This 2015 edition of the California Department of Transportation Standard Plans is based on U.S. Customary units. This is the Department's third edition Standard Plans since the Department reverted back to U.S. Customary units as its base units. U.S. Customary units ("inch-pound") are defined by the National Institute of Standards and Technology (NIST). The last edition of the Department's Standard Plans published in U.S. Customary units only was the 2010 edition.

This 2015 edition of the Department's Standard Plans is to be used in conjunction with the 2015 edition of the Department's Standard Specifications.
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**Facing Westbound Traffic (FWBT)**
- **Flush Valve (FV)**
- **Elevation (Elev)**
- **Culvert (Cyl)**
- **Check Valve (CV)**

**Facing Southbound Traffic (FSBT)**
- **Electroliner (EdC)**
- **Concrete Barrier (Cyl)**
- **Concrete Surface (Cyl)**
- **Concrete Bound Fiber Matrix (CBF)**

**Facing Northbound Traffic (FNBT)**
- **Backed-Up Traffic (B-B)**
- **Flexible Roadway (Fr Rd)**
- **Drainage Inlet (DI)**
- **Equivalence Single Axle Load (ASRP)**

**Construction**
- **Bolt Circle (B-C)**
- **Face of Concrete (FOC)**
- **Column (Cyl)**
- **Concrete Barrier (Cyl)**

**End Wall (EW)**
- **End of Bridge (EB)**
- **End of Vertical Curve (ETV)**
- **Edge of Travelled Way (ETW)**
- **Emergency Vehicle Unit Cable (EVUC)**

**General Rules**
1. Words are preferred over abbreviations and acronyms.
2. Use only upper case letters in tables.
3. The above abbreviation and acronym are limited on the plan sheet.
4. Abbreviations and acronyms may be used in callouts, dimensions, and tables.
5. Abbreviations and acronyms may be used in callouts, dimensions, and tables.
6. Use upper case letters for acronyms.

**Units of Measurement**
1. See Tables A, B, and C on Standard Plan A3C.
2. Units of measurement are not part of abbreviations and acronyms.
3. The above abbreviation and acronym are limited on the plan sheet.
4. Abbreviations and acronyms may be used in callouts, dimensions, and tables.
5. Abbreviations and acronyms may be used in callouts, dimensions, and tables.
6. Use upper case letters for acronyms.

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SHOWING THE RELOCATION OF EXISTING FACILITIES TO THE NEW LOCATION

JOINT OVERHEAD/TRENCH

NEW FACILITY
NEW RECYCLED WATER
NEW TELEPHONE
NEW JOINT OVERHEAD
ABANDONED SYMBOL IS THE CELL "ABANDON"

NEW FACILITY
NEW OIL
NEW TELEPHONE
NEW JOINT TRENCH
ABANDON SYMBOL IS THE CELL "ABANDON"

NEW FACILITY
NEW GASOLINE
NEW TELEPHONE
NEW JOINT TRENCH
ABANDON SYMBOL IS THE CELL "ABANDON"

NEW FACILITY
NEW ELECTRICAL
NEW TELEPHONE
NEW JOINT OVERHEAD
ABANDON SYMBOL IS THE CELL "ABANDON"

NEW FACILITY
NEW FIBER OPTIC
NEW TELEPHONE
NEW JOINT TRENCH
ABANDON SYMBOL IS THE CELL "ABANDON"

NEW FACILITY
NEW JOINT OVERHEAD
ABANDON SYMBOL IS THE CELL "ABANDON"

NEW FACILITY
NEW JOINT TRENCH
ABANDON SYMBOL IS THE CELL "ABANDON"

NEW FACILITY
NEW JOINT TRENCH
ABANDON SYMBOL IS THE CELL "ABANDON"

NEW FACILITY
NEW JOINT TRENCH
ABANDON SYMBOL IS THE CELL "ABANDON"

NEW FACILITY
NEW JOINT TRENCH
ABANDON SYMBOL IS THE CELL "ABANDON"

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NEW JOINT TRENCH
ABANDON SYMBOL IS THE CELL "ABANDON"

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ABANDON SYMBOL IS THE CELL "ABANDON"

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ABANDON SYMBOL IS THE CELL "ABANDON"

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ABANDON SYMBOL IS THE CELL "ABANDON"

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NEW JOINT TRENCH
ABANDON SYMBOL IS THE CELL "ABANDON"

NEW FACILITY
NEW JOINT TRENCH
ABANDON SYMBOL IS THE CELL "ABANDON"

NEW FACILITY
NEW JOINT TRENCH
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NEW JOINT TRENCH
ABANDON SYMBOL IS THE CELL "ABANDON"

NEW FACILITY
NEW JOINT TRENCH
ABANDON SYMBOL IS THE CELL "ABANDON"
EXISTING UTILITY POINT FEATURES

EXISTING UTILITY CELL SYMBOLOGY REPRESENTING UTILITY POINT FEATURES

ATTACHED W / ETD RECORDS FOR EXISTING UTILITY FEATURES WILL BE LOCKED IN UTILITY DATABASE ONLY AS-BUILT FACILITIES ARE IN THE UTILITY DATABASE. UTILITY DATABASE DOES NOT INCLUDE NEW FACILITIES TO BE CONSTRUCTED.

- CABINET
  ELECTRICAL, FIBER OPTIC, TELECOMMUNICATION, TELEPHONE, TELEVISION
- DRAINAGE INLET
  SEWER, STORM DRAIN
- FIRE HYDRANT
  WATER
- LAMP POST
  ELECTRICAL
- METER
  ELECTRICAL, NATURAL GAS, WATER
- MANHOLE
  ELECTRICAL, FIBER OPTIC, GAS, JOINT FACILITY, NATURAL GAS OIL, RECYCLED WATER, SEWER, STEAM, STORM DRAIN, TELECOMMUNICATION, TELEPHONE, TELEVISION, WATER
- PULL BOX
  ELECTRICAL, FIBER OPTIC, JOINT FACILITY, TELECOMMUNICATION, TELEPHONE, TELEVISION
- POWER POLE
  ELECTRICAL, FIBER OPTIC, JOINT FACILITY, TELECOMMUNICATION, TELEPHONE, TELEVISION
- TRANSMISSION TOWER
  ELECTRICAL, FIBER OPTIC, JOINT FACILITY, TELECOMMUNICATION, TELEPHONE, TELEVISION
- VALVE
  WATER, NATURAL GAS
- VENT
  GAS, NATURAL GAS, SEWER, STEAM
- VAULT
  ELECTRICAL, JOINT FACILITY
<table>
<thead>
<tr>
<th>SYMBOL</th>
<th>HOLE TYPE</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>AUGER BORING (HOLLOW OR SOLID STEM BUCKET)</td>
<td></td>
</tr>
<tr>
<td>R</td>
<td>ROTARY DRILLED BORING (CONVENTIONAL)</td>
<td></td>
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<tr>
<td>RC</td>
<td>ROTARY DRILLED WITH SELF-CASING WIRE-LINE</td>
<td></td>
</tr>
<tr>
<td>P</td>
<td>ROTARY CORE BORING (AIR)</td>
<td></td>
</tr>
<tr>
<td>E</td>
<td>ROTARY DRILLED DIAMOND CORE</td>
<td></td>
</tr>
<tr>
<td>MD</td>
<td>HAND AUGER (1-INCH SOIL TUBE)</td>
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<tr>
<td>D</td>
<td>DYNAMIC CONE PENETRATION BORING</td>
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<tr>
<td>▲</td>
<td>CPT</td>
<td>CONE PENETRATION TEST (ASTM D 5776)</td>
</tr>
<tr>
<td>C3</td>
<td>OTHER (NOTE ON LOBT)</td>
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</tr>
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Note: Size in inches.

**CONSIDERATION OF COHESIVE SOILS**

<table>
<thead>
<tr>
<th>DESCRIPTION</th>
<th>SHEAR STRENGTH (tsf)</th>
<th>TUBULAR PENETROMETER MEASUREMENT, PP (tsf)</th>
<th>VANE SHEAR MEASUREMENT, VS (tsf)</th>
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<tbody>
<tr>
<td>VERY SOFT</td>
<td>LESS THAN 0.12</td>
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<td>SOFT</td>
<td>0.12 - 0.25</td>
<td>0.25 - 0.5</td>
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<td>MED / MEDIUM STIFF</td>
<td>0.25 - 0.5</td>
<td>0.5 - 1</td>
<td>0.5 - 1</td>
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<tr>
<td>STIFF</td>
<td>0.5 - 1</td>
<td>1 - 2</td>
<td>0.5 - 1</td>
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<tr>
<td>VERY STIFF</td>
<td>1 - 2</td>
<td>2 - 4</td>
<td>1 - 2</td>
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<tr>
<td>HARD</td>
<td>GREATER THAN 2</td>
<td>GREATER THAN 4</td>
<td>GREATER THAN 2</td>
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<thead>
<tr>
<th>SYMBOL</th>
<th>HOLE I.D.</th>
<th>DESCRIPTION</th>
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<tbody>
<tr>
<td>TOP HOLE ID</td>
<td>ABOUT 15</td>
<td>DESCRIPTION OF MATERIAL SITE OF SAMPLER (INCHES)</td>
</tr>
<tr>
<td>SPT</td>
<td>N-VALUE</td>
<td>FIELD POSTED AS NOTED</td>
</tr>
<tr>
<td>P</td>
<td>PULLS</td>
<td>MATERIAL CHANGE (AS NOTED)</td>
</tr>
<tr>
<td>E</td>
<td>ESTIMATED MATERIAL CHANGE (AS NOTED)</td>
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</tr>
<tr>
<td>BOREHOLE IDENTIFICATION</td>
<td>SAMPLE</td>
<td>TAKEN</td>
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<tr>
<td>BOREHOLE IDENTIFICATION</td>
<td>TIP BEARING (tsf)</td>
<td>MEASURED</td>
</tr>
<tr>
<td>BOREHOLE IDENTIFICATION</td>
<td>PRESSURE MEASURED ALONG SLEEVE FRICTION ELEMENT (12.33 SQUARE INCHES AREA)</td>
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</tr>
<tr>
<td>BOREHOLE IDENTIFICATION</td>
<td>BOREHOLE IDENTIFICATION</td>
<td>DYNAMIC CONE PENETRATION BORING</td>
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<tr>
<td>BOREHOLE IDENTIFICATION</td>
<td>CPT</td>
<td>CONE PENETRATION TEST (CPT) BORING</td>
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</tbody>
</table>

**REFERENCE:** CALTRANS SOIL & ROCK LOGGING, CLASSIFICATION, AND PRESENTATION MANUAL (2010)
TYPICAL LANE LINE DELINEATION
IN ADVANCE OF EXIT RAMP

NOTE:
Detail 14 is to be used in combination
with detail 13. Detail 14A is to be used
in combination with detail 12.

LEGEND
MARKERS
O TYPE A WHITE NON-REFLECTIVE
O TYPE AY YELLOW NON-REFLECTIVE
O TYPE C RED-CLEAR RETROREFLECTIVE
O TYPE D TWO-WAY YELLOW RETROREFLECTIVE
O TYPE G ONE-WAY CLEAR RETROREFLECTIVE
O TYPE H ONE-WAY YELLOW RETROREFLECTIVE

LINES
4" WHITE
4" YELLOW

MARKER DETAILS

TYPE A AND TYPE AY
TYPE C AND TYPE D
TYPE G AND TYPE H

RETROREFLECTIVE FACE

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION
PAVEMENT MARKERS
AND TRAFFIC LINES
TYPICAL DETAILS
NO SCALE

A20A

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FOR RECESSED INSTALLATION
LANE LINE EXTENSIONS THROUGH INTERSECTIONS
INTERSECTION LINE
BIKE LANE LINE
LANE LINE EXTENSIONS THROUGH INTERSECTIONS
CENTER LINE EXTENSIONS THROUGH INTERSECTIONS
MARKER DETAILS
RECESS DETAIL FOR RETROREFLECTIVE PAVEMENT MARKER
RECESSED MARKER NOTES:
1. See typical traffic line details for marker patterns to be used with pavement marking patterns as shown on this plan sheet that require a Type 2 recess.
2. The retroreflective pavement markers shown for recessed installations are not to be used for non-recessed installations.
3. The top of pavement markers installed in recesses shall be 0 to 1/8" below the pavement surface.

TYPE C AND TYPE D
TYPE C AND TYPE H
See Notes 1 and 2.

RETROREFLECTIVE PAVEMENT MARKER
FOR RECESSED INSTALLATION

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION
PAVEMENT MARKERS AND TRAFFIC LINES TYPICAL DETAILS
NO SCALE
A2OD
NOTE:
Minor variations in dimensions may be accepted by the Engineer.
RAILROAD CROSSING SYMBOL

* 70 ft² does not include the 2'-0" x variable width transverse lines.

NOTE:

Minor variations in dimensions may be accepted by the Engineer.

A24B

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

PAVEMENT MARKINGS
ARROWS AND SYMBOLS

NO SCALE

A24B
1. If a message consists of more than one word, it must read "UP," i.e., the first word must be nearest the driver.

2. The space between words must be at least four times the height of the characters for low speed roads, but not more than ten times the height of the characters. The space may be reduced appropriately where there is limited space because of local conditions.

NOTES:

3. Minor variations in dimensions may be accepted by the Engineer.

4. Portions of a letter, number or symbol may be separated by connecting segments not to exceed 2" in width.

The height of the characters for low speed roads, but not more than ten times the height of the characters. The space may be reduced appropriately where there is limited space because of local conditions.

- A=6 ft
- A=5 ft
- A=10 ft
- A=18 ft
- A=22 ft
- A=26 ft
- A=19 ft
- A=23 ft
- A=24 ft
- A=32 ft
- A=35 ft
- A=43 ft

NO SCALE

DEPARTMENT OF TRANSPORTATION
STATE OF CALIFORNIA

PAVEMENT MARKINGS
WORDS MARKINGS

Return to Table of Contents
1. If a message consists of more than one word, it must read "up", i.e., the first word must be nearest the driver.

2. The space between words must be at least four times the height of the characters for low-speed roads, but not more than ten times the height of the characters. The space may be reduced appropriately where there is limited space because of local conditions.

3. Minor variations in dimensions may be accepted by the Engineer.

4. Portions of a letter, number or symbol may be separated by connecting segments not to exceed 2" in width.

5. The words "NO PARKING" pavement marking is to be used for parking facilities. For typical locations of markings, see Standard Plans A90A and A90B.

6. The words "NO PARKING" shall be painted in white letters not less than 1'-0" high on a contrasting background and located so that it is visible to traffic enforcement officials.

NOTES:

PORTIONS OF A LETTER, NUMBER OR SYMBOL MAY BE SEPARATED BY CONNECTING SEGMENTS NOT TO EXCEED 2" IN WIDTH.

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

PAVEMENT MARKINGS
WORDS, LIMIT AND YIELD LINES

NO SCALE

2015 STANDARD PLAN A24E

A24E

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NOTES:
1. Spaces between markings must be placed in wheel tracks of each lane.
2. Spacings not to exceed 2.5 times width of longitudinal line.
3. All crosswalk markings must be white except those near schools must be yellow.
TYPICAL GROUND-IN RUMBLE STRIP
SHOULDER PLACEMENT

NOTES:
1. Where bicycles are permitted, shoulder rumble strips should not be used right of direction of travel unless a minimum of 5'-0" of clear shoulder width for bicycle use is available between the rumble strip and the outer edge of the shoulder.

2. Where bicycles are not permitted, a minimum of 4'-0" of distance is required between the rumble strip and the outer edge of the shoulder.

Unless otherwise shown on the plans or specified in the special provisions, the 6" offset from the edge of traveled way to the edge of the rumble strip shall be used for rumble strip placement right of the direction of travel.
1. This drawing indicates the work to be done and limits of payment for:

- Roadway Excavation
- Ditch Excavation
- Structure Excavation for Slope Protection

2. Slopes and dimensions may vary to fit field conditions.

3. Top limit of structure excavation is original ground if ditch is not excavated.

NOTES:
### Notes:

1. Roadway embankment is not delineated on excavation drawings for clarity.
2. Embankment, if any, must be in place before structure excavation is made.
3. If no roadway or ditch excavation or embankment is involved at the wall, structure excavation will be measured from the original ground.
4. No deduction for crib wall member volumes is made from structure backfill quantities.
5. When an embankment settlement period is required, the upper limits of structure excavation are raised to conform to the elevation of the embankment after the settlement period or, when an embankment surcharge is used to the finished surface and grading plane elevations.
6. Embankment slopes to be as steep as material permits, slope assumed to be 1:1 for purposes of quantity calculations.

---

### Bridge Embankment Surcharge

**Limits of Payment for Excavation and Backfill**

**Bridge Embankment Surcharge and Wall**
Roadway embankment is not delineated on excavation drawings for clarity. Embankment must be in place before structure excavation is made.

If no roadway excavation is involved at bridge, structure excavation is measured from original ground.
1. Unless otherwise shown on the plans or specified in the special provisions, the Contractor shall have the option of selecting the class of RCP and the method of backfill to be used, provided the height of cover does not exceed the value shown for the RCP selected.

Examples:
- 2'-0" RCP culvert with maximum cover of 19'-0" the options are:
  a) Class I Special or stronger with Method 1.
  b) Class III or stronger with Method 2.
  c) Class III or stronger with Method 3.

2. The class of RCP, method of backfill and bedding selected shall be the same throughout the length of any given culvert.

3. The "height of any culvert" is defined as the vertical distance from the top of pipe to finished grade within the length of any given culvert.

4. Slope or shore excavation sides as necessary.

5. Embankment height prior to excavation for installation of all classes of RCP under Methods 2 and 3A shall be as follows:
   - Pipe sizes 1'-0" to 3'-6", ID = 2'-6"
   - Pipe sizes 4'-0" to 7'-0", ID = 2'-6"
   - Pipe sizes larger than 7'-0", ID = 3'-0"

6. The maximum size for all classes of RCP placed under Method 1 is 6'-6" ID.

7. Non-reinforced precast pipe sizes 3'-0" or smaller may also be placed under Methods 2 and 3A.

8. Oval or arch shaped RCP shall be placed under Method 2 only.

9. Backfill shall be placed full width of excavation except where dimensions are shown for backfill width or thickness. Dimensions shown are minimums.

10. Backfill shall be placed per the fill height allowed shall not exceed that shown for the cast-in-place pipe.

11. Unless otherwise shown on the plans or specified in the special provisions, the Contractor shall have the option of selecting the class of RCP and the method of backfill to be used, provided the height of cover does not exceed the value shown for the RCP selected.

12. The inlet and outlet end of the culvert when there are no intervening drainage structures, a drainage structure and the inlet or outlet end of the culvert:
   a) 2'-0" RCP culvert with maximum cover of 19'-0" the options are:
      - Class I Special or stronger with Method 1.
      - Class III or stronger with Method 2.
      - Class III or stronger with Method 3.

13. Soil cement bedding shall be placed under Method 2 only.

14. The fill height allowed shall not exceed that shown for the cast-in-place pipe.

15. The inlet and outlet end of the culvert when there are no intervening drainage structures:
   a) Class I Special or stronger with Method 1.
   b) Class III or stronger with Method 2.
   c) Class III or stronger with Method 3.
INSTALLATION TYPE 1:
The haunch and outer bedding shall be compacted to a minimum 90 percent relative compaction. In addition, the minimum sand equivalent in these areas shall be 25 and the maximum percent passing the No. 200 sieve size shall be 12.

INSTALLATION TYPE 2:
The haunch and outer bedding shall be compacted to a minimum 80 percent relative compaction. In addition, the minimum sand equivalent in these areas shall be 30 and the maximum percentage passing the No. 200 sieve size shall be 12.

INSTALLATION TYPE 3:
The haunch and outer bedding shall be compacted to a minimum 90 percent relative compaction. In addition, the minimum sand equivalent in these areas shall be 25 and the maximum percent passing the No. 200 sieve size shall be 12.

NOTES:
1. Unless otherwise shown on the plans or specified in the special provisions, the contractor shall have the option of selecting the class of RCP and the type of installation to be used, provided the height of cover does not exceed the value shown for the RCP selected.
2. The class of RCP and installation selected shall be the same throughout the length of any given culvert.
3. The "length of any culvert" is defined as the culvert between:
   a) a drainage structure and the inlet or outlet end of the culvert,
   b) a drainage structure and the inlet or outlet end of the culvert. The inlet and outlet end of the culvert when there are no intervening drainage structures.
   c) The inlet and outlet end of the culvert when there are no intervening drainage structures.
4. Oval and arch shaped RCP shall not be used.
5. Beadings: (0) 00 Min, not less than 3.
6. Slurry cement backfill may be substituted for backfill in the outer bedding and haunch areas, if slurry is used, the outer and middle bedding shall be omitted. Prior to installation, the soil under the middle 1/3 of the outside diameter of the pipe shall be softened by scarifying or other means to a minimum depth of 6" OD, but not less than 3", where slurry cement backfill is used, clear distance to trench wall may be reduced as set forth in the Standard Specifications.
7. Backfill shall be placed full width of excavation except where dimensions are shown for backfill width or thickness. Dimensions shown are minimum.
8. Lower side shall be suitable material as determined by the Engineer. Otherwise, it shall be considered unsuitable as set forth in the Standard Specifications, See Note 9.
9. Where the pipe is placed in a trench, if the trench walls are sloped at a vertical to horizontal ratio of 1 horizontal for at least 80 percent of the trench height or up to not less than 12" from the grading planes, the firmness of the soil in the lower side need not be considered.
10. Non-reinforced prestressed concrete pipe sizes 3'-0" or smaller may be placed under installation Types 1, 2 or 3.
EXCAVATION AND BACKFILL
CAST-IN-PLACE
REINFORCED CONCRETE BOX
AND ARCH CULVERTS

NOTES:
1. Slope or shore excavation sides as necessary.
2. Dimensions shown are minimum.

LEGEND

- STRUCTURE EXCAVATION (CULVERT)
- STRUCTURE BACKFILL (CULVERT)
- 95% RELATIVE COMPACTION
- ROADWAY EMBANKMENT

State of California
Department of Transportation

EXCAVATION AND BACKFILL
REINFORCED CONCRETE BOX
AND ARCH CULVERTS
NO SCALE

Carl M. Duan
October 30, 2015

Return to Table of Contents
NOTES:
1. PIPES: 30" minimum for diameters up to and including 42" then 35" diameter but no more than 60" required. Corrugated metal pipe arches 30" maximum.
2. h up to 60" maximum.
3. Slope or shore excavation sides as necessary.
4. Backfill shall be placed full width of excavation except as noted.
5. Diagrams do not apply to overside drains.
6. Dimensions shown are minimum.
7. Construction strutting of structural steel plate pipe, arches and vehicular undercrossing to be used when shown on the project plans. When shown, see standard plan D88A for strutting requirements.
8. Excavation below pipe and 80% relative compaction requirements for plastic pipes only.
9. D is the inside diameter (ID) of the pipe.

LEGEND

- STRUCTURE EXCAVATION (CULVERT)
- ROADWAY EMBANKMENT
- STRUCTURE BACKFILL (CULVERT)
- 95% RELATIVE COMPACTION
- STRUCTURE BACKFILL (CULVERT)
- 80% RELATIVE COMPACTION

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

EXCAVATION AND BACKFILL
METAL AND PLASTIC CULVERTS

NO SCALE

A62F
EXCAVATION
BACKFILL
IN TRENCH

EXCAVATION
BACKFILL
IN EMBANKMENT

FILL HEIGHT GREATER THAN 2'-0"

EXCAVATION
METHOD 1
BACKFILL

METHOD 2

METHOD 3

EXCAVATION
BACKFILL
FILL HEIGHT 2'-0" OR LESS

* 1'-0" Where Method 1 or 2 Backfill is used.
2'-0" Where Method 3 Backfill is used.

NOTES:
1. Slope or shore excavation sides as necessary.
2. Dimensions shown are minimum.
3. Method 2 and 3 for single or multiple boxes requires an approved external sealing bond.
See Standard Plan 383A.

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION
EXCAVATION AND BACKFILL PRECAST
REINFORCED CONCRETE BOX CULVERT
NO SCALE

Carl M. Duan
REGISTERED CIVIL ENGINEER

October 30, 2015
Iss. Date
Dist
No.
SHEETS
No.
TOTAL

THE ACCURACY OR COMPLETENESS OF SCANNED OR AGENTS SHALL NOT BE RESPONSIBLE FOR
THE STATE OF CALIFORNIA OR ITS OFFICERS

October 30, 2015
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PORTABLE CONCRETE BARRIER (TYPE 60K)

NOTES:
1. Interconnected panels of the following types:
   - "N" Panels - Notched concrete end at both ends of panel. Majority of panels used for portable barrier are "N" Panels.
   - "T" Panels - Notched concrete end at one end of the panel and a vertical concrete face at the other end of the panel used to connect "N" Panels to the "N" Panels.
   - "R" Panels - Vertical concrete face at both ends of the panel. Used to connect "N" Panels to the "R" Panels.

2. Connection Plate Configurations Type A and Type B apply to "N", "T" and "R" Panels. The ends of Connection Plates No. 3 overlap the ends of Connection Plate No. 2. One connection pin inserted through the holes in Connection Plates No. 4 and No. 2.

For Details of "T" and "R" Panels and Typical layouts of portable concrete barrier (Type 60K), see Standard Plan A63A.
NOTE:
1. The marker shall be white (non-reflective) target plate with black Series D numerals and letters, except that minor variations in design and dimensions may be permitted to meet manufacturer's standards.

2. A post mile prefix, such as "R", shall apply only when directed by the Engineer.

3. "H" (right), "A" (ahead), or a blank space shall apply as directed by the Engineer.

4. All information shall be in U.S. Customary units (miles).

NOTE:
A. See Std Plan A73A for additional object markers.
B. Type P(CA) and R(CA) markers shall have orange and white retroreflective stripes in work zones.
C. Diagonal stripes on Type P(CA) markers shall be sloped down in the direction of travel.

HIGHWAY POST MARKER NOTES:
1. The marker shall be white (non-reflective) target plate with black Series D numerals and letters, except that minor variations in design and dimensions may be permitted to meet manufacturer's standards.

2. A post mile prefix, such as "R", shall apply only when directed by the Engineer.

3. "H" (right), "A" (ahead), or a blank space shall apply as directed by the Engineer.

4. All information shall be in U.S. Customary units (miles).

Notes:
A. See Std Plan A73A for additional object markers.
B. Type P(CA) and R(CA) markers shall have orange and white retroreflective stripes in work zones.
C. Diagonal stripes on Type P(CA) markers shall be sloped down in the direction of travel.

The marker shall be white (non-reflective) target plate with black Series D numerals and letters, except that minor variations in design and dimensions may be permitted to meet manufacturer's standards.

A post mile prefix, such as "R", shall apply only when directed by the Engineer.

"H" (right), "A" (ahead), or a blank space shall apply as directed by the Engineer.

All information shall be in U.S. Customary units (miles).

Notes:
A. See Std Plan A73A for additional object markers.
B. Type P(CA) and R(CA) markers shall have orange and white retroreflective stripes in work zones.
C. Diagonal stripes on Type P(CA) markers shall be sloped down in the direction of travel.

The marker shall be white (non-reflective) target plate with black Series D numerals and letters, except that minor variations in design and dimensions may be permitted to meet manufacturer's standards.

A post mile prefix, such as "R", shall apply only when directed by the Engineer.

"H" (right), "A" (ahead), or a blank space shall apply as directed by the Engineer.

All information shall be in U.S. Customary units (miles).

Notes:
A. See Std Plan A73A for additional object markers.
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The marker shall be white (non-reflective) target plate with black Series D numerals and letters, except that minor variations in design and dimensions may be permitted to meet manufacturer's standards.

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Notes:
A. See Std Plan A73A for additional object markers.
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C. Diagonal stripes on Type P(CA) markers shall be sloped down in the direction of travel.

The marker shall be white (non-reflective) target plate with black Series D numerals and letters, except that minor variations in design and dimensions may be permitted to meet manufacturer's standards.

A post mile prefix, such as "R", shall apply only when directed by the Engineer.

"H" (right), "A" (ahead), or a blank space shall apply as directed by the Engineer.

All information shall be in U.S. Customary units (miles).
DELINERATORS, CHANNELIZERS AND BARRICADES

NOTES:

1. The retroreflective sheeting used on the back of delineator shall be a minimum size of 3" x 3".
2. The type of delineator to be installed will be designated on the plans.
3. All barricade stripes shall be retroreflective and sloped downward in the direction of the opened traffic lane.
5. Unless shown otherwise on the plans, or as directed by the Engineer, the color of the retroreflective sheeting for permanent channelizers shall conform to the color of the pavement markings it supplements.
6. Except, Class 1 (Flexible Post) temporary delineators and temporary channelizers in work zones shall be orange post with white retroreflective sheeting.

TABLE 1 - DELINERATORS

<table>
<thead>
<tr>
<th>TYPE</th>
<th>RETROREFLECTIVE SHEETING</th>
</tr>
</thead>
<tbody>
<tr>
<td>E</td>
<td>White Red (See Note 1)</td>
</tr>
<tr>
<td>F</td>
<td>White White (See Note 1)</td>
</tr>
<tr>
<td>G</td>
<td>Yellow None</td>
</tr>
<tr>
<td>J</td>
<td>Red None</td>
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</tbody>
</table>

TABLE 2 - BARRICADES

<table>
<thead>
<tr>
<th>BARRICADE</th>
<th>TYPE I</th>
<th>TYPE II</th>
</tr>
</thead>
<tbody>
<tr>
<td>WIDTH OF RAIL</td>
<td>6&quot; Min - 12&quot; Max *</td>
<td>6&quot; Min - 12&quot; Max *</td>
</tr>
<tr>
<td>LENGTH OF RAIL</td>
<td>24&quot; Min</td>
<td>24&quot; Min</td>
</tr>
<tr>
<td>WIDTH OF STRIPES **</td>
<td>6&quot;</td>
<td>6&quot;</td>
</tr>
<tr>
<td>HEIGHT</td>
<td>36&quot; Min</td>
<td>36&quot; Min</td>
</tr>
<tr>
<td>NUMBER OF RETROREFLECTIVE RAIL PAGES</td>
<td>2 (ONE EACH DIRECTION)</td>
<td>4 (TWO EACH DIRECTION)</td>
</tr>
</tbody>
</table>

* For the wooden option dimensions are nominal lumber dimensions.
** For rails less than 36" long, 4" wide stripes shall be used.

NOTE A:

Barricades to have a minimum of 270 square inches of retroreflective area facing traffic when used on freeways, expressways, and other high-speed highways.

* 36" Min where speeds are 40 miles/h or less.

CHANNELIZERS

SHEETING, SEE NOTE 5

SOIL EMBEDDED

SHEETING, SEE NOTE 5

SURFACE MOUNT

POST, SEE NOTE 6

POST, SEE NOTE 6

DISTRICT

STATE OF CALIFORNIA

DEPARTMENT OF TRANSPORTATION

October 30, 2015

2015 STANDARD PLAN A73C

Atifa Ferouz

C80402

3-31-17

9-22-15

October 30, 2015

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### NOTES:

1. The configuration of the cast iron or cast steel frame and cover may vary from that shown.
2. Frame shall be embedded in the concrete a minimum of 3".
CONCRETE BARRIER TYPE 60 DELINEATION

See note 5

CONCRETE BARRIER TYPE 60A
Details similar to Type 60 except as noted.

CONCRETE BARRIER TYPE 60

NOTES:

1. See Standard Plan A76A for details of Concrete Barrier Type 60 and anchor connection to structures and transitions to Concrete Barrier Type 50 and Concrete Barrier Type 60S.

2. See Standard Plan A76C for Concrete Barrier Type 60 transitions at bridge column and sign pedestals.

3. Where glare screen is required on Concrete Barrier Type 60, use Concrete Barrier Type 60A.

4. Where roadbed offset is greater than 1½", see Concrete Barrier Type 60C.

5. See Project Plans for barrier delineation locations.

6. Reinforcing stirrups not required for roadbed offsets less than 1½".

1. For roadbed surfaces offset greater than 1½" and less than or equal to 3", no reinforcement required. For roadbed surfaces offset greater than 3" and less than or equal to 6", use two #4 Reinft at 3" above the lower roadbed surface. For roadbed surfaces offset greater than 6" and less than or equal to 12", use two #4 Reinft at 3" above the lower roadbed surface and two #4 Reinft at 6" above the lower roadbed surface. For roadbed surfaces offset greater than 12" and less than or equal to 36", use two #4 Reinft at 3" above the lower roadbed surface and two #4 Reinft at every 8" increment vertical spacing above the first two #4 Reinft.

CONCRETE BARRIER TYPE 60C
Details similar to Type 60 except as noted. Use concrete barrier and anchor when necessary. 36" roadbed surfaces offset shown.

CONCRETE BARRIER TYPE 60D

OFFSET ROADBED SURFACES

SEENOTE7

SEE NOTE 4
Max OFFSET 1½" ROADBED SURFACES

0% SLOPE

24"
1. See Standard Plan A76A for Concrete Barrier Type 60 and Type 60A.
2. Footing monolithic or dowelled with 2-#8 x 8" @ 2'-0". The footing is required at concrete barrier ends and at interruptions in concrete barrier.
3. 10" concrete barrier footing extends 10' back from structure.
4. See Standard Plan A78B for transition to Thrie Beam Barrier.
A. Place 4" PCC at base between concrete barrier walls.

B. Place 1'-0" of granular material at base between walls.

C. Place granular material from base to bottom of 4" cap.

SECTION A-A

TRANSITION AT BRIDGE COLUMNS

Concrete Barrier Type 60F

See Note 7

NOTES:

1. See Standard Plan A76A for Concrete Barrier Type 60.
2. Contractor options for fill between concrete barrier walls:
   A. Place 4" PCC at base between concrete barrier walls.
   B. Place 1'-0" of granular material at base between walls.
   C. Place granular material from base to bottom of 4" cap.
   D. Monolithic concrete with form blockouts is not permitted.
3. Reinforcing steel shall extend continuous through construction joints.
4. See Overhead Sign plans for sign pedestal elevations on new construction.
5. Adjust height of concrete barrier wall on low side of offset or superelevated roadways to provide level grade across top of concrete barrier cap.
7. All locations with limited shoulder width available for barrier, see Standard Plan A76E for use of Concrete Barrier Type 60E.

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

CONCRETE BARRIER TYPE 60F
NO SCALE

A76C
Details similar to Type 60G except as noted.

36" roadbed surfaces offset shown.

NOTES:

1. See Standard Plan A76E for details of Concrete Barrier Type 60G and transition to structures and transitions to Concrete Barrier Type 60G.

2. See Standard Plan A76F for Concrete Barrier Type 60G transitions at bridge column and sign pedestals.

3. Where roadbed offset is greater than 1½", see Concrete Barrier Type 60GC.

4. Barrier delineation to be used when required by the Special Provisions.

5. Reinforcing stirrup not required for offsets less than 1'-0".

6. For roadbed surfaces offset greater than 1½" and less than or equal to 3", no reinforcement required. For roadbed surfaces offset greater than 3" and less than or equal to 6", use two #4 Reinf at 3" above the lower roadbed surface. For roadbed surfaces offset greater than 6" and less than or equal to 12", use two #6 Reinf at 3" above the lower roadbed surface and two #8 Reinf at 8" above the lower roadbed surface. For roadbed surfaces offset greater than 12" and less than or equal to 24", use two #8 Reinf at 3" above the lower roadbed surface and two #10 Reinf at every 8" increment vertical spacing above the first two #8 Reinf.
CONCRETE BARRIER TYPE 60G CONNECTION TO STRUCTURE

CONCRETE BARRIER TYPE 60G END ANCHORAGE

TRANSITION CONCRETE BARRIER TYPE 60G TO CONCRETE BARRIER TYPE 60

TRANSITION CONCRETE BARRIER TYPE 60G TO CONCRETE BARRIER TYPE 60S

NOTES:
1. See Standard Plan A76D for Concrete Barrier Type 60G and Type 60GA.
2. Footing monolithic or doweled with 2-#8 x 8" @ 2'-0". The footing is required at concrete barrier ends and at interruptions in concrete barrier.
3. 10" concrete barrier footing extends 10' back from structure.
4. See Standard Plan A76I for transition to Thrie Beam Barrier.

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION
CONCRETE BARRIER TYPE 60G
NO SCALE

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LIMITS OF PAYMENT FOR CONCRETE BARRIER TYPE 60GE

SECTION A-A

LIMITS OF PAYMENT FOR CONCRETE BARRIER TYPE 60GE

SECTION B-B

SECTION C-C

ELECTRICAL PULL BOX FOR SIGN FLUSH WITH TOP OF CONCRETE BARRIER CAP

SECTION D-D

NOTES:
1. See Standard Plan A76F for Concrete Barrier Type 60GE.
2. Contractor options for fill between concrete barrier walls:
   a. Place 4" PCC at base between concrete barrier walls.
   b. Place 1'-0" of granular material at base between walls.
   c. Place 4" PCC at base between concrete barrier walls.
3. Reinforcing steel shall extend continuous through construction joints.
4. See Overhead Sign plans for sign pedestal elevations on new construction.
5. Adjust height of concrete barrier wall on low side of offset or superelevated roadways to provide level grade across top of concrete barrier cap.
CONCRETE BARRIER TYPE 60S
Details similar to Type 60S except as noted.

CONCRETE BARRIER TYPE 60SC
Details similar to Type 60S except as noted. Use concrete barrier and anchor when necessary.
36” roadbed surfaces offset shown.

CONCRETE BARRIER TYPE 60S DELINEATION

NOTES:
1. See Standard Plan A76G for details of Concrete Barrier Type 60S end anchors, connection to structures and transitions to Concrete Barrier Type 50.
2. See Standard Plan A76G for Concrete Barrier Type 60S transitions at bridge column and sign pedestals.
3. Where glare screen is required on top of concrete barrier, use Concrete Barrier Type 60SC.
4. Where roadbed offset is greater than 1½” see Concrete Barrier Type 60SC.
5. Barrier delineation to be used when required by the Special Provisions.
6. Reinforcing stirrup not required for roadbed offsets less than 1½”.
7. For roadbed surfaces offset greater than 1½” and less than or equal to 3”, no reinforcement required. For roadbed surfaces offset greater than 3” and less than or equal to 8”, use two #4 Rein on 3” above the lower roadbed surface. For roadbed surfaces offset greater than 8” and less than or equal to 12”, use two #4 Rein 3” above the lower roadbed surface and two #4 Rein at 3” above the lower roadbed surface and two #4 Rein at every 8” increment vertical spacing above the first two #4 Rein.

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

CONCRETE BARRIER TYPE 60S
NO SCALE

A76G

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See Standard Plan A76G for Concrete Barrier Type 60S and Type 60SA.

required at concrete barrier ends and at interruptions in concrete barrier.

Footing monolithic or doweled with 2-#8 x 8" @ 2'-0". The footing is required at concrete barrier ends and at interruptions in concrete barrier.

10" concrete barrier footing extends 10'-0" back from structure.

See Standard Plan A78H for transition to Thrie Beam Barrier.
TRANSITION AT BRIDGE COLUMNS

Concrete Barrier Type 60SF

See Note 7

TRANSITION AT SIGN PEDESTAL

Concrete Barrier Type 60SF

See Note 7

NOTES:
1. See Standard Plan A76G for Concrete Barrier Type 60SF.
2. Contractor options for fill between concrete barrier walls:
   a. Place 4" PCC at base between concrete barrier walls.
   b. Place 1'-0" of granular material at base between walls.
   c. Place granular material from base to bottom of 4" cap.
   d. Monolithic concrete with foam blockout is not permitted.
3. Reinforcing steel shall extend continuous through construction joints.
4. See Overhead Sign plans for sign pedestal elevations on new construction.
5. Adjust height of concrete barrier wall on low side of offset or superelevated roadways to provide level grade across top of concrete barrier cap.
7. All locations with limited shoulder width available for barrier, see Standard Plan A76F for use of Concrete Barrier Type 60GE.
SECTION A-A
(Concrete Barrier Type 60 shown)

ELEVATION
See Notes 1 and 2

NOTES:
1. Type S Passageway typically used for crossing of small size animals.
2. See Standard Plan A76A for typical details of Concrete Barrier Type 60.
1. Type M Passageway typically used for crossing of medium size animals.

2. For details of the thrie beam element and hardware, see the A78 series of the Standard Plans. For details of Concrete Barrier Type 60, see the A76 series of the Standard Plans.

3. The end cap, and the thrie beam element, may be spliced together prior to bolting the elements to the concrete barrier. All 8 splice bolts to connect the end cap to the rail element are not required. The top and bottom splice bolts with washers and nuts shall be used.
NOTES:

1. Type L Passageway typically used for crossing of large size animals.

2. Barrier and anchorage shall be constructed as shown in Section A-A of this plan or as shown on Standard Plan A76B.

CONCRETE BARRIER
WILDLIFE PASSAGEWAY
(TYPE L)

NO SCALE
RAIL ELEMENT
SECTION THRU
Œ

SECTION A-A
TYPICAL WOOD LINE
POST INSTALLATION
ELEVATION

RAIL ELEMENT SPLICE DETAIL

ELEVATION
RAIL ELEMENT SPLICE DETAIL

MIDWEST GUARDRAIL SYSTEM WITH WOOD POST AND BLOCKS

NOTES:
1. For details of steel post installations, see Standard Plan A77L2.
2. For details of standard hardware used to construct MGS, see Standard Plan A77N1.
3. For details of wood posts and wood blocks used to construct MGS, see Standard Plan A77N1.
4. For additional installation details, see Standard Plan A77N3.
5. At typical layouts, see the ATP, AT10 and AT11 series of Standard Plans.
6. If railing is connected to terminal system end treatment, use 31" height terminal system and treatment.
7. For MGS end anchor details, see Standard Plans A77S1 and A77T2.
8. For details of MSG transition to bridge railing, see Standard Plan A77U3.
9. For additional details of MSG connection to bridge railing, see Standard Plans A77U1, A77U2 and A77U4.
10. For additional installation details, see Standard Plans A77U6, A77U7 and A77U8.
11. For MGS connection details to documents and walls, see Standard Plan A77V4.
12. For typical MGS delineation and line positioning details, see Standard Plan A77V8.
13. Slot plus hole for bolted connection of rail element to block and post.
14. Slot plus hole for bolted connection to overlap ends of rail element.
15. Additional hole in uppermost portion of line post is for potential future adjustments of railing height, see Standard Plan A77V9.

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION
MIDWEST GUARDRAIL SYSTEM
STANDARD RAILING SECTION
(WOOD POST WITH WOOD BLOCK)
NO SCALE
A77L1

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RAIL ELEMENT SPLICE DETAIL

Connect the overlapped end of the rail elements with 
3/8" x 1/2" button head oval shoulder splice bolts
inserted into the 3/8" x 1/2" slots and bolted together
with 3/8" recessed hex nuts. Recess of hex nut points
b) The ends of the rail elements are to be overlapped in the
toward rail element. A total of 4 bolts and nuts
direction of traffic (see details).
a) are to be used at each rail splice connection.

c) where end cap is to be attached to the end of a rail
element, a total of 4 of the above described splice bolts
and nuts are to be used.

NOTES:
1. For details of wood post installations, see Standard
   Plan A77L1.
2. For details of standard hardware used to construct MGS,
   see Standard Plan A77N1.
3. For details of steel posts and notched wood blocks used to
   construct MGS, see Standard Plan A77N2.
4. For additional installation details, see Standard
   Plan A77N3.
5. MGS post spacing to be 6'-3" center to center,
   except as otherwise noted.
6. For MGS typical layouts, see the A77M, A77Q and
   A77R Series of Standard Plans.
7. If railing is connected to terminal system end treatment,
   use 31" height terminal system and treatment.
8. For MGS end anchor details, see Standard Plane
   A77S1 and A77T2.
9. For details of MGS transition to bridge railing,
   see Standard Plan A77U1.
10. For additional details of MGS connection to bridge railings,
    see Standard Plans A77U1, A77U2 and A77V1.
11. For dive positioning and MGS delineation details,
    see Standard Plans A77Q and A77T2.
13. Slotted hole for bolted connection of rail element to block
and post.
14. Slotted holes for splice bolts to overlap ends of rail element.
POST INSTALLATION

1. For wood post and wood block, toenail with 2-16d Galv nails to top of block. For steel post and notched wood or plastic block, toenail with 2-16d Galv nails to top of block.

2. A 6'-0" length steel foundation tube, TS 8 x 6 x ¾", without a soil plate, may be furnished and installed in place of the 4'-6" length steel foundation tube and soil plate shown. Minimum embedment of the 6'-0" length tube shall be 5'-9" x ¾" hex head bolt and nut shall be installed in the hole in the 6'-0" length tube to keep the wood post from dropping into the tube.

3. To connect railing to 27" terminal system end treatment, transition the top of rolling height at a ratio of 100:1 to terminal system end treatment height plus one (12'-6") standard railing section at the transitioned height for a horizontal connection to the end treatment.

NOTE:
1. Slotted holes for splice bolts to overlap ends of rail element.

BUTTON HEAD BOLT

<table>
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<tr>
<th>L</th>
<th>THREAD LENGTH</th>
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</thead>
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<td>1.75&quot;</td>
<td>FULL THREAD LENGTH</td>
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<td>FULL THREAD LENGTH</td>
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<tr>
<td>18&quot;</td>
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<tr>
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</tr>
<tr>
<td>** 1/8&quot;</td>
<td>4&quot; Min THREAD LENGTH</td>
</tr>
</tbody>
</table>

** For nested rail applications.

MIDWEST GUARDRAIL SYSTEM
STANDARD HARDWARE

NO SCALE

A77M1
**NOTES:**

1. All holes in wood posts and blocks shall be 3/8" Dia ± 1/8".
2. Dimensions shown for wood post are nominal.
3. This post and block combination used for standard line post sections of MGS.
4. This post and 8" x 12" block combination used for line post sections of MGS on narrow roadways.
5. This post and 8" x 12" block combination is typically used where strengthened line post sections of MGS are warranted to shield fixed objects.
6. See Standard Plan A77L3 for use of 6" x 8" and 8" x 8" wood blocks.

**Dimensions:**

- 6" x 8" Wood Post
- 8" x 8" Wood Post
- 10" x 10" Wood Post
- 6" x 12" Wood Block
- 8" x 12" Wood Block

**Specifications:**

- See Note 1
- See Note 2
- See Note 3
- See Note 4
- See Note 5
- See Note 6

**Notes:**

- MidWest Guardrail System
- Wood post and wood block details
- No scale

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NOTCHED WOOD BLOCK DETAILS

STEEL POST AND

PLANS

APPROVAL

DATE

No.

Exp.

REGISTRATION

DEPARTMENT OF TRANSPORTATION

STATE OF CALIFORNIA

MIDWEST GUARDRAIL SYSTEM

STEEL POST AND

NOTCHED WOOD BLOCK DETAILS

NOTES:

1. All holes in steel post shall be 3/8" Dia maximum.
2. Dimensions shown for wood block are nominal.
3. Notched face of block faces steel post.
4. 6'-0" length posts to be used for typical roadway installation. See Standard Plan A77N3.
5. See Standard Plan A77L3 for use of 6" x 8" and 8" x 8" notched wood blocks.
6. This post and 8" x 10" block combination to be used for line post sections of MGS on narrow roadways and where strengthened line post sections of MGS are warranted to shield fixed objects.

See Notes 2 and 3

shield fixed objects.

strengthened line post sections of MGS on narrow roadways and where strengthened line post sections of MGS are warranted to shield fixed objects.

See Note 6

See Notes 2 and 3

See Note 5

guard railing. See Note 5

Only for use with metal beam guard railing. See Note 5

See Standard Plan A77L3 for use of 6" x 8" and 8" x 8" notched wood blocks.

This post and 8" x 10" block combination to be used for line post sections of MGS on narrow roadways and where strengthened line post sections of MGS are warranted to

Notched face of block faces steel post.

Dimensions shown for wood block are nominal.

All holes in steel post shall be 3/8" Dia maximum.

See Note 6

See Note 6

8" x 8" notched wood blocks.

6'-0" length posts to be used for typical roadway installation. See Standard Plan A77N3.

See Standard Plan A77L3 for use of 6" x 8" and 8" x 8" notched wood blocks.

This post and 8" x 10" block combination to be used for line post sections of MGS on narrow roadways and where strengthened line post sections of MGS are warranted to shield fixed objects.

See Notes 2 and 3

shield fixed objects.

strengthened line post sections of MGS on narrow roadways and where strengthened line post sections of MGS are warranted to shield fixed objects.

See Note 6

See Notes 2 and 3

See Note 5

guard railing. See Note 5

Only for use with metal beam guard railing. See Note 5

See Standard Plan A77L3 for use of 6" x 8" and 8" x 8" notched wood blocks.

This post and 8" x 10" block combination to be used for line post sections of MGS on narrow roadways and where strengthened line post sections of MGS are warranted to shield fixed objects.

See Notes 2 and 3

shield fixed objects.

strengthened line post sections of MGS on narrow roadways and where strengthened line post sections of MGS are warranted to shield fixed objects.

See Note 6

See Notes 2 and 3

See Note 5

guard railing. See Note 5

Only for use with metal beam guard railing. See Note 5

See Standard Plan A77L3 for use of 6" x 8" and 8" x 8" notched wood blocks.

This post and 8" x 10" block combination to be used for line post sections of MGS on narrow roadways and where strengthened line post sections of MGS are warranted to shield fixed objects.
NOTES:

1. These installation details also applicable to steel line post installations. For Details A, C, and D, where steel line post installations are constructed, W6 x 8.5 or W6 x 9 steel post, 6'-0" in length, with 6" x 12" x 1'-2" notched wood block or notched recycled plastic blocks are to be used in place of the size of wood post and wood block shown. For Detail A, see Note 2, where steel line post installations are constructed, W6 x 8.5 steel post, 6'-0" in length, with 6" x 12" x 1'-2" notched wood block or notched recycled plastic blocks are to be used in place of the size of wood post and wood block shown. For additional installation details, see Standard Plans A77L1 and A77L2.

2. Where the distance between the face of the rail and the hinge point is less than 2'-6", see the Project Plans for special details.

3. For dike positioning with MGS installations, see Standard Plan A77N4.
MGS DELINEATION

See Note 3

DIKE POSITIONING

See Note 1

NOTES:

1. When necessary to place dike more than 1" in front of face of MGS, only Type C dike may be used. For dike details, see Standard Plan A87A.

2. For standard railing post embedment, see Standard Plan A77N3.

3. MGS delineation to be used where shown on the Project Plans.

4. When dike or curb is placed under MGS, the maximum height of the dike or curb shall be 6". Mountable dike should not be used. For dike and curb details, see Standard Plans A77A and A87B.

5. For details of typical distance between the face of rail and hinge point, see Standard Plan A77N3.

6. For steel line posts, use 1/4 - 20 self-tapping screws in 0.25" diameter holes or 1/4" bolts in 1/2" diameter holes.

MIDWEST GUARDRAIL SYSTEM

TYPICAL RAILING DELINEATION

AND DIKE POSITIONING DETAILS

STATE OF CALIFORNIA

DEPARTMENT OF TRANSPORTATION

A77N4

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NOTES:

1. Where the distance between back of post and hinge point is less than 42", construct vegetation control to 6" from hinge point while maintaining the 8" block-out at back of post. If the 8" block-out at back of post can not be maintained, construct vegetation control flush with the back edge of post.

2. Where dike is constructed under railing, construct vegetation control to back edge of dike. Where paved shoulder is constructed within 36" in front of the post, construct vegetation control to the edge of paved shoulder.

3. For wood post sizes, see Standard Plan A77N1.
4. For steel post sizes, see Standard Plan A77N2.
5. For details not shown, see Standard Plans A77L1 and A77L2.
1. See Standard Plan A77N5 for additional vegetation control details.

2. Where the distance between back of post and hinge point is less than 42", construct vegetation control to 8" from hinge point while maintaining the 8" block-out on back of post. If the 8" block-out or back of post cannot be maintained, construct vegetation control flush with the back edge of post.

3. Where dike is constructed under railing, construct vegetation control to back edge of dike. Where paved shoulder is constructed within 36" in front of the post, construct vegetation control to the edge of paved shoulder.
End vegetation control at end of backside rail element.

NOTES:
1. See Standard Plan A77N5 for additional vegetation control details.
2. Where the distance between back of post and hinge point is less than 42", construct vegetation control to 6" from hinge point while maintaining the 8" block-out at back of post. If the 8" block-out at back of post cannot be maintained, construct vegetation control flush with the back edge of post.
3. Where dike is constructed under railing, construct vegetation control to back edge of dike, where called shoulder is constructed within 36" in front of the post, construct vegetation control to the edge of paved shoulder.
4. End vegetation control at end of backside rail element.
NOTES:
1. See Standard Plan A77N8 for additional vegetation control details.

2. Where the distance between back of post and hinge point is less than 48", construct vegetation control to 6" from hinge point while maintaining the 8" block-out at back of post. If the 8" block-out at back of post can not be maintained, construct vegetation control flush with the back edge of post.

3. Where dike is constructed under railing, construct vegetation control to back edge of dike. Where paved shoulder is constructed, construct vegetation control to the edge of paved shoulder.

MAN-MADE FIXED OBJECT

VEGETATION CONTROL
NOTES:
1. See Standard Plan A77N5 for additional vegetation control details.
2. Where dike is constructed under railing, construct vegetation control to back edge of dike. Where paved shoulder is constructed within 36” in front of the post, construct vegetation control to the edge of paved shoulder.
NOTES:

1. See Standard Plan A77N5 for additional vegetation control details.

2. Where dike is constructed under railing, construct vegetation control to back edge of dike. Where paved shoulder is constructed within 36" in front of the post, construct vegetation control to edge of paved shoulder.

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NOTE 8

The type of 31" terminal system end treatment to be used will be shown on the Project Plans.

