedures.
6. Depths below the main excavation bottom elevation to which the support system will be installed.
7. Elevations of ground surface, struts, and shores, as applicable.
8. Permissible depth to which excavation may be carried before supports must be installed and preloaded.
9. Full excavation depth load to be carried by various support system members.
10. Bracing loads for various stages of excavation, bracing removal, and concrete placement.
11. Preloads as required.
12. Proposed sequence of strut and shore removal as applicable and as related to concrete placement and backfilling operations.

G. Grout for Structures: The Contractor shall submit to the Engineer for review and approval, prior to installation of any grout materials, the following items:

1. Manufacturer's literature containing instructions and recommendations on the mixing, handling, placement, and appropriate uses for each type of non-shrink and epoxy grouts proposed for use in the work.
2. Certified test results verifying the compressive strength, shrinkage, and expansion properties for proposed non-shrink and epoxy grouts.

H. Geotextiles: The Contractor shall submit to the Engineer for review and approval, prior to installation of any geotextile materials, the following items:

1. Manufacturer material specifications and product literature.
2. Installation drawings showing geotextile sheet layout, location of seams, direction of overlap, and sewn seams.
3. Description of proposed method of geotextile deployment, sewing equipment, sewing methods, and provisions for holding geotextile temporarily in place until permanently secured.

I. Fiberglass Reinforced Plastic (FRP) Assemblies: The Contractor shall submit to the Engineer for review and approval, prior to installation of any FRP assemblies, the following items:

1. Grating material data sheets, including dimensions and bearing loads.
2. Certificate of compliance stating that the FRP assemblies meet all the specifications and requirements of the work.

J. Sewer Facilities Testing: The Contractor shall submit to the Engineer for review and approval, prior to testing of any sewer facilities the following item:

1. Proposed plans for sewer facilities testing, including plans for water conveyance, control, and disposal; design and manufacture data for the mandrel (if proposed); and a minimum 48-hour advance written notice of proposed testing schedule.

PRODUCT TESTING

The Contractor's attention is directed to Section 6-3, "Testing", of the State Standard Specifications.

In accordance with Section 207-17.4.2 of the Utility Standard Specifications, pipe which has not been installed within 120 days of the latest test shall not be accepted for installation and shall not be used.

All pipe shall be subject to inspection at the factory. The Contractor shall notify the Engineer in writing of the manufacturing start date not less than 14 days prior to the start of manufacture. For all pipe, an affidavit of compliance, certified by the manufacturer, that the proposed pipe, joints, and gaskets comply with the requirements of these Specifications and the plans shall be submitted to the Engineer, before installation of the pipe.

PVC pipe shall be subject to testing in accordance with Section 207-17.4 of the Utility Standard Specifications. In addition, PVC pressure pipe shall be tested in accordance with the requirements of AWWA C-900 and C-905, as applicable.

VCP pipe shall be subject to testing in accordance with Section 207-8.5 of the Utility Standard Specifications.

SEWAGE DIVERSION PLAN

Prior to the start of construction which involves any existing wastewater facilities, the Contractor shall be responsible for developing and submitting to the Resident Engineer a wastewater flow diversion plan in compliance with the City's policy of "Zero Spills" for review and approval at least 15 working days prior to implementation of the plan.

The diversion plan shall include a comprehensive emergency response plan including the procedures, standby redundant by-pass equipment, and activities that will be implemented in the event of an emergency shutdown or failure of a pump, by-pass, or the flow diversion equipment used for construction. The Sewage Diversion Plan shall allow construction in a dry trench and indicate the sequence of diversion operations and all other operations the Contractor will establish to maintain wastewater service during the construction period. The Contractor's wastewater flow diversion plan shall be reviewed and approved by the wastewater collection division and Metropolitan Wastewater Department before any flow can be diverted. The contractor shall be responsible for implementation of the emergency plan in accordance with section 7-8.8.1 of the 2003 City of San Diego supplement amendments (Doc. No. AEC 70104) to the standard specification for public works construction.

By-passes shall be of sufficient capacity to handle peak flows without storage. Duplicate peak flow capacity pump units shall be provided by the Contractor to continuously handle sewer flow without interruption in the event of failure of either pump unit. Approval must be attained prior to placement of any bypass pumping equipment on the Project.

The Contractor shall submit to the Engineer per the requirements indicated in Drawings and Data Required, for approval, prior to the commencement of sewer bypass work, the following items:

A. Sewer Bypass Pumping Plan: The sewer bypass pumping system plan and calculations shall be prepared and stamped by a civil Engineer registered in the State of California. The sewer bypass pumping plan shall include, but not be limited to the following:

1. Drawings showing location of bypass pumps, piping, power source, all appurtenances, required crossings of traveled roadways and methods for crossings, and trunk sewer main and lateral connections.
2. Calculations showing bypass pumping and piping meet the design capacity requirements.
3. Name and manufacturer designation of equipment used in sewer bypass pumping system.

4. Name, address, phone and fax number, e-mail, and contact name of bypass pumping system manufacturer, or representative.
5. Emergency sewer bypass pumping contingency plan.
6. Name, address, and phone number of all personnel in-charge of and overseeing bypass pumping system, and all personnel maintaining bypass pumping system.
7. Name, address, phone number, and pager number of two (2) contacts employed by the Contractor that can be called by the City of San Diego, Engineer, or other appointed representative for emergencies 24 hours a day.

B. Spill Prevention, Control, and Contingency Plan: A spill prevention, control and contingency (SPCC) plan shall be submitted to the Engineer for approval. The SPCC plan must include information in compliance with the Regional Water Quality Control Board requirements.

The contractor shall observe and comply with all federal state and local laws, ordinances, codes, orders, and regulations, which in any manner affect the conduct of the work, specifically as it relates to sewer spills. The contractor shall be fully responsible for preventing sewage spills, for containing sewage spills, for recovery and legal disposal of any spilled sewage, for any fines, penalties, claims and liability arising from causing a sewage spill, and for any violation of any law, ordinance, code, order, or regulation as a result of the spill(s).

The Contractor, City of San Diego, and Engineer shall meet at a designated date and location set by the Engineer and City of San Diego, after submittal and review of the bypass pumping system plan by the Engineer and City of San Diego. This meeting will be conducted by the Engineer and City of San Diego. This meeting is designed to allow both the Contractor, City of San Diego, and Engineer to discuss issues and concerns on the bypass pumping system and plan. Final approval of the bypass pumping system plan will not take place until completion of the meeting and all changes to the plan required by the Engineer and City of San Diego are met by the Contractor.

SEWAGE BY-PASS

The Contractor shall maintain sewage flows in the existing sewers at all times except when flows shall be by-passed as mentioned herein.

By-passing of sewage shall be necessary at locations where the existing sewers are in conflict with the new construction work or to facilitate air testing of new sewer pipes as mentioned elsewhere in these Special Provisions.

The Contractor shall install the sewer bypass pumping system in accordance with the approved bypass pumping system plan. The bypass pumping system shall be installed and operational prior to commencement of the sewer connection work.

Wherever required, the Contractor shall provide all plugs, piping, pumps, power sources, valves, stand-by equipment, and appurtenances necessary to remove sewage from the existing system and shall legally dispose of the sewage into the closest downstream sewer system. Pumps and bypass lines shall be of adequate size and provide adequate capacity to handle all flows to be diverted. The bypass pumping system shall be designed to meet the force main maximum flow of two million gallons per day and the gravity sewer main maximum flows indicated on the Sewer Design Table in the plans.

Victaulic coupled steel pipe shall be used to pump sewage and shall be sized for peak flow velocity not to exceed 3 m per second. (Flows in the existing sewers vary depending on the season and the time of the day). When pumping is required to maintain sewage flows, the Contractor shall furnish at the job site stand-by-pumping equipment and piping of equal capacity to account for failure of mechanical equipment.

The bypass pumping system shall be operational during the entire time to install the new sewer main and complete all connections. This may include nighttime operation of the bypass system. The Contractor shall provide personnel on the site at all times, located at the bypass pumping station, in order to assure that the bypass pumping system is operational at all times. The Contractor shall also provide additional fuel or another power source on the site to maintain continuous operation of the bypass-pumping system.

It shall be the Contractor's responsibility to inform the affected homeowners and businesses regarding its by-pass operations and any potential of flooding. By-passing of sewage into surface water or drainage courses shall not be permitted. All sewers and lateral connections shall remain in continuous and full operation. It shall be Contractor's responsibility to notify property owners regarding any disruption/ non-availability of facilities during temporary disconnection of house connection sewers (laterals). Sewer service must be restored to each and every customer by the end of the work day.

On non-working days and during extended shut down periods, the Contractor shall suspend by-passing and restore flows to the existing sewers or new sewers (which have been air pressure tested) through use of adequate size flow through plug(s) and flexible pipe connection between the new and the existing pipe. The plug shall be secured to Engineer's satisfaction and the site shall be fenced in for security purposes. The by-pass line when in operation shall be guarded day and night against damage including vandalism. Any sewage spill resulting from the Contractors operations shall be the Contractors responsibility and no additional payment will be made.

All bypass systems shall meet all City of San Diego noise restrictions, particularly at night. At no time shall the bypass pumping system be allowed to fail during construction of the new sewer main and until the existing sewer is connected to the new piping and operating properly.

All costs related to spills or backups due to the failure of the bypass pumping system shall be borne by the Contractor.

In the event of a sewage spill, the Contractor shall immediately notify the County's emergency operation center at telephone number (619)-565-5255 and then follow directions of the Engineer and the County Health Department and proceed with clean up and mopping in accordance with Proposition 65 for sanitizing the area contaminated by spill. The Contractor shall paint the emergency contact phone number adjacent to the end of the trench during the construction period. If sewage backup occurs and enters buildings, houses, or surcharges above the surface of the existing ground, the Contractor shall be responsible for clean up, repair, property, damage costs, and claims.

SEWER MAIN REMOVAL AND DISPOSAL

Existing sewer pipes where shown on the plans to be abandoned shall be removed and disposed of in accordance with the provisions of Section 7-1.13 of the State Standard Specifications. All resulting sewer pipe openings into existing structures, that are to remain in place, shall be plugged with minor concrete.

ADJUST SEWER MANHOLE

Existing manhole frame and cover shown on the plans shall be adjusted in conformance with the details shown on the plans.

MODIFY MANHOLES

Existing sewer manholes shall be modified as shown on the plans.

Where a new sewer main differing in direction is to be added to an existing manhole, the bottom of the manhole shall be rechanneled, to minimize turbulence, as directed by the Engineer

REMOVE SEWER MANHOLES

Manholes shall be removed in accordance with Section 306-5, "Abandonment of Conduits and Structures," of the Utility Standard Specifications.

EXCAVATION

Excavation shall conform to the provisions in Section 19-3, "Structure Excavation and Backfill", of the State Standard Specifications, these Special Provisions, and to the lines and grades shown on the plans and as directed by the Engineer.

STRUCTURE EXCAVATION

Structure excavation shall consist of the removal of material for the construction of foundations for vaults, manholes, headwalls, culverts, or other structures, and shall be in accordance with Section 300-3 of the Utility Standard Specifications. The foundation material for vaults shall be firm native soils. If loose or soft materials are encountered, it shall be removed and replaced with 19 mm crushed rock materials wrapped in geotextile fabric specified elsewhere in these Special Provisions.

TRENCH EXCAVATION

Whenever work involves trench excavation, the Contractor shall provide all necessary shoring, bracing, sloping, or other provisions to be made for worker protection from hazard of caving ground during the excavation. If such plan varies from the shoring system standards established by the Construction Safety Orders of the Division of Industrial Safety, a Civil Engineer or Structural Engineer registered in the State of California shall prepare and stamp the Drawings and calculations. In accordance with "Excavation Support Systems" and "Drawings and Data Required" listed elsewhere in these Special Provisions, the Contractor shall submit to the Engineer for approval all excavation support systems proposed.

Contractor shall comply with the Safety Orders of California, Code of Regulations: Title 8, Section 1539 (Excavation, Trenches, Earthwork).

Trench excavation shall conform to the provisions in Sections 5-1.02A, "Trench Excavation Safety Plans," and 19-1.02 "Preservation of Property," of the State Standard Specifications, the Contract Plans, and these Special Provisions.

Excavation for underground conduits shall be in accordance with Section 306-1.1 of the Utility Standard Specifications and the requirements contained herein. Unless otherwise shown or ordered, excavation for pipelines and utilities shall be open-cut trenches. Trench widths shall be kept as narrow as is practical for the method of pipe zone densification selected by the Contractor, but shall have a minimum width at the bottom of the trench equal to the outside diameter of the pipe plus 610 mm for mechanical compaction methods. The maximum width at the top of the pipe shall be as shown on the plans for sewer pipe 1050 mm diameter or greater. For sewer pipe less than 610 mm diameter, the maximum width at the top of pipe shall be equal to the outside diameter of the pipe plus 915 mm for pipe diameters 450 mm and larger and to the outside diameter of the pipe plus 610 mm for pipe diameters less than 450 mm. The maximum amount of open trench permitted in any one location shall be150 m, or the length necessary to accommodate the amount of pipe installed in a single day, whichever is greater. All trenches shall be fully backfilled at the end of each day or, in lieu thereof, shall be covered by heavy steel plates

adequately braced and capable of supporting vehicular traffic in those locations where it is impractical to backfill at the end of each day. The above requirements for backfilling or use of steel plate will be waived in cases where the trench is located further than 30 m from any traveled roadway or occupied structure. In such cases, however, barricades and warning lights conforming to requirements set forth in the California Department of Transportation Traffic Manual shall be provided and maintained.

Safe and suitable ladders which project 0.7 m above the top of the trench shall be provided for all trenches over 1.2 m in depth. One ladder shall be provided for each 15 m of open trench, or fraction thereof, and be so located that workers in the trench need not move more than 8 m to a ladder.

Shoring is considered to be adequate sheeting, shoring, bracing, or equivalent method for (1) protection of life and limb which shall conform to applicable safety orders; (2) protection of existing underground and above-ground private and public improvements; and (3) the remedy of any and all conditions encountered, regardless of depth, (including, but not limited to trench sloughing, pavement separation, etc.) during the construction of the project.

Should a bracing system utilize steel H-beams or piles or other similar vertical supports, driving of said vertical supports will not be permitted except for the last 1.2 m above the bottom of pile, except where this procedure is impracticable. The vertical support may then be driven to the required depth, not to exceed 1.2 m. During the drilling and driving operations the Contractor shall take care to avoid damage to utilities.

At locations where the drilling of such holes is impracticable because of the existence of rocks, running sand, or other similar conditions, and provided said impracticability is demonstrated to the satisfaction of the Engineer by actual drilling operations by the Contractor, the Engineer may, upon request of the Contractor, approve the use of means other than drilling for the purpose of placing the vertical support. Such other means, however, must be of a nature which will accomplish, as nearly as possible, the purpose of the drilling, namely, the prevention of damage to existing surface or subsurface improvements, both public and private.

EXCESS TRENCH EXCAVATION

Wherever the Contractor over-excavates the bottom of a trench, the bottom of the trench for sewer mains shall be backfilled in accordance with "Bedding" listed elsewhere in these Special Provisions.

Over-excavations shall be corrected by backfilling with approved imported granular material or crushed rock, compacted to 95 percent relative compaction, as directed by the Engineer.

The Contractor shall remove and legally dispose of all excess excavated material and demolition debris.

It is the intent of these Specifications that all surplus material shall be legally disposed of by the Contractor. Before acceptance of the work by the Engineer, the Contractor shall provide the Engineer with written releases signed by all property owners with whom the Contractor has entered into agreements for disposing of excess excavated material, absolving the Owner from any liability connected therewith.

Over excavation and associated bedding not ordered by the Engineer shall be at the Contractor's expense.

EXCAVATION SUPPORT SYSTEMS

Support of temporary open excavations shall be by means of sheet pilings, soldier piles and lagging, structural steel walls and struts, liner plates, and timber. The Contractor shall be responsible for the design and selection of methods in conformance with the design criteria as specified herein. Temporary excavation support systems shall be utilized for demolition, construction of underground cast-in-place concrete structures, and installation of buried pipelines.

Excavation support systems shall be designed, and shop drawings and calculations stamped and signed, by a Professional Engineer, licensed to practice in the State of California and experienced in the design of excavation support systems. All design drawings and calculations shall be submitted in accordance with "Drawings and Data Required" listed elsewhere in these Special Provisions.

Shop drawings with supporting calculations for the various excavation support systems shall be prepared in accordance with the following design criteria:

A. Design the excavation support system and all components to support the earth pressures, unrelieved hydrostatic pressures, utility loads, equipment, traffic, and construction loads including impact, and other surcharge loads in such manner as will allow the safe and expeditious construction of the permanent structures, to minimize ground movement or settlement, and to prevent damage to or movement of adjacent buildings, structures, roadways and utilities.
B. Design support members to resist the maximum loads expected to occur during the excavation and support removal stages.
C. Design for staged removal shall conform to construction concrete placement, and backfill sequence shown. Design shall consider provisions for future construction, and limits on bracing level elevations as shown on the plans.

D. Maximum vertical center-to-center spacing of supports shall be 4.9 m between top 2 support levels and 3.6 m below second support level unless otherwise approved. If decking beams are not required, install the uppermost bracing tier at a vertical distance of not more than 1.82 m below the top of excavation.
E. Where water flows from the face of excavation, the maximum height of unsupported excavation shall not exceed 35 cm.
F. In running sand and silt, provide positive means for securing timber lagging to the soldier piles to avoid shifting or falling off of the lagging, and positive means for containing such material behind lagging.
G. Review of the Contractor's shop drawings and methods of construction by the Engineer does not relieve the Contractor of responsibility for the adequacy of the excavation support systems.
H. No portion of the excavation support system's vertical face will be permitted to penetrate the design lines as indicated on the plans for the permanent concrete structure to be constructed within the excavation.
I. Vertical support capacity shall be provided for wall systems and internal bracing elements, for loads due to vertical force components of tieback anchors, the weight of the structural systems themselves, and live load on any portion of the system.

Design of Timber Support Systems and Members shall be prepared in accordance with the following additional design criteria:

A. Bases for determination of minimum allowable working stress: UBC Chapter 25.
B. The minimum thickness of timber lagging between soldier piles spaced 1.5 to 2.1 m center-to-center shall be 75 mm for excavations up to 7.6 m in depth, and 100 mm for excavations deeper than 7.6 m.
C. For other conditions and types of lagging, design calculations shall be submitted.

If existing utility facilities interfere with the proposed method of support, the method shall be modified in a manner that will protect the facility and accommodate the proposed work. Shop drawings shall be revised and resubmitted along with design calculations required to account for the modified support method and to show the actual location of the existing utilities.

Provisions shall be made for contingencies as follows:

A. Monitor performance of support system components, for both vertical and horizontal movement, at regular intervals not to exceed 3 days.
B. Provide contingency plan for alternative procedures to be implemented if unfavorable performance is evidenced.
C. Keep on hand materials and equipment necessary to implement contingency plan.

Elements of the support system shall not be spliced unless approved by the Engineer.
Materials for excavation support systems shall be as follows:

A. Steel sheet piling shall be continuous interlocking type ASTM A 328 of appropriate shape and provided with at least one 65 mm-diameter handling hole on the centerline of the web located at least 150 mm from each end of the sheet pile.
B. Fabricated connections and accessories, steel H-piles, WF shapes, and other structural steel shall conform to the requirements of ASTM A 36, unless otherwise approved.
C. Concrete shall be as specified in Utility Standard Specifications except as otherwise noted herein:

    1. For encasement of steel soldier piles below the final level of excavation, 1.723×10^8 dynes/cm^2 shall be used.
    2. For encasement of soldier piles above the final level of excavation, lean concrete shall be used, the strength of which shall be adequate to protect the excavated faces of the augured hole.

D. Wood lagging shall be dimension lumber with minimum allowable stress of 7.584×10^7 dynes/cm^2.

    1. The stress grade of the lagging shall be in conformance with the allowable stresses of the UBC, Chapter 25.
    2. Lumber shall be grade marked by WWPA or WCLIB with species and grade conforming with those shown on approved shop drawings.

The support system shall extend the main excavation bottom elevation to a depth adequate to prevent lateral movement and to adequately support applied vertical loads. In areas where additional excavation is required below the main excavation subgrade provisions shall be made to prevent movement of main excavation supports. Damage to existing utilities during installation of excavation support system shall be avoided.

Installation of solider piles shall be as follows:

A. Soldier piles shall be installed by preboring or other approved pre-excavation methods to tip elevation shown on approved shop drawings. Prevent prebored or other pre-excavated holes from collapsing.
B. Prebored hole shall be filled with lean concrete from bottom of hole to subgrade dependent upon analysis of vertical support requirements.
C. Remaining pile length shall be filled with lean concrete, completely encasing the pile.
D. Concrete shall be placed from the bottom of the hole upwards by means of a flexible pipe connected to a hopper.

Installation of sheeting and lagging shall be as follows:

A. Sheeting and lagging shall be installed with no gap between the boards unless specifically approved. As installation progresses, the voids between the excavation face and the lagging or sheeting shall be backfilled with sand or soil rammed into place. Materials such as hay or burlap shall be used where necessary to allow drainage of groundwater without loss of soil or packing material. If gaps in the lagging are allowed, the gap width between lagging boards shall be limited to 12 mm maximum.
B. If unstable material is encountered, suitable measures shall be taken to retain it in place or to otherwise prevent soil displacement.
C. Extend lagging down to final subgrade.
D. A sufficient quantity of material shall be on hand for sheeting, shoring, bracing, and other operations for protection of work and for use in case of accident or emergency.

Installation of steel sheet piling shall be as follows:

A. Steel sheet piling may be used only where existing subsurface conditions are suitable for installation of sheet piling to the full depth of penetration required, and to proper alignment and plumbness, specified herein, without damage to the sheet piling or rupture of its interlocks. The use of steel sheet piling will not be permitted where sheeting would be required to penetrate boulders, rock or other materials which may prevent the proper installation of sheet piling.
B. Steel sheet piling shall be installed in plumb position with each pile interlocked with adjoining piles for its entire length so as to form a continuous diaphragm throughout the length of each run of wall, bearing tightly against original ground. Install sheeting to depth required for design. Exercise care during installation so that interlocking members can be extracted, if required, without injury to adjacent ground. The installation equipment shall be suitable to the type and nature of the subsurface materials anticipated to be encountered. The equipment, and methods of installation, cutting, and splicing shall conform to the approved shop drawings.
C. Liner plate shall be installed to proper line and grade and dimensions which will enable final liner to be placed in accordance with tolerances specified by the excavation support system Design Engineer. Annular void, if present by method of ground support shall be filled with tunnel grout as specified by the excavation support system Design Engineer.

Installation of all internal bracing support systems shall be as follows:

A. All bracing support members shall be installed and maintained in tight contact with each other and with the surface being supported.
B. Bracing members shall be preloaded by jacking the struts and shores in accordance with loads, methods, procedures, and sequence as described on the approved shop drawings. Coordinate excavation work with bracing installation and preloading. Use steel shims and steel wedges welded or bolted in place to maintain the preloading force in the bracing after release of the jacking equipment pressure. Use procedures so as to produce uniform bracing member loading without appreciable eccentricities, overstressing, or support member distortion.
C. Struts shall be provided with intermediate bracing as needed to enable them to carry their maximum design load without distortion or buckling. Provide diagonal bracing as necessary to maintain the stability of the system. Web stiffeners, plates, or angles shall be provided as needed to prevent rotation, crippling, or buckling of connectors at points of bearing between structural steel members. Allow for eccentricities resulting from field fabrication and assembly.
D. Excavations shall be to a depth no more than 600 mm below the elevation of the support member about to be placed. The support member shall be installed and preloaded immediately after installation and prior to continuing excavation.

Removal of all excavation support systems shall be as follows:

A. Where removal is required wholly or in part, such removal shall be performed in a manner that will not disturb or damage adjacent new or existing construction or utilities. Fill all voids immediately with lean concrete, or other approved means.
B. All elements of support systems shall be removed to a minimum depth of 1.8 m below final ground surface. However, when a structure poured against the sheeting system extends above the 1.8 m limit, removal of the sheeting system shall be to the top of the structure.
C. All damage to property resulting from removal shall be promptly repaired at no cost to the Owner. The Engineer shall be the sole judge as to the extent and determination of the materials and methods for repair.

DEWATERING

The Contractor shall provide and maintain at all times during construction ample means and devices to promptly remove and dispose of all water from any source entering excavations or other parts of the work. Dewatering shall be performed by methods that will ensure a dry excavation and preservation of the final lines and grades of the bottoms of excavations. Dewatering methods may include well points, sump points, suitable rock or gravel placed as pipe bedding for drainage and pumping, temporary pipelines, or other means, all subject to the approval of the Engineer. The cost of all dewatering activities shall be borne by the Contractor.

Sewer systems shall not be used as drains for dewatering trenches or excavations, nor for disposal of collected or accumulated groundwater, without the approval of the Engineer and Agency of jurisdiction.

Concrete shall not be poured in water, nor shall water be allowed to rise around concrete or mortar until it has set at least four hours.

The Contractor is responsible for meeting all Federal, State, and local laws, rules and regulations, including all Regional Water Quality Control Board conditions, regarding the treatment and disposal of water from dewatering operations at the construction site.