NOTES:
1. Line posts, blocks and hardware to be used are shown on Standard Plan A77L1, A77L2, A77M1, A77N1 and A77N2.
2. W6 post spacing to be 6'-3" center to center, except as otherwise noted.
3. Except as noted, line posts are 6" x 8" x 6'-0" wood with 6" x 12" x 1'-2" wing blocks. W6 x 8.5 or W6 x 8 street posts, 6'-0" in length, with 6" x 12" x 1'-2" notched wood blocks or recycled plastic blocks may be used for 6" x 8" x 6'-0" wood post with 6" x 10" x 1'-2" wood blocks where applicable and when specified.
4. For End Anchor Assembly (Type SFT) details, see Standard Plan A77S1.
5. Layout Types 11A, 11B or 11C are typically used where MGS is recommended to shield embankment slopes and a crashworthy end treatment is required for only one direction of traffic.

TYPICAL PARABOLIC LAYOUT

BEGIN PARABOLA

BEGIN FLARE

FOR 1 FOOT MAX END OFFSET

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

MIDWEST GUARDRAIL SYSTEM
TYPICAL LAYOUTS FOR EMBANKMENTS
NO SCALE

A77P1

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THE STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

MIDWEST GUARDRAIL SYSTEM
TYPICAL LAYOUTS FOR EMBANKMENTS

NOTES:
1. Line post, blocks and hardware to be used are shown on Standard Plans A77L1, A77L2, A77N1 and A77N2.
2. MGS post spacing to be 6'-3" center to center, except as otherwise noted.
3. Except as noted, line posts are 6" x 8" x 6'-0" wood with 6" x 12" x 1'-2" wood blocks where applicable and when specified, 6" x 12" x 1'-2" notched wood blocks or plastic blocks may be used for 6" x 8" x 6'-0" wood post with 6" x 12" x 1'-2" wood blocks where applicable and when specified.
4. Layout Types 11D through 11L, shown on the A77P Series of Standard Plans, are typically used where MGS is recommended to shield embankment slopes and when specified.
5. MGS post spacing to be 6'-3" center to center, except as otherwise noted.
6. The type of 31" terminal system end treatment to be used will be shown on the Project Plans.
7. Layout Types 11D through 11L, shown on the A77P Series of Standard Plans, are typically used where MGS is recommended to shield embankment slopes and when specified.

TYPE 11D LAYOUT
(Equipment MGS installation with 31" in-line end treatment at each end of railing)
See note 4

TYPE 11E LAYOUT
(Equipment MGS installation with 31" flared end treatment at each end of railing)
See note 4

NO SCALE

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NOTES:

1. Line post, blocks and hardware to be used are shown on Standard Plans A77L1, A77L2, A77M1, A77N1 and A77N2.

2. MGS post spacing to be 6'-3" center to center, except as otherwise noted.

3. Except as noted, line posts are 6" x 8" x 6'-0" wood with 6" x 12" x 1'-3" wood blocks, 6" x 8.5 or 6" x 9 steel posts, 6"-0" in length, with 6" x 12" x 1'-2" notched wood blocks or plastic blocks may be used for 6" x 12" x 1'-3" wood post with 6" x 12" x 1'-2" wood blocks where applicable and when specified.

4. Layout Types 11G through 11L, shown on the A77P Series of Standard Plans, are typically used with MGS. It is recommended to shield embankment both directions of traffic.

5. The type of 31" terminal system end treatment to be used will be shown on the Project Plans.

6. Dependent on site conditions (embankment height and side slope), construction of additional MGS (length equal to multiples of 12'-6" with 6'-3" post spacing) may be advisable.

7. The 15:1 or flatter flare used with buried end anchors is based on the edge of the paved shoulder or offset line of edge of the traveled way. The length of MGS within the 15:1 or flatter flare is based on site conditions and should be length equal to multiples of 12'-6".

8. For details of the buried post end anchor used with Type 11F and 11G Layouts, see Standard Plan A77T2.

9. Additional HMA dikes, Type C. See Notes 4 and 9

10. For typical flare offsets for 25'-0" length parabola with maximum offset of 1'-0", see Standard Plan A77P1.
NOTES:

1. Line post, blocks and hardware to be used are shown on Standard Plan A77L1, A77L2, A77N1 and A77N2.
2. MGS post spacing to be 6'-3" center to center, except as otherwise noted.
3. Except as noted, line posts are 6" x 8" x 6'-0" wood with 6" x 12" x 1'-2" wood blocks. 6" x 8" x 12" or 6" x 9" steel posts, 6'-0" in length, with 6" x 12" x 1'-2" notched wood blocks or plastic blocks may be used for 6" x 8" x 6'-0" wood post with 6" x 12" x 1'-2" wood blocks where applicable and when specified.
4. Layout Types 11J through 11L, shown on the A77P Series of Standard Plans, are typically used where MGS is recommended to shield embankment slopes and a crashworthy 31" end treatment is required for both directions of traffic.
5. The type of 31" terminal system and treatment to be used will be shown on the Project Plans.
6. Depending on site conditions (embankment height and side slope), construction of additional MGS (length equal to multiples of 12'-6" with 6'-3" post spacing) may be advisable.
7. Where placement of dike is required with MGS installations, see Standard Plan A77N4 for dike positioning details.

CALTRANS APPROVED 31" FLARED TERMINAL SYSTEM END TREATMENT

CALTRANS APPROVED 31" IN-LINE TERMINAL SYSTEM END TREATMENT

TYPE 11H LAYOUT

(Embankment MGS installation with 31" flared end treatment and 31" in-line end treatment at the ends of railing)

See Notes 4 and 7.

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION
MIDWEST GUARDRAIL SYSTEM
TYPICAL LAYOUTS FOR EMBANKMENTS
NO SCALE

9-22-15

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1. Line post, blocks and hardware to be used are shown on Standard Plan A77L1, A77L2, A77N1 and A77N2.
2. WGS post spacing to be 6'-3" center to center, except as otherwise noted.
3. Except as noted, line posts are 6" x 8" x 6'-0" wood with 6" x 12" x 1'-2" wood blocks, 6" x 8.5" or 6" x 9 steel posts, 6"-0" in length, with 6" x 12" x 1'-2" notched wood blocks or plastic blocks may be used for 6" x 8" x 6'-0" wood post with 6" x 12" x 1'-2" wood blocks where applicable and when specified.
4. Layout Types 11D through 11L, shown on the A77 Series of Standard Plans, are typically used where MGS is recommended to shield embankments from traffic.
5. 31" in-line terminal system end treatments are used where site conditions will not accommodate a 31" flared end treatment.
6. The type of 31" terminal system end treatment to be used will be shown on the Project Plans.
7. Depending on site conditions (embankment height and side slopes), construction of additional MGS length equal to multiples of 12'-6" with 6'-3" post spacing may be advisable.
8. Where placement of block is required with MGS installations, see Standard Plan A77N4 for dike positioning details.
9. The 15:1 or flatter flare used with buried end anchors is based on the edge of the traveled way. The length of MGS within the 15:1 or flatter flare is based on site conditions and should be a length equal to multiples of 12'-6".
10. For details of the buried post end anchor used with Type 11I Layout, see Standard Plan A77F1.
11. For typical flare offsets for 25'-0" length parabola with maximum offset of 1'-0", see Standard Plan A77F1.

**NOTE 7**

G I E T D E S R
NOTES:
1. Line post, blocks and hardware to be used are shown on Standard Plans A77K, A77L, A77M, A77N and A77T.
2. WSG post spacing to be 6'-3" center to center, except as otherwise noted.
3. Except as noted, line posts are 6" x 8" x 6'-0" wood with 8" x 12" x 1-2" wood blocks, W6 x 8.5 or W6 x 9 steel posts, 6'-0" in length, with 8" x 12" x 1-2" notched wood blocks or plastic blocks may be used for 6" x 12" x 6'-0" wood post with 6" x 12" x 1-2" wood blocks where applicable and when specified.
4. Layout Types 11K through 11L, shown on the A77P Series of Standard Plans, are typically used where MGS is recommended to shield embankment slopes and a crashworthy 31" end treatment is required for both directions of traffic. 5. 31" in-line terminal system and treatments are used where site conditions will not accommodate a 31" flared end treatment.
6. The type of 31" terminal system and treatment to be used will be shown on the project plans.
7. Depending on site conditions (embankment height and side slope), construction of additional WSG (length equal to multiples of 12'-6" with 6'-3" post spacing) may be advisable.
8. Where placement of piles is required with WSG installations, see Standard Plan A77T for pile positioning details.
9. The 15:1 or flatter flare used with buried end anchors is based on the edge of the paved shoulder or offset line of edge of traveled way, the length of MGS within the 15:1 or flatter flare is based on site conditions and should be a length equal to multiples of 12'-6".
10. For details of the buried post and anchor used with Type 11K and 11L Layouts, see Standard Plan A77T.
11. For typical flare offsets for 25'-0" length parabola with maximum offset of 1'-0", see Standard Plan A77K.
TYPICAL LAYOUTS FOR the Project Plans from the edge of traveled way through the outer most point railing and end treatment. A 12.5 degree angle of departure can be drawn on

MIDWEST GUARDRAIL SYSTEM
TYPICAL LAYOUTS FOR STRUCTURE APPROACH
NO SCALE

A77Q1
**PARABOLIC FLARE OFFSETS**

\[ WX^2 \]

\[ L \]

**OFFSET FROM BASE LINE**

\[ X = DISTANCE ALONG BASE LINE \]

\[ L = LENGTH OF FLARE \]

**BEGIN PARABOLA**

**BEGIN 15\(^\circ\) OR FLATTER FLARE**

**DISTANCE ALONG BASE LINE**

**OFFSET FROM BASE LINE**

**LENGTH OF FLARE**

**PARABOLIC FLARE OFFSETS**

**TYPICAL PARABOLIC LAYOUT**

**TYPE 12E LAYOUT**

See Note 9

**NOTES:**

1. Line post, blocks and hardware to be used are shown on Standard Plans ATT1, ATT2, AT71, AT7N1 and AT7N2.

2. MGS post spacing to be 6'-3" center to center, except as otherwise noted.

3. Except as noted, line posts are 6" x 8" x 6'-0" wood with 6" x 12" x 1'-2" wood blocks, W6 x 8.5 or W6 x 9 steel posts, 6'-0" in length, with 6" x 12" x 1'-2" notched wood blocks or notched recycled plastic blocks may be used for 6" x 8" x 6'-0" wood line posts with 6" x 12" x 1'-2" wood blocks where applicable and when specified.

4. For Transition Railing (Type WB-31) details, see Standard Plan A77U4.

5. For additional details of a typical connection to bridge rail, see Connection Detail AA on Standard Plan A77U1.

6. For Rail Tensioning Assembly details, see Standard Plan A77S2.

7. The type of Crash Cushion to be used will be shown on the Project Plans.

8. Type 12E Layout is typically used left of approaching traffic at the end of each structure on multilane freeways or expressways where a median type barrier is not constructed between separated roadways.

9. The 15\(^\circ\) or flatter flare is measured off of the edge of traveled way.
Type 12AA Layout
(MGS installation at structure departure with 31" in-line end treatment at trailing end of railing)
See Notes 8 and 9

Type 12BB Layout
(MGS installation at structure departure with 31" flared end treatment at trailing end of railing)
See Notes 8 and 9

Notes:
1. Line post, blocks and hardware to be used are shown on Standard Plans A77L1, A77L2, A77M1, A77N1 and A77N2.
2. MGS post spacing to be 6'-3" center to center, except as otherwise noted.
3. Except as noted, line posts are 6" x 8" x 6'-0" wood with 6" x 12" x 1'-2" wood blocks. W6 x 8.5 or W6 x 9 steel posts, 6'-0" in length, with 6" x 13" x 1'-2" notched wood blocks or notched recycled plastic blocks may be used for 6" x 8" x 6'-0" wood posts with 6" x 12" x 1'-2" wood blocks where applicable and when specified.
4. For Transition Railing (Type WB-31) details for Types 12AA and 12BB Layouts, see Standard Plan A77U4.
5. 31" in-line terminal system treatments are used where site conditions will not accommodate a 31" flared end treatment.
6. The type of 31" terminal system to be used will be shown on the Project Plans.
7. Dependent on site conditions (embankment height, side slopes, other fixed objects), it may be advisable to construct additional MGS in length equal to multiples of 12'-6" with 6'-3" post spacing between the transition railing and 31" end treatments.
8. Where placement of dike is required with MGS installations, see Standard Plan A77N4 for dike positioning details.
9. Type 12AA or Type 12BB Layouts are typically used to the right of traffic departing a structure on two-way conventional highways where the roadbed width across the structure is less than 40 feet.
10. For additional details of typical connections to bridge rail, see Connection Detail CC on Standard Plan A77U2 and Connection Detail HH on Standard Plan A77V2.

State of California Department of Transportation
Midwest Guardrail System Typical Layouts for Structure Departure

No Scale

A77Q4

2015 Standard Plan A77Q4
NOTES:

1. Line posts, blocks and hardware to be used are shown on Standard Plans A77L1, A77L2, A77M1, A77N1 and A77N2.

2. MSG post spacing to be 6'-3" center to center, except as otherwise noted.

3. Except as noted, line posts are 6" x 8" x 6'-0" wood with 6" x 12" x 1'-0" wood blocks. 6" x 8.5 or 6" x 9 steel posts, 6" x 0" in length, with 6" x 12" x 1'-0" notched wood blocks or notched recycled plastic blocks may be used for 6" x 8" x 6'-3" wood line posts with 6" x 12" x 1'-0" wood blocks where applicable and when specified.

4. For Transition Railing (Type WB-31) details for Type 12CC Layout, see Standard Plan A77N4 for dike positioning details.

5. For details of the buried post end anchor used with Type 12CC Layout, see Standard Plan A77U1.

6. Type 12DD layout is typically used to the right of traffic departing a structure on two-way conventional highways where the roadbed width across the structure is equal to or greater than 40 feet and MSG is recommended (embankment heights, side slopes, other fixed objects). Length of railing to be equal to multiples of 12'-6".

7. The 15:1 or flatter flare for Type 12CC Layout is based on the side of the paved shoulder or offset line of edge of the traveled way. The length of MSG within the 15:1 or flatter flare is based on site conditions and should be a length equal to multiples of 12'-6".

8. For details of a typical connection to bridge rail for Layout Type 12DD, see Standard Plan ATTH4 for dikes positioning details.

9. Where placement of dikes is required with MSG installations, see Standard Plan ATTH4 for dikes positioning details.

10. Type 12CC Layout is typically used to the right of traffic departing a structure on two-way conventional highways where the roadbed width across the structure is less than 40 feet.

11. For additional details of a typical connection to bridge rail for Layout Type 12DD, see Standard Plan ATTH4 and Connection Detail 15 on Standard Plan ATTH4.

12. For additional details of a typical connection to bridge rail for Layout Type 12CC, see Connection Detail 13 on Standard Plan ATTH4 and Connection Detail 16 on Standard Plan ATTH4.

13. For typical flare offsets for 25'-0" length parapet with maximum offset of 1'-0", see Standard Plan ATTP1.
Strengthened Midwest Guardrail System

Sections for Fixed Object

Use strengthened MGS sections with Type 14A layout where minimum clearance between the face of the railing and fixed object(s) is less than 4'-0", but not less than 3'-0", see Note 4.

For a series of fixed objects (bridge columns, overhead sign supports, etc.), additional 10" x 10" x 1'-2" wood post with 8" x 12" x 1'-2" wood blocks on 3'-1½" centers to center spacing are to be used between fixed objects.

NOTE A:

For End Anchor Assembly (Type SFT) details, see Standard Plan A7751.

5. For End Anchor Assembly (Type SFT) details, see Standard Plan A7751.

6. For details of Rail Tensioning Assembly, see Standard Plan A7752.

7. The type of crash cushion to be used is shown on the Project Plans.

8. Type 14A layout is typically used on multiline freeways or expressways to shield fixed objects where a median type barrier is not constructed between the separated roadbeds.

9. For typical flare offsets for 25'-0" length parabola with maximum offset of 1'-0", see Standard Plan A77PI.

10. The 1511 or flatter flare is measured off of the edge of traveled way.

11. W6 x 8 steel post, 8'-0" in length, with 8" x 12" x 1'-2" wood blocks or notched recycled plastic blocks may be used for 8" x 8" x 8" wood line post with 8" x 12" x 1'-2" wood blocks where applicable and when specified.

A 4'-0" minimum clearance is required between the face of the railing and the face of a fixed object located directly behind MGS sections with post spacing of 6'-0". Construct MGS as shown in the detail "Strengthened Midwest Guardrail System Sections for Fixed Object" on this plan, where the clearance between the face of the railing and the face of a fixed object is less than 3'-0", where the clearance is less than 3'-0", a concrete wall or barrier should be constructed to shield the fixed object(s).

NOTES:

1. Line post, blocks and hardware to be used are shown on Standard Plans A77L1, A77L2, A77M1, A77N1 and A77N2.

2. MGS post spacing to be 6'-3" center to center, except as otherwise noted.

3. Except as noted, line posts are 6" x 8" x 6'-0" wood with 6" x 12" x 1'-2" wood blocks. W6 x 2 or W6 x 3 steel posts, 8'-0" in length, with 8" x 12" x 1'-2" notched wood blocks or notched recycled plastic blocks may be used for 8" x 8" x 8" wood line post with 8" x 12" x 1'-2" wood blocks where applicable and when specified.

4. A 4'-0" minimum clearance is required between the face of the railing and the face of a fixed object located directly behind MGS sections with post spacing of 6'-0". Construct MGS as shown in the detail "Strengthened Midwest Guardrail System Sections for Fixed Object" on this plan, where the clearance between the face of the railing and the face of a fixed object is less than 3'-0", where the clearance is less than 3'-0", a concrete wall or barrier should be constructed to shield the fixed object(s).

5. Fixed objects where a median type barrier is not constructed between the separated roadbeds.

6. Fixed objects where a median type barrier is not constructed between the separated roadbeds.

7. Type 14A layout is typically used on multiline freeways or expressways to shield fixed objects where a median type barrier is not constructed between the separated roadbeds.

8. Type 14A layout is typically used on multiline freeways or expressways to shield fixed objects where a median type barrier is not constructed between the separated roadbeds.

9. For typical flare offsets for 25'-0" length parabola with maximum offset of 1'-0", see Standard Plan A77PI.

10. The 1511 or flatter flare is measured off of the edge of traveled way.

11. W6 x 8 steel post, 8'-0" in length, with 8" x 12" x 1'-2" notched wood blocks or notched recycled plastic blocks may be used for 8" x 8" x 8" wood line post with 8" x 12" x 1'-2" wood blocks where applicable and when specified.
NOTES:
1. Line post, blocks and hardware to be used are shown on Standard Plans A77L1, A77L2, A77M1 and A77N1.
2. MGS post spacing to be 6'-3" center to center, except as otherwise noted.
3. Except as noted, line posts are 6" x 8" x 6'-0" wood with 6" x 12" x 1'-2" wood blocks, 6'-0" in length, with 8" x 12" x 1'-2" notched wood blocks or notched recycled plastic blocks may be used for 6" x 8" x 6'-0" wood line posts with 6" x 12" x 1'-2" wood blocks where applicable and when specified.
4. A 4'-0" minimum clearance is required between the face of the railing and the face of a fixed object located directly behind MGS section with post spacing of 6'-3". Construct MGS as shown in the detail "Strengthened Midwest Guardrail System Sections for Fixed Object" on this plan, where the clearance between the face of the railing and the face of a fixed object is less than 4'-0", but not less than 3'-0", the clearance is less than 3'-0", a concrete wall or barrier should be constructed to shield the fixed objects.
5. For End Anchor Assembly (Type SFT) details, see Standard Plan A77S1.
6. Type of crash cushion to be used will be shown on the Project Plans.
7. Type 15A layout is typically used on multilane freeways or expressways to shield fixed objects in the area between separated one-way roadbeds.
8. Type 15A layout is typically used on multilane freeways or expressways to shield fixed objects in the area between separated one-way roadbeds.
9. The 15:1 or flatter flare is measured off of the edge of the traveled way.
10. W6 x 15 steel post, 8'-0" in length, with 6" x 12" x 1'-2" notched wood block or notched recycled plastic blocks may be used in place of the 10" x 10" x 8'-0" wood post with 6" x 12" x 1'-2" wood block shown in the detail "Strengthened Midwest Guardrail System Sections for Fixed Object".

DETAIL "A"

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

MIDWEST GUARDRAIL SYSTEM
TYPICAL LAYOUTS FOR FIXED OBJECTS BETWEEN SEPARATE ROADBEDS (ONE-WAY TRAFFIC)

NO SCALE
**ROADSIDE FIXED OBJECTS**

A 4'-0" minimum clearance is required between the face of the railing and the face of a fixed object located directly behind MGS sections with post spacing at 6'-3", except as otherwise noted.

*NOTE A1:* For a series of fixed objects (bridge columns, overhead sign supports, etc.), construct 10" x 10" x 8'-0" wood post with 6" x 12" x 1'-2" wood blocks at 3'-1/2" center to center spacing and to be used between fixed objects.

**STRENGTHENED MIDWEST GUARDRAIL SYSTEM SECTIONS FOR FIXED OBJECT**

Use strengthened MGS sections with layout Types 16D or 16E where minimum clearance between the face of the MGS and fixed object is less than 4'-0", but not less than 3'-0". See Note 4.

1. Type 16D Layout
   - (Guard railing installation at roadside fixed object or objects with 31" in-line and treatment at each end of railing)
   - SHOULDER ETW
   - CALTRANS APPROVED 31" IN-LINE TERMINAL SYSTEM END TREATMENT
   - ETW 25'-0" Win
   - SEE NOTE 6
   - HMA Dike, Type C
   - See Note 9
   - 25'-0" Win, See Note 9
   - 3'-0" Typ, From ES
   - 6'-3" Typ, From ES
   - 10'-0" Typ, From ES
   - 2015 STANDARD PLAN A77R4
   - NOTE A2: For a series of fixed objects (bridge columns, overhead sign supports, etc.), construct 10" x 10" x 8'-0" wood post with 6" x 12" x 1'-2" wood blocks at 3'-1/2" center to center spacing and to be used between fixed objects.

2. Type 16E Layout
   - (MGS installation at roadside fixed object or objects with 31" flared end treatment at each end of railing)
   - SHOULDER ETW
   - CALTRANS APPROVED 31" FLARED TERMINAL SYSTEM END TREATMENT
   - ETW 25'-0" Win
   - SEE NOTE 6
   - Additional HMA Dike, Type C
   - See Note 9
   - 25'-0" Win, See Note 9
   - 3'-0", SEE NOTE 4

**NOTES:**

1. Line post, blocks and hardware to be used are shown on Standard Plans ATTL1, ATTL2, ATTL4, ATTN and ATTNL.
2. MGS post spacing to be 6'-3" to center, except as otherwise noted.
3. Except as noted, line posts are 6" x 8" x 6'-0" wood with 6" x 12" x 1'-2" wood blocks. W6 x 8, W6 x 3 steel posts, 6'-0" in length, with 6" x 12" x 1'-2" notched wood blocks or notched recycled plastic blocks may be used for 6'-0" wood line posts with 6" x 12" x 1'-2" wood blocks where applicable and when specified.
4. A 4'-0" minimum clearance is required between the face of the railing and an object located directly behind MGS sections with post spacing of 6'-3", construct MGS as shown. In the detail "Strengthened Midwest Guardrail System Sections for Fixed Object", on this plan, where the clearance between the face of the railing and the face of a fixed object is less than 4'-0", but not less than 3'-0", a concrete wall or barrier should be constructed to shield the fixed object(s).
5. 31" in-line terminal system and treatments are used where site conditions will not accommodate a 31" flared end treatment.
6. The type of 31" terminal system to be used will be shown on the Project Plans.
7. As site conditions dictate, construct additional MGS to shield roadside fixed object(s) and a crashworthy 31" end treatment is required for both directions of traffic.
8. Layout Types 16D through 16L, shown on the A77R Series of Standard Plans, are typically used where MGS is recommended to shield roadside fixed object(s) and a crashworthy 31" end treatment is required for both directions of traffic.
9. Where placement of dike is required with MGS, see Standard Plan ATTN for dike placement details.
1. Line post, blocks and hardware to be used are shown on Standard Plans A77L1, A77L2, A77N1, A77NL1 and A77NM1.

2. MGS post spacing to be 6'-3" center to center, except as otherwise noted.

3. Except as noted, line posts are 6" x 8" x 6'-0" wood with 6" x 12" x 1'-2" wood blocks, W/16 R or W 8" x 10" x 8'-0" steel posts, 8'-0" in length, with 8" x 12" x 1'-2" notched wood blocks or notched recycled plastic blocks may be used for 6" x 6" x 6'-0" wood posts. 8" x 12" x 1'-2" wood blocks are required for a minimum clearance of 3'-0".

4. A 4'-0" minimum clearance is required for the occurrence of the roller and the face of the roller located directly in line with MGS sections with a 6'-3" center to center spacing where applicable when roller is less than 3'-0", but not less than 3'-0".

5. The use of MGS sections with layout Types 16F or 16L 6'-0" are typically used on highways where MGS is required to shield fixed objects and the use of fixed objects is less than 3'-0". Where the clearance is less than 3'-0", a concrete wall or barrier should be constructed to shield the fixed object.

6. The 15:1 or flatter flare is based on the edge of the roller and the roller is less than 3'-0". Where the clearance is less than 4'-0", but not less than 3'-0". Where the edge of the roller is less than 4'-0", but not less than 3'-0". Where the edge of the roller is less than 4'-0", but not less than 3'-0". Where the edge of the roller is less than 4'-0", but not less than 3'-0".

7. A 4'-0" minimum clearance is required for the occurrence of the roller and the face of the roller located directly in line with MGS sections with a 6'-3" center to center spacing where applicable when roller is less than 3'-0", but not less than 3'-0".

8. A 4'-0" minimum clearance is required for the occurrence of the roller and the face of the roller located directly in line with MGS sections with a 6'-3" center to center spacing where applicable when roller is less than 3'-0", but not less than 3'-0".

9. Layout Types 16F through 16L, shown on the A77R Series of Standard Plans, are typically used on highways where MGS is required to shield fixed objects and the use of fixed objects is less than 3'-0". Where the clearance is less than 3'-0", a concrete wall or barrier should be constructed to shield the fixed object.

10. Where placement of dike is required with MGS, see Standard Plan A77N1 for dike positioning details.

11. For fixed objects, see Standard Plan A77N1 for dike positioning details.

STRENGTHENED MIDWEST GUARDRAIL SYSTEM SECTIONS
FOR FIXED OBJECT

Use strengthened MGS sections with layout Type 16H where minimum clearance between the face of the MGS and fixed objects is less than 4'-0", but not less than 3'-0". See Note 4.

MIDWEST GUARDRAIL SYSTEM TYPICAL LAYOUTS FOR ROADSIDE FIXED OBJECTS
NO SCALE

NOTES:

1. Line posts, blocks and hardware to be used are shown on Standard Plans ATTL1, ATTL2, ATTN1, and ATTN2.

2. MGS post spacing to be 6'-3" center to center, except as otherwise noted.

3. Except as noted, line posts are 6" x 8" x 6'-0" wood with 6" x 12" x 1'-2" wood blocks. W6 x 8.5 or W6 x 9 steel posts, 6'-0" in length, with 6" x 12" x 1'-2" notched wood blocks or notched recycled plastic blocks may be used for additional 10" x 10" x 8'-0" wood post with 8" x 12" x 1'-2" wood blocks at 3'-1" center to center spacing are to be used between fixed objects.

4. A 4'-0" minimum clearance is required between the face of the rolling and the face of a fixed object located directly behind MGS sections with post spacing at 6'-3". Construct MGS as shown in the detail "Strengthened Midwest Guardrail System Sections for Fixed Object" on this plan, where the clearance between the face of the rolling and the face of a fixed object is less than 4'-0", but not less than 3'-0", where the clearance is less than 3'-0", a concrete wall or barrier should be constructed to shield the fixed object.

5. 31" in-line terminal system and treatments are used where site conditions will not accommodate a 31" flared end treatment.

6. The type of 31" terminal system to be used will be shown on the Project Plans.

7. As site conditions dictate, construct additional MGS to shield fixed objects. Additional MGS length equal to multiples of 12'-6". Post spacing at 6'-3", except as specified in Note 4.

8. Layout Types 15O through 16L, shown on the A77 Series of Standard Plans, typically used where MGS is recommended to shield roadside fixed object(s) and when specified.

9. Where placement of dikes is required with MGS, see Standard Plan A77N4 for dikes positioning details.

10. W6 x 15 steel post, 8'-0" in length, with 8" x 12" x 1'-2" notched wood stock or notched recycled plastic blocks may be used in place of the 10" x 10" x 8'-0" wood post with 8" x 12" x 1'-2" wood block shown in the detail "Strengthened Midwest Guardrail System Sections for Fixed Object".
ROADSIDE FIXED OBJECTS

 Guardsrail System Sections for Fixed Objects

Typical Layouts for Roadside Fixed Objects

Strengthened Midwest Guardrail System Sections

For Fixed Object

Use strengthened MGS sections with layout Types 16I or 16J layouts where minimum clearance between the face of the MGS and fixed object(s) is less than 4'-0", but not less than 3'-0". See Note 4.

Bury end anchors, see Note 11

For a series of fixed objects (bridge columns, overhead sign supports, etc.) with 31" in-line end treatment and a buried end anchor treatment at the ends of railing) with site conditions that will not accommodate a 31" flared end treatment.

Type 16I Layout

(MGS installation at roadside fixed object or objects with 31" in-line end treatment and a buried end anchor treatment at the ends of railing) See Note 8. Additional MGS length equal to multiples of 12'-6".

See Notes 5 and 6

For details of Buried Post End Anchor, see Standard Plan A77T2.

Parabolic Flare Offsets

\[ WX = \text{MAXIMUM OFFSET} \]

\[ LY = \text{DISTANCE ALONG BASE LINE} \]

\[ X = \text{OFFSET FROM BASE LINE} \]

\[ Y = \text{LENGTH OF FLARE} \]

Notes:

1. Line post, blocks and hardware to be used are shown on Standard Plan A77A1, A77A2, A77N, A77M and A77N1.

2. MGS post spacing to be 6'-3" center to center, except as otherwise noted.

3. Except as noted, line posts are 6" x 6" x 6'-0" long, wood blocks are 8" x 6" x 8" hard as steel plates, 6'-0" in length, with 3" x 12" x 1-1/2" notched wood blocks or notched recycled plastic blocks may be used for 8" x 8" x 6'-0" wood posts with 6" x 12" x 1-1/2" wood blocks where applicable and when specified.

4. A 4'-0" minimum clearance is required between the face of the railing and the face of fixed object(s). This clearance may be less than 4'-0", but not less than 3'-0". Where the clearance is less than 3'-0", a concrete wall or barrier should be constructed to shield the fixed object(s).

5. 31" In-line terminal system and treatments are used where site conditions will not accommodate a 31" flared end treatment.

6. The type of 31" terminal system to be used will be shown on the Project Plans.

7. As site conditions dictate, construct additional MGS to shield fixed objects. Additional MGS length equal to multiples of 12'-6".

8. Layouts Types 16I through 16J, shown on the A77R Series of Standard Plans, are typically used where MGS is recommended to shield roadside fixed object(s) and a non-rotary 31" and treatment is required for both directions of traffic.

9. Where placement of dike is required with guard railing, see Standard Plan A77N1 for dike and guard details.

10. The 1511 or flatter flare for the buried post end anchor is based on the edge of the paved shoulder or offset line of edge of traveled way. The length of MGS within the 1511 or flatter flare is based on site conditions and should be a length equal to multiples of 12'-6".

11. For details of buried post end anchor, see Standard Plan A77A12.

12. For typical flare offsets for 25'-0" length parapets with maximum offset of 1'-6", see Standard Plan A77N1.

13. MGS or steel post, 8'-0" in length, with 6" x 12" x 1-1/2" notched wood blocks or notched recycled plastic blocks may be used in place of the 10" x 10" x 1'-2" wood block shown in the detail "Strengthened Midwest Guardrail System Section for Fixed Object".

State of California
Department of Transportation

Midwest Guardrail System
Typical Layouts for Roadside Fixed Objects

No Scale

A77R7

2015 Standard Plan A77R7

Randell D. Hiatt
Registered Civil Engineer

October 30, 2015
STRENGTHENED MIDWEST GUARDRAIL SYSTEM SECTIONS

FOR FIXED OBJECT

Use strengthened MGS sections with layout Types 16K or 16L layouts where minimum clearance between the face of the MGS and fixed object(s) is less than 4'-0", but not less than 3'-0". See Note 4.

HINT P

NOTE A: For a series of fixed objects (bridge columns, overhead sign supports, etc.) that are not spaced in a straight line, the distance between the face of the MGS and fixed object(s) is less than 4'-0", but not less than 3'-0". See Note 4 and Note 13.

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STRENGTHENED MIDWEST GUARDRAIL SYSTEM SECTIONS

FOR FIXED OBJECT

Use strengthened MGS sections with layout Types 16K or 16L layouts where minimum clearance between the face of the MGS and fixed object(s) is less than 4'-0", but not less than 3'-0". See Note 4.

HINT P

NOTE A: For a series of fixed objects (bridge columns, overhead sign supports, etc.) that are not spaced in a straight line, the distance between the face of the MGS and fixed object(s) is less than 4'-0", but not less than 3'-0". See Note 4 and Note 13.

81
1. See Standard Plans A703 and A77MI for typical use of rail tensioning assembly.
2. For details of the anchor plate and ½" cable, see Standard Plan A7753.
NOTE:
See Standard Plans A77S1, A77S2 and A77T1 for typical use of anchor cable and anchor plate.

ANCHOR PLATE DETAIL
(MGS shown, TBB similar)

ANCHOR PLATE DETAIL (MGS shown, TBB similar)

NOTE:
Dimensioning applies to both types.

SECTION A-A (ALTERNATIVE TYPE 1)
SECTION A-A (ALTERNATIVE TYPE 2)

ANCHOR CABLE WITH SWAGED FITTING AND STUD
DETAIL "E"

RETURN TO TABLE OF CONTENTS
ANCHOR PLATE DETAILS

SECTION A-A
(Alternative Type 1)

ANCHOR PLATE DETAILS

SECTION A-A
(Alternative Type 2)

ELEVATION
END ANCHOR ASSEMBLY
(TYPE CA)

(Wood deck, MGS shown; details similar for Thrie Beam Barrier.)

NOTE:
Dimensioning applies to both types.

ANCHOR CABLE WITH SWAGED FITTING AND STUD

DETAIL C

ANCHOR CABLE WITH SWAGED FITTING AND STUD

DETAIL C

RETURN CAP (TYPE TA) FOR DOUBLE THRIE BEAM OR RETURN CAP (TYPE TA) FOR SINGLE MGS END CAP (TYPE A) FOR SINGLE MGS OR END CAP (TYPE T) FOR SINGLE THRIE BEAM

RETURN CAP (TYPE TA) FOR DOUBLE THRIE BEAM OR RETURN CAP (TYPE TA) FOR SINGLE MGS END CAP (TYPE A) FOR SINGLE MGS OR END CAP (TYPE T) FOR SINGLE THRIE BEAM

RETURN CAP (TYPE TA) FOR DOUBLE THRIE BEAM OR RETURN CAP (TYPE TA) FOR SINGLE MGS END CAP (TYPE A) FOR SINGLE MGS OR END CAP (TYPE T) FOR SINGLE THRIE BEAM

RETURN CAP (TYPE TA) FOR DOUBLE THRIE BEAM OR RETURN CAP (TYPE TA) FOR SINGLE MGS END CAP (TYPE A) FOR SINGLE MGS OR END CAP (TYPE T) FOR SINGLE THRIE BEAM

RETURN CAP (TYPE TA) FOR DOUBLE THRIE BEAM OR RETURN CAP (TYPE TA) FOR SINGLE MGS END CAP (TYPE A) FOR SINGLE MGS OR END CAP (TYPE T) FOR SINGLE THRIE BEAM

RETURN CAP (TYPE TA) FOR DOUBLE THRIE BEAM OR RETURN CAP (TYPE TA) FOR SINGLE MGS END CAP (TYPE A) FOR SINGLE MGS OR END CAP (TYPE T) FOR SINGLE THRIE BEAM

RETURN CAP (TYPE TA) FOR DOUBLE THRIE BEAM OR RETURN CAP (TYPE TA) FOR SINGLE MGS END CAP (TYPE A) FOR SINGLE MGS OR END CAP (TYPE T) FOR SINGLE THRIE BEAM
1. For typical use of this type of end anchor with MGS see the A77P, A77Q and A77R Series of the Standard Plans.

2. The buried post end anchor shall only be constructed at those locations where the slope perpendicular to the roadway is non-traversable.
MIDWEST GUARDRAIL SYSTEM CONNECTION TO BRIDGE RAILING WITHOUT SIDEWALK

NOTES:
1. See Standard Plan A77U2 for additional connection details to bridges without sidewalks.
2. Additional details of posts, blocks and hardware are shown on Standard Plans A77M1, A77N1 and A77N2.
3. For additional details of Transition Railing (Type WB-31), see Standard Plan A77U4. Transition Railing (Type WB-31) transitions the 12 gauge MGS railing section to a heavier gauge nested thrie beam railing section which is connected to the concrete bridge railing.
4. For typical use of Connection Detail AA, see Layout Types 12A and 12B on Standard Plan A77Q1, Layout Type 12C and 12D on Standard Plan A77Q2, and Layout Type 12E on Standard Plan A77Q3.
5. For typical use of Connection Detail BB, see Layout Type 12F (structure departure railing connection) on Standard Plan A77Q4 and Layout Type 12G on Standard Plan A77Q5.
6. Where the height of the bridge railing exceeds the height of the thrie beam railing, taper the top of the end of the bridge railing at 45 degrees so that the top of the thrie beam railing connects to the concrete bridge railing.
7. For details of End Cap (Type TC), see Standard Plan A77Q4.
8. See Standard Plan A77U4 for additional details regarding depth dimension for straight metal box spacer.
MIDWEST GUARDRAIL SYSTEM CONNECTION TO BRIDGE RAILING WITHOUT SIDEWALK

NOTES:
1. See Standard Plan A77U1 for additional connection details to bridges without sidewalks.
2. Additional details of posts, blocks and hardware are shown on Standard Plans A77M1, A77N1 and A77N2.
3. For additional details of Transition Railing (Type WB-31), see Standard Plan A77U4, Transition Railing (Type WB-31) Transition the 12 gauge MGS railing section to a heavier gauge nested thrie beam railing section which is connected to the concrete bridge railing.
4. For typical use of Connection Detail AA, see Layout Types 12A and 12B, see Standard Plan A77Q3, Layout Type 1/2E on Standard Plan A77Q4, and Layout Type 1/2E on Standard Plan A77Q3.
5. For typical use of Connection Detail CC, see Layout Types 12A and 12B, see Standard Plan A77Q2, and Layout Type 12C on Standard Plan A77Q4.
6. Where the height of the bridge railing exceeds the height of the thrie beam railing by more than 1' of Connection Detail AA and connection Detail CC, taper the top elevation of the thrie beam railing.
7. For details of End Cap (Type TC), see Standard Plan A77U4.
8. See Standard Plan A77U4 for additional details regarding depth dimension for straight metal box spacer.
MIDWEST GUARDRAIL SYSTEM CONNECTION TO ABUTMENT OR WALL

CONNECTION DETAIL EE

See Note 5

ELEVATION

MIDWEST GUARDRAIL SYSTEM CONNECTION TO ABUTMENT OR WALL

CONNECTION DETAIL DD

See Note 4

NOTES:

1. These connection details apply to abutments and walls.

2. Additional details of posts, blocks and hardware are shown on Standard Plans A77M1, A77M2 and A77N2.

3. For additional details of Transition Railing (Type WB-31), see Standard Plan A77Q4. Transition Railing (Type WB-31) transitions the 12 gauge MGS railing section to a heavier gauge nested thrice beam railing section which is connected to the concrete anchor block.

4. For typical use of Connection Details DD, see Layout Types 12A and 12B on Standard Plan A7701 and Layout Types 12C and 12D on Standard Plan A7702.

5. For typical use of Connection Detail EE, see Layout Type 12D on Standard Plan A7702 and Layout Type 12EB on Standard Plan A7705.
NOTES:
1. Use †" Ø button head bolts and hex nuts for connections to posts. No washer slot is provided for bolted connections to posts.
2. The nested rail elements, end cap, and "W" beam to thrie beam elements may be spliced together prior to bolting the elements to the wood post and concrete barrier or railing.
3. Exterior splice bolt holes for rail element splices at Post No. T5 and the connection to the concrete barrier or railing shall be the standard †" x †" size. Interior splice bolt holes at these locations may be increased up to †" Ø. Only the top 4 and the bottom 4 splice bolts with washers and nuts are required for rail splices at Post No. T5 and the connection to the concrete barrier or railing.
4. The top elevation of Posts No. T2 through No. T7 shall not project more than †" above the top elevation of the rail element.
5. Typically, the railing connected to Transition Railing (Type WB-31) will be either standard rolling section of MGS with height transition ratio of 150:1 or a Caltrans approved 31" end treatment attached to Post No. T1.
6. The depth of the metal box spacer varies from the 3" No. 1/2" and is dependent on the width of the concrete railing or wall. The combined depth for the depth of the metal box spacer plus the depth of rolling or wall is typically 21". Where the space between the front thrie beam element and the rear thrie beam element is less than 1½", metal plates similar to Plate A are to be used as spacers.
7. Where the width of the concrete railing or wall is greater than 1½", wood blocks are to be used to fill the space created between the bocskide of Posts No. T5 through No. T8 and the rear thrie beam element. These wood blocks shall be 1½" in width and 1½" in length. The dimension between the front thrie beam element and the rear thrie beam element is to match the width of the concrete railing or wall.
8. End caps may befastened over 12 gauge and 10 gauge thrie beam elements where transition railing is installed on the departure end of bridge railing.

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

MIDWEST GUARDRAIL SYSTEM
TRANSITION RAILING (TYPE WB-31)
NO SCALE

A77U4
NOTE:
1. Refer to Standard Plans A77L1 and A77L2 for component details for MGS not shown on this plan.

2015 STANDARD PLAN A77U5

MIDWEST GUARDRAIL SYSTEM
TRANSITION TO METAL BEAM GUARDRAIL

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

Randall D. Whitt
C50200

October 30, 2015

No Scale

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MIDWEST GUARDRAIL SYSTEM CONNECTION TO BRIDGE RAILING WITH SIDEWALKS

NOTES:
1. See Standard Plan A77V2 for additional connection details to bridges with sidewalks.
2. For additional details of Transition Railings (Type WB-31), see Standard Plan A77U4. Transition Railings (Type WB-31) transitions the 12 gauge MGS railing section to a heavier gauge nested thrie beam railing section which is connected to the concrete bridge railing.
3. For typical use of Connection Detail FF, see Layout Types 12A and 12B on Standard Plan A77Q1.
4. For typical use of Connection Detail GG, see Layout Type 12D on Standard Plan A77Q2 and Layout Type 12DD on Standard Plan A77Q2.
5. Where the bridge sidewalk is not continued beyond the end of the bridge railing, the portion of the sidewalk beyond each end of the bridge railing shall be transitioned down from the top elevation of the sidewalk, for its entire width, to the finished grade of the adjacent roadbed. The longitudinal slope of each sidewalk elevation transition shall not exceed 8.33 percent.
6. For details of End Cap (Type TC), see Standard Plan A77U4.
7. See Standard Plan A77V4 for additional details regarding depth dimension for straight metal box spacer.
MIDWEST GUARDRAIL SYSTEM CONNECTION TO BRIDGE RAILING WITH SIDEWALKS

NOTES:
1. See Standard Plan A77V1 for additional connection details to bridges with sidewalks.
2. For additional details of Transition Railing (Type WB-31), see Standard Plan A77V4. Transition Railing (Type WB-31) transitions the 12 gauge MGS railing section to a heavier gauge nested thrie beam railing section which is connected to the concrete bridge railing.
3. For typical use of Connection Detail FF, see Layout Types 12A and 12B on Standard Plan A77Q4.
4. For typical use of Connection Detail HH, see Layout Types 12AA and 12BB on Standard Plan A77Q4.
5. Where the bridge sidewalk is not continued beyond the end of the bridge railing, the portion of the sidewalk beyond each end of the bridge railing shall be transitioned down from the top elevation of the sidewalk, for its entire width, to the finished grade of the adjacent roadbed. The longitudinal slope of each sidewalk elevation transition shall not exceed 8.33 percent.
6. For details of End Cap (Type TC), see Standard Plan A77U4.
7. See Standard Plan A77U4 for additional details regarding depth dimension for straight metal box spacer.
The ends of the rail elements are to be overlapped in the direction of traffic (see details).

c) Where end cap is to be attached to the end of a rail element, a total of 4 of the above described splice bolts and nuts are to be used. Where a return cap is to be attached to the ends of rail elements, a total of 8 of the above described splice bolts and nuts are to be used.

THREE BEAM BARRIER
STANDARD BARRIER RAILING
SECTION (STEEL POST
WITH NOTCHED WOOD BLOCK
OR NOTCHED RECYCLED PLASTIC BLOCK)
NO SCALE

RAIL SPLICE DETAIL

1. For details of the cross section of the thrie beam rail element and details for wood post with wood block installations, see Standard Plan A78A.
2. For details of standard hardware, posts and blocks used to construct thrie beam barrier, see Standard Plans A78B1 and A78B2.
3. Three beam barrier post spacing to be 6'-3" center to center, except as otherwise noted.
4. Top of barrier rail to be 2'-8" above ground line or shoulder surfacing under the rail element.
5. For barrier end treatments and barrier connections, see Standard Plans A78C1, A78C2, A78E1, A78E2, A78E3, A78F1, A78F2, A78G and A78H.
6. For connection to Concrete Barrier, see Standard Plan A78I.
7. Attach rail element to block and steel post with 2 bolts or rods on approaching traffic side of block and post web. No washer on rail face for rod or bolted connections to line post.
8. For details of thrie beam barrier on bridges, see Standard Plan A78D1. For details of thrie beam barrier at fixed objects, see Standard Plan A78D2.
NOTES:
1. All holes in steel post to be £ 3/8" Dia maximum; holes in wood posts and wood blocks to be £ 1/4" Dia maximum.
2. Dimensions shown for wood post are nominal.
3. For use with W6 x 8.5 or W6 x 9 steel post.
4. For use with W6 x 15 steel post.
5. Notched face of block faces steel post.

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

THREE BEAM BARRIER
POST AND BLOCK DETAILS
NO SCALE

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**NOTES:**

1. Where the distance between back of post and hinge point is less than 36”, construct vegetation control to 8” from hinge point while maintaining the 8” block-out at back of post. If the 8” block-out at back of post cannot be maintained, construct vegetation control flush with the back edge of post.

2. Where dike is constructed under barrier, construct vegetation control to back edge of dike. Where paved shoulder is constructed within 36” in front of the post, construct vegetation control to the edge of paved shoulder.

3. For wood and steel post sizes, see Standard Plan A77N2.

4. For details not shown, see Standard Plan A78A and A78B.
NOTE:
1. For wood and steel post sizes, see Standard Plan A78C2.
2. For details not shown, see Standard Plans A78A and A78B.
1. See Standard Plan A78C3 for additional vegetation control.

2. Where dike is constructed under barrier, construct vegetation control up to 36" in front of the post. Where paved shoulder is constructed, construct vegetation control within 36" in front of the post, construct vegetation control to the edge of paved shoulder.

NOTES:

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION
THREE BEAM BARRIER
TYPICAL VEGETATION CONTROL
AT FIXED OBJECTS
IN MEDIAN
NO SCALE
A78C5

PLAN

SECTION A-A

E16
TYPICAL VEGETATION CONTROL

DEPARTMENT OF TRANSPORTATION
STATE OF CALIFORNIA

NOTE:

1. See Standard Plan A78C4 for additional vegetation control details.

2. Where dike is constructed under barrier, construct vegetation control to back edge of dike. Where paved shoulder is constructed, ETW 36" in front of the post, construct vegetation control to the edge of paved shoulder.

3. End vegetation control at end of backside rail element attached to bridge railing.

SECTION A-A

SECTION B-B
For typical flare offsets for 25'-0" length parabola with maximum offset of 1'-0"

3. Wood post with 8" x 8" x 1'-10" wood blocks shown at 3'-1" center to center spacing.

4. Where applicable and when specified, (W6 x 15) x 8'-0" steel post with 8" x 8" x 1'-10" wood blocks shown at 3'-1" center to center spacing.

5. Concrete barrier should be constructed to shield the fixed object(s).

See Notes 1, 2 and 3.
DOUBLE THRIE BEAM BARRIER ON BRIDGE

NOTES:
2. Attach rail element to wood block and steel post with 2 bolts or rods on approaching traffic side of block and post web. No washer on rail faces for rods or bolted connections to post.
For one-way roadways

SINGLE THRIE BEAM BARRIER
END TREATMENT FOR TRAFFIC APPROACH END
OF SINGLE THRIE BEAM BARRIER
(See Note 1)

END ANCHOR FOR TRAFFIC DEPARTURE END
OF SINGLE THRIE BEAM BARRIER

NOTES:
1. For additional details of End Anchor Assembly (Type SFT), see Standard Plan A77S1.
2. The "W" beam to thrie beam section is only required where the terminal system connection to the thrie beam barrier is a "W" beam rail.
3. In-line Terminal System End Treatments are used where site conditions will not accommodate a flared end treatment. The type of terminal system to be used will be shown on the Project Plans. Do not use a Caltrans approved 31° end treatment.
4. A Caltrans approved crash cushion should be used in place of a terminal system end treatment where the backside of the railing would be exposed to traffic.
5. A 6'-0" length steel foundation tube, TS 8 x 6 x ¾", without a soil plate, may be furnished and installed in place of the 4'-6" length steel foundation tube and soil plate shown. Minimum embedment of the 6'-0" length tube shall be 5'-9". A 1" Ø hex head bolt and nut shall be installed in the hole of the 6'-0" length tube to keep the wood post from dropping into the tube.

SEE NOTE 2

END TREATMENT FOR TRAFFIC APPROACH END
OF SINGLE THRIE BEAM BARRIER

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1. For End Anchor Assembly (Type CA) details, see Standard Plan A77P1.

2. The typical passageway opening for motorcycles is 6'-0" to 8'-0". Generally, motor/pedestrian passageways are used where median width is less than 22'-0". The typical passageway opening for motor vehicles is 12'-0" to 15'-0", generally. Car/pedestrian passageways are not used where median width is 12'-0" or less. See Project Plans for width of passageway opening.

3. Barrier end offsets from edge of traveled way vary depending on type of highway facility involved. End offsets other than 10'-0" will be shown on the Project Plans.

4. For typical flare offsets for 25'-0" length parabola with maximum offset of 1'-0", see Standard Plan A77P1.

NOTE:

- For End Anchor Assembly (Type CA) details, see Standard Plan A77P1.
- The typical passageway opening for motorcycles is 6'-0" to 8'-0". Generally, motor/pedestrian passageways are used where median width is less than 22'-0". The typical passageway opening for motor vehicles is 12'-0" to 15'-0", generally. Car/pedestrian passageways are not used where median width is 12'-0" or less. See Project Plans for width of passageway opening.
- Barrier end offsets from edge of traveled way vary depending on type of highway facility involved. End offsets other than 10'-0" will be shown on the Project Plans.
- For typical flare offsets for 25'-0" length parabola with maximum offset of 1'-0", see Standard Plan A77P1.
END TREATMENT FOR DOUBLE THRIE BEAM BARRIER

NOTES:
1. For the type of Crash Cushion to be used, see Project Plans and Special Provisions.
2. For details of standard double thrie beam barrier, see Standard Plans A78A, A78B, A78C1, and A78C2.
3. The 'W' beam to thrie beam sections are only required where the crash cushion connection to the thrie beam barrier assembly is a 'W' beam rail.

For details of standard double thrie beam barrier, see Standard Plans A78A, A78B, A78C1, and A78C2.
1. For details of Transition Railing (Type DTB), see Standard Plans A78K.
2. For typical use of Connection Detail 1A, see Type 25A Connection Layout on Standard Plan A78H.
3. Where the height of the bridge railing exceeds the height of the thrie beam railing by more than 1" at Connection Detail 1A, taper the top of the end of the bridge railing at 4:1 to match the top elevation of the thrie beam railing.
4. For details of End Cap (Type TC), see Standard Plan A78C1.
5. See Standard Plan A78K for additional details regarding depth dimension for straight metal box spacer.
1. For additional details of Transition Railing (Type STB), see Standard Plans A78J.
2. Transition Railing (Type STB) transitions the 12-gauge single thrie beam barrier to a heavier gauge single thrie beam barrier section then to a heavier gauge nested double thrie beam barrier section when then is connected to the concrete bridge railing.
3. Where the height of the bridge railing exceeds the height of the thrie beam railing by more than 1" at Connection Detail 2A, taper the top of the end of the bridge railing or 411 to match the top elevation of the thrie beam railing.
4. For details of End Cap (Type TC), see Standard Plan A78C1.
5. See Standard Plan A78J for additional details regarding depth dimension for straight metal box spacer.
NOTES:
1. These connection details apply to concrete abutments and walls. For additional connections details, see Project Plans.
2. For additional details of Transition Railing (Type STB), see Standard Plan A78J. Transition Railing (Type STB) transitions the standard 12 gauge single thrie beam barrier to a heavier gauge single thrie beam railing section then to a heavier gauge nested double thrie beam barrier section which then is connected to the concrete anchor block.
3. For details of End Cap (Type TC), see Standard Plan A78C1.

For details of End Cap (Type TC), see Standard Plan A78C1.

For additional details of Transition Railing (Type STB), see Standard Plan A78J. Transition Railing (Type STB) transitions the standard 12 gauge single thrie beam barrier to a heavier gauge single thrie beam railing section then to a heavier gauge nested double thrie beam barrier section which then is connected to the concrete anchor block.

For additional connections details, see Project Plans.

These connection details apply to concrete abutments and walls. For additional connections details, see Project Plans.