The Engineer shall be present for all dewatering.

The Contractor shall keep all excavations free from water during construction. Where groundwater is encountered, the static water level shall be drawn down a minimum of 300 millimeters below the bottom of the excavation to maintain the undisturbed state of the native soils to prevent softening of the bottom of the excavation, and to allow the placement of any fill to the specified density. Disposal of the water shall not damage property or create a public nuisance. The Contractor shall have on hand pumping equipment and machinery in good working condition for emergencies. Dewatering systems shall operate continuously until the backfill has been completed to 300 millimeters above the normal static groundwater level. Water may be discharged into an existing storm drain, channel, or street gutter only with the approval of the Engineer.

Dewatering systems shall not remove natural soils.

Release of the ground water to its static level shall be controlled to prevent the disturbance of the natural foundation soils or compacted fill and to prevent flotation or movement of structures or pipes.

Crushed rock shall be used for drainage when required by the Engineer. When crushed rock is used, filter fabric shall be installed between the rock and backfill material. Crushed rock shall be the 25 millimeters crushed rock gradation in accordance with Section 200-1.2 of the Utility Standard Specifications.

When crushed rock for drainage is so ordered by the Engineer, crushed rock will be paid for as extra work as provided in Section 4-1.03D of the State Standard Specifications.

The Contractor shall anticipate and correct any erosion problem arising from its operations. The Contractor shall abide by the conditions of the Regional Water Quality Control Board, General Construction Activity Storm Water Permit and the project Storm Water Pollution Prevention Plan (SWPPP).

FOUNDATION STABILIZATION

When unsuitable soil materials are encountered, the unsuitable material shall be removed to the depth determined necessary in the field by the Soils Technician, and as acceptable to the Engineer. The sub-grade shall be restored with compacted imported granular material or crushed rock as recommended by the Soils Technician. Place the appropriate bedding or base material on this restored foundation.

When rock encroachment is encountered, the rock shall be removed to a point below the intended trench or excavation sub-grade as determined necessary in the field by the Soils Technician, and as acceptable to the Engineer. The sub-grade shall be restored with compacted imported granular material as recommended by the Soils Technician. Place the appropriate bedding or base material on this restored foundation.

When excessively wet, soft, spongy, or similarly unstable material is encountered at the surface upon which the bedding or base material is to be placed, the unsuitable material shall be removed to the depth determined necessary in the field by the Soils Technician, and as acceptable to the Engineer. Restore the trench with crushed rock enclosed in filter fabric as directed by the Engineer. Larger size rocks, up to 75 mm, with appropriate gradation, may be used if recommended by the Engineer. Place the appropriate bedding or base material on this restored foundation.

BEDDING FOR SEWER MAINS

All sanitary sewer pipes shall be bedded with 10 mm crushed rock. The crushed rock shall be in accordance with Section 200-1.2 of the Utility Standard Specifications.

All pipe shall be bedded in either sand, gravel, crushed aggregate, or native free-draining granular material having a sand equivalent of not less than fifty and a expansion when saturated of not more than half of one percent. The sand shall be in accordance with Section 200-1.5 of the Utility Standard Specifications.

All sewer pipe bedding shall have a pH within the range of 6.0 to 8.5, a resistivity of 2,000 ohm-cm, or greater, a soluble sulfate content of 500 ppm or less and a soluble chloride content of 200 ppm or less. The analytical methods described in California Test 643 shall be used to measure pH and resistivity. The analytical methods described in California Tests 417 and 422 shall be used to measure soluble sulfates and soluble chlorides, respectively.

ADDITIONAL BEDDING

When so ordered by the Engineer, additional bedding required below subgrade to replace soft or unstable material will be paid for as extra work as provided in Section 4-1.03D of the State Standard Specifications.

Material for additional bedding shall be the 25 millimeters crushed rock gradation in accordance with Section 200-1.2 of the Utility Standard Specifications.

PIPE LAYING-GENERAL

All pipe shall be carefully inspected for defects before being placed in the trench. Pipe shall be bedded true to line and grade, with uniform bearing for the entire barrel length. Pipe sections shall be so laid and fitted together that when complete, the sewer sections will have a smooth and uniform interior. Each section of pipe shall be laid in the order and position shown on the laying schedule. Unless indicated otherwise, the pipe shall be laid to the design line and grade, within approximately 15 mm plus or minus. No tolerance is permitted on pipes designed for zero slope. Bell holes shall be dug so that the pipe rests on the barrel. All material shall be removed from the interior of the pipe, and the inner surface of the bell and the outer surface of the spigot ends shall be thoroughly cleaned to insure good joints.

Except for short runs which may be permitted by the Engineer, sections of pipe shall be laid in a sequence moving in an upgrade direction on grades exceeding 10 percent. Pipe which is laid in a downgrade direction shall be blocked and held in place until sufficient support is furnished by the following pipes to prevent movement.

Installation of all pipe shall be in accordance with Section 306-1.2 of the Utility Standard Specifications. Pipe laying shall proceed upgrade with spigot ends pointing in direction of flow. After a section of pipe has been lowered into the prepared trench and immediately before joining the pipe, the ends of the pipe to be joined shall be cleaned, and the rubber gasket lubricated, all in accordance with the pipe manufacturer's written instructions. Assembly of the pipe length shall be in accordance with the recommendations of the manufacturer of the type of joint used. When cutting or machining of the pipe is necessary, only tools and methods recommended in writing by the pipe manufacturer shall be employed.

The minimum depth of cover over the top of all pipe shall be 1,525 mm unless otherwise shown.

If water enters the trench from any source, pipe laying operations shall be stopped and dewatering operations shall be adjusted to prevent the pipe from floating. The Contractor shall reinstall all affected pipe to its specified condition and grade.

VCP pipe installation shall be in accordance with Section 306-1.2.3 of the Utility Standard Specifications.

PVC pipe installation be in accordance with Sections 306-1.2.12 and 306-1.2.13 of the Utility Standard Specifications, and per ASTM D 2321. In addition, installation of PVC pressure pipe shall conform to all applicable requirements of AWWA M23.

HDPE pipe installation shall comply with ASTM D 2321, Section 7. Allow extra length of pipe to compensate for contraction in the cooler trench bottom. Sections of polyethylene pipe and fittings shall be joined into continuous lengths as much as possible. The joining method shall be the thermal butt fusion method, performed in strict accordance with the pipe manufacturer's recommendations and producing joint strength equal to or greater than the pipe strength. Butt fusion shall conform to ASTM D 2657 and pipe manufacturer's criteria for the type of joining. Fusion equipment used in the joining procedure shall be capable of meeting all requirements of the pipe manufacturer, including fusion temperature, alignment, and fusion pressure. Fusion equipment shall be operated only by technicians who have been certified by a gas public utility or by the fusion equipment supplier.

In accordance with Section 207-17.4.2 of the Utility Standard Specifications, pipe which is not installed within 120 days of the latest test shall not be accepted for installation and shall be removed from the project site by the Contractor.

Immediately after a connection has been made to an existing manhole, the sewer main entering the manhole shall be sealed and shall be kept sealed until all sewer lines tributary to the connection have been tested and accepted by the Engineer.

At night, and whenever the work ceases for any reason, the unfinished end of the sewer shall be securely closed with a tight fitting cap or plug to prevent the entrance of mud, sand or other obstructing material. The sewer shall be clean and unobstructed at the time of its completion and acceptance, and shall be true to the line and grade as shown on the plans and profiles.

All necessary precautions shall be taken to prevent uplift or floating of the pipe prior to the completion of the back filling operation. The Contractor shall assume full responsibility for any damage due to this cause and shall restore and replace the pipe to its specified condition and grade at no increased cost to the Owner.

Sheet piling used for shoring shall extend at least 610 mm below the bottom of the trench. After completion of the pipe, it may be removed by cutting at least 300 mm above the top of the pipe. No vibratory methods for pile removal will be accepted, and piling lower than 300 mm above the top of the pipe shall be left in place.

CASING INSTALLATION – GENERAL

Pipe casing shall be provided for the carrier piping where shown on the plans or as required by the Engineer.

The trench for pipe casing installations shall be adequately shored to safeguard existing substructures and surface improvements.

Proper care shall be used to prevent damage in handling, moving and placing the pipe casing. All pipe casing materials shall be lowered into the trench in a manner that prevents damage. The pipe casing shall not be dropped, dragged or handled in a manner that will cause dents, cracks, or other damage to the pipe casing.

Installation of pipe casings shall be as described herein and in accordance with the plans. The Contractor's attention is called to the fact that extreme care is required in placing the casing so as to permit the installation of the carrier pipe to the lines and grades shown on the plans. Gravity flow pipelines are designed at grades that do not permit variance from the lines and grade as shown on the plans.

Steel casing sections shall be full-circumference butt-welded in the field.

All welding procedures used to fabricate steel casings shall be prequalified under the provisions of ANSI/AWS D1.1. Welding procedures shall be required for, but not necessarily limited to, longitudinal and girth or special welds for pipe cylinders, casing joint welds, reinforcing plates and grout coupling connections.

All welding shall be done by skilled welders, welding operators, and tackers who have had adequate experience in the type of materials to be used. Welders shall be qualified under the provisions of ANSI/AWS D1.1 by an independent local, approved testing agency not more than 6 months prior to commencing work on the casing or pipeline. Machines and electrodes similar to those used in the work shall be used in qualification tests. The Contractor shall furnish all material and bear the expense of qualifying welders.

CARRIER PIPE INSTALLATION – GENERAL

Carrier pipe shall be pushed into the casing incorporating the use of casing spacers as described below.

The end seals shall be pulled on (in case of pull-on type of seals) and the casing spacers shall be installed over the carrier pipe at the proper location, in accordance with the casing spacer's manufacturer's instructions. Care shall be taken not to damage the carrier pipe coating or the inner coating of casing pipe while installing the carrier pipe. The position of the runners in the casing shall be as per manufacturer's recommendations. The clearance between the carrier pipe and casing shall be as indicated and shall be uniform throughout the casing length.

PVC or VCP carrier pipe joints shall be restrained either by mechanical means or by use of splined gaskets.

Upstream and downstream elevations of the carrier pipe shall be verified prior to installing the end seals.

Testing of the carrier pipe shall be completed prior to strapping the end seals. The portion of carrier pipe installed within a casing shall have pressure, leakage, and infiltration testing completed prior to installation of the end seals.

The annular space between the carrier pipe and casing shall be filled.

After the carrier pipe has been tested, and the annular space filled, the end seals shall be strapped by stainless steel bands in accordance with manufacturer's instructions.

MINOR CONCRETE

Minor Concrete where shown on the plans to be placed for sewer lines shall conform to Section 90-10, "Minor Concrete" of the State Standard Specifications, except that the minor concrete shall contain not less than 325 kg of Portland cement per cubic meter, and as shown on the plans.

REINFORCED CONCRETE PIPE

Reinforced Concrete Pipe where shown on the plans to be placed for sewer lines shall conform to Section 65, "Reinforced Concrete Pipe" of the State Standard Specifications.

GEOTEXTILE INSTALLATION

Geotextiles for subgrade enhancement shall be placed in accordance with Section 300-10.1 of the Utility Standard Specifications. Geotextiles shall be placed free of tension, folds, wrinkles, or creases.

The Contractor shall repair or replace torn, punctured, flawed, deteriorated, or otherwise damaged geotextile. The Contractor shall repair damaged geotextile by placing a patch of undamaged geotextile over the damaged area plus at least 0.50m in all directions beyond the damaged area. The Contractor shall remove interfering material as necessary to expose the damaged geotextile for repair. The Contractor shall sew patches or secure them with pins and washers, or by other means approved by the Engineer.

The Contractor shall protect the geotextile from contamination that would interfere, in the Engineer's opinion, with its intended function. The Contractor shall remove and replace any contaminated geotextile with clean geotextile.

BACKFILL

Backfill material shall consist of material obtained from the excavation, imported material, granular bedding material, or unclassified material. The Contractor shall import at his expense materials in excess of the approved material obtained from excavation as required to complete the backfill and grading work as indicated.

Fill and backfill shall be placed in accordance with the applicable provisions of Section 300 shall be in accordance with Section 306-1.3.1 and Section 306-1.3.2 of the Utility Standard Specifications, and the requirements stated herein.

Backfill shall not be dropped directly upon any structure or pipe. Backfill shall not be placed around or upon any structure until the concrete has been properly cured in accordance with the requirements of the Utility Standard Specifications and has attained sufficient strength to withstand the loads imposed.

Except for drain rock materials being placed in over-excavated areas or trenches, backfill shall not be placed until all water is removed from the excavation.

Materials shall be placed and spread evenly in layers. When compaction is achieved using mechanical equipment the layers shall be evenly spread so that when compacted each layer shall not exceed 150 mm in thickness. Flooding and jetting methods shall not be used to densify backfill.

During spreading, each layer shall be thoroughly mixed as necessary to promote uniformity of material in each layer. Bedding materials shall be brought up evenly around the pipe so that when compacted the material will provide uniform bearing and side support.

Where the material moisture content is below the optimum moisture content water shall be added before or during spreading until the proper moisture content is achieved. During backfilling the soil moisture content should be maintained at or with two or three percent above the optimum moisture content of the backfill materials.

Where the material moisture content is too high to permit the specified degree of compaction the material shall be dried until the moisture content is satisfactory.

The relative compaction of fill, backfill, and base material shall be accordance with Section 300 of the Utility Standard Specifications, with the following exceptions:

Description	Percent
Subgrade where trench has been over excavated	95
One foot layer of crushed aggregate backfill in over excavated trench. Where trench is over excavated more than610 mm, minimum of 2 layers shall be compacted	95
Pipe zone for flexible and rigid pipe:	95
Backfill above the bedding (pipe) zone	90
Backfill for section with 0.61m directly below pavement material.	95
Fill beneath structures	95

The trench backfill shall be placed and mechanically compacted. Compaction shall be in accordance with Section 306-1.3.1 and Section 306-1.3.2 of the Utility Standard Specifications, as shown on the plans and these Special Provisions.

All soils testing shall be done in accordance with Section 211 of the Utility Standard Specifications, and by a testing laboratory of the Owner's choice at the Owner's expense.

Compaction Tests: Compaction tests shall be performed in accordance with Section 211-2 of the Utility Standard Specifications. Where soil material is required to be compacted to a percentage of maximum density, the maximum density shall be determined in accordance with Section 211-2 of the Utility Standard Specifications. In case the tests of the fill or backfill show non-compliance with the required density, the Contractor shall accomplish such remedy as may be required to insure compliance. Subsequent testing to show compliance shall be by a testing laboratory selected by the Owner and shall be at the Contractor's expense.

A. Backfill, General. Unclassified backfill material shall be in accordance with Section 300-4 of the Utility Standard Specifications, except as noted below:

1. The largest dimension of any rock shall be less than 100 mm in any dimension.
2. Material shall be free of biodegradable materials, hazardous substance contamination, oil alkali, broken Portland cement concrete products, and bituminous type pavement materials.
3. At least 70 percent (by weight) of unclassified material shall pass U.S. Standard 19 mm sieve, and no more than 40 percent (by weight) of unclassified fill shall pass U.S. Standard No. 200 Sieve.

Rock products, consisting of crushed rock, rock dust, gravel, sand, and stone shall be clean, hard, sound, durable, uniform in quality and free of disintegrated material, organic matter, oil alkali, or other deleterious substance, and shall be in accordance with Section 200-1 of the Utility Standard Specifications, unless otherwise specified.

Untreated base materials shall be crushed aggregate base in accordance with Section 200-2 of the Utility Standard Specifications, unless otherwise specified.

A. Backfill, Pipe Zone. Backfill, pipe zone, material shall be defined as material supporting, surrounding and extending to 300 mm above the top of a pipe, and shall be in accordance with Section 306-1.2.1 of the Utility Standard Specifications, except as modified herein. Pipe zone material shall be 19 mm crushed rock or gravel meeting the requirements of Sections 200-1.2 and 200-1.3 of the Utility Standard Specifications, unless otherwise indicated on the plans.
B. Backfill, Structure. Backfill, structure, material shall be in accordance with Sections 300-3.5 and 300-4.5 of the Utility Standard Specifications, unless otherwise indicated on the plans. Backfill above the bedding shall be considered as starting at the subgrade for cast-in-place structures such as manholes, transition structures, junction structures, vaults, and valve boxes.

IMPORTED BACKFILL

The densification method for imported backfill material shall be the same as the method for non-imported backfill.

A minimum relative compaction of 90 percent shall be achieved.

Separate payment for imported backfill will be made only when the excavation is done in heavy clay, highly expansive or other deleterious material, and the imported backfill is ordered by the Engineer. The Engineer will be responsible for decisions whether or not the excavated material is suitable for backfill and when separate payment is made for imported backfill. When ordered by the Engineer, imported backfill will be paid for as extra work provided in Section 4-1.03D of the State Standard Specifications.

BURIED WARNING AND IDENTIFICATION TAPE

Warning/identification tape shall be used to identify locations of underground utilities and to act as a warning against accidental dig-ins of buried utilities. Warning/identification tape shall be used on all underground sewer mains, and all related appurtenances. Warning/identification tape shall also be used on cathodic protection wiring systems and tracer wire brought into and out of access ports.

Warning/identification tape shall be as indicated below.

A. Tape shall be an inert plastic film (non-metallic) formulated for prolonged underground use that will not degrade when exposed to alkalies, acids and other destructive substances commonly found in soil.
B. Tape shall be puncture-resistant and shall have an elongation of two times its original length before parting.
C. Tape shall be colored to identify the type of utility intended for identification. Printed message and tape color shall be as follows:

Printed Message	Tape Color
Caution: Sewerline Buried Below	Green
Caution: Cathodic Protection Cable Buried Below	Red

D. Ink used to print messages shall be permanently fixed to tape and shall be black in color with message printed continuously throughout.
E. Tape shall be minimum 0.102 mm thick x 150 mm wide with a printed message on one side. Tape shall be placed at the top of the pipe zone 300 mm and centered over the utility intended for identification.

F. Tape shall be installed with the printed side up and run continuously along the entire length of the utility intended for identification. Tape shall be installed on the main piping and all appurtenant laterals. Tape splices shall overlap a minimum of 600 mm for continuous coverage.
G. Tape shall be installed prior to placement of the Trench Zone Backfill.

TRENCH RESURFACING

Trench resurfacing where required shall consist of asphalt concrete or Portland cement concrete as per Section 39, "Asphalt Concrete" or Section 90, "Portland Cement Concrete", of the State Standard Specifications and these Special Provisions, as shown on the plans, and as directed by the Engineer.

Whenever excavation is made through pavement, sidewalk, driveway or drainage ditch, temporary bituminous resurfacing 50 millimeter thick shall be placed and maintained in accordance with Section 306-1.5.1 of the Utility Standard Specifications unless permanent pavement is placed within 24 hours after backfill of trench.

SEWER FACILITIES TESTING

Testing of sewer pipes for leakage shall be performed after backfill and compaction tests have been approved. Leak testing shall be in accordance with Section 306-1.4 of the Utility Standard Specifications and these Special Provisions.

Prior to air pressure testing, each pipe shall be "Wayne" balled and mandreled in the presence of the Engineer.

The Contractor shall notify the Engineer at least three working days in advance of performing any pressure test, except no pressure test shall be made on Saturdays, Sundays or designated legal holidays, unless otherwise approved in writing by the Engineer.

The pipeline shall be air tested by the Contractor in the presence of the Engineer after all pipe and appurtenances have been installed as shown on the plans and after completion of trench backfill and finished grading, but prior to the introduction of sewage into the pipe, or the placement of pavement or permanent trench resurfacing where these items occur. Where there is no connected sewer the pipe shall be tested between manhole sections.

Connected sewers shall be by-passed so as to isolate and cap the section to be tested.

The gage utilized for the test shall be of a scale and range equivalent to 60 mm diameter, 0-70 kPa range (2.5 kPa maximum increments). Gauges supplied by the Contractor shall have a recent certification of accuracy from an approved testing agency.

Pipes that fail the above test shall be repaired and retested at the Contractor's expense until all pipes pass the appropriate pressure tests.

The Contractor shall furnish all materials including water, equipment, bracing, connections, labor and expense required for testing of pipeline. The Contractor shall be responsible for the result of any failure under test which is attributable to defective material and/or workmanship furnished by the Contractor or to the Contractor’s negligence or improper conduct of the test.

DEFLECTION TESTING PVC PIPE

Flexible and semi-rigid main line pipe shall be tested for deflection, joint displacement, and other obstructions by mandrel test in accordance with Section 306-1.4.8 of the City of San Diego Supplement Amendments to Utility Standard Specifications.

The test shall be performed not less than 30 days after completion of the trench backfill, but prior to permanent resurfacing. The mandrel shall be a full circle, solid cylinder, or a rigid, non-adjustable, odd-numbered leg (9 leg minimum) steel cylinder which has been approved by the Engineer as to design and manufacture and shall be in accordance with Section 306-1.4.8 of the Utility Standard Specifications.

Obstructions and deflections, greater than 5 percent, encountered by the mandrel shall be corrected by the Contractor.

AIR PRESSURE TEST FOR SEWER PIPE

The air test shall be in accordance with Section 306-1.4.4 of the Utility Standard Specifications, except as modified herein. After laying, backfilling and compacting sewer lines, they shall be air pressure tested by the Contractor. For sewer main replacement where live laterals are connected to the new main, air pressure testing shall not be required. Joints may be air tested individually with the use of specialized equipment provided the joint testing procedure is submitted for the Engineer's review prior to testing. Prior to each test, the pipe at the joint shall be wetted with water. The maximum test pressure shall be 2.06×10^5 dyne/cm^2. The maximum allowable pressure drop shall be 68.9×10^4 dyne/cm^2 over a 30-second test period.

MANHOLE TESTING

Each manhole shall be vacuum tested for leakage immediately after assembly and prior to backfilling in accordance with ASTM C 1244.

Prior to vacuum testing, manholes shall be visually inspected for leaks. Leaks or cracks shall be repaired by the Contractor prior to vacuum testing.

All lift holes shall be plugged with an approved non-shrink grout.

All pipes entering the manhole shall be temporarily plugged, taking care to securely brace the pipes and plugs to prevent them from being drawn into the manhole.

The test head shall be placed at the top of the manhole in accordance with the manufacturer's recommendations.

A vacuum of 250 mm of mercury shall be drawn on the manhole. The valve on the vacuum line of the test head shall then be closed and the vacuum pump shut off. With the valves closed, the time shall be measured for the vacuum to drop to 230 mm of mercury.

The manhole shall pass if the time for the vacuum reading to drop from 250 mm of mercury to 230 mm of mercury meets or exceeds 1 minute for 0-3.0 m deep manholes, 1 minute 15 seconds for 3.0 to 4.6 m deep manholes, and 1 minute 30 seconds for 4.6 to 7.6 m deep manholes. If the pressure drop exceeds 25 mm of mercury in the specified time, the manhole shall be repaired and then retested. If the manhole fails to meet a 25 mm mercury drop in the specified time after repair, the manhole shall be tested by water exfiltration and repaired as necessary.

TELEVISING SEWER MAINS

Existing and new sewer mains shall be inspected by CCTV (Closed Circuit Television) and shall be recorded on to a color VHS (Video Home System) or DVD (Digital Video Disc) after completion of trench backfill, but prior to finished grading and placement of pavement or permanent trench resurfacing, to determine the existence and extent of any obstructions, structural deficiencies, or sags.

The Contractor shall furnish all equipment and materials required for inspection.

The Contractor, in cooperation with the Engineer, shall televise the existing and new sewer mains. It shall be the Contractor's responsibility to provide a record log of the TV inspection in accordance with Section 306-1.4.8.4 of the Regional Supplement Amendments to the Utility Standard Specifications.

The Contractor shall perform the initial televising inspection once the first six hundred-ten meter (610) of sewer is constructed to identify any early deficiencies and make necessary adjustments to construction methods.

The Engineer reserves the right to re-televise any existing and new sewer main after the placement of pavement or permanent trench resurfacing, but before final acceptance by the City, to determine the existence and extent of any foreign material or obstructions such as, but not necessarily limited to, cement grout, wood, rocks, sand, concrete, or pieces of pipe, and any structural deficiencies, or sags precipitated by the permanent resurfacing operations or other contract work. The Contractor shall notify the Engineer thirty (30) working days in advance of the anticipated date that final acceptance will be requested. If the specified advance notice is not given, final acceptance and bond release may be delayed.

The Contractor shall review the videotapes or DVDs for any discrepancies and or deficiencies in the installation of the pipe and submit a written list of all deficiencies including proposed repairs to the Engineer prior to the City review of the videotapes or DVDs. The Contractor shall submit the videotapes or DVDs and report to the Engineer within two (2) days from when the sewer reach was videotaped. Fifteen (15) working days shall be allowed for the Engineer and City MWWD to review each individual videotape or DVD of each and every sewer main documented on that particular videotape or DVDs. In the event that any deficiencies or sags are discovered by the Engineer, five (5) working days shall be allowed for the Engineer to judge whether the deficiencies or sags are repairable in place. If the judgment is made that the deficiencies or sags are non-repairable in place, the affected portion(s) shall be reconstructed at the Contractor's expense.

The Contractor shall not be entitled to any additional working days due to delays resulting from the need to correct any deficiencies or sags, either repairable or non-repairable in place, as determined by televised inspections.

TELEVISING EQUIPMENT

Televising equipment shall include the television camera, television monitor, cables, power source, lights and other equipment necessary for the televising operation. The camera system shall include a pan-and-tilt, radial viewing, pipe inspection camera that pans plus or minus 275 degrees and rotates 360 degrees with zooming capability. The Contractor shall use a camera with an accurate footage counter that displays, on the operator's monitor and the videotape or DVD, the distance of the camera from the centerline of the starting manhole. The Contractor shall use a camera with height adjustment so that the camera lens is always centered at one-half the inside diameter, or higher, in the pipe being televised. The Contractor shall provide a lighting system that allows the features and condition of the pipe to be clearly seen. A reflector in front of the camera may be required to enhance lighting in large diameter pipe. The camera system shall be controlled from the operator's truck. CCTV inspections may be recorded onto digital media such as DVD with the prior permission of the Engineer

Recording shall be on a 4-head VHS format VCR recorded at standard play mode in color or on a DVD disk that can be replayed on standard US NTSC (National Television System(s) Committee) DVD player.

The video equipment utilized shall be specifically designed and constructed to be operative in one hundred percent humidity conditions. Lighting for the camera shall minimize reflective glare. Lighting and camera quality shall be suitable to provide a clear, continuously in-focus picture of the entire inside periphery of the pipe for all conditions encountered during the inspection. A reflector in front of the camera may be required to enhance lighting in large diameter pipe.

Video cassette or DVD capacity shall be adequate to record inspection of at least one complete pipe segment between manholes, but no more than 5 segments shall be recorded on a single cassette or DVD. Recording of a single segment shall not extend to more than one videocassette or one DVD diskette. The Contractor shall not leave gaps in the recording of a segment between manholes.

Only segments between manholes on the same sewer reach shall be included on one videotape or DVD.

Two permanent labels are required. One label shall be placed on the spine and the other on the face of the videotape or in case of DVD one label shall be placed on the DVD case and the other on the DVD disk.

CASSETTE SPINE LABEL INFORMATION

1. Contractor Name
2. Project Name
3. Tape Number
4. Date Televised
5 Date Submitted

DVD CASE LABEL INFORMATION

1. Contractor Name
2. Project Name
3. DVD Disk Number
4. Date Televised
5. Date Submitted

CASSETTE FACE LABEL INFORMATION

1. Name of street
2. From Manhole Number and VCR counter number
3. To Manhole Number and VCR counter number
4. Pipe Length and Size
5. Project Name
6. Tape Number

DVD DISK LABEL INFORMATION

1. Name of street
2. From Manhole Number and VCR counter number
3. To Manhole Number and VCR counter number
4. Pipe Length and Size
5. Project Name
6. Disk Number

For each cassette or DVD the Contractor shall prepare a TV Inspection Report which shall be a complete written log of pipe conditions and connections, indexed to the footage counter.

TELEVISING PROCEDURES

1. Contractor shall notify the Engineer 48 hours in advance of TV inspection so that the Engineer may observe inspection operations.
2. In addition, the Contractor shall clean all associated sewer manholes, and shall pan the camera to document the conditions of manholes. Camera operator shall slowly inspect each connection and sewer transitions from one pipe material to another.
3. The Contractor shall move the camera downstream at a uniform rate not greater than 9.14 m per minute. The Contractor shall stop and thoroughly inspect each of the following:

    a. Collapsed pipe, obstructions

b. Structural cracking, with and without deflection
c. Sag, excessively deflected joint
d. Cracked and open joints
e. Protruding joint sealing material
f. Missing, damaged, bulging PVC sheet liner.

4. The camera operator shall log on a suitable form theirobservations in the inspection of the above items.
5. If the camera is unable to pass an obstruction even though flow is unobstructed, the Contractor shall also approach the obstruction from the other direction in order to obtain complete video or DVD on both sides of the obstruction. The Contractor shall notify the Engineer whenever such an obstruction is encountered. The Engineer will determine if the obstruction must be removed.
6. Audio and written documentation shall accompany all videotape(s)or DVDs submitted to the Engineer.
7. If voice recording is used on the videotape or DVD the recording shall have brief informative comments on unusual conditions, type and size of connection and fitting, collapsed sections, the presence of scale and corrosion, location and description of each defect, and other significant data.
8. The Contractor shall prepare an inspection report, which shall be a complete written log of pipe conditions, indexed to the footage counter. The Contractor shall turn over the original videotape and written reports to the Engineer at completion of the inspection.

TESTING AND ACCEPTANCE

Contractor shall make a video record of the finished internal surface of the pipe using CCTV or other means approved by the City. The video record shall clearly show the finished condition of all inside pipe surfaces. The video record shall include 61 m (200') of existing pipe on each side of the points of connection, both prior to and after the new construction.

Contractor shall prepare a testing plan that covers all aspects of pipe and manhole condition and suitability for service. The plan shall include the following elements: manhole testing, pipe testing, and CCTV inspection.

Contractor shall conduct a water infiltration test if groundwater is encountered anywhere within the project limits, as directed by the engineer. The water infiltration test and air pressure test shall be conducted on the finished pipe sections.

Contractor shall conduct testing in accordance with the green book Section 306-1.4, as amended by the City of San Diego. The passing criterion for the water test is found in green book Section 306-1.4.2. The criterion for the air test is found at Section 306-1.4.4.

MEASURMENT AND PAYMENT

Televising sewer main performed under these special provisions will be measured by the meter determined by actual measurement along the centerline of the pipe. Televising of pipe in excess of the length designated by the Engineer will not be paid for.

The contract price paid per meter for televising sewer mains shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in televising sewer mains, including the cleaning of sewer manholes, as specified in these special provisions, and as directed by the Engineer.

SECTION 10-4.07 MATERIALS FOR SEWER SYSTEM WORK

GENERAL DESCRIPTION

Provide materials and appurtenances of the sizes and types indicated on the plans and that shall comply with the applicable Sections of these Special Provisions.

All pipe installed as gravity sewer pipe shall be polyvinyl chloride (PVC) as specified in these Special Provisions, and as shown on the Contract Plans.

All pipes for sewer force mains shall be polyvinyl chloride (PVC) pressure pipe for sewer application.

All pipes for pipe casings shall be welded steel pipe, RCP, as specified in these Special Provisions, and as shown on the Contract Plans

Flexible pipe joints at manholes for pipes other than PVC shall be in accordance with Section 208-6 of the Utility Standard Specifications.

Pipe and fittings for house connection sewer (laterals) shall be PVC in accordance with Section 207-17 of the Utility Standard Specifications.

AWWA C905, DR-25 POLYVINILYL CHLORIDE (PVC) SEWER PIPE

AWWA C905, DR-25 PVC sewer pipe shall be in accordance to the Utility Standard Specifications and these Special Provisions, shall be of the diameter and pressure class or pressure rating indicated, shall be provided complete with rubber gaskets, and all specials and fittings as required in the plans. The dimensions and pressure classes for Dimension Ratios shall conform to the requirements of AWWA C905, as appropriate.

All joints for the pipe shall be either an integral bell manufactured on the pipe or a restrained joint employing a harness, coupling, or gland type restraint. The bell and coupling shall be the same thickness as of the pipe barrel, or greater thickness. The sealing ring groove in the coupling shall be of the same design as the groove in cast iron fittings and valves available from local water works supply distributors.

For additives and fillers, unless otherwise required in alternate qualification procedures of PPI-TR3, compounds which have a Hydrostatic Design Basis (HDB) of 2.76 x 10^8 dyne/cm^2 at 23 degrees C for water shall not contain additives and fillers that exceed the recommended values in Table 1, Part Y of PPI-TR3 (e.g., allowable content range for calcium carbonate is 0.0-5.0 parts per hundred of resin). If requested by the Engineer, the additive and filler content shall be determined using the pyrolysis method as specified in ASTM D 2584.

Deflection at the joint shall not exceed 1.5 degrees or one-half the maximum deflection recommended by the manufacturer, whichever is less. No deflection of the joint shall be allowed for joints which are over-belled or not belled to the stop mark.

Pipe shall be identified in conformance with AWWA C905, as appropriate.

VITRIFIED CLAY (VCP) SEWER PIPE

Vitrified clay pipe shall be in accordance with Section 207-8 of the Utility Standard Specifications, and shall be the size and strength indicated.

The joints shall be bell and spigot Type "G" compression joints in accordance with Section 208-2 of the Utility Standard Specifications, unless otherwise indicated.

The imperfection criteria in Section 207-8.2.3 of the Utility Standard Specifications and the following shall apply. Sections of pipe with imperfections exceeding said criteria shall be rejected:

A. No blisters, lumps, pits or flakes shall occur on the outside of the spigot or the barrel or the inside of the socket.
B. No single crack in the barrel shall be longer than 75 mm or shall penetrate more than 20 percent of the wall thickness. No crack shall be wider than 0.8 mm.
C. No pipe shall have tramp clay, grog, or foreign matter, which is permanently fused to the interior or exterior surface.

HIGH DENSITY POLYETHYLENE (HDPE) SEWER PIPE

High density polyethylene (HDPE) pipe shall conform to ASTM D 2513 (incl, Annex A1), including meeting all requirements for the diameter, wall thickness, eccentricity, ovality, dimensions, tolerances, and markings. Unless indicated otherwise, the pipe shall have a Dimension Ratio (DR) of 26 and shall utilize iron pipe size (IPS) dimensions.

High density polyethylene resin shall be ASTM D 3350, type PE 3408 with minimum cell classification 345464C. Color shall be black, and material shall be UV-stabilized.

Joints shall be butt fusion type complying with ASTM D 2657. Fittings shall be molded, with pressure classification equal to the pipe.

PIPE CASING – WELDED STEEL PIPE

The pipe casing shall be welded steel, of the diameter indicated, and shall be furnished complete with welded joint ends and pressure grout couplings as indicated. The Contractor may select a greater diameter or thickness for the method of work and loadings involved, site conditions, and possible interferences at no additional cost to the Owner.

Welded steel pipe casing designated on the plans shall be steel pipe in accordance with ASTM A283, Grade C, unless otherwise indicated. Casing section joints shall be butt welded, lap welded, or welded using butt straps in the field to form a continuous casing. Each end of the casing for butt welding shall be prepared by providing 6 mm by 45-degree chamfer on the outside edges. Minimum thickness of filet welds for butt-welded casing shall be the casing pipe thickness.

ANNULAR SPACE MATERIAL FOR CASING

Silica sand shall be used to fill the annular space between the carrier pipe and casing or as indicated on the plans. Silica sand shall meet the requirements of sand for asphalt concrete as shown in Table 200-1.5.5 (A) of the Utility Standard Specifications.

PIPE CASING SPACERS AND END SEALS

Casing spacers and end seals shall be used for all pipe installations within casings. If the carrier pipe is not installed within the casing, as a continuous operation, following completion of the casing installation, then bulkhead the portals and backfill the trench. Bulkheads will be removed at a later time to allow for the installation of the carrier pipe.

Casing spacers shall be used to prevent the carrier pipe bell from touching the casing and to maintain a uniform space between the carrier pipe and casing interior. Casing spacers shall be installed on the carrier pipe at intervals per the manufacturer's recommendations with a minimum of three spacers per pipe section equally spaced.

Pipe casing spacers shall be bolt-on type bands. The bands shall be 300 mm wide and shall be made of two or three sections of 12 gauge steel coated with fusion bonded epoxy or polyvinyl chloride. The thickness of fusion bonded coating shall be at least 10 mils. The bands shall be lined with a 2.3 mm thick PVC ribbed liner having a hardness of Durometer "A" 85-90. The runners shall be made of at least 50 mm wide fiberglass reinforced plastic. Bolts, studs, nuts and washers shall be cadmium plated.

Casing end seals shall be installed in accordance with the manufacturer's recommendations. Carrier pipe shall pass hydrostatic or leakage tests prior to the installation of casing end seals or backfilling operations.

End seals shall be made of synthetic rubber. Banding straps and clamps shall be made of Type 316 stainless steel.

CATHODIC PROTECTION SYSTEM

Contractor shall furnish all labor, materials, tools and incidentals to install the sacrificial anode cathodic protection system for the steel casings associated with the project. Cathodic protection installation, inspection, and testing are required for a complete and workable system.

The publications listed below form part of this Specification to the extent referenced and are referred to in the text by the basic designation only. Reference shall be made to the latest edition of said standards unless otherwise called for.

ASTM B3 - Standard Specification for Soft or Annealed Copper Wire
ASTM B8 - Standard Specification for Concentric-Lay-Stranded Copper Conductors
ASTM C94 – Standard Specification for Ready-Mixed Concrete
ASTM D 1248 - Standard Specification for Polyethylene Plastics Molding and Extrusion Materials for Wire and Cable
ASTM D-2220 - Standard Specification for Poly(Vinyl Chloride) Insulation for Wire and Cable
MIL-C-18480B – Military Specification for Coating Compound, Bituminous, Solvent, Coal Tar Base
UL 83-80 - Thermoplastic-Insulated Wires
UL 486-76 - Wire Connectors and Soldering Lugs for Use with Copper Conductors
NACE RP0169-96 - Recommended Practice, Control of External Corrosion on Underground or Submerged Metallic Piping Systems
NACE RP0286 - Electrical Isolation of Cathodically Protected Pipelines

The Contractor shall submit per the requirements of "Drawings and Data Required" elsewhere in these Special Provisions, a minimum of five (5) copies of manufacturer's catalog data on the following:

A. High potential magnesium anode
B. At-grade, traffic-rated concrete test box with cast iron lid
C. Shunts
D. Wire and cable
E.. Exothermic weld kits
F. Weld caps
G. Weld coating
H. Plastic warning tape
I. Wax tape coating system

One copy of each manufacturer's catalog data shall be copied to the Owner’s corrosion section.

The Contractor shall maintain As-Built drawings showing exact locations of anodes, test stations, and wire trenching runs. Location changes from the design shall be clearly marked in red on a blue line copy of the design drawings

All materials and equipment shall be new and the standard product of manufacturers regularly engaged in the manufacturing of such products. All materials and equipment shall bear evidence of safe operation approval from a nationally recognized testing laboratory.

High Potential Magnesium Anodes:

A. Capacity: High potential magnesium anodes shall have a theoretical energy content of 1000 ampere-hours per pound and have a minimum useful output of 500 ampere-hours per pound.

B. Chemical Composition (High Potential Magnesium, ASTM B-843-93):

Description	Percent
aluminum	0.010
zinc	
manganese	0.5 to 1.30
silicon	0.050
copper	0.02
nickel	0.001
iron	0.03
calcium	
other metallic	0.05
others, total	0.30
magnesium	balance

C. Open Circuit Potential:

1. The open circuit potential of all anodes, buried in the soil, shall be between 1.65 and 1.75 volts dc versus a copper-copper sulfate reference electrode.

D. Anode Size And Weight:

1. Anodes shall be 21.8 Kg pre-packaged, high potential ingots with a trapezoidal cross section. Ingot length shall be 813 mm long. The total packaged weight shall be 47.6 Kg.

E. Anode Construction:

1. Anodes shall be cast magnesium with a galvanized steel core rod recessed on one end to provide access to the rod for connection of the lead wire. Silver braze the lead wire to the rod and make the connection mechanically secure. Insulate the connection to a 600 volt rating by filling the recess with epoxy and covering any exposed bare steel core or wire with heat shrinkable tubing. The insulating tubing shall extend over the lead wire insulation by not less than 12.7 mm.

F. Anode Pre-Packaged Backfill Material:

1. The anodes shall be completely encased and centered within a permeable cloth bag in a special low resistivity backfill mix with the following composition:

Description	Percent
Gypsum	75
Powdered bentonite	20
Anhydrous sodium sulfate	5

Backfill grains shall be such that 100 percent is capable of passing through a screen of 100 mesh. Backfill shall be firmly packed around the anode such that the ingot is approximately in the center of the backfill. The resistivity of the backfill shall be no greater than 50 ohm-cm when tested wet in a soil box. Total prepackaged weight shall be approximately 47.6 KG.

At-Grade Test Stations:

A. Test Box. At-grade test boxes shall be round, pre-cast concrete, traffic rated, with a 241.3 mm cast iron lid. The lid shall be cast with the legend referred in the appropriate Material List or as indicated on the plans.
B. Identification Tags. All test leads shall be identified with an avery label (model 5361), self adhesive covered with polyolefin clear heat shrink tubing (3mfp301). The label shall include: name of facility – size – pipe material; type of insulation; station number.
C. Concrete Pad: Test boxes mounted in unpaved areas shall be mounted in a reinforced 660 mm square by 102 mm thick concrete pad constructed of ASTM C94 ready-mix concrete. Rebar shall be No. 13 steel.

D. Wire and Cable: All wires shall be stranded copper with HMWPE or THWN insulation suitable for direct burial in corrosive soil and water, conforming to UL 83 and ASTM standards B3 or B8. HMWPE insulation shall conform to ASTM D1248 type 1, class c, grade 5. THWN insulation shall conform to ASTM D-2220.
Test Leads: No. 8 AWG HMWPE.
Anode Lead Wire: Anode lead wires shall be No. 12 AWG THWN.
Wire Connectors: All wire and copper connectors shall conform to UL 486-76.
Wire Splicing: NO wire splicing is permitted.
Shunts: Holloway Type RS, 0.01 ohm, 6 Ampere Capacity
Test Lead To Anode Lead Connections: Shall be made by brass splitbolt connectors (supplied by the Contractor)

E. Exothermic Weld Kit: Wire-to-metal connections shall be made by the exothermic "cadweld" welding process. Weld alloy shall be for steel pipe. It is the Contractor's responsibility to determine the manufacturer's recommended weld charge size for metallic surfaces.
Weld Caps: Royston Roybond Primer 747 and Royston Handy Cap 2 or equal.
Weld Coating: Cold-applied fast-drying mastic consisting of bituminous resin and solvents per Mil. Spec. Mil-C-18480B such as Koppers bitumastic 50 or 505, Tnemec 40-h-413, tape-coat TC mastic or 3M Scotch Clad 244. The minimum coating thickness shall be 0.64 mm.

F. Plastic Warning Tape: Plastic warning tape for all cable trenches shall be a minimum of 0.1 mm thick and 152 mm wide, inert plastic film designed for prolonged use underground, and printed with "Caution: Cathodic Protection Cable Below".

G. External Coating For Buried Non-Shop Coated Surfaces: All buried, non-coated pipe sections and fitting surfaces shall be wrapped with a three-layer petrolatum wax tape coating system per AWWA C217.
Primer: All surfaces shall be prime coated with a blend of petrolatum, plasticizer, inert fillers, and corrosion inhibitors having a paste-like consistency.
Wax Tape: Covering material shall be a synthetic felt tape, saturated with a blend of petrolatum, plasticizers, and corrosion inhibitors that is formable over irregular surfaces.
Plastic Outer Wrap: The primed and wax taped surface shall be covered with a plastic outer wrap consisting of three layers of 50-guage polyvinylidene chloride or PVC, high cling membrane wound together.

Execution

A. Standard. Cathodic protection installation shall conform to NACE RP0169-96 "Recommended Practice, Control of External Corrosion on Underground or Submerged Metallic Piping Systems. Contractor shall retain a Corrosion Engineer who is trained and experience in cathodic protection installations and design and who is either a Registered Corrosion Engineer or a NACE Certified Cathodic Protection Specialist.

B. Contractor Qualifications: All work shall be performed by qualified, experienced personnel working under continuous, competent supervision. Qualified Contractors must demonstrate at least five years of experience with cathodic protection installations.

C. Test Results: The Contractor shall submit a Corrosion Engineer's report including all test data, conclusions, repairs, and cathodic protection system performance.

D. Notification For Testing: The Contractor shall notify the Engineer and the City's MWWD Corrosion Section (858-292-6382) at least five days in advance of the anodes and test station installations. The Engineer or the Owner's representative shall, at their discretion, witness the installation of anodes and cathodic protection facilities. Testing shall be as described in this section.

Magnesium Anodes:

A. Inspection: All lead wires shall be inspected to ensure that the lead wire is securely connected to the anode core and that no damage has occurred to the lead wire. Lead wire failures shall require replacement of the complete anode and lead wire.

B. Pre-Packaged Anode Inspection: Each anode shall be inspected to ensure that the backfill material completely surrounds the anode and that the cloth bag containing the anode and backfill material is intact. If the prepackaged anodes are supplied in a waterproof container or covering, that container or covering shall be removed before installation. The Contractor shall notify the Engineer at least five (5) days in advance of installing the anodes.

C. Location: Anodes are to be installed in augured holes at the locations shown in the plans. Anode positions can be adjusted slightly to avoid interference with existing structures. Alternate anode positions must be approved by the Engineer.

D. Handling: Care shall be taken to ensure that the anode is never lifted, supported, transported, or handled by the lead wire. All anodes shall be lowered into the hole using a sling or a rope.

E. Anode Hole Size And Depth: Anodes shall be placed vertically at the bottom of a 3.66 m deep augured hole, 305 mm in diameter (minimum).

F. Soaking Requirements, Pre-Packaged Anodes: Once the prepackaged anodes are in the hole, water shall be poured into the hole so that the anodes are completely covered with water. Allow the anodes to soak for a minimum of 30 minutes before any soil backfill is added.
G. Soil Backfill: After the pre-packaged anodes are soaked, the hole is backfilled with stone-free, native soil. No voids shall exist around the anode bags and the anode lead wire shall not be damaged. The backfill shall be tamped and compacted in 457 mm lifts taking care not to damage the anode lead wire.

At-Grade Test Stations

A. Location: At-grade corrosion monitoring test boxes shall be located as indicated in the plans. All test box locations shall be approved by the Engineer.
B. Test Box Bottom: Test boxes shall be set in native soil.
C. Test Lead Attachment: Test leads shall be attached to the pipe using the exothermic weld process. A 457 mm length of slack wire shall be coiled at each weld and inside each test box.
D. Concrete Pad: A 610 mm square by 102 mm thick reinforced concrete pad is required around each at-grade test station. Test boxes and concrete pad shall be flush with the top of the median curb.

Wire and Cable:

A. Test Lead Trench: Horizontal test or anode lead runs shall be placed in a 915 mm trench.
B. Wire Handling: Wire leads shall not be stretched or kinked. Care shall be taken when installing wire and backfilling. If wire insulation is damaged during installation, it shall be rejected and replaced completely at the Contractor's expense. All rejected wire shall be removed from the job site at the close of each workday.
C. Plastic Warning Tape: Plastic warning tape shall be installed in all wire trenches and 305 mm below finished grade.
D. Splicing: Wire splices are not permitted.
E. Wire-To-Pipe Connections: All connections of copper wires to the pipe shall be made by the exothermic weld method.
F. Weld Charge Size: It is the Contractor's responsibility to ensure that the manufacturer’s recommended weld charge size is used.
G. Preparation Of Wire: Do not deform cable. Remove only enough insulation from the cable to allow for the exothermic weld.
H. Preparation Of Metal: Remove all coating, dirt, grime and grease from the metal structure by wire brushing. Clean the structure to a bright, shiny surface free of all serious pits and flaws by using a file. The surface area of the structure must be absolutely dry.
I. Wire Position: The wire is to be held at a 30-degree angle to the surface when welding. Only one wire shall be attached with each weld.
J. Testing Of Welds: After the weld has cooled, the weld shall be tested by striking the weld with a 907 g hammer while pulling firmly on the wire. All unsound welds shall be cleaned, re-welded, and re-tested. All weld slag shall be removed.
K. Coating Of Welds: The area to be coated shall be clean and completely dry. Apply a primer specifically intended for use with an elastomeric weld cap. Apply the weld cap and a bituminous mastic coating material to all exposed areas around the cap in accordance with the manufacturer's recommendations. The coating shall overlap the structure coating by a minimum of 76 mm.

External Coating:

All buried, non-coated pipe or casing sections shall be covered with a 3-layer wax tape coating system per AWWA C217:

A. Primer: Surfaces must be cleaned of all dirt, grime, and dust by using a wire brush and clean cloth. The surface shall be dry. Apply the primer by hand or brush. A thin coating of primer shall be applied to all surfaces and worked into all crevices. The primer shall be applied generously around bolts, nuts, and threads, and shall fully cover all exposed areas. The primer should overlap the pipe coating by a minimum of 75 mm.
B. Petrolatum Saturated Tape: The wax tape can be applied immediately after the primer. Short lengths of tape shall be cut and carefully molded around each individual bolt, nut, and stud end. For long bolts (such as in couplings), short lengths of tape shall be cut and circumferentially wrapped around each individual bolt. After the bolts are covered, the tape shall be circumferentially wrapped around the flange with sufficient tension to provide continuous adhesion without stretching the tape. The tape shall be formed, by hand, into all voids and spaces. There shall be no voids or gaps under the tape. The tape shall be applied with a 2.50 cm minimum overlap.
C. Outer Covering: A plastic outer cover shall be applied over the petrolatum-saturated tape. The plastic shall be a minimum of 50-guage and shall have two layers applied.