For additional details of Transition Railing (Type STB), see Standard Plan A78J. Transition Railing (Type STB) transitions the standard 12 gauge single thrie beam barrier to a heavier gauge single thrie beam railing section then to a heavier gauge nested double thrie beam barrier section which then is connected to the concrete anchor block.

For details of End Cap (Type TC), see Standard Plan A78C1.

For details of End Cap (Type TC), see Standard Plan A78C1.

For additional details of Transition Railing (Type STB), see Standard Plan A78J. Transition Railing (Type STB) transitions the standard 12 gauge single thrie beam barrier to a heavier gauge single thrie beam railing section then to a heavier gauge nested double thrie beam barrier section which then is connected to the concrete anchor block.

For details of End Cap (Type TC), see Standard Plan A78C1.

For additional details of Transition Railing (Type STB), see Standard Plan A78J. Transition Railing (Type STB) transitions the standard 12 gauge single thrie beam barrier to a heavier gauge single thrie beam railing section then to a heavier gauge nested double thrie beam barrier section which then is connected to the concrete anchor block.

For details of End Cap (Type TC), see Standard Plan A78C1.
Type 25A Connection Layout

Notes:
1. Line post, blocks and hardware to be used are shown on Standard Plans A78A, A78B, A78C1 and A78C2.
2. Post spacing to be 6'-3" center to center, except as otherwise noted.
3. Except as noted, line posts are 6" x 8" x 6'-0" wood with 6" x 8" x 1'-10" wood blocks. 6" x 8" x 3' steel posts, 6'-8" in length, with 6" x 8" x 1'-10" notched wood blocks or notched recycled plastic blocks may be used for 6" x 8" x 6'-0" wood posts with 6" x 8" x 1'-10" wood blocks where applicable and when specified.
4. For Transition Railing (Type DTB) details, see Standard Plan A78B.
5. The 15:1 or flatter flare is measured off of the edge of traveled way.
1. For details of Concrete Barrier Type 60, see Standard Plan A76A. Thrie beam barrier connections to Concrete Barrier Type 60S and Type 60G are similar to details shown on this plan.
2. For additional thrie beam barrier details, see Standard Plans A76A, A76B, A76C1, and A76C2.
3. Where beveled metal box spacer is installed, place 1/4" # x 3" and 1/4" # x 2" pipe spacers on 1/8" HS bolts passing through interior of box.

NOTES:

LEGEND

A. NESTED THRIE BEAM ELEMENTS
   (ONE 12 GAUGE ELEMENT NESTED
   OVER ONE 10 GAUGE ELEMENT)

B. ONE 12 GAUGE THRIE BEAM ELEMENT.

C. ONE 12 GAUGE THRIE BEAM ELEMENT.

10 GAUGE = 0.135" THICK
12 GAUGE = 0.108" THICK

SECTION A-A
(Type 60 Concrete Barrier shown)
ALTERNATIVE 1

Approach speed less than 45 mph

ARRAY 'U11'

SAND FILLED MODULE

SURFACE

5% Max

DOWNWARD SLOPE

GREATER THAN 5%

ALTERNATIVE 2

Approach speed 45 mph or more

ARRAY 'U14'

SLOPED SEAT DETAIL

PAINTING DETAIL

NOTES:

1. *** Indicates module location and weight of sand in pounds for each module. Module spacing is based on the greater diameter of the modules.

2. All sand weights are nominal.

3. Modules shall be placed on hot mix asphalt, epoxy mortar or concrete surface. Modules to be placed on surfacing with greater than 5% downward slope shall be seated as shown.

4. Weight of sand and outline of each module shall be painted on the surface of each module location.

5. Module blocking, epoxied to the deck surface, is required for all modules placed on bridge decks. Two acceptable alternatives are shown. Other alternatives recommended by the manufacturer and approved by the Engineer will be accepted.

6. Approach speeds indicated conform to NCHRP Report criteria.

Crash Cushion, Sand Filled (Unidirectional)

No Scale

State of California Department of Transportation

Randall D. Watt

October 30, 2015

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1. (x) indicates module location and weight of sand in pounds for each module. Module spacing is based on the greater diameter of the module.

2. All sand weights are nominal.

3. Modules shall be placed on hot mix asphalt, epoxy mortar or concrete surface. Modules to be placed on surfacing with greater than 5% downward slope shall be seated as shown.

4. Weight of sand and outline of each module shall be painted on the surface of each module location.

5. Module Blocking, epoxied to the deck surface, is required for all modules placed on bridge decks. Two acceptable alternatives are shown. Other alternatives recommended by the manufacturer and approved by the Engineer will be accepted.

6. Approach speeds indicated conform to NCHRP Report criteria.

NOTES:

- Approach speed less than 45 mph
- Approach speed 45 mph or more
- Downward slope shall be seated as shown.
- Sand weights are nominal.

ARRAY 'U16'
Approach speed less than 45 mph

ARRAY 'U21'
Approach speed 45 mph or more

SLOPED SEAT DETAIL
See Note 3

BRIDGE DECK MODULE BLOCKING DETAILS
See Note 5

CRASH CUSHION, SAND FILLED (UNIDIRECTIONAL)

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

Randell D. Hiatt
CIVIL ENGINEER

October 30, 2015

THE STATE OF CALIFORNIA OR ITS OFFICERS OR AGENTS SHALL NOT BE RESPONSIBLE FOR COPIES OF THIS PLAN SHEET.
**NOTES:**

1. **See Note 1** indicates module location and weight of sand in pounds for each module. Module spacing is based on the greater diameter of the module.

2. **See Note 2** indicates all sand weights are nominal.

3. **See Note 3** indicates bidirectional crash cushion arrays may be angled toward approaching traffic. Amount of angle not to exceed 10 degrees.

4. **See Note 4** indicates modules shall be placed on hot mix asphalt, epoxy mortar or concrete surface. Modules to be placed on surfacing with greater than 5% downslope shall be seated as shown.

5. **See Note 5** indicates weight of sand and outline of each module shall be painted on the surface of each module location.

6. **See Note 6** indicates module blocking, applied to the deck surface, is required for all modules placed on bridge decks. Two acceptable alternatives are shown. Other alternatives recommended by the manufacturer and approved by the Engineer will be accepted.

7. **See Note 7** indicates approach speeds indicated conform to NCHRP Report criteria.
NOTES:

1. The tables below show minimum sized posts and braces complying with the specifications. Larger or heavier post and brace sizes may be used upon approval.

2. Sections shown in the tables must also comply with the strength requirements and other provisions of the Specifications.

3. Other sections which comply with the strength requirements and other provisions of the Specifications may be used upon approval.

4. Options exercised shall be uniform on any one project.

5. Offset to be 5'-0" at monuments locations, measured at right angles to R/W lines. Taper to achieve offset to be at least 2'-0" long.


**TYPICAL MEMBER DIMENSIONS (See Notes)**

<table>
<thead>
<tr>
<th>FENCE WIDTH</th>
<th>ROLL FORMED</th>
<th>END, LATCH AND CORNER POSTS</th>
<th>BRACES</th>
</tr>
</thead>
<tbody>
<tr>
<td>6&quot; AND LESS</td>
<td>1,400&quot;</td>
<td>2.72 x 1.875 x 1.875&quot;</td>
<td>1.85</td>
</tr>
<tr>
<td>8'-0&quot; TO 10'-0&quot; MAX</td>
<td>2.375&quot;</td>
<td>3.65 x 2.25 x 1.70&quot;</td>
<td>2.78</td>
</tr>
<tr>
<td>10'-0&quot; MAX</td>
<td>2.875&quot;</td>
<td>5.80</td>
<td>1.66&quot;</td>
</tr>
</tbody>
</table>

**GATE POST**

<table>
<thead>
<tr>
<th>FENCE HEIGHT</th>
<th>GATE WIDTHS</th>
<th>ROUND OD POST</th>
<th>WEIGHT (lbs/)</th>
</tr>
</thead>
<tbody>
<tr>
<td>6&quot; AND LESS</td>
<td>UP THRU 6&quot;</td>
<td>2,875&quot;</td>
<td>5.80</td>
</tr>
<tr>
<td>8'-0&quot; TO 10'-0&quot; MAX</td>
<td>4,500&quot;</td>
<td>10.80</td>
<td></td>
</tr>
<tr>
<td>12'-0&quot; TO 18'-0&quot;</td>
<td>5,563&quot;</td>
<td>14.63</td>
<td></td>
</tr>
<tr>
<td>18'-0&quot; TO 24'-0&quot;</td>
<td>6,625&quot;</td>
<td>18.99</td>
<td></td>
</tr>
<tr>
<td>24'-0&quot; TO 30'-0&quot;</td>
<td>8,625&quot;</td>
<td>26.58</td>
<td></td>
</tr>
</tbody>
</table>
### Chain Link Fence Details

#### Method of Erecting Fence for Fill Slope

- **Double Gate Removable Center Post**
- **Gate Post**
- **Horizontal Brace with \( \frac{3}{4} \) Truss Rods**
- **Concrete**
- **Tension Wire Variations**
- **Line Post**
- **Brace**

#### Method of Tying Fence to Headwall

- **Tension Wire**
- **Line Post**
- **Concrete**
- **Headwall**
- **Tie Wire**

**Notes:**

1. \( H \) is 3'-6" for fabric less than 5'-0" high.
2. \( H \) is 5'-0" for fabric 5'-0" and over.
3. \( T \) is not less than 3 times maximum cross section of post with minimum of 3".
5. See Detail A on Standard Plan A86B for connection of headwall.

---

**Barbed Wire Post Top**

- **Plunger Rod**
- **Steel**
- **Concrete**
- **Gusset Detail**
- **Plunger Cup Detail**
- **Walk Gate**
- **Pipe Gate Frame**

---

**Department of Transportation**

**State of California**
1. All material for abutment connection to be galvanized.
2. The chain link fabric shall be replaced by barbed wire strands of 12" maximum centers between the double posts.
3. Where the width of the culvert makes it necessary to anchor a post to the top of the culvert, a cast iron shoe or other device approved by the Engineer shall be used.
4. Fencing over stream and around headwall may also use Barbed Wire or mesh fencing with either wood post or steel post installation.
5. See Standard Plan A85 for Chain Link fence dimensions.

See Note 4 for Barbed Wire and Wire Mesh fence dimensions and for wood post and steel post installation.
NOTES:
1. Offset to be 2'-0" at monument locations, measured at right angles to R/W lines. Taper to achieve offset to be at least 20'-0" long.
2. See Standard Plan A86 for Barbed Wire and Wire Mesh dimensions and for steel post and wood post dimensions and weight.
3. Use wood posts when specified in the Special Provisions or shown on the Project Plans.

WOOD MORTISE DETAIL
See Note 3

WIRE MESH DETAIL

LEGEND:
- WIRE MESH FENCING
- BARBED WIRE FENCING

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION
BARBED WIRE AND WIRE MESH FENCE DETAIL ON SHARP BREAK IN GRADE
RETURN TO TABLE OF CONTENTS
METHOD OF TYING FENCE TO HEADWALL

1. Wire mesh fencing shown, can also use Barbed Wire fencing.
2. See Standard Plan A86 for Wire mesh and Barbed Wire fence dimensions.
3. T is not less than 3 times maximum cross section of post with minimum of 8'.
4. H is 2'-6" for fabric less than 5'-0" high.
5. H is 3'-0" for fabric 5'-0" and over.
6. May be used when thickness of concrete is 1'-0" or more.

NOTES:

SEE DETAIL A OR B
SEE DETAIL C
SEE DETAIL D
SEE DETAIL D

FILL SLOPE
HEADWALL
HEADWALL
FILL SLOPE

METHOD OF TYING FENCE TO HEADWALL

WOOD POST
METAL POST

DETAIL A
DETAIL B
DETAIL C
DETAIL D

ALTERNATIVE DETAIL D

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

BARBED WIRE AND WIRE MESH
FENCE DETAILS

NO SCALE

A86B

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THE ACCURACY OR COMPLETENESS OF SCANNED

October 30, 2015

REGISTERED CIVIL ENGINEER

THE STATE OF CALIFORNIA OR ITS OFFICERS

RETURN TO TABLE OF CONTENTS
1. Type I Ditch Crossing shows wood posts. Steel posts may be used in place of wood.

2. Ditch crossings show Wire Mesh fencing. Barbed Wire fencing may be used in place of Wire Mesh.


DRIVE STAPLES AT ANGLE

DO NOT DRIVE STAPLES PARALLEL TO SIDE OF POST

LEAVE WIRE LOOSE IN STAPLE

LINE POST STAPLING DETAILS
(Apply to rectangular/square and round posts)
Do not staple vertical wire in wire mesh.

OPTION A

OPTION B

LINE POST WIRE TIE OPTION DETAILS
(option details also apply to rectangular/square posts)

BARBED WIRE/FENCE - MISCELLANEOUS DETAILS
(state of california department of transportation)

2015 STANDARD PLAN A86D

Return to Table of Contents
5. Minimum width of clear passageway for sidewalk shall be 4'-2".

6. Retaining curbs and acquisition of construction easement may be necessary for narrow sidewalks or curb heights in excess of 4".

7. Across the pedestrian route or curb ramp locations, the gutter pan slope shall not exceed 1' in 2'-0" width.

8. Across the pedestrian route or curb ramp locations, the gutter pan slope shall not exceed 1' in 2'-0" width.

9. Across the pedestrian route or curb ramp locations, the gutter pan slope shall not exceed 1' in 2'-0" width.

10. Across the pedestrian route or curb ramp locations, the gutter pan slope shall not exceed 1' in 2'-0" width.

NOTES:

1. Case A driveway section typically applies.

2. X=3'-0" except for curb heights over 10" where 411 slopes shall be used on curb slope.

3. Sidewalk and ramp thickness "T" at driveway shall be 4" for residential and 6" for commercial.

4. Difference in slope of the driveway ramp and the slope of a line between the gutter and a point on the roadway 5'-0" from gutter line shall not exceed 13%. Reduce driveway ramp slope, not gutter slope, where required.

5. Minimum width of clear passageway for sidewalk shall be 4'-2".

6. Retaining curbs and acquisition of construction easement may be necessary for narrow sidewalks or curb heights in excess of 4".

7. Across the pedestrian route or curb ramp locations, the gutter pan slope shall not exceed 1' in 2'-0" width.

8. Across the pedestrian route or curb ramp locations, the gutter pan slope shall not exceed 1' in 2'-0" width.

9. Across the pedestrian route or curb ramp locations, the gutter pan slope shall not exceed 1' in 2'-0" width.

10. Across the pedestrian route or curb ramp locations, the gutter pan slope shall not exceed 1' in 2'-0" width.

11. Across the pedestrian route or curb ramp locations, the gutter pan slope shall not exceed 1' in 2'-0" width.

12. Across the pedestrian route or curb ramp locations, the gutter pan slope shall not exceed 1' in 2'-0" width.

13. Across the pedestrian route or curb ramp locations, the gutter pan slope shall not exceed 1' in 2'-0" width.

14. Across the pedestrian route or curb ramp locations, the gutter pan slope shall not exceed 1' in 2'-0" width.

15. Across the pedestrian route or curb ramp locations, the gutter pan slope shall not exceed 1' in 2'-0" width.

16. Across the pedestrian route or curb ramp locations, the gutter pan slope shall not exceed 1' in 2'-0" width.

17. Across the pedestrian route or curb ramp locations, the gutter pan slope shall not exceed 1' in 2'-0" width.

18. Across the pedestrian route or curb ramp locations, the gutter pan slope shall not exceed 1' in 2'-0" width.

19. Across the pedestrian route or curb ramp locations, the gutter pan slope shall not exceed 1' in 2'-0" width.
NOTES:
1. For HMA shoulders only, extend top layer of HMA placed on the shoulder under
dike with no joint of the ES, For projects with OGFC shoulders, do not extend
OGFC under dike, see project plans for modified dike details.
2. Case R applies to retrofit only projects where restrictive conditions do not
provide enough width for Case F backfill.
3. Type A dike only to be used where restrictive slope conditions do not provide
enough width to use Type D or Type E dike.
4. Fill and compact with excavated material to top of dike.
5. Use Type E dike, where dike is required with guardrail installations, See
Standard Plan A77N4 for dike positioning details.

DIKE QUANTITIES

<table>
<thead>
<tr>
<th>TYPE</th>
<th>PER LINEAR FOOT</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>0.0135</td>
</tr>
<tr>
<td>B</td>
<td>0.0058</td>
</tr>
<tr>
<td>C</td>
<td>0.0093</td>
</tr>
<tr>
<td>D</td>
<td>0.0130</td>
</tr>
<tr>
<td>E</td>
<td>0.0066</td>
</tr>
</tbody>
</table>

Quantities based on 5% cross slope.
NOTES:

1. Sidewalk, ramp and passageway thickness, "T", shall be 3½" minimum.

2. For details of detectable warning surfaces, see Standard Plan A88A.

3. Where an island passageway length is greater than or equal to 6'-0", but less than 8'-0", each detectable warning surface shall extend the full width and 2'-0" depth of the passageway length. Where an island passageway length is greater than or equal to 8'-0", each detectable warning surface shall extend the full width and 3'-0" depth of the passageway length. A 4'-0" wide detectable warning surface may be used on a 4'-2" wide island passageway.

4. Transitions from ramps to walks, gutters or streets shall be flush (no lip) and free of abrupt changes.

5. Utility pull boxes, manholes, vaults and all other utility facilities within the boundaries of the curb ramp will be relocated or adjusted to grade by the owner prior to, or in conjunction with, curb ramp construction.

6. Detectable warning surface may have to be cut to allow removal of utility covers while maintaining full detectable warning width and depth.

7. For additional curb ramp details, see Standard Plan A88A.

See Note 3
See Note 7
See Note 2
See Note 2
See Note 2
See Note 2
See Note 2
See Note 2
See Note 2
See Note 2
See Note 2
See Note 2
See Note 2

NOTES:
1. Transverse joint spacing may be adjusted to no less than 10' and no more than 14' to conform to bridges, change in pavement type, and hardened concrete pavement.
2. For transverse joint and dowel bar details not shown, see Standard Plan P10.
3. For longitudinal joint and tie bar details not shown, see Standard Plan P18.
4. For additional longitudinal joint layout details, see Standard Plan P10.
5. For joint layout at intersections, see Project Plans.
6. For dowel bars at longitudinal joints, see Standard Plan P18.
NOTES:
1. For transverse joint and dowel bar details not shown, see Standard Plan P10.
2. For longitudinal joint and tie bar details not shown, see Standard Plan P15.
3. For joint layout at intersections, see Project Plans.
4. For additional longitudinal joint details, see Standard Plan P18.
5. Omit longitudinal joint when edge of new concrete pavement is 3'-3" or less from JPCP lane line.
6. Transverse joint spacing may be adjusted to no less than 10' and no more than 15'-6" to conform to bridges, change in pavement type and existing pavement.
7. Dowel bars at longitudinal joint, see Standard Plan P18.
8. For isolation joints, see Detail A on Standard Plan P18.

For joint layout at intersections, see Project Plans.

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

JOINTED PLAIN CONCRETE PAVEMENT
LANE AND SHOULDER
ADDITION OR REPLACEMENT

NO SCALE

P3A

Return to Table of Contents
TABLE No. 1  LONGITUDINAL BAR REINFORCEMENT

<table>
<thead>
<tr>
<th>SLAB SIZE</th>
<th>FIRST SPACING AT EDGE OR JOINT</th>
<th>REGULAR BARS AT TRANSVERSE CONSTRUCTION JOINT</th>
<th>ADDITIONAL BARS AT TRANSVERSE CONSTRUCTION JOINT</th>
<th>Cir</th>
</tr>
</thead>
<tbody>
<tr>
<td>D</td>
<td>BAR SPACING</td>
<td>SPACING</td>
<td>SPACING</td>
<td></td>
</tr>
<tr>
<td>205</td>
<td>3&quot; TO 4&quot;</td>
<td>3.5&quot;</td>
<td>3.5&quot;</td>
<td></td>
</tr>
<tr>
<td>250</td>
<td>3&quot; TO 4&quot;</td>
<td>13&quot;</td>
<td>13&quot;</td>
<td>4&quot;</td>
</tr>
<tr>
<td>300</td>
<td>3&quot; TO 4&quot;</td>
<td>16&quot;</td>
<td>16&quot;</td>
<td>4&quot;</td>
</tr>
<tr>
<td>350</td>
<td>3&quot; TO 4&quot;</td>
<td>19&quot;</td>
<td>19&quot;</td>
<td>4&quot;</td>
</tr>
<tr>
<td>400</td>
<td>3&quot; TO 4&quot;</td>
<td>22&quot;</td>
<td>22&quot;</td>
<td>5&quot;</td>
</tr>
<tr>
<td>450</td>
<td>3&quot; TO 4&quot;</td>
<td>25&quot;</td>
<td>25&quot;</td>
<td>5&quot;</td>
</tr>
<tr>
<td>500</td>
<td>3&quot; TO 4&quot;</td>
<td>28&quot;</td>
<td>28&quot;</td>
<td>5&quot;</td>
</tr>
</tbody>
</table>

NOTES:
1. Place tie bars and intermediate transverse bars parallel to and in the same plane as transverse bars.
2. The length of lap splices for bar reinforcement must be at least 25".
3. For longitudinal contraction and construction joint details, see Standard Plan P16.
4. For curved lane layout see Standard Plan P16.
5. For tie bar and intermediate transverse bar details, see Standard Plan P16.

ABBREVIATION:
D = Thickness of CRCP
NOTES:
1. For longitudinal bar size, spacing and clearances, see Standard Plan P4.
2. The length of lap splice for bar reinforcement must be at least 25".
3. For tie bar and intermediate transverse bar details, see Standard Plan P16.
4. Place intermediate transverse bars parallel to and in the same plane as transverse bars.
5. Construct transverse joints at right angle to the longitudinal joints in adjacent CRCP. Space joints at no less than 10' intervals and no more than 14' intervals. Match location of JPCP transverse joint with CRCP transverse construction joint, expansion joint or wide flange beam. Omit dowel bars.
6. For longitudinal construction joint details, see Standard Plan P16.
7. For additional longitudinal bars detail, see Detail A on Standard Plan P14.
8. For longitudinal construction joint plan layout not shown, see Standard Plan P4.
9. For tie bar details at longitudinal construction joint, see Standard Plan P16.

ABBREVIATION:
D = Thickness of CRCP

The length of lap splices for bar reinforcement must be at least 25".

For limits of rumble strips, see Project Plans.

Construct transverse joints at right angle to the longitudinal joints in adjacent CRCP. Space joints at no less than 10' intervals and no more than 14' intervals. Match location of JPCP transverse joint with CRCP transverse construction joint, expansion joint or wide flange beam. Omit dowel bars.

For tie bar details at longitudinal construction joint, see Standard Plan P16.

For longitudinal contraction joint details, see Standard Plan P16.

For longitudinal bar size, spacing and clearances, see Standard Plan P4.

For tie bar and intermediate transverse bar details, see Standard Plan P16.

For longitudinal construction joint plan layout not shown, see Standard Plan P4.

For additional longitudinal bars detail, see Detail A on Standard Plan P14.

For limits of rumble strips, see Project Plans.
NOTES:
1. For longitudinal bar size, spacing and clearances, see Standard Plan P4.
2. The length of lap splice for bar reinforcement must be at least 25”.
3. For tie bar and intermediate transverse bar details, see Standard Plan P14.
4. Place Intermediate transverse bars parallel to and in the same plane as transverse bars.
5. Construct transverse joints at right angle to the longitudinal joints in adjacent CRCP. Space joints at no less than 10’ intervals and no more than 14’ intervals. Match location of JPCP transverse joint with CRCP transverse construction joint, expansion joint or wide flange beam. Omit dowel bars.
6. For longitudinal contraction joint details, see Standard Plan P16.
7. Do not construct longitudinal contraction joint when edge of new CRCP is less than 3’-3” from lane line.
8. For additional longitudinal bars detail, see Detail A on Standard Plan P14.
10. For limits of rumble strips, see Project Plans.

ABBREVIATION:
D = Thickness of CRCP

FOR LANE AND SHOULDER
ADDITION OR REPLACEMENT

CONTRIBUTIONE REINFORCED CONCRETE PAVEMENT
(WIDENED LANE)

SECTION Z-Z

DETAIL A
NOTES:
1. See Project Plans for spall repair locations.
2. Combine spall repair areas closer than 2' apart.
3. If the spall repair area is less than 6" from a joint, extend the repair to the joint.
4. Cut at least 2" beyond the rectangular limits of unsound concrete determined by the Engineer.

Determine the saw cut depth using the following table:

<table>
<thead>
<tr>
<th>CONC MATERIAL</th>
<th>SAW CUT DEPTH</th>
</tr>
</thead>
<tbody>
<tr>
<td>FAST-SETTING</td>
<td>2&quot; 3/8&quot;</td>
</tr>
<tr>
<td>POLYESTER</td>
<td>1/2&quot; 3/8&quot;</td>
</tr>
</tbody>
</table>

SECTION A-A

JOINT, CRACK, OR EDGE OF CONCRETE PAVEMENT REPAIR

SECTION B-B

MISCELLANEOUS SPALL REPAIR
NOTES:
1. Details for skewed joints also apply to perpendicular joints.
2. Use 1'-6" 1/2" long dowel bars with a 1/2" diameter except 1" diameter dowel bars may be used if D < 0.70'.
3. Caulk existing transverse joint at bottom and sides of the dowel bar slot prior to placing dowel bar and foam insert.
4. Foam insert thickness must match width of existing transverse joint or crack.

2015 STANDARD PLAN P7

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION
DOWEL BAR RETROFIT
NO SCALE
P7

Return to Table of Contents
**Design Notes:**

1. For concrete slab repair with > 5 years design life.
2. For short term repairs with 5 yrs or less design life or for slab replacements with cracking and seating.

**Notes:**

1. For details not shown, see Standard Plan P10.
2. Where the existing outside shoulder is asphalt concrete pavement, "a" = 1'-0" and "b" = 2'-0".
3. Use side forms where edge of RSC pavement is adjacent to asphalt concrete.
4. Transverse contraction joint to match skew of existing joint. Limit dowel bars.
5. Do not place tie bars at longitudinal joints.

**Legend:**

- RSC: Rapid Strength Concrete
- IND: Individual Slab Replacement with RSC

**Notes:**

- See Design Note 1
- See Design Note 2

**Sections:**

- Section A-A
- Section B-B
- Section C-C

**Dowel Stamp Detail:**

- Date stamp detail
- Stamp "D" for every TS joint with dowel bars

**Contract Number:**

- Month/day/year

**State of California Department of Transportation**

**Individual Slab Replacement with Rapid Strength Concrete**

No Scale
NOTE 1: See Standard Plan P4 for spacing of longitudinal bars.

NOTE 2: Tensile strength of chair shall be at least 50,000 psi.

NOTE 3: Wire sizes shown are minimum required.

NOTE 4: For concrete cover (X), see Table 1 in Standard Plan P4.

TRANVERSE BAR ASSEMBLY

#6 BAR CLIP DETAIL

CHAIR DETAIL

ISOMETRIC VIEW OF CHAIR ASSEMBLY
NOTES:
1. For longitudinal bar size, spacing and clearances, see Table 1 on Standard Plan P4.
2. The length of lap splices for bar reinforcement must be at least 25".
3. For the bars in longitudinal construction joint, see Standard Plan P16.
4. Place additional longitudinal bars parallel to and in the same plane as the longitudinal bars.
5. Place additional longitudinal bars symmetrically about longitudinal construction joint.

ABBREVIATION
D = Thickness of CRCP
7. The bottom of the saw cut must be at least 0.5" clear of any dowel bar, tie bar, or bar reinforcement.
NOTES:
1. For longitudinal bar spacing and clearances, see Table 1 on Standard Plan P4.
2. The length of lap splices for bar reinforcement must be at least 25%.
3. Place tie bars and intermediate transverse bars parallel to and in the same plane as the transverse bars.
4. Place longitudinal bars parallel to roadway curvature.
5. Place transverse bars, additional transverse bars, tie bars and intermediate transverse bars perpendicular to the pavement curvature.
6. Place additional transverse bars where required, see Detail B.
7. The bottom of the saw cut must be at least 0.5" clear of any dowel bar, tie bar and bar reinforcement.

ABBREVIATION:
D = Thickness of CRCP
TIE BAR BASKET
(Tie bars at Longitudinal joint)

NOTEs:
1. "U" frame shape assembly shown. Use either "U" frame shape or "A" frame shape.
2. Wire sizes shown are the minimum required.
3. Weld may be at top or bottom of tie bars.
4. Use anchor pins where soil or granular base is used.

PLAN

SECTION A-A
See Note 1

SECTION B-B
See Note 1

SECTION C-C
See Note 1

Notes:
1. "U" frame shape assembly shown. Use either "U" frame shape or "A" frame shape.
2. Wire sizes shown are the minimum required.
3. Weld may be at top or bottom of tie bars.
4. Use anchor pins where soil or granular base is used.
3 LANES WITH CONCRETE SHOULDERS
4 LANES WITH CONCRETE SHOULDERS
5 LANES WITH CONCRETE SHOULDERS

CASE 1
Plan
Transverse joints do not align between new and existing.

CASE 2
Plan
Transverse joints align between new and existing. (For JPCP only)

CASE 3 (INTERIOR LANE REPLACEMENT)
Plan
Transverse joints do not align between new and existing.

LANE/SOULDER ADDITION OR RECONSTRUCTION
For JPCP and CRCP

NEW CONSTRUCTION
Location of Longitudinal Joints
For JPCP

NOTES:
5. See Standard Plan P10 for longitudinal joint with tie bars.
7. See Standard Plan P10 for longitudinal joint with tie bars.
27. See Standard Plan P10 for longitudinal joint with tie bars.
32. See Standard Plan P15 for longitudinal joint with tie bars.
33. See Standard Plan P10 for longitudinal joint with tie bars.
34. See Standard Plan P15 for longitudinal joint with tie bars.
35. See Standard Plan P10 for longitudinal joint with tie bars.
37. See Standard Plan P10 for longitudinal joint with tie bars.
38. See Standard Plan P15 for longitudinal joint with tie bars.
41. See Standard Plan P10 for longitudinal joint with tie bars.
42. See Standard Plan P15 for longitudinal joint with tie bars.
43. See Standard Plan P10 for longitudinal joint with tie bars.
44. See Standard Plan P15 for longitudinal joint with tie bars.
45. See Standard Plan P10 for longitudinal joint with tie bars.
46. See Standard Plan P15 for longitudinal joint with tie bars.
47. See Standard Plan P10 for longitudinal joint with tie bars.
49. See Standard Plan P10 for longitudinal joint with tie bars.
51. See Standard Plan P10 for longitudinal joint with tie bars.
52. See Standard Plan P15 for longitudinal joint with tie bars.
55. See Standard Plan P10 for longitudinal joint with tie bars.
57. See Standard Plan P10 for longitudinal joint with tie bars.
60. See Standard Plan P15 for longitudinal joint with tie bars.
61. See Standard Plan P10 for longitudinal joint with tie bars.
63. See Standard Plan P10 for longitudinal joint with tie bars.
64. See Standard Plan P15 for longitudinal joint with tie bars.
65. See Standard Plan P10 for longitudinal joint with tie bars.
68. See Standard Plan P15 for longitudinal joint with tie bars.
69. See Standard Plan P10 for longitudinal joint with tie bars.
70. See Standard Plan P15 for longitudinal joint with tie bars.
71. See Standard Plan P10 for longitudinal joint with tie bars.
73. See Standard Plan P10 for longitudinal joint with tie bars.
74. See Standard Plan P15 for longitudinal joint with tie bars.
75. See Standard Plan P10 for longitudinal joint with tie bars.
76. See Standard Plan P15 for longitudinal joint with tie bars.
77. See Standard Plan P10 for longitudinal joint with tie bars.
78. See Standard Plan P15 for longitudinal joint with tie bars.
79. See Standard Plan P10 for longitudinal joint with tie bars.
81. See Standard Plan P10 for longitudinal joint with tie bars.
82. See Standard Plan P15 for longitudinal joint with tie bars.
83. See Standard Plan P10 for longitudinal joint with tie bars.
84. See Standard Plan P15 for longitudinal joint with tie bars.
85. See Standard Plan P10 for longitudinal joint with tie bars.
86. See Standard Plan P15 for longitudinal joint with tie bars.
87. See Standard Plan P10 for longitudinal joint with tie bars.
88. See Standard Plan P15 for longitudinal joint with tie bars.
89. See Standard Plan P10 for longitudinal joint with tie bars.
90. See Standard Plan P15 for longitudinal joint with tie bars.
91. See Standard Plan P10 for longitudinal joint with tie bars.
93. See Standard Plan P10 for longitudinal joint with tie bars.
94. See Standard Plan P15 for longitudinal joint with tie bars.
95. See Standard Plan P10 for longitudinal joint with tie bars.
96. See Standard Plan P15 for longitudinal joint with tie bars.
98. See Standard Plan P15 for longitudinal joint with tie bars.
100. See Standard Plan P15 for longitudinal joint with tie bars.
103. See Standard Plan P10 for longitudinal joint with tie bars.
104. See Standard Plan P15 for longitudinal joint with tie bars.
105. See Standard Plan P10 for longitudinal joint with tie bars.
111. See Standard Plan P10 for longitudinal joint with tie bars.
112. See Standard Plan P15 for longitudinal joint with tie bars.
113. See Standard Plan P10 for longitudinal joint with tie bars.
115. See Standard Plan P10 for longitudinal joint with tie bars.
117. See Standard Plan P10 for longitudinal joint with tie bars.
118. See Standard Plan P15 for longitudinal joint with tie bars.
120. See Standard Plan P15 for longitudinal joint with tie bars.
121. See Standard Plan P10 for longitudinal joint with tie bars.
122. See Standard Plan P15 for longitudinal joint with tie bars.
123. See Standard Plan P10 for longitudinal joint with tie bars.
125. See Standard Plan P10 for longitudinal joint with tie bars.
129. See Standard Plan P10 for longitudinal joint with tie bars.
130. See Standard Plan P15 for longitudinal joint with tie bars.
133. See Standard Plan P10 for longitudinal joint with tie bars.
137. See Standard Plan P10 for longitudinal joint with tie bars.
139. See Standard Plan P10 for longitudinal joint with tie bars.
140. See Standard Plan P15 for longitudinal joint with tie bars.
141. See Standard Plan P10 for longitudinal joint with tie bars.
143. See Standard Plan P10 for longitudinal joint with tie bars.
144. See Standard Plan P15 for longitudinal joint with tie bars.
146. See Standard Plan P15 for longitudinal joint with tie bars.
147. See Standard Plan P10 for longitudinal joint with tie bars.
149. See Standard Plan P10 for longitudinal joint with tie bars.
150. See Standard Plan P15 for longitudinal joint with tie bars.
**NOTES:**

1. Details do not apply to isolation joints and transverse construction joints.
2. Tie bars, dowel bars, and bar reinforcement are not shown.
3. Depths are measured from the final concrete pavement surface elevation after any grinding.

---

**LIQUID JOINT SEALANT**

**PREFORMED COMPRESSION JOINT SEAL**

---

**JOINT SEAL DIMENSIONS**

<table>
<thead>
<tr>
<th>Reservoir Width</th>
<th>Preformed Compression Joint Seal Dimensions</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Reservoir Width</strong></td>
<td><strong>Preformed Compression Joint Seal Dimensions</strong></td>
</tr>
<tr>
<td><strong>Reservoir Width</strong></td>
<td><strong>Nominal Seal Width</strong></td>
</tr>
<tr>
<td><strong>Reservoir Width</strong></td>
<td><strong>Depth</strong></td>
</tr>
<tr>
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<td><strong>Depth</strong></td>
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<td><strong>Reservoir Width</strong></td>
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<td><strong>Depth</strong></td>
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<tr>
<td><strong>Reservoir Width</strong></td>
<td><strong>Depth</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Reservoir Width</th>
<th>Liquid Joint Sealant Dimensions</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Reservoir Width</strong></td>
<td><strong>Liquid Joint Sealant Dimensions</strong></td>
</tr>
<tr>
<td><strong>Reservoir Width</strong></td>
<td><strong>Diaphragm (Asphalt Rubber)</strong></td>
</tr>
<tr>
<td><strong>Reservoir Width</strong></td>
<td><strong>Diaphragm (Silicone)</strong></td>
</tr>
<tr>
<td><strong>Reservoir Width</strong></td>
<td><strong>Diaphragm (Silicone)</strong></td>
</tr>
<tr>
<td><strong>Reservoir Width</strong></td>
<td><strong>Diaphragm (Silicone)</strong></td>
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<tr>
<td><strong>Reservoir Width</strong></td>
<td><strong>Diaphragm (Silicone)</strong></td>
</tr>
<tr>
<td><strong>Reservoir Width</strong></td>
<td><strong>Diaphragm (Silicone)</strong></td>
</tr>
</tbody>
</table>

**STATE OF CALIFORNIA**

**DEPARTMENT OF TRANSPORTATION**

**JOINT SEALS**

**NO SCALE**

---

* Larger diameter backer rods may be substituted according to manufacturer recommendations if reservoir depth is increased equivalently.

**Asphalt rubber sealant recess depth "r" varies from \( \frac{1}{4} \)" to \( \frac{3}{8} \)"
ELEVATION

CONCRETE PAVEMENT TRANSITION PANEL

TERMINAL JOINT TYPE 1
For Existing JPCP or Approach Slab

TERMINAL JOINT TYPE 2
For JPCP Transition Panel or Approach Slab

NOTE:
1. Maintain same base thickness as JPCP.
TERMINAL JOINT DETAILS
CONCRETE PAVEMENT
CONTINUOUSLY REINFORCED

NOTES:
1. For the locations of wide flange beam terminal, pavement
anchor or expansion joints, see Project Plans.
2. See Standard Plans P31B and P32A.

ABBREVIATIONS
D = Thickness of CRCP
A = Depth of HMA as shown on Project Plans
U = Thickness of Base

PLANS APPROVAL DATE
REGISTERED CIVIL ENGINEER
DIST. No.
THE STATE OF CALIFORNIA OR ITS OFFICERS
OR AGENTS SHALL NOT BE RESPONSIBLE FOR
COPIES OF THIS PLAN SHEET.
THE ACCURACY OR COMPLETENESS OF SCANNED
DOWEL BARS
FOR DETAIL NOT SHOWN
SEE STANDARD PLAN P10

BASE
SUPPORT SLAB
SUPPORT SLAB AND UPPER LIMIT OF CONSTRUCTION JOINT PERMISSIBLE

DEPARTMENT OF TRANSPORTATION
STATE OF CALIFORNIA
NO SCALE

TERMINAL JOINT TYPE A
(For Existing AC)

TERMINAL JOINT TYPE B
(For Future Pavement)

TERMINAL JOINT TYPE C
(For Temporary HMA Pavement)

TERMINAL JOINT TYPE D
(For Existing JPCP or Structure Approach Slab)

TERMINAL JOINT TYPE E
(For New JPCP or Structure Approach Slab)

NEW CRCP WITH WIDE FLANGE BEAM TERMINAL, PAVEMENT ANCHOR OR EXPANSION JOINT, SEE NOTES 1 AND 2
NEW JPCP OR STRUCTURE APPROACH SLAB

NOTES:
1. For the locations of wide flange beam terminal, pavement
anchor or expansion joints, see Project Plans.
2. See Standard Plans P31B and P32A.

ABBREVIATIONS
D = Thickness of CRCP
A = Depth of HMA as shown on Project Plans
U = Thickness of Base
CONSTRUCTION JOINT AND ANCHOR DETAILS

EXPANSION JOINT TYPE AN

NOTES:
1. For the locations of the terminal joints, expansion joints and pavement anchors, see project plans.
2. The CRCP shall continue across the pavement anchor and expansion joints as shown.
3. Details of reinforcement, tie bars, and longitudinal joints when necessary, transverse construction joints are shown on Standard Plans P4 and P16.
4. Transverse construction joints are not allowed within 20'-0" of the pavement anchor.
5. When placing pipe through concrete barrier, use 4" unslotted plastic pipe wrapped completely with ¾' polystyrene.
7. See Standard Plan P4 for "a".
8. Place the 4" Slotted Plastic Pipe on the high side of the longitudinal grade.
9. See Standard Plan B6-21 for "b".

ABBREVIATION:
D = Thickness of CRCP

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION
CONTINUOUSLY REINFORCED
CONCRETE PAVEMENT-
EXPANSION JOINT AND ANCHOR DETAILS
NO SCALE

P31B
NOTES:
1. For additional details on reinforcement member quantities of the wide flange beam terminal and Pavement Expansion Joint Type WF, see Standard Plan P32B.
2. For reinforcement A, B, and C Details, see Standard Plan P32B.
3. For the Pavement Terminal Joint Details, see Standard Plan P31A.
4. For Pavement Terminal Joint Type, see Project Plans.
5. D = Thickness of CRCP
6. See Standard Plan B6-21 for "a".
**Type I**

**JOINTED PLAIN CONCRETE PAVEMENT WITH CONCRETE SHOULDER**

(See Std Plan P1 for joint spacing and other details not shown)

**Notes:**
1. Location of transverse joint to match transverse joint of adjacent lane.
2. Place transverse joint of lane and shoulder perpendicular to longitudinal joint of thru lane.

**Type II**

**JOINTED PLAIN CONCRETE PAVEMENT WITH ASPHALT SHOULDER**

(See Std Plan P2 for joint spacing and other details not shown)

**Type III**

**JOINTED PLAIN CONCRETE PAVEMENT WITH WIDENED SLAB AND ASPHALT SHOULDER**

(See Std Plan P2 for joint spacing and other details not shown)
**Type IV**

JOINTED PLAIN AND CONTINUOUSLY REINFORCED CONCRETE PAVEMENT

(See Std Plans P1, P2, or P4 for details not shown)

LENGTH OF LANE DROP (SEE PROJECT PLANS)

TRANSVERSE JOINTS (JPCP ONLY),
SEE NOTE 2

ETW

**Type V**

JOINTED PLAIN AND CONTINUOUSLY REINFORCED CONCRETE PAVEMENT

(See Std Plans P1, P2, or P4 for details not shown)

LENGTH OF LANE DROP (SEE PROJECT PLANS)

TRANSVERSE JOINTS (JPCP ONLY),
SEE NOTE 2

M A I N T A I N  F U L L  W I D T H  ' W '  O F  C O N C R E T E

ETW

**Type VI**

CONTINUOUSLY REINFORCED CONCRETE PAVEMENT

(See Std Plan P4 for details not shown)

LEGEND

S = SHOULDER WIDTH

W = LANE WIDTH

**NOTES:**

1. Location of transverse joint to match transverse joint of adjacent lane.
2. Place transverse joint of lane and shoulder perpendicular to longitudinal joint of through lane.
3. Isolation joint detail shown on Standard Plan P18.
**NOTES:**
1. Details for gore area paving are applicable to both exit and entrance ramps.
2. Transverse joint layouts are not shown. Refer to Standard Plan P1 or Project Plans for details regarding joint layouts, tie bars, and dowel bars not shown.
3. WWF 4 x 4 - W6.0 x W6.0 can be used in place of steel reinforcement for gore area paving only.
4. Omit longitudinal joint when concrete on ramp shoulder is less than 3'-0".
5. Place joint perpendicular to ramp longitudinal joints. Match location of joint with ramp transverse joints.
6. Place joint perpendicular to ramp longitudinal joints. Match location of joint with mainline transverse joints.
8. For jointed plain concrete pavement, transverse joints to be spaced from fixed transverse joint and shall follow spacing pattern on Standard Plan P1. Minimum spacing shall be 6 feet.

**TABLE S**

<table>
<thead>
<tr>
<th>Location</th>
<th>Transverse Bar</th>
<th>Longitudinal Bar</th>
</tr>
</thead>
<tbody>
<tr>
<td>Core Area Paving</td>
<td>#4 @ 1'-0&quot;</td>
<td>#4 @ 1'-0&quot;</td>
</tr>
<tr>
<td>Ramp Transition (JPCP)</td>
<td>#6 @ 1'-6&quot;</td>
<td>#6 @ 9&quot;</td>
</tr>
<tr>
<td>Ramp Transition (CRCP)</td>
<td>See Std Plan P4, Table No. 2</td>
<td>See Std Plan P4, Table No. 2</td>
</tr>
</tbody>
</table>

* See Note 3
1. Refer to Project Plans for location and type of drainage inlets.

2. Top of inlet shall be flush with shoulder surface.

3. Extend joint filler material to bottom from all outside edges of isolation joint.

4. For Jointed Plain Concrete Pavement only. For Continuously Reinforced Concrete Pavement, terminate pavement steel reinforcement 2" clear from outside edges of isolation joint.

5. Dowel and tie bars not shown, see Standard Plan P1.

NOTES:
- **LONGITUDINAL JOINT**
  - Transverse joint more than 2'-0" clear of drainage inlet wall or no transverse joint

- **TRANSVERSE JOINTS**
  - Transverse joint within 2'-0" of drainage inlet wall, or matches drainage inlet wall,
  - Transverse joint intersects drainage inlet, or matches drainage inlet wall.

**CASE 1**
- Transverse joint more than 2'-0" clear of drainage inlet wall or no transverse joint

**CASE 2**
- Transverse joint intersects drainage inlet, or matches drainage inlet wall.

**CASE 3**
- Transverse joint within 2'-0" of drainage inlet wall, or matches drainage inlet wall.

**SECTION A-A**
- D = Pavement Thickness
- 1/4" LIQUID JOINT SEALANT, FLUSH WITH PAVEMENT SURFACE
- JOINT FILLER MATERIAL
- FLUSH WITH PAVEMENT SURFACE

**TABLE A**

<table>
<thead>
<tr>
<th>DISTANCE</th>
<th>BARS REQUIRED</th>
</tr>
</thead>
<tbody>
<tr>
<td>2'-0&quot; TO 1'-6&quot;</td>
<td>2</td>
</tr>
<tr>
<td>1'-6&quot; TO 9&quot;</td>
<td>1-1/2</td>
</tr>
<tr>
<td>9&quot; OR LESS</td>
<td>NONE</td>
</tr>
</tbody>
</table>

**NOTES:**
1. Refer to Project Plans for location and type of drainage inlets.
2. Top of inlet shall be flush with shoulder surface.
3. Extend joint filler material to bottom of Lean Concrete Base. Where Lean Concrete Base is not used as base material, the joint filler material shall only extend to the bottom of the new concrete pavement.
4. For Jointed Plain Concrete Pavement only. For Continuously Reinforced Concrete Pavement, terminate pavement steel reinforcement 2" clear from outside edges of isolation joint.
5. Dowel and tie bars not shown, see Standard Plan P1.
ISOLATION JOINT

CASE A

CASE B

SECTION A-A

SECTION B-B

TABLE A

NOTES:
1. Refer to Project Plans for location and type of drainage inlets.
2. Extend joint filler material to bottom of Lean Concrete Base. Lean Concrete Base is not used as base material, the joint filler material shall extend to the bottom of the new concrete pavement.
3. For Jointed Plain Concrete Pavement only. For Continuously Reinforced Concrete Pavement, terminate pavement steel reinforcement 2" clear from all outside edges of isolation joints.
4. For Jointed Plain Concrete Pavement only. For Continuously Reinforced Concrete Pavement, see Standard Plan P4.
See the project plans and typical cross sections for pavement structure details.

**Type 1 Pavement Structure Drainage System**  
(For existing highway facility)

**Type 2 Pavement Structure Drainage System**  
(New construction)

**Type 3 Pavement Structure Drainage System**  
(New construction)

**Type 4 Pavement Structure Drainage System**  
(New construction)

**Type 5 Pavement Structure Drainage System**  
(New construction)

**Type 6 Pavement Structure Drainage System**  
(New construction)

**Notes:**
1. At the Contractor's option, on new construction, the vertical jointline (including the filter fabric) between the treated permeable material and the shoulder base/subgrade material may be rotated about its midpoint to a slope not flatter than 1:1 as shown by the dashed lines.
2. See the project plans and typical cross sections for pavement structure details.
3. The plan layout for pavement structure drainage collector and outlet systems for new concrete pavement and new hot mix asphalt pavement is the same as that shown on Standard Plan P3-1.
4. For plastic pipe edge drain diameter larger than 3", the minimum trench width shall be equal to the outside diameter of the plastic pipe plus 4".
5. For plastic pipe edge drain diameters larger than 3", all details for 3" plastic pipe edge drain shall apply.
6. For pavements thicker than 0.75", the minimum trench depth is 1.0'.

State of California  
Department of Transportation  
Pavement Structure Drainage System Details  
No Scale  
P50
3. Other types of plugs may be substituted with the Engineer's approval.

2. The position of slotted plastic pipe and limits of treated permeable material shown are for the Type 1 structural section drainage system shown on Standard Plan P50.

1. See project plans for location and type of cleanout or vent installations.

4. The Type 3 cleanout and Type G vent is for use with concrete shoulders. The Type 6 structural section drainage system from Standard Plan P50 is shown. Use plastic pipe plug shown in Detail A with Type 3 cleanouts. Use vent cover shown on Standard Plan P51 with Type G vents.

NOTES:

ALTERNATIVE 1

PLASTIC PIPE Plug

See Note 3

ALTERNATIVE 2

PLASTIC PIPE PLUG

See Note 4

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

EDGE DRAIN CLEANOUT
AND VENT DETAILS

NO SCALE

P52
NOTE:
1. Tapered notch wedge shall extend 1'-0" into adjacent lane or shoulder to receive follow-up paving.

SECTION A-A

LONGITUDINAL TAPERED NOTCHED WEDGE JOINT

NOTE:
1. Tapered notch wedge shall extend 1'-0" into adjacent lane or shoulder to receive follow-up paving.
ABBREVIATIONS:
TE  TAPERED EDGE

NOTES:
1. For details not shown, see Standard Plans P75 and P76.
2. Tapered edge is optional when L is less than 30'.
NOTES:
1. For limits of tapered edge and vertical edge treatments, see Standard Plan P74.
2. Details shown for HMA overlay thickness less than 0.43'. See Detail "A" for HMA overlay thickness more than 0.43' or concrete overlay.
3. For locations and limits of shoulder backing or embankment see project plans.
4. Grade existing ground to place tapered edge, 1' minimum width.
5. Tapered edge transverse joint must match overlay transverse joint.
6. Tapered edge is not needed in the area of MGS, barrier, right turn lane and acceleration lane. See Standard Plan P74.

TABLE A

| EDGE TREATMENT FOR VARIOUS OVERLAY THICKNESS AND CONDITIONS |
|-------------|------------------|------------------|
|              | OVERLAY THICKNESS |                  |
|              | FIELD CONDITION  | LESS THAN 0.15'  |
|              |                  | 0.15' OR MORE    |
|              |                  |                  |
|              | EXIST SLOPE      | CASE E            |
|              | 6\(^\circ\) TO 8\(^\circ\) | CASE A            |
|              | 8\(^\circ\) TO 10\(^\circ\) | CASE A            |
|              | 10\(^\circ\) TO 12\(^\circ\) | CASE B            |
|              | 12\(^\circ\) TO 15\(^\circ\) | CASE F            |
|              | 15\(^\circ\) TO 20\(^\circ\) | CASE F            |
|              | 20\(^\circ\) TO 30\(^\circ\) | CASE F            |
|              | 30\(^\circ\) TO 45\(^\circ\) | CASE C            |
|              |                  |                  |
|              | CUT SECTION      |                  |
|              | (REPLACE, COLD PLANE, PROTECT) |                  |
|              |                  |                  |
|              | TOTAL ADDITIONAL |                  |
|              | CONCRETE (TON)   |                  |
|              |                  |                  |
|              | TOTAL PROJECT    |                  |
|              | SHEETS           |                  |

LEGEND:
- **HMA OVERLAY**
- **HMA OR CONCRETE OVERLAY**
- **CONCRETE OVERLAY**

ABBREVIATIONS:
- **TE** TAPERED EDGE
- **TT** TOTAL THICKNESS OF TE

ADDITIONAL HMA OR CONCRETE QUANTITIES FOR TE/SIDE/MILE

<table>
<thead>
<tr>
<th>TOTAL ADDITIONAL MATERIAL FOR TE/SIDE/MILE</th>
</tr>
</thead>
<tbody>
<tr>
<td>TT</td>
</tr>
<tr>
<td>HMA (TON)</td>
</tr>
<tr>
<td>0.15'</td>
</tr>
<tr>
<td>0.20'</td>
</tr>
<tr>
<td>0.25'</td>
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<tr>
<td>0.30'</td>
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<tr>
<td>0.35'</td>
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<tr>
<td>0.40'</td>
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<td>0.60'</td>
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<tr>
<td>0.65'</td>
</tr>
<tr>
<td>0.70'</td>
</tr>
<tr>
<td>0.75'</td>
</tr>
<tr>
<td>0.80'</td>
</tr>
</tbody>
</table>

NOTES:
- HMA overlay thickness more than 0.43' or concrete overlay.

TYPICAL CROSS SECTION

<table>
<thead>
<tr>
<th>TT</th>
<th>HMA (TON)</th>
<th>CONCRETE (CY/FT)</th>
</tr>
</thead>
<tbody>
<tr>
<td>TT</td>
<td>HH</td>
<td>HH</td>
</tr>
<tr>
<td>TT</td>
<td>HP</td>
<td>HP</td>
</tr>
</tbody>
</table>

OPTIONAL DETAIL "A"

For concrete overlay see Note 5

For HMA overlay thickness more than 0.43' or concrete overlay see Note 5.
NEW CONSTRUCTION
PAVEMENT EDGE TREATMENTS—
THE STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION

NOTES:
1. For limits of tapered edge and vertical edge treatments, see Standard Plan P74
2. Details shown for HMA pavement thickness less than 0.43'. See Detail "B" for HMA pavement thickness more than 0.43' or concrete pavement.
3. For locations and limits of embankment see project plans.
4. Tapered edge transverse joint must match pavement transverse joint.
5. Tapered edge is not needed in the area of MGs, barrier, right turn lane and acceleration lane. See Standard Plan P74.