Testing And Inspection:

A. The Contractor's Corrosion Engineer shall submit his proposed test procedures to the Engineer at least five (5) days in advance of the time that the cathodic protection system testing is scheduled. The Engineer and the City's MWWD Corrosion Section shall witness all testing at their discretion. All test data shall be submitted to the Engineer within seven (7) days of the completion of the testing. All testing shall be done under the supervision of a qualified Corrosion Engineer who is retained by the Contractor. All deficiencies found to be due to faulty materials or workmanship shall be repaired or replaced by the Contractor and at his expense. The City of San Diego's MWWD Corrosion Section shall be notified (858.292.6382) at least three (3) days in advance to witness the performance testing.
B. Test Leads: It is the Contractor's responsibility to test all test leads.
C. Test Method: All completed wire connection welds shall be tested by striking the weld with a 907 g hammer while pulling firmly on the wire. Welds failing this test shall be re-welded and re-tested. Wire welds shall be spot tested by the Engineer. After backfilling the pipe, all test lead pairs shall be tested using a standard ohmmeter.
D. Acceptance: The resistance between each pair of test leads shall not exceed 150 percent of the total wire resistance as determined from published wire data.

Anode Lead Wire:

The Contractor is responsible for inspecting anode lead wires. Lead wires shall be spot inspected by the Engineer:

A. Test Method: A visual inspection and by running his hand along the full length of the lead while installing.
B. Acceptance: All lead shall be free of cuts nicks or abrasions in the wire insulation. Damaged leads shall be rejected.

Test Lead Trenching:

The Engineer, at his or her discretion, shall inspect wire trenches and backfill material and methods.

A. Test Method: The depth, trench bottom, padding, and backfill material shall be visually inspected prior to backfilling.
B. Acceptance: Conformance with Specifications.

Cathodic Protection Performance:

The cathodic protection system shall be activated and tested by the Contractor's Corrosion Engineer in the presence of the Engineer.

A. Test Method: The installed cathodic protection system testing shall include: native pipe-to-soil potentials, protected pipe-to-soil potentials, open-circuit anode potentials, and anode current output measurements.
B Acceptance: Shall be based on achieving the –850 mV criterion as outlined in NACE RPO169-96. All data shall be submitted, in a typed 21.6 X 27.9 cm report to the Engineer and the City's MWWD Corrosion Engineer for approval.

Compliance With Specifications: Deficiencies or omissions in materials or workmanship found by these tests shall be rectified at the Contractor's expense. Deficiencies shall include but are not limited to: broken leads, improper or unclean trenches, lack of 450 mm or slack wire in test boxes; improperly mounted test boxes; and other deficiencies associated with the workmanship, installation, and non-functioning equipment.

CONCRETE VAULTS AND MANHOLES

Sewer vaults and manholes shall be constructed of either pre-cast components or cast-in-place construction at the Contractor's option, per approval from the Engineer, per the requirements of the Special Provisions, and per the Contract Plans. For cast-in-place construction, Contractor shall submit to the Engineer for review and approval, manhole design, including calculations and drawings, showing cast-in-place manhole meets the requirements of these Special Provisions, the Contract Plans, and the State Standard Specifications.

Sewer vaults and manholes shall be constructed without steps. Upon request from the Engineer, the Contractor shall provide a workman with a ladder or other safe and adequate means for inspection access during the course of construction and acceptance of the sewer main.

Where a vault or manhole is to be constructed on unstable native material, a stable base shall first be constructed with additional bedding material, in accordance with Section 306-1.2.1 of the Utility Standard Specifications, and to the dimensions specified in writing by the Engineer.

All precast components (risers, base sections, tops, and cones) shall be manufactured in accordance with ASTM-C-478 except step spacing. Mortar for joining vault and manhole sections shall consist of 1 part cement to 2-1/2 parts of sand by volume. Manhole shelf sections shall be cast-in-place where specified on the plans. See the plans for shelf reinforcement and design.

All risers shall be lined with PVC sheet liners and the exterior surfaces of all vaults and manholes shall be coated with a waterproofing agent as specified in "Manhole Coating And Lining" in these Special Provisions.

Precast concrete vaults and manholes shall be installed in strict conformance with the manufacturer's written instructions, on a well-compacted foundation. Contractor shall finish vaults and manholes to -1 m below finished grade. The Contractor shall be responsible for adjusting manhole covers to finished grade. Each new vault and manhole shall be vacuum tested prior to backfilling.

The entrance to every unventilated vault and manhole shall be fitted with a plastic warning sign, located 300 mm below the top of the manhole frame, with the inscription "CAUTION -VENTILATE BEFORE ENTERING" in clear letters no smaller than 12 mm in height. The sign shall be attached to the concrete with four Type 316 stainless steel screws and anchors.

MANHOLE FRAMES AND COVERS

Manhole frames and covers shall be non-rocking and shall conform to the requirements of ASTM A 48, Class 30. Unless otherwise indicated, manhole frames and covers shall be heavy duty cast iron type with 915 mm opening. Manhole cover insert shall be 610 mm diameter with lettering "CITY OF SAN DIEGO" and "SEWER" following the arrangement similar to what is indicated on the Contract Drawing.

Manholes located outside of the public right-of-way shall have covers locked to the frame as indicated on the Contract Drawing.

Imported cover, cover inserts, and frames shall have the country of origin marking in compliance with federal regulations.

MANHOLE COATING AND LINING

All manhole interiors are to be lined with a PVC liner and exteriors coated with a waterproofing system per this Section.

The waterproofing system for the exterior of manholes shall be three coats of Koppers Bitomastic Super Service Black or an approved equivalent, applied by brush, spray or roller to completely cover the exterior surface at the manufacturer's recommended usage rate. The three coats shall be applied at 14 – 17 mils DFT each, for a 42 – 51 mils total.

The PVC liner material shall be in accordance with Section 210-2 and shall be installed per Section 311-1 of the Utility Standard Specifications Tests shall be made on samples taken from plastic sheets, joints or weld strips in compliance with Subsection 210-2.3. However, before testing, the Engineer will visually and manually inspect the lining with a putty knife or a similar instrument. Any imperfections found as a result of all of the above tests shall be repaired per manufacturer's instruction and Engineer's approval, and surfaces restored before placing the lining in service. The manufacturer, applicator, and the Contractor shall, upon completion of the work, make a field inspection of the lining and installation and shall provide the Owner a written certificate of work compliance in their respective areas of responsibility.

Provide an epoxy coating system on all interior concrete surfaces not lined with PVC sheeting. The system shall be a 100-percent solids, solvent-free two component epoxy resin system thixotropic in nature and filled with select fillers to minimize permeability and provide sag resistance acceptable to these Specifications. The epoxy coating system shall be Raven Lining System's Raven 405 or approved equal meeting the following requirements:

Product type	Amine cured epoxy
Color	Light Blue
Solids Content (vol. percent)	100
Mix Ratio	3:1
Compressive Strength, dynes/cm^2	1.24×10^9
Tensile Strength, dyne/cm^2	5.24×10^8
Tensile Elongation, percent 1.50	
Flexural Modulus, dyne/cm^2	4.13×10^{10}
Hardness, Type D	88
Bond Strength – Concrete	>Tensile Strength of Concrete
Chemical Resistance:	
Severe Municipal Sewer:	All types of service
Successful Pass:	Utility Standard Specifications 210.2.3.3

A. Manufacturer approved heated plural component spray equipment shall be used in the application of the specified epoxy coating.
B. Epoxy coating must be applied by a Certified Applicator of the epoxy coating manufacturer and according to manufacturer Specifications.
C. Appropriate actions shall be taken to comply with local, state and federal regulatory and other applicable agencies with regard to environment, health and safety.
D. Installation of the epoxy coating shall not commence until the concrete substrate has properly cured.
E. Temperature of the surface to be coated should be maintained between 4 degree C and 49 degree C during application. Prior to and during application, care should be taken to avoid exposure of direct sunlight or other intense heat source to the structure being coated.
F. Surface Preparation:

1. Applicator shall inspect all specified surfaces prior to surface preparation. Applicator shall notify the Engineer of any noticeable disparity in the surfaces which may interfere with the proper preparation or application of the repair material and/or epoxy coating. Contractor shall repair all disparities prior to application of epoxy coating.
2. Applicator shall perform all surface preparation and epoxy coating installation.
3. All contaminants including: oils, grease, incompatible existing coatings, waxes, form release, curing compounds, efflorescence, sealers, salts, or other contaminants shall be removed. All concrete or mortar that is not sound or has been damaged shall be removed by the Contractor to a sound concrete surface or replaced.

G. Application:

1. Application procedures shall conform to the recommendations of the epoxy coating manufacturer, including material handling, mixing, environmental controls during application, safety, and spray equipment.
2. The spray equipment shall be specifically designed to accurately ratio and apply the specified epoxy coating materials and shall be regularly maintained and in proper working order.
3. The epoxy coating material must be spray applied by a Certified Applicator of the epoxy coating manufacturer.
4. Specified surfaces shall be coated by spray application of a moisture tolerant, solvent-free, 100 percent solids, epoxy coating as further described herein. Spray application shall be to a minimum wet and dry film thickness as defined below:

   Concrete, New/Smooth: 80-100 mils

5. If necessary, subsequent top coating or additional coats of the epoxy coating should occur as soon as the basecoat becomes tack free, but no later than the recoat window for the specified products. Additional surface preparation procedures will be required if this recoat window is exceeded.
6. A final visual inspection shall be made by the Engineer and Applicator. Any deficiencies in the finished coating shall be marked and repaired by Applicator according to the procedures set forth herein.

GEOTEXTILES

Nonwoven geotextiles shall be in accordance with Section 213-2.1 of the Utility Standard Specifications. The unseamed sheet width shall be a minimum of 1.8 m. The nominal weight per 0.84 square meters shall be 140 to 225 g. Physical properties of woven geotextiles shall conform to the following requirements:

Fabric Property	Minimum Certified Values	Test Method
Grab Tensile Strength	136 kg	ASTM D 4632
Grab Tensile Elongation	35 percent (Maximum)	ASTM D 4632
Burst Strength	4.136×10^7 dynes/cm^2	ASTM D 3786
Trapezoid Tear Strength	1.66×10^6 dynes	ASTM D 4533
Puncture Strength	1.80×10^6 dynes	ASTM D 4833

Sewing thread shall be polypropylene, polyester, or Kevlar thread with durability equal to or greater than durability of geotextile sewn.

Securing pins shall be steel rods or bars, 5 mm diameter, Pointed at one end; head on other end sufficiently large to retain washer, and minimum length of 10 mm.

Steel washers for securing pins shall have an outside diameter of not less than 38 mm, inside diameter of 6 mm, and thickness of 3 mm.

Steel wire staples shall be U-shaped, 10-gauge and a minimum of 150 mm long.

Geotextiles shall be protected and identified in accordance with Section 213-2.3 of the Utility Standard Specifications. Storage and handling shall comply with Section 213-1.4 of the Utility Standard Specifications.

Sampling and test compliance shall be in accordance with Section 213-1.3 of the Utility Standard Specifications.

FIBERGLASS REINFORCED PLASTIC (FRP) ASSEMBLIES

Fiberglass items shall be constructed of new, filament-wound or fiberglass-fabric-reinforced polyester resin laminate material of the strength, thickness, and dimensions indicated, using the matched die-molded or contact molded method.

Finished surfaces of fiberglass items and fabrications shall be smooth, resin-rich, free of voids, without dry spots and unreinforced areas, corrosion resistant and without exposed glass fibers.

Fiberglass grating shall be minimum 25 mm high with 25 mm by 100 mm grid, or 38 mm high with 38 mm by 150 mm grid, and cut edges shall be resealed. The maximum deflection under design load shall not exceed at 610 mm span. Fiberglass grating shall have a permanently slip-resistant surface. Cut edges and openings shall be banded.

FRP assemblies shall be installed in accordance with the manufacturer's installation instructions.

SECTION 10-4.08 SEWER LINE MEASUREMENT AND PAYMENT

MEASUREMENT

Sewer system facilities work performed under these Special Provisions will be designated in the contract item by size, type, thickness, quality, or whatever information is necessary for identification.

The quantity of various size and types of sewer pipe, and welded steel pipe casing to be paid for will be determined by the meter from actual measurements along the centerline of the pipe in place in the completed work. Pipe placed in excess of the length designated by the Engineer will not be paid for.

Fittings, which increase the length of the sewer main and for which no separate contract item is provided, will be measured by the meter for the size of sewer main involved. Fittings will be measured along centerlines to the point of intersections.

The abandoning of the various size sewer pipes will be measured by the unit.

Sand backfill and the various types of minor concrete will be measured by the cubic meter in accordance with the dimensions shown on the plans or such other dimensions as may be ordered in writing by the Engineer.

Quantities sewer manholes, modify manholes and sewer laterals to be paid for will be determined as units from actual count in the completed work.

Televising sewer will be paid for at contract lump sum price.

PAYMENT

Items of work measured as provided in these Special Provisions will be paid for at the contract prices per meter for the various sizes and types of sewer mains and welded steel pipe casing; at the contract prices per unit sewer manholes, modify manholes and sewer laterals; and at the contract price per cubic meter for sand backfill, the various types of minor concrete; and at the contract lump sum price for televising sewer.

Abandon sewer main will be measured and paid for as abandon sewer.

Full compensation for all other concrete and miscellaneous iron and steel involved in constructing the sewer work shall be considered as included in the contract prices paid for the various items of sewer work and no separate payment will be made therefore.

When imported backfill is ordered by the Engineer, it will be paid for as extra work as specified in Section 4-1.03D of the State Standard Specifications.

Full compensation for furnishing all labor and materials including structure excavation, structure backfill, and bedding material, temporary cap, and polyethylene wrapping, dewatering pipe, testing, metallic tape locator for non-metallic pipe, pipe, pipe joints, linings, coatings, pipe fittings, tees, and bends, reducers, adapters, and end caps, spacers and supports within any casing and other appurtenances, tools, equipment and incidentals involved in constructing the sewer system, complete in place as specified in these Special Provisions and as directed by the Engineer shall be considered as included in the prices paid for the various contract items of sewer work and no additional compensation will be allowed therefore.

Full compensation for protective work operations required to accommodate or safeguard public traffic or existing facilities (including fencing) and for all trenching and shoring, control of water in and outside the excavations and trenches, and all sewage diversion systems shall be considered as included in the prices paid for the various contract items of sewer systems involved, and to additional compensation will be allowed therefore.

SECTION 10-4.09 APPROVED MATERIALS LIST

CITY OF SAN DIEGO APPROVED MATERIALS LIST

SUBJECT	SPEC* REFERENCE	MANUFACTURER (Brand Name)	NOTES
BRONZE WATER SERVICES FOR IRON PIPE, PLASTIC, AND COPPER TUBING	*207-21.1	(Refer to section G, page 7 for model numbers).	Minimum 10.55 kg/cm2 working pressure.
CorporationStop,Curb Stop, Property Valve, Coupling. All Fittings. To be Pack-Joint, Insta-Tite, or Flared Copper Type Only.		Jones Ford Mueller McDonald	
Adaptors, Bends, and Misc. fittings. To be Pack-Joint, Insta-Tite, or Flared copper Type Only.			
Service Saddle (double-bronze straps and nuts for pipe other than PVC).		Jones (J-979) Ford (202B) Mueller (H-16000) Romac (202B)	
Service Saddle (full support for PVC C-900 pipe,100 mm through 300 mm unless otherwise noted). All SStl. Saddles		Smith-Blair (372) Romac (306)	
Bronze Saddle w/SStl. Strap		Jones (J-979) APAC (114) Smith-Blair (393) Ford (202BS) Romac (202BS)	
Water Services			
Polyvinyl Chloride Pipe (PVC) Schedules 40 & 80-50 mm diameter	*207-21.1	J-M Certainteed Carlon Flintkote	

SUBJECT	SPEC. REFERENCE.	MANUFACTURER (Brand Name)	NOTES
Water Services			
With Schedules 40 & 80 socket solvent weld type fittings		R.G. Sloane Lasco Dura Spears	
Copper Tube, Type "K" (soft) 25 mm & 50 mm diameters	*207-21.1	Mueller Brass Chase Cerro Phelps	
Water Service Lines			
Polyvinyl Chloride Pipe (PVC) - Schedules 40 & 80 -50 mm diameter	*207-21.1	1. J-M 2. Certainteed 3. Carlon 4. Flintkote	
WATER MAINS			
Valves			
Gate Valves75 mm through 1200 mm (a) All internal parts to be bronze (b) 300 mm diameter and larger to be mounted horizontally with by-passes and enclosed gear cases 75 mm thru 300 mm diameter-10.55 kg/cm2 working pressure	*207-21.3 AWWA C-500	1.Mueller A2380-9206 2.Kennedy 3.American Flow Control 4. Iowa-Eddy-Clow	
Resilient-Seat-Gate Valves 75 mm thru 300 mm diameter (NRS)	AWWA C-509	Clow American Flow Control American Flow Control (AFC 500) M & H American AVK (Series 25) Kennedy Stockham U.S. Pipe Metroseal (250)	
Rubber-Seated Butterfly Valves	*207-21.4	BIF	Class 150B
150 mm thru 300 mm diameter		M & H (Dresser) Mueller	

SUBJECT	SPEC. REFERENCE.	MANUFACTURER (Brand Name)	NOTES
Valves			
400 mm thru 1200 mm diameter		Kennedy American-Darling Keystone (fig. 504/507) Mueller	
150 mm thru 300 mm diameter		American-Darling BIF Pratt Keystone (fig. 47)	
Plug valves 100 mm		Dezurik	Series 100, Fig. 118RS17ANG
Plug valves 300 mm		Dezurik	100, Fig. 118 RS 17AGG12H12
Combination Air & Vacuum Valves (25 mm,50 mm,75 mm &100 mm diameters) All internal parts to be stainless steel or bronze		1. APCO 143C 145C 147C 149C 2. ValMatic 201C 202C 3. GA Industries, Inc. #945	
Automatic Control Valves		CLA VAL Co. GA industries	

***** The "Standard Specifications for Public Works Construction" section number. or other Reference

APPROVED MATERIALS LIST

SUBJECT	SPEC* REFERENCE	MANUFACTURER (Brand Name)	NOTES
Fire Hydrants			
Fire Hydrants	AWWA C-503	1.Clow - Rich	Ranger 850, 860, 950, 960
Wet Barrel Fire Hydrants for ordinary water works service		2.Long Beach Iron	Lido 702, 704 Anacapa 614, 615, 425, 430, B-125, B-133, B-135
(Hydrants with one-piece barrel only, no welded ports allowed)		3 James Jones	3700 series J-4040 J-4060C
		4 Mueller	A-481
Meter Boxes			
Concrete Water Meter Box	*207-21.1 SDW 112, 113	Brooks Products Associated Concrete Products San Diego Precast Eisel Enterprise (Nos. 6 and 37)	
Water Distribution Pressure Pipe			
Polyvinyl Chloride (PVC) Pipe, Class 150 or 200 100 mm through300 mm diameter	207-18 AWWA C-900 and C905	Any Manufacturer Meeting Specifications Pipe ends-Plain by gasket bell or plain by plain with gasket bell couplings.	Marking Pressure Class AWWA C-900 NSF Certification Pipe ends-plain/gasket bell or plain/plain with gasket bell couplings
Ductile Iron (Dl) pipe100 mm through 1380 mm diameter	207-9 AWWA C-111 AWWA C-151	Any Manufacturer Meeting Specifications	
Polyvinyl Chloride (PVC) pipe, 350 mm thru 900 mm diameter	*207-18.1 AWWA C-905 DR-18	Any Manufacturer Meeting Specification	Pressure Rating 16.52 kg/cm2
Water Distribution Miscellaneous			
Cast Iron & Ductile Iron Fittings and Joints For DI & PVC pipe, short body, cement lined	*207-9.2 AWWA C-110 AWWA C-111 AWWA C-153	Any Manufacturer Meeting Specifications	Only mechanical joint fittings shall be used on PVC pipe

SUBJECT	SPEC* REFERENCE	MANUFACTURER (Brand Name)	NOTES
Water Distribution Miscellaneous			
Tapping Sleeve 100 mm thru 500 mm diameter		International (228) APAC (502) Baker (428) ford (FTSC) Mueller (H619) Clow-Rich Improved Corey Smith-Blair (622) JCM (412) Romac (FTS420)	
Stainless Steel Bands (Repair Clamps)		JCM (101, 210, 211, 301) Ford (FS1, FS2) Romac (SS1, SS2) Cascade (CR1, CR2, CR3)	
D.I.P. Joints		Raychem Hotcladv	110 heat shrinkable
High Deflection fittings, and restrained expansion couplings		U.S. pipe	XTRA FLEWX
Paint and Protective Covering on Welded Steel Pipe			
Primer:		1) Ameron Amercoat 3127 2) Engard 3) Koppers	Amercoat 3127 511 P-1500 Inorganic Zinc
Intermediate Coat:		1) Ameron 2) Engard 3) Koppers	Amercoat 385 480 Hi-Gard Epoxy
Top Coat		1) Ameron 2) Engard 3) Koppers	Amershield 448 2501
Dry Standpipe			
Hose valve		Potter Roemer Inc.	Series 4300
Telescpoing Sleeve		TR-FLEX	
Cathodic Protection			
Test Station Housing		1) Christy Concrete Products Inc 2) Brooks Products	G5 Utility Box No. lRT Utility Box

SUBJECT	SPEC* REFERENCE	MANUFACTURER (Brand Name)	NOTES
Cathodic Protection			
Bitumastic Coating		1) Tapecoat Company 2) Kopcoat Inc.	TC Mastic Bitumastic 505
Weld Caps		1) Royston Laboratories, Inc.	Royston Handy Cap
		2) Phillips Petroleum Co.	Thermit Weld Cap

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APPROVED MATERIALS LIST

SUBJECT	SPEC* REFERENCE	MANUFACTURER (Brand Name)	NOTES
SEWER MAINS			
Sewer Pipe			
Vitrified Clay Extra Strength Pipe and Fittings	207-8	1.Pacific Clay Products 2.Gladdin & McBean 3.Mission Clay	Plain End and Bell & Spigot type pipe
PVC Sewer Pipe and Fittings - Gasket Joints, 100 mm through 375 mm diameter	207-17 ASTM D-3034 SDR 35	1.J-M. 2.Certainteed 3.Carlon 4.Pacific Western Plastics 5.Vinyltech 6. Diamond Plastics Corp.	Green Bell ----- ----- ----- ----- -----
PVC Sewer Pipe and Fittings - Gasket Joints, 450 mm through 750 mm diameter	*207-17 ATSM F-679 "T-1" only	J-M Diamond Plastics Corp. Vinyltech Pacific Western Plastics	
Sewer Laterals			
Vitrified Clay	*207-8	Pacific Clay Products Gladdin & McBean Mission Clay	Plain End & Bell and Spigot Type Pipe
PVC	*207-17 ASTM D-2751	J-M Certainteed Pacific Western Plastic Vinyltech	
ABS	*207-15 ATSM D-2751	Apache Grinnel Colby Standard Plastic	
PVC	207-17	1.J-M. 2. Certainteed 3. Pacific Western Plastics 4. Vinyltech	
Sewer Fittings			
Vitrified Clay	*207-8	Pacific Clay Products Gladdin & McBean Mission Clay	Plain end Type Pipe/Bell & Spigot Type Pipe

SUBJECT	SPEC* REFERENCE	MANUFACTURER (Brand Name)	NOTES
Sewer Fittings			
PVC	*207-17	Vassallo Multi-Fitting G.P.K. J-M	
ABS	*207-15	U-Brand	
Manhole			
Precast Manhole Bases	ASTM C-478	Mar-Con Products	
Polymer Mortar		1. Engard Coatings	490 Epoxy Putty or 498 Underwater Epoxy Putty
		2. Sika Corporation	Sikadur 31 Hi-Mod Gel or Sikadur 32 Hi-Mod
		3. Fluid Polymer	FP 1212 polyurethane sealant
		4. RAM NEK	FP 1212 polyurethane sealant
Coal Tar Emulsion		Koppers Bituplastic	No. 28
Miscellaneous			
Flexible Couplings		Smith-Blair 441 Rockwell APAC (331, 332, 323, 335) Cascade, (CDC-EC) DFW, Plastics, Inc. Romac (501)	Eccentric couplings **NOT** acceptable
Transition Gaskets	Atsm D-1869	Newby Rubber, Inc	**Class 150** **DR-18 PVC**
High-Deflection Coupling 100 mm thru 300 mm diameter		Certainteed	
Flexible-Saddles (Wye)		DFW Plastics, Inc.	

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OTAY WATER DISTRICT APPROVED MATERIALS LIST

Item	Description	Manufacturer
ACTUATOR	Electric Valve Actuators used for Valve Control on Motor Operated Valves. Full Submittal Required.	Auma SG Series EIM Rotork Flo-Loc FloPak
ADAPTER, CAM AND GROOVE FITTING	316 Stainless Steel Adapter, MIP x Male Cam and Groove Fitting, 50mm (2”), 100mm (4”) or 150mm (6”) with 6mm (1/4”) 304 Stainless Steel Street Ell and Pet Cock Tapped into the Side of the Fitting.	OPW Kamlock 600-F-SS Dixon “Andrews”/”Boss-Lock” Type F-SS
ADAPTER, FLANGE COUPLING	150mm (6”) and Larger, MJ x Flg. Steel or Ductile-Iron Construction without Anchor Pins, Epoxy Coated, 304 Stainless Steel Bolts and Nuts.	Dresser 127 Dresser 227 Ford FFCA Style JCM 301 Powerseal 3521 Powerseal 3528 Romac FCA501 Romac FC400 Smith-Blair 912 Smith-Blair 913
AIR/VACUUM VALVE ENCLOSURE	12 Gauge Steel, Clam Shell Hinged Construction, Polyester Powder Coated. Use Enclosure Size As Indicated Below. 25mm (1”) & 50mm (2”) Air Valve Sizes Use: 400mm (16”) x 600mm (24”) 100mm (4”) & 150mm (6”) Air Valve Sizes Use: 600mm (24”) x 900mm (36”) 200mm (8”) Air Valve Size Use: 750mm (30”) x 1,050mm (42”) Potable Water Color: Chocolate Brown Recycled Water Color: OSHA Safety Purple	Pipeline Products VCDD-1624 Pipeline Products VCDD-2436 Pipeline Products VCCD-3042 Christys C-WASC-1624 Christys C-WASC-2436 Christys C-WASC-3042
AIR/VACUUM VALVE SUCTION SCREEN	For use on 25mm (1”) and 50mm (2”) Air/Vacuum Installations. FIP Nylon Nut Style with 20 Mesh Stainless Steel Screen.	Christy VC Series McMaster-Carr 9877K52 McMaster-Carr 9877K65 Northtown Hytech
ANODE, MAGNESIUM	High or Standard Potential Anode with a Galvanized Steel Core Encased in a Square Magnesium Alloy Ingot Pre-packaged in a Permeable Cotton Cloth Bag Filled with a 75% Gypsum, 20% Bentonite, 5% Sodium Sulfate Mixture. Provide Ingot Weight as Specified on the Approved Plans. See Standard Drawing WC-12. **Full Submittal Required.**	
ANODE, ZINC	Pre-Packaged 6.8 Kg (15 lbs) Min. Sacrificial Anode, #12 THHN Lead Wire, for the Protection of Copper Tubing. See Standard Drawings WC-17 and WC-18.	Hytech Pipeline Products CP-Z15 Christy’s
ANTI-SEIZE COMPOUND	For use on Stainless Steel Bolts and Nuts.	Locktite Nevr Seize

Item	Description	Manufacturer
BACKFLOW PREVENTER	Reduced Pressure Principal Type Assemblies as Approved by the State of California, Department of Health Services.	As Shown on List of Approved Backflow Prevention Assemblies
BOLTS AND NUTS, 304 SS	Hex-Head Machine, ASTM A193, Grade B8 Bolts and ASTM A194, Grade 8 Nuts. **Full Submittal Required.**	
BOLTS AND NUTS, 316 SS	Hex-Head Machine, ASTM A193, Grade B8M Bolts and ASTM A194, Grade 8M Nuts. **Full Submittal Required.**	
BOLTS AND NUTS, A307	Hex-Head Machine, Cadmium/Zinc Plated, ASTM A307, Grade A Bolts and A307 2H Heavy Hex Nuts**. Full Submittal Required.**	
BOLTS AND NUTS, A307	Hex-Head Machine, Fluoropolymer Coated, ASTM A307, Grade A Bolts and A307 2H Heavy Hex Nuts.	Tripac 2000 Blue
BOLTS AND NUTS, A307, BREAK AWAY, 15mm (5/8”) FOR 100mm (4”) AIR VAC	Wet Barrel Fire Hydrant Flange Bolts, Hex Head Machine, Break Away Bolts, 15mm x 75mm (5/8" x 3”) and Nuts. Bolts Shall Incorporate a 12.3mm x 47.6mm (23/64" x 1-7/8") Hole Drilled in the Bolt Shaft and Filled with Silicone Sealant. Bolts and Nuts Shall be Zinc Plated ASTM A307 Carbon Steel. **Full Submittal Required.**	
BOLTS AND NUTS, A307, BREAK AWAY, 19mm (3/4”) FOR FIRE HYDRANTS AND 150mm (6”) AIR VALVES	Wet Barrel Fire Hydrant Flange Bolts, Hex Head Machine, Break Away Bolts, 19 mm x 81mm (3/4" x 3-1/4") and Nuts. Bolts Shall Incorporate a 12.3mm x 47.6mm (31/64" x 1-7/8") Hole Drilled in the Bolt Shaft and Filled with Silicone Sealant. Bolts and Nuts Shall be Zinc Plated ASTM A307 Carbon Steel. **Full Submittal Required.**	
BOLTS, EXPANSION, DROP-IN ANCHOR	13mm (1/2”) x 75mm (3”) Stainless Steel Heavy Duty Anchor System with Anchor Assembly with Hex Head Threaded Rod and Washer, Drop-in Sleeve and Epoxy Resin Adhesive Capsule. For use on Air Valve and Water Test Station Enclosures.	Hilti HSLG-R Series U.S. Anchor W Series
BONDING AGENT, EPOXY	Epoxy Resin Based Bonding Agent for Bonding New Mortar or Concrete to Existing Concrete.	**Sika Sikadur 32 Hi-Mod**
BUSHING, INSULATING	Nylon, 31mm x 25mm (1-1/4” x 1”), 38mm x 25mm (1-1/2” x 1”), 63mm x 50mm (2-1/2” x 2”).	**Calpico** Corrosion Control Products F.H. Mahoney
CASING END SEAL	6.25mm (1/4”) Thick Styrene Butadiene Rubber Sheet End Seal. Use 25mm (1”) Wide Stainless Steel Bands. Zippered End Seals with Stainless Steel Bands May Also be Used.	Advance Products & Systems Cascade Calpico Pipeline Seal & Insulator Powerseal Raychem

Item	Description	Manufacturer
CASING SPACER	Stainless Steel Casing Spacer, Center Restrained, Position Type with PVC Liner and Non-metallic Anti-friction Runners. **Full Submittal Required.**	Advance Products & Systems Cascade Calpico Pipeline Seal & Insulator Powerseal Raychem
CATHODIC TEST STATION BOX	25.4 Kg (54 lbs) Concrete Body with 5.4 Kg (12 lbs) Ductile Iron Lid and Lid Ring. "CP TEST" Shall Be Cast into the Lid in 25mm (1") Letters. For Cathodic Protection Test Stations, Anode Ground Beds and Insulated Flange Test Stations.	Brooks 1-RT series Christy Farwest Type 1-RT J & R Model V6-R
CATHODIC WELDING	For Welding Cathodic Bond Wires to Steel Pipelines.	Cadweld
CHLORINE	Liquid (Gas) or Sodium Hypochlorite Solution. **Chlorination Plan Submittal Required per Section 15041.**	
CLAMP, REPAIR	Stainless Steel, Full circle, Double Lug. For ACP, PVC, DI or CI Pipe, Sizes 100mm (4") Through 55mm (20").	Adams 220 APAC 402 APAC 422 APAC 432 Cascade CR-2 Cascade CRT-2 Ford F2 Ford FS2 JCM 102 Mueller 510 Powerseal 3111 Powerseal 3122 Romac SS2 Romac CL2 Smith-Blair 227
COATING, INTERNAL PIPE	For Coating the Internal Pipe Lining for an Insulated Flange.	Aquatapoxy CCI Hydro-Pox
COATING, MASTIC	Cold-Applied Coal Tar- or Epoxy-Based Single Component, Self-Priming, Heavy Duty Protective Exterior Coating for Buried Concrete.	Carboline Bitumastic 50 Devoe Devtar 5A Polykem 938 Tnemec HB Tnemecol 46-465 Tnemec HB Tneme-Tar 46H-413
COATING, WATERPROOF	Epoxy Resin-Based Cementitious Trowel Grade Protective Waterproofing for Concrete.	Sika Top Seal 107 Sto CR 241
COPPER DISC, SOLID	For Plugging Corporation Stops When a Service is to be Abandoned.	Ford Copper Disc A.Y. McDonald 6125 Mueller H-15535
CORPORATION STOP, COMPRESSION x MIP	Bronze Compression x MIP Thread Ball Valve (T-Head only) 25mm (1") and 50mm (2") Full Opening.	Ford FB1100-Q Series Jones J-1935SG Jones J-1957SG A.Y. McDonald 4704BQ Mueller B-25028 Cambridge 1" 311-m4m4 Cambridge 2" 311-m7m7
CORPORATION STOP, INSULATED	Bronze Compression x MIP Thread Ball Valve (T-Head only) 25mm (1") Full Opening.	A.Y. McDonald 4755DBT Mueller N-35028

Item	Description	Manufacturer
CORPORATION STOP, MIP x MIP	Bronze MIP x MIP Thread Ball Valve (T-Head only), 25mm (1”) and 50mm (2”) Full Opening.	Ford FB500 Series Jones J-1943 Jones J-1956 A.Y. McDonald 3131B Mueller B-20013 Mueller B-2969 Cambridge 1” 311-M4M4 Cambridge 2” 311-M7M7
COUPLING, COMPRESSION x COMPRESSION	Three-Part Compression Coupling (Both Ends) for 25mm (1”) and 50mm (2”) Copper Pipe.	Ford C44-Q Series Jones J-2609SG A.Y. McDonald 4758Q Mueller H-15403 Cambridge 1” 119-H4H4 Cambridge 2” 119-H7H7
COUPLING, C900 PVC DEFLECTION	100mm (4”) through 300mm (12”) Solid PVC for Obtaining Deflection Only. Provides 5 Degree Maximum Deflection.	Certainteed Vinyl Iron HD
COUPLING, C900 PVC CLOSURE OR REPAIR	100mm (4”) through 300mm (12”) Solid PVC for Closure or Repair.	Certainteed Vinyl Iron HD
COUPLING, C905 PVC CLOSURE, DEFLECTION OR REPAIR	400mm (16”) through 900mm (36”) Solid PVC for Closure, Deflection or Repair.	IPEX Nyloplast America Scepter
COUPLING, FLEXIBLE	150mm (6”) Long PVC Flexible Coupling with Stainless Steel Bands. Use For Securing Gate Valve Cap and Can Assembly to 200mm (8”) Class 200 PVC C900 Gate Well.	**Calder** **DFW/HPI** **Fernco**
COUPLING, GROOVED	Use for Aboveground DI or Steel Pipe 100mm (4”) or Larger.	Grinnell #7001 Tyler 500 Victaulic Style 44 Victaulic Style 77
COUPLING, HALF, STEEL	Forged Steel Half Coupling, ASTM A105, 3000#, NPT Threads.	Bonney Forge
COUPLING, INSULATED, COMPRESSION x COMPRESSION	Three-Part Compression Insulated Coupling (Both Ends) for 25mm (1”) Copper Pipe.	A.Y. McDonald 4755DBT Mueller N-35403
COUPLING, STRAIGHT FLEXIBLE	100mm (4”) and Larger, Steel or Ductile-Iron Construction, Slip x Slip, Epoxy-Coated with 304 or 316 Stainless Steel Bolts and Nuts. For use on AC, PVC, DI, or Steel Pipe.	APAC 301 Ford FC1 Dresser 253 Powerseal 3501 Powerseal 3538 Romac 501 Smith-Blair 441 Viking Johnson MaxiFit
COUPLING, TRANSITION FLEXIBLE	100mm (4”) and Larger, Steel or Ductile-Iron Construction, Slip x Slip, Epoxy Coated with 304 or 316 Stainless Steel Bolts and Nuts. For use on AC, PVC, DI, or Steel Pipe.	APAC 311 APAC 313 Baker Ford FC2A Dresser 253 Powerseal 3501 Powerseal 3538 Romac 501 Romac XR501 Smith-Blair 413 Viking Johnson MaxiFit

Item	Description	Manufacturer
CUSTOMER SIDE SHUT- OFF VALVE	19mm (3/4") and 25mm (1") Bronze Customer Shut-off (Ball Valve), Inlet Swivel Meter Nut x Outlet FIP Thread, Lockable Tabs, with Lever Handle.	Cambridge ¾ 212-F3T3H Cambridge 1 212-F4T4H Ford B13-332W w/ HT34 Ford B13-444W w/ HT34 Jones J-1908W A.Y. McDonald 6101MWHB Mueller B-24351 w/B-20298-99000
CUSTOMER SIDE SHUT- OFF VALVE	38mm (1-1/2") and 50mm (2") Bronze Customer Shut-off (Ball Valve), Inlet Meter Flange x Outlet FIP Thread, Lockable Tabs, with Lever Handle.	Cambridge 1 ½ 212-F6MF6H Cambridge 2 212-F7MF7H Ford BF13-666W w/HB-67S Ford BF13-777W w/HB-67S Jones J-1913W A.Y. McDonald 6101MWHB Mueller B-24337
DECOMPOSED GRANITE	Imported Quarry Decomposed Granite. **Full Submittal Required.**	
DEFLECTION BEND, PVC C900 AND C905	5 Degree Deflection Bend Manufactured from C900 and C905 PVC Pipe.	Ipex
DISMANTLING JOINT	Telescoping, Adjustable, Double-Flanged Fitting, with High Tensile Strength Zinc-Plated Tie Bars. NSF-61 Epoxy or Nylon Interior and Exterior Coating.	Viking Johnson Romac DJ400 Dresser 131
DUST CAP, CAM AND GROOVE FITTING, LOCKING	316 Stainless Steel Cam and Groove Fitting Dust Cap, 50mm (2"), 100mm (4") or 150mm (6").	OPW Kamlock 700 Type DC-SS Dixon "Andrews" Type DC
ELL, BURY, DUCTILE IRON	150mm (6") x 400mm (16") Ductile Iron Bury Ells, Long Radius, Flg x MJ/PO (Use of Short Radius Bury Ells with District Engineer Approval Only).	Clow Sigma South Bay Foundry
ELL, FIP x COMP, 45 Deg 1/8 BEND	25mm (1") and 50mm (2") Bronze Ell, FIP x Compression for Copper Pipe.	A.Y. McDonald 4747Q Mueller H-15534
ELL, FIP x COMP, 90 Deg 1/4 BEND	25mm (1") and 50mm (2") Bronze Ell, FIP x Compression for Copper Pipe.	Cambridge 1" 105-H4F4 Ford L14-44Q Ford L14-77Q Jones J-2621SG A.Y. McDonald 4779Q Mueller H-15533
ELL, STREET, MIP x FIP STAINLESS STEEL	6mm (1/4") 304 SS Street Ell for Blowoff Dust Cap. **Full Submittal Required.**	
ELL, SUPER GRIP TYPE	25mm (1") and 50mm (2") Bronze Ell Compression x Compression for Copper Pipe.	Cambridge 1" 105-H4H4 Cambridge 2" 105-H7H7 Ford L44-Q Series Jones J-2611SG A.Y. McDonald 4761Q Mueller H-15526
EPOXY ADHESIVE	High-Modulus, Low-Viscosity, Epoxy Resin-Based Adhesive Suitable for Grouting Bolts or Dowels.	Sika Sikadur 31 Sika Sikadur 35
EXPANSION JOINT	For Water Pipeline Bridge Crossings.	APAC 703 Dresser 63 Onyx Valve 99 Powerseal 3563 Smith-Blair 611 Smith-Blair 612

Item	Description	Manufacturer
EXPANSION JOINT, RUBBER	Expansion Joints at Reservoir and Pump Station Inlet/Outlet Piping to Allow Lateral Movement and Isolate Vibration.	General Rubber 1050 General Rubber 1075 Holz CSM Holz CR Holz C11R Mercer 500-700 Metraflex Metra Red Valve Redflex
FIRE HYDRANT BREAK–OFF CHECK VALVE	Break-off Valves for Fire Hydrants. **Full Submittal Required.**	Long Beach Iron LB400
FIRE HYDRANT CAP	Screwed Brass or Ductile-Iron Cap for Fire Hydrant Hose Ports, 63mm (2-1/2") and 100mm (4").	AVK Jones Long Beach Iron US Pipe
FIRE HYDRANT SPOOL, DUCTILE OR CAST IRON, FLANGED	Ductile- or Cast-Iron Spool with Integrally Cast Flanges and Machined or Cast Exterior Grooves. Spools 300mm (12") or Longer Shall Have Grooves 75mm (3") from Each Flange. Spools Shorter than 300mm (12") Shall Have One Groove Centered Between the Flanges. Grooves Shall be 5mm (3/16") Deep, ± 2mm (1/16") and 6mm (1/4") Wide, ± 2mm (1/16").	
FIRE HYDRANT, 1.03 MPa (150 PSI)	150mm (6") Standard 1.03 MPa (150 PSI) Wet Barrel Ductile-Iron (DI) or Bronze Fire Hydrants with Six-Hole Bolt Pattern. DI Hydrants shall be Fusion Epoxy Lined. Color shall be Safety Yellow.	AVK 2470 AVK 2490 Clow 850 (Ductile-Iron Only) Clow 860 (Ductile-Iron Only) Clow 2050 Clow 2060 Clow 2065 Jones J3700 Jones J3765 Jones J3775
FIRE HYDRANT, 1.38 MPa (200 PSI)	150mm (6") High Pressure 1.38 MPa (200 PSI) Wet Barrel, Ductile-Iron Fire Hydrant with Six-Hole Bolt Pattern, Fusion Epoxy Lined. Color shall be Safety Yellow.	AVK 2470 AVK 2490
FIRE HYDRANT, 1.72 MPa (250 PSI)	150mm (6") High Pressure 1.72 MPa (250 PSI) Dry Barrel, Ductile-Iron Fire Hydrant, Fusion Epoxy Lined. Color shall be Safety Yellow.	U.S. Metropolitan 250
FITTING, DUCTILE IRON	Flanged, Mechanical Joint or Push-on Tees, Bends, Crosses, Reducers, Adapters, etc., for Water Lines 100mm (4") and Larger. Manufactured per AWWA C110, C111 and C153.	Bachman Griffin Nappco/Sigma Pipeline Components Star Tyler
FITTING, GROOVED	Grooved Ductile-Iron Fittings for Grooved End Pipes, 100mm (4") through 600mm (24").	Grinnell Tyler G-B Victaulic
GASKET	3.125mm (1/8") Thick Full Face Aramid Fiber Bound with Nitrile. No Asbestos Content.	Calpico Garlock 3000 Johns-Manville Klinger 4401 Tripac 5000

Item	Description	Manufacturer
GASKET, RUBBER, GASOLINE-RESISTANT	Gasoline-Resistant Pipe Gaskets for Water Mains.	Newby
GATE WELL 100mm (4”)	For Buried 50mm (2”) Ball Valve Installations, 100mm (4”) SDR-35 PVC Sewer Pipe.	Refer to PIPE, PVC SDR35 (Sewer Materials List)
GATE WELL 200mm (8”)	For Valve Installations 100mm (4”) and Larger, 200mm (8”) C900 Class 200 PVC Pressure Pipe, White or Blue for Potable Water, Purple for Recycled Water.	Refer to PIPE, PVC C900
GATE WELL LID- 100mm (4”)	Ductile- or Cast-Iron Lid used for Air Valve Ball Valve Access, 100mm (4”) Nominal Diameter with a 62mm (2-1/2”) Long Skirt.	South Bay Foundry B50
GATE WELL LID- 200mm (8”)	Ductile- or Cast-Iron Lid used for Valve Access, 200mm (8”) Nominal Diameter Lid with a 150mm (6”) Long Skirt and Lifting Slot. For use with Type 1 Gate Well Installations. See Standard Drawing WV-03 for Required Markings.	South Bay Foundry SBF (single lid) 1200/40 lb. lid
GATE WELL LID AND CAN ASSEMBLY	Ductile- or Cast-Iron, Machined Frame with Ductile- or Cast-Iron Lid. Used for Valve Access. 200mm (8”) Nominal Diameter Lid with a 150mm (6”) Long Skirt and Lifting Slot. For use with Type 2 Gate Well Installations. See Standard Drawing WV-03 for Required Markings.	South Bay Foundry SBF 1200 Cap and Can (2-piece) Assembly
GREASE	For Bolt Corrosion Protection on Buried Bolts.	Sanchem NO-OX-ID Dearborn Chemical
GROUT	Non-Shrink Cementitious Construction Grout for Crack Repair, Flooring Mortar, Dowel Grouting, Crack Sealing and General Binding.	Sika Sikagrout 212 Sto Epoxy Binder CR633 Sto Epoxy Gel CR635 Sto N-S Grout CR732
HUMIDISTAT	120 Volt, 6.0 AMP, Single Phase with Adjustable Low and High Lockable Limit Stops. Adjustable Range of 20% to 70% Humidity and Suitable for Wet Locations. **Full Submittal Required.**	
INSULATING BLANKET	Insulating Blanket for Corrosion Interference Mitigation.	McMaster-Carr
INSULATING COUPLINGS	Insulating Couplings for Corrosion Protection of Pipelines.	Romac IC400 Romac IC501 Lochinvar
INSULATING GASKET KIT	Insulating Gasket Kits for Corrosion Protection of Pipelines.	Advance Products & Systems Calpico Pipeline Seal & Insulator GasketSeal Pipeline Seal & Insulator LineBacker Farwest
ISOLATOR, VIBRATION	Wire Rope Seismic Support for Pipelines for Isolating Vibrations and Shocks.	Enidine Steelpaw

Item	Description	Manufacturer
JOINT RESTRAINT ASSEMBLY	360-Degree Wedge-Type Restraint System for Ductile-Iron, PVC, and Steel Pipe, Sizes 150 mm (6”) Through 750 mm (30”). For use by District Forces only Where Concrete Thrust Restraint is not Possible. Prior Approval of District Engineer is Required.	Ford Uni-Flange 1300 Series Ford Uni-Flange 1500 Series Mueller Aquagrip Sigma PV-Lok Star Allgrip series 3600
JOINT SEALING COMPOUND, PLASTIC ROPE	For use on Precast Vault and Manhole in Grooved Joints Between Sections.	Quickset Joint Sealing Compound
LUBRICANT, PIPE GASKET	Rubber Gasket Pipe Lubricant for Use on PVC or Ductile-Iron Pipe Joints, NSF-61 Listing Required.	Christy Pro-Lube Seacord Ease-On Whitlam Blue Lube
MARKER, UTILITY	Flexible Reinforced Polymer Glass Fiber Composite Strip Identification Marker. Branded or Customized Identification Markings for Pipelines and Appurtenances May Be Required.	Carsonite CUM-375 Christy’s
METER ADAPTER	For Replacing Large Meters with Smaller Meters.	Cambridge 440 Series Ford A Series Jones J128H A.Y. McDonald 10J Series Mueller H10889
METER BOX	250mm x 500mm (10” x 20”) Polymer Meter Box and Cover for 25mm (1”) Water Services. Gray for Potable Water use, Purple for Recycled Water use.	Armorcast A6000486SA with #A6000483DQ Cover and #A6000487 Read Lid
METER BOX	425mm x 750mm (17” x 30”) Polymer Meter box with 2-Piece Lid for 50mm (2”) Water Services and Blowoff Assemblies. Gray for Potable Water use, Purple for Recycled Water use.	Armorcast A6001640PC-12 with #A60001643DZ Cover and A6000482 Read Lid
METER BOX	325mm x 600mm x 300mm (13"x 24"x 12") Polymer Meter box with Flared Fiberglass Base rated 20K and 2-Piece Lid for use with Dual Water Service Assembly. Gray for Potable Water use.	Armorcast A6001946TX12-SDGTD with #A6001969W Cover and #A6000481DT Read Lid
METER FLANGE	Bronze Meter Flanges for 38mm (1-1/2”) and 50mm (2”) Meters with Slotted Holes.	Cambridge 1 ½” 5030295 Cambridge 2” 5030390 Ford CF Series Jones J129 A.Y. McDonald 610F
METER STOP, ANGLE COMPRESSION x METER	25mm (1”) Bronze Angle Meter Stop (Ball Valve) with 90-Degree Lock Wing, Inlet 110 Style Compression x Outlet Swivel Meter Nut.	Cambridge 210-H4T4 Ford BA43-444W-Q Jones J-1963WSG, A.Y. McDonald 4602BQ Mueller B24258-1
METER STOP, ANGLE COMPRESSION x METER	50mm (2”) Bronze Angle Meter Stop (Ball Valve) with 90-Degree Lock Wing, Inlet 110 Style Compression x Outlet Meter Flange.	Cambridge 210-H7MF7 Ford BFA43-777W-Q Jones J-1975WSG A.Y. McDonald 4602BQ Mueller B-24276
METER STOP, DUAL ASSEMBLY	Special tandem setting for 25mm (1") and 18.8mm (3/4") Angle Meter Stop (Ball Valve) with Padlock Wings and a 25mm (1") Single Inlet 110 Style Compression x Outlet Swivel Meter Nut	Ford UVB-95271-02