LEGEND:
- HMA PAVEMENT
- HMA OR CONCRETE PAVEMENT

ABBREVIATIONS:
- TE TAPERED EDGE
- TT TOTAL THICKNESS OF TE
- HW HINGE WIDTH, DISTANCE FROM ES OR EP TO HP

OPTIONAL DETAIL "B"
For HMA pavement thickness more than 0.43' or concrete pavement

STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION
PAVEMENT EDGE TREATMENTS—
NEW CONSTRUCTION
NO SCALE

P76

Return to Table of Contents
Dist

POST MILES
TOTAL PROJECT

ROUTE

SHEET TOTAL
No. SHEETS

FESSIO
RO
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P
A

REGISTERED CIVIL ENGINEER
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R

E

MAXIMUM WALL HEIGHTS

LEGEND:

COUNTY

BATTER
10" x 6" x 1’-0"

LC1

LC2

LC1

LC1

LC2

PLANS APPROVAL DATE

LC2

THE STATE OF CALIFORNIA OR ITS OFFICERS

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VERTICAL

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11’-0"

24’-0"

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10" x 6" STRETCHERS

27’-0"

20’-0"

27’-0"

31’-0"

THE ACCURACY OR COMPLETENESS OF SCANNED
COPIES OF THIS PLAN SHEET.

LC1 = LOADING CASE I

1:6

31’-0"

13’-0"

36’-0"

23’-0"

36’-0"

33’-0"

1:4

33’-0"

15’-0"

36’-0"

25’-0"

36’-0"

36’-0"

S

OR AGENTS SHALL NOT BE RESPONSIBLE FOR
.

No.

C55599

Exp. 12-31-16

FILLER BLOCK ALIGNED AGAINST HEADER.
.

Kathryn Griswell

IN E E R

October 30, 2015

G

TYPE C

TYPE B

R E G IS T

E

N

TYPE A

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A
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CIVIL
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N
OF
OR
F
CALI

LC2 = LOADING CASE II
y = 4 AND 6 FOR BATTERED
FOR TYPES A, B, AND C

EMBANKMENT SLOPE

LOADING CASE I & II

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TYPE C

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

REINFORCED CONCRETE CRIB WALL
TYPES A, B AND C
NO SCALE

C7A
9-22-15

Return to Table of Contents


STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

PARTIAL PLAN AT BASE
Type "B" shown, others similar

10" x 6" x 1'-0" FILLER BLOCKS

PARTIAL ELEVATION

FINISHED GRADE AT FACE OF WALL
10" x 6" x 1'-0" FILLER BLOCKS

SEE NOTE 12

HEADER DETAIL

SECTION A-A

HEADER AND STRETCHER DETAILS

STRETCHER DETAIL

FILLER BLOCK DETAIL

SECTION B-B

NOTES:


2. Reinforced Concrete:
   \[ f' = 3.6 \text{ ksi} \]
   \[ f = 60 \text{ ksi} \]
   \[ \gamma = 0.2g \]
   \[ n = 8 \]
   \[ c = 34^\circ \]

Lateral earth pressure determined by Coulomb's theory.

3. Soil Parameters:
   \[ \sigma = 34^\circ \]
   \[ \beta = 25.5^\circ \]
   \[ c = 120 \text{ psf} \]

4. Concrete to concrete bearing surfaces shall be finished to a smooth plane. The gap between bearing surfaces shall not exceed 1/4 inch. Where a gap of 1/4 inch to 3/4 inch exists, a 1/4 inch pad of asphalt felt or sheet neoprene shall be placed between the bearing surfaces. For wall Types B and C, a 1/4 inch asphalt felt pad or sheet neoprene shall be placed between all concrete bearing surfaces below the 29'-10" level.

5. All members may be manufactured to dimensions 1/2 inch greater in thickness and stretchers 1/2 inch less in length.

6. Where an opening is specified in the face of a wall, special length stretchers and additional headers may be required.

7. For non-tangent wall alignment, special length stretchers may be required.

8. For non-tangent wall alignment and at locations where filler blocks are required, special length front face closure members may be required.

9. The thickness of the lowest step for each wall type shall not be less than the dimension shown on these plans.

10. Use "Front Face Closure Member" only when specified on project plans or in the Special Provisions.

11. All stretchers are 12'-0" except as noted.

12. Place 2 filler blocks midspan between stretchers in the bottom 2 levels of walls 9' high and higher.
NOTES:

1. "H" is the difference in elevation between the outlet pipe flow line and the normal gutter grade line undepressed of the curb face.

2. For "T" wall thickness, see Table A below.

3. Height of curb opening will vary with the type of curb and the depth of the local depression.

4. Wall reinforcing not required when "H" is 5'-0" or less and the unsupported width or length is 1'-0" or less. Depths exceeding these limits shall be reinforced with #4 bars @ 1'-0" centers placed 1/2" clear to inside of box unless otherwise shown.

5. Inlet bottom reinforcing not required. See Standard Plan D74C alternative reinforced bottom.

6. Steps-hone required where "H" is less than 2'-6", where "H" is 2'-6" or more, install steps with longest run 1'-0" above the floor and highest run not more than 6" below top of inlet. The distance between steps shall not exceed 1'-0" and steps shall be placed such that their edges are not more than 12" below the floor or gutter. A horizontal surface shall be provided on opening. Step treads may be substituted for the bar steps. Step treads shall comply with State Industrial Safety requirements. See Standard Plan D74C for step details.

7. When shown on the project plans, place a 3'-0" plain protection batten horizontally across the length of the opening and bend back 4" into the inlet wall on each side.

8. Pipe(s) can be placed in any wall.

9. Curb section shall match adjacent curbs.

10. Except for inlets used as junction boxes, basin floor shall have a minimum slope of 4:1 from all directions toward outlet pipe and shall have a wood trowel finish.


13. Complete joint penetration butt welds may be substituted for the fillet welds on all anchors.

14. Standard acquires, hexagon, round or equivalent headed anchors may be substituted for the right angle hooks on the anchors shown on this plan.

15. Cost-in-place inlets to be formed around all pipes/stakes intersecting the inlet, and concrete poured in one continuous operation. Precast inlets shall have molded connections conforming to details for Type G2P inlet shown on Standard Plan D75B. See Standard Specifications for more information.

**TABLE A**

<table>
<thead>
<tr>
<th>Type</th>
<th>3'-0&quot; to 5'-0&quot; (20&quot;)</th>
<th>5'-0&quot; to 20'-0&quot; (240&quot;)</th>
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<tr>
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<tr>
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<tr>
<td>G4</td>
<td>4.00</td>
<td>2.03</td>
</tr>
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</table>

Based on H=1.1

Table based on 8'-0" floor slab, 7'-0" curb openings, and curb type giving highest quantity of concrete. No deductions or adjustments are to be made to these quantities because of pipe openings, different floor alternatives, different curb types or different height of curb openings.
SECTION G-G
(with G2 Top)

TYPICAL SECTION

90" Max OR OUTSIDE Dia OF PIPE + 3" Min

SEE CHART

STATE OF CALIFORNIA

REINFORCEMENT, PERIMETER

#4 @ 6"

UPPER "A" BAR,

8"

SEE NOTE 11

LOWER "A" BAR,

6"

SEE NOTE 12

NOTE:

1. "H" is the difference in elevation between the outlet pipe flow line and the normal gutter grade line undereaves.

2. For "T" wall thickness, toll when "H" is 6" or less, toll when "H" is over 6".

3. Wall reinforcing not required when "H" is 6" or less and the unsupported width or length is 6'-0" or less. Reinforce wall exceeding these lines with #4 bars @ 1'-6" centers placed 2" clear to the inside of lintel unless otherwise shown. Joint reinforcement wall sections over 1'-0" high must have a minimum of two #4 horizontal bars.

4. Seal precast inlets connection openings between wall and pipe with non-shrink grout or resilient connectors as specified in the Special Provisions.

5. Steps - Note required where "H" is less than 2'-6", where "H" is 2'-6" or more, install steps after tying #1-1/2" above the floor and higher may not more than 1'-0" below bottom of lid. The distance between steps must not exceed 1'-0" and be uniform throughout the length of the wall. Wall steps in the wall without an opening. Step inserts may be manufactured for the bar steps. Step inserts must comply with State Industrial Safety Requirements. See Standard Plan D14C for step details.

6. Pipe(s) can be placed in any wall.

7. Set inlet so that grate bars are parallel to direction of principal surface flow.

8. Type G4 inlet can use Grate Type 18 or 24. Type G2 inlet uses Grate Type 24. See Standard Plan D7A and Standard Plan D7B for grate and frame details and weights of miscellaneous iron and steel.

9. G4 inlet details are the same as the G2 with the addition of a curb and sloped grate that matches the adjacent curb and gutter depression. See Standard Plans D7A & D7B for curb and inlet depression details. See Standard Plans A & A for curb and drain details.

10. Provide precast Inlets with separate top sections for final grade adjustment. Provide keyed joints between the top and wall and multiple wall sections. Joint design may vary but must be 1'-0" in depth.

11. Perimeter reinforcement serves as a rigid frame to position and attach the required structural reinforcement and may be tied welted at outer corner when using ASTM A106 weldable bars.

12. T" unless inlet is expanded in the direction of principal surface flow.

13. Place "A" bars at an angle so hooked end will maintain 2" clear coverage.


15. Non-shrink grout may be used for uppermost joints to facilitate final top grade adjustment.

16. Slope inlet floors according to the outlet pipe. Precast Inlets may have monolithic shaped floors, flat floors, or no floors in which case a sloped floor must be cast in the field.

17. Set inlet so that grate bars are parallel to direction of principal surface flow.

18. Extend sand bedding under all structure backfill.

NOTE:

35 3/4" TO 38"

1" CHAMFER

SECTION A-A

SEE NOTE 12

SECTION B-B

(with G2 Top)

SECTION C-C

UPPER "A" BAR,

8"

SEE NOTE 11

LOWER "A" BAR,

6"

SEE NOTE 12

3" MIN. SAND

REINFORCEMENT,

SEE NOT 3

SECTION D-D

SECTION E-E

SECTION F-F

(with G2 Top)

TYPICAL SECTION

(with G2 Top)

OUTSIDE DIG

OF PIPE + 3" MIN

VARIERS

4" X 6"

UPPER "A" BAR,

SEE CHART

LOWER "A" BAR,

SEE CHART

SECTION G-G

(with G2 Top)

TOP REINFORCEMENT CHART

16 BAR

DEPTURES

"A" BARS

SEE CHART

VARIERS

SPAN "A" BARS

REQUIRED STEEL AREA

PER FOOT LENGTH

SPAN "A" BARS

"A" BARS

RECOMMENDED STEEL AREA

PER FOOT LENGTH

STATE OF CALIFORNIA

DRAINAGE INLETS

(PRECAST)

NO SCALE

D73A

Return to Table of Contents
NOTES:

1. "H" is the difference in elevation between the outlet pipe flow line and the normal gutter grade line depressed.

2. For "T" wall thickness, see Table A below.

3. Wall reinforcing not required when "H" is 8'-0" or less and the unsupported width of wall length is 7'-0" or less. Walls exceeding these limits shall be reinforced with 40 bars at 4'-0" centers placed 1-5/8" clear to inside of box unless otherwise shown.


5. Stages - none required when "H" is less than 3'-0", where "H" is 2'-0" or more. Install steps with lowest rung 1'-0" above the floor andhighest rung not more than 6" below top of inlet. Distance between steps shall not exceed 1'-0" and shall be uniform throughout the length of the wall. Place steps in the wall without crossings. Steps may be substituted for the bar steps. Step inserts shall comply with State Industrial Safety requirement. See Standard Plan D74C for step details.

6. Pipe(s) can be placed in any wall.

7. Curb section shall match adjacent curb.

8. Slab floors shall have wood trowel finish and a minimum slope of 4:1 from all directions toward outlet pipe.


10. See Standard Plans D74A and D74B for grate frame details and weights of miscellaneous iron and steel.


12. Complete joint penetration butt welds may be substituted for the fillet welds on all anchors.

13. Standard square, hexagon, round or equivalent headed anchors may be substituted for the right angle hooks on the anchors shown on this plan.

14. Cost-in-place Inlets to be formed around all pipes/stands intersecting the inlet and concrete poured in one continuous operation. Precast Inlets shall have mortared pipe connections conforming to details for Type C6F. Inlet on Standard Plan D74H, see Standard Specifications for mortar composition.
STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION
DRAINAGE INLETS
NO SCALE

D74B

TABLE A
CONCRETE QUANTITIES

<table>
<thead>
<tr>
<th>TYPE</th>
<th>H=3'-0&quot; to 8'-3&quot;</th>
<th>H=3'-0&quot; to 20'-0&quot;</th>
<th>H=11'-1&quot;</th>
<th>H=11'-1&quot; to 20'-3&quot;</th>
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<tr>
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<td>ADDITIONAL PCC</td>
<td>ADDITIONAL PCC</td>
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<tr>
<td></td>
<td>PER FOOT</td>
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<td>PER FOOT</td>
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<td>CY</td>
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<td>CY</td>
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Table based on 8" floor slab and curb type giving highest quantity of concrete. No exclusions or adjustments are to be made to these quantities because of pipe openings, different floor alternatives or different curb type.

TABLE B
CURB CYLINDER NORMAL CURB CURB BATTER CURB DIMENSION "a" CURB DIMENSION "b"

<table>
<thead>
<tr>
<th>CURB TYPE</th>
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<th>&quot;b&quot;</th>
<th>CURB BATTER</th>
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</thead>
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<tr>
<td>A1-6</td>
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<td>1/2&quot;</td>
<td>T+1/2&quot;</td>
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<td>A1-8</td>
<td>0&quot;</td>
<td>2&quot;</td>
<td>T+1&quot;</td>
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<tr>
<td>B1-6</td>
<td>0&quot;</td>
<td>3/4&quot;</td>
<td>T+3/4&quot;</td>
</tr>
</tbody>
</table>

Type A Curb

NOTES:
1. "h" is the difference in elevation between the outlet pipe flow line and the normal gutter grade line undepressed.
2. For "H" wall thickness, see Table A below.
3. Wall reinforcing not required when "h" is 5'-0" or less and the unsupported width or length is 7'-0" or less. Walls exceeding these limits shall be reinforced with 4" x 4"-1/2 centers placed 10" clear to inside of box unless otherwise shown.
5. Steps - None required where "H" is less than 2'-6". Where "H" is 2'-6" or more, install steps with lowest rung 1'-0" above the floor and highest rung not more than 6" below 40.00 of inlet. The distance between steps shall not exceed 1'-0" and shall be uniform throughout the length of the wall. Place steps in the wall without an opening. Step inserts may be substituted for the bar stools. Step inserts shall comply with State Industrial Safety requirements. See Standard Plan DT4C for step details.
6. When shown on the project plans, place a 1/8" plain surface around all pipes. See Standard Plan D77A and D77B for grate and curb requirements. Cast-in-place inlets to be formed around all pipes/stubs intersecting the inlet and concrete poured in one continuous operation. The inserts shall have a 1" mortar connections conforming to details for Type GDO inlets on Standard Plan D78B. See Standard Specifications for mortar composition.
**Typical Section**

(Step Insert)

- 3/4" Min. OR Steel Step OR 1" Min. OR Steel Step
- 1 1/2" Hole in face angle
- Nut tight on last thread
- 3/4" Min. OR Steel step

**Step Details**

- 2'-11 1/2" Min. OR 1'

**Curb Support Detail**

See Note 2

- 1 1/2" Hole in face angle
- Nut tight on last thread
- 3/4" Min. OR Steel step

**Alternative**

- Half Round Bottom

**Alternative**

- Reinforced Bottom

**Face Angle Anchor Detail "A"**

<table>
<thead>
<tr>
<th>Length of Curb Opening</th>
<th>No. of Anchors</th>
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</thead>
<tbody>
<tr>
<td>3'-0&quot; or less</td>
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<tr>
<td>3'-1 1/2&quot;</td>
<td>3</td>
</tr>
<tr>
<td>10'-0&quot;</td>
<td>4</td>
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<tr>
<td>14'-0&quot;</td>
<td>5</td>
</tr>
<tr>
<td>21'-0&quot;</td>
<td>7</td>
</tr>
</tbody>
</table>

**Face Angle Anchor Detail "B"**

- 3/8" Min. OR Steel (60 ksi) w/ 3/8" Min. OR Steel (60 ksi) except for Type B Curb use L4 x 3 x 3/8

**Notes:**

1. When shown on the project plans, place a 3/8" plain round protection bar horizontally across length of the opening and bend back 4" into the inlet wall on each side.

2. Curb supports shall be evenly spaced and minimal in number such that maximum span of unsupported curb is 7'-0".

**State of California**

**Department of Transportation**

**Drainage Inlet Details**

No Scale
SECTION A-A
TYPE OCP
Concrete pipe inlet with grate

SECTION B-B
TYPE OCP or OCPI
Concrete pipe inlet with steel cover
(See Note 6)

SECTION C-C
DETAIL "F"

SECTION D-D
TYPE OCP or OCPI
Concrete pipe inlet with redwood cover
(See Notes 6 and 10)

DETAIL "G"

NOTES:
1. For details of steel pipe inlets, see Standard Plan D75A.
2. For details of ladder and steps and when ladder or steps are required, see Standard Plan D75C.
3. Inlet pipes shall not protrude into basin.
4. Except for inlets used for junction boxes, basin floors shall have minimum slope of 1:24 from all directions toward outlet pipe, and a wood trowel finish.
6. Designation of Type OCP pipe inlets on plans indicates trash racks are to be furnished and installed on all side openings. See Standard Plan D75C for Trash Rack details.
7. More than one side opening may be required. Location and number as ordered by the Engineer. Opening may be cast in pipe.
8. Chain to be provided when specified.
9. Place pipe so bars of grate will be parallel with main surface flow.
10. Redwood covers shall only be placed at locations designated on the plans.

CAST 1" x 2-1/2" SLOT IN PIPE TO RECEIVE LUG
HOLE
-SQUARED END
MORTAR
Dia PIPE + 1'-4"

DETAIL "E"

CAST 1" x 2-1/2" SLOT
-1/4" CHECKERED E COVER

SEE DETAIL "E"

SEE DETAIL "F"

(SEE SECTION A-A FOR BOTTOM DESIGN)

SEE DETAIL "F"

1/2" REDWOOD TOP
2" x 6" REDWOOD

MORTAR
Dia PIPE + 1'-4"

SECTION B-B
TYPE OCP or OCPI
Concrete pipe inlet with steel cover
(See Note 6)

DETAIL "G"

REDWOOD COVER
~ PEE N END OF EYEBOLT

3/8" # EYEBOLTS W/RASHERS

1/4" x 2" HEAT-TREATED CHAIN TO LUG AND COVER (SEE NOTE 6)

1/2" W 

SEE DETAIL "E"

SEE DETAIL "E"

1 1/4" HEAT-TREATED CHAIN TO LUG AND COVER (SEE NOTE 6)

SEE DETAIL "E"

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION
CONCRETE PIPE INLETS
NO SCALE
D75B
1. Ladders and Steps - None required where "H" dimension of pipe inlet is less than 2'-6". Where "H" is 2'-6" or more, install steps or ladder with lowest rung not more than 1'-0" above inlet or level of inlet. The distance between steps or rungs shall not exceed 1'-0" and shall be uniform throughout the length of the wall. Place steps or ladder to the wall without an opening.

2. Ladder may be constructed in one length at contractor's option on RCP inlet.

3. On CSP inlet, connect ladder splice plate so joint can compress 1/2".

4. Ladder splice plate to be connected with 1/2" Ø bolts with double nuts.

5. Trash racks used on Type OCPP and OMPF inlets. Trash racks required for pumping installations.
NOTES:
1. Alternative methods of securing drop-handles to cover will be acceptable.
2. This hinged cover is to be used only on embankment or steep slopes.

Provide one brass flathead screw in each top corner of cover. Min size to be $3/16" x 1/2" x 2."

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION
ALTERNATIVE HINGED COVER
FOR TYPE OL AND OS INLETS
AND TRASH RACK FOR
TYPE OCP INLET
NO SCALE
D77C

Return to Table of Contents
NOTES:
1. W = Width of depressed apron. Depressed aprons shall be 4'-0" unless indicated otherwise.
2. D = Inlet depression. The Inlet depression shall be 1'-0" unless indicated otherwise.
3. H = Dike Height.
5. = Straight grade, downward slope.
6. = Direction of flow.
7. Aprons shall be portland cement concrete and match thickness of adjacent shoulder pavement.
8. Establish curb opening height of Type GO or GDO at mid-point of grate.

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

INLET DEPRESSIONS
CONCRETE SHOULDERS

NO SCALE

DEPARTMENT OF TRANSPORTATION
STATE OF CALIFORNIA

October 30, 2015

Bruce D.

REGISTERED CIVIL ENGINEER

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THE D78B PLAN SHEETS.

D78B PLAN SHEET.

TOTAL PROJECT COUNTY ROUTE POST MILES DIST.

TOTAL SHEET No.

DATE APPROVAL EXP. No.

OCTOBER 30, 2015

B. D.

RETURN TO TABLE OF CONTENTS
1. W = Width of depressed apron. Depressed aprons shall be 4'-0" unless indicated otherwise.
2. D = Inlet depression. The Inlet depression shall be 1" unless indicated otherwise.
3. Apron shall be hot mix asphalt and match thickness of adjacent shoulder pavement.

NOTES:
1. W = Width of depressed apron. Depressed aprons shall be 4'-0" unless indicated otherwise.
2. D = Inlet depression. The Inlet depression shall be 1" unless indicated otherwise.
3. Establish curb opening height of Type GO or GDO at midpoint of grate.
### MINIMUM COVER TO 10'-0" Max COVER

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### SINGLE CIRCULAR REINFORCEMENT

- **Aso** = Outer cage reinforcement
- **Asi** = Inner cage reinforcement, or single circular cage reinforcement
- **Cla** = Design clearance, inches (see note 6)
- **Ase** = Outer cage reinforcement, square inches

### DESIGN NOTES:

1. For details of the method of excavation, backfill and grading, see Standard Plan A62G.
2. The tables for minimum allowable classes and D-loads of RCP on Standard Plan A62G shall not apply to direct design RCPs.
3. Notes 1 and 9 on Standard Plan A62G shall apply to standard design RCPs.
4. Throughout the length of any given culvert, the direct design selected by the Contractor shall be the same, including the method of excavation, backfilling and grading.
5. The embankment height prior to excavation specified in note 5 of the Standard Plan A62G shall apply to the direct design RCP installation when Method 2, 3A or 3B are used.

### PRECAST REINFORCED CONCRETE PIPE

**DIRECT DESIGN METHOD**

**NO SCALE**

### STATE OF CALIFORNIA

**DEPARTMENT OF TRANSPORTATION**
### INSTALLATION TYPE 1

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<td>0.15±0.15</td>
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**NOTES:**

1. For details of the method of excavation, backfill and bedding, refer to Standard Plan A62DA.
2. The tables for minimum allowable classes and values of RCP on Standard Plan A62DA shall not apply to direct design RCP.
3. Notes 3 and 7 on Standard Plan A62DA shall apply to direct design RCP.
4. Throughout the length of any given culvert, the direct design selected by the Contractor shall be the same, including the method of excavation, backfill and bedding.
5. For single circular cage reinforcement, minimum clearance shall be 40% of the wall thickness (t1). For elliptical and double circular cage reinforcement, the minimum clearance shall be 10% of the wall thickness (t1). For reinforcement shall be 1/2", and where the wall thickness is less than 1/2", the minimum clearance shall be 1/4".
6. Minimum cover measured at the edge of pavement shall be 2" to top of pipe or existing AC pavement and 1" to top of rigid pavement.
7. Cover greater than the table maximum requires a special design.
1. For boxes with spans or height less than any of those shown in tables, use equivalent box dimensions and rebar arrangement. Make necessary changes in bar lengths.

2. For boxes with spans or height or cover greater than those shown in tables, a special design is required.

3. Quantities are approximate and for design purposes only.

4. It is permissible to eliminate the 18" hooks on every other "a" bar.

5. "a" bars are on half spacing.

6. Provide paying notch when top is exposed and when paving is concrete, and adjust quantities.

7. For design and details not shown, see Standard Plan D82.

8. This plan sheet may be used for multiple cell culverts by making necessary adjustments.

9. Soil pressures shown are factored per AASHTO LRFD and include soil weight or fill over box, self weight of box and live load where applicable.
**Design Notes:**
Design specifications.
AASHTO LRFD Bridge Design Specifications, 8th Edition with California Amendments.

**Loadings:**
Live load (AASHTO LRFD 3.6.1.2)
250 kips consists of design traffic and design live load.
Impact factors: (AASHTO LRFD 3.6.2.2)
1.25 x 500 kips, 250 kips, or 100 kips with minimum cover over.

**Earthen embankment:**
Earth embankment for two conditions:
140 pcf vertical, 140 pcf horizontal.

**Longitudinal Wall:**
140 pcf vertical, 140 pcf horizontal.

**Foundation:**
AASHTO LRFD Table 3.4.1.1 & Table 3.4.1.2

**Concrete Box Culvert:**

- **General Notes:**
  - Standard single or multiple box culverts are shown on plans with invert, parapet, paving, and concrete for parapet, paving notches and cut-off wall.
  - Earth pressure for two conditions:
    - 191000 pcf
    - 203500 pcf

- **Construction Notes:**
  - Construction joints are provided where needed.
  - Expansion joints are provided where needed.
  - Roof and walls are provided where needed.

- **Erection:**
  - Parapet walls are shown on plans as double box culvert, single box culvert, and multiple box culvert.

- **Reinforcement:**
  - Single span and multiple span
  - Parapet detail

- **Parapet Extension:**
  - Part Plan - Skewed

- **RCB Terminology:**
  - State of California Department of Transportation
  - Cast-in-Place Reinforced Concrete Box Culvert
  - Miscellaneous Details

---

**Diagram Notes:**

- **Diagram Title:**
  - 2015 Standard Plan D82

- **Diagram Description:**
  - State of California
  - Department of Transportation
  - Cast-In-Place Reinforced Concrete Box Culvert
  - Miscellaneous Details

---

**Return to Table of Contents**
**Precautions:**

- For greater depth of bridge or street, check waterway and invert.
- For larger size of culvert, check the invert for waterway and invert.
- For a larger size of culvert, check the invert for waterway and invert.

**Design Notes:**

- Standard single or multiple Precast Box Culverts are shown on the plans as shown in the figure with 9" x 5" RCB with 20° - 00, followed by alternatives.
- Alternatives:
  - Single cells: Standard dimensions of ASHMO Material Specification "M259" or "M2592".
  - Multiple cells: Constructed by joining single cells adjacent to each other, inlet and outlet ends of culvert will be rounded unless square ends are designated. Parapet will be shown unless designated in plans. Such design may be different for interior and outlet ends.

**Limitations:**

- Where the overfill is less than 12", Precast RCB Culverts are not to be used. Precast RCB Culverts are not to be used in a corrosive environment or where there is a severe abrasive flow condition or freeze-thaw locations.
- Special reinforcement coverage:
  - Precast RCB Culvert standard plans are not to be used in a corrosive environment or where there is a severe abrasive flow condition or freeze-thaw locations.
- Special reinforcement:
  - Required for culvert with different conditions, loads or design pressure greater than those given on these plans. Required for culvert where end and outlet are higher or lower than the adjacent sections.

**Construction Notes:**

- Cutoff walls:
  - 4'-0" cutoffs are to be provided at inlet and outlet unless channel is lined and outlet otherwise. These walls are to be extended if scour conditions warrant. See Standard Plans D84, D85 and D86.
- Wingwalls:
  - Wingwalls shall be cast-in-place and shall conform to standard plan details for box culvert wingwalls. See Standard Plans D84, D85 and D86.

**Earthworks:**

- See Standard Plan A62G.
- Construction loads:
  - Stiffening may be required near temporary ends, for construction loads on culverts. See Standard Plan D86.

**Precast RCB Terminology:**

- Notes: Inner and outer reinforcement to be exposed as required to tie to cast-in-place construction. A minimum of two bars shall be exposed on all sides.

**Partial Plan Interior Wall MultiCell Culvert:**

- 1" SPACE BETWEEN BOXES TO BE FILLED WITH SLURRY CEMENT

**Barrier Parapet Reinforcement:**

- Cast-In-Place End Elevation
- Reinforcing required for barrier parapet application only.

** Typical Culvert End Details:**

- For wall and invert reinforcement not shown, See "End Elevation" detail.
**Type A**

- **Section B-B**
- **Eliminate cutoff wall if adjacent channel is paved and skew is 20° maximum.**
- **Equivalent fluid pressure:** 36 pcf
- **Earth density:** 120 pcf
- **Unit Stresses:** $f'_c = 3,600$ psi, $f_y = 60,000$ psi

**Typical Section**

- **H = 4' thru 12'**
- **H = 13' thru 16'**

**Reinforced Concrete Wingwalls**

<table>
<thead>
<tr>
<th>H'</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
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<tbody>
<tr>
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<td>1:1</td>
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</tr>
<tr>
<td>C'</td>
<td>2</td>
<td>2</td>
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</tr>
<tr>
<td>6&quot; Bars</td>
<td>879</td>
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</tr>
<tr>
<td>8&quot; Bars</td>
<td>1092</td>
<td>1092</td>
<td>1092</td>
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<td>1092</td>
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<td>1518</td>
</tr>
</tbody>
</table>

**Notes:**

- Unit stress $f_c = 3,600$ psi, $f_y = 60,000$ psi
- Earth density: 120 pcf
- Equivalent fluid pressure: 36 pcf
- Elevations, length of wall, and angle of flares of wings may be varied by the Engineer to suit conditions encountered in the field.
- Dimensions $H', H$, $H''$, $W$, $W'$, elevation of $C'$ and angle of flares (if applicable) are shown on the plans.
- Wall height may be decreased by 6" before going to next greater $H'$.
- Eliminate cutoff wall if adjacent channel is paved and skew is 20° maximum.
- For wall offset values, see Standard Plan 83-5.

**Detail "v"**

- **Section B-B**

---

**State of California**

**Department of Transportation**

**Box Culvert Wingwalls Types A, B and C**

No scale.
NOTES:
1. Eliminate cutoff walls if adjacent channel is paved.
2. For "H" not shown use reinforcement for next greater height.
3. For parapet details not shown see Standard Plan D82.
Dimensions "L", "W", "H", "M", Elevation "a", "Angle of flare", and end "Slope" (as applicable) are shown on the plans.

Where abrasion is anticipated increase apron thickness to 7" minimum to provide 2" minimum reinforcement coverage.

ALTERNATIVE WARPED WINGWALL

Use where additional protection to toe of embankment is required.

NOTES:

- Walls designed for 2'-0" surcharge. Earth density = 120 pcf; equivalent fluid pressure = 36 pcf.
- "W" or warped will uniformly from that of cutoff wall to that of culvert, for maximum "H" > 12'-0".
Dimensions "L", "W", "H", "M", "N", Elevation "O", Angle of Flare, and end "Slope" (as applicable) are shown on the plans.

Vary "D" of warped wall uniformly from that at cutoff wall to that at headwall or endwall, for maximum "H" > 12'-0".

NOTES:
- NO SCALE
- 6" 6" TOTAL 8-#9
- 6" 6" TOTAL 6-#7
- 8" 8" TOTAL 8-#8
- 6" 6" TOTAL 6-#6
- 18' 18' TOTAL 6-#5
- 16' 16' TOTAL 6-#4
- 20' 20' TOTAL 6-#3
- 25' 25' TOTAL 6-#2
- 30' 30' TOTAL 6-#1

PIPE CULVERT
HEADWALLS, ENDWALLS AND WARPED WINGWALLS

NO SCALE

DEPARTMENT OF TRANSPORTATION
STATE OF CALIFORNIA
COUNTY
ROUTE
DIST
SHEET
C59976

ALTERNATIVE WARPED WINGWALL

Use where additional protection to toe of embankment is required, if at upstream end, fillet is not shown.

SECTION A-A

EXTEND WALL SPACERS 2'-0" INTO HEADWALL OR ENDWALL.

SECTION B-B

LAP

LEVEL

Detail E

FOOT OF FLARE

TOE OF SLOPE

TOE OF SLOPE

TOE OF SLOPE

NOTE:

Water designed for 2'-0" surcharge; earth density = 100 psi, equivalent fluid pressure = 26 psi.

Dimensions "L", "W", "H", "M", Elevation "O", Angle of Flare, and end "Slope" (as applicable) are shown on the plans.
Dimensions "L", "W", "H", "M", "N", Elev "a", Angle of flare, and "Slope" (as applicable) are shown on the plans.

Where abrasion is anticipated, increase apron thickness to 2'-0" for Max "H" > 10'.

Use where additional protection to toe of embankment is required.

Alternative warped wingwall

Elements parallel to cutoff walls are straight line.

Match backface of warped wingwall or 9" win.

Match backface of warped wingwall or 9" win.

Plan

Elements parallel to cutoff walls are straight line.

End elevation

Typical for maximum "H" > 10'

Typical for maximum "H" < 10'

Part longitudinal section

Without stiffening beam

3-#8 doweled 2-0" into headwall or endwall.

To fit channel

Stiffening beam

For transverse beam in warped wingwall see table below, slope varies.

1/2" CIR

For number and size of bars see table below.

12" See table below

9" Min

Match backface of warped wingwall or 9" win.

CUT OFF WALL

For transverse beam in warped wingwall see table below, slope varies.

1/2" CIR

For number and size of bars see table below.

12" See table below

9" Min

Match backface of warped wingwall or 9" win.
**ENTRANCE TAPER - TYPE 1**

- **ALTERNATIVE A**
  - Spot welded and made water tight with asphaltic plastic cement
  - 0.079" thick smooth metal bulkhead with reinforcing beads
  - 0.279" thick smooth metal taper with reinforcing beads

- **ALTERNATIVE B**
  - Taper inlet of same construction and dimensions as Type 1 - Alternative A or B except tail pipe length will be 2'-0".

**ENTRY TAPER - TYPE 2**

- Taper joints may be welded or riveted. Dimensions to be as published below for Type 1 Alternatives A and B.

---

**CABLE CLAMP**

- 12" ANNUAL COUPLING BAND
- HELICAL COUPLING BAND
- TWO PIECE INTEGRAL FLANGE DIE FORGED BAND
- FOR HELICAL CORRUGATED STEEL PIPE

**FLATEN OR POINT PIPE STAKES**

- Tail pipe of same thickness as downdrain pipe.

**NOTES:**

1. Either Alternative A or Alternative B anchor assemblies and pipe stakes may be used at Contractor's option for corrugated steel pipe or corrugated aluminum pipe, provided that: Attachment A anchor assembly only to be placed in annular corrugation. Alternative A anchor assembly may be placed in annular coupling band if securely fastened on downstream side of joint. Alternative B anchor assembly to be fastened to pipe sections and not to a band coupler used to join sections.

2. For cable anchorage system details, see Standard Plan D8TC.
Alternative B

WITH ELBOW

PLAN

ENGLISH TAIL PIPE

JOINT RESTRAINER ASSEMBLY

TAPERED INLET

ENTRANCE TAPER - TYPE 2

NOTES:
1. Cable or slip joint to be used when specified.
2. Slip joint to be omitted when completely buried.

T他在STANDARD PLAN D87B

SHEET

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

PLASTIC PIPE
DOWNSCAPE DETAILS
NO SCALE

D87B

Return to Table of Contents
1. Diameter of downdrain 24" maximum.

2. 3/8" cable shown, 5/8" cable is allowable for pipe downdrain diameters of 6" to 15", use 1 1/2" dimension for 3/8" cable and 1 3/4" dimension for 5/8" cable.

3. Slip joints not shown.


5. Cable shall not contact soil in finished position. Either adjust position, or replace affected portion of cable with galvanized steel rod of equivalent diameter.
### TABLE OF MINIMUM COVER AND STRUTTING REQUIREMENTS FOR CONSTRUCTION LOADS

<table>
<thead>
<tr>
<th>TYPE</th>
<th>Maximum Design Fill</th>
<th>Span</th>
<th>18-50 k Axle</th>
<th>50-75 k Axle</th>
<th>75-110 k Axle</th>
<th>110-150 k Axle</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Box Culverts</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10'-0&quot; and 20'-0&quot;</td>
<td>4'-0&quot; to 8'-0&quot;</td>
<td>5'-0&quot;</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20'-0&quot;</td>
<td>10'-0&quot;</td>
<td>5'-0&quot;</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>METAL CULVERTS</strong></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Plastic Pipes</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Pipe Arches</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Reinforced Concrete Culverts</strong></td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

### TABLE OF MINIMUM COVER FOR CONSTRUCTION LOADS

<table>
<thead>
<tr>
<th>TYPE</th>
<th>Dia or Span</th>
<th>18-50 k Axle</th>
<th>50-75 k Axle</th>
<th>75-110 k Axle</th>
<th>110-150 k Axle</th>
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</thead>
<tbody>
<tr>
<td><strong>Reinforced Concrete Culverts</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PIPES</td>
<td>12&quot; to 39&quot;</td>
<td>2'-0&quot;</td>
<td>3'-0&quot;</td>
<td>3'-0&quot;</td>
<td></td>
</tr>
<tr>
<td>ARCHES</td>
<td>42&quot; to 108&quot;</td>
<td>Dia 1.75 or 3'-0&quot;</td>
<td>Dia 1.75 or 3'-0&quot;</td>
<td>Dia 1.75 or 3'-0&quot;</td>
<td>Dia 1.75 or 3'-0&quot;</td>
</tr>
<tr>
<td><strong>Metal Culverts</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Plastic Pipes</strong></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>PIPE ARCHES</td>
<td>15'-0&quot; to 22'-0&quot;</td>
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<tr>
<td><strong>Plastic Pipes</strong></td>
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</tr>
</tbody>
</table>

**Notes:**
- Minimum cover shall be the greater value of alternatives shown. The diameter and span shown in the table to calculate the minimum cover (Example: Dia = 12") is the diameter or span of the facility expressed in number of feet.
- Minimum distance equals 3 times the span or 3 times the diameter.
Struts required when span of structural arch exceeds 18'-0" pad size as directed by Engineer.

NOTES:
1. Struts shown are minimum required during construction when construction vehicle loading exceeds 32 kips/axle, and minimum cover is less than that shown for metal culverts in the Table on Standard Plan D88.
2. Backfill shall be brought up uniformly on both sides of the structure.
3. For minimum cover over structure for construction loads, see Standard Plan D88.
4. Strut all situations where overfill is removed in an unbalanced manner.

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

STRT DETAILS FOR STRUCTURAL STEEL PIPES, ARCHES AND VEHICULAR UNDERCROSSING
NO SCALE

Return to Table of Contents
**DESIGN NOTES:**

- **Loadings:**
  - Live loads (ASHTO LRFD 3.6.1.2)
  - Minimum depth of earth cover
  - Earth loads (ASHTO LRFD 3.6.1.2)

- **Impact Factor:**
  - Apply to top slab only
  - D = minimum depth of earth cover

**GENERAL NOTES:**

1. Risers shall be positioned to either side of the structure as shown.
2. Each riser shall have a ladder. For details, see Standard Plan D93A.
3. Reinforcing steel shall be placed 2" clear, except as shown.
4. Maximum skew of lateral pipe B is 45°.
5. Lateral pipe may be placed in either side wall.
6. Vertical pipe shall be extended directly into the wall for use as an inside form. A collar conforming to the structure.

**REINFORCED CONCRETE JUNCTION STRUCTURE**

- **Type MH**
- **Upper Structure**
- **Cast-in-Place**
- **No Scale**

---

**DESIGN NOTES:**

- **Loadings:**
  - Live loads (ASHTO LRFD 3.6.1.2)
  - Minimum depth of earth cover
  - Earth loads (ASHTO LRFD 3.6.1.2)

- **Impact Factor:**
  - Apply to top slab only
  - D = minimum depth of earth cover

**GENERAL NOTES:**

1. Risers shall be positioned to either side of the structure as shown.
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4. Maximum skew of lateral pipe B is 45°.
5. Lateral pipe may be placed in either side wall.
6. Vertical pipe shall be extended directly into the wall for use as an inside form. A collar conforming to the structure.

**REINFORCED CONCRETE JUNCTION STRUCTURE**

- **Type MH**
- **Upper Structure**
- **Cast-in-Place**
- **No Scale**
REINFORCED CONCRETE PIPE DRAIN

REINFORCEMENT AND COLLAR DETAIL

INSTALLER’S OPTIONS

1. Ladder may be constructed in one length at contractor’s option on reinforced concrete pipe risers.
2. On corrugated steel pipe riser, connect ladder splice plate so joint can compress 0.138" Galv. J bolts, tot. 4
3. Ladder splice plate to be connected with 3/8" bolts with double nuts.
4. Pay limit for 36" risers to centerline of cross pipe.
5. Where angle steps are required, the lowest angle shall not be more than 1'-0" above the flowline of the drain. The distance between angle steps and between the uppermost angle step and the lowest rung of the ladder shall not exceed 1'-0", lower driven footstep, equivalent to the 3/8" bolts shown, may be used for fixing the angle steps to the wall of the reinforced concrete pipe drain.
6. Position ladder so that the highest rung is not more than 1'-0" below the top of the ladder.

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

PIPE RISER CONNECTIONS

NO SCALE

D93A

October 30, 2015

Bruce D. Swanger
REGISTERED CIVIL ENGINEER

COUNTY DISTRICT

POST MILES

TOTAL SHEET

CIVIL ENGINEER

APPROVAL

DISTRICT ENGINEER

COUNTY ENGINEER

NOTE:

1. See Notes 1, 2 and 6.
NOTES:
1. Structure at top of riser may be any standard drainage inlet or pipe inlet.
2. Diameter of slip joint to be 3" greater than diameter of riser.
3. Plastic pipe riser may be substituted for CSP riser shown. Slip joint diameter to be as necessary to accommodate plastic pipe outside diameter.
4. For plastic pipe cross drain, use fabricated reducing tee or some material as cross drain as appropriate to provide watertight connection.
Exist HW AND PIPE 5'-0" at 9" FILLET Concrete

3'-0" ID JUNCTION BOX

Exist PIPE

4-3/8" @ 1-0" ANCHOR BOLTS ON 4-1/2" BOLT CIRCLE

3" x 8" BOARD PROPERLY BRACED

SECTION A-A

CMP RISER AND JUNCTION BOX

TYPE A

DEBRIS RACK CAGE TO UNPERFORATED SECTION OF RISER

CLAMP DEBRIS RACK CAGE TO UNPERFORATED SECTION OF RISER

SEE DETAIL "A"

SEE DETAIL "A"

10" SLOTS, AT QUARTER POINTS AROUND CIRCUMFERENCE, 32" ROW SPACING, STAGGER ALTERNATE ROWS - Gor

10" SLOTS, AT QUARTER POINTS AROUND CIRCUMFERENCE, 32" ROW SPACING, STAGGER ALTERNATE ROWS - Gor

CONNECTING RING L3 x 3 x ½ SHIP RIVETS, SPOTWELDED OR TACKWELDED TO 48" CMP & 1-0" BOX C-C

CLAMP DEBRIS RACK CAGE TO UNPERFORATED SECTION OF RISER

BOLTS ON 4'-4" BOLT CIRCLE

SPOTWELD EACH POST 4 PLACES

8" OF 48" CMP

SPOTWELD EACH POST 4 PLACES

8" BAND COUPLER

DEBRIS RACK CAGE

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

PIPE RISER WITH
DEBRIS RACK CAGE
NO SCALE

2-11

D93C

2015 STANDARD PLAN D93C

2015 STANDAR PLAN D93C

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Connections for Pipe to Metal Flared End Sections

- Type A
- Type B
- Type C

Connections for Pipe to Plastic Flared End Sections

- Circular Pipes
- Pipe-Arch

Metal and Plastic Flared End Sections

Notes:

1. All 3-piece bodies to have 0.109" thick sides and 0.138" thick center panels. Width of center panels to be greater than 20% of the pipe periphery. Multiple panel bodies to have lap seams which are to be tightly joined by rivets or bolts.

2. Reinforced edges to be supplemented with stiffener angles for the 60" thru 84" round, 77" x 52" and 83" x 57" pipe-arch sizes. The angles shall have 1" x 0.109" USD BOLT ROD for the 60" thru 72" round, 77" x 52" and 83" x 57" pipe-arch sizes and 1.25" x 0.125" for 77" thru 84" round. The angles to be attached by 1/4" nuts and bolts.

3. Reinforcement shall be placed under the center panel seams on the 77" x 52" and 83" x 57" pipe-arch sizes.

4. Toe plate to be provided as an accessory when specified.

5. End of pipe to be finished with annular corrugations to conform flared end so that minimal leakage results from the connection. Other designs may be used with approval of the Engineer.

6. For 12" thru 24" helical end section connection, a universal coupling band attached to the metal and section by rivets, bolts or 1" long shop tack welds spaced at some intervals as displayed may be used in place of the 12" end. See Standard Plan D97C.

7. The types of alternative connections for pipe to metal flared end sections shall conform to the following:

- Circular Pipes
- Pipe-Arch

For RCP or alternative pipe:

- Mortar collar
- Flared end section
- Corrugated pipe

Pipes-Arch

Designation: 8" x 24"

FLARED END SECTIONS CONNECTION TO RCP

FLARED END SECTIONS FOR CORRUGATED METAL AND PLASTIC PIPE CULVERTS

ALTERNATIVE CONNECTIONS FOR PIPE TO METAL FLARED END SECTIONS

ALTERNATIVE CONNECTIONS FOR PIPE TO PLASTIC FLARED END SECTIONS

REINFORCED EDGE, SEE NOTE 2

CONNECTOR STRAP DETAIL

TYPE I

ROUND ROD MOLDING

TYPE II

LONG THREADED ROD

TYPE III

CONNECTOR STRAP DETAIL

3/8" # NYLON THREADED ROD

3/8" # NYLON THREADED ROD

21" x 0.109" STRAP WITH 3/8" # 6" BOLT

21" x 0.109" STRAP WITH 3/8" # 6" BOLT

TYPICAL CROSS-SECTION

FLARED END SECTIONS

CIRCULAR PIPES

TYPICAL CROSS-SECTION

FLARED END SECTIONS FOR CORRUGATED METAL AND PLASTIC PIPE CULVERTS

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

2015 STANDARD PLAN D94A

Return to Table of Contents
Contractor has the option of using either Type A or B precast concrete flared end section.

NOTES:
1. Contractor has the option of using either Type A or B precast concrete flared end section.
2. "C" dimension varies by manufacturer and will be paid for as concrete pipe.
1. All ferrous metal coupling band connection hardware shall be galvanized or electroplated in accordance with the Standard Specifications.

2. Dimensions and thicknesses shown are minimum.

3. Spot welds shall develop minimum required strength of strap,

4. Fillet welds of equivalent strength may be substituted for spot welds or rivets.

NOTES:

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

C O U P L I N G  D E T A I L S  N o .  1
A N N U L A R  C O U P L I N G  B A N D  B A R
A N D  S T R A P  A N D
A N G L E  C O N N E C T I O N S

N O  S C A L E
in accordance with the Standard specifications.

1. All ferrous metal coupling band connection hardware shall be galvanized or electroplated in accordance with the Standard specifications.
2. Dimensions and thicknesses shown are minimum.
3. Spot welds shall develop minimum required strength of strap.
4. Fillet welds of equivalent strength may be substituted for spot welds or rivets.

PLATE WASHER UNDER NUT FOR CORRUGATED STEEL PIPE

- BOLTS
- HELICAL PIPE

END VIEW

- PLATE WASHER
- TOP VIEW

TWO PIECE INTEGRAL FLANGE DIE FORMED BAND

helical Coupling bands

- BAND
- PIPE

END VIEW

- BOLTS
- ANGLE

HELICAL BAND

- PIPE
- BAND

SIDE VIEW

- BOLTS

NOTES:

1. Dimensions and thicknesses shown are minimum.
2. Spot welds shall develop minimum required strength of strap.
3. Fillet welds of equivalent strength may be substituted for spot welds or rivets.
NOTES:
1. Dimensions and thicknesses shown are minimum.
2. Spot welds shall develop minimum required strength of strap.
3. Fillet welds of equivalent strength may be substituted for spot welds or rivets.
4. Dimension depends upon whether end condition is lips up or lips down.
### ANNULAR AND HELICAL PROFILE

<table>
<thead>
<tr>
<th>PIPE WALL THICKNESS</th>
<th>BAND THICKNESS</th>
<th>BAR AND STRAP</th>
<th>BOLTS</th>
<th>RIVETS</th>
<th>SPOT WELDS</th>
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</thead>
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<tr>
<td>STRAP THICKNESS</td>
<td>BAND THICKNESS</td>
<td>BAR RIVETS</td>
<td>BOLTS</td>
<td>RIVETS</td>
<td>SPOT WELDS</td>
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#### Dimensions

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<th>SPOT WELDS</th>
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<tr>
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</tbody>
</table>

#### Notes:

1. For helically corrugated coupling bands, the complete coupling may be located parallel to the pipe axis, provided connecting holes or slotted lengths are sufficient to allow adjustment for the helix angle.
2. Tension strain may be connected to bands with either spot welds or fillet welds that develop minimum required strength of strap.
3. Use 1/6" angle leg for rivets and spot welds.
4. Band thickness shall not be less than:
   - 3 standard thickness lighter than the thickness of the pipe for Corrugated Steel Pipe,
   - 2 standard thickness lighter than the thickness of the pipe and in no case lighten than 0.060" for Corrugated Aluminum Pipe.
5. Dimensions, thicknesses and strengths shown are minimum.
6. For round pipe with wall thickness shown for round pipe of equal periphery.
7. Either welds of equivalent strength may be substituted for spot welds or rivets.
8. Spot welds shall develop minimum required strength of strap.
9. Pipe with rolled ends having at least two 2" x 2" x 1/2" annular corrugations each end and with or without an unattached flange may be connected with any of the annular coupling bands shown for pipe of the same diameter and wall thickness.
10. In the case of H-12 huggers, two pieces are required for diameters through 96 and three pieces are required for diameters 102 through 120.
11. Two piece bands are required for pipes greater than 120 diameter.

#### Spiral Rib Profile

<table>
<thead>
<tr>
<th>PIPE WALL THICKNESS</th>
<th>BAND THICKNESS</th>
<th>BAR AND STRAP</th>
<th>BOLTS</th>
<th>RIVETS</th>
<th>SPOT WELDS</th>
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<td>RIVETS</td>
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#### Dimensions

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<th>SPOT WELDS</th>
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</tr>
<tr>
<td>CSP</td>
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</tr>
</tbody>
</table>

### Notes:

1. All profiles of Spiral Rib Pipe (1/2" x 9/16" or 7/16" pitch and 5/16" x 5/32" pitch in steel and aluminum and 3/4" x 11/32" pitch in steel only) shall be manufactured with rerolled ends. Corrugation profile of the rerolled ends shall be 29 x 1/2" annular corrugations with a minimum of two full corrugations at each end.

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**State of California**

**Department of Transportation**

**Corrugated Metal Pipe Coupling Details No. 5**

**Standard Joint**

**NO SCALE**

October 30, 2015

Return to Table of Contents
<table>
<thead>
<tr>
<th>COUPLING TYPE</th>
<th>PIPE DIMENSIONS</th>
<th># OR A</th>
<th>STRAP THICKNESS</th>
<th>BAND THICKNESS</th>
<th>STRAP THICKNESS</th>
<th>BAND THICKNESS</th>
<th>BAR YIELD STRENGTH</th>
<th>BAR YIELD STRENGTH</th>
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<tr>
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<td>3½&quot; x ½&quot;</td>
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<td>0.060&quot;</td>
<td>0.105&quot;</td>
<td>0.060&quot;</td>
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<tr>
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<td>0.060&quot;</td>
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<td></td>
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<td>0.105&quot;</td>
<td>32 ksi</td>
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</table>

**NOTES:**
1. For helically corrugated coupling bands, the connection angles may be oriented parallel to the pipe axis, provided the connecting holes are staggered sufficiently to allow adjustment for the helical angle.
2. Tension strap may be connected to band with either spot welds or fillet welds that develop minimum required strength of strap.
3. Use ¥ 1½ gage line dimension on attached angle leg for rivets or spot welds.
4. Band thickness shall not be less than:
   a. 3 standard thicknesses lighter than the thickness of the pipe for corrugated Steel Pipe,
   b. 2 standard thicknesses lighter than the thickness of the pipe and in no case lighter than 0.060" for corrugated Aluminum Pipe.
5. Dimensions, thicknesses and strengths shown are minimum.
6. For pile anchors use same width band as for round pipe at equal peripheral lengths.
7. Fillet welds of equivalent strength may be substituted for spot welds or rivets.
8. Spot welds shall develop minimum required strength of strap.
9. Pipe with rerolled ends having at least two 2½" x ½" annular corrugations at each end with one or two 4½" diameters may be connected with any of the annular coupling bands shown for pipe of the same diameter and wall thickness and having 2½" x ½" corrugations.
10. In the case of H-12 huggers, two place bands are required for sizes through 96" and three place bands are required for diameters 102" through 120".
11. Two place bands are required for pipes greater than 42" diameter.
ANNULAR AND HELICAL PROFILE

<table>
<thead>
<tr>
<th>COUPLING TYPE</th>
<th>PIPE WALL THICKNESS</th>
<th>BAR AND STRAP (CSP ONLY)</th>
<th>ANGLE</th>
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<td>SPOT WELDS</td>
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<td>CAP</td>
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<tr>
<td></td>
<td>BAR YIELD STRENGTH</td>
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<tr>
<td>TWO PIECE INTEGRAL FLANGE</td>
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<td>3/16&quot; x 3/16&quot;</td>
<td>3-3/16&quot;</td>
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</table>

NOTES:
1. For helically corrugated coupling bands, the connection angles may be oriented parallel to the pipe axis, provided connecting holes are slotted lengthwise sufficiently to allow adjustment for the helix angle.
2. Tension strap may be connected to band with either spot welds or fillet welds that develop minimum required strength of strap.
3. Use 1/4" gage line dimension on attached angle leg for rivets and spot welds.
4. Band thickness shall not be less than:
   a. 3 standard thicknesses lighter than the thickness of the pipe for Corrugated Steel Pipe,
   b. 2 standard thicknesses lighter than the thickness of the pipe and in no case lighter than 0.060" for Corrugated Aluminum Pipe.
5. Dimensions, thicknesses and strengths shown are minimum.
6. For pipe arches use same width band as for round pipe of equal periphery.
7. Fillet welds of equivalent strength may be substituted for spot welds or rivets.
8. Spot welds shall develop minimum required strength of strap.
9. Pipe with rerolled ends having at least two 3 1/2" x 3/16" circular corrugations at each end with or without an upturned flange may be connected with any of the annular coupling bands shown for pipe of the same diameter and wall thickness and having 2 1/2" x 3/16" corrugations.
10. For downdrain applications, two-piece integral flange couplers shall have factory applied sleeve type rubber gaskets with a minimum length of 1" measured along the length of the pipe.