Item	Description	Manufacturer
METER, WATER	19mm (3/4") Through 50mm (2") Water Meter with Bronze Body, Bronze Bonnet, Thermoplastic Chamber, and Register Odometer at the Bottom of the Register Face. Odometer and Sweep Hand Read in Cubic Feet. Short or Long Pattern Body.	Badger Model 35 Badger Model 70 Badger Model120 Badger Model 170 Sensus Model SR Sensus Model SRII Sensus Series W Turbo Sensus Model W-120 DRS Sensus Model W-160 DRS
MORTAR, REPAIR	Two-Component, Low Shrinkage, Cementitious Mortar with High Compressive and Bonding Strength.	Sika Sika Top 122 Sika Sika Top 123 Sto CR 735 Sto CR 740
NOZZLE, WELD-ON	Weld-on Nozzle with Reinforcing Pad or Collar for Connection to CMC&L Steel Pipe. ASTM A-53B 6mm (1/4") Minimum Thickness Seamless Pipe, Mortar Lined and Coated with AWWA C207 Flange. **Full Submittal Required.**	
PAINT, POLYESTER POWDER	TGIC Polyester Powder For Air Valve and Water Test Station Enclosures.	Tiger Dylac Series 49 Porter Paint J-Series Fuller O'Brien PF Series
PAINT, SILICONE ALKYD ENAMEL	One-Component, Minimum 46% Solids (by Volume), 30 % Silicone Content (by Volume), High Gloss, VOC Compliant Industrial Grade Paint. See Section 09910 for Color and Application Requirements.	Amteco SA-3 Silicone Poly Plus Carboline Carbocoat 30 Devoe Devshield 475 Dunn-Edwards 42-53 Pittsburgh Paints 97-480 Porter Paint Porter Guard 2200 Sherwin-Williams Steel Master 9500
PAINT, WATERBORNE ACRYLIC LATEX	One-Component, Rapid Dry 100% Acrylic Latex Waterborne Marking Paint Meeting Caltrans Specification #8010-21C-30. See Section 09910 for Color and Application Requirements.	TMT-Pathway Waterborne Traffic Paint #2343A9
PENETRATION SEALS, INTERLOCKING	Mechanical Link Type Interlocking Vault, Casing and Building Penetration Seals.	Advance Products & Systems Interlynx Link Seal
PIPE, ASBESTOS CEMENT	150mm (6") through 600mm (24") AWWA C400 Pipe. **District Approval and Full Submittal Required.**	
PIPE, COPPER TUBING	25mm (1") Type K Soft Seamless Rolled Tubing, 50mm (2") Type K Soft Seamless Straight Lengths, 25mm (1") and 50mm (2") Type K Rigid Seamless Straight Lengths.	Cerro Halstead Lee Mueller Phelps-Dodge
PIPE, DUCTILE IRON	For Water Lines 100mm (4") and Larger Manufactured per AWWA C111, C115, C150, and C151.	American Pipe Griffin Pacific States U.S. Pipe
PIPE, PVC C900	For Water Lines 100mm (4") through 300mm (12") and 200mm (8") Gate Wells. Manufactured per AWWA C900, Class 200 Only.	Certainteed Diamond Plastics Extrusion Technologies IPEX Johns-Manville Pacific Western VinylTech

Item	Description	Manufacturer
PIPE, PVC C905	For Water Lines 400mm (16”) and 500mm (20”) through 900mm (36”). Manufactured per AWWA C905, DR 25 or DR 18.	Certainteed Diamond Plactics Extrusion Technologies IPEX Johns-Manville Pacific Western Vinyltech
PIPE, STEEL, CEMENT-MORTAR LINED AND COATED (CML&C)	Steel Cylinder (CML&C), per AWWA M11 and Section 15061. 6mm (1/4”) Minimum Wall Thickness. Steel Pipes Used for Recycled Water Installation are to be Identified Per District Requirements. **Full Submittal Required.**	
PLASTIC ENCASEMENT	12-mil Thick Polyethylene Encasement Sleeve for Ductile Iron Pipe (DIP) per AWWA C105 and Recycled PVC, CMC/L, or DIP Non-Purple Water Pipe. Clear Sleeve for Potable Water, Purple Sleeve for Recycled Water.	
PLASTIC WRAP	8-mil Thick Polyethylene Encasement for Buried Fittings and Valves. Clear Sleeve for Potable Water, Purple Sleeve for Recycled Water.	
PRIMER, WAX TAPE	Surface Primer for Underground Application of Petrolatum Wax Tape.	Carboline Denso Paste Trenton Tem-Coat
PROTECTOR POST, STEEL	100mm (4”) Diameter, 6.25mm (0.250”) Wall Galvanized A-120 Steel Pipe, Concrete Filled with 100mm (4”) Galvanized Fence Post Cap.	
REFERENCE ELECTRODE, COPPER SULFATE	High or Standard Potential Electrode with PVC Pipe Housing Pre-Packaged in a Permeable Cotton Cloth Bag Filled with a 50% Gypsum/50% Powered Bentonite Mixture. Electrode Shall have a Design Life of 15 Years with a Stability of +/- 5 Millivolts under a 3.0 Microampere Load. Provide Electrode with Integrally Attached #10 AWG HMW/PE Insulated Wire. **Full Submittal Required.**	
ROCK, CRUSHED	Washed 10mm (3/8”) and 19mm (3/4”) Crushed Rock. 10mm (3/8”) for Use in Meter Boxes Only. **Full Submittal Required.**	
SEALANT	Chemical Grout for Joint Sealing.	3M Scotch Seal
SEISMIC COUPLING	Flexible Expansion Joints for Pipelines, Reservoirs and Pump Stations. **Full Submittal Required.**	EBAA Iron Flex-Tend Romac FlexiJoint Star Pipe Starflex 5000
SEISMIC SENSOR DEVICE	Seismic Sensors for Reservoirs and Pipelines. **Full Submittal Required.**	

Item	Description	Manufacturer
SERVICE SADDLE FOR ACP AND CI PIPE	Cast Brass ASTM B62 Body with Silicone Bronze Double Straps, IP Outlet Sizes 25mm (1”) and 50mm (2”).	Cambridge 810 Series Ford 202B Jones J-979 A.Y. McDonald 3826 Mueller BR2B Series Romac 202B Smith-Blair 323
SERVICE SADDLE FOR PVC C900 PIPE	Bronze or Brass Saddle with Stainless Steel Four Bolt Strap(s), IP Thread Outlet for Saddle Sizes 25mm (1”) and 50mm (2”) Installed on Pipe Sizes 100mm (4”) through 300mm (12”).	Cambridge 812 Series Ford 202BS Jones J-969 A.Y. McDonald 3846 Mueller BR2S Series Romac 202BS Smith-Blair 393
SERVICE SADDLE FOR PVC C905 PIPE	Bronze or Brass Saddle with Stainless Steel Four Bolt Strap(s), IPT Thread Outlet for Sizes 25mm (1”) and 50mm (2”) Installed on Pipe Sizes 400mm (16”) and Larger (Romac Saddle Requires Nylon Bushing).	Ford 202BS Jones J-969 Romac 202N
TAG, BRASS IDENTIFICATION	25mm (1”) Diameter, 18 Gauge Brass with 4.76mm (3/16”) Die-Stamped Letters and Numbers, Suitable for Attachment to Cathodic Protection Wires using a Nylon Zip Tie.	
TAPE, OUTER WRAP	Adhesive Plastic Outer Wrap for Wax Petrolatum Tape in Underground Applications.	Polyken 960 Trenton Polyply
TAPE, UTILITY	10 to 50 Mil x 50mm (2”) Wide General Utility Tape for Corrosion Protection of Aboveground and Underground Pipes and Fittings.	3M Scotchwrap 50 3M Scotchwrap 51 Calpico Christy Northtown Polyken 900
TAPE, WARNING/ IDENTIFICATION	150mm (6”) wide, Warning/Identification (Non-Metallic) Marking Tape for Buried Facilities. See Section 15000 for Required Colors and Markings.	Calpico Type 1 Christy Type 1 Line-Tec Type B Terra Tape Standard 250 Thor Elast Tec Northtown
TAPE, WARNING/ IDENTIFICATION FOR RECYCLED IRRIGATION	75mm (3”) wide, Warning/Identification (Non-Metallic) Marking Tape for Buried Irrigation Pipelines, Purple Color with continuous warning “CAUTION RECLAIMED WATER MAIN BURIED BELOW.”	Calpico Type 1 Christy Type 1 Line-Tec Type B Terra Tape Standard 250 Thor Elast Tec Northtown
TAPE, WAX ABOVEGROUND	Petrolatum-Saturated Synthetic Fabric Tape for use on Aboveground Couplings, Flanges, Fittings, etc.	Trenton #2 Wax-Tape
TAPE, WAX UNDERGROUND	Petrolatum-Saturated Synthetic Fabric Tape for use on Underground Couplings, Flanges, Fittings, etc. Primer and Outer Wrap Required.	Carboline Densyl Tape Trenton #1 Wax-Tape

Item	Description	Manufacturer
TAPPING SLEEVE FOR AC, CI, DI, AND PVC PIPE	Fabricated Steel Tapping Sleeve for 100mm (4”) Through 300mm (12”) Wet Taps. Epoxy Coated with Stainless Steel Bolts and Nuts.	APAC 502 APAC 512 Baker 428 Series Clow F-5205 Clow F-5207 Dresser 610 Ford FTSC JCM 412 Mueller 615 Mueller 619 Powerseal 3460 Romac FTS-420 Smith-Blair 622
THREDOLET	Forged Steel Fitting, ASTM A105. 3000#, NPT Threads.	Bonney Forge
VALVE STEM EXTENSION, FIBERGLASS	Three-Part Fiberglass Valve Extension Kit. Use for Extensions 2.4m (8’) Long or Shorter.	Pipeline Products FPU-210 Pipeline Products FPT-200 Pipeline Products FPL-220 Christy’s
VALVE STEM EXTENSION, STEEL	Round or Square 37mm (1-1/2”) Diameter Steel Rod, Welded Construction, Hot Dipped Galvanized with Top Centering Ring and AWWA 50mm (2”) Operating Nuts Top and Bottom. Use for Extensions Longer Than 2.4m (8’).	Pipeline Products SX-900 South Bay Foundry E4160 Christy’s
VALVE, AIR RELEASE, 1.03 MPa (150 PSI)	Pressure Air Release Valve, Cast-Iron Body with Stainless Steel Internal Parts. Suction Screens Required. 25mm (1”) through 75mm (3”) NPT, 100mm (4”) Flanged. **Full Submittal Required.**	APCO 50 APCO 200 APCO 200A Crispin PL10 Crispin PL20 Crispin PL30 Crispin PL41 Val-Matic #45 Val-Matic #88
VALVE, AIR RELEASE, 2.05 MPa (300 PSI)	Pressure Air Release Valve, Cast-Iron Body with Stainless Steel Internal Parts. Suction Screens Required 25mm (1”) through 75mm (3”) NPT, 100mm (4”) Flanged. **Full Submittal Required.**	APCO 50 APCO 200 APCO 200A Crispin PL10H Crispin PL20H Crispin PL30H Crispin PL42H Val-Matic #45 Val-Matic #88
VALVE, BALL	25mm (1”) and 50mm (2”) Bronze, Straight, Compression x Compression.	Cambridge 1” 202-H4H4 Cambridge 2” 202 H7H7 Ford B44-444-Q Ford B44-777-Q Jones J-1949SG A.Y. McDonald 6100Q Mueller B-25209
VALVE, BALL WITH LOCKING TABS	50mm (2”) Bronze, Straight, Compression x Compression with Locking Tabs and Brass Handle.	Cambridge 212-H7H7H Ford B44-777-QW Jones J-1949SGW A.Y. McDonald 6100WQ Mueller B-25146

Item	Description	Manufacturer
VALVE, BALL WITH LOCKING TABS	19mm (3/4”) and 25mm (1”) Bronze, Straight, FIP x Meter Swivel with Locking Tabs and Purple Handle.	Cambridge ¾” 212-F3T3H Cambridge 1” 212-F4F4H Ford B13-332W Jones J-1908W A.Y. McDonald 6100M Mueller B-24351-1
VALVE, BALL, 1.03 MPa (150 PSI)	6mm (1/4”) through 50 mm (2”), FIP Threads with Handle.	Apollo 70-100 Series Milwaukee BA-1005 Nibco 560 Series Stockham S-214 Watts WBV-3 Watts WEBS-3
VALVE, BALL, 1.03 MPa (150 PSI)	100mm (4”) and Larger, Rubber Seated, AWWA C507. Thermosetting or Fusion Bonded Epoxy Coated. **Full Submittal Required.**	Pratt
VALVE, BUTTERFLY 1.03 MPa (150 PSI)	400mm (16”) and Larger, AWWA C504, Class 150B with Ductile-Iron Body. Thermosetting or Fusion Bonded Epoxy Coated and Lined. Class D or E Flange x Flange Ends. **Full Submittal Required.**	Dezurik AWWA M & H 1450 M & H 4500 Mueller Lineseal III Pratt Groundhog Val-Matic Series 2000
VALVE, BUTTERFLY 1.72 MPa (250 PSI)	400mm (16”) and Larger, AWWA C504, Class 250B with Ductile-Iron Body. Thermosetting or Fusion Bonded Epoxy Coated and Lined. Class F Flange x Flange Ends. **Full Submittal Required.**	Dezurik BAW 250 M & H 1450 M & H 4500 Mueller Lineseal XP 250 Val-Matic Series 2000
VALVE, BUTTERFLY 1.03 MPa (150 PSI)	100mm (4”) through 300mm (12”), AWWA C504, Class 150B with Ductile-Iron Body. Thermosetting or Fusion Bonded Epoxy Coated and Lined. Class D or E Flange x Flange Ends. **Full Submittal Required.**	Dezurik AWWA Keystone 504 M & H 4500 Mueller Lineseal III Val-Matic Series 2000
VALVE, BUTTERFLY 1.72 MPa (250 PSI)	100mm (4”) through 300mm (12”), AWWA C504, Class 250B with Ductile-Iron Body. Thermosetting or Fusion Bonded Epoxy Coated and Lined. Class F Flange x Flange Ends. **Full Submittal Required.**	Dezurik AWWA Keystone 507 M & H 1450 M & H 4500 Mueller Lineseal XP 250 Val-Matic Series 2000
VALVE, BUTTERFLY, WAFER 1.03 MPa (150 PSI)	400mm (16”) and Larger, Thermosetting or Fusion Bonded Epoxy Coated and Lined. **District Approval and Full Submittal Required.**	Pratt MKII
VALVE, CHECK	1.03 & 2.07 MPa (150 & 300 PSI), Slanting Disc Check Valve 100mm (4”) and Larger. **Full Submittal Required.**	APCO Series 800 Crispin TD Series Val-Matic Series 9000
VALVE, COMBINATION AIR RELEASE AND AIR/VACUUM, 50mm (2”)	Single Body Style Combination Air Release and Air/Vacuum Valve. Stainless Steel Internal Parts, BUNA-N seats per AWWA C512, and Epoxy Coated Interior per AWWA C550. N.P.T. Threaded Inlet and Outlet. Suction Screen Required, 2.04 Mpa (300 PSI) Rated Body and Internals. **Full Submittal Required.**	APCO 145C Cla-Val 33A Crispin UL20 Val-Matic 202C.2 Vent-O-Mat RBX Series

Item	Description	Manufacturer
VALVE, COMBINATION AIR RELEASE AND AIR/VACUUM, 100mm (4") AND LARGER	Single-Body Style Combination Air Release and Air/Vacuum Valve. Stainless Steel Internal Parts, BUNA-N seats per AWWA C512, with Protection Hood, Suction Screen Required, and Epoxy Coated Interior per AWWA C550. Flanged 125# or 250# Inlet. 2.04 MPa (300 PSI) Rated Body and Internals. **Full Submittal Required.**	APCO 150 Series Cla-Val Series 35 Crispin UL Series (for 100 mm (4") size) Crispin C Series (for 150mm (6") and larger) Val-Matic 200 Series Vent-O-Mat RBX Series
VALVE, GATE, RESILIENT WEDGE (RWGV)	100mm (4") Through 300mm (12"), Non-Rising Low Zinc Bronze or Stainless Steel Stem, Ductile-Iron Body and Bonnet, Stainless Steel Trim Bolts, Encapsulated Wedge per AWWA C509 or C515 with Epoxy Coated Interior. Manufactured to AWWA C509 or C515, with 1.72 MPa (250 PSI) Rating.	American FC, Series 2500 American R/D AVK 45 Clow 2639 F6100 Series Kennedy Ken-Seal II, KRSR Mueller 2361 M&H 4067 M&H 7067 U.S. Pipe Metroseal U.S. Pipe Metroseal 250
VALVE, GATE, RESILIENT WEDGE, 400mm (16") AND LARGER	400mm (16") Through 600mm (24"), per AWWA C509, Ductile Iron Body, Stainless Steel Trim Bolts, Encapsulated Wedge, Non-Rising Stem, Epoxy Coated Interior per AWWA C550, Minimum 1.36 MPa (200 PSI) Rating. **District Approval and Full Submittal Required.**	Clow F-6100 Series Kennedy Ken-Seal II M&H 4067 Mueller A-2361 U.S. Pipe Metroseal 250
VALVE, INSULATED BALL	25mm (1") Bronze, Straight, Compression x Compression, Insulated Type.	Mueller N-35209
VALVE, PET COCK	6mm (1/4") 304 SS Pet Cock Valve for Use on Blowoff Cam and Groove Adapter.	
VALVE, PRESSURE REDUCING	For Water Main Pressure Reducing, 100mm (4") through 400mm (16"). **Full Submittal Required.**	Ames 910/610 Series Cla-Val 90G-01 Singer 106 PR Singer 206 PR Watts ACV 115E Series
VALVE, PRESSURE REGULATING 1.03 MPa to 1.72 MPa (150 TO 249 PSI)	19mm (3/4") through 50mm (2").	Cash Acme E55 Watts 223, 25AUB Wilkins 600 Series
VALVE, PRESSURE REGULATING 1.72 MPa to 2.74 MPa (250 TO 400 PSI)	19mm (3/4") through 50mm (2").	Cash Acme E55 Watts N35B Series
VALVE, PRESSURE RELIEF	For Service Connections, 19mm (3/4").	Cash Acme FWC
VALVE, PRESSURE RELIEF AND SUSTAINING	For Water Main Pressure Reducing and Sustaining, 100mm (4") through 400mm (16"). **Full Submittal Required.**	Ames 920/620 Series Cla-Val 50-01 Cla-Val 650-01 Singer 106 RPS Singer 206 RPS Watts ACV 116E Series
VAULT ACCESS DOOR, ALUMINUM	Aluminum Vault Access Door, Dual Door Configuration, Spring Loaded and Counter Balanced, with Inset for Padlock. H-10 Parkway or H-20 Street Loading Required. **Full Submittal Required.**	Bilco Type JD-AL USF Fabrication THS, THD

Item	Description	Manufacturer
VAULT EXHAUST FAN	Electric, 110 Volt, Single Phase, Squirrel Cage Type, Suitable for Wet Locations. Size for 6 Volume Changes per Hour. **Full Submittal Required.**	
VAULT GROUND FAULT RECEPTACLE	125 Volt, 20 AMP, Duplex, with Gasketed, Self-Closing Aluminum Cover. **Full Submittal Required.**	
VAULT LADDER EXTENSION	Vault Ladder Extension, Retractable, 1,200mm (48") Extension. **Full Submittal Required.**	Bilco Ladder-Up Pipeline Products VL-100
VAULT LADDER, ALUMINUM	High Strength 6061-T6 Aluminum Alloy, 25mm (1") Diameter Solid Rungs and 450mm (18") Between Side Rails. Ladder to Exceed Requirements of CAL/OSHA Standards.	Alaco Model 560
VAULT LADDER, FIBERGLASS	Fiberglass Reinforced Plastic, 25mm (1") Solid Square Rungs with Grit Safety Surface, Ultraviolet Inhibitors. 42 KPa (30,000 PSI) Tensile Strength with a 3 to 1 Safety Factor per OSHA Requirements. **Full Submittal Required.**	
VAULT LIGHT SWITCH	120 Volt, 20 AMP, Single Pole, Spring Loaded with Clear Waterproof Cover. **Full Submittal Required.**	
VAULT LIGHTS	Non-Metallic Incandescent Vaportite, 120 Volt, 6.0 AMP, Wall or Ceiling Mounted, with 100 Watt Bulb with Cage and Glass Protector for Bulb. Suitable for Wet Locations. Two Light Fixtures Per Vault. **Full Submittal Required.**	
VAULT LOAD CENTER	125 AMP, Double Pole, 1 Phase, 3 Wire, Solid Neutral 120/240 VAC with Plug-In GFI Breaker. **Full Submittal Required.**	
VAULT SUMP PUMP	Automatic Submersible, Minimum 1/2 HP, 115 Volt, 60 Hz, 1 Phase, Ball Bearing Motor with Thermal Overload Protection. Either bronze or Epoxy Coated Cast Iron Body. **Full Submittal Required.**	
VAULT, FIBERGLASS REINFORCED PLASTIC (FRP)	For Meter Sizes 75mm (3") and Larger. 1.82m Long x 1.2m Wide x 1.5m Deep (6' x 4' x 5'). FRP Construction, Minimum H-10 Parkway Loading with Reinforced Plastic Concrete or Aluminum Access Door. See Section 06620. **Full Submittal Required.**	Armorcast A6001506AMTF
VAULT, PRECAST CONCRETE	For Pressure Reducing Stations, Reservoir Altitude Valves, etc. Various Sizes. Precast Base, Sections and Top with Aluminum Two Leaf Access Door. See Section 03462. **Full Submittal Required.**	Brooks J & R San Diego Precast Utility Vault
WATER TEST STATION ENCLOSURE	12 Gauge Steel, 200mm (8")x 1200mm (48"), Single Lockable Door, Powder Polyester Coated. Potable Water Color: Chocolate Brown. Recycled Water Color: OSHA Safety Purple.	Pipeline Products WTS-1200

Item	Description	Manufacturer
WIRE, CATHODIC	Stranded Copper, 600 Volt Rated Insulation, 2.08mm (7/64") Thick High Molecular Weight Polyethylene (HMW/PE) Insulation Jacket. Use the Wire Sizes and Insulation Jacket Colors of Wire as Required in Section 13110 and on the Standard Drawings.	
WIRE, TRACER	#14 AWG Solid Copper UF Type Wire, with Cross Linked Polyethylene Insulation. White or Yellow in Color.	Cosberg Industries Paige Baron
WIRE, TRACER CONNECTOR	Direct Bury Silicone-Filled Capsule Tube with Standard Wire Nut or Silicone-Filled Wire Nut Connectors for Tracer Wire Connections.	3M DBR-6 King 4 King 5 King 6

AMENDMENTS TO THE STANDARD SPECIFICATIONS

DATED JULY 1999

(Issued 09-05-08)

SECTION 0 GLOBAL REVISIONS
(Issued 07-01-08)

Global revisions are changes to contract documents not specific to a section of the Standard Specifications.

In each contract document at each occurrence:

1. Except where existing asphalt concrete is described, replace "asphalt concrete" with "hot mix asphalt"
2. Except where existing AC is described, replace "AC" with "HMA" where AC means asphalt concrete
3. Replace "Engineer's Estimate" with "verified Bid Item List"
4. Replace "Notice to Contractors" with "Notice to Bidders"
5. Except in "Contract Project Information Signs," replace "Project Information" with "Supplemental Project Information"

Where Standard Specifications refer to the special provisions to describe the work, interpret the reference to the Bid Item List, the special provisions, or both.

Interpret a reference to the Standard Specifications as a reference to the Standard Specifications as amended in these Amendments to the Standard Specifications.

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SECTION 1 DEFINITIONS AND TERMS
(Issued 07-01-08)

Replace Section 1 with:

SECTION 1 GENERAL
1-1 GENERAL
1-1.01 GENERAL

Section 1 includes general rules of interpretation.

The Department is gradually standardizing the style and language of the specifications. The new style and language includes:

1. Use of:

    1.1. Imperative mood
    1.2. Introductory modifiers
    1.3. Conditional clauses

2. Elimination of:

    2.1. Language variations
    2.2. Definitions for industry-standard terms
    2.3. Redundant specifications
    2.4. Needless cross-references

The use of this new style does not change the meaning of a specification not yet using this style.

The specifications are written to the Bidder before award and the Contractor after. Before award, interpret sentences written in the imperative mood as starting with "The Bidder must" and interpret "you" as "the Bidder" and "your" as "the Bidder's." After award, interpret sentences written in the imperative mood as starting with "The Contractor must" and interpret "you" as "the Contractor" and "your" as "the Contractor's."

Unless an object or activity is specified to be less than the total, the quantity or amount is all of the object or activity.

All items in a list apply unless the items are specified as choices.

Headings are included for the purposes of organization and referencing. Inclusion of a heading with no related content, "Reserved," or "Not Used" does not indicate that no specification exists for that subject; applicable specifications may be covered in a general or referenced specification.

1-2 REFERENCES

1-2.01 REFERENCES

A reference within parentheses to a law or regulation is included in the contract for convenience only and is not a comprehensive listing of related laws and regulations. Lack of a reference does not indicate no related laws or regulations exist.

If the version of a referenced document is not specified, use the current version in effect on the date of Notice to Bidders.

A reference to a subsection includes the section's general specifications of which the subsection is a part.

A code not specified as a Federal code is a California code.