SPIRAL RIB PROFILE

<table>
<thead>
<tr>
<th>COUPLING TYPE</th>
<th>PIPE WALL THICKNESS</th>
<th>BAND THICKNESS</th>
<th>BAR AND STRAP (SSRP ONLY)</th>
<th>ANGLE</th>
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<td>CAP</td>
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<tr>
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<td>BAR YIELD STRENGTH</td>
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</tr>
<tr>
<td>ANNULAR</td>
<td>2 1/2&quot; x 1&quot;</td>
<td>3/16&quot; x 3/16&quot;</td>
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<tr>
<td>MUGGER</td>
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<td>3/16&quot; x 3/16&quot;</td>
<td>3-3/16&quot;</td>
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</table>

* See Note 11.
1. For pipe sections installed on straight alignment, the pipe sections shall be joined to provide maximum joint overlap at all points on the joint periphery, but in no case less than the values shown in Table A for "A" if the installation is required to be watertight or "W" for all other installations.

2. For pipe sections installed on curved alignment, the pipe sections shall be joined to provide maximum joint overlap on one side of the joint and not less than 1/4" overlap on the other. The 1/4" overlap shall be the "W" dimension for installations required to be watertight, or the "A" dimension for all other installations.

3. Watertight joint requirement shall typically be met with the use of rubber gaskets as shown. Pipe installed with rubber gaskets shall have a minimum overlap meeting or exceeding the indicated "W" dimension shown in Table A or indicated in Note 2. Joints shown with rubber gaskets may be installed without gaskets in non-watertight applications, in which case the joints shall be sealed with sealing materials and the minimum joint overlap shall meet or exceed the "A" dimension shown in Table A or indicated in Note 2.

4. For self-centering Tongue and Groove Joints, the mortar shall be applied after the pipe ends are pushed together. The mortar shall be applied to the joint gap on the inside of the pipe for pipe diameters of 24" or more, or to the gap on the outside of the pipe for pipe smaller than 24" in diameter.

5. When watertight joints are required [See Note 3] and cement mortar joints are not allowed, the taper on surfaces within the "W" dimension at full joint closure and the opposing seating surfaces of the bells and spigots on which the rubber gaskets may bear during closure of the joint and at any degree of partial closure shall form an angle of not more than 2 degrees with the longitudinal axis of the pipe.

TABLE A

<table>
<thead>
<tr>
<th>PIPE DIAMETER LIMITS</th>
<th>STANDARD &quot;A&quot;</th>
<th>POSITIVE &quot;A&quot;</th>
<th>STANDARD &quot;W&quot;</th>
<th>POSITIVE &quot;W&quot;</th>
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<tr>
<td>12&quot; THROUGH 18&quot;</td>
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<td>18&quot; THROUGH 23&quot;</td>
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</table>
NOTES:
1. For pipe sections installed on straight alignment, the pipe sections shall be joined to achieve maximum joint overlap at all points on the periphery as indicated in Table A where the plans call for positive or watertight joints. Maximum joint overlap is recommended where the plans call for standard joints, but in no case shall the joint overlap be less than 3/8".

2. For pipe sections installed on curved alignment, the maximum angle of deflection from straight alignment of any joint shall not exceed two degrees, where the plans call for watertightness, field testing for compliance is required. Where plans call for positive joints, the pipe sections shall be joined to achieve Table A dimensions on one side of the joint. Joints classified as standard shall have no less than 3/8" joint overlap at any point on the periphery.

3. Factory applied insertion line limit shall be placed on spigot.

4. Liner insert to be used inside of existing pipe.

<table>
<thead>
<tr>
<th>TABLE A</th>
</tr>
</thead>
<tbody>
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<td>JOINT OVERLAP DIMENSIONS</td>
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STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION
CORRUGATED POLYVINYL CHLORIDE PIPE
WITH SMOOTH INTERIOR
STANDARD AND POSITIVE JOINTS
NO SCALE
COMPOSITE STEEL SPIRAL RIB PIPE

SEE PIPE WALL DETAIL
SEE STEEL RIB DETAIL
SEE JOINT DETAIL

SLEEVE JOINT
½" x 6" BOLTS THROUGH PREFORRED ANGLE

COMPOSITE STEEL SPIRAL RIB PIPE

0.052" STEEL COUPLING BAND
½" EXPANDED RUBBER GASKET

10 mil POLYETHYLENE
10 mil POLYETHYLENE TIE LAYER FILM
65 mil POLYETHYLENE LINER

ZINC COATING

STEEL RIB DETAIL

STEEL RIB ⅜" x ⅜"

PIECE RIB DETAIL

PIECE WALL DETAIL

1/6" Typ 5/6" Typ 7/6" WDK

EXPANDED RUBBER FILLER STRIP
GROOVED TO FIT OVER RIBS

NOTES:
3. Strap joint connection shall consist of 2 separate bolted preformed connectors joined to form one strap when pipe inside diameter is greater than or equal to 60".

PIPE WALL DETAIL

POLYETHYLENE LINER

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

2015 STANDARD PLAN D97J

COUNTY ROUTE
POST MILES
TOTAL SHEET
EXP.LIN.
6-30-16

EXP. No.

PLANS

No.

PLANS

RETURN TO TABLE OF CONTENTS
SECTION C-C

Mortar

TYPICAL CROSS SECTION

RISER CONNECTION DETAIL

SLOTTED DRAIN CONNECTIONS TO STANDARD INLET STRUCTURES

TYPE GMP INLET
See Standard Plans D75A, D75C and D77B for additional inlet details.

TYPE GCP INLET
See Standard Plans D75A, D75C and D77B for additional inlet details.

SECTION C-C

METAL CAP DETAIL
See Note 2

NOTES:
1. Either field joint sealed with a pliable mixture of sand, portland cement and emulsified asphalt (mixture of 1 part portland cement, 3-5 parts sand and 1½ parts SSI emulsified asphalt) or continuous weld.
2. "D" equals nominal pipe diameter.

ELEVATION
SHOULDER INSTALLATION 18" SLOTTED CSP TO 12" DOWNDRAIN

PLAN

ELEVATION-END VIEW

ELEVATION-SIDE VIEW

SLOTTED CORRUGATED STEEL PIPE DRAIN DETAILS

STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION

RETURN TO TABLE OF CONTENTS
1. Drain pipe seams may be continuous helical lock seam or helical weld seam.
2. Drain sections shall be assembled with either of the coupling bands shown.
3. The cross bar spacer shall be welded to the bearing bars in such a manner as to develop a minimum tensile strength of 12,000 LBS normal to the longitudinal axis of the bearing bars.
4. The maximum variance from a straight line between the extreme top corners of the bearing bars shall be 1/2" in 20'-0".
5. Spot welds shall develop minimum required strength of strap.
6. Dimensions shown are minimums.
7. Minimum pipe wall thickness is 0.064".
8. Use heel guard when specified.
10. Unless otherwise shown on the plans or specified in the special provisions, cross bar spacers shall be either rectangular or tapered at the contractor's option.

NOTES:

1. Drain pipe seams may be continuous helical lock seam or helical weld seam.
2. Drain sections shall be assembled with either of the coupling bands shown.
3. The cross bar spacer shall be welded to the bearing bars in such a manner as to develop a minimum tensile strength of 12,000 LBS normal to the longitudinal axis of the bearing bars.
4. The maximum variance from a straight line between the extreme top corners of the bearing bars shall be 1/2" in 20'-0".
5. Spot welds shall develop minimum required strength of strap.
6. Dimensions shown are minimums.
7. Minimum pipe wall thickness is 0.064".
8. Use heel guard when specified.
10. Unless otherwise shown on the plans or specified in the special provisions, cross bar spacers shall be either rectangular or tapered at the contractor's option.
GRATED LINE DRAIN PLAN

SECTION A-A
See Note 1

SECTION C-C

SECTION B-B
See Note 6

NOTES:
1. See Project Plans for trench sections to be installed.
2. Nominal dimensions shown. Allowable tolerance ± 2%.
3. For GMP inlet connection, field joint sealed with a pliable mixture of sand, portland cement and emulsified asphalt (mixture of 1 part portland cement, 3-5 parts sand and 1½ part SSI emulsified asphalt).
4. Within designated pedestrian paths of travel, the maximum grate opening in the direction of pedestrian traffic shall be 2¾".
5. Grate patterns may vary from detail shown. See Special Provisions for requirements.
6. Steel anchoring rods not used when frame is integral with polymer concrete grated line drain section.
7. ½" maximum gap between adjacent gratings.

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GRATED LINE DRAIN DETAILS
NO SCALE
D98C
NOTES:
1. H must be a minimum of 2 1/2", or otherwise shown on the plans.
2. For Slotted Corrugated Steel Pipe Drain Details, see Standard Plans D98A and D98B.
4. Minimum grate slot extension length is 80".
5. The top corners of the grate slot extension's bearing bars must not vary from a straight line more than 1/8" in 20'-0".
6. Cross bar spacers must be welded to the grate slot extension's bearing bars to achieve a minimum tensile strength of 12,000 LB normal to the longitudinal axis of the bearing bars.

RETURN TO TABLE OF CONTENTS
**STANDARD GABION SIZES**

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**NOTES:**
1. Internal connecting wire (13.5-gage) to be installed across width of interior gabions and across width and length of end gabions.
2. Internal connecting wires required on all gabions 3'-0" H.".
3. Preformed stiffeners (11-gage or 9-gage) are an acceptable alternative to internal connecting wires. Install them as recommended by manufacturer or as directed by the Engineer at ½ points.
4. Place rock in end gabion cell first, and continue by filling interior gabion cells.
5. For gabion dimensions, refer to table "Standard Gabion Sizes".

**TYPICAL ACCEPTABLE MESH STYLES**
- TWISTED MESH
- WELDED MESH

**NOTES:**
- Area of opening not to exceed 10.3 square inches.
- Mesh need not be twisted, see typical acceptable mesh styles.
To Assemble Transitional Gabion Basket:

1. Cut mesh along joint between Front Panel and Base Panel.
2. Unfasten End Panel "A" from Base Panel and rotate End Panel "A" into right position along diagonal from the diaphragm to the corner of the Back Panel.
3. Fold the cut portion of the Base Panel into upright position along diagonal from the diaphragm to the corner of the Back Panel.
5. Rotate End Panel "B" and the cut portion of the Front Panel inward against the upturned portion of the Base Panel, fasten along the overlapped portion of the Front Panel and End Panel "B" to the fold upright portion of the Base Panel along the diagonal (as described in Step 3).
6. Fill the transitional Gabion Basket with rock as per specifications.

Notes:
1. A joint connection must be made where any panel edge meets another panel. This includes adjacent gabion baskets, individual panels within a basket, diaphragm edges, etc.
2. Standard tie wire may be used as a joint connector for either twisted or welded mesh. Spiral binder is to be used with welded mesh only.
3. When alternative gabion joint material fasteners are not capable of enclosing all wires along a joint, especially at individual panels within a basket, diaphragm edges, etc. a joint connection must be made where any panel edge meets another panel. This includes adjacent gabion baskets, individual panels within a basket, diaphragm edges, etc.

To assemble:

- Cut mesh along joint between Front Panel and Base Panel.
- Unfasten End Panel "A" from Base Panel and rotate End Panel "A" into right position along diagonal from the diaphragm to the corner of the Back Panel.
- Fold the cut portion of the Base Panel into upright position along diagonal from the diaphragm to the corner of the Back Panel.
- Fold the Back Panel, Front Panel and End Panel "B" into upright positions. Fasten End Panel "B" to the Back Panel and the Front Panel.
- Rotate End Panel "B" and the cut portion of the Front Panel inward against the upturned portion of the Base Panel, fasten along the overlapped portion of the Front Panel and End Panel "B" to the fold upright portion of the Base Panel along the diagonal (as described in Step 3).
- Fill the transitional Gabion Basket with rock as per specifications.
- Close lid and fold over corner of Lid Panel. Fasten along Lid Panel edges.

Spiral Binder Lacing

- Flat Layout of Gabion Basket

Transitional Gabion Basket

(For 6'-0", 9'-0" or 12'-0" gabion)

Spiral Binder Lacing

- Standard Spiral Binder

Standard Spiral Binder Detail

Note: 2.

Transitional Gabion Basket

(See Note 2)
WELDED METAL COVER

TERMINAL RISER

VERTICAL RISER

Metal pipe risers and perforated metal pipe underdrain shown, use type of pipe specified.

UNDERDRAIN LOCATION AND RISERS ANGLED TO CUT SLOPE

EXCAVATION AND BACKFILL

INCREASE OR DECREASE DISTANCE BETWEEN TERMINAL AND VERTICAL RISERS AS NEEDED.
## LAYOUT A

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**NOTE:** VALVE CODES FOR EXISTING VALVES ARE SHOWN IN A DASHED ENCLOSURE.
* Basin area equivalent to 24" Dia
PERSPECTIVE
VINE STAKING

TIE VINES TO STAKE WITH PLANT TIE MATERIAL
2 - STAKES

PREVAILING WIND

SECTION
ROOT PROTECTOR

TOP OF CYLINDER
WIRE CYLINDER
ROOT BALL
WIRE CYLINDER
WITH BOTTOM

SECTION
FOLIAGE PROTECTOR

WRAP TWINE TWO WRAPS AROUND CYLINDER

JUTE MESH COVER

FASTENER Typ
ROOT BALL
SUPPORT STAKE Typ

SECTION
CORE HOLE (VINE)

CONCRETE MASONRY BLOCK Typ
HOLE IN UNGROUTED CELLS, LOCATIONS AS SHOWN ON THE PLANS. EACH HOLE SHALL BE DIRECTLY ABOVE THE OTHER. LOWER HOLE ON VINE SIDE.

TREE STAKING

PLANT TIE Typ
PLANT TIE Typ
STAKE Typ
FG

TOP OF CYLINDER
ROOT BALL

October 30, 2015

The State of California or its officers or agents shall not be responsible for the accuracy or completeness of scanned copies of this plan sheet.
NOTES:
1. Install tree well sprinkler assembly on upslope side of plant when on slope.
2. Install bubbler within basin.
NOTES:
1. Wye strainer and fittings must be the same size as the backflow preventer shown on the plans.
2. Backflow preventer assembly manifold pipe must be the same pipe as the supply line (main) pipe to be installed from the water meter to the backflow preventer assembly.
3. All metal in contact with soil and Portland Cement Concrete must be wrapped with 2" wide plastic backed adhesive polyethylene tape 20 mil thick with 1/2" overlap.
Erosion Control Details
Fiber Roll and Compost Sock
Type 1
Type 2

State of California
Department of Transportation

Erosion Control Details
Fiber Roll and Compost Sock
No Scale

NOTE:
1. Installation shown in the perspective are for slope inclination of 10\% (Horiz:Vert) and steeper.
1. Fiber Roll/Compost Sock shown for reference purposes only.

2. If transverse rolled erosion control product joints are required on slopes, see Detail B.

NOTES:
1. Fiber Roll/Compost Sock shown for reference purposes only.
2. If transverse rolled erosion control product joints are required on slopes, see Detail B.
Indicates sand filled module location and weight of sand in pounds for each module.

Diameter of the module.

Module spacing is based on the greater criteria.

Approach speeds indicated conform to NCHRP 350 Report criteria.

NOTES:
1. (XXX) Indicates sand filled module location and weight of sand in pounds for each module. Module spacing is based on the greater diameter of the module.
2. All sand weights are nominal.
3. Refer to Standard Plan A73B for marker details.
4. Approach speeds indicated conform to NCHRP 350 Report criteria.

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION
TEMPORARY CRASH CUSHION,
SAND FILLED
(UNIDIRECTIONAL)
NO SCALE

CRASH CUSHION PALLET DETAIL

Return to Table of Contents
1. XXX Indicates sand filled module location and weight of sand in pounds for each module. Module spacing is based on the greater diameter of the module.

2. All sand weights are nominal.

3. Refer to Standard Plan A73B for marker details.

4. Approach speeds indicated conform to NCHRP 350 Report criteria.

NOTES:

ARRAY 'TB11'
Approach speed less than 45 mph

ARRAY 'TB14'
Approach speed 45 mph or more

ELEVATION
CRASH CUSHION PALLET DETAIL
Refer to Standard Plan A73B for marker details.

Notes:

1. Indicates sand filled module location and weight of sand in pounds for each module. Module spacing is based on the greater diameter of the module.

2. All sand weights are nominal.

3. The temporary crash cushion arrays shown on this plan shall be used only in locations where there will be traffic on one side of the temporary crash cushion array.

4. Arrays for median shoulders shall conform to details shown on this plan for outside shoulders.

5. Refer to Standard Plan A138 for marker details.

6. For shoulder widths less than 8'-0", appropriate approved crash cushion protection, other than sand filled modules, shall be provided at fixed objects and at approach ends of temporary railing. The specific type of crash cushion shall be as shown on the project plans or as specified in the Special Provisions, or if not shown on the project plans or specified in the Special Provisions, shall be as approved by the Engineer.

7. Approach speeds indicated conform to NCHRP 350 Report criteria.

Approach speed less than 45 mph

Array 'TS11'

See Note 6

Approach speed 45 mph or more

Array 'TS14'

See Note 6

Approach speed indicated conform to NCHRP 350 Report criteria.

State of California

Department of Transportation

Temporary Crash Cushion, Sand Filled

(Shoulder Installations)

No Scale

Elevation

Crash Cushion Pallet Detail
NOTES:

1. Where Type K Temporary Railing is placed on curves and radii that are too severe to connect panels with bolted joints the railing must be backed continuously with earth fill. See Section F-F.

2. Where Type K Temporary Railing is placed as a temporary or long term barrier in two-way traffic on highways with less than 24" from the edge of traveled way, use four capped stakes per every other panel with end panels staked.

3. Where Type K Temporary Railing is placed 3" to 24" from the edge of an excavation on highways, use two capped stakes per panel along the traffic side.

4. Staked Type K Temporary Railing must be supported by at least 4" thick concrete, hot mix asphalt or existing asphalt concrete pavement.

5. The minimum yield strength for the washer must be 60,000 psi.

RAILING STAKING CONFIGURATION FOR TWO-WAY TRAFFIC

See Note 2

RAILING STAKING CONFIGURATION ADJACENT TO AN EXCAVATION

See Note 3

CAPPED STAKE DETAIL

CURVED LAYOUT

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

TEMPORARY RAILING
(TYPE K)

NO SCALE
1. Tapered holes 1\%" Ø of the depth shown may be used in lieu of the tapered holes.
2. Resin capsule-type anchorage devices may be substituted for threaded rods.
3. Place screen on work area side of the temporary railing where traffic will only be on one side of the temporary railing.
4. Clinched 8d box nails may be substituted for screws. The nails shall be clinched on the work area side of the screen.
5. U-bolts may be substituted for \%" Ø bolts.
1. If lifting holes are used with the concrete connector, they shall conform to the lifting hole details shown on Standard Plan T3A.
TABLE 1

TAPER LENGTH CRITERIA AND
CHANNELIZING DEVICE SPACING

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<th>TYPICAL TAPER LENGTH *</th>
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<td>70</td>
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* For other offsets, use the following merging taper length formula for L:
  Speed of 40 mph or less, L = WS + 60
  Speed of 45 mph or more, L = WS

Where:

L = Taper length in feet
W = Width of offset in feet

** - For other offsets, use the following merging taper length formula for L:
  Speed of 40 mph or less, L = WS + 60
  Speed of 45 mph or more, L = WS

Where:

L = Taper length in feet
W = Width of offset in feet

TABLE 2

LONGITUDINAL BUFFER SPACE AND
FLAGGER STATION SPACING

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<th>DOWNGRADE MIN D ***</th>
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<tr>
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** - Speed is posted speed limit, off-peak 85th-percentile speed prior to work starting, or the anticipated operating speed in mph

*** - Longitudinal buffer space or flagger station spacing

TABLE 3

ADVANCE WARNING SIGN SPACING

<table>
<thead>
<tr>
<th>ROAD TYPE</th>
<th>DISTANCE BETWEEN SIGNS ***</th>
</tr>
</thead>
<tbody>
<tr>
<td>TRAFFIC CONTROL SYSTEM TABLES FOR LANE AND RAMP CLOSURES</td>
<td></td>
</tr>
</tbody>
</table>

* - The distances are approximate, are intended for guidance purposes only, and should be applied with engineering judgment. These distances should be adjusted by the Engineer for field conditions, if necessary, by increasing or decreasing the recommended distances.

** - Use on sustained downgrade steeper than -3 percent and longer than 1 mile.

*** - Use for taper and tangent sections where there are no pavement markings or where there is a conflict between existing pavement markings and channelizers (CA).

For speed of 45 mph or more, L = WS

Where:

L = Taper length in feet
W = Width of offset in feet

S = Posted speed limit, off-peak 85th-percentile speed prior to work starting, or the anticipated operating speed in mph

RETURN TO TABLE OF CONTENTS
NOTES:
1. Median lane closure shall conform to the details as shown except that C30(CA) and W1-2L signs shall be used.

2. At least one person shall be assigned to provide full time maintenance of traffic control devices for lane closures.

3. Duplicate sign installations are not required:
   a) On opposite shoulder if at least one-half of the available lanes remain open to traffic.
   b) In the median if the width of the median shoulder is less than 8' and the outside lanes are to be closed.

4. Each advance warning sign on each side of the roadway shall be equipped with at least two flags for double-sided closure. Each flag shall be at least 16" x 16" in size and shall be orange or fluorescent-red-orange in color. Flashing beacons shall be placed at the locations indicated for lane closure during hours of darkness.

5. A C30(CA) sign, with minimum size of 48" x 24" as appropriate, shall be placed at the end of the work area unless the end of work area is obvious or ends within a larger project's limits.

SHOULDER CLOSURE

6. If the W20-1 sign would follow within 2000' of a shoulder or W2-1, use a C30(CA) sign for the first advance warning sign.

7. Place a C30(CA) sign every 2000' throughout length of lane closure.

8. Use one flashing orange sign for each lane closure; the flashing orange sign shall be type 2.

9. A minimum 1000' of sight distance shall be provided where possible for vehicles approaching the first flashing orange sign. Lane closures shall not begin at too steep a vertical curve or on a horizontal curve.

10. All cones used for lane closures during the hours of darkness shall be fitted with retroreflective bands (or sleeves).

11. Portable delineators, placed at one-half of the spacing indicated for traffic cones may be used instead of cones for daytime closures only.

12. A minimum of 3 cones shall be placed transversely across each closed lane and shoulder at each location where a taper across a traffic lane ends and every 2000' as shown on this sheet. The transverse spacing is shown on this sheet.

13. The 2L tangent shown along lane lines shall be modified to provide access to the work.

14. A G20-2 "END ROAD WORK" sign, with minimum size of 48" x 24", shall be placed at the locations indicated for traffic lanes.

15. A W7-3aP "NEXT MILES" plaque must be used if the shoulder closure extends beyond the distance that can be perceived by road users.

NOTES 10 AND 11

See Notes 3, 4 and 6.

CONE SPACING X SEE TABLE 1 AND SEE NOTES 10 AND 11

Notes 1 and 3

CONE SPACING SEE TABLE 1 AND SEE NOTES 10 AND 11

Notes 1 and 3
LANE CLOSURE WITH PARTIAL SHOULDER USE

NOTES:
1. Lane closures on the right side using partial median shoulder as a traffic lane shall conform to the details shown except that C20(CA) and W4-2R signs shall be used.
2. All left one person shall be assigned to provide full time maintenance of traffic control devices for lane closures.
3. Each advance warning sign on each side of the roadway shall be equipped with at least two flags for daylight closure. Each flag shall be at least 16" x 16" in size and shall be orange or fluorescent orange in color. Flashing beacon shall be placed at the locations indicated for lane closure during hours of darkness.
4. A C20-2 "END ROAD WORK" sign, with minimum size of 48" x 24" as appropriate, shall be placed at the end of the lane closure unless the end of work area is obvious or ends within a larger project's limits.
5. If the W0-1 sign would follow within 2000' of a stationary W0-1 or W0-1 "ROAD WORK NEXT 2000'" (if using for the first advance warning sign).
6. Place a C30(CA) sign every 2000' throughout length of lane closure.
7. Use one flashing arrow sign for each lane closed, the flashing arrow signs shall be Type 1.
8. A minimum 1500' of sign distance shall be provided where possible for vehicles approaching the first flashing arrow sign. Lane closures shall not begin at the top of crest vertical curve or on a horizontal curve.
9. All cones used for lane closures during hours of darkness shall be fitted with retrorefractive bands (or sleeves).
10. Portable delineators, placed at one-half the spacing indicated for traffic cones, may be used instead of cones for daylight closures only.
11. A minimum of 3 cones shall be placed transversely across each closed lane and shoulder at each location where a taper crosses a traffic lane ends and every 2000' as shown on the "Lane Closure With Partial Shoulder Use" detail. Two Type 2 Barricades may be used instead of the 3 cones. The transverse alignment of the cones or barricades on the closed shoulder may be shifted from the transverse alignment to provide access to the work.
12. The 2L tangent shown along lane lines shall be used between the L tapsers required for each closed traffic lane.
13. A minimum of Two Type II Barricades shall be placed between each closed lane and shoulder at the location shown and every 2000' within the complete closure area. Within the complete closure area, the transverse alignment of the barricades on the closed shoulder may be shifted from the transverse alignment to provide access to the work.

SIGN PANEL SIZE (MIN)
- 48" x 48"
- 48" x 18"
- 48" x 30"
NOTES:

1. Each advance warning sign shall be equipped with at least two flags for daytime closure. Each flag shall be of least 16" x 16" in size and shall be orange or fluorescent red-orange in color. Flashing beacons shall be placed at the location indicated for lane closure during hours of darkness.

2. A G20-2 "END ROAD WORK" sign, as appropriate, shall be placed at the end of the lane closure unless the end of work area is obvious, or ends within a larger project's limits.

3. If the W20-1 sign would follow within 2000' of a stationary W20-1 or G20-1 "ROAD WORK NEXT MILES", use a C20(CA) sign for the first advance warning sign.

4. All cones used for lane closures during the hours of darkness shall be fitted with retroreflective bands (or sleeves).

5. Portable delineators, placed at one-half the spacing indicated for traffic cones, may be used instead of cones for daytime closures only.

6. Flashing arrow sign shall be either Type J or Type B.

7. For approach speeds over 50 mph, use the "Traffic Control System for Lane Closure On Freeways And Expressways" plan for lane closure details and requirements.

8. A minimum 1500' of sight distance shall be provided where possible for vehicles approaching the first flashing arrow sign. Lane closures shall not begin at the top of crest vertical curve or on a horizontal curve.

9. Place a C30(CA) sign every 2000' throughout length of lane closure.

10. Median lane closures shall conform to the details shown except that C30(CA)L and W4-2L signs shall be used.

11. At least one person shall be assigned to provide full time maintenance of traffic control devices for lane closure unless, otherwise directed by the Engineer.

Sign panel size (min):

- Traffic cone (48" x 48")
- Traffic cone (optional taper) (36" x 18")
- Temporary traffic control sign (30" x 30")

Legend:

- Traffic cone
- Temporary traffic control sign
- Flashing arrow sign (FAS)
- FAS support or trailer
- Portable flashing beacon

State of California Department of Transportation
Traffic Control System for Lane Closure on Multilane Conventional Highways
No scale

T11

Return to Table of Contents
NOTES:

1. At least one person shall be assigned to provide full time maintenance of traffic control devices unless, otherwise directed by the Engineer.

2. Each advance warning sign in each direction of travel shall be equipped with at least two flags for daytime closure. Each flag shall be at least 18" x 18" in size and shall be orange or fluorescent red-orange in color. Flashing beacons shall be placed at the locations indicated for lane closure during hours of darkness.

3. A G20-2 "END ROAD WORK" sign, as appropriate, shall be placed at the end of the lane closure unless the end of work area is obvious, or ends within a larger project's limits.

4. If the W20-1 sign would follow within 2000' of a stationary W20-1 or G20-1 "ROAD WORK NEXT" sign, use a C20(CA) sign for the first advance warning sign.

5. All cones used for lane closures during the hours of darkness shall be fitted with retroreflective bands (or sleeves).

6. Portable delineators, placed at one-half the spacing indicated for traffic cones, may be used instead of cones for daytime closures only.

7. Flashing arrow signs shall be either Type I or Type B.

8. Advisory speed will be determined by the Engineer. The W13-1P Plaque will not be required when advisory speed is more than the posted or maximum speed limit.

9. The tangent (L/2) shall be used.

10. A minimum 1500' of sight distance shall be provided where possible for vehicles approaching the first flashing arrow sign. Lane closures shall not begin at the top of crest vertical curve or on a horizontal curve.
MOVING LANE CLOSURE ON MEDIAN LANE OR OUTSIDE LANE OF MULTILANE HIGHWAYS

NOTES:

1. Either a changeable message sign or a SC11(CA) sign panel and a Type II flashing arrow sign shall be mounted on the rear of sign vehicle V1. The changeable message sign shall be sequenced to show the "ROAD WORK AHEAD" message first, followed by the "RIGHT LANE CLOSED" message. For median lane closure, the flashing arrow symbol shall be reversed with the arrowhead on the right and the changeable message sign shall show LEFT LANE CLOSED.

2. If traffic queues develop, sign vehicle V1 should be positioned upstream from the end of queue. Sign vehicle V1 shall be positioned where highly visible when shoulders are not available.

3. A minimum sight distance of 1500' should be provided in advance of sign vehicle V1.

4. Sign vehicle V1 should remain at the beginning of horizontal or vertical curves until the other vehicles V2 and V3 are far enough beyond the curve to reduce the minimum sight distance of 1500'.

5. Vehicle-mounted sign panels shall have Type II or above retroreflective sheathing, black on white, or black on fluorescent orange, with 6" minimum series D letters per Caltrans sign specifications.

6. Shadow vehicle V2 shall be equipped with a truck-mounted attenuator. The sign panel shown and a Type II flashing arrow sign shall be mounted on the rear of shadow vehicle V2. For median lane closure the flashing arrow sign symbol shall be displayed with the arrowhead on the right.

7. All vehicles used for lane closures shall be equipped with two-way radios, and the vehicle operators shall maintain communication during the work or application operation.

8. All vehicles shall be equipped with flashing or rotating amber lights.

9. If sign vehicle V1 encroaches into the traffic lane due to insufficient shoulder width, sign vehicle V1 shall be equipped with a truck-mounted attenuator. Sign vehicle V1 shall stay as close to the edge of shoulder as practicable.

10. Where workers would be on foot in the work area, a stationary type lane closure (Standard Plan T10, T11, etc., as applicable) shall be used instead of this plan.

11. For moving lane closure on interior lane of multilane highways, use Standard Plan T16.

12. The spacing between work vehicles V3 and the shadow vehicles V1 and V2 should be minimized to deter road users from driving between.

13. When the work/application vehicle V3 occupies the median lane, sign vehicle V1 should drive in the median shoulder and indicate left lane closed ahead.

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

TRAFFIC CONTROL SYSTEM
FOR MOVING LANE CLOSURE
ON MULTILANE HIGHWAYS
NO SCALE

T15

Return to Table of Contents
NOTES:

1. A changeable message sign shall be mounted on the rear of sign vehicle V1. The changeable message sign shall be located as close to the edge of shoulder as practicable, followed by the "INTERIOR LANE CLOSED" message. The message "CENTER LANE CLOSED" may be used in place of the "INTERIOR LANE CLOSED" message.

2. If traffic queues develop, sign vehicle V1 should be positioned upstream from the end of queue. Sign vehicle V1 shall be positioned where highly visible when shoulders are not available.

3. A minimum sight distance of 1500' should be provided in advance of sign vehicle V1.

4. Sign vehicle V1 should remain at the beginning of the project, followed by the "INTERIOR LANE CLOSED" message. The spacing between road work (Standard Plan T15, T16 etc., multilane highways, use Standard Plan T15).

5. Vehicle-mounted sign panels shall have Type I or above retroreflective sheeting, black on yellow, or black on fluorescent orange, with a minimum series 0 letters per Caltrans sign specifications.

6. Shadow vehicle V2 shall be equipped with a truck-mounted attenuator, the sign panel shown and a Type I flashing or rotating light shall be mounted on the rear of the shadow vehicle V2.

7. All vehicles used for lane closures shall be equipped with two-way radios, and the vehicle operators shall maintain communication during the work or application operation.

8. All vehicles shall be equipped with flashing or rotating amber lights.

9. If sign vehicle V1 approaches into the traffic lane due to insufficient shoulder width, sign vehicle V1 shall be equipped with a truck-mounted attenuator. Sign vehicle V1 shall stay as close to the edge of shoulder as practicable.

10. Where workers would be on foot in the work area, a stationary type lane closure (Standard Plan T10, T11 etc., as applicable) shall be used instead of this plan.

11. For moving lane closure on median lane or outside lane of multiline highways, use Standard Plan T15.

12. The spacing between work vehicles (V1 and V2) and the shadow vehicles, and between each shadow vehicle should be minimized to deter road users from driving in between.

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION
TRAFFIC CONTROL SYSTEM
FOR MOVING LANE CLOSURE
ON MULTILANE HIGHWAYS
NO SCALE

T16
NOTES:

1. Either a changeable message sign or a SC12(CA) "SLOW TRAFFIC AHEAD" sign shall be mounted on the rear of sign vehicle V1. The changeable message sign shall be sequenced to show the "CAUTION" message first, followed by the "SLOW TRAFFIC AHEAD" message. A Type B flashing arrow sign may be used with the SC12(CA) sign panel.

2. Sign vehicle V1 should be positioned where highly visible when shoulders are not available.

3. If traffic queues develop, sign vehicle V1 should be positioned upstream from the end of queue.

4. Vehicle-mounted sign panels shall have Type II or above retroreflective sheathing, black on white, or black on fluorescent orange, with 6" minimum series B letters per Caltrans sign specifications.

5. Shadow vehicle shall be equipped with a truck-mounted attenuator. The sign panel shown shall be mounted on the rear of shadow vehicle V2. The message "LANE CLOSED" may be used in place of the "DO NOT PASS" message.

6. The sign panel shown shall be mounted on the front of sign vehicle V4, facing opposing traffic.

1. All vehicles shall be equipped with flashing or rotating amber lights.

2. Sign vehicle V4 will not be required when the work and vehicles V2 and V3 are 3' or more from the centerline of the highway during the work or application operations.

3. All vehicles used for lane closures shall be equipped with two-way radios, and the vehicle operators shall maintain communication during the work or application operation.

4. This plan shall not be used where workers would be on foot in the work area. Use a stationary type lane closure (Standard Plan T13) for this condition.

5. Minimize spacing between vehicles V2 and V3 and vehicles V3 and V4 to deter road users from driving in between them.

6. If sign vehicle V1 approaches into the traffic lane due to insufficient shoulder width, sign vehicle V1 shall be equipped with a truck-mounted attenuator. Sign vehicle V1 shall stay as close to the edge of shoulder as practicable.
Joint sections shall not be placed at sump locations.

1. The downstream end of the temporary silt fence shall have the last 8' angled up slope.

2. Setback dimensions may vary to fit field conditions.

3. Posts to overlap and fence fabric to fold around each post one full turn. Secure fabric with 4 staples for each post.

4. Posts shall be driven tightly together to prevent potential flow-through of sediment at the joint. The tops of the posts shall be secured to each other with wire.

5. Minimum of 4 staples shall be installed around two posts one full turn and secured with 4 staples.

6. Minimum of 4 staples shall be installed per post. Dimensions shown are typical.

7. Maintenance openings shall be constructed in a manner to ensure that sediment is retained by the temporary silt fence.

8. Joint sections shall not be placed at sump locations.
Temporary Straw Bale Barrier

Section Placement Detail for Temporary Silt Fence and Temporary Fence (Type ESA) Used with Temporary Straw Bale Barrier (See Note 1)

Section Placement Detail for Temporary Silt Fence Used with Temporary Straw Bale Barrier (See Note 1)

Notes:
1. Temporary silt fence and temporary fence (Type ESA) shown for reference purposes only.
STAPLE PATTERN

TEMPORARY BLANKET FABRIC

EDGE OVERLAPPING EDGE

STEEL STAPLE

PLAN

DETAIL A

STAPLE PATTERN

PERSPECTIVE

DETAIL B

LONGITUDINAL BLANKET JOINT

SECTION

DETAIL C

KEY TRENCH

SECTION

DETAIL D

TRANSVERSE BLANKET JOINT

NOTE:

1. For clarity, perspective view does not show all staples.
1. Temporary fiber roll spacing varies depending upon slope inclination.
2. Distances shown in the perspectives are for slope inclination of 10:1 and steeper.

NOTES:
STAKE NOTCH DETAIL

ELEVATION

SECTION
PERSPECTIVE

TEMPORARY CHECK DAM (TYPE 1)
(Total of 3 check dams shown)

STAKE
ROPE
FIBER ROLL
FINISHED GRADE

STAKE
ROPE
FIBER ROLL

FINISHED GRADE
ELEVATION AT END OF CHECK DAM
(TOP OF FIBER ROLL)

ELEVATION OF CHECK DAM AT CENTERLINE OF DITCH OR SWALE CHECK
(TOP OF FIBER ROLL)

CENTERLINE DITCH OR SWALE
SPILLWAY (SEE NOTE 1)

FINISHED GRADE

SECTION

PERSPECTIVE

TEMPORARY CHECK DAM (TYPE 2)
(Total of 3 check dams shown)

SPILLWAY (SEE NOTE 1)

FINISHED GRADE

ELEVATION AT END OF CHECK DAM
(TOP OF FIBER ROLL)

ELEVATION OF CHECK DAM AT CENTERLINE OF DITCH OR SWALE CHECK
(TOP OF FIBER ROLL)

CENTERLINE DITCH OR SWALE

NOTE:
1. Spillway depth "d" shall be maintained to prevent trapping of concentrated flow
around the ends of each check dam.
SEE CONFORM DETAIL TO PAVEMENT OR CURB, EXCAVATE TO CONFORM
SUMP SEDIMENT TRAPPING

A

A

TO SUMP
GRADE TO DRAIN

PERSPECTIVE TEMPORARY CONSTRUCTION ENTRANCE (TYPE 1)

EXCAVATE TO CONFORM TO PAVEMENT OR CURB, SEE CONFORM DETAIL

SECTION A-A

ROCK

TAPER AT ALL EDGES

SMALL TRAPPING SUMP

GRADE TO DRAIN TO SUMP

MATCH ELEVATION OF TOP OF EXISTING PAVEMENT

EXISTING PAVEMENT

4'-0" ROCK

4'-0" TEMPORARY ENTRANCE FABRIC

SECTION CONFORM DETAIL

PERSPECTIVE TEMPORARY CONSTRUCTION ENTRANCE (TYPE 2)

SECTION B-B

ROCK

CROSS SLOPE 35 OR FLATTER

TAPER EDGES AT 1:1

SEDIMENT TRAPPING SUMP

PERSPECTIVE TEMPORARY CONSTRUCTION ENTRANCE (TYPE 2)

SECTION B-B

ROCK

CROSS SLOPE 35 OR FLATTER

TAPER EDGES AT 1:1

SEDIMENT TRAPPING SUMP

PLATE

TYPICAL CORRUGATED STEEL PANEL DETAIL

SECTION C-C

VERTICAL BARS

PLAN

TEMPORARY WATER POLLUTION CONTROL DETAILS

(TEMPORARY CONSTRUCTION ENTRANCE)

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

NO SCALE

Return to Table of Contents
NOTES:

1. The concrete washout sign shall be installed within 20'-10" of the temporary concrete washout facility.

2. Plastic liner shall be anchored with gravel-filled bags for below grade concrete washout facility.
NOTES:
2. Dimensions may vary to fit field conditions.

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION
TEMPORARY WATER POLLUTION
CONTROL DETAILS
(Temporary Drainage Inlet Protection)
NO SCALE

2015 STANDARD PLAN T61

Return to Table of Contents
DRAINAGE INLET
FROM CONCENTRATED FLOW
POSITION JOINTS AWAY
BEHIND EXISTING CURB OR DIKE

INLET PROTECTION (TYPE 4A)

SECTION A-A

FLEXIBLE SEDIMENT BARRIER DETAIL
(FOAM BARRIER SHOWN)

FLEXIBLE SEDIMENT BARRIER SPACING TABLE

NOTES:

2. Dimensions may vary to fit field conditions.

3. Install a minimum of 3 flexible sediment barriers upstream of each drainage inlet to be protected.

4. Position erosion control blanket or geosynthetic fabric at edge of concrete apron and secure in trench.

5. Erosion control blanket or geosynthetic fabric is not required if the area adjacent to the drainage inlet is vegetated.

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION
TEMPORARY WATER POLLUTION
CONTROL DETAILS
(TEMPORARY DRAINAGE INLET PROTECTION)

RETURN TO TABLE OF CONTENTS
2. Dimensions may vary to fit field conditions.
TEMPORARY FENCE (TYPE ESA)

SECTION

PLACEMENT DETAIL

FOR TEMPORARY LINEAR SEDIMENT BARRIER
USED WITH TEMPORARY FENCE (TYPE ESA)

For temporary silo fence

AND TEMPORARY STRAW BALE BARRIER
USED WITH TEMPORARY FENCE (TYPE ESA)

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

TEMPORARY WATER POLLUTION
CONTROL DETAILS
[TYPICAL DETAIL]

T65

NO SCALE

DEPARTMENT OF TRANSPORTATION
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THE STATE OF CALIFORNIA OR ITS OFFICERS OR AGENTS SHALL NOT BE RESPONSIBLE FOR COPIES OF THIS PLAN SHEET.

October 30, 2015

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1. Temporary fence (Type ESA) shown for reference purposes only.

2. Setback dimension may vary according to field conditions or as designated on plans.
B. 6" square aluminum or galvanized steel wire 1/4" mesh hardware cloth, minimum wire diameter 0.005", anchor firmly to backface.

C. One cubic yard pervious backfill material in a nonwoven filter fabric, securely tied.

D. Pervious backfill material continuous behind retaining wall or abutment.
ALTERNATIVE DECK CONSTRUCTION JOINTS

DECK CONSTRUCTION JOINTS

BRIDGE DETAIL 5-2
Top or bottom slab

BRIDGE DETAIL 5-3

REINFORCED BOX GIRDER
Girder or diaphragm

A reinforcement bar must be placed inside of each stirrup hook or 90° bend.

ALTERNATIVE STIRRUPS

BRIDGE DETAIL 5-5

NOTES:
1. In simple spans, transverse joints are not permitted unless approved by the Engineer.
2. In continuous spans, transverse joints may be located at about the 1/4 point of the span.
3. Reinforcing steel shall be continuous through all construction joints.
4. Longitudinal joints shall be located at the edge of a traffic lane unless otherwise permitted by the Engineer.

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

BRIDGE DETAILS
NO SCALE

BO-5

Return to Table of Contents
SURFACES OF EXPANDED POLYSTYRENE AGAINST WHICH CONCRETE IS TO BE PLACED SHALL BE FACED WITH HARDBOARD. 

SECTION C-C 

SECTION D-D 

SECTION E-E 

NOTE:
1. Attach door stiffener angles and bent sheet to steel door with blind rivets.

3 Required for larger opening

4'-0" Min - 6'0" Max

5/8" x 0.108" BENT GALV SHEET

SECTION B-B

SECTION A-A

BRIDGE DETAIL 13-1
PROTECTION OF HORIZONTAL POLYSTYRENE

BRIDGE DETAIL 13-2
PROTECTION OF VERTICAL POLYSTYRENE

BRIDGE DETAIL 13-3
ACCESS DOOR

4" x 4" FIXED PIN BUTT HINGES
2 REQUIRED FOR 4'-0" OPENING
3 REQUIRED FOR LARGER OPENING

2'-0" x 2'-0" (1 EACH FACE)

1/4" STEEL BLIND RIVETS
AT 1'-0" CENTERS MAX

1/4" CHAMFER

1/2" x 5" STUD CONNECTOR Ø 1/2"
### Design Capacity

**90 kip and 140 kip**

**Design Capacity**

1. Reinforcement extending into footing shall be hooked as required to provide clearance to top of footing.

2. Piles shall be extended only in accordance with details shown on the Project Plans.

#### Reinforced Concrete

- $f_y = 60,000$ psi
- $f_c = 4,000$ psi

#### Design Capacity

- **Compression**
  - 140 kip (Service state)
  - 280 kip (Nominal axial structural resistance)

- **Tension**
  - 56 kip (Service state)
  - 140 kip (Nominal axial structural resistance)

**200 kip Pile**

- **Compression**
  - 200 kip (Service state)
  - 400 kip (Nominal axial structural resistance)

- **Tension**
  - 80 kip (Service state)
  - 200 kip (Nominal axial structural resistance)
Resistance (Tension) Requirements

PILE DETAILS

* See Pile Data Table on the Project Plans for Nominal Resistance (Tension) Requirements

1. Details are the same for both Class 90 and Class 140 piles unless noted otherwise.

2. At the Contractor's option, alternative steel pipe with at least the diameter and wall thickness shown on these plans may be used. The diameter shall not exceed 1'-8".

3. Pile reinforcement and steel pipe anchor bars extending into a footing shall be hooked or required to provide clearance to top of footing; piles shall be extended only with details shown on the Project Plans.

4. 2" clearance to spiral reinforcement shall be maintained if section used is larger than the minimum section shown.

5. Maximum cutoff length at the top of the Alternative "X" and Alternative "W" pile is 10'-0".

6. For longitudinal reinforcement and prestressing for anchor piles and load test piles, see "Load Test Pile Details (2)", Standard Plan B2-10.

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

PILE DETAILS
CLASS 90 AND CLASS 140

NO SCALE

B2-5
1. Pile reinforcement extending below footing shall be hooked to the top of the footing as required to provide clearance to the top of the footing.

2. At the Contractor's option, alternative steel pipe piles with a diameter of at least 1'-6" may be used. The diameter shall not exceed 2'-0".

3. Minimum cut-off length at the top of the alternative "W" and alternative "Y" piles is 1'-10".
Plan

Anchor Pile - Load Test Pile - Anchor Pile

Space in accordance with plan details

Note: (five pile group)
Clear spacing between load test pile and anchor pile shall not be less than five pile diameters or 7'-0", whichever is greater, except that dimension "A" shall not exceed 17'-6" or be less than 7'-6" when possible, maximum spacing is to be used.

Plan

Anchor Pile - Load Test Pile - Anchor Pile

Space in accordance with plan details

Note: (three pile group)
Clear spacing between load test pile and anchor pile shall not be less than five pile diameters or 7'-0", whichever is greater, except that dimension "B" shall not exceed 17'-6" or be less than 8'-6" when possible, maximum spacing is to be used.

Load Test Pile Details (2), Load Test Pile Details (3), Standard Plan B2-11.

Load Test Pile Details (1)

Three - Pile Load Test Pile Group
(for tension pile load tests)

Five - Pile Load Test Pile Group
(for compression - tension pile load tests)

Top of Load Test and Anchor Piles to be smooth and level.

Cut off pile after testing to provide embedment in accordance with plan details.

Bottom of footing or top of pile casing, load test site must be level, smooth and free of debris, water and mud.

Pile cut off for testing.

Cut off pile after testing to provide embedment in accordance with plan details.

Length for payment.

State of California Department of Transportation

Load Test Pile Details (1)

No Scale
3. For details not shown, see applicable pile details shown on the Project Plans.
4. For the additional top 4'-0" of pile for testing, the spiral reinforcement shall be the same size and placed at the same pitch as detailed for the top of piles shown in the Project Plans.
5. Details applicable for load test and anchor piles.
STEEL H-PILE DETAILS

SECTION A-A

Maximum Tensile Test Force Per Pile:
- HP 10 x 42 = 180 kips
- HP 10 x 57 = 245 kips
- HP 14 x 89 = 300 kips

NOTE:
Alignment of slots and 1½" E's shall permit a 1" x 12" x 3'-3" to pass through pile parallel to the web of pile and achieve a snug fit. Details applicable for load test and anchor piles. Slots to be cut after piles are driven.

SECTION B-B

ALTERNATIVE "W" STEEL PIPE - PILE

Maximum Tensile Test Force Per Pile:
- Class 90 (PP 14 x 0.375) = 180 kips
- Class 140 (PP 14 x 0.437) = 280 kips
- Class 200 (PP 16 x 0.50) = 300 kips

NOTE:
Alignment of slots and 1½" E's shall permit a 1" x 12" x 3'-3" to pass through pile. Details applicable for load test and anchor piles. Slots to be cut after piles are driven.
TYPICAL SECTION

1. For details not shown and drainage notes see

2. For wall stem joint details see

3. At and short bars:

4. Bundle bars for H > 26'.

5. Hook strands around & space with alternating transverse reinforcement at 2 x ".

DESIGN CONDITIONS:
Design H may be exceeded by 6' before going to the next size. Special footing design is required where foundation material is incapable of supporting bearing stress listed in the table.

DESIGN NOTES:

SYMBOLS:

| Sr | Service limit state I
| Ext | Extreme event limit state II

| T | Effective footing width (ft)
| q | net bearing stress (ksf), OG assumed to be FG at toe
| H | Top of footing to top of \@ bar
| H' | Top of footing to top of \@ bar
| H'' | Top of footing to top of \@ bar

SOIL:

| h' | 4" of concrete (75 psf) considered
| h" | Top of footing to top of b bar
| h"' | Top of footing to top of d bar
| h"" | Top of footing to top of short d bar
| q" | net bearing stress (ksf), OG assumed to be FG at toe
| q"' | net bearing stress (ksf), OG assumed to be FG at toe
| q"" | net bearing stress (ksf), OG assumed to be FG at toe

TABLE OF REINFORCING STEEL, DIMENSIONS AND DATA

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COTE Plan B3-1B

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

RETAILING WALL TYPE 1 (CASE 2)

NO SCALE
DESIGN CONDITIONS:

Design is to be conducted by 6" before going to the next size. Sufficient footing design is required where foundation stress is incapable of supporting bearing stress listed in the table.

DESIGN NOTES:

- **Design**: ASHBOI RRRP Bridge Design Specifications, 4th Edition with California Amendments
- **LSA**: Varied surcharge on level ground surface
- **DCS**: Stem Architectural Treatment of thickness up to 6" depth of concrete (15 psf) considered
- **SEISMIC**: He = 0.2, Ho = 0.5
- **SOIL**: d = 34", f = 120 psf
- **REINFORCED CONCRETE**: f_c = 3,600 psf

LOAD COMBINATIONS AND LIMIT STATES:

<table>
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<tr>
<th>Service</th>
<th>Strength</th>
<th>Load Factors</th>
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<td>1.00DC+1.00EV+1.00EH+1.00EQD+1.00EQE</td>
<td>1.00DC+1.00EV+1.00EH+1.00EQD+1.00EQE</td>
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Where:

- **Q**: Force Effects
  - D = 1.50 or 0.50, Whichever Controls Design
  - E = 1.50 or 0.50, Whichever Controls Design
  - S = Load of Structure Components
  - WE = Horizontal Earth Felt Pressure
  - VE = Vertical Earth Felt Pressure
  - LE = Live Load Limit States
  - EE = Earthquake Earth Felt Pressure

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<th>SYMBOLS</th>
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<tr>
<td><strong>H</strong></td>
<td>= 22' TO 34'</td>
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<td><strong>W</strong></td>
<td>3'-0&quot; FOR H = 36', 2'-0&quot; FOR H = 36&quot;</td>
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<td><strong>VARIABLE LIVE LOAD SURFACE</strong></td>
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**NOTE:**

1. For details not shown and drainage notes see (a) and (b).
2. For wall stem joint details see (c).
3. At stem bases, 6" no slabs are allowed within 1'-4" above the top of footing. 6" no slabs are allowed within H/4 above the top of footing.
4. Bundle # bars for H = 36'.
5. Hook stirrups around & space with alternating transverse reinforcement at 2 x 3".

**TYPICAL SECTION**

- **SAMPLE**
  - For details not shown and drainage notes see (a) and (b).
  - For wall stem joint details see (c)
  - At stem bases, 6" no slabs are allowed within 1'-4" above the top of footing. 6" no slabs are allowed within H/4 above the top of footing.
  - Bundle # bars for H = 36'.
  - Hook stirrups around & space with alternating transverse reinforcement at 2 x 3".

**ELEVATION**

**TABLE OF REINFORCING STEEL, DIMENSIONS AND DATA**

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**NOTES:**

- For details not shown and drainage notes see (a) and (b).
- For wall stem joint details see (c).
- At stem bases, 6" no slabs are allowed within 1'-4" above the top of footing. 6" no slabs are allowed within H/4 above the top of footing.
- Bundle # bars for H = 36'.
- Hook stirrups around & space with alternating transverse reinforcement at 2 x 3".
SPREAD FOOTING SECTION
Place concrete in toe against undisturbed material, except as permitted by the Engineer.

APPROPRIATE DETAILS AT TOP OF WALL ARE SHOWN ELSEWHERE.
SEE STEM HAUNCH DETAIL WHEN USED WITH BARRIER.

PLACE WATERSTOP AS SHOWN WHEN REQUIRED.

FINISHED GRADE AS SHOWN WHEN REQUIRED.

BACKFILL SUFFICIENTLY TO PREVENT PONING, TO BE DONE AFTER REMOVAL OF WALL FORMS AND BEFORE BACFILLING BEHIND WALLS.

DESIGN SECTION

SYMBOLS:
Ser - service limit state
Str - strength limit state
Ext I - extreme event limit state
Ext II - extreme event limit state II
B' - effective footing width (ft)
q - net bearing stress (ksf), assumed to be kg at the toe
q' - gross uniform bearing stress (ksf)

DESIGN CONDITIONS:
Design H may be exceeded by 6" before going to the next size. Special footing design is required where foundation material is incapable of supporting bearing stress listed in the table.

DESIGN NOTES:
DESIGN: AASHTO LRFD Bridge Design Specifications, 4th Edition with California Amendments
LS - Varyed surcharge on level ground surface
OC - Stem Architectural Treatment of thickness up to 8' of concrete (75 psf) considered
CT - 54 kip transverse force applied at H = 32", distributed over 10 feet at the top of wall and 1:1 distribution down and outwards. Distribution below footing taken no less than 40'.
SEISMIC:
hm = 0.2
kd = 0.2
SOILS:
\( \theta = 34^\circ \)
\( \gamma = 120 \text{pcf} \)
REINFORCED CONCRETE:
\( fc = 3,600 \text{psi} \)
\( fy = 60,000 \text{psi} \)

LOAD COMBINATIONS AND LIMIT STATES:
Service 1: 0 = 1.00DC+1.00EV+1.00EH+1.00CT
Extra 1: 0 = 1.00DC+1.00EV+1.00EH+1.00EQD+1.00EQE
Extra 3: 0 = 1.00DC+1.00EV+1.00EH+1.00LS

WHEREAS:
DG - Force Effects
OC - 1.25 or 1.50, Whichever Controls Design
CS - 1.15 or 1.00, Whichever Controls Design
CLC - Deep Load of Structure Components
EM - Horizontal Erench Fill Pressure
ENV - Vertical Erench Pressure from Erench Fill Weight
EPS - Seismic Earth Pressure
ESD - Soil and Structural and Nonstructural Components抗震
CT - Vehicle Collision Force

NOTES:
1. For details not shown and drainage notes see
2. For wall stem joint details see
3. At 8" or 10" bars:
\( \leq 6' \), no splices are allowed within 1'-6" above the top of footing.
\( > 6' \), no splices are allowed within 1'-6" above the top of footing.
4. Provide 4@8" expansion joint in addition to tabulated @ over a distance of 8'-0" measured from all expansion joints, begin wall and end wall location.

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

RETAINING WALL TYPE 1A (CASE 1)

B3-3A
**Retaining Wall Type 1A (Case 2)**

**Design Section**

- Spread Footing Section
- Spread footing concrete is cast against undisturbed material, except as permitted by the Engineer.

**Elevation**

**Symptoms:**

- Seismic = service limit state I
- Str = strength limit state I
- Ext = extreme event limit state I
- B" = effective footing width
- q = net bearing stress (ksf), assumed to be FC or toe
- qo = gross uniform bearing stress (ksf)

**Table of Reinforcing Steel, Dimensions and Data**

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**Notes:**

1. For details not shown and drainage notes see B3-5.
2. For wall stem joint details see Use of Flexible Joint Amenity.
3. At top and short @ bars:
   - H < 5", no collars are allowed within 1'-0" above the top of footing.
   - H > 5", no collars are allowed within 1/4 above the top of footing.

**Design Conditions:**

- Design H may be expanded by 6" before going to the next size. Special footing design is required where foundation material is incapable of supporting bearing stress listed in the table.

**Design Notes:**

- Design: AASHTO LRFD Bridge Design Specifications, 4th Edition with California Amendments
- LS: Required level of ground surface
- ODC: Seismic Treatment of thickness up to 6" of concrete (50 psi) considered
- SEECD:
  - kH = 0.2
  - kV = 0.2
- SOILS: d = 12"
- Reinforced Concrete:
  - fc' = 3,600 psi
  - fy = 60,000 psi
- Load Combinations and Limit States:
  - Service: 90% of LS + 100% of ODC + 100% of SEECD + 100% of SEEED
  - Extreme: 100% of LS + 100% of ODC + 100% of SEECD + 100% of SEEED

**Notes:**

- CONCRETE:
  - PC: 60,000 psi
  - CE: 1,500 lb/ft³
  - Variables:
    - DC: Horizontal Earth Fill Height
    - EH: Vertical Earth Pressure from Earth Fill Height
    - LS: Live Load Surcharge
    - EQE: Uniform Earth Pressure
    - EQD: Dead Load Additions
    - SEECD: ODC = Seismic Earth Pressure
    - SEEED: ODC = Earthquake Earth Pressure
    - SEEED: ODC = Uniform and Vertical Earth Pressure
    - SEEED: ODC = Vertical Earth Pressure
    - SEECD: ODC = Live Load Additions
    - SEEED: ODC = Uniform and Vertical Earth Pressure

- Design H may be exceed by 6" before going to the next size. Special footing design is required where foundation material is incapable of supporting bearing stress listed in the table.

**Design Conditions:**

- Design: AASHTO LRFD Bridge Design Specifications, 4th Edition with California Amendments
- LS: Required level of ground surface
- ODC: Seismic Treatment of thickness up to 6" of concrete (50 psi) considered
- SEECD:
  - kH = 0.2
  - kV = 0.2
- SOILS: d = 12"
- Reinforced Concrete:
  - fc' = 3,600 psi
  - fy = 60,000 psi
- Load Combinations and Limit States:
  - Service: 90% of LS + 100% of ODC + 100% of SEECD + 100% of SEEED
  - Extreme: 100% of LS + 100% of ODC + 100% of SEECD + 100% of SEEED

**Notes:**

1. For details not shown and drainage notes see B3-5.
2. For wall stem joint details see Use of Flexible Joint Amenity.
3. At top and short @ bars:
   - H < 5", no collars are allowed within 1'-0" above the top of footing.
   - H > 5", no collars are allowed within 1/4 above the top of footing.

**Design Conditions:**

- Design: AASHTO LRFD Bridge Design Specifications, 4th Edition with California Amendments
- LS: Required level of ground surface
- ODC: Seismic Treatment of thickness up to 6" of concrete (50 psi) considered
- SEECD:
  - kH = 0.2
  - kV = 0.2
- SOILS: d = 12"
- Reinforced Concrete:
  - fc' = 3,600 psi
  - fy = 60,000 psi
- Load Combinations and Limit States:
  - Service: 90% of LS + 100% of ODC + 100% of SEECD + 100% of SEEED
  - Extreme: 100% of LS + 100% of ODC + 100% of SEECD + 100% of SEEED

**Notes:**

1. For details not shown and drainage notes see B3-5.
2. For wall stem joint details see Use of Flexible Joint Amenity.
3. At top and short @ bars:
   - H < 5", no collars are allowed within 1'-0" above the top of footing.
   - H > 5", no collars are allowed within 1/4 above the top of footing.
TABLE OF REINFORCING STEEL, DIMENSIONS AND DATA

<table>
<thead>
<tr>
<th>DESIGN</th>
<th>B</th>
<th>B</th>
<th>B</th>
<th>B</th>
</tr>
</thead>
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<tr>
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<td>2.5</td>
<td>2.5</td>
<td>2.5</td>
<td>2.5</td>
</tr>
</tbody>
</table>

NOTES:

1. @ bars are allowed within 6" above the top of footing.

2. Provide 6" & 8" @ bars in addition to tabulated @ bars over a distance of 8'-0" measured from all expansion joints, begin wall and end wall locations.

DESIGN CONDITIONS:
- Design H may be exceeded by 6" before going to the next size. Special footing design is required where foundation material is incapable of supporting bearing stress listed in the table.
- Design H may be exceeded by 6" before going to the next size.

DESIGN NOTES:
- Ext II - extreme event limit state II
- Ext I - extreme event limit state I
- Ser - service limit state I

LOAD COMBINATIONS AND LIMIT STATES:
- Extreme I: 0 ≤ 1.00DC + 1.00EV + 1.00EH + 1.00EQD + 1.00EQE
- Extreme II: 0 ≤ 1.00DC + 1.00EV + 1.00EH + 1.00LS
- DC: Dead Load of Structure Components
- EV: Vertical Earth Fill Pressure
- EQE: Earthquake Force Effects
- EQD: Dead Load of Structure Components
- LS: Live Load Surcharge
- Q: Force Effects
- Seismic: kx = 0.2, ky = 0.0
- Soil: f = 34" (100 psi)
- Reinforced Concrete: f'c = 3,600 psi, fy = 60,000 psi
- Design H: Design H may be exceeded by 6" before going to the next size.
- Design H: Design H may be exceeded by 6" before going to the next size.
- Design H: Design H may be exceeded by 6" before going to the next size.
- Design H: Design H may be exceeded by 6" before going to the next size.
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- Design H: Design H may be exceeded by 6" before going to the next size.
**RETAINING WALL TYPE 5 (CASE 2)**

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

**TABLE OF REINFORCING STEEL, DIMENSIONS AND DATA**

<table>
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<th>DESIGN H</th>
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<th>8&quot;</th>
<th>10&quot;</th>
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<tr>
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<td>7&quot; x 9&quot;</td>
<td>6&quot; x 9&quot;</td>
<td>6&quot; x 8&quot;</td>
<td>6&quot; x 7&quot;</td>
<td>6&quot; x 6&quot;</td>
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<td>BARS</td>
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<td>50.0</td>
<td>50.0</td>
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</tbody>
</table>

**SYMBOLS:**

- S - service limit state
- S - strength limit state
- E - extreme event limit state

**NOTES:**

1. @ and # bars.
2. H ≤ 6', no splices are allowed within 1'-8" above the top of footing.
3. H > 6', no splices are allowed within 1'-4" above the top of footing.
## Design Conditions

Design H may be exceeded by 6" before going to the next size. Special footing design is required where foundation material is incapable of supporting bearing stress listed in the table.

### Design Notes

**Design**
- ASCE 7-16 LRFD Bridge Design Specifications, 4th Edition with California Amendments

**Load Combinations and Limit States**
- Service I: 0.5 x 1.00EQD + 1.00EV + 1.00EH + 1.00DC
- Strength I: 0.6 x 1.00EQD + 1.00EV + 1.00EH + 1.00DC
- Extremes I: 0.6 x 1.00EQD + 1.00EQE

**Where:**
- G:
  - 0 = Force Effects
  - 1 = 1.00 or 0.20, Whichever Controls Design
  - 2 = 1.00, Whichever Controls Design
- DC:
  - 3 = Dead Load of Structure Components
- EQD:
  - 4 = Vertical Earth Fill Pressure
- EQE:
  - 5 = Seismic Earth Pressure
- EV:
  - 6 = Live Load Surcharge
- LS:
  - 7 = Soil and Structural and Nonstructural Components Interic

**Notes:**
1. @ and @ bars:
   - H ≤ 6", no splices are allowed within 1'-6" above the top of footing
   - H > 6", no splices are allowed within H/4 above the top of footing

## Typical Layout Example

1. At a and b bars:
2. SEE TABLE

## Table of Reinforcing Steel, Dimensions and Data

<table>
<thead>
<tr>
<th>Design H</th>
<th>4'</th>
<th>6'</th>
<th>8'</th>
<th>10'</th>
<th>12'</th>
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<tbody>
<tr>
<td>B' Spread Footing</td>
<td>1'-6&quot;</td>
<td>1'-6&quot;</td>
<td>1'-6&quot;</td>
<td>1'-6&quot;</td>
<td>1'-6&quot;</td>
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<td>B' Bars</td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>O Bars</td>
<td>0.3 in</td>
<td>0.3 in</td>
<td>0.3 in</td>
<td>0.3 in</td>
<td>0.3 in</td>
</tr>
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<td>none</td>
<td>none</td>
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<tr>
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<td>4.0, 1.5</td>
<td>4.0, 1.5</td>
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<tr>
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<td>4.0, 2.0</td>
<td>5.0, 3.0</td>
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<td>5.0, 3.0</td>
</tr>
</tbody>
</table>

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**Design**
- ASCE 7-16 LRFD Bridge Design Specifications, 4th Edition with California Amendments

**Notes:**

1. 9-22-15
2. B3-4C
3. Return to Table of Contents
DETAILS No. 1

RETURN WALL TYPE "A"
Use where H=10' or more

RETURN WALL TYPE "B"
Use where H<10' or more on offset walls

RETURN WALL TYPE "C"
Use where H<10' or less

RETURN WALL TYPE "D" (For return wall Type "D")

VERTICAL LOL
SEE TABLE A FOR OFFSET VALUES
Values for offsetting forms to be determined by the Engineer.

PLAN OF WALL WITH BRIDGE DETAIL 3-4
EXPANSION JOINT ONLY

PLAN OF WALL WITH EXPANSION JOINT FILLER

APPROXIMATE WALL SLOPE CHANGES

20'-0" VC AT TOP OF WALL SLOPE CHANGE
Where shown on the plans

FOOTING STEP

PLACE WATERSTOP AS SHOWN WHEN REQUIRED

BACKFILL SUFFICIENTLY TO PREVENT CRACKING TO BE DONE AFTER REMOVAL OF WALL FORMS AND BEFORE BACKFILLING BEHIND WALL

RETURN WALL REINFORCEMENT

CONCRETE IN ICE FREEZING MATERIAL EXCEPT AS PERMITTED BY THE ENGINEER

DESIGN AND DRAINAGE

LIVE LOAD
Surcharge on level ground surface

SOIL:

REINFORCED CONCRETE:

DESIGN CONSIDERATIONS:
Design "H" may be exceeded by 6" before going to the next size. Special footing design is required where foundation material is incapable of supporting bearing stress listed in table. Return wall not required unless shown elsewhere.

DESIGN NOTES:

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

RETURN WALL DETAILS No. 1

NO SCALE
ELEVATION - MASONRY CONSTRUCTION

FOOTING STEP DETAILS

- Finished Grade - Front Face
  - 2" Cement Mortar Cap
  - Placement Expansion Joint at 96'-0" C-C Max
  - Extend Caulking 6" Below Finished Grade

- 2" Cement Mortar Cap
  - @ 12"
  - @ 16"

- CAULKING
  - 1/4" Premolded Joint Filler

- FRONT FACE
  - FINISHED GRADE
  - 1'-0" Min
  - 2'-0"
  - 3'-4"
  - 4'-8"
  - 6'-0"

- MASONRY CONSTRUCTION
  - BARS
  - Count: 4

- STATE OF CALIFORNIA
  - DEPARTMENT OF TRANSPORTATION
  - RETAINING WALL TYPE 6 DETAILS

- B3-7C

Return to Table of Contents
SPACING DIAGRAM

DETAIL S-2
TRANSVERSE
GIRDER WEB REINFORCEMENT

DETAIL J-1
GIRDER WEB REINFORCEMENT

DETAIL J-3
TRANSVERSE GIRDER CONSTRUCTION JOINTS

DETAIL B-1
TYPICAL BOX GIRDER DETAILS

DETAIL D-1
INTERMEDIATE DIAPHRAGM SECTION

DETAIL S-3
STIRRUP SPACING DIAGRAM

DETAIL V-1
TYPICAL GIRDER FLARE AND
STIRRUP SPACING DIAGRAM

RETURN TO TABLE OF CONTENTS
DRAIN - TYPE "A" DETAIL 7-1

FACE OF MEDIAN CURB OR TYPE H CURB
EXTEND PIPE 12" BELOW BOTTOM OF DECK SOFFIT UNLESS DETAILED OTHERWISE.

TOP OF DRAIN TO BE SET 1/2" BELOW DECK ROADWAY SURFACE
SLOPE CONCRETE 1:1
BAR 1/4" x 1'-9"

SECTION A-A

DRAIN - TYPE "B" DETAIL 7-3

(For Type 25 barrier railing)
RELOCATE #6, #8, #10 DOWELS (DECK TO RAIL) TO CLEAR

4'-0" MIN TO EXPANSION JOINT IN RAIL, ELECTROLIER OR PULL BOX

SECTION F-F

DECK BLEEDER DRAIN DETAIL 7-6

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION
DECK DRAINS
NO SCALE

AREA DRAIN DETAIL 7-4

PEDESTRIAN STRUCTURE DRAIN DETAIL 7-5

MACHINE SCREWS, RECESSED HEAD
CAST IRON
4" OUTLET
2" OR 3" IF NOTED

CENTERS ON LOW SIDE OF DECK
PIPE 2 Std DRAIN @ 20'-0" MAX
BAR 1/4" x 8" MATE THREADS IF REQUIRED
GALV WIRE MESH, 6" SQUARE, PLACE BETWEEN DECK SEAL AND HMA
DECK SEAL

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION
NO SCALE

B7-5
For drain pipe alignment, sleeve connection, drain outlet details and notes, see Standard Plan B7-6.
NOTES:
1. Pipe casing OD = Drain pipe Dia + 4" (1/4" min. wall thickness).
2. Unless otherwise shown on Project Plans, casing shall extend to the greater of 5'-0" beyond the end of approach slab or 20'-0" beyond the back of abutment.

Expansion Coupling

1. For "A" dimension and pipe diameter, see Project Plans.
2. Expansion coupling with 4 bolts shown. Coupling with a greater number of bolts allowed.
3. Adjust dimension to suit coupler end ring bolt circle.

Expansion Coupling

NOTE:
Adjust spacing of main column reinforcement to clear drain outlet.

COLUMN REINFORCEMENT AT DRAIN OUTLET

DECK DRAIN PIPE DETAIL

NOTE:
Adjust spacing of main column reinforcement to clear drain outlet.

COLUMN REINFORCEMENT AT DRAIN OUTLET

ELEVATION A-A

SCUPPER DETAIL

* At exterior face of barrier

B7-8

DECK DRAINAGE DETAILS

NO SCALE

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

DECK DRAINAGE DETAILS

NO SCALE

B7-8

DECK DRAINAGE DETAILS

NO SCALE

B7-8

DECK DRAINAGE DETAILS

NO SCALE

B7-8

DECK DRAINAGE DETAILS

NO SCALE

B7-8

DECK DRAINAGE DETAILS

NO SCALE

B7-8

DECK DRAINAGE DETAILS

NO SCALE

B7-8
For future utility opening dimensions not shown on Project Plans use:

- 4" 5-#6
- 6" total 5 when Y ≤ 8'
- @ 12 Max
- #6 or #8
- @ 9
- 1'-6" Typ
- Min

**NOTES:**
1. The exact location, elevation, size, and direction of openings shall be in accordance with the Project Plans and as directed by the Engineer.
2. Dimensions not shown. See Project Plans.
3. All reinforcement detailed to be placed in addition to reinforcement shown on Project Plans.
4. Seal utilities at abutments with concrete or mortar, after tightly wrapping utility with 2 layers of 15 LBS building paper. If structure is prestressed, seal to be placed after stressing is completed.
5. Main reinforcement to clear opening.
6. Replace each set of 2-#9 bars cut off by opening. Place 4" Fillet on each side of opening.
7. When "Y" is less than 8', extend top of opening to bottom of bearing seat elevation.
8. Unless otherwise shown on Project Plans, casing shall extend to the greater of 8' or 5'-0" beyond the end of the approach slab, 5'-0" beyond the end of the adjacent wingwall, or 20'-0" beyond the back of the abutment.
Where manhole is located.

1. For exact location of openings see other sheets.
2. Location and size of manholes may be modified as directed by the Engineer, provided minimum dimensions are maintained.
3. All reinforcement detailed to be placed in addition to reinforcement shown on other sheets.

1. Frame and cover shall be cast iron.
2. Cover shall be supplied with bolt down or locking devices.

1. Step inserts may be substituted for the standard step detail. Step inserts shall comply with State Industrial Safety requirements.
CENTRAL COUNTY
ROUTE
POST MILE
TOTAL PROJECT
SHEET
TOTAL
PLANS
APPROVAL
DATE
No.
Exp.
REGISTRATION
B R O K E R S
S I O N
A L
E N G I N E E R
DIST No.
THE STATE OF CALIFORNIA OR ITS OFFICERS
OR AGENTS SHALL NOT BE RESPONSIBLE FOR
COPIES OF THIS PLAN SHEET.
THE ACCURACY OR COMPLETENESS OF SCANNED
CIVIL ENGINEER

NOTES FOR DETAIL 5-1:
1. Tendon horizontal angle change at end diaphragm shown. Duct tie placement similar to other locations where tendon horizontal angle changes occur. For tendon angle changes where tendon radius is smaller than girder radius.
2. Adjacent duct ties may be staggered to facilitate placement if stirrup spacing is less than 12 inches.
3. Place closed end of duct tie toward inside of tendon curve.
4. Wrap duct ties around both stirrup legs.
5. Individual duct ties may only be used to anchor one duct.

NOTES FOR DETAIL 5-3:
1. Stirrup may be used.
2. For additional details, see Standard Plan B7-1, and Project Plans.
3. Bar reinforcing which interferes with prestressing ducts may be adjusted as approved by the Engineer.

CAST-IN-PLACE POST-TENSIONED GIRDER DETAILS
No Scale

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

Return to Table of Contents
NOTES:
1. Maximum distance between turnbuckles shall be 200'-0".
2. Intermediate turnbuckles to be placed in adjacent spans.
3. Cable shall not be spliced between intermediate turnbuckles and end posts.
4. Posts to be vertical.
5. Alignment of holes in posts may vary to conform to slope of top of retaining wall.
6. The Contractor shall verify all dependent dimensions in the field before ordering or fabricating any material.
7. Line posts shall be braced horizontally and trussed diagonally in both directions at intervals not to exceed 1000'.
8. Post pockets to be centered in top of wall.
9. Typical end spans, procured in both directions, shall be constructed of changes in line where the angle of deflection is 10° or more.
1. Post shall be normal to railing.
2. Tube splices shall be located in the tubes spanning deck or wall joints. Increase joint width in tubes to match expansion joint width and increase sleeve length correspondingly.
3. Top rail tube shall be continuous over not less than two posts except a short post spacing is permitted near deck or wall joints, electroliers, or other rail discontinuities as noted.
4. For details and reinforcement not shown see Standard Plan B11-54.
NOTE:
1. Note 1 to be backfilled before barrier is placed.
2. Clearance to reinforcing steel in barrier to be 1", except as noted. Longitudinal reinforcement to stop at all expansion joints.
3. Dimensions may vary with roadway cross slope and with certain thickness of surfacing, see Project Plans.
4. For typical metal railing connection details not shown, see Standard Plans A77U1 and A77U2.
5. Concrete edge distance, to the reinforcing in the barrier is limited to two 2" conduits along with one 3" conduit, when a 3" conduit is used, it is restricted to the base of the barrier.
6. For electroliver mounting details, see Standard Plans ES-9A and ES-9B.
7. Minimum concrete edge distance, to the reinforcing shown, shall be maintained. Edge distance may be adjusted to accommodate intrusion in concrete cover for architectural treatment.

The accuracy or completeness of scanned plans or plans No. 3-31-16. Approval Tillat Satter.

October 30, 2015

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION
CIVIL ENGINEERING

CONCRETE BARRIER
TYPE 732
NO SCALE

B11-55
NOTES:
1. Walls are to be backfilled before barrier is placed.
2. Clearance to reinforcing steel in barrier to be 1", except as noted. Longitudinal reinforcement to stop or limit expansion joints.
3. Dimensions may vary with roadway cross slope and with certain thicknesses of surfacing. See Project Plans.
4. For typical metal railing connection details not shown, see Standard Plans ES-9A and ES-9B.
5. See Standard Plans ES-9A, ES-9B, ES-9C, ES-9G and ES-13 for electrical details. The maximum number of conduits in the barrier is limited to two (2) conduit (along with one 3" conduit, when a 3" conduit is used). It is restricted to the base of the barrier.
6. For electrolizer mounting details, see Standard Plans ES-6A and ES-6B.
7. Minimum concrete edge distance to the reinforcing steel shall be maintained. Edge distance may be adjusted to accommodate increase in concrete cover for architectural treatment.
8. Taper the top of the end of the bridge railing to a 4:1 concrete cover for architectural treatment.

DEPARTMENT OF TRANSPORTATION

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION
CONCRETE BARRIER TYPE 742
NO SCALE

Return to Table of Contents
1. Walls are to be backfilled before the barrier is placed.
2. Longitudinal reinforcing steel to stop at all expansion joints.
3. The front face dimensions are to be constant above the finish.
4. Expansion joint to match deck joint.
5. No lap splicing allowed on the longitudinal rail reinforcing. Splicing shall be staggered.
6. For typical metal railing connection details not shown, see Standard Plans A77U1 and A77U2.
7. Chain link railing is not allowed on Type 80 Barriers.
8. Posts to be spaced equally, typically 6'-6" spacing. Post spacing may be reduced where location of hinges or expansion joints or the length of wingwalls will not accommodate the 6'-6" spacing. Maximum see-through availability is to be achieved, where 6'-6" post spacing can not be achieved.
BARRIER MODIFICATION FOR ELECTROLIER

**SECTION D-D**

**ELECTRICITY**

1. See Project Plans for electrolater and pull box locations.
3. This barrier is designed to accommodate only two 1 1/2" electrical conduit for electrolaters on the structure. Any transporting of larger conduit is restricted to within the structure.
4. Only the additional reinforcing for the electrolater pedestal is shown. For other typical reinforcing for Type 80 Barrier, see Standard Plan B11-60.

---

RETURN TO TABLE OF CONTENTS
NOTES:
1. Expansion joint to match deck joint.
2. Continue #4, #6, and #5 longitudinal reinforcing.
   See Type 80SW typical section on Standard Plan B11-62.
3. Post to be spaced equally, typically 6'-8" spacing. Post spacing may be reduced where location of hinges or expansion joints or the length of wingspans will not accommodate the 6'-8" spacing. Maximum see-through availability is to be strived for, where 6'-8" post spacing cannot be achieved.
2. Rail posts shall be set normal to grade.

3. All exposed cuts or sheared edges shall be trimmed and free of burrs.

4. Lengths of rail bar shall be attached at 1'-8" splice tube.

5. Rail post anchoring nuts shall be tightened to a snug fit and given additional 1/4 turn.

6. This barrier is to be used only for speeds of 45 mph or less. For speeds greater than 45 mph, pedestrians should be protected by a separation traffic barrier.

7. Minimum of six - 4" round openings are to be field drilled. Holes shall be coated with an approved zinc-rich paint prior to erection.

NOTES:

1. All exposed cuts or sheared edges shall be rounded and free of burrs.

2. Rail posts shall be set normal to grade.

3. Lengths of rail bar shall be attached at a minimum of two rail posts.

4. Rail post anchoring nuts shall be tightened to a snug fit and given additional 1/4 turn.

5. Holes in posts for rail bar attachment may be field drilled. Holes shall be coated with an approved zinc-rich paint prior to erection.

6. This barrier is to be used only for speeds of 45 mph or less. For speeds greater than 45 mph, pedestrians should be protected by a separation traffic barrier.

7. Minimum of six - 4" round openings are to be field drilled. Holes shall be coated with an approved zinc-rich paint prior to erection.

NOTES:

1. All exposed cuts or sheared edges shall be rounded and free of burrs.

2. Rail posts shall be set normal to grade.

3. Lengths of rail bar shall be attached at a minimum of two rail posts.

4. Rail post anchoring nuts shall be tightened to a snug fit and given additional 1/4 turn.

5. Holes in posts for rail bar attachment may be field drilled. Holes shall be coated with an approved zinc-rich paint prior to erection.

6. This barrier is to be used only for speeds of 45 mph or less. For speeds greater than 45 mph, pedestrians should be protected by a separation traffic barrier.

7. Minimum of six - 4" round openings are to be field drilled. Holes shall be coated with an approved zinc-rich paint prior to erection.

8. Water connections are to be a minimum of 1'-6" from face of sidewalk and a minimum of 6" from face of sidewalk curb.
NOTES:
1. Post spacing and/or end block length to be adjusted to fit bridge length or wingwall length.
2. A maximum of six 4" and a minimum of two 4" round openings for future utilities. Openings are to be sealed at ends and extended 8" minimum past end of sidewalk curb. Round openings are to be a minimum of 1'-6" from face of sidewalk curb and a minimum of 6" from face of rail.

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION
BRIDGE RAIL
CALIFORNIA ST-40
(SHEET 2 OF 2)
TYPICAL RAIL SECTION

SHIMS NOT SHOWN Typ

3/4" x 1"-4 1/2" MS BOLTS WITH 6/4" THREADS, 2 NUTS, 2 WASHERS AND THREAD LOCKING SYSTEM

LEVEL

1" CHAMFER

TS @ 11"

SEE NOTE A
PLACt ANCHOR BARS BETWEEN MATS
OF REINFORCEMENT, SEE SECTION C-C AND D-D FOR ANCHOR BAR DETAILS

1 1/2" HOLES Typ

SECTION B-B

SECTION C-C

SECTION D-D

STUD DETAIL

SHIMS REQUIRED FOR TOP AND BOTTOM RAIL

SECTION AT POST

STUD ATTACHED WITH CUP BUTT WELD

3/4" x 2 1/4" STUD BOLT

1 1/2" HOLES Typ

TS @ 4 x 1/4"

NOTE A
Adjust spacing to clear scupper opening by 3" if applicable.
EXPANSION SLEEVE DETAIL

SECTION SLEEVE

STANDARD SLEEVE DETAIL

ALTERNATE TUBE
WELDED SPLICE

GENERAL NOTES:
1. Anchor bolts may be tack welded (shop or field) to anchorage.
2. All rough edges on posts and rails shall be ground smooth.
3. The alternative welded splice may be used in lieu of the Standard Splice;
4. Each rail length shall be continuous over a minimum of two posts;
5. The contractor shall check that the tubular sleeves splices conform to the dimensions indicated to ensure proper clearance;
6. Except for expansion splices, not more than one splice shall be permitted per side of post;
7. See project plans for approach guard railing details.
END OF RAILING ELEVATION

SECTION D-D

SECTION E-E

WALL ANCHOR PLATE DETAIL

BRIDGE RAILING ELEVATION

EXPANSION SPlice

STANDARD SPlice

NOTE A:
Post spacing and/or block length to be adjusted to fit bridge length or wingwall length.

NOTE B:
Use ½” x 5½” 6# bolts with washers, fully tensioned, 1” holes in rail Typ

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION
CALIFORNIA ST-10
( SHEET 3 OF 3)
NO SCALE
B11-70
**CONDUIT LOCATIONS**

<table>
<thead>
<tr>
<th>CONDUIT</th>
<th>2/3&quot; OR LESS</th>
<th>3&quot;</th>
<th>3 1/2&quot;</th>
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</thead>
<tbody>
<tr>
<td>ROD</td>
<td>5/16&quot; #</td>
<td>1/2&quot; #</td>
<td>5/8&quot; #</td>
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<tr>
<td>STRAP</td>
<td>0.090&quot; x 1&quot;</td>
<td>0.090&quot; x 1&quot;</td>
<td>0.105&quot; x 1/2&quot;</td>
</tr>
<tr>
<td>SUPPORT SPACING</td>
<td>10'-0&quot;</td>
<td>10'-0&quot;</td>
<td>10'-0&quot;</td>
</tr>
</tbody>
</table>

**NOTES:**

1. The maximum conduit sizes shown are for a straight run across the bridge without pull boxes.
2. In a bridge railing with lighting standards or pull boxes, reduce size of affected conduits as needed.

**CONDUIT IN BRIDGE RAILING**

 Attach conduit to inside face of railwall with centers as shown in Table A.

**CONDUIT IN OVERHANG-WINGWALL DETAIL**

 Conduit in overhang-ridge support details.

**CONDUIT IN OVERHANG**

 Conduit in overhang.
**Box Girder Installation**

- **Pipe Installation at Hinge**: Same for hanger type installation
- **Utility Opening**: 4" min. clearance around casing for seat type abutment only
- **Bridge Deck**: 1" air release valve assembly at high point, see note 5
- **Pipe End Seal**: 6" standard weight casing, extend 5'-0" from approach slab
- **Pipe Installation**: 1" air release valve assembly at high point, see note 5
- **Pipe Anchorage**: Located halfway between hose assemblies
- **Water Supply Line**: SEE NOTE 2
- **Approach Slab**: 2'-0" x 12" x 12" long timber block rest on smooth finished slab, for box girder only
- **Bridge Abutment**: 1/2" x 1/4" galv. steel clamp, fastened to timber block with 1/4" screws
- **Pipe Terminal**: See note 1
- **Water Supply Line**: See note 2
- **Pipe Anchorages**: Located halfway between hose assemblies
- **Pipe Hanger**: See note 4
- **Utility Opening**: 4" min. clearance around pipe
- **Hose Assembly**: 45° flanged elbow with size shall be same as pipe
- **Casing Insulator**: At 5'-0" max. spacing, first and last insulator shall be within 1'-0" from end of casing.

**Installation for Other Structure Types**

- **Approach Slab**: Bridge deck
- **Bridge Abutment**: Conc. pipe support, see notes 3 and 4
- **Conc Pipe Support**: See Notes 3 and 4
- **Bridge Deck**: Conc. pipe support
- **Pipe End Seal**: Conc. pipe support, see note 4
- **Bridge Soffit**: Conc. pipe support
- **Pipe Hanger**: See note 4
- **Water Supply Line**: SEE NOTE 2
- **Utility Opening**: 4" min. clearance around pipe
- **Hose Assembly**: 45° flanged elbow with size shall be same as pipe
- **Casing Insulator**: At 5'-0" max. spacing, first and last insulator shall be within 1'-0" from end of casing.

**Notes:**
1. Extend pipe 5'-0" beyond the edge of shoulder or as shown on bridge plans. Terminate in a pull box as shown on Standard Plan B14-3, detail B.
2. Water supply line shall be installed parallel to bridge soffit or deck.
3. For concrete pipe support, pipe shall be tightly clamped at the pipe support located halfway between hose assemblies. At all other supports, pipe clamp shall be shimmed with steel washer plates to provide 1/2" clearance between pipe and clamp.
4. Maximum spacing between pipe hangers or supports shall be 10'-0" unless otherwise detailed on the plans.
5. Install air release valve using threaded tee or pipe saddle.
6. Openings through diaphragm and bent caps shall be 6" diameter unless otherwise detailed on the plans.
7. For details of pipe hanger and concrete pipe support see Standard Plan B14-5.
TRENCH FOOTING SECTION

CASE 1
For details not shown, see Case 2.
Level ground (±10%) on both sides of the sound wall.

CASE 2
For details not shown, see Case 1.
Level ground (±10%) on traffic side of the sound wall.

GENERAL NOTES:
1. For type of block and joint finish, see other sheets.
2. When blocks are laid in stacked bond, ladder-type, galvanized joint reinforcement shall be provided. A minimum of 2" gauge wire continuous on 4"-0" maximum to be used. Locate reinforcement in joints that are at the approximate midpoint between bond and beam.
3. Horizontal joints shall be made to be retained concrete or may be weathered. Vertical joints shall be field coated or may be sealed.
4. For intermediate wall heights that are between the "H" given, use the tabular information for the next higher "H".
5. Masonry strengths are noted in the "SOUND WALL REINFORCEMENT TABLE".

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION
SOUND WALL
MASONRY BLOCK ON FOOTING
DETAILS (1)
NO SCALE
B15-1

Return to Table of Contents
A1
A1

ELEVATION
SECTION A-A
For details not shown, see other sections.

FOOTING STEP DETAILS
SPREAD FOOTING
TOTAL 1 -
H=6'-0" THRU H=10'-0"

SPREAD FOOTING
TOTAL 2 -
H=12'-0" THRU H=16'-0"

DESIGN NOTES:
Note I: For details not shown, see Standard Plan B15-1

MASONRY BLOCK ON FOOTING DETAILS (2)
NO SCALE
For details not shown, see Case 2.
Level ground (±10%) on one side of the sound wall.

CASE 2

For details not shown, see Case 1.
Level ground (±10%) on one side of the sound wall and sloping ground on the opposite side.

ELEVATION C-C

Note I: For details not shown, see Standard Plans B15-4 and B15-5.

Note II: See Standard Plan B15-9 for other details.

SOUND WALL REINFORCEMENT TABLE

<table>
<thead>
<tr>
<th>MAXIMUM</th>
<th>1&quot;</th>
<th>1-1/4&quot;</th>
<th>1-3/4&quot;</th>
<th>1&quot;</th>
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<tbody>
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<td>10'-0&quot;</td>
<td>M4</td>
<td>—</td>
<td>—</td>
<td>M4</td>
<td>M4</td>
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<tr>
<td>12'-0&quot;</td>
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<td>—</td>
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<tr>
<td>16'-0&quot;</td>
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<td>—</td>
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COMPRESSIVE STRENGTH OF CMU (psi)

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<td>1' - 9 &quot;</td>
</tr>
<tr>
<td>4&quot;</td>
</tr>
<tr>
<td>9&quot;</td>
</tr>
<tr>
<td>1500</td>
</tr>
<tr>
<td>2800</td>
</tr>
</tbody>
</table>

TYPICAL SECTION

- Full mortar bed at bottom of wall.

H=6'-0" THRU H=10'-0"

H=12'-0" THRU H=16'-0"

For details not shown, see H=4'-0" thru H=10'-0".

For details not shown, see Standard Plan B15-9.
GENERAL NOTES:
1. For type of block and joint finish, see other sheets.
2. When blocks are laid in stacked bond, ladder type, galvanized joint reinforcement shall be provided. A minimum of 2-8 gauge wires continuous at 4'-0" maximum to be used. Locate reinforcement in joints that are at the approximate midpoint between bond beams.
3. Horizontal joints shall be tooled concave or may be weathered. Vertical joints shall be tooled concave or may be raked.
4. For intermediate wall heights that are between the "H's" given, use the tabular information for the next higher "H".

DESIGN NOTES:

DESIGN

DESIGN WIND LOAD
 20 psf  0.57 Dead load

REINFORCED CONCRETE

<table>
<thead>
<tr>
<th>Reg Strength</th>
<th>High Strength</th>
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<tbody>
<tr>
<td>$f'c = 3.6 \text{ ksi}$</td>
<td>$f'c = 3.6 \text{ ksi}$</td>
</tr>
<tr>
<td>$f_y = 60 \text{ ksi}$</td>
<td>$f_y = 60 \text{ ksi}$</td>
</tr>
<tr>
<td>$f' m = 1500 \text{ psi}$</td>
<td>$f' m = 1500 \text{ psi}$</td>
</tr>
<tr>
<td>$f' m = 2000 \text{ psi}$</td>
<td>$f' m = 2000 \text{ psi}$</td>
</tr>
<tr>
<td>$f' m = 2500 \text{ psi}$</td>
<td>$f' m = 2500 \text{ psi}$</td>
</tr>
<tr>
<td>$n = 25.8$</td>
<td>$n = 19.3$</td>
</tr>
<tr>
<td>$n = 15.5$</td>
<td>$n = 15.5$</td>
</tr>
</tbody>
</table>

CONCRETE MASONRY

H=6'-0" THRU H=10'-0"

Cells with vertical and bond beams to be filled with grout.

Expansion joint filled placed in sash block recesses, size as required for snug fit.

Horizontal joints shall be tooled concave or may be weathered.

At expansion joints, continuous expansion joint filler placed in sash block recesses, size as required for snug fit.

SECTION A-A
For details not shown, see other sections.

H=12'-0" THRU H=16'-0"

NOTE 3
SECTION E-E

PILE CAP STEP DETAIL

MAXIMUM H | # = 25 Min | # = 30 Min | # = 35 Min
---|---|---|---
S | L | PILE Reinfl | S | L | PILE Reinfl | S | L | PILE Reinfl

Case 1 - Level ground (±10%) on both sides of the sound wall.

Case 2 - Level ground (±10%) on traffic side of the sound wall.

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

SOUND WALL
MASONRY BLOCK ON PILE CAP
DETAILS (3)

NO SCALE
**PARTIAL ELEVATIONS**

**CASE 1**

For details not shown, see Case 2.

- Level ground ±10% on both sides of barrier.
- Level ground ±10% at the traffic side of barrier.
- Slope ground at traffic side of barrier to drain.
- For details not shown, see Case 1.

**CASE 2**

For details not shown, see Case 1.

- Level ground ±10% at the traffic side of barrier.
- Slope ground at traffic side of barrier to drain.
- For details not shown, see Case 2.

**BARRIER SECTIONS**

- 4'-0" with bond beam and Reinforcement at step.
- Expansion joints at 6'-0" mid centers. See other sheets for locations.
- 1'-0" minimum above ground.
- Profile Grade.

**TYPICAL SECTIONS**


**SOUND WALL REINFORCEMENT TABLE**

<table>
<thead>
<tr>
<th>H (ft)</th>
<th>BARS (a)</th>
<th>BARS (b)</th>
<th>y (in)</th>
<th>f’m (psi)</th>
<th>f’m (psi)</th>
</tr>
</thead>
<tbody>
<tr>
<td>6'-0&quot;</td>
<td>#4</td>
<td>#4</td>
<td>1'-0&quot;</td>
<td>1500</td>
<td>1500</td>
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<tr>
<td>8'-0&quot;</td>
<td>#4</td>
<td>#4</td>
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<td>1500</td>
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</tr>
<tr>
<td>10'-0&quot;</td>
<td>#6</td>
<td>#4</td>
<td>1'-0&quot;</td>
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<tr>
<td>12'-0&quot;</td>
<td>#5</td>
<td>#5</td>
<td>1'-0&quot;</td>
<td>1500</td>
<td>1500</td>
</tr>
<tr>
<td>14'-0&quot;</td>
<td>#4</td>
<td>#5</td>
<td>1'-0&quot;</td>
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<tr>
<td>16'-0&quot;</td>
<td>#4</td>
<td>#5</td>
<td>1'-0&quot;</td>
<td>1500</td>
<td>1500</td>
</tr>
</tbody>
</table>

**NOTES A THROUGH F:**

A. For type of block, type of block bond, and joint finish, see other sheets.
B. Spacing may be varied, but shall not exceed the tabular values. See Standard Plan B15-8.
C. Masonry strengths are listed in the "SOUND WALL REINFORCEMENT TABLE".
D. Masonry strengths are listed in the "SOUND WALL REINFORCEMENT TABLE".
E. Masonry strengths are listed in the "SOUND WALL REINFORCEMENT TABLE".
F. Masonry strengths are listed in the "SOUND WALL REINFORCEMENT TABLE".

**NOTES 1 THROUGH 6:**

1. Details shown are primarily to conform design of sound walls to Type 736S and Type 736 SV Concrete Barriers. For sound wall details conforming with barriers see Standard Plans B15-7 and B15-8.
2. Horizontal joints shall be tooled concave or may be weathered. Vertical joints shall be tooled concave or may be raked.
3. For intermediate wall heights (H), or barrier heights (H), given, use the tabular information for the next higher (H) or (H).
4. Masonry strengths are listed in the "SOUND WALL REINFORCEMENT TABLE".
CASE 1: PILE DATA TABLE

<table>
<thead>
<tr>
<th>Depth (ft)</th>
<th># = 25 Min</th>
<th># = 30 Min</th>
<th># = 35 Min</th>
</tr>
</thead>
<tbody>
<tr>
<td>3'-0&quot;</td>
<td>6'-0&quot; 10'-0&quot; 13'-0&quot;</td>
<td>6'-0&quot; 10'-0&quot; 13'-0&quot;</td>
<td>6'-0&quot; 10'-0&quot; 13'-0&quot;</td>
</tr>
<tr>
<td>6'-0&quot;</td>
<td>6'-0&quot; 9'-0&quot; 16'-0&quot;</td>
<td>6'-0&quot; 9'-0&quot; 16'-0&quot;</td>
<td>6'-0&quot; 9'-0&quot; 16'-0&quot;</td>
</tr>
<tr>
<td>9'-0&quot;</td>
<td>9'-0&quot; 12'-0&quot; 16'-0&quot;</td>
<td>9'-0&quot; 12'-0&quot; 16'-0&quot;</td>
<td>9'-0&quot; 12'-0&quot; 16'-0&quot;</td>
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<tr>
<td>12'-0&quot;</td>
<td>6'-0&quot; 9'-0&quot; 16'-0&quot;</td>
<td>6'-0&quot; 9'-0&quot; 16'-0&quot;</td>
<td>6'-0&quot; 9'-0&quot; 16'-0&quot;</td>
</tr>
<tr>
<td>16'-0&quot;</td>
<td>10'-0&quot; 15'-0&quot; 16'-0&quot;</td>
<td>10'-0&quot; 15'-0&quot; 16'-0&quot;</td>
<td>10'-0&quot; 15'-0&quot; 16'-0&quot;</td>
</tr>
</tbody>
</table>

CASE 2: PILE DATA TABLE

<table>
<thead>
<tr>
<th>Depth (ft)</th>
<th># = 30 Min</th>
<th># = 35 Min</th>
</tr>
</thead>
<tbody>
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<td>3'-0&quot;</td>
<td>6'-0&quot; 9'-0&quot; 16'-0&quot;</td>
<td>6'-0&quot; 9'-0&quot; 16'-0&quot;</td>
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<tr>
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<td>9'-0&quot; 15'-0&quot; 16'-0&quot;</td>
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<td>15'-0&quot; 18'-0&quot; 16'-0&quot;</td>
<td>15'-0&quot; 18'-0&quot; 16'-0&quot;</td>
</tr>
</tbody>
</table>

NOTE:
1. For details not shown, see Standard Plans B15-6 and B15-7.

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION
SOUND WALL MASONRY BLOCK
ON TYPE 736S/SV BARRIER
DETAILS (3)
NO SCALE
Type I
Slope batter shall not be flatter than 1:1.

Type II

Architectural Alternatives

H=10'-0" to H=14'-0"
2 STEPS

H=14'-8" to H=16'-0"
3 STEPS

End of Wall Details

Type IV

NOTES:
1. 1'-0" wide block not allowed within 6'-0" of profile grade.
2. For structural details, see other sheets.
3. Type II is not permitted for sound walls with "H" less than 10'-0".
4. The end of the wall details may be used with any of the standard supporting foundations shown for masonry block. The foundations shown for the different types are for the purpose of illustration only.
**PART ELEVATION (BACK)**

For details not shown, see above.

**DETAILS FOR CONCRETE BLOCK WALLS**

- Open End Bond Beam (Inverted)
- Bond Beam
- Wall Opening
- BOND BEAM
  - 12-GA STEEL CHANNEL
  - #5 x 11'-8" BOND BEAM
- Gate Opening

**IN BOND BEAM**

- 6'-0" MIN
- #5
- 4'-0"
- #5 x 10'-8" BOND BEAM
- 3" ELEVATION - METAL FRAME
- 45°

**CONCRETE BLOCK WALLS**

- Details for 6 equal spaces
- Wood screws, Tot 5 near and far sides, spacing staggered, total 4 each, 2" x 6" T & G
- 2-NYLON FINISHING WASHERS 1/4" Dia Min

**ELEVATION - METAL FRAME**

- Open End Bond Beam (Inverted)
- Bond Beam
- Wall Opening
- Gate Opening
- 5'-0" BOND BEAM

**DETAILS (2)**

- 12 Ga STEEL CHANNEL
- 11'-8" MIN BOND BEAM
- 5'-10" #5
- 1'-10" #10 x 1/2" ROUND HEAD
- Wood screws, Tot 4 each, 2" x 6" T & G

**SOUND WALL MASONRY BLOCK ON FOOTING OR PILE CAP**

5'-0" ACCESS GATE DETAILS (2)

**NO SCALE**

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

October 30, 2015

Tillat Satter C42892

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THE ACCURACY OR COMPLETENESS OF SCANNED...
NOTES:
1. Masonry anchors to be installed after the grout in the block has obtained specified strength.
2. Contractor may submit alternative gate locking assemblies for approval by the Engineer.
3. See other sheets for gate details.
For details not shown, see Case 1.

**CASE 1**

For details not shown, see Case 2.

**Design Notes:**

**Design**


**Design Wind Load**

27 psf

**Design Seismic Load**

0.57 Dead load

**Reinforced Concrete**

Regular Strength

High Strength

**Concrete Masonry**

**Part Elevations**

**Case 1**

For details not shown, see Case 2.

**Case 2**

For details not shown, see Case 1.

**Design Notes:**

For details not shown, see Case 2.
When clear roadside recovery areas are provided, signs shall be placed as far from the edge of traveled way as possible, up to a maximum of 30'. When possible, they shall be placed in protected locations.

Signs in medians shall be placed at midpoint of edge of traveled way. When appropriate, signs for opposing directions shall be placed back to back.

Does not apply at locations where minimum horizontal distance is not reasonable due to terrain characteristics, steep slopes, roadway features, or when signs are installed on structures or signal or lighting standards.

**NOTES:**

1. When clear roadside recovery areas are provided, signs shall be placed as far from the edge of traveled way as possible, up to a maximum of 30'. When possible, they shall be placed in protected locations.

2. Signs in medians shall be placed at midpoint of edge of traveled way. When appropriate, signs for opposing directions shall be placed back to back.

3. Does not apply at locations where minimum horizontal distance is not reasonable due to terrain characteristics, steep slopes, roadway features, or when signs are installed on structures or signal or lighting standards.

**ABBREVIATION:**

 EPS = Edge of Paved Shoulder

* 1' Min WHERE LATERAL CLEARANCE LIMITED

* 5' Min AT 30' FROM ETW

* 5' Min WHERE LATERAL CLEARANCE LIMITED

* 1' Min WHERE LATERAL CLEARANCE LIMITED

* 30'
**GALVANIZED STEEL FRAME**

- 3 5/8" # HOLE
- 5/8" # HOLE, TOTAL 8
- JOIN CHANNEL UNITS BY WELDING WITH #6063-T5 ALUMINUM #4043, ALL 4 CORNERS

**SADDLE BRACKET**

- 0.1046" STAINLESS STEEL
- STRAP SLOT
- STRAPPING SEAL
- 2 REVOLUTIONS OR ROUND EDGE STAINLESS STEEL STRAP 3/4" X .020" MINIMUM WITH 3/4" STAINLESS STRAP SEAL

**ALUMINUM FRAME**

- 2" x 2" x 3/16" #6063-T5 ALUMINUM
- ADAPTER CHANNEL FOR ARROWS AND PLATES

**ELEVATION**

- Adapter channel rests inside frame channel when used.

**NOTE:**

- Adapter channel rests inside frame channel when used.

**SPECIAL BRACKET**

- BACK BRACE DETAILS

**SINGLE SIGN**

- INSTALLATION ON ELECTROLIER, SIGNAL STANDARD OR SIGN STRUCTURE POST

**MULTIPLE SIGN**

- ADAPTER CHANNEL

**GALVANIZED STEEL FRAME**

- 3 5/8" # HOLE
- 5/8" # HOLE, TOTAL 8
- JOIN CHANNEL UNITS BY WELDING WITH #6063-T5 ALUMINUM #4043, ALL 4 CORNERS

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- BACK BRACE DETAILS

**SINGLE SIGN**

- INSTALLATION ON ELECTROLIER, SIGNAL STANDARD OR SIGN STRUCTURE POST

**MULTIPLE SIGN**

- ADAPTER CHANNEL

**GALVANIZED STEEL FRAME**

- 3 5/8" # HOLE
- 5/8" # HOLE, TOTAL 8
- JOIN CHANNEL UNITS BY WELDING WITH #6063-T5 ALUMINUM #4043, ALL 4 CORNERS
INSTRUCTIONS TO FABRICATOR

PROJECT PLANS SHOW:
1. Sign structure location.
2. Length of structure frame.
3. Footing elevation or location of pile foundation.
4. Walkway length for two post signs.
5. Post type and height to bottom of frame.
7. Footing elevation or location of pile foundation.
8. Photoelectric unit location if required.

REFER TO THE FOLLOWING STANDARD PLANS FOR DETAILS NOT SHOWN ON PROJECT PLANS:

Sheet No. SHEET NAME
S1  Overhead Signs-Truss, Instructions and Examples
S2  Overhead Signs-Truss, Single Post Type, Post Types D to II
S3  Overhead Signs-Truss, Single Post Type, Post Types I to S
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
S6  Overhead Signs-Truss, Single Post Type, Round Pedestal Pile Foundation
S7  Overhead Signs-Truss, Two Post Type, Post Types I-S through S-1
S8  Overhead Signs-Truss, Two Post Type, Base Plate and Anchorage Details
S9  Overhead Signs-Truss, Two Post Type, Structural Frame Members
S10 Overhead Signs-Truss, Two Post Type, Round Pedestal Pile Foundation
S11 Overhead Signs-Truss, Frame Juncture Details
S12 Overhead Signs-Truss, Single Post Type, Structural Frame Details
S13 Overhead Signs-Truss, Frame Juncture Details
S14 Overhead Signs, Walkway Safety Railing Details
S15 Overhead Signs, Walkway Safety Railing Details
S16 Overhead Signs, Walkway Details No. 1
S17 Overhead Signs, Walkway Details No. 2
S18 Overhead Signs, Walkway Details No. 3
S19 Overhead Signs, Walkway Details No. 4
S20 Overhead Signs, Steel Frames, Removable Sign Panel Frames
S21 Overhead Signs, Sign Mounting Details, Laminated Panel-Type A
S22 Overhead Signs, Sign Mounting Details, Removable Panel Frames, 9'-2" and 10'-0" Sign Panels

WALKWAY BRACKETS:
Space all walkway brackets maintaining uniform spacing where possible. Maximum spacing shall not exceed 5'-6".

LIGHT FIXTURE SUPPORTS
Where distance from walkway bracket to end of sign panel exceeds 1'-4", extend lighting fixture supports to next walkway bracket. See Example No. 2.

WALKWAY AND SAFETY RAILING:
Walkway to be continuous for entire length of frame for single post signs. For two post signs, walkway to be continuous on each side of walkway, but continuous for no more than 11'-0" in one unit.

NOTE:
1. Signs are shown and dimensioned looking in the direction of traffic. Double faced signs are shown and dimensioned looking ahead along structure.
ANCHOR BOLT TEMPLATE ASSEMBLY
NOTE: One bolt shown only, other bolts same configuration around pipe sleeve.