1-3 ABBREVIATIONS AND MEASUREMENT UNITS

1-3.01 ABBREVIATIONS

Abbreviations

Abbreviation	Meaning
AAN	American Association of Nurserymen
AASHTO	American Association of State Highway and Transportation Officials
AISC	American Institute of Steel Construction
AISI	American Iron and Steel Institute
ANSI	American National Standards Institute
APHA	American Public Health Association
API	American Petroleum Institute
AREMA	American Railway Engineering and Maintenance-of-Way Association
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
AWG	American Wire Gage
AWPA	American Wood-Preservers' Association
AWS	American Welding Society
AWWA	American Water Works Association
CIH	Certified Industrial Hygienist
DBE	Disadvantaged Business Enterprise
DVBE	Disabled Veteran Business Enterprise
EIA	Electronic Industries Alliance
ETL	Electrical Testing Laboratories
FHWA	Federal Highway Administration
IEEE	Institute of Electrical and Electronics Engineers
NETA	National Electrical Testing Association, Inc.
NEMA	National Electrical Manufacturers Association
PLAC	permit, license, agreement, certification, or any combination of these
SSPC	The Society for Protective Coatings
UL	Underwriters' Laboratories Inc.

1-3.02 MEASUREMENT UNITS

Some of the symbols for units of measurement used in the specifications and in the Bid Item List are defined as follows. The symbols for other units of measurement used in the specifications are as defined in ASTM E 380 or in the various specifications and test referenced in the specifications.

Measurement Units

Symbols as used in the specifications	Symbols as used in the Bid Item List	Meaning
A	—	amperes
—	EA	each
g	G	gram
kg	KG	kilogram
ha	HA	hectare (10 000 m^2)
h	H	hour
J	—	joule
—	LNKM	lane kilometer
L	L	liter
—	LS	lump sum
m	M	meter
km	KM	kilometer
mm	MM	millimeter
µm	—	micrometer
nm	—	nanometer
m^2	M2	square meter
m^3	M3	cubic meter
N	—	newton
N·m	—	newton meter
Ω	—	ohm
Pa	—	pascal
kPa	—	kilopascal
MPa	—	megapascal
s	—	second
—	STA	station (100 m)
—	TAB	tablet
tonne	TONN	metric ton (1000 kg)
W	—	watt

1-4 DEFINITIONS

1-4.01 GENERAL

Interpret terms as defined in the contract documents. A construction-industry term not defined in the contract documents has the meaning defined in Means Illustrated Construction Dictionary, Condensed Version, Second Edition.

1-4.02 GLOSSARY

acceptance: Formal written acceptance by the Director of an entire contract that has been completed in all respects in accordance with the plans and specifications and any modifications to them previously approved.

base: Layer of specified material of planned thickness placed immediately below the pavement or surfacing.

basement material: Material in excavation or embankments underlying the lowest layer of subbase, base, pavement, surfacing, or other specified layer to be placed.

bid item: Specific work unit for which the bidder provides a price.

Bid Item List: List of bid items and the associated quantities.

Bid Item List, verified: Bid Item List with verified prices. The Contract Proposal of Low Bidder at the Department's Web site is the verified Bid Item List.

bridge: Structure, with a bridge number, that carries a utility facility, or railroad, highway, pedestrian or other traffic, over a water course or over or under or around any obstruction.

building-construction contract: Contract that has "building construction" on the cover of the Notice to Bidders and Special Provisions.

business day: Day on the calendar except Saturday or holiday.

California Manual on Uniform Traffic Control Devices: The California Manual on Uniform Traffic Control Devices for Streets and Highways (California MUTCD) is issued by the Department of Transportation and is the Federal Highway Administration's MUTCD 2003 Edition, as amended for use in California.

Certified Industrial Hygienist: Industrial hygienist certified in comprehensive practice by the American Board of Industrial Hygiene.

conduit: Pipe or tube in which smaller pipes, tubes, or electrical conductors are inserted or are to be inserted.

contract: Written and executed contract between the Department and the Contractor.

contract bonds: Security for the payment of workers and suppliers furnishing materials, labor, and services and for guaranteeing the Contractor's work performance.

contract item: Bid item.

Contractor: Person or business or its legal representative entering into a contract with the Department for performance of the work.

culvert: Structure, other than a bridge, that provides an opening under a roadway for drainage or other purposes.

day: 24 consecutive hours running from midnight to midnight; calendar day.

deduction: Amount of money permanently taken from progress payment and final payment. Deductions are not retentions under Pub Cont Code § 7107.

Department: Department of Transportation as defined in St & Hwy Code § 20 and authorized in St & Hwy Code § 90; its authorized representatives.

detour: Temporary route for traffic around a closed road part. A passageway through a job site is not a detour.

Director: Department's Director.

Disabled Veteran Business Enterprise: Business certified as a DVBE by the Office of Small Business and DVBE Services, Department of General Services.

divided highway: Highway with separated traveled ways for traffic, generally in opposite directions.

Engineer: Department's Chief Engineer acting either directly or through properly authorized agents; the agents acting within the scope of the particular duties delegated to them.

Federal-aid contract: Contract that has a Federal-aid project number on the cover of the Notice to Bidders and Special Provisions.

fixed costs: Labor, material, or equipment cost directly incurred by the Contractor as a result of performing or supplying a particular bid item that remains constant regardless of the item's quantity.

frontage road: Local street or road auxiliary to and located generally on the side of an arterial highway for service to abutting property and adjacent areas and for control of access.

grading plane: Basement material surface on which the lowest layer of subbase, base, pavement, surfacing, or other specified layer is placed.

highway: Whole right of way or area that is reserved for and secured for use in constructing the roadway and its appurtenances.

holiday:

1. Every Sunday
2. January 1st, New Year's Day
3. 3rd Monday in January, Birthday of Martin Luther King, Jr.
4. February 12th, Lincoln's Birthday
5. 3rd Monday in February, Washington's Birthday
6. March 31st, Cesar Chavez Day
7. Last Monday in May, Memorial Day
8. July 4th, Independence Day
9. 1st Monday in September, Labor Day
10. 2nd Monday in October, Columbus Day
11. November 11th, Veterans Day
12. 4th Thursday in November, Thanksgiving Day
13. Day after Thanksgiving Day
14. December 25th, Christmas Day

If January 1st, February 12th, March 31st, July 4th, November 11th, or December 25th falls on a Sunday, the Monday following is a holiday. If November 11th falls on a Saturday, the preceding Friday is a holiday. Interpret "legal holiday" as "holiday."

informal-bid contract: Contract that has "Informal Bid Authorized by Pub Cont Code §10122" on the cover of the Notice to Bidders and Special Provisions.

Information Handout: Supplemental project information furnished to bidders as a handout.

laboratory: Laboratory authorized by the Department to test materials.

liquidated damages: Amount prescribed in the specifications, pursuant to the authority of Pub Cont Code § 10226, to be paid to the State or to be deducted for each day's delay in completing the whole or any specified portion of the work beyond the time allowed in the specifications.

median: Portion of a divided highway separating the traveled ways for traffic in opposite directions including inside shoulders.

Notice to Bidders: Document that provides a general work description, bidder and bid specifications, and the time and location the Department receives bids.

pavement: Uppermost layer of material placed on the traveled way or shoulders. This term is used interchangeably with surfacing.

plans: Official project plans and Standard Plans, profiles, typical cross sections, working drawings and supplemental drawings, or reproductions thereof, approved by the Engineer, which show the location, character, dimensions and details of the work to be performed. These documents are to be considered as a part of the plans.

In the above definition, the following terms are defined as follows:

Standard Plans: Standard Plans issued by the Department.

project plans: Specific details and dimensions peculiar to the work supplemented by the Standard Plans insofar as the same may apply.

roadbed: Area between the intersection of the upper surface of the roadway and the side slopes or curb lines. The roadbed rises in elevation as each increment or layer of subbase, base, surfacing or pavement is placed. Where the medians are so wide as to include areas of undisturbed land, a divided highway is considered as including 2 separate roadbeds.

roadway: Highway portion included between the outside lines of sidewalks, or curbs, slopes, ditches, channels, waterways, and including all the appertaining structures, and other features necessary to proper drainage and protection.

shoulder: Roadway portion contiguous with the traveled way for accommodation of stopped vehicles, for emergency use, and for lateral support of base and surface courses.

special provisions: Specific clauses setting forth conditions or requirements peculiar to the work and supplementary to these Standard Specifications. The Department's publication titled "Labor Surcharge And Equipment Rental Rates" is part of the special provisions.

specifications: Directions, provisions, and requirements contained in these Standard Specifications, Amendments to the Standard Specifications, and the special provisions. Where the term "these specifications" or "these Standard Specifications" is used in this book, it means the provisions set forth in this book.

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

Structure Design: Offices of Structure Design of the Department.

subbase: Layer of specified material of planned thickness between a base and the basement material.

subgrade: Roadbed portion on which pavement, surfacing, base, subbase, or a layer of any other material is placed.

substructure: Bridge portions below the bridge seats, tops of piers, haunches of rigid frames, or below the spring lines of arches. Backwalls and parapets of abutments and wingwalls of bridges are portions of the substructure.

superstructure: Bridge portion except the bridge substructure.

supplemental project information: Information relevant to the project, specified as supplemental project information, and made available to bidders.

surfacing: Uppermost layer of material placed on the traveled way, or shoulders. This term is used interchangeably with pavement.

traffic lane: Portion of a traveled way for the movement of a single line of vehicles.

traveled way: Portion of the roadway for the movement of vehicles, exclusive of shoulders.

total bid: Sum of the item totals as verified by the Department; original contract price.

withhold: Money temporarily or permanently taken from progress payment. Withholds are not retentions under Pub Cont Code § 7107.

work: All the work specified, indicated, shown or contemplated in the contract to construct the improvement, including all alterations, amendments, or extensions to it made by contract change order or other written orders of the Engineer.

1-5 DISTRICTS

District Composition and Office Addresses

District	Counties	Location Address	Mailing Address
1	Del Norte (DN), Humboldt (Hum), Lake (Lak), Mendocino (Men)	1656 UNION ST EUREKA, CA	PO BOX 3700 EUREKA CA 95502
2	Lassen (Las), Modoc (Mod), Plumas (Plu), Shasta (Sha), Siskiyou (Sis), Tehama (Teh), Trinity (Tri)	1657 RIVERSIDE DR REDDING, CA	PO BOX 496073 REDDING CA 96049-6073
3	Butte (But), Colusa (Col), El Dorado (ED), Glenn (Gle), Nevada (Nev), Placer (Pla), Sacramento (Sac), Sierra (Sie), Sutter (Sut), Yolo (Yol), Yuba (Yub)	703 B ST MARYSVILLE, CA	PO BOX 911 MARYSVILLE CA 95901
4	Alameda (Ala), Contra Costa (CC), Marin (Mrn), Napa (Nap), San Francisco (SF), San Mateo (SM), Santa Clara (SCl), Solano (Sol), Sonoma (Son)	111 GRAND AVE OAKLAND, CA	PO BOX 23660 OAKLAND CA 94623-0660
5	Monterey (Mon), San Benito (SBt), San Luis Obispo (SLO), Santa Barbara (SB), Santa Cruz (SCr)	50 HIGUERA ST SAN LUIS OBISPO, CA	50 HIGUERA ST SAN LUIS OBISPO CA 93401-5415
6	Fresno (Fre), Kern (Ker), Kings (Kin), Madera (Mad), Tulare (Tul)	1352 W. OLIVE AVE FRESNO, CA	PO BOX 12616 FRESNO CA 93728-2616
7	Los Angeles (LA), Ventura (Ven)	100 S. MAIN ST LOS ANGELES	100 S MAIN ST LOS ANGELES CA 90012
8	Riverside (Riv), San Bernardino (SBd)	464 W 4TH ST SAN BERNARDINO, CA	464 W 4TH ST SAN BERNARDINO CA 92401-1400
9	Inyo (Iny), Mono (Mno)	500 S MAIN ST BISHOP, CA	500 S MAIN ST BISHOP CA 93514-3423
10	Alpine (Alp), Amador (Ama), Calaveras (Cal), Mariposa (Mpa), Merced (Mer), San Joaquin (SJ), Stanislaus (Sta), Tuolumne (Tuo)	1976 E CHARTER WAY STOCKTON, CA	PO BOX 2048 STOCKTON CA 95201
11	Imperial (Imp), San Diego (SD)	4050 TAYLOR ST SAN DIEGO, CA	4050 TAYLOR ST SAN DIEGO CA 92110-2737
12	Orange (Ora)	3347 MICHELSON DR STE 100 IRVINE, CA	3347 MICHELSON DR STE 100 IRVINE CA 92612-0661

A project with work in District 1, 2, or 3 is a North Region project. For Districts 1, 2, and 3, interpret each reference to the district office as the North Region office. The North Region office address is the District 3 address.

1-6 WEB SITES, ADDRESSES, AND TELEPHONE NUMBERS

Web Sites, Addresses, and Telephone Numbers

Agency, Department Unit, or Reference	Web Site	Address	Telephone No.
Bid Document Unit		MSC 26 BID DOCUMENT UNIT DEPARTMENT OF TRANSPORTATION 1120 N ST RM 200 SACRAMENTO CA 95814-5605	
Department	www.dot.ca.gov		
Department of General Services, Office of Small Business and DVBE Services	www.pd.dgs.ca.gov/smbus/default.htm	OFFICE OF SMALL BUSINESS AND DVBE SERVICES DEPARTMENT OF GENERAL SERVICES 707 3RD ST WEST SACRAMENTO CA 95605-2811	(800) 559-5529 (916) 375-4940
Department of Industrial Relations	www.dir.ca.gov		
Department of Industrial Relations, Division of Apprenticeship Standards		455 GOLDEN GATE AVENUE SAN FRANCISCO, CA 94102	
Office Engineer		MSC 43 OFFICE ENGINEER DEPARTMENT OF TRANSPORTATION 1727 30TH ST SACRAMENTO CA 95816-7005	
Office Engineer–Verified Bid Results	http://www.dot.ca.gov/hq/esc/oe/awards/bidsum_html/6week_list.html.		
Offices of Structure Design, Documents Unit		MSC 9-4/4I DOCUMENTS UNIT OFFICES OF STRUCTURE DESIGN DEPARTMENT OF TRANSPORTATION 1801 30TH ST SACRAMENTO CA 95816-7006	(916) 227-8252
Publication Distribution Unit		PUBLICATION UNIT DEPARTMENT OF TRANSPORTATION 1900 ROYAL OAKS DRIVE SACRAMENTO CA 95815-3800	
Transportation Laboratory		MATERIALS AND ENGINEERING TESTING SERVICES AND GEOTECHNICAL SERVICES DEPARTMENT OF TRANSPORTATION 5900 FOLSOM BLVD SACRAMENTO CA 95819-4612	(916) 227-7000
Department's Pre-Qualified Products List	http://www.dot.ca.gov/hq/esc/approved_products_list		

SECTION 2 PROPOSAL REQUIREMENTS AND CONDITIONS
(Issued 09-05-08)

Replace Section 2 with:

SECTION 2 BIDDING

2-1.01 GENERAL

Section 2, "Bidding," includes specifications related to bid eligibility and the bidding process.

2-1.02 BID INELIGIBILITY

A firm that has provided architectural or engineering services to the Department for this contract before bid submittal for this contract is prohibited from any of the following:

1. Submit a bid
2. Subcontract for a part of the work
3. Supply materials

2-1.03 BID DOCUMENTS

2-1.03A General

Standard Specifications and Standard Plans may be viewed at the Department's Web site and may be purchased at the Publication Distribution Unit.

Special provisions, Amendments to the Standard Specifications, and project plans may be viewed at:

1. Department's Web site
2. District office of the district in which the work is located
3. Districts 4 and 12 offices
4. Bid Document Unit

Bid books, special provisions, Amendments to the Standard Specifications, and project plans may be obtained at the Bid Document Unit.

2-1.03B Supplemental Project Information

If supplemental project information is available, it is specified in the special provisions.

The Information Handout may be viewed and obtained at the Bid Document Unit.

If rock cores are available, you may view them by sending a request to Coreroom@dot.ca.gov.

Make your request at least 7 days before viewing. Include in your request:

1. District-County-Route
2. Bridge number
3. Contract number
4. Viewing date
5. Contact information, including telephone number.

If bridge as-built drawings are available:

1. For a project in District 1 through 6 or 10, you may request them from the Office of Structure Maintenance and Investigations, fax (916) 227-8357
2. For a project in District 7, 8, 9, 11, or 12, you may request them from the Office of Structure Maintenance and Investigations, fax (916) 227-8357, and are available at the Office of Structure Maintenance and Investigations, Los Angeles, CA, telephone (213) 897-0877

As-built drawings may not show existing dimensions and conditions. Where new construction dimensions are dependent on existing bridge dimensions, verify the field dimensions and adjust dimensions of the work to fit existing conditions.

2-1.04 SMALL BUSINESS ENTERPRISE GOAL

The Department has established an overall 25 percent small business participation goal. To determine if the goal is achieved, the Department is tracking small business participation on all contracts.

Contractors, subcontractors, suppliers, and service providers who qualify as small business are encouraged to apply for certification as a small business by submitting their application to the Department of General Services, Office of Small Business and DVBE Services.

2-1.05 DISADVANTAGED BUSINESS ENTERPRISES

Section 2-1.05, "Disadvantaged Business Enterprises," applies to a Federal-aid contract.

Under 49 CFR 26.13(b):

> 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.

In order to ensure the Department achieves its federally mandated statewide overall DBE goal, the Department encourages the participation of DBEs as defined in 49 CFR 26.

2-1.06 DISABLED VETERAN BUSINESS ENTERPRISES

2-1.06A General

Section 2-1.06, "Disabled Veteran Business Enterprises," applies to a non-Federal-aid contract.

Take necessary and reasonable steps to ensure that DVBEs have opportunity to participate in the contract.

Comply with Mil & Vet Code § 999 et seq.

2-1.06B No Goal

Section 2-1.06B, "No Goal," applies if no DVBE goal is shown in the Notice to Bidders.

The Department encourages bidders to obtain DVBE participation in order to ensure the Department achieves its State-mandated overall DVBE goal.

2-1.06C Goal

Section 2-1.06C, "Goal," applies if a DVBE goal is shown in the Notice to Bidders.

Make work available to DVBEs and select work parts consistent with available DVBE subcontractors and suppliers.

Meet the goal shown or demonstrate that you made good faith efforts to meet this goal.

If a DVBE joint venture is used, submit the joint venture agreement with the Certified DVBE Subcontractor Summary form.

The Department determines a bidder has made good faith efforts if it submits evidence within the specified time that it:

1. Contacted the Office of Small Business and DVBE Services, Department of General Services
2. Advertised in trade media and media focusing on DVBEs unless time limits the Department imposes do not allow the advertising
3. Submitted invitations to bid to potential DVBE contractors
4. Considered available DVBEs

2-1.07 SMALL BUSINESS AND NON–SMALL BUSINESS SUBCONTRACTOR PREFERENCES (GOVT CODE § 14835 ET SEQ. AND 2 CA CODE OF REGS § 1896 ET SEQ.)

2-1.07A General

Section 2-1.07, "Small Business and Non–Small Business Subcontractor Preferences (Govt Code § 14835 et seq. and 2 CA Code of Regs § 1896 et seq.)," applies to a non-Federal-aid contract.

2-1.07B Small Business Preference

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

1. You completed a Request for Small Business Preference or Non–Small Business Preference form
2. You attached a copy of your Office of Small Business and DVBE Services small business certification to the form

3. The apparent low bidder is not certified as a small business

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

The Department of General Services determines if a bidder was certified on bid opening date. The Department confirms the bidder's status as a small business before applying the small business preference.

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

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

If this reduction results in the small business contractor becoming the low bidder, the contract award is based on the total bid, not the reduced bid.

2-1.07C Non–Small Business Subcontractor Preference

The Department allows a bidder not certified as a small business by the Office of Small Business and DVBE Services, Department of General Services, a preference if:

1. You completed a Request for Small Business Preference or Non–Small Business Preference form
2. The apparent low bidder is not certified as a small business and has not requested preference

The listed subcontractors and suppliers must be certified as a small business at the time and day of bid or must have submitted a complete application to the Department of General Services. The complete application and any required substantiating documentation must be received by the Department of General Services by 5:00 p.m. on bid opening date.

The Department of General Services determines if a bidder was certified on bid opening date. The Department confirms the bidder's status as a small business before applying the small business preference.

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

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

If this reduction results in the non–small business contractor becoming the low bidder or a tie with a non-small business apparent low bidder not requesting the preference, the contract award is based on the total bid, not the reduced bid.

2-1.08 DVBE INCENTIVE EVALUATION

The Department applies the Small Business and Non–Small Business preference during bid verification and proceeds with the following evaluation for DVBE incentive.

The Department grants a DVBE incentive to bidders who achieve a DVBE participation of 1 percent or greater of the value of their bid (Mil & Vet Code and Code of Regs § 1896.98 et seq).

The DVBE incentive is a reduction, for bid comparison only, in the total bid submitted by the lesser of:

1. Percentage of DVBE achievement, rounded to 2 decimal places, of the verified total bid of the original low bidder
2. 5 percent of the verified total bid of the original low bidder
3. $100,000

The Department applies DVBE incentive and determines if bid ranking changes.

A non-small business bidder cannot displace a small business bidder. However, a small business bidder with higher DVBE achievement can displace another small business bidder.

The Department proceeds with awarding the contract to the new apparent low bidder and posts the new verified bid results at its Office Engineer Web site.

2-1.09 PREFERENCE HIERARCHY

If a small business bidder and a non–small business bidder request preferences and the reductions result in a tied bid, the Department awards the contract to the small business bidder.

If a DVBE bidder and a non-DVBE bidder request preferences and the reduction results in a tied bid, the Department awards the contract to the DVBE bidder.

2-1.10 CALIFORNIA COMPANIES

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

Complete a California Company Preference form.

The California company reciprocal preference amount is equal to the preference amount applied by the state of the nonresident contractor with the lowest responsive bid unless the California company is eligible for a small business preference or a non–small business subcontractor preference; in which case the preference amount is the greater of the two, but not both.

If the bidder submitting the lowest responsive bid is a California company and with the reciprocal preference, a California company's responsive bid is equal to or less than the original lowest responsive bid, the Department awards the contract to the California company on the basis of its total bid, not the reduced bid used for comparison except as specified in Section 2-1.09, "Preference Hierarchy."

2-1.11 JOB SITE AND DOCUMENT EXAMINATION

Examine the job site and bid documents.

Bid submission is your acknowledgment that you have examined the job site and bid documents and are satisfied with:

1. General and local conditions to be encountered
2. Character, quality, and scope of work to be performed
3. Quantities of materials to be furnished
4. Character, quality, and quantity of surface and subsurface materials or obstacles
5. Requirements of the contract

2-1.12 BID DOCUMENT COMPLETION

2-1.12A General

Complete forms in the Bid book. Submit the forms with your bid except:

1. For the following 2 forms for non-federal-aid non-informal-bid contracts:

    1.1. Certified DVBE Summary form. You may submit this form with your bid. If you do not and you are the apparent low bidder or the second or third low bidder, submit it so that it is received at the Office Engineer no later than 4:00 p.m. on the 4th business day after bid opening. If you are not the apparent low bidder or the second or third low bidder, you are not required to submit this form unless the Department asks for it.

    1.2. Certified Small Business Subcontractor form. If you are applying for the non–small business subcontractor preference, you may submit this information with your bid. If you do not, submit it so that it is received at the Office Engineer no later than 4:00 p.m. on the 2nd business day after bid opening.

2. On the Subcontractor List you may either submit the percentage of each bid item subcontracted with your bid or fax the percentage to (916) 227-6282 within 24 hours after bid opening.

Except for the percentage of each bid item subcontracted, do not fax submittals.

2-1.12B Bid Item List and Bid Comparison

Submit a bid based on the work item quantities the Department shows in the Bid Item List.

For a lump sum based bid, the Department compares bids based on the total price.

For a unit price based bid, the Department compares bids based on the sum of the item totals.

For a cost plus time based bid, the Department compares bids based on the sum of the item totals and the total bid for time.

2-1.12C Subcontractor List

In the Subcontractor List, list each subcontractor to perform work in an amount in excess of 1/2 of 1 percent of the total bid or $10,000, whichever is greater (Pub Cont Code § 4100 et seq.). The Subcontractor List must show the name, address,

and work portions to be performed by each subcontractor listed. Show work portion by bid item number, description, and percentage of each bid item subcontracted.

2-1.13 BIDDER'S SECURITY

Submit your bid with one of the following forms of bidder's security equal to at least 10 percent of the bid:

1. Cash
2. Cashier's check
3. Certified check
4. Bidder's bond signed by a surety insurer who is licensed in California

Make checks and bonds payable to the Department of Transportation.

If paying with a bidder's bond, you may use the form in the Bid book. If you do not use the form in the Bid book, use a form containing the same information.

2-1.14 BID SUBMITTAL

Submit your bid:

1. Under sealed cover
2. Marked as a bid
3. Identifying the contract number and the bid opening date

If an agent other than the authorized corporation officer or a partnership member signs the bid, file a Power of Attorney with the Department either before opening bids or with the bid. Otherwise, the bid may be nonresponsive.

2-1.15 BID WITHDRAWAL

You or an authorized agent may withdraw a bid before the bid opening date and time by submitting a written bid withdrawal request at the location where the bid was submitted. Withdrawing a bid does not prevent you from submitting a new bid.

After the bid opening time, you cannot withdraw a bid.

2-1.16 BID OPENING

The Department publicly opens and reads bids at the time and place described in the Notice to Bidders. The Department invites bidders or their authorized agents to attend.

2-1.17 BID REJECTION

The Department may reject:

1. All bids
2. A nonresponsive bid

2-1.18 BID RELIEF

The Department may grant bid relief under Pub Cont Code § 5100 et seq. Submit any request for bid relief to the Office Engineer. For Relief of Bid Request form, go to:

http://www.dot.ca.gov/hq/esc/oe/contractor_info/relief.pdf

2-1.19 SUBMITTAL FAILURE HISTORY

The Department considers a bidder's past failure to submit documents required after bid opening in determining a bidder's responsibility.

2-1.20 BID RIGGING

Section 2-1.20, "Bid Rigging," applies to a Federal-aid contract.

The U.S. Department of Transportation (DOT) provides a toll-free hotline to report bid rigging activities. Use the hotline to report bid rigging, bidder collusion, and other fraudulent activities. The hotline number is (800) 424-9071. The service is available Monday through Friday between 11:00 a.m. and 8:00 p.m. and is confidential and anonymous. The

hotline is part of the DOT's effort to identify and investigate highway construction contract fraud and abuse and is operated under the direction of the DOT Inspector General.

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SECTION 3 AWARD AND EXECUTION OF CONTRACT
(Issued 09-05-08)

Replace Section 3 with:
SECTION 3 CONTRACT AWARD AND EXECUTION

3-1.01 SCOPE

Section 3, "Contract Award and Execution," includes specifications related to contract award and execution.

3-1.02 CONTRACT AWARD

Submit any bid protest to the Office Engineer.

If the Department awards the contract, the award is made to the lowest responsible bidder within the number of days shown in the following table:

Contract Award Period

Days	Project Estimated Cost shown in the Notice to Bidders
30	< $200 million
60	≥ $200 million

The Department may extend the specified award period if the bidder agrees.

3-1.03 CONTRACT BONDS (PUB CONT CODE §§ 10221 AND 10222)

The successful bidder must furnish 2 bonds:

1. Payment bond to secure the claim payments of laborers, workers, mechanics, or materialmen providing goods, labor, or services under the contract. This bond must be equal to at least 100 percent of the total bid.
2. Performance bond to guarantee the faithful performance of the contract. This bond must be equal to at least 50 percent of the total bid.

The Department furnishes the successful bidder with bond forms.

3-1.04 CONTRACTOR LICENSE

For a Federal-aid contract, the Contractor must be properly licensed as a contractor (Pub Cont Code § 10164) from contract award through contract acceptance.

For a non-Federal-aid contract:

1. The Contractor must be properly licensed as a contractor from bid opening through contract acceptance (Bus & Prof Code § 7028.15)
2. Joint venture bidders must obtain a joint venture license before contract award (Bus & Prof Code § 7029.1)

3-1.05 INSURANCE POLICIES

The successful bidder must submit:

1. Copy of its commercial general liability policy and its excess policy or binder until such time as a policy is available, including the declarations page, applicable endorsements, riders, and other modifications in effect at the time of contract execution. Standard ISO form No. CG 0001 or similar exclusions are allowed if not inconsistent with Section 7-1.12, "Indemnification and Insurance." Allowance of additional exclusions is at the discretion of the Department.

2. Certificate of insurance showing all other required coverages. Certificates of insurance, as evidence of required insurance for the auto liability and any other required policy, shall set forth deductible amounts applicable to each policy and all exclusions that are added by endorsement to each policy. The evidence of insurance shall provide that no cancellation, lapse, or reduction of coverage will occur without 10 days prior written notice to the Department.
3. A declaration under the penalty of perjury by a CPA certifying the accountant has applied GAAP guidelines confirming the successful bidder has sufficient funds and resources to cover any self-insured retentions if the self-insured retention is $50,000 or higher.

If the successful bidder uses any form of self-insurance for workers compensation in lieu of an insurance policy, it shall submit a certificate of consent to self-insure under Labor Code § 3700.

3-1.06 SMALL BUSINESS PARTICIPATION REPORT

A Small Business Participation Report will be included in the contract documents to be executed by the successful bidder. The purpose of this form is to collect small business participation data. Even if no small business participation is reported, the successful bidder must execute and return the form.

3-1.07 PAYEE DATA RECORD

The Department includes a Payee Data Record in the contract documents to be signed by the successful bidder, the payee. Complete the form.

3-1.08 CALTRANS BIDDER - DBE INFORMATION FORM

Section 3-1.08, "Caltrans Bidder - DBE Information Form," applies to a Federal-aid contract.

The Department includes a Caltrans Bidder - DBE Information form in the contract documents to be completed and signed by the successful bidder.

The purpose of this form is to collect data required under 49 CFR 26.

The Department encourages you to provide written confirmation from each DBE that the DBE is participating in the contract. A copy of a DBE's quote serves as written confirmation. If a DBE is participating as a joint venture partner, the Department encourages you to submit a copy of the joint venture agreement.

3-1.09 CONTRACT EXECUTION

The successful bidder must sign the contract.

Deliver to the Office Engineer:

1. Signed Contract form
2. Contract bonds
3. Documents identified in Section 3-1.05, "Insurance Policies"
4. Small Business Participation Report
5. Payee data record
6. For a Federal-aid contract, Caltrans Bidder - DBE Information form

For a non-informal-bid contract, the Office Engineer must receive these documents before the 10th business day after the bidder receives the contract.

For an informal-bid contract, the Office Engineer must receive these documents before the 5th business day after the bidder receives the contract.

The bidder's security may be forfeited for failure to execute the contract (Pub Cont Code §§ 10181 and 10182).

The following is a copy of the Contract form:

STATE OF CALIFORNIA • DEPARTMENT OF TRANSPORTATION

CONTRACT

DES-OE-0103A (NEW 3/2008)

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION
CONTRACT NO. _____

This contract is entered into between the State of California's Department of Transportation and the Contractor named below:

_____

CONTRACTOR'S NAME

The parties agree to comply with the terms of the following exhibits that are by this reference made a part of this contract.

Exhibit A - Bid book dated _____

Exhibit B - Notice to Bidders and Special Provisions dated _____

Exhibit C - Project Plans approved _____

Exhibit D - Standard Specifications dated _____

Exhibit E - Standard Plans dated _____

Exhibit F - Addenda

Exhibits A, B, C, and F are those exhibits identified with the same contract number as this contract.

This contract has been executed by the following parties:

CONTRACTOR

CONTRACTOR'S NAME *(if other than an individual, state whether a corporation, partnership, etc.)*

BY *(Authorized Signature)*	DATE SIGNED *(Do not type)*

PRINTED NAME AND TITLE OF PERSON SIGNING

FEDERAL EMPLOYER IDENTIFICATION NUMBER

DEPARTMENT OF TRANSPORTATION

BY *(Authorized Signature)*	DATE SIGNED *(Do not type)*

PRINTED NAME AND TITLE OF PERSON SIGNING

ADA Notice For individuals with sensory disabilities, this document is available in alternate formats. For information call (916) 654-6410 or TDD (916) 654-3880 or write Records and Forms Management, 1120 N Street, MS-89, Sacramento, CA 95814.

3-1.10 BIDDERS' SECURITIES

The Department keeps the securities of the 1st, 2nd, and 3rd lowest responsible bidders until the contract has been executed. The other bidders' securities, other than bidders' bonds, are returned upon determination of the 1st, 2nd, and 3rd apparent lowest bidders, and their bidders' bonds are of no further effect.

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SECTION 4 SCOPE OF WORK
(Issued 07-01-08)

Add to Section 4-1.01:

Nothing in the specifications voids the Contractor's public safety responsibilities.

Add:

4-1.015 PROJECT DESCRIPTION

Construct the work described in the special provisions and on project plans and by the bid items. The special provisions, project plans, and bid item descriptions set forth the specifications that apply.

Add:

4-1.035 VALUE ENGINEERING

4-1.035A General

Reserved

4-1.035B Value Engineering Change Proposal

You may submit a VECP to reduce any of the following:

1. Total cost of construction
2. Construction activity duration
3. Traffic congestion

Before preparing a VECP, meet with the Engineer to discuss:

1. Proposal concept
2. Permit issues
3. Impact on other projects
4. Project impacts, including traffic, schedule, and later stages
5. Peer reviews
6. Overall proposal merits
7. Review times required by the Department and other agencies

The VECP must not impair the project's essential functions or characteristics, such as:

1. Service life
2. Operation economy
3. Maintenance ease
4. Desired appearance
5. Design and safety

The VECP must include:

1. Description of the contract specifications and drawing details for performing the work and the proposed changes.
2. Itemization of contract specifications and drawing details that would be changed.

3. Detailed cost estimate for performing the work under the existing contract and under the proposed change. Determine the estimates under Section 9-1.03, "Force Account Payment."
4. Deadline for the Engineer to decide on the changes.
5. Bid items affected and resulting quantity changes.

The Department is not required to consider a VECP. If a VECP is similar to a change in the plans or specifications being considered by the Department at the time the proposal is submitted or if the proposal is based on or similar to drawings or specifications adopted by the Department before Contract award, the Department does not accept the VECP and may make these changes without VECP payments.

Until the Department approves a change order incorporating the VECP or parts of it, continue to perform the work under the contract. If the Department does not approve a change order before the deadline stated in the VECP or other date you subsequently stated in writing, the VECP is rejected. The Department does not adjust time or payment for a rejected VECP.

The Department decides whether to accept a VECP and the estimated net construction-cost savings from adopting the VECP or parts of it.

The Department may require you to accept a share of the investigation cost as a condition of reviewing a VECP. After written acceptance, the Department considers the VECP and deducts the agreed cost.

If the Department accepts the VECP or parts of it, the Department issues a change order that:

1. Incorporates changes in the contract necessary to implement the VECP or the parts adopted
2. Includes the Department's acceptance conditions
3. States the estimated net construction-cost savings resulting from the VECP
4. Obligates the Department to pay you 50 percent of the estimated net savings

In determining the estimated net construction-cost savings, the Department excludes your VECP preparation cost and the Department's VECP investigation cost, including parts paid by you.

If a VECP providing for a reduction in working days is accepted by the Department, 50 percent of the reduction is deducted from contract time.

If a VECP providing for a reduction in traffic congestion or avoiding traffic congestion is accepted by the Department, the Department pays 60 percent of the estimated net savings in construction costs attributable to the VECP. Submit detailed traffic handling comparisons between the existing contract and the proposed change, including estimates of the traffic volumes and congestion.

The Department may apply an accepted VECP for general use on other contracts.

If an accepted VECP is adopted for general use, the Department pays only the contractor who first submitted the VECP and only to the contracts awarded to that contractor before the submission of the accepted VECP.

If the Department does not adopt a general-use VECP, an identical or similar submitted proposal is eligible for acceptance.

4-1.035C Value Analysis Workshop

Section 4-1.035C, "Value Analysis Workshop," applies to a non-building-work contract with a total bid of over $5 million.

You may request a value analysis workshop by submitting a request after contract approval.

The Department offers a value analysis workshop to:

1. Identify value enhancing opportunities
2. Consider changes to the contract that will reduce the total cost of construction, construction activity duration, or traffic congestion without impairing the essential functions specified for a VECP in Section 4-1.035B, "Value Engineering Change Proposal."

If the request is authorized, you and the Engineer:

1. Schedule a value analysis workshop
2. Select a facilitator and workshop site
3. Agree to other workshop administrative details

The workshop must be conducted under the methods described in the Department's Value Analysis Team Guide available at:

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

The facilitator must be a certified value specialist as recognized by the Society of American Value Engineers.

The Department reimburses you for 1/2 of the workshop cost. The workshop cost is the sum of the workshop-facilitator cost and the workshop-site cost. The Department determines the workshop cost based on the facilitator and workshop-site invoice prices minus any available or offered discounts. The Department does not pay you for any other associated costs.

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SECTION 5 CONTROL OF WORK
(Issued 09-05-08)

Add:

5-1.005 GENERAL

Failure to comply with any specification part is a waiver of your right to an adjustment of time and payment related to that part.

After contract approval, submit documents and direct questions to the Engineer. Orders, approvals, and requests to the Contractor are by the Engineer.

The Engineer furnishes the following in writing:

1. Approvals
2. Notifications
3. Orders

The Contractor must furnish the following in writing:

1. Assignments
2. Notifications
3. Proposals
4. Requests, sequentially numbered
5. Subcontracts
6. Test results

The Department rejects a form if it has any error or any omission.

Convert foreign language documents to English.

Use contract administration forms available at the Department's Web site.

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

Add to 5-1.01:

Failure to enforce a contract provision does not waive enforcement of any contract provision.

Add:

5-1.012 PARTNERING

5-1.012A General

The Department strives to work cooperatively with all contractors; partnering is our way of doing business. The Department encourages project partnering among the project team, made up of significant contributors from the Department and the Contractor, and their invited stakeholders.

For a project with a total bid greater than $1 million, professionally facilitated project partnering is encouraged.

For a project with a total bid greater than $10 million, professionally facilitated project partnering is required.

In implementing project partnering, you and the Engineer manage the contract by:

1. Using early and regular communication with involved parties
2. Establishing and maintaining a relationship of shared trust, equity, and commitment
3. Identifying, quantifying, and supporting attainment of mutual goals

4. Developing strategies for using risk management concepts
5. Implementing timely communication and decision making
6. Resolving potential problems at the lowest possible level to avoid negative impacts
7. Holding periodic partnering meetings and workshops as appropriate to maintain partnering relationships and benefits throughout the life of the project
8. Establishing periodic joint evaluations of the partnering process and attainment of mutual goals

Partnering does not void any contract part.

The Department's "Field Guide to Partnering on Caltrans Construction Projects" current at the time of bid is available to the project team as reference. This guide provides structure, context, and clarity to the partnering process requirements. This guide is available at the Department's Partnering Program website:

http://www.dot.ca.gov/hq/construc/partnering.html

In implementing project partnering, the project team must:

1. Create a partnering charter that includes:

    1.1. Mutual goals, including core project goals and may also include project-specific goals and mutually supported individual goals.
    1.2. Partnering maintenance and close-out plan.
    1.3. Dispute resolution plan that includes a dispute resolution ladder and may also include use of facilitated dispute resolution sessions.
    1.4. Team commitment statement and signatures.

2. Participate in monthly partnering evaluation surveys to measure progress on mutual goals and may also measure short-term key issues as they arise.
3. Evaluate the partnering facilitator on Forms CEM-5501 and CEM-5502. The Engineer provides the evaluation forms to the project team and collects the results. The Department makes evaluation results available upon request. Facilitator evaluations must be completed:

    3.1. At the end of the initial partnering workshop on Form CEM-5501.
    3.2. At the end of the project close-out partnering workshop on Form CEM-5502.

4. Conduct a project close-out partnering workshop.
5. Document lessons learned before contract acceptance.

5-1.012B Partnering Facilitator, Workshops, and Monthly Evaluation Surveys

The Engineer sends you a written invitation to enter into a partnering relationship after contract approval. Respond within 15 days to accept the invitation and request the initial and additional partnering workshops. After the Engineer receives the request, you and the Engineer cooperatively:

1. Select a partnering facilitator that offers the service of a monthly partnering evaluation survey with a 5-point rating and agrees to follow the Department's "Partnering Facilitator Standards and Expectations" available at the Department's Partnering Program website
2. Schedule initial partnering workshop
3. Determine initial workshop site and duration
4. Agree to other workshop administrative details

Additional partnering workshops and sessions are encouraged throughout the life of the project as determined necessary by you and the Engineer, recommended quarterly.

5-1.012C Training in Partnering Skills Development

For a project with a total bid of $25 million or greater, training in partnering skills development is required.

For a project with a total bid between $10 million and $25 million, training in partnering skills is optional.

You and the Engineer cooperatively schedule the training session and select a professional trainer, training site, and 1 to 4 topics from the following list to be covered in the training:

1. Active Listening
2. Building Teams
3. Change Management
4. Communication
5. Conflict Resolution
6. Cultural Diversity
7. Dealing with Difficult People
8. Decision Making
9. Effective Escalation Ladders
10. Emotional Intelligence
11. Empathy
12. Ethics
13. Facilitation Skills
14. Leadership
15. Partnering Process and Concepts
16. Project Management
17. Project Organization
18. Problem Solving
19. Running Effective Meetings
20. Time Management
21. Win-Win Negotiation

Before the initial partnering workshop, the trainer conducts a 1-day training session in partnering skills development for the Contractor's and the Engineer's representatives. This training session must be a separate session from the initial partnering workshop and must be conducted locally. The training session must be consistent with the partnering principles under the Department's "Field Guide to Partnering on Caltrans Construction Projects."

Send at least 2 representatives to the training session. One of these must be your assigned representative as specified in Section 5-1.06, "Superintendence," of the Standard Specifications.

5-1.012D Payment

The Department pays you for:

1. 1/2 of partnering workshops and sessions based on facilitator and workshop site cost
2. 1/2 of monthly partnering evaluation survey service cost
3. Partnering skills development trainer and training site cost

The Department determines the costs based on invoice prices minus any available or offered discounts. The Department does not pay markups on these costs.

The Department does not pay for wages, travel expenses, or other costs associated with the partnering workshops and sessions, monthly partnering evaluation surveys, and training in partnering skills development.

Add:

5-1.015 RECORDS

5-1.015A General

Reserved

5-1.015B Record Retention

Retain project records from bid preparation through:

1. Final payment
2. Resolution of claims, if any

For at least 3 years after the later of these, retain cost records, including records of:

1. Bid preparation
2. Overhead

3. Payrolls
4. Payments to suppliers and subcontractors
5. Cost accounting

Maintain the records in an organized way in the original format, electronic and hard copy, conducive to professional review and audit.

5-1.015C Record Inspection, Copying, and Auditing

Make your records available for inspection, copying, and auditing by State representatives for the same time frame specified under Section 5-1.015B, "Record Retention." The records of subcontractors and suppliers must be made available for inspection, copying, and auditing by State representatives for the same period. Before contract acceptance, the State representative notifies the Contractor, subcontractor, or supplier 5 business days before inspection, copying, or auditing.

If an audit is to start more than 30 days after contract acceptance, the State representative notifies the Contractor, subcontractor, or supplier when the audit is to start.

5-1.015D Cost Accounting Records

Maintain cost accounting records for the project distinguishing between the following work cost categories:

1. Contract item work
2. Work character changes
3. Force account work
4. Extra work
5. Work performed under protests and claim notifications
6. Overhead
7. Subcontractors, suppliers, owner-operators, and professional services

Cost accounting records must include:

1. Final cost code lists and definitions
2. Itemization of the materials used and corresponding vendor's invoice copies
3. Direct cost of labor
4. Equipment rental charges
5. Workers' certified payrolls
6. Equipment:

    6.1. Size
    6.2. Type
    6.3. Identification number
    6.4. Hours operated

5-1.015E Extra Work Bills

Maintain separate records for force account costs.

Submit extra work bills using the Department's Internet extra work billing system.

The Contractor submitting and the Engineer approving an extra work bill using the Internet force account work billing system is the same as each party signing the report.

The Department provides billing system:

1. Training within 30 days of your written request
2. Accounts and user identification to your assigned representatives after a representative has received training

Each representative must maintain a unique password.

Replace Section 5-1.02A with:

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."

Replace Section 5-1.04 with:

5-1.04 CONTRACT COMPONENTS

A component in one contract part applies as if appearing in each. The parts are complementary and describe and provide for a complete work.

If a discrepancy exists:

1. The governing ranking of contract parts in descending order is:

    1.1. Special provisions
    1.2. Project plans
    1.3. Revised Standard Plans
    1.4. Standard Plans
    1.5. Amendments to the Standard Specifications
    1.6. Standard Specifications
    1.7. Supplemental project information

2. Written numbers and notes on a drawing govern over graphics
3. A detail drawing governs over a general drawing
4. A detail specification governs over a general specification
5. A specification in a section governs over a specification referenced by that section

If a discrepancy is found or confusion arises, request correction or clarification.

Add:

5-1.055 SUBCONTRACTING

5-1.055A General

No subcontract releases you from the contract or relieves you of your responsibility for a subcontractor's work.

If you violate Pub Cont Code § 4100 et seq., the Department may exercise the remedies provided under Pub Cont Code § 4110. The Department may refer the violation to the Contractors State License Board as provided under Pub Cont Code § 4111.

Perform work equaling at least 30 percent of the value of the original total bid with your employees and with equipment owned or rented by you, with or without operators.

Each subcontract must comply with the contract.

Each subcontractor must have an active and valid State contractor's license with a classification appropriate for the work to be performed (Bus & Prof Code, § 7000 et seq.).

Submit copies of subcontracts upon request.

Before subcontracted work starts, submit a Subcontracting Request form.

Do not use a debarred contractor; a current list of debarred contractors is available at the Department of Industrial Relations' Web site.

Upon request, immediately remove and not again use a subcontractor who fails to prosecute the work satisfactorily.

5-1.055B Disadvantaged Business Enterprises

Section 5-1.055B, "Disadvantaged Business Enterprises," applies to a Federal-aid contract.

Use each subcontractor as listed on the Subcontractor List form unless you receive authorization for a substitution.

The Department requests the Contractor to:

1. Notify the Engineer of any changes to its anticipated DBE participation
2. Provide this notification before starting the affected work

Maintain records including:

1. Name and business address of each 1st-tier subcontractor
2. Name and business address of each DBE subcontractor, DBE vendor, and DBE trucking company, regardless of tier
2. Date of payment and total amount paid to each business

If you are a DBE contractor, include the date of work performed by your own forces and the corresponding value of the work.

Before the 15th of each month, submit a Monthly DBE Trucking Verification form.

For a DBE that leases trucks from a non-DBE, count only the fee or commission the DBE receives as a result of the lease arrangement.

If a DBE subcontractor is decertified before completing subcontracted work, the subcontractor must notify you in writing of the decertification date. If a subcontractor becomes a certified DBE before completing subcontracted work, the subcontractor must notify you in writing of the certification date. Submit the notifications. On contract work completion, complete a Disadvantaged Business Enterprises (DBE) Certification Status Change form. Submit the form within 90 days of contract acceptance.

Upon contract work completion, complete a Final Report – Utilization of Disadvantaged Business Enterprises (DBE), First-Tier Subcontractors form. Submit it within 90 days of contract acceptance. The Department withholds $10,000 until the form is submitted. The Department releases the withhold upon submission of the completed form.

5-1.055C Disabled Veteran Business Enterprises

Section 5-1.055C, "Disabled Veteran Business Enterprises," applies to a non-Federal-aid contract.

If a DVBE goal is shown in the Notice to Bidders:

1. Use each DVBE as shown on the Certified DVBE Summary form unless you receive authorization for a substitution
2. The requirement that DVBEs be certified by the bid opening date does not apply to DVBE substitutions after contract award
3. Maintain records of subcontracts made with certified DVBEs. Include in the records:

    3.1. Name and business address of each business
    3.2. Total amount paid to each business

4. For the purpose of determining compliance with Pub Cont Code § 10115 et seq.:

    4.1. Provide the Department relevant information requested
    4.2. Upon reasonable notice and during normal business hours, permit access to its premises for the purpose of:

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

If no DVBE goal is shown in the Notice to Bidders and if you obtain DVBE participation, submit the participating DVBE names and value of work or supplies supplied by each DVBE transaction upon contract completion.

5-1.055D Non–Small Businesses

Section 5-1.055D, "Non–Small Businesses," applies to a non-Federal-aid contract.

Use each subcontractor as shown on the Certified Small Business Listing for the Non–Small Business Preference form unless you receive authorization for a substitution.

The requirement that small businesses be certified by the bid opening date does not apply to small business substitutions after contract award.

Maintain records of subcontracts made with certified small business subcontractors and records of materials purchased from certified small business suppliers. Include in the records:

1. Name and business address of each business
2. Total amount paid to each business

For the purpose of determining compliance with 2 CA Code of Regs § 1896 et seq.:

1. Provide the Department relevant information requested.
2. Upon reasonable notice and during normal business hours, permit access to its premises for the purpose of:

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

Replace Section 5-1.07 with:

5-1.07 LINES AND GRADES

The Engineer places stakes and marks under Chapter 12, "Construction Surveys," of the Department's Surveys Manual.
Submit your request for Department-furnished stakes:

1. On a Request for Construction Stakes form. Ensure:

    1.1. Requested staking area is ready for stakes
    1.2. You use the stakes in a reasonable time

2. A reasonable time before starting an activity using the stakes

Establish priorities for stakes and note priorities on the request.
Preserve stakes and marks placed by the Engineer. If the stakes or marks are destroyed, the Engineer replaces them at the Engineer's earliest convenience and deducts the cost.

Replace Section 5-1.116 with:

5-1.116 DIFFERING SITE CONDITIONS (23 CFR 635.109)

5-1.116A Contractor's Notification

Promptly notify the Engineer if you find either of the following:

1. Physical conditions differing materially from either of the following:

    1.1. Contract documents
    1.2. Job site examination

2. Physical conditions of an unusual nature, differing materially from those ordinarily encountered and generally recognized as inherent in the work provided for in the contract

Include details explaining the information you relied on and the material differences you discovered.
If you fail to notify the Engineer promptly, you waive the differing site condition claim for the period between your discovery of the differing site condition and your notification to the Engineer.
If you disturb the site after discovery and before the Engineer's investigation, you waive the differing site condition claim.

5-1.116B Engineer's Investigation and Decision

Upon your notification, the Engineer investigates job site conditions and:

1.