POST TO BASE PLATE CONNECTION DETAIL

ANCHOR BOLT TEMPLATE
NOTE: One bolt shown only, other bolts same configuration around pipe sleeve.
### Structural Frame Members

<table>
<thead>
<tr>
<th>Span L1 + L2</th>
<th>Frame Depth</th>
<th>Frame Width</th>
<th>Chord L1</th>
<th>Vertical Ls</th>
<th>Diagonal Ls</th>
<th>Top and Bottom Wind Bracing Ls</th>
</tr>
</thead>
<tbody>
<tr>
<td>12'-0&quot;</td>
<td>8'-0&quot;</td>
<td>5 x 5 x 1/2</td>
<td>3/8 x 3/8 x 1/6</td>
<td>3/8 x 3/8 x 1/6</td>
<td>1/2 x 21/2 x 1/6</td>
<td></td>
</tr>
</tbody>
</table>

**Notes:**
1. Frame width = Pipe Dia plus 2 x shorter L leg plus 1".
2. Frame length L1 = Left arm length.
3. Frame length L2 = right arm length.
4. For full cantilever, short arm used to compute L1 + L2 on this sheet shall be taken as 2'-6".

---

### Details No. 2

- **State of California Department of Transportation**
- **October 30, 2015**
GRINDING OPERATION OF GUSSET PLATE BEFORE INITIAL PROFILE AT TOP 1"

WELD LIMITS OF WELD DETAILS

NOTES:
1. All gussets to be same height.
2. Provide a smooth transition from gusset plate to tube.
3. ½" for post Types I-S through I-5.
4. 6½" for post Types I-S and III-5; single post trusses and tubular.

OVERHEAD SIGNS-TRUSS GUSSET PLATE DETAILS

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

REGISTERED CIVIL ENGINEER C57793

October 30, 2015

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Stanley P. Johnson

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

2015 STANDARD PLAN S6
1. For anchor bolt layout, see Standard Plan S3.
2. For "Base Elevation" see Project Plans.
3. Prior to erection of the post, backfill which is equivalent to the surrounding material shall be in place.
4. Pedestal shall be formed 6" minimum below ground surface. Remainder to be placed against undisturbed material.
5. Slope protection required when indicated on the Project Plans.
6. For drain holes and central void in mortar see Standard Plan ES-6B.

**NOTES:**

* Use Foundation Depth shown in table unless otherwise shown on the Project Plans.

### TABLE: ANCHOR BOLTS

<table>
<thead>
<tr>
<th>Post Type</th>
<th>Bolt Total and Dia</th>
<th>Total Length</th>
<th>Dia</th>
<th>Vertical Reinforcing</th>
<th>Bar Size</th>
<th>Bar Pitch</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I</td>
<td>3/4&quot;</td>
<td>3-2&quot;</td>
<td>3</td>
<td>16</td>
<td>3/8&quot;</td>
<td>3-2&quot;</td>
</tr>
<tr>
<td>II</td>
<td>3/4&quot;</td>
<td>3-2&quot;</td>
<td>3</td>
<td>16</td>
<td>3/8&quot;</td>
<td>3-2&quot;</td>
</tr>
<tr>
<td>III</td>
<td>3/4&quot;</td>
<td>3-2&quot;</td>
<td>3</td>
<td>16</td>
<td>3/8&quot;</td>
<td>3-2&quot;</td>
</tr>
</tbody>
</table>

### TABLE: ROUND PILE PEDESTAL

<table>
<thead>
<tr>
<th>Post Type</th>
<th>Bolt Total and Dia</th>
<th>Total Length</th>
<th>Dia</th>
<th>Vertical Reinforcing</th>
<th>Bar Size</th>
<th>Bar Pitch</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I</td>
<td>3/4&quot;</td>
<td>3-2&quot;</td>
<td>3</td>
<td>16</td>
<td>3/8&quot;</td>
<td>3-2&quot;</td>
</tr>
<tr>
<td>II</td>
<td>3/4&quot;</td>
<td>3-2&quot;</td>
<td>3</td>
<td>16</td>
<td>3/8&quot;</td>
<td>3-2&quot;</td>
</tr>
<tr>
<td>III</td>
<td>3/4&quot;</td>
<td>3-2&quot;</td>
<td>3</td>
<td>16</td>
<td>3/8&quot;</td>
<td>3-2&quot;</td>
</tr>
</tbody>
</table>

### TABLE: CIDM PILE

<table>
<thead>
<tr>
<th>Post Type</th>
<th>Bolt Total and Dia</th>
<th>Total Length</th>
<th>Dia</th>
<th>Vertical Reinforcing</th>
<th>Bar Size</th>
<th>Bar Pitch</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I</td>
<td>3/4&quot;</td>
<td>3-2&quot;</td>
<td>3</td>
<td>16</td>
<td>3/8&quot;</td>
<td>3-2&quot;</td>
</tr>
<tr>
<td>II</td>
<td>3/4&quot;</td>
<td>3-2&quot;</td>
<td>3</td>
<td>16</td>
<td>3/8&quot;</td>
<td>3-2&quot;</td>
</tr>
<tr>
<td>III</td>
<td>3/4&quot;</td>
<td>3-2&quot;</td>
<td>3</td>
<td>16</td>
<td>3/8&quot;</td>
<td>3-2&quot;</td>
</tr>
</tbody>
</table>

### Foundation Depth

* Use Foundation Depth shown in table unless otherwise shown on the Project Plans.
**Notes:**

1. For General Notes, see Standard Plan S1.
2. Longer side of post and footing (longitudinal) shall be normal to axis of sign.
3. Backfill shall be in place prior to erection of post.
4. Thread upper 10" of anchor bolts and galvanize upper 1'-0".
5. Spread footing with square pedestal shown, use pile foundation when shown on the Project Plans. For pile foundation, details, see Standard Plan S15.
6. Anchor plates may be retained with Hex nut or formed head as an alternative to details shown.

**Table IV**

<table>
<thead>
<tr>
<th>Post Type</th>
<th>Pipe</th>
<th>Round Pedestal</th>
<th>Square Pedestal</th>
<th>Moop</th>
<th>(See Note 2)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>NPS</td>
<td>Thickness</td>
<td>SPLIT, SEE TABLE IV</td>
<td>Vertical J-Bars</td>
<td>Spiral</td>
</tr>
<tr>
<td>I-S</td>
<td>1-5</td>
<td>1&quot;</td>
<td>3(^\circ)</td>
<td>12</td>
<td>16</td>
</tr>
<tr>
<td></td>
<td>2-5</td>
<td>2&quot;</td>
<td>3(^\circ)</td>
<td>12</td>
<td>16</td>
</tr>
<tr>
<td>I-S</td>
<td>3-5</td>
<td>3&quot;</td>
<td>3(^\circ)</td>
<td>12</td>
<td>16</td>
</tr>
<tr>
<td>I-S</td>
<td>4-5</td>
<td>4&quot;</td>
<td>3(^\circ)</td>
<td>12</td>
<td>16</td>
</tr>
</tbody>
</table>

**Anchor Details**

- Drill 1½" hole, plus weld after reiling.
- For pile foundation details, see Project Plans.
- Slope protection required when indicated on Project Plans.
- For general notes, see Standard Plan S1.
- Ground edges smooth, roughness of edges no greater than 1000 microinches.
- Post wall cemented to cover.
- Contour contact edges of structural tubing to fit outside surface of pipe.
- Handhole and cover not shown.
- Cover not shown.

**Overhead Signs-Truss Two Post Type**

**Post Types I-S through VII-S**

State of California Department of Transportation

October 30, 2015
ANCHORAGE DETAIL

POST TO BASE PLATE CONNECTION DETAIL

ANCHORAGE DETAIL

ANCHOR BOLT TEMPLATE ASSEMBLY

NOTE: One bolt shown only. Other bolts same configuration around pipe sleeve. Combination base plate anchor bolt pattern.

TWO POST TRUSS

<table>
<thead>
<tr>
<th>POST TYPE</th>
<th>PIPE</th>
<th>NPS</th>
<th>THICKNESS</th>
<th>BASE ø &amp; THICKNESS</th>
<th>BOLT CIRCLE</th>
<th>BOLT TOTALS AND Ø</th>
<th>LENGTH</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-S</td>
<td>14</td>
<td>5&quot;</td>
<td>3-1/16 x 2&quot;</td>
<td>2-3/4&quot;</td>
<td>12-2&quot;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2-S</td>
<td>16</td>
<td>6&quot;</td>
<td>3-1/16 x 2&quot;</td>
<td>2-3/4&quot;</td>
<td>16-2&quot;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3-S</td>
<td>20</td>
<td>8&quot;</td>
<td>3-1/8 x 2&quot;</td>
<td>2-1/16&quot;</td>
<td>18-2&quot;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4-S</td>
<td>24</td>
<td>10&quot;</td>
<td>4-3/8 x 2&quot;</td>
<td>2-3/16&quot;</td>
<td>20-2&quot;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>24</td>
<td>12&quot;</td>
<td>10&quot;</td>
<td>4-3/8 x 2&quot;</td>
<td>3-3/4&quot;</td>
<td>20-2&quot;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>36</td>
<td>12&quot;</td>
<td>10&quot;</td>
<td>4-3/8 x 2&quot;</td>
<td>3-3/4&quot;</td>
<td>20-2&quot;</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

2 ½" dia hole for 2" dia bolt
Total 12, equally spaced

12 BOLTS
Type 1-S shown

14 BOLTS
Base Plate Details
Two Post Type

16 BOLTS
Type 2-S shown

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

OVERHEAD SIGNS-TRUSS
TWO POST TYPE
BASE PLATE AND ANCHORAGE DETAILS

NO SCALE

S10
** Š" Filler at Ĳ" thick chord angle

WELDED CHORD SPLICE

SECTION T-T

TWO POST SIGNS

** Ĳ" Filler Ĳ" or Ĳ" thick chord angle

SINGLE POST SIGNS

SECTION T-T

NO SCALE

BOLTED CHORD SPLICE

TWO POST SIGNS

CHORD L NOMINAL BOLT DIAMETER "" Min

5 x 3 1/2 x 3" 2 1/2"

6 x 4 x 3" 2"

8 x 4 x 3" 3/4"

1 1/2"

3/4"

SINGLE POST SIGNS

CHORD L NOMINAL BOLT DIAMETER "" Min

5 x 5 1/2 x 3/4"

6 x 6 x 3/4"

VERTICAL L

CHORD L

UPPER CHORD

WIND BRACING

OVERLAP DISTANCES

"" 3/2" 2 1/2"

4" 2 1/2"

5" 3/2"

6" 4"

8" 5"

CROSSTEE AT VERTICAL Ls AND DIAGONAL Ls ONLY

INTERNAL DIAGONALS AT VERTICAL Ls ONLY

HIGH STRENGTH BOLTS, TOTAL 16 PER SPLICE

"" 3/4"

VS BOLTS, TOTAL 16 PER SPLICE

FOR TWO POST SIGNS 20 PER SPLICE FOR SINGLE POST SPLICE, SEE TABLE FOR SIZE

SPLICE WITH DIAGONAL ANGLE

SPLICE WITHOUT DIAGONAL ANGLE

BOLTED CHORD SPLICE

SPICE NOTES:

Location of Splines:
The splice shall be located so as not to interfere with mounting the walkway brackets or the clip angles for the removable sign panel frame. For two post type see also S11.

FILTER E

The plates welded to the angle legs on the inside shall be welded before drilling the bolt holes. The plates shall be the same length as the cover plates. The plates are not necessary if the single post signs if the splice is located over 1/4 of the cantilever length from the post.

Alternative splice details may be used if approved by the Engineer.

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

OVERHEAD SIGNS-TRUSS
STRUCTURAL FRAME DETAILS

NO SCALE

S12

Return to Table of Contents
OVERHEAD SIGNS - TRUSS
TWO POST TYPE
ROUND PEDESTAL PILE FOUNDATION
NO SCALE

SECTION A-A

SECTION B-B

GROUND SURFACE
AWAY FROM TRAFFIC

BASE E Elev

4" Mix Mortar SEE NOTE 7
GROUND SURFACE
ADJACENT TO TRAFFIC

PEDESTAL SPIRAL Reinforcement
SEE TABLE FOR SIZE

PEDESTAL VERTICAL Reinforcement
SEE TABLE FOR SIZE

PLACE CONCRETE AGAINST
UNDISTURBED MATERIAL

CONDUIT, SEE
ELECTRICAL PLANS

SEE "ANCHORAGE DETAILS"
ON STANDARD PLAN S9
AND SEE STANDARD PLAN S10
#5 @ 3½" PITCH

PEDESTAL VERTICAL Reinforcement
SEE TABLE FOR SIZE

GROUND SURFACE
AWAY FROM TRAFFIC

GND SURFACE
ABT TRF

SPiral Reinforcement

PERMISSIBLE Const JOINT

PILE Vert Reinforcement

PILE DIAMETER
SEE TABLE

VERTICAL Reinforcement
SEE TABLE

DEPTH FOR PAYMENT = FOUNDATION DEPTH
LENGTH FOR PAYMENT = FOUNDATION DEPTH

LENGTH OF PILE

364

S15

3-31-17
C41260

Jeffrey B. Woody
REGISTERED CIVIL ENGINEER

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

2015 STANDARD PLAN S15

OVERHEAD SIGNS - TRUSS
TWO POST TYPE
ROUND PEDESTAL PILE FOUNDATION
NO SCALE

S15

Return to Table of Contents
A BOX BEAM
CLOSED TRUSS

TYPICAL WALKWAY SECTION

1. For spacing of lighting fixtures, see Standard Plan ES-15A.
3. For double faced sign frames with double walkways, use a total 8 bolt assemblies per bracket.

WALKWAY PLAN (TRUSS)

2. For safety lug details, see Standard Plan S17.

NOTE:
1. For spacing of lighting fixtures, see Standard Plan ES-15A.
2. For safety lug details, see Standard Plan S17.
3. For double faced sign frames with double walkways, use a total 8 bolt assemblies per bracket.

WALKWAY DETAILS No. 1

Return to Table of Contents
LIGHTING FIXTURE MOUNTING CHANNEL DETAILS 1

1. Welded type grating shall have 1" x 1/8" bearing bars at 1 1/8" centers with 1/8" diameter (or equal) cross bars at 4" centers. If mechanical lock grating is used, it shall be equal in strength to the welded type. Alternate hold-down clips may be submitted for approval.

2. Walkway grating and light fixture mounting channels to be continuous (no splices) over as many walkway brackets as practical and consistent with fabrication, ease restricting shackle bolt rotation or contacting cable.

3. Contractor may substitute 1 1/8" x 1 1/8" x .1084" cont-slot steel channel with pre-punched slots not larger than 1/8" x 3". Slots shall be at bottom of channel and shall be parallel to channel. Slots shall be spaced not closer than 4" center to center.

4. Place an equal amount of washers on each side to align cable with end lug without restricting shackle bolt rotation or contacting cable.
MOUNTING BEAM SPACING TABLE

SECTION A-A

NOTES:

CHORD ANGLE CLAMP

SPLICE LINE

HORIZONTAL

SECTION D-D

SECTION B-B

SIGN MOUNTING DETAILS

LAMINATED PANEL-TYPE A

OVERHEAD SIGNS-TRUSS

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

REGISTERED CIVIL ENGINEER

October 30, 2015

Jeffrey B. Woody

CIVIL

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2015 STANDARD PLANS S19

No. Ex. Dist.

STANDARD PLAN S19

PLAN No.

SHEET

TOTAL SHEETS

TOTAL

APPROVAL DATE

Remind me that the location of the horizontal splice line is dependent on the Contractor for signs greater than 60" in depth.
TYPICAL 2'-0" PANEL LENGTH
TYPICAL 4'-0" PANEL LENGTH

DETAIL 10
BAR 1" x …

TYPICAL REMOVABLE FRAME
GREATER THAN 20'-0"

* 9'-2" & 10'-0" sign panel frames will project above the top chord of the truss. In these cases the top clips shall be bolted to vertical frame members. See Standard Plan S22 for details.

NOTES:
Frames for signs greater than 20'-0" in length shall be fabricated in segments with left section a multiple of 4'-0" in length. See table above.

Sections shall be bolted into place individually and bolted together as per detail 10 prior to tightening of mounting clip bolts.

Bolting two sections together and hoisting simultaneously will not be permitted.

FRAME MOUNTING DETAILS

For overhead formed panels refer to "Removable Sign Panel Frames, Mounting Details" Sheet.

All holes 1/8" diameter maximum.

Mounting Hole Spacing
Sign Panel & Frame

Hole spacing is for single sheet sign panels.

For overhead formed panels refer to "Removable Sign Panel Frames, Mounting Details" Sheet.

Frame and Clip
Member
Shim Between
W = 4' - 2" Through 10' - 0"

TOP AND BOTTOM L3 x 2" as Required

Riblet weld all around.

WTO 3 x 6 may be crimped at ends to join frame angles.

Drilled and tapped holes 1/8" may be used where interference due to welds or structural members is encountered.

6. Holes for mounting removable sign panel frame may be staggered 1" maximum parallel to the axis of the sign.
7. WT3 x 6 may be crimped at ends to join frame angles.

1. Frames shall be all-welded construction.
2. Panel mounting holes shall be drilled by template.
3. Drilled and tapped holes 1/8" may be used where interference due to welds or structural members is encountered.
4. WT3 x 6 shall be flush with faces of frame angles.
5. Mounting clip angles shall be located such as to allow the sign panel to be considered as a template.
6. Holes for mounting removable sign panel frame may be staggered 1" maximum parallel to the axis of the sign.
7. WT3 x 6 may be crimped at ends to join frame angles.

Fillet weld all around.
When constructing a new frame:

1. Refer to Standard Plan Sheet S20 for structural details.
2. Sign panels shall be considered as a template for drilling holes for mounting bolts.
3. The Contractor shall verify all dependent dimensions in the field before ordering or fabricating any materials.
General Specifications:
- Minimum fillet weld is \( \frac{1}{8}\) for clip angles welded to chord member of truss.
- Maximum spacing of bottom clip angle is 5'-6".
- Top clips required for each vertical member of Removable Sign Panel Frame.

Details:
1. For details not shown, see Sections C-C and D-D.
2. Minimum fillet weld is \( \frac{1}{8}\) for clip angles welded to chord member of truss.
3. Maximum spacing of bottom clip angle is 5'-6".
4. Top clips required for each vertical member of Removable Sign Panel Frame.
INSTRUCTIONS TO FABRICATOR

Format sheet shows:
1. Sign structure location.
2. Length of structure span.
3. Panel size and location on structure.
4. Post height to bottom of panel or mast arm elevation.
5. Base plate elevation.
6. Photoelectric unit location if required.
7. Walkway location.

Maintain uniform spacing where possible and be continuous between signs. Extend walkway to edge of pavement if required. Safety railing to protect entire walkway unless otherwise shown on format sheet.

Format sheet shows:

WALKWAY BRACKETS:
WALKWAY AND SAFETY RAILING:
PHOTOELECTRIC UNIT:

UNIT STRESSES:

MINIMUM CLEARANCE
Vertical roadway clearance 18'-0" above roadway and shoulders

WELDING:
All welding continuous unless otherwise noted on the plans.

LOADING:

WIND LOADS:
Normal to face of sign: 40.3 psf on 100% panel coverage.
Transverse to face of sign: 20% of normal force.

WALKWAY LOADING:
Dead load 500 LBS concentrated live load.

UNIT STRESSES:

STRUCTURAL STEEL: $f_y = 60,000$ psi
REINFORCED CONCRETE: $f'_c = 3600$ psi
FOOTING SOIL PRESSURE 2.5 ksf (spread footing)

MOTION CLEARANCE
Vertical roadway clearance 18'-0" above roadway and shoulders

WELDING:
All welding continuous unless otherwise noted on the plans.

NOTES:
1. Maximum post height = 24'-0" + sign panel depth/2.
2. For walkway details, see Standard Plan S16.
3. For safety railing and cable details, see Standard Plans S17 and S18.
### SLANTED POST CANTILEVER

#### Maximum Sign Panel Length

<table>
<thead>
<tr>
<th>Panel Depth</th>
<th>36'-0&quot;</th>
<th>37'-0&quot;</th>
<th>38'-0&quot;</th>
<th>39'-0&quot;</th>
<th>40'-0&quot;</th>
<th>41'-0&quot;</th>
<th>42'-0&quot;</th>
<th>43'-0&quot;</th>
<th>44'-0&quot;</th>
<th>45'-0&quot;</th>
<th>46'-0&quot;</th>
<th>47'-0&quot;</th>
<th>48'-0&quot;</th>
<th>49'-0&quot;</th>
<th>50'-0&quot;</th>
<th>51'-0&quot;</th>
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<th>53'-0&quot;</th>
<th>54'-0&quot;</th>
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</tbody>
</table>

### VERTICAL POST CANTILEVER

#### Maximum Sign Panel Length

<table>
<thead>
<tr>
<th>Panel Depth</th>
<th>Sign Panel Axis and Away from Approaching Traffic</th>
</tr>
</thead>
<tbody>
<tr>
<td>29'-0&quot;</td>
<td>X</td>
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<tr>
<td>28'-0&quot;</td>
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<td>27'-0&quot;</td>
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<td>26'-0&quot;</td>
<td>X</td>
</tr>
<tr>
<td>25'-0&quot;</td>
<td>X</td>
</tr>
</tbody>
</table>

### Abbreviation

- "0" = Post Outside Diameter

### Notes

1. The maximum sign panel overlap onto the post elbow shall not exceed 6'-0" from the field splice.
2. When several sign panels are to be installed with a space between the panels, the space shall be as small as possible and 2'-0" maximum.
3. All posts between base plate and field splice shall be as scheduled in Table. All cast arms are standard pipe.
4. During sign erection the post shall be marked as necessary with the aid of sleepers in order to level the sign panels.
5. At final position post top is bolted anchor bolts nuts shall be snug tightened against base plate.
6. Drill and tap for 1/2" chase nipple and plug with recessed pipe plug. Place perpendicular to sign panels and away from approaching traffic. See Standard Plan ES-15C.
Table A

<table>
<thead>
<tr>
<th>Post Type No.</th>
<th>Span Length Below</th>
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<tbody>
<tr>
<td>120°</td>
<td>140°-0&quot; to 190°-0&quot;</td>
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<tr>
<td></td>
<td>130°-0&quot; to 180°-0&quot;</td>
</tr>
<tr>
<td></td>
<td>120°-0&quot; to 170°-0&quot;</td>
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<tr>
<td></td>
<td>110°-0&quot; to 160°-0&quot;</td>
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<td></td>
<td>100°-0&quot; to 150°-0&quot;</td>
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<tr>
<td></td>
<td>90°-0&quot; to 140°-0&quot;</td>
</tr>
<tr>
<td></td>
<td>80°-0&quot; to 130°-0&quot;</td>
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<tr>
<td></td>
<td>70°-0&quot; to 120°-0&quot;</td>
</tr>
</tbody>
</table>

Table B

<table>
<thead>
<tr>
<th>Post Type No.</th>
<th>Pipe Type</th>
<th>&quot;s&quot;</th>
</tr>
</thead>
<tbody>
<tr>
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<td>20</td>
<td>12&quot;</td>
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<td>24</td>
<td>12&quot;</td>
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<tr>
<td>3</td>
<td>30</td>
<td>12&quot;</td>
</tr>
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</table>

Table C

<table>
<thead>
<tr>
<th>Post Type No.</th>
<th>Span Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>120°-0&quot; to 170°-0&quot;</td>
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<tr>
<td>2</td>
<td>120°-0&quot; to 160°-0&quot;</td>
</tr>
<tr>
<td>3</td>
<td>120°-0&quot; to 150°-0&quot;</td>
</tr>
</tbody>
</table>

Notes:
1. The maximum sign panel overlap onto elbow shall not exceed 6'-0" from the field splice.
2. When several sign panels are to be installed with spaces between panels, the total sign panel length is the sum of individual sign panel lengths only.
3. For spans ranging from 50'-0" to 145'-0", maximum sign panel coverage is as follows:
   a) For slanted post types, 6'-0" on both sides from each CIDH Pile.
   b) For vertical post types, 6'-0" on both sides from each CIDH Pile.
4. All posts between base plate and field plate splice shall be as scheduled in table. All notes are standard pipe.
5. Before any portion of sign frame is assembled in its final position, the Contractor shall demonstrate to the Engineer by preassembly or other approved methods that the span length of the frame, with no local condition, is within 2% of field measured span length between foundations.
6. If sign frames are erected as one unit, they shall be adequately suspended to avoid distortions or changes in span lengths between base plates.
7. All signs shall be hung tight against base plate.
8. Drill and tap for 1-1/2" chase nipple and plug with recessed pipe plugs. Place perpendicular to sign panel axis and away from approaching traffic. See Standard Plan ES-15C.
9. Maximum difference between post heights on an individual frame ± 3'-0".
10. For post splice holes with lengths greater than 12'-0", an optional field splice will be permitted at the centerline of span to facilitate routing operations.
11. For spacing of optional field splice in post, see Standard Plan S31.
NOTE: For details not shown or noted see "SECTION F-F".

1.  For walkway chain details, see Standard Plan S18.

2. Drill through panel at integral track. Install Type A-2 MOUNTING HARDWARE, A-2 MOUNTING HARDWARE, and NOTE 5.

3. Install aluminum "H" Section closure extrusions at vertical pipe only. For mounting bracket on elbow see "DETAIL B".

4. Drill through panel at integral track. Install elevator bolt with interstate green reflective tape. Typical at panel elbow.

5. Drill through panel at integral track. Install Type A-2 MOUNTING HARDWARE and attach reflective tape. Typical at border.

6. For walkway chain details, see Standard Plan S18.

NOTE: See "SECTION K-K".
### MAST ARM END DETAIL
(For "Single Post Type" only)

- **1/2" COVER E**
  - Dia = PIPE OD + 1/2"
- **1/2" x 1/2" BACKING RING**

### SHOP SPLICE

- **E MOUNTING BRACKET**
- **1 1/4" BS SPLICE PLATE**
- **1 1/4" CUP Typ**
- **BAR 1/4"**

### FIELD SPLICE

- **FIELD SPLICE DETAIL**
- **1 1/4" BACKING RING**
- **6"**

### FIELD SPLICE TABLE

<table>
<thead>
<tr>
<th>PIPE SIZE (NPS)</th>
<th>ID</th>
<th>THICKNESS</th>
<th>BC</th>
<th>Dia</th>
<th>No. OF HS BOLTS AND BOLT Dia</th>
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<td>1 1/16&quot;</td>
<td>2&quot;-0&quot;</td>
<td>22-11&quot;</td>
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<tr>
<td>24</td>
<td>1 1/2&quot;</td>
<td>2&quot;-0&quot;</td>
<td>26-11&quot;</td>
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<td></td>
</tr>
<tr>
<td>30</td>
<td>1 1/4&quot;</td>
<td>2&quot;-0&quot;</td>
<td>34-11&quot;</td>
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<td></td>
</tr>
</tbody>
</table>

### NOTES:
- **NOTES:**
  1. Place single thin bead of silicone caulking compound around hole before bolting. Caulking not to interfere with friction between plates in bolted area.
  2. Prime and paint post interior from base E to 6" above lower handhole unless post is galvanized.
  3. Field splice diameters marked "*" may be increased 2" to facilitate bolting.

### PHOTOELECTRIC UNIT DETAILS
(See "Layout" sheet for location when required)

- **PHOTOELECTRIC UNIT AND 3 PRONG, EEI-NEMA STANDARD TWIST LOCK PLUG RECEPTACLE**
- **PHOTOELECTRIC UNIT MOUNTING 3/4" NPS STANDARD PIPE CUT TO FIT MAST ARM CURVATURE**
- **MOUNTING BRACKET**
- **HS BOLTS (GALVANIZED) EQUALLY SPACED, SEE TABLE FOR OTHER DETAILS**

### SECTION H-H

### FIELD SPLICE SECTION H-H

- **PIPE ID-2"**
- **BC = Bolt Circle**
- **ID = Inside Diameter of Post Pipe**
- **OD = Outside Diameter of Pipe**
- **BC DIAM = Bolt Circle Diameter of Post Pipe**

### ELEVATION

- **DETAILS OF LOWER HANDHOLE & COVER**
  - **POST WALL**
  - **E HANDHOLE = E PIPE**
  - **TS 7 x 9 1/2 x 0'-1 3/4"**
  - **COVER E NOT SHOWN**
  - **ELLIPICAL HANDHOLE OPENING TO MATCH PATTERN PROVIDED**

### OVERHEAD SIGNS-TUBULAR STRUCTURAL FRAME DETAILS No. 2

### STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

### 2015 STANDARD PLAN S34

### Return to Table of Contents
SINGLE POST AND TWO POST TUBULAR

POST TO BASE PLATE CONNECTION DETAIL

POST HOLE = BOLT Dia PLUS 1/16"

PLATE WASHER DETAIL FOR 14 AND 16 BOLT TEMPLATE PATTERN

ANCHOR BOLT TEMPLATE

Template to match base plate anchor bolt pattern (option: template similar to ring plate type)

ANCHOR BOLT TEMPLATE TYPE

14 BOLTS

ANCHOR BOLT TEMPLATE RING PLATE TYPE

NOTE: One bolt shown only, other bolts same configuration around ring plate.

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

OVERHEAD SIGNS-TUBULAR
SINGLE AND TWO POST TYPE
BASE PLATE AND ANCHORAGE DETAILS
NO SCALE

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

OVERHEAD SIGNS-TUBULAR
SINGLE AND TWO POST TYPE
BASE PLATE AND ANCHORAGE DETAILS
NO SCALE

ANCHOR BOLT TEMPLATE ASSEMBLY
PLATE WASHER TYPE

NOTE: One bolt shown only, other bolts same configuration around pipe sleeve.

ANCHOR BOLT TEMPLATE RING PLATE TYPE

NOTE: One bolt shown only, other bolts same configuration around pipe sleeve.

RETURN TO TABLE OF CONTENTS
### Section A-A

- **Ground Surface Away from Traffic**
  - 6" Min. with Mortar, see Note 6

- **Ground Surface Adjacent to Traffic**
  - 2½" Min. with Mortar, see Note 6

- **Concrete**
  - See Electrical Plans

- **Spiral Reinforcement**
  - See Table

#### Vertical Reinforcement
- **Concrete Against Undisturbed Material**
- **Pile Vertical Reinforcement**
- **Place Concrete Against Undisturbed Material**

#### Details
- **Pile Vertical Reinforcement**
  - See Table

### Section B-B

- **Base Elevation**
- **Conduit**
  - See Standard Plan S35

### Foundation Details

#### Anchor Bolts
<table>
<thead>
<tr>
<th>Bolt No.</th>
<th>Bolt Total</th>
<th>Bolt Length</th>
<th>Vertical Reinforcing</th>
<th>Hoop</th>
<th>Pile</th>
<th>Vertical Reinforcing</th>
<th>Spiral</th>
<th>Foundation Depth</th>
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</tbody>
</table>

**Notes:**

1. For anchor bolt layout, see Standard Plan S35.
2. For "Base Elevation", see Project Plans.
3. Before erection of the post, backfill which is equivalent to the surrounding material, shall be in place.
4. Pile shall be formed 6" minimum below ground surface. Remainder to be placed against undisturbed material.
5. Slope protection required when indicated on the Project Plans.
6. For drain holes and central void in mortar, see Standard Plan ES-68 detail H.

---

**Overhead Signs-Tubular**

**Single Post and Two Post Type Square Pedestal Pile Foundation**

---

**State of California**

**Department of Transportation**

---

**October 30, 2015**

**Stanley E. Johnson, Registered Civil Engineer**

---

**2015 Standard Plan S36**

---

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SECTION A-A

SINGLE POST AND TWO POST TYPE

PEDESTAL SPIRAL @ 3½" PITCH

PEDESTAL VERTICAL REINFORCEMENT

PILE SPIRAL REINFORCEMENT

PILE VERTICAL REINFORCEMENT

SECTION B-B

GROUND SURFACE AWAY FROM TRAFFIC

BASE E Elev

4½” Min MORTAR, SEE NOTE 6

GROUND SURFACE ADJACENT TO TRAFFIC

PEDESTAL VERTICAL REINFORCEMENT, SEE TABLE FOR SIZE

PLACE CONCRETE AGAINST UNDISTURBED MATERIAL

PENETRABLE CONCRETE JOINT

PILE Vert Reinf

PILE DIAMETER SEE TABLE

VERTICAL REINFORCEMENT EQUALLY SPACED (SEE TABLE)

Spiral Reinf

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

OVERHEAD SIGNS-TUBULAR
SINGLE POST AND TWO POST TYPE
ROUND PEDESTAL PILE FOUNDATION

NO SCALE

S37

NOTES:
1. For anchor bolt layout, see Standard Plan S35.
2. For "Base E elevation", see Project Plans.
3. Before erection of the post, backfill which is equivalent
to the surrounding material, shall be in place.
4. Pedestal shall be formed 6" minimum below ground surface.
   Reinforced to be placed against undisturbed material.
5. Slope protection required when indicated on the Project Plans.
6. For groin holes and central void in mortar, see Standard Plan ES-68
detail No.
1. Backfill shall be in place before erection of post.
2. Slope protection required when indicated on plans.
3. Pile pedestal shall be formed 6" minimum below ground surface. Remainder to be placed against undisturbed material.

**NOTES:**

- 2. Slope protection required when indicated on the plans.
- 3. Pile pedestal shall be formed 6" minimum below ground surface. Remainder to be placed against undisturbed material.
OVERHEAD LAMINATED SIGN
SINGLE OR MULTIPLE PANEL
(TYPE A, 1" THICK)

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

2015 STANDARD PLAN S81

NOTES:
1. Panel length shall be graduated in increments of 1'-0".
Panel depth shall be 1'-8" to 5'-0", graduated in increments of 1'-0".

2. Unless otherwise shown on the plans, refer to applicable Standard Plan for location of structure supports and mounting details.

3. For multiple panel signs, see Standard Plan S86 for seam closure extrusion quantities.


6. All horizontal extrusions shall be continuous.

7. Place three 3/8" x 1" weep holes in bottom of each panel.
   One hole in the center and one hole 3" from each end.

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3-31-17
9-22-15

October 30, 2015

Return to Table of Contents
OF EACH PANEL
POST CENTERLINE OF EACH PANEL
SIGNAL DEPTH
EACH PANEL AS SHOWN
4 HOLES ø " (ø " AT LAMINATED WOOD BOX POSTS)
SEE BOLT HOLE (TYPICAL)
POST SPACING: SEE NOTE 1
PANEL LENGTH: SEE TABLE
PANEL DEPTH:
STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION
NO SCALE
ROADSIDE LAMINATED SIGN
SINGLE OR MULTIPLE PANEL
(TYPE B, 1" THICK)
S82

SECTION A-A
SECTION B-B

FACED VIEW OF LAMINATED PANEL
Two panels shown, see Note 6

NOTES:
3. All horizontal extrusions shall be continuous.
4. Depth and length of panel shall be graduated in increments of 6".
5. For multiple panel signs, see Standard Plan S86 for seam closure extrusion quantities.
6. Place three ø " weep holes in bottom of each panel.
   One hole in the center and one hole 3" from each end.

CHANNEL EDGE
VERTICAL TUBE SPACER
BOLT HOLE (TYPICAL)

See Table

<table>
<thead>
<tr>
<th>TYPE B PANEL 1&quot; THICK</th>
<th>DEPTH</th>
<th>LENGTH</th>
</tr>
</thead>
<tbody>
<tr>
<td>5'-0&quot;</td>
<td>4'-6&quot; TO 15'-0&quot;</td>
<td></td>
</tr>
<tr>
<td>4'-0&quot;</td>
<td>4'-6&quot; TO 15'-0&quot;</td>
<td></td>
</tr>
<tr>
<td>3'-6&quot;</td>
<td>4'-6&quot; TO 15'-0&quot;</td>
<td></td>
</tr>
<tr>
<td>3'-0&quot;</td>
<td>4'-6&quot; TO 15'-0&quot;</td>
<td></td>
</tr>
<tr>
<td>2'-6&quot;</td>
<td>4'-6&quot; TO 15'-0&quot;</td>
<td></td>
</tr>
<tr>
<td>2'-0&quot;</td>
<td>4'-6&quot; TO 15'-0&quot;</td>
<td></td>
</tr>
<tr>
<td>1'-6&quot;</td>
<td>4'-6&quot; TO 15'-0&quot;</td>
<td></td>
</tr>
</tbody>
</table>

See Note 4

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION
ROADSIDE LAMINATED SIGN
SINGLE OR MULTIPLE PANEL
(TYPE B, 1" THICK)
NO SCALE
S82
SIGN DEPTH

CHANNEL EDGE AT PERIMETER OF EACH PANEL

VERTICAL TUBE SPACER AT EACH POST CENTERLINE OF EACH PANEL

SEE BOLT HOLE (TYPICAL)

HOLE AT EACH POST CENTERLINE. (½" Ø AT LAMINATED WOOD BOX POSTS)

SEE NOTE 1

Panel length see Table

Depth, length of panel shall be graduated in increments of 6'.

All horizontal extrusions shall be continuous.

See Standard Plan S85 for post spacing table.

See Standard Plan S86 for extrusion details.

See Note 4.

One hole in the center and one hole 3" from each end.

Three "Ø weep holes in bottom of each panel for seam closure extrusion quantities.

Two panels shown, see Note 6.

Face view of laminated panel

See Table

Table

TYPE B PANEL 2½" THICK

<table>
<thead>
<tr>
<th>DEPTH</th>
<th>LENGTH</th>
</tr>
</thead>
<tbody>
<tr>
<td>5'-0&quot;</td>
<td>15'-6&quot; to 16'-6&quot;</td>
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<tr>
<td>4'-6&quot;</td>
<td>15'-6&quot; to 18'-6&quot;</td>
</tr>
<tr>
<td>4'-0&quot;</td>
<td>15'-6&quot; to 20'-6&quot;</td>
</tr>
<tr>
<td>3'-6&quot;</td>
<td>15'-6&quot; to 22'-6&quot;</td>
</tr>
<tr>
<td>3'-0&quot;</td>
<td>15'-6&quot; to 24'-0&quot;</td>
</tr>
<tr>
<td>2'-6&quot;</td>
<td>15'-6&quot; to 24'-0&quot;</td>
</tr>
<tr>
<td>2'-0&quot;</td>
<td>15'-6&quot; to 24'-0&quot;</td>
</tr>
<tr>
<td>1'-6&quot;</td>
<td>15'-6&quot; to 24'-0&quot;</td>
</tr>
</tbody>
</table>

See Note 4.

NOTES

3. All horizontal extrusions shall be continuous.
4. Depth and length of panel shall be graduated in increments of 6'.
5. For multiple panel signs, see Standard Plan S85 for seam closure extrusion quantities.
6. Place three ¼" # weep holes in bottom of each panel. One hole in the center and one hole 3" from each end.

BOLT HOLE (TYPICAL)

BOLT HOLE (TYPICAL)

SECTION A-A

SECTION B-B

Return to Table of Contents
NOTES:
3. All horizontal extrusions shall be continuous.
4. Depth and length of panel shall be graduated in increments of 6".
5. For multiple panel signs, see Standard Plan S85 for seam closure extrusion quantities.
6. Panels with the dimensions shown in Table A are designated as large panels.
7. Place three 3/8" # weep holes in bottom of each panel, one hole in the center and one hole 3" from each end.

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION
ROADSIDE LAMINATED SIGN
SINGLE OR MULTIPLE PANEL
(TYPE H, 2½" THICK)
NO SCALE

2015 STANDARD PLAN S84

RETURN TO TABLE OF CONTENTS
<table>
<thead>
<tr>
<th>DETAIL NO.</th>
<th>DETAILS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Typical</td>
</tr>
<tr>
<td>2</td>
<td>Typical</td>
</tr>
<tr>
<td>3</td>
<td>Typical</td>
</tr>
<tr>
<td>4</td>
<td>Typical</td>
</tr>
<tr>
<td>5</td>
<td>Typical</td>
</tr>
<tr>
<td>6</td>
<td>Typical</td>
</tr>
<tr>
<td>7</td>
<td>Typical</td>
</tr>
<tr>
<td>8</td>
<td>Typical</td>
</tr>
<tr>
<td>9</td>
<td>Typical</td>
</tr>
</tbody>
</table>

**TABLE**

<table>
<thead>
<tr>
<th>EXTRUSION TYPE</th>
<th>1&quot; THICK PANEL</th>
<th>2½&quot; THICK PANEL</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHANNEL EDGE</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>TUBE-CHANNEL EDGE</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>MODIFIED &quot;H&quot; EDGE</td>
<td>DETAIL NO. 1</td>
<td>N/A</td>
</tr>
<tr>
<td>VERTICAL TUBE SPACER</td>
<td>N/A</td>
<td>DETAIL NO. 3</td>
</tr>
<tr>
<td>VERTICAL TUBE SPACER (LARGE PANEL)</td>
<td>N/A</td>
<td>DETAIL NO. 8</td>
</tr>
<tr>
<td>SEAM CLOSURE &quot;H&quot; SECTION</td>
<td>DETAIL NO. 2</td>
<td>DETAIL NO. 5</td>
</tr>
</tbody>
</table>

Note: All extrusions shall be aluminum alloy 6063-T6.

Unless noted, wall thickness is 0.07".

State of California Department of Transportation
LAMINATED PANEL DETAILS (EXTRUSIONS FOR TYPE A, B AND H PANELS)
NO SCALE

S86

Return to Table of Contents
R = VaR

**A-1 HARDWARE QUANTITY TABLE**

<table>
<thead>
<tr>
<th>SIGN LENGTH</th>
<th>SIGN DEPTH</th>
<th>UNITS REQUIRED</th>
<th>SEE NOTE 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>15'-0&quot; OR LESS</td>
<td>5'-0&quot; - 8'-0&quot;</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>16'-0&quot; - 24'-0&quot;</td>
<td>5'-0&quot; - 10'-0&quot;</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>16'-0&quot; - 24'-0&quot;</td>
<td>5'-10&quot; - 10'-0&quot;</td>
<td>8</td>
<td></td>
</tr>
</tbody>
</table>

**NOTES:**

1. Refer to applicable Standard Plan for additional mounting details.
2. Rectangular head bolt, hexagon step nut, and flat washer shall be 1/2" diameter (18-8) stainless steel.
3. One unit of A-1 hardware shall consist of two sets of these components: clamp, bolt, nut and washer.
4. Signs 9'-2" and 10'-0" in depth may be fabricated in three panel sections to avoid legend from being placed on a horizontal seam. Increase number of units of mounting hardware accordingly.

---

**STATE OF CALIFORNIA**

**DEPARTMENT OF TRANSPORTATION**

**TYPE A-1 MOUNTING HARDWARE**

**FOR OVERHEAD LAMINATED TYPE A PANEL**

**(TRUSS AND LIGHTWEIGHT SIGN STRUCTURES)**

**NO SCALE**

**S87**

---

**Return to Table of Contents**
**NOTES:**

1. Refer to applicable Standard Plan for additional mounting details.

2. Beveled washer for tapered flange only.

3. Elevator head bolt, hexagon nut, and lock washer shall be 1/4" diameter (18-8) stainless steel.

4. Furnish retroreflective stick-ons for bolt head in same color as sign. Apply during installation.

5. One unit of A-2 hardware shall consist of one each; bolt, nut, lock washer and beveled washer. Quantity listed includes 1 spare unit.

6. Signs 9'-2" and 10'-0" in depth may be fabricated in three panel sections to avoid legend from being placed on a horizontal seam. Increase number of units of mounting hardware accordingly.

---

**A-2 HARDWARE QUANTITY TABLE (STANDARD TUBULAR)**

<table>
<thead>
<tr>
<th>SIGN LENGTH</th>
<th>SIGN DEPTH</th>
<th>UNITS REQUIRED</th>
</tr>
</thead>
<tbody>
<tr>
<td>14'-0&quot; OR LESS</td>
<td>4'-0&quot; TO 5'-0&quot;</td>
<td>9</td>
</tr>
<tr>
<td>15'-0&quot; TO 20'-0&quot;</td>
<td>4'-0&quot; TO 5'-0&quot;</td>
<td>13</td>
</tr>
<tr>
<td>21'-0&quot; TO 24'-0&quot;</td>
<td>4'-0&quot; TO 5'-0&quot;</td>
<td>17</td>
</tr>
<tr>
<td>14'-0&quot; OR LESS</td>
<td>5'-10&quot; TO 10'-0&quot;</td>
<td>17</td>
</tr>
<tr>
<td>15'-0&quot; TO 20'-0&quot;</td>
<td>5'-10&quot; TO 10'-0&quot;</td>
<td>25</td>
</tr>
<tr>
<td>21'-0&quot; TO 24'-0&quot;</td>
<td>5'-10&quot; TO 10'-0&quot;</td>
<td>33</td>
</tr>
</tbody>
</table>

---

**SIDE VIEW**

---

**MOUNTING HARDWARE**

---

**STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION**

**TYPE A-2 MOUNTING HARDWARE FOR OVERHEAD LAMINATED TYPE A PANEL (BRIDGE MOUNTED AND TUBULAR SIGN STRUCTURES)**

**NO SCALE**

---

*Return to Table of Contents*
3.2.1. Face view of formed panel

NOTES:

1. Sign size to be graduated in 6" increments, both vertically and horizontally. Area of sign not to exceed 20 square feet.

2. Channel strut extrusions shall be 1" x 1" x ½" aluminum alloy 6063-T6.


STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION
ROADSIDE SIGN-FORMED
SINGLE SHEET ALUMINUM PANEL
NO SCALE

S89
LEGEND:

"C" indicates location of channel.
"BC" indicates location of bolt and channel.
* This bolt may be omitted when depth is 4'-2".

<table>
<thead>
<tr>
<th>PANEL DEPTH</th>
<th>DIMENSION &quot;A&quot;</th>
<th>DIMENSION &quot;B&quot;</th>
<th>DIMENSION &quot;C&quot;</th>
<th>TOTAL NO. OF CHANNELS PER PANEL</th>
</tr>
</thead>
<tbody>
<tr>
<td>4'-2&quot;</td>
<td>1'-11 1/2&quot;</td>
<td>1'-8&quot;</td>
<td>1'-8&quot;</td>
<td>3</td>
</tr>
<tr>
<td>5'-0&quot;</td>
<td>2'-4&quot;</td>
<td>2'-4&quot;</td>
<td>2'-4&quot;</td>
<td>3</td>
</tr>
<tr>
<td>5'-10&quot;</td>
<td>1'-6&quot;</td>
<td>1'-6&quot;</td>
<td>1'-6&quot;</td>
<td>4</td>
</tr>
<tr>
<td>6'-8&quot;</td>
<td>1'-6&quot;</td>
<td>1'-6&quot;</td>
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<td>5</td>
</tr>
<tr>
<td>7'-8&quot;</td>
<td>1'-6&quot;</td>
<td>1'-6&quot;</td>
<td>1'-6&quot;</td>
<td>5</td>
</tr>
<tr>
<td>8'-2&quot;</td>
<td>1'-6&quot;</td>
<td>1'-6&quot;</td>
<td>1'-6&quot;</td>
<td>6</td>
</tr>
<tr>
<td>9'-2&quot;</td>
<td>1'-6&quot;</td>
<td>1'-6&quot;</td>
<td>1'-6&quot;</td>
<td>6</td>
</tr>
<tr>
<td>10'-0&quot;</td>
<td>1'-6&quot;</td>
<td>1'-6&quot;</td>
<td>1'-6&quot;</td>
<td>6</td>
</tr>
</tbody>
</table>

3 CHANNELS FOR 4'-2" AND 5'-0" DEPTH
4 CHANNELS FOR 5'-10" DEPTH
5 CHANNELS FOR 7'-6" DEPTH
5 CHANNELS FOR 6'-8" AND 8'-4" DEPTH
6 CHANNELS FOR 9'-2" AND 10'-0" DEPTH
### TRUSS HEAD BOLT

![Diagram of TRUSS HEAD BOLT]

- **Material:** 2024 Aluminum alloy (per QQ-A-430 or ASTM B316)
- **Anodize:** Interstate green per MIL-A-8625

### WASHER

- **Material:** Fiber/Nylon

### LOCKNUT WITH NYLON INSERT

- **Material:** 6061-T6 or 2011-T3 Aluminum alloy or equivalent (per WIL-A-8625)
- **Anodize:** Interstate green per MIL-A-8625
- **Minimum torque:** 60 in-lbs

### MOUNTING HARDWARE QUANTITY CHART

<table>
<thead>
<tr>
<th>SIGN LENGTH</th>
<th>SIGN DEPTH</th>
<th>NUMBER OF UNITS REQUIRED</th>
</tr>
</thead>
<tbody>
<tr>
<td>8'-0&quot;</td>
<td>4'-2&quot;</td>
<td>8</td>
</tr>
<tr>
<td>10'-0&quot; to 12'-0&quot;</td>
<td>5'-0&quot; to 6'-4&quot;</td>
<td>12</td>
</tr>
<tr>
<td>14'-0&quot; to 16'-0&quot;</td>
<td>5'-0&quot; to 6'-4&quot;</td>
<td>20</td>
</tr>
<tr>
<td>18'-0&quot; to 20'-0&quot;</td>
<td>5'-0&quot; to 6'-4&quot;</td>
<td>28</td>
</tr>
<tr>
<td>22'-0&quot; to 24'-0&quot;</td>
<td>5'-0&quot; to 6'-4&quot;</td>
<td>36</td>
</tr>
<tr>
<td>26'-0&quot; to 28'-0&quot;</td>
<td>5'-0&quot; to 6'-4&quot;</td>
<td>48</td>
</tr>
<tr>
<td>30'-0&quot; to 32'-0&quot;</td>
<td>5'-0&quot; to 6'-4&quot;</td>
<td>60</td>
</tr>
<tr>
<td>34'-0&quot; to 36'-0&quot;</td>
<td>5'-0&quot; to 6'-4&quot;</td>
<td>66</td>
</tr>
<tr>
<td>38'-0&quot; to 40'-0&quot;</td>
<td>5'-0&quot; to 6'-4&quot;</td>
<td>72</td>
</tr>
<tr>
<td>42'-0&quot; to 44'-0&quot;</td>
<td>5'-0&quot; to 6'-4&quot;</td>
<td>88</td>
</tr>
<tr>
<td>46'-0&quot; to 48'-0&quot;</td>
<td>5'-0&quot; to 6'-4&quot;</td>
<td>96</td>
</tr>
</tbody>
</table>

*Unit: 1 Truss head bolt, 1 Nylon insert locknut, 1 washer (Fiber/Nylon), 1 washer (Aluminum)*
**NOTES:**

1. See Standard Plan S90 for location and configuration of struts.
2. Bolt channel and channel extrusions shall be 1" x 1" x 3/16" aluminum alloy 6063-T6.

**ABBREVIATIONS:**

BC = Centerline of Bolt Channel Strut

C = Centerline of Channel Strut

**FACE VIEW OF FORMED PANEL**

Single panel shown.

**RETROREFLECTIVE SHEETING OVERLAP ON INTERIOR EDGES**

Two panels shown.

**TYPICAL BOLT HOLE DETAIL**

A-3 MOUNTING HARDWARE, SEE NOTE 4

**SECTION A-A**

**SECTION B-B**

**STATE OF CALIFORNIA**

**DEPARTMENT OF TRANSPORTATION**

**OVERHEAD SIGN**

**FORMED SIGN PANEL**

**NO SCALE**

October 30, 2015

Donald E. Howe

CIVIL ENGINEER

2015 STANDARD PLAN S92

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## Variable Weld Details

### No. of Horizontal Members

- 2, 2, 3, 3, 3, 3, 3, 3, 3, 4

### No. of Vertical Members

- 2, 3, 3, 3, 3, 3, 3, 3, 3, 3

### Panel Thickness

- 0.063", 0.080", 0.063", 0.063", 0.063", 0.063", 0.063", 0.063", 0.063", 0.063"

### Channel Sizes

- **Type A:** 1" x 1" x 
- **Type B:** 2" x 2" x 
- **Type C:** 2" x 3" x 

### Sign Depth

- 1'-0" to 2'-0", 2'-0" to 2'-0", 3'-0" to 4'-0", 4'-0" to 6'-0", 6'-0" to 8'-0", 8'-0" to 11'-0"

### Sign Length

- Up to 3'-11", 4'-0" to 4'-7", 6'-0" to 6'-6", 6'-0" to 6'-6", 7'-0" to 7'-6", 8'-0" to 11'-0"

### No Frame Required

- No frame required

### Rivet at Splice

- **Detail A:**
- **Detail B:**

### Typical Weld Details

- **Weld Detail No. 1**
- **Weld Detail No. 2**

### Notes:

1. Type A - 1½" x 1½" x ½" Channel to be aluminum alloy 6063-T5.
2. Type B - 2½" x 1½" x ½" Channel to be aluminum alloy 6063-T6.
3. Type C - 2" x 3" x ½" Channel to be aluminum alloy 6063-T6.
4. 1½" x 1½" x ½" Rectangular tubing aluminum alloy 6063-T6 may be substituted for Types B and C, but more than one type of framing material used on one sign is unacceptable.
5. For rectangular tubing, weld all around and grind beads flush where weld contacts sign panel.

### Post Spacing

- Centerline Spacing

<table>
<thead>
<tr>
<th>Sign Length</th>
<th>Centerline Spacing</th>
</tr>
</thead>
<tbody>
<tr>
<td>4'-0&quot; to 5'-0&quot;</td>
<td>5'-0&quot;</td>
</tr>
<tr>
<td>5'-0&quot; to 6'-0&quot;</td>
<td>6'-0&quot;</td>
</tr>
<tr>
<td>6'-0&quot; to 6'-6&quot;</td>
<td>6'-6&quot;</td>
</tr>
<tr>
<td>6'-0&quot; to 7'-0&quot;</td>
<td>7'-0&quot;</td>
</tr>
<tr>
<td>7'-0&quot; to 7'-6&quot;</td>
<td>7'-6&quot;</td>
</tr>
<tr>
<td>8'-0&quot; to 9'-0&quot;</td>
<td>9'-0&quot;</td>
</tr>
<tr>
<td>9'-0&quot; to 10'-0&quot;</td>
<td>10'-0&quot;</td>
</tr>
<tr>
<td>10'-0&quot; to 11'-0&quot;</td>
<td>11'-0&quot;</td>
</tr>
</tbody>
</table>

### Sign Details

- **Sign Depth:** 1'-0" to 2'-0", 2'-0" to 2'-0", 3'-0" to 4'-0", 4'-0" to 6'-0", 6'-0" to 8'-0", 8'-0" to 11'-0"

---

**NOTE:**

- See Note 5

---

**S93**

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

Framing Details for Framed Single Sheet Aluminum Signs, Rectangular Shape

No Scale
ROADSIDE FRAMED SINGLE SHEET
ALUMINUM SIGNS,
RECTANGULAR SHAPE
NO SCALE

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

NOTES:
2. All members welded at joints as shown on Standard Plan S93.

ROADSIDE SIGN DETAIL No. 1

ROADSIDE SIGN DETAIL No. 2

ROADSIDE SIGN DETAIL No. 3

ROADSIDE SIGN DETAIL No. 4

ROADSIDE SIGN DETAIL No. 5
Weld all around outside at joints as shown on this plan. All channel members welded
4’ - 6" Typ 8" CENTERS 24 RIVETS ON ALUMINUM, Typ CHANNEL, 6063-T5 1’" x 1’" x 
HOLES - 4 PLACES … Dia MOUNTING

Framing detail for Typ 3" 10" Typ ALUMINUM, Typ CHANNEL, 6063-T5 1’" x 1’" x 
HOLES - 4 PLACES … Dia MOUNTING

Made from 2 - 3’-0" x 6’-0" panels, spliced and braced by channels as shown.

EXCEPT AT SPLICE ON 8" CENTERS 57 RIVETS

2’-3"

ROADSIDE SIGN DETAIL No. 7
Framing detail for 6’-0" x 6’-0" diamond. Made from 2 - 3’-0" x 6’-0" panels, spliced and braced by channels as shown.

NOTE: All channel members welded at joints as shown on this plan.

ROADSIDE SINGLE SHEET ALUMINUM SIGNS, DIAMOND SHAPE
NO SCALE

WELD DETAIL No. 3

ROADSIDE SIGN DETAIL No. 6
Framing detail for 5’-0" x 5’-0" diamond

ROADSIDE SIGN DETAIL No. 8
Framing detail for 8’-0" x 8’-0" diamonds. Made from 2 - 4’-0" x 8’-0" panels, spliced and braced by channels as shown.
LOADING:

WIND LOADING:
100 mph (3-second gust)
Normal to face of sign 40 psf on 100% panel coverage, Transverse to face of sign 20% of normal force.

WALKWAY LOADING:
Dead load 4500 LBS concentrated live load.

UNIT STRESSES:

MINIMUM CLEARANCE
Vertical roadway clearance 18'-0" above roadway and shoulders

FOOTING SOIL PRESSURE:
2.00 ksf (spread footing)

REINFORCED CONCRETE:
f'c = 3600 psi
fy = 60000 psi
fy = 36000 psi

STRUCTURAL STEEL:

2.50 ksf (spread footing)

WELDING:
All welding continuous unless otherwise noted on the plans.

NOTES:
1. Drill and tap for 2½" recessed pipe plug,
   See Standard Plan ES-15C.
2. For location and elevation of sign structure see Project Plans.
3. Sign support post shall be raked out of plumb with leveling nute to make the bottom of the sign frame level.
4. At final position of post, top and bottom nuts shall be tightened against base plate.

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION
OVERHEAD SIGN-TRUSS
SINGLE POST TYPE LAYOUT
UNBALANCED BUTTERFLY CHANGEABLE MESSAGE SIGNS
MODEL 500
NO SCALE

Jeffrey B. Woody
CIVIL
C41260
3-31-17

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1. Walkways and safety anchorages not shown for clarity.

2. For Section B-B details, see Standard Plan S104.

3. For Section A-A details, including vertical angle spacing, see Standard Plan S104.

NOTES:
NOTES:
1. Cross ties at vertical and diagonal angles and internal diagonals not shown for clarity.
2. Interior grating, backside safety cable and backside weld lugs shall be installed only for projects requiring backside walkways.

**DETAIL A**

- BACKSIDE WELD LUG, SEE NOTE 2
- SAFETY CABLE ANCHORAGE, SEE "END SAFETY CABLE DETAIL" ON STANDARD PLAN S141
- SAFETY CABLE ANCHORAGE, SEE "BACKSIDE WELD LUG DETAIL" ON STANDARD PLAN S141

- INTERIOR WALKWAY BRACING SUPPORT, 1 PER VERTICAL MEMBER ON LONG SPAN OF CANTILEVER ARM, ADJUST TO CLEAR VERTICAL AND DIAGONAL BRACING, NOT TO EXCEED 5'-6", SEE "INTERIOR WALKWAY BRACING DETAILS" ON STANDARD PLAN S114, SEE NOTE 2

- INTERIOR SAFETY LUG AT EVERY WALKWAY BRACKET BETWEEN EXTERIOR WALKWAY BRACKETS, SEE STANDARD PLAN S141

**PLAN**

- INSTALL BOLT AFTER GALVANIZING
- 3" O.D. A325 H.S. BOLTS TOTAL 6 TO BE SNUG TIGHT
- 7" O.D. BOLT CIRCLE

**NOTES:**
Drill thru outer collar and post wall for bolts, provide contoured washers and hardened washers under bolt head and nut, contoured washers to be 3" x 3" x 1/8" minimum, Grind face to fit.
1. In all cases truss shall be supported at lower juncture connection.

2. Post to truss connections shall be fitted in shop.

NOTES:
1. In all cases truss shall be supported at lower juncture connection.
2. Post to truss connections shall be fitted in shop.
NOTES:
1. Drill and tap for 2½" recessed pipe plug.
2. For location and elevation of sign structure, see Project Plans.
3. Sign support post shall be raked out of plumb with leveling nuts to make the bottom of the sign frame level.
4. At final position of post, top and bottom nuts shall be tightened against base plate.
5. For "General Notes", see Standard Plan S101.
NOTES:
1. Walkways and safety anchorages not shown for clarity.
2. For Section B-B details, see Standard Plan S108.
3. For Section A-A details, including vertical angle spacing, see Standard Plan S108.
NOTES:

1. Crossties at vertical and diagonal angles and internal diagonals not shown for clarity.

2. Interior grating, backside safety cable and backside weld lugs shall be installed only for projects requiring backside walkways.

BOLT-ACCESS HOLE

Backside Walkway and Interior Grating, SEE NOTE 2

Backside Weld Lug, SEE NOTE 2

Interior Grating Support, 1 per vertical member on long span of cantilever arm. Adjust to clear vertical and diagonal bracing, not to exceed 5'-6". See "Interior Walkway Grating Details" on Standard Plan S141, SEE NOTE 2

Safety Cable Anchorage, SEE "End Safety Cable Detail" on Standard Plan S141, SEE NOTE 2

Interior Safety Lug at Every Walkway Bracket, SEE Standard Plan S141

EXTERIOR WALKWAY GRATING

Backside Walkway and Interior Safety Lug at Every Walkway Bracket, SEE Standard Plan S141

Safety Cable Anchorage

OVERHEAD SIGN-TRUSS
SINGLE POST TYPE
PLAN AND UPPER BOLT DETAILS
BALANCED BUTTERFLY
CHANGEABLE MESSAGE SIGNS
MODEL 500

NOT SCALE

Return to Table of Contents
1. In all cases, truss shall be supported at lower juncture connection.

2. Post to truss connections shall be fitted in shop.
NOTES:
1. Drill and tap for 2½" recessed pipe plugs.
2. For location and elevation of sign structure see Project Plans.
3. Sign support post shall be raked out of plumb with leveling nuts to make the bottom of the sign frame level.
4. At final position of post, top and bottom nuts shall be tightened against base plate.
5. For "General Notes", see Standard Plan S101.

CMS MODEL 500

FULL CANTILEVER
CHANGEABLE MESSAGE SIGNS
MODEL 500
NO SCALE

STATE OF CALIFORNIA
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OVERHEAD SIGN-TRUSS
SINGLE POST TYPE
LAYOUT

COPIES OF THIS PLAN SHEET.
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CIVIL

DIST.

DIAGRAM
NOTES:
1. Walkways and safety anchorages not shown for clarity.
2. For Section A-A details, see Standard Plan S112.
3. For Section B-B details, see Standard Plan S112.

HORIZONTAL ANGLES OF DIAGONAL AND TRUSS FRAME
L6 x 6 x ¼
LOWER SHELF
L6 x 6 x ¼
UPPER SHELF L5 x 5 x ½ x 25'-6"

FRAME ELEVATION
See Note 1

ELLiptical Handhole
OPENING TO MATCH PATTERN PROVIDED

ORIG. ENDS SMOOTH, ROUGHNESS OF EDGES NO GREATER THAN 100 MICROINCHES

1½ Dia Cap Screw, TOTAL 4

ELLiptical Handhole = E Pipe

4½" Dia Cap Screws, TOTAL 4

10 GAUSe COVER PLATE 7" x 5" WITH ½ Neoprene Gasket CEMENTED TO COVER PLATE

1/2" Dia Cap Screws

OvERHEAD SIGN-TRUSS
SINGLE POST TYPE
FULL CANTILEVER
CHANGEABLE MESSAGE SIGNS
MODEL 500

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

OVERHEAD SIGN-TRUSS
SINGLE POST TYPE
STRUCTURAL FRAME DETAILS
FULL CANTILEVER
CHANGEABLE MESSAGE SIGNS
MODEL 500

NO SCALE
NOTES:
1. Cross ties at vertical and diagonal angles not shown for clarity.
2. Interior grating, backside safety cable and backside weld lugs shall be installed only for projects requiring backside walkways.

NOTE:
Drill thru outer collar and post wall for bolts. Provide contoured washers and hardened washers under bolt head and nut. Contoured washers to be 3" x 3" x 5/8" Win Grind face to fit.

INTERIOR SAFETY LUG AT EVERY WALKWAY BRACKET BETWEEN EXTERIOR WALKWAY BRACKETS, SEE STANDARD PLAN S114, "INTERIOR WALKWAY GRATING SUPPORT 1 PER VERTICAL MEMBER ON LONG SPAN OF CANTILEVER ARM, ADJUST TO CLEAR VERTICAL AND DIAGONAL BRACING, NOT TO EXCEED 5'-6". SEE "INTERIOR WALKWAY GRATING DETAIL" ON STANDARD PLAN S114, (SEE NOTE 2)

SAFETY CABLE ANCHORAGE, SEE "END SAFETY CABLE DETAIL" ON STANDARD PLAN S141

INTERIOR SAFETY LUG, SEE NOTE 2

STAINLESS STEEL CABLE, SEE NOTE 2

BACKSIDE WELD LUG, SEE NOTE 2

SAFETY CABLE ANCHORAGE, SEE "BACKSIDE WELD LUG DETAIL" ON STANDARD PLAN S141

COVER A
8" Ø x 3/8"
EQUALY SPACED LONG, 4 HOLES
MACHINE SCREW 1"
ROUND HEAD BRASS CAP FOR 1/2" Ø
DRILL AND TAP THRU
CAP R FOR 1/2" Ø
ROUND HEAD BRASS MACHINE SCREW 1"
LONG, 4 HOLES
COVER E
BOLT-ACCESS HOLE
Single Post Type

409
SECTION A-A
LOWER JUNCTURE CONNECTION
See Standard Plan S110

NOTE:
For gussets parallel to the sign panel, cut to clear bolts as shown on Standard Plan S110.

SECTION B-B
See Standard Plan S1110
ALUMINUM Z BAR SPACING

NOTE:
Contractor shall verify Z bar spacing prior to drilling holes in shelf angle.

FOR Z BAR CONNECTIONS ONLY, FIELD DRILL ALUMINUM Z BAR 3/8" # HOLE FOR 3/8" x 1/4" HS BOLT WITH HARDENED WASHER EACH SIDE. LOCK WASHER BETWEEN NUT AND HARDENED FLAT WASHER. HS BOLTS SHALL BE SNUG TIGHT.

NOTE:
Mainway grating not shown for clarity.

NOTES:
1. Diagonal angles in plane of truss not shown. Bracing shown is at all vertical angles of truss.
2. Interior grating and backside weld lugs shall be installed only for projects requiring backside walkways.

NOTE:
Backside weld lug shall be installed only for projects requiring backside walkways.
Welded type grating shall have $1\frac{1}{2}'$ x $\frac{3}{8}'$ bearing bars at $\frac{1}{4}'$ centers. If mechanical lock grating is used, it shall be equal in strength to the welded type. Alternate hold-down clips may be submitted for approval.

2. Walkway grating to be continuous (no splices) over as many walkway brackets as practical and consistent with fabrication, ease of handling and assembly.

3. Interior grating shall be installed for project requiring backside walkways.

NOTES:

- $\frac{3}{4}'$ THICK SADDLE ANCHOR
- $\frac{5}{8}'$ BOLT, NUT, FLAT AND LOCK WASHERS
- $\frac{5}{8}'$ BOLT, NUT, AND LOCK WASHERS
- $\frac{5}{8}'$ HOLE FOR $\frac{5}{8}'$ BOLT, NUT, FLAT AND LOCK WASHERS
- DRILL $\frac{3}{8}'$ HOLE FOR $\frac{3}{8}'$ BOLT, NUT, 2 FLAT WASHERS AND ONE LOCK WASHER, DRILL TIGHTER ASSEMBLY.

---

**END PLATE CONNECTOR DETAIL**

**SECTION D-D**

**SECTION C-C**

**DETAIL G**

**CLIP L DETAIL**

---

**OVERHEAD SIGN-TRUSS SINGLE POST TYPE WALKWAY DETAILS**

**CHANGEABLE MESSAGE SIGNS**

**MODEL 500**

**NO SCALE**

---

**STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION**

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**Jeffrey B. Woody**

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NOTES:

1. Thread upper 10" and galvanize upper 1" of the anchor bolts.

2. Provide anchor bolt templates during installation of anchor bolts. Templates to match base plate anchor bolts pattern. See Standard Plans S3 for typical use of templates, OD = 3'-2", ID = 2'-6", hole = 2½" Min. Permanent template thick = ½", temporary template thick = ⅜".

3. Following initial tightening, upper nuts shall be brought to a snug tight condition. This can be obtained by a few impacts of an impact wrench or the full effort of a man using an ordinary spud wrench. Snug tightening shall progress systematically according to the tightening sequence as shown. Upper nuts and washers to have full even bearing on base plate.

4. 2½" # Anchor bolts with nut, leveling nut, 2 flat washers, and plate washer per bolt. Leveling nuts and washers to be adjusted for full even bearing on base plate prior to final tightening of upper nuts. (See Note 3).

5. For drain holes and central void in mortar see Standard Plan ES-6B detail.

OVERHEAD SIGN-TRUSS
SINGLE POST TYPE
ANCHORAGE AND BASE
PLATE DETAILS
CHANGEABLE MESSAGE SIGNS
MODEL 500
NO SCALE
NOTES:
1. Pile shall be placed against undisturbed material.
2. Primer and paint post interior from base plate to 6" above lower handhole-unless post is galvanized.
3. On single post sign structures, the post shall be raked out of plumb, with the use of leveling nuts to make the bottom of the sign frame level.
4. When foundation is located on a steep slope with exposed face of concrete adjacent to traffic, see "DETAIL C".
5. Slope protection required when indicated on Project Plans.

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OVERHEAD SIGN-TRUSS
SINGLE POST TYPE
FOUNDATION AND
MISCELLANEOUS DETAILS
CHANGEABLE MESSAGE SIGNS
MODEL 500
NO SCALE

S116
NOTE:
Chain assembly behind (see detail this page)

SAFETY RAILING ELEVATION

SECTION D-D

NOTE:
See Standard Plans 5101 and 5105 and 5109 for walkway bracket spacing.

DETAIL "A"

NOTE:
Alternative venting methods may be used if approved by the Engineer.

DETAIL "B"

OVERHEAD SIGN-TRUSS
SINGLE POST TYPE
WALKWAY SAFETY RAILING DETAILS
CHANGEABLE MESSAGE SIGNS
MODEL 500 AND 510

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

REGISTERED CIVIL ENGINEER
C57793

October 30, 2015
2. For walkway grating details, see Standard Plan S114.

**NOTES:**
1. Place an equal amount of washers on each side to align cable with end lug without restricting shackle bolt rotation or contacting cable.
2. Backside weld lug shall be installed only for projects requiring backside walkways.
GRINDING OPERATION
OF GUSSET PLATE BEFORE
INITIAL PROFILE AT TOP

CJP

1"
6"
1"
2"
'"
'"

END OF PLATE
CONTINUES AROUND
REINFORCING FILLET

LIMITS OF CJP WELD AT END OF PLATE
INITIAL PROFILE AT TOP OF GUSSET PLATE BEFORE GRINDING OPERATION
REMOVE EXCESS MATERIAL
GRIND SMOOTH TO 150 MICROINCHES

BASE PLATE
PIPE WALL
GUSSET PLATE

NOTES:
1. All gussets to be same height.
2. Provide a smooth transition from gusset plate to tube.

LEGEND:
NEW
REMOVAL

SECTION A-A
SECTION B-B

BASE PLATE
PIPE WALL
GUSSET PLATE

(Initial Shape)
(See Weld Details)

GUSSET PLATE WELDING
GUSSET PLATE GRINDING

REFERENCE:
(See Weld Details)

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

OVERHEAD SIGN-TRUSS
SINGLE POST TYPE
GUSSET PLATE DETAILS
CHANGEABLE MESSAGE SIGNS
MODEL 500 AND 510

NO SCALE

REGISTERED CIVIL ENGINEER
C57793

Stanley P. Johnson

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LEGEND:

1. Abandon, if applied to conduit, remove conductors
2. Install pull box in existing conduit run
3. Pedestrian barricade, type as indicated on plan
4. Install conduit into existing pull box
5. Connect new and existing conduit, remove existing conductors, and install conductors as indicated
6. Conduit to remain for future use, remove conductors, install full tape
7. Detector handhole
8. Foundation to be abandoned
9. Install sign on signal mast arm
10. No slip base on standard
11. Photoelectric control
12. Photoelectric unit
13. Equipment or material to be removed and become the property of the contractor
14. Remove electrometer, fuses and ballast, tape ends of conductors
15. Relocate equipment
16. Remove and reuse equipment
17. Remove and salvagge equipment
18. Splice new to existing conductors
19. Service disconnect
20. Telephone service point

STANDARD ELECTROLIER

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<th>EXISTING</th>
<th>STANDARD TYPE</th>
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MISCELLANEOUS ELECTROLIERS

NEW | EXISTING
☐️- - | LUMINAIRE ON WOOD POLE
☐️- - | NON-STANDARD ELECTROLIER (SEE PROJECT LEGEND)
☐️- - | CITY ELECTROLIER
☐️- - | ELECTROLIER FOUNDATION (FUTURE INSTALLATION)

NOTES:

1. LED luminaires shall be 235 W when installed on Type 21, 21D, 30, 31 and 32 Standards, unless otherwise specified. LED luminaires shall be 165 W when installed on other type standards or poles, unless otherwise specified.
2. Luminaires shall be the cutoff type, ANSI Type III medium cutoff lighting distribution, unless otherwise specified.

SOFIT AND WALL-MOUNTED LUMINAIRES

☐️- | PENDANT SOFIT LUMINAIRE, 70 W HPS
☐️- | FLUSH MOUNTED SOFIT LUMINAIRE, 70 W HPS
☐️- | WALL MOUNTED LUMINAIRE, 70 W HPS
☐️- | EXISTING SOFIT OR WALL-MOUNTED LUMINAIRE TO BE MODIFIED AS SPECIFIED
☐️- | EXISTING SOFIT OR WALL-MOUNTED LUMINAIRE TO REMAIN UNMODIFIED

NOTE:

Arrow indicates 'street side' of luminaire.
## Conduit

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<th>Existing</th>
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<td>LIGHTING CONDUIT, UNLESS OTHERWISE INDICATED OR NOTED</td>
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<td>TRAFFIC SIGNAL CONDUIT</td>
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<td>COMMUNICATION CONDUIT</td>
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<td>FIRE ALARM CONDUIT</td>
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<td>FIBER OPTIC CONDUIT</td>
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<td>CONDUIT TERMINATION</td>
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<tr>
<td>![U]</td>
<td>![U] CONDUIT Riser Attached to the Structure or Service Pole</td>
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</table>

## Signal Equipment

### Existing Equipment

- PEDESTRIAN SIGNAL HEAD
- PUSH BUTTON ASSEMBLY POST
- PEDESTRIAN BARRIÈRE
- VEHICLE SIGNAL HEAD (WITH BACKPLATE AND 3-SECTIONS: RED, YELLOW, AND GREEN)
- VEHICLE SIGNAL HEAD WITH ANGLE VISOR
- VEHICLE SIGNAL HEAD CONSISTING OF RED, YELLOW, AND GREEN LEFT ARROW SECTIONS
- VEHICLE SIGNAL HEAD (9 SECTION) CONSISTING OF RED, YELLOW AND GREEN RIGHT ARROW SECTIONS
- VEHICLE SIGNAL HEAD CONSISTING OF RED, YELLOW AND GREEN BACKPLATE SECTIONS
- VEHICLE SIGNAL HEAD CONSISTING OF RED, YELLOW AND GREEN LEFT ARROW SECTIONS
- VEHICLE SIGNAL HEAD WITH BACKPLATE AND GREEN ARROW SECTION
- VEHICLE SIGNAL HEAD WITH BACKPLATE AND 3-SECTIONS: RED, YELLOW, AND GREEN
- VEHICLE SIGNAL HEAD WITH BACKPLATE AND VISOR
- CONTROLLER ASSEMBLY, DOOR INDICATES FRONT OF CABINET

### New Equipment

- SINGLE POST, SINGLE ILLUMINATED SIGN
- SINGLE POST, DOUBLE ILLUMINATED SIGN
- SINGLE POST, SINGLE ILLUMINATED SIGN, BALANCED BUTTERFLY
- DOUBLE POST, SINGLE ILLUMINATED SIGN, FULL CANTILEVER
- DOUBLE POST, SINGLE ILLUMINATED SIGN MOUNTED ON STRUCTURE
- DOUBLE POST, SINGLE ILLUMINATED SIGN WITH ELECTROLIZER

### Notes

1. All signal sections shall be 12" unless shown otherwise.
2. Signal heads shall be provided with backplates unless shown otherwise.

## Service Equipment

### Existing Equipment

- POLE-MOUNTED SERVICE DESIGNATION
- TYPE H SERVICE, 28'-10" TYPE OF INSTALLATION AND POLE HEIGHT ABOVE GRADE
- SERVICE EQUIPMENT ENCLOSURE TYPE, DOOR INDICATES FRONT OF ENCLOSURE
- TELEPHONE DECOMMISSION CABINET
- TELEPHONE DEMARCATION CABINET
- SERVICE EQUIPMENT ENCLOSURE TYPE, DOOR INDICATES FRONT OF ENCLOSURE
- TELEPHONE DEMARCATION CABINET
- TELEPHONE DEMARCATION CABINET

### New Equipment

- SINGLE POST, SINGLE ILLUMINATED SIGN, BALANCED BUTTERFLY
- SINGLE POST, DOUBLE ILLUMINATED SIGN, FULL CANTILEVER
- SINGLE POST, SINGLE ILLUMINATED SIGN, BALANCED BUTTERFLY
- DOUBLE POST, SINGLE ILLUMINATED SIGN, FULL CANTILEVER
- DOUBLE POST, SINGLE ILLUMINATED SIGN MOUNTED ON STRUCTURE
- DOUBLE POST, SINGLE ILLUMINATED SIGN WITH ELECTROLIZER

## Illuminated Overhead Sign

- STANDARD WITH LUMINAIRE AND SIGNAL MAST ARMS AND ATTACHED VEHICLE SIGNAL HEADS
- TYPE 1 STANDARD WITH ATTACHED VEHICLE SIGNAL HEADS
- TYPE 15TS STANDARD WITH VEHICLE SIGNAL HEAD AND LUMINAIRE
- TYPE 21TS STANDARD WITH VEHICLE SIGNAL HEAD AND LUMINAIRE
- STANDARD WITH LUMINAIRE AND SIGNAL MAST ARMS AND ATTACHED VEHICLE SIGNAL HEADS

## Flashing Beacon

### New Equipment

- FLASHING BEACON (ONE VEHICLE SIGNAL HEAD WITH BACKPLATE AND VISOR)
- FLASHING BEACON WITH TYPE 15-FBS STANDARD AND A SIGN.
- FLASHING BEACON WITH TYPE 9, 9A OR 9B SIGN
- FLASHING BEACON WITH TYPES 9, 9A OR 9B SIGN
- CONTROLLER ASSEMBLY, DOOR INDICATES FRONT OF CABINET

### Existing Equipment

- FLASHING BEACON (ONE VEHICLE SIGNAL HEAD WITH BACKPLATE AND VISOR)
- FLASHING BEACON WITH BACKPLATE AND VISOR
- FLASHING BEACON WITH TYPE 15-FBS
- STANDARD AND A SIGN.
- FLASHING BEACON WITH TYPES 9, 9A OR 9B SIGN

## Signal Equipment Cont

- MODIFICATIONS OF BASIC SYMBOL:
  - "U" INDICATES ALL NON-ARROW SECTIONS LOUVERED
  - "LG" INDICATES LOUVERED GREEN SECTION ONLY
  - "PV" INDICATES ALL 12" SECTIONS PROGRAMMED VISIBILITY
  - "8" INDICATES ALL 8" SECTIONS (ONLY WHEN SPECIFIED)
  - VEHICLE SIGNAL HEAD CONSISTING OF RED, YELLOW AND GREEN BACKPLATE SECTIONS
  - VEHICLE SIGNAL HEAD CONSISTING OF RED, YELLOW AND GREEN LEFT ARROW SECTIONS
  - VEHICLE SIGNAL HEAD CONSISTING OF RED, YELLOW, AND GREEN RIGHT ARROW SECTIONS
  - VEHICLE SIGNAL HEAD CONSISTING OF RED, YELLOW AND GREEN BACKPLATE SECTIONS
  - VEHICLE SIGNAL HEAD CONSISTING OF RED, YELLOW AND GREEN LEFT ARROW SECTIONS
  - VEHICLE SIGNAL HEAD CONSISTING OF RED, YELLOW, AND GREEN RIGHT ARROW SECTIONS
  - VEHICLE SIGNAL HEAD WITH BACKPLATE AND 3-SECTIONS: RED, YELLOW, AND GREEN
  - VEHICLE SIGNAL HEAD WITH BACKPLATE AND VISOR
  - VEHICLE SIGNAL HEAD WITH BACKPLATE AND 3-SECTIONS: RED, YELLOW, AND GREEN
  - VEHICLE SIGNAL HEAD WITH BACKPLATE AND VISOR
  - CONTROLLER ASSEMBLY, DOOR INDICATES FRONT OF CABINET
**EQUIPMENT IDENTIFICATION**

**ILLUMINATED SIGN IDENTIFICATION NUMBER:**

- SIGN NO.: 12345
- TRANSFORMER RATING (VA): 10
- LIGHTING CONTROL TYPE: LTS
- NUMBER AND TYPE OF FIXTURES: D0020.500
- DO NOT PLACE ON STANDARD OR STRUCTURE

**ELECTRICIEN OR EQUIPMENT IDENTIFICATION NUMBER:**

- WAND ARM LENGTH, IF SHOWN: 10
- DO NOT PLACE ON STANDARD OR STRUCTURE
- EQUIPMENT NUMBER: 10
- NUMBER AND TYPE OF STRUCTURE: EXISTING

**CONDUIT AND CONDUCTOR IDENTIFICATION:**

- 1/2"C, 2X10, 3X14, 2 DCL, 10X18:
  - NUMBER AND SIZE OF CONDUCTORS AND CABLES: 1/2"C
  - SIZE OF CONDUIT IN INCHES: 1/2"
  - TRAFFIC PHASE IDENTIFICATION FOR SIGNALS, DETECTORS AND PHASE DIAGRAMS:
  - LEGEND NUMBERS:
    - A: EQUIPMENT
    - B: SIGNAL POLES
    - C: INSTALLATION OR ITEMS
    - D: CONDUIT RUN NUMBERS
  - SIGNAL AND LIGHTING STANDARD (TYPICAL DESIGNATION):
    - 1/2"C, 100: WIND VELOCITY = 100 mph
    - CASE 3 ARM LOADING: NO SCALE

**WIRING DIAGRAM LEGEND**

- ---: EXTERNAL CONDUCTOR
- O: CONDUCTOR OR BUS
- O: TIE POINT
- O: CONTINUATOR OR BUS
- O: CONTACT BLOCKS
- O: CONTINUATOR, NO CONTACT
- O: ENCLOSURE BOND
- O: GROUNDING ELECTRODE
- O: CIRCUIT BREAKER
- O: RECEPTACLE
- O: TERMINAL BLOCKS
- O: ENCLOSURE BOND
- O: EXTERNAL CONDUCTOR
- O: ENCLOSURE BOND

**PULL BOXES**

- NEW
- EXISTING
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- PULL BOX, NO. 5 UNLESS OTHERWISE INDICATED OR NOTED
- PULL BOX, ADDITIONAL DESIGNATIONS OR DESCRIPTIONS
- PULL BOX, ADDITIONAL DESIGNATIONS OR DESCRIPTIONS

- CASE 3 ARM LOADING:
  - NO SCALE

**VEHICLE DETECTORS**

- VEHICLE DETECTOR DESIGNATION:
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- ROCK AND VEHICLES IDENTIFICATION:
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- DETECTORS AND PHASE DIAGRAMS:
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**CONDUIT AND CONDUCTOR IDENTIFICATION:**

- 1/2"C, 2X10, 3X14, 2 DCL, 10X18:
  - NUMBER AND SIZE OF CONDUCTORS AND CABLES: 1/2"C
  - SIZE OF CONDUIT IN INCHES: 1/2"

**MISCELLANEOUS EQUIPMENT**

- NEW
- EXISTING
- ---
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- ---

- CHANGEABLE MESSAGE SIGN
- CIRCUIT TELEVISION CAMERA
- HIGHWAY ADVISORY RADIO POLE AND ANTENNA
- LED EXTENDABLE MESSAGE SIGN
- DETECTION DEVICE
  - M: MICROWAVE SENSOR
  - V: VIDEO IMAGE SENSOR

**STATE OF CALIFORNIA**

**DEPARTMENT OF TRANSPORTATION**

**ELECTRICAL SYSTEMS**

**LEGEND**

**NO SCALE**

Return to Table of Contents
NOTES:
1. In unpaved areas, a raised Portland cement concrete pad of 2'-0" x 4' x width of service equipment enclosure or controller cabinet foundation shall be constructed in front of Type II service equipment enclosure.
2. Circuit breakers may be mounted in the vertical or horizontal position.
The plan shows the approximate location of devices within the enclosure. Components may be rearranged, however, the "working" clearances within the service equipment enclosure shall be maintained.

1. In unpaved areas a raised Portland cement concrete pad 2'-0" x 4' x width of foundation shall be constructed in front of new service equipment enclosure installation. Pad shall be set to elevation of foundation.

2. Plug-in circuit breakers may be mounted in the vertical or horizontal position. Cable-in/cable-out circuit breakers shall be mounted in the vertical position.

3. Type B-MF and Type B-MF service equipment enclosures shall have the meter viewing windows located on the front side of the service equipment enclosures.

4. Type B-MF and Type B-MF service equipment enclosure shall be similarly constructed as Type B-MF and Type B-MF respectively, except the meter viewing windows shall be located on the back side of the service equipment enclosures.
5. Item 12, 20 and 27 shall be gang-operated CB.

4. Type I photoelectric control shall be used unless otherwise indicated on the plans.

3. Items 1 and 6 shall be isolated from the service equipment enclosure.

2. Connect to remote test switch mounted on lighting equipment enclosure as shown.

1. Items 1 through 11 shall be provided for each service equipment enclosure.

NOTES:

1. Unless otherwise indicated on the plans, service equipment items shall be provided for each service equipment enclosure as shown.

2. Connect to remote test switch mounted on lighting equipment enclosure as shown.

3. Items 1 through 11 shall be isolated from the service equipment enclosure.

4. Type I photoelectric control shall be used unless otherwise indicated on the plans.

5. Items 12, 20 and 27 shall be gang-operated CB.
RETURN TO TABLE OF CONTENTS
### THREE PHASE, 2" SERVICE EQUIPMENT ENCLOSURE

#### Details:
- **Connection**: Remote test switch mounted from the service equipment enclosure.
- **Terminal Blocks**: Photoelectric unit (NOTE 4) and automatic test switch.
- **Insulation Color**: Color of insulation of the neutral shall be color indicated on the plans.
- **Neutral Bus (240 V)**: Neutral bus (240 V) 30 A, 2P, NO CONTACTOR.
- **Main Breaker (480 V)**: Main breaker (480 V) 30 A, 2P, NO CONTACTOR.
- **Service Entrance**: Service entrance 20 A, 120 V, 1P, CB.

#### Table: 277/480 V Service Wiring Diagram (Typical)

<table>
<thead>
<tr>
<th>Item</th>
<th>Component</th>
<th>Nameplate Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Neutral LLG</td>
<td>30 A, 120 V, 1P, CB</td>
</tr>
<tr>
<td>2</td>
<td>Landing Lug</td>
<td>20 A, 120 V, 1P, CB</td>
</tr>
<tr>
<td>3</td>
<td>Test Bypass Facility</td>
<td>10 A, 277 V, 1P, CB</td>
</tr>
<tr>
<td>4</td>
<td>Meter Socket and Support</td>
<td>10 A, 277 V, 1P, CB</td>
</tr>
<tr>
<td>5</td>
<td>Terminal Blocks</td>
<td>15 A, 1P, TEST SWITCH</td>
</tr>
<tr>
<td>6</td>
<td>Neutral Bus Neutral Bus (480 V)</td>
<td>30 A, 2P, NO CONTACTOR</td>
</tr>
<tr>
<td>7</td>
<td>Neutral Bus Neutral Bus (240 V)</td>
<td>15 A, 120 V, 1P, CB</td>
</tr>
<tr>
<td>8</td>
<td>Ground Bus</td>
<td>120 V, 1OE</td>
</tr>
<tr>
<td>9</td>
<td>Grounding Electrode</td>
<td>20 A, 120 V, 1P, CB</td>
</tr>
<tr>
<td>10</td>
<td>30 A, 2P, NO CONTACTOR</td>
<td>20 A, 480 V, 3P, CB</td>
</tr>
<tr>
<td>11</td>
<td>Transformer (277/480 V)</td>
<td>40 A, 480 V, 3P, CB</td>
</tr>
<tr>
<td>12</td>
<td>Transformer (120 V)</td>
<td>50 A, 120 V, 1P, CB</td>
</tr>
<tr>
<td>13</td>
<td>100 A, 480 V, 3P, CB</td>
<td>MAIN BREAKER (480 V)</td>
</tr>
<tr>
<td>14</td>
<td>15 A, 480 V, 2P, CB</td>
<td>LIGHTING (480 V)</td>
</tr>
</tbody>
</table>

#### Notes:
1. Unless otherwise indicated on the plans, service equipment items shall be provided for each service equipment enclosure as shown.
2. Connect to remote test switch mounted on loading standard, sign post or structure when required.
3. Items No. 1, 2 and 3 shall be isolated from the service equipment enclosure, unless otherwise indicated on the plans.
4. Type D photoelectric control shall be used unless otherwise indicated on the plans.
5. Color of insulation of the neutral shall be gray for the 277/480 V system and shall be white for the 120/240 V system.
6. Items 5, 6 and 7 shall be ganged operated CBs.
7. The NEMA 3R enclosure shall be located to the side of the service equipment enclosure unless otherwise indicated on the plans.
8. The base dimension for the NEMA 3R enclosure for the transformer shall be as per manufacturer's design.
1. Cabinet dimensions are nominal.
2. Cabinet fan may be installed at an alternate location near the top of the cabinet when approved by the Engineer.

**NOTES:**

- Slip fitter, rain tight holes
- Screened vent, 3/8" or longer
- Filtered ventilating louvers
- Air filter
- Ventilation housing with electric fan
- Police panel when required
- Ductile iron gusset (4 required)
- Gasket sealing bead

**GENERAL:**

- Door stop detail (2 positions)
- Optional electric fan
- Optional gusset
- Optional door stop
- Optional ventilation housing
- Optional air filter

**ELECTRICAL SYSTEMS (CONTROLLER CABINET DETAILS):**

- No scale

**RETURN TO TABLE OF CONTENTS**
**NOTES:**

1. Foundation shall be located to provide 2'-0" minimum clearance between face of curb and any portion of cabinet.
2. Controller units, plug-mounted equipment, shelf-mounted equipment and wall-mounted equipment shall be located to permit safe and easy removal or replacement without removing any other piece of equipment.
3. Cabinet fan may be installed at an alternate location near the top of the cabinet when approved by the Engineer.
4. Where telephone interconnect is required, a minimum of 5" vertical space shall be provided inside the cabinet for the equipment.
5. Telephone interconnect conductors shall be enclosed in ⅝" conduit through the foundation. Type 4 conduit or larger conduit through the foundation. Type 4 conduit shall be used to separate telephone and power conductors in cabinets.

**CONTROLLER CABINET FOUNDATION AND PAD DETAILS**

- TOP VIEW
  - BBS CABINET DOOR
  - FRONT DOOR
  - CONDUIT AREA
- SIDE VIEW
  - MODEL 332L, 334L OR 334LC CABINET
  - ANCHOR BOLTS (2 Min) ¾" Ø x 1'-3" WITH A 2"-90° BEND (4 Min)
- BASE PLAN FOR BBS MOUNTED TO THE MODEL 332L CABINET
- LEFT SIDE INSTALLATION DETAIL A
  - MODEL 332L, 334L OR 334LC CABINET
  - ANCHOR BOLTS WITH A 2"-90° BEND (4 Min)
- RIGHT SIDE INSTALLATION DETAIL B
  - MODIFIED MODEL 332L CABINET
  - FOUNDATION DETAIL FOR BATTERY BACKUP SYSTEM

**CONSULTANT CREDENTIALS**

- Oct 30, 2015
- State of California
- Department of Transportation
- Registered Electrical Engineer
- Strachan Engineering
- Aziz Gabriel
- Theresa E15129

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Use Type G cabinet foundation. Mount cabinet on Type G cabinet pedestal (see ES-3B). For termination cabinet:

1. Dimensions are nominal.
2. The steel pedestal, base plate, bolt circle and foundation for the telephone demarcation cabinet shall be the same as that shown for a Type 1-C Standard. The steel pedestal shall be 2'-3" to 2'-6" in length. Anchor bolts shall be 3/8" x 1'-6" with a 2" - 90° bend. Four bolts required per cabinet.
3. Telephone interconnect conductors shall be enclosed in a 3/4" or larger conduit through the foundation. Type 4 conduit shall be used to separate telephone and power conductors in the cabinet and pedestal.
4. For termination cabinet:
   a. Mount cabinet on Type G cabinet pedestal (see ES-3B).
   b. Use Type G cabinet foundation.

**Fastener Schedule**

- BACKBOARD: 4 - 3/8" (LENGTH) WOOD SCREWS
- 2 SHELF SUPPORTS: 4 - 3/8" (LENGTH) WOOD SCREWS
- JUNCTION BOX: 4 - 3/8" (LENGTH) WOOD SCREWS
- TERMINAL BLOCK: 4 - 3/8" (LENGTH) WOOD SCREWS

**Electrical Systems (Telephone Demarcation Cabinet, Type A)**

- 15 A, 1P, CB
- DUPLEX RECEPTACLE
- NON-GFCI
- GFCI
- 2 SHELF SUPPORTS
- BACKBOARD
- BOTTOM SHELF
- KNOCKOUTS (3)
- TERMINAL BLOCK (12 POSITIONS)
- LABEL "GFCI"
NOTES:
1. Dimensions are nominal.
2. Hardware for fastening of mounting boards:
   a. Fasten backboard A and backboard B to telephone demarcation cabinet with 1/4" x 1/2" stainless steel carriage bolts (8 required).
   b. Fasten hinged metal bracket to backboard B and backboard C to hinged metal bracket with number 10 x 3/4" wood screws (8 required).
**NOTES:**
1. See Standard Plan H10 for other details.
2. Underground electrical work done prior to foundation installation.
ABBREVIATIONS:

SY  SIDE MOUNTED SIGNAL HEADS
T  TERMINAL COMPARTMENT
TV  TOP MOUNTED SIGNAL HEADS

1, 2, 3, 4  NUMBER OF SIGNAL FACES
A - SECTION, UNLESS OTHERWISE INDICATED
B, C, D  CONFIGURATION OF SIGNALS

NOTES:

1. Mountings shall be oriented to provide maximum horizontal clearance to adjacent roadway.
2. Bracket arms shall be long enough to permit proper alignment of signals and backplate installation.
Notes:
1. Mounting shall be oriented to provide maximum horizontal clearance to adjacent roadway.
2. Bracket arms shall be long enough to permit proper alignment of signals.

Abbreviations:
1, 2 - Number of signal faces
SP - Side mounted pedestrian signal
T - Terminal compartment
TP - Top mounted pedestrian signal

Person walking interval
Flashing upraised hand interval
Steady upraised hand interval
LED countdown pedestrian signal face module
**SIGNAL STANDARD PLACEMENT DIMENSIONS AND EQUIPMENT LOCATIONS**

1. **Typical signal pole placement unless dimensioned on plans.**

2. **For A and B dimensions, see Pole Schedule.**

**NOTES:**
1. Typical signal pole placement unless dimensioned on plans.
2. For A and B dimensions, see Pole Schedule.

**SIGNAL STANDARD PLACEMENT DIMENSIONS AND EQUIPMENT LOCATIONS**

**VISORS**
- 8" in diameter for 8" sections
- 12" in diameter for 12" sections

**BACKPLATE**
- Drill signal face and attach backplate with six 10-24 or 10-32 self-tapping and locking stainless steel machine screws and flat washers.
- 8" and 12" sections

**DIRECTIONAL LOUVER**
- Directional louvers shall be oriented toward intersection and secured in place with one plated brass machine screw and nut.

**TYPICAL SIGNAL HEAD INSTALLATIONS**
- **Top mounted signals (TV)**
  - Type 1-A, 1-B, 1-C, and 1-D standard as indicated on the plans
- **Side mounted signals (SV and SP)**
  - Normally used on standards with luminaire or signal mast arm
- **Left turn lane signal**
  - Type 1-A, 1-B, 1-C, and 1-D standard as indicated on plans

**SIGNAL FACES**
- **U-turn**
- **Bicycle**
- **Lane control**
- **Lane control**

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

**ELECTRICAL SYSTEMS**
(SIGNAL HEADS AND MOUNTINGS)

**NO SCALE**

---

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TOP MOUNTINGS

SIGNAL SLIP FITTERS

3 CADMIUM PLATED STEEL SET SCREWS

1 TO 4 OPENINGS AS REQUIRED

MISCELLANEOUS MOUNTING HARDWARE

3. 2. 1.

COVER
CABLE GUIDE

SECTION A-A

SECTION B-B

TOP MOUNTING
SIDE MOUNTING

TERMINAL COMPARTMENT

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DEPARTMENT OF TRANSPORTATION

ELECTRICAL SYSTEMS
(SIGNAL HEAD MOUNTING)

NO SCALE
**DEPARTMENT OF TRANSPORTATION**

**STATE OF CALIFORNIA**

**ELECTRICAL SYSTEMS**

- **Ø x 2" CARRIAGE BOLTS**
- **WITH 1" HUBS**
- **2-WAY CENTER SUPPORT**
- **BLANK COVER**
- **Ø - 20 Hex NUTS**
- **LOCK WASHER**
- **WASHER**
- **SLIP FITTER**
- **SERRATIONS**
- **Detail A**
  - **... Ø x ½ Hex HEAD COVER SCREW**, **BACKPLATE**, **LOCK WASHER**, **SHAKE PROOF TOP OF SIGNAL HEAD**
  - **1 ⅛ NPS NIPPLE OR SEALING COMPOUND SEAL WITH A GASKET FLAT WASHER**, **Detail B**
  - **VISIBLE ABOVE BACKPLATE MAST ARM MOUNTINGS**
  - **PIPE TENON MAST ARM OR BACKPLATE TYPE MAS-4B FITTER SLIP PIPE TENON MAST ARM OR TYPE MAS-4C FITTER SLIP BACKPLATE SEE DETAIL A TYPE MAS-5A TYPE MAS-5B TYPE MAS-4A TYPE MAT TYPE MAS**

**OPTICAL DETECTOR MOUNTING FOR EMERGENCY VEHICLE DETECTION DETAIL B**

**OPTICAL DETECTOR SHALL BE VISIBLE ABOVE BACKPLATE**

**OPTICAL DETECTOR MOUNTING FOR**

**STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION**

**ELECTRICAL SYSTEMS**

**(SIGNAL HEADS AND OPTICAL DETECTOR MOUNTING)**

**NO SCALE**

---

**Aziz Gabriel**

**October 30, 2015**

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SAWCUT DETAILS
Type A loop detector configurations illustrated
1. 1A thru 4A = 1 Type A loop configuration in each lane.
2. 1B thru 4B = 1 Type B loop configuration in each lane.
3. 1C = 1 Type C loop configuration entering lanes as required.
4. 1D thru 4D = 1 Type D loop configuration in each lane.
5. 1E thru 4E = 1 Type E loop configuration in each lane.
6. 1F thru 4F = 1 Type F loop configuration in each lane.
Use Type A, B, C, D, E or F loop detector configurations only when specified or shown on plans.

SECTION A-A
SECTION B-B
SECTION C-C
SLOT DETAILS - TYPE 1 AND TYPE 2 LOOP CONDUCTOR

ABBREVIATIONS:
S - START
F - FINISH

TYPICAL LOOP CONNECTIONS
Dashed lines represent the pull box

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION
ELECTRICAL SYSTEMS
LOOP DETECTORS
NO SCALE
NOTES:
1. Round corners of acute angle sawcuts to prevent damage to conductors.
2. Typical distance separating loops from edge to edge is 10' for Type A, B, D, and E installations in single lanes.
3. Use Type D loops for limit line detector installations in left turn and bicycle lanes.
NOTES:
1. Back casting shape to fit curvature of pole.
2. Provide cover fitting for top of post, when PBA is mounted on push button assembly post.
3. Install push button on crosswalk side of standards.
4. Use R10 series regulatory signs and plaques for pedestrian and bicycle facilities.
Curb Termination Details

- **Type A**
  - Pull box
  - Curb
  - Conduit
  - Sealant
  - See notes 1 and 7

- **Type B**
  - Pull box
  - See notes 1 and 17
  - Conduit
  - Sealant
  - See note 3

**Curb Termination Details**

- Pull box
- See notes 1 and 7
- Curb
- Conduit
- See note 3

**Plan View**

- Sections C-C
- Type C
- Curb termination detail
- Paving joint
- Type 3 conduit
- Saw slot
- For loop wire
- Conductor pairs
- Type 3 conduit

**Cross Section**

- Pavement joint
- Type 3 conduit
- Saw slot
- For loop wire
- Conductor pairs
- Type 3 conduit

**Pavement Joint**

- Type 3 conduit
- Saw slot
- For loop wire

**Section C-C**

- Type C
- Curb termination detail
- Paving joint
- Type 3 conduit
- Saw slot
- For loop wire
- Conductor pairs
- Type 3 conduit

**Notes:**

1. Bushing shall be used at end of conduit.
2. Tape detector conductors or cables 3" each side of bushings.
3. Install duct seal compound to each end of terminus conduit before installing sections.
4. Round all sharp edges to detector conductors or cables have to pass.
5. End of conduit shall be 3½" below roadway surface.
6. Conduit size
   - Loop conductors
     - ½" minimum
     - ½" minimum 5 or more pairs
   - Conduit size
     - ½" minimum
     - ½" minimum 5 or more pairs
7. Splice detector conductors or cables to detector lead-in-cable.
8. Location of detector handhole when shown on plans.
9. When the shoulder and traveled way are paved with the same material and there is no joint between them, the conduit shall extend only 2'-0" into the shoulder pavement.
10. ½" Type 3 conduit 6" long minimum, plug both ends with duct compound to keep out sealant.
11. ½" minimum between top of conduit and pavement surface.
12. Saw cut shall not exceed 1" in width and ½" longer than conduit to be installed.
13. Conductors with ½" minimum slack inside conduit.
TYPE 15 AND TYPE 21
ELEVATION A

TYPE 15 AND TYPE 21 BARRIER RAIL MOUNTED
ELEVATION B

<table>
<thead>
<tr>
<th>POLE TYPE</th>
<th>POLE DATA</th>
<th>CYLINDER CIRCLE THICKNESS ANCHOR BOLT SIZE</th>
<th>BASE PLATE DATA</th>
<th>LUMINAIRE MAST ARM DATA</th>
</tr>
</thead>
<tbody>
<tr>
<td>15</td>
<td>35'-0&quot;</td>
<td>3%&quot; 0.1196&quot; 1'-0&quot; 1&quot; 1# x 3'-0&quot;</td>
<td>BASE PLATE</td>
<td>TOTAL PROJECT</td>
</tr>
<tr>
<td>21</td>
<td>35'-0&quot;</td>
<td>3%&quot; 0.1196&quot; 1'-0&quot; 1&quot; 1# x 3'-0&quot;</td>
<td>BASE PLATE</td>
<td>TOTAL PROJECT</td>
</tr>
</tbody>
</table>

* FOR BARRIER RAIL BOLTS, SEE STANDARD PLAN ES-66.

NOTES:
1. Indicates mast arm length to be used unless otherwise noted on the plans.
2. For Type 15-SB, use Type 15 standard with Type 30 slip base plate details, see Standard Plan ES-6F.
3. Handhole shall be located on the downstream side of traffic.
4. For additional notes and details, see Standard Plans ES-7M and ES-7N.

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DEPARTMENT OF TRANSPORTATION

ELECTRICAL SYSTEMS
(LIGHTING STANDARD, TYPES 15 AND 21)

NO SCALE

ES-6A
Pouring by means of anchor plates and suitable templates.

1. Anchor bolt or stud length shall be such that thread extends 1⁄4" maximum above nut on level base plate after grouting. See Detail N.

2. Electrolier anchor bolts shall be held in position for pouring by means of anchor plates and suitable templates. Deviation from the true position, vertical and height shall not exceed 1⁄4".

3. See railing sheets for reinforcement and structural details of electroliers and pull boxes.

**Table BC**

<table>
<thead>
<tr>
<th>Type</th>
<th>BC = Bolt Circle</th>
<th>Anchor Bolt Diameter</th>
<th>Coupling Nut Basic Length</th>
<th>Set Screw Length Detail B-2</th>
</tr>
</thead>
<tbody>
<tr>
<td>15</td>
<td>1&quot;</td>
<td>1 1/2&quot;</td>
<td>3&quot;</td>
<td>1&quot;</td>
</tr>
<tr>
<td>21</td>
<td>1 1/2&quot;</td>
<td>1 1/2&quot;</td>
<td>3 1/2&quot;</td>
<td>1 1/2&quot;</td>
</tr>
</tbody>
</table>

**Notes:**

1. Anchor bolt or stud length shall be such that thread extends 1⁄4" maximum above nut on level base plate after grouting. See Detail N.

2. Electrolier anchor bolts shall be held in position for pouring by means of anchor plates and suitable templates. Deviation from the true position, vertical and height shall not exceed 1⁄4".

3. See railing sheets for reinforcement and structural details of electroliers and pull boxes.
**LUMINAIRE MAST ARM DATA**

<table>
<thead>
<tr>
<th>W Proj Length</th>
<th>N Rise</th>
<th>Min CG at Pole</th>
<th>Nominal Thickness</th>
</tr>
</thead>
<tbody>
<tr>
<td>15'-0&quot;</td>
<td>4'-9&quot;</td>
<td>4 1/2&quot;</td>
<td>0.1196&quot;</td>
</tr>
<tr>
<td>20'-0&quot;</td>
<td>2'-6&quot;</td>
<td>5&quot;</td>
<td>0.1793&quot;</td>
</tr>
</tbody>
</table>

**POLE DATA**

<table>
<thead>
<tr>
<th>Pole Extension Type</th>
<th>Height &quot;H&quot;</th>
<th>Min OD Base</th>
<th>Thickness</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>5'-0&quot;</td>
<td>4 1/2&quot;</td>
<td>5/8&quot;</td>
</tr>
<tr>
<td>10</td>
<td>10'-0&quot;</td>
<td>5&quot;</td>
<td>5/8&quot;</td>
</tr>
</tbody>
</table>

**POLE DATA**

<table>
<thead>
<tr>
<th>Pole Extension Type</th>
<th>Height &quot;H&quot;</th>
<th>Min OD Top</th>
<th>Thickness</th>
</tr>
</thead>
</table>

**NOTES:**

1. The Contractor shall verify all controlling field dimensions before ordering or fabricating any material.
2. Bolt hole locations may vary at the discretion of the Engineer.
3. Wind Loading (Fastest Mile): 80 mph AASHTO.
5. Unit stresses (Structural Steel):
   - $f_y = 55,000$ psi tapered steel tube (pole)
   - $f_y = 50,000$ psi unless otherwise noted

**ELEVATION A**

- **Shim Detail:**
  - Furnish shims 0.012" thick and G305" thick. Shims shall be fabricated brass shim stock or galvanized steel.

**DETAIL A**

- **1" - BNC - 2 1/4" long HS Cap Screws**
  - Shim as required to plumb pole, calm around base plate after installation for main tight joint.

**SECTION K-K**

- **Upper Chord Plate**
  - See Note 4

- **Central Hole in Base Plate Diameter = Pole Inside Diameter = 2"**
  - **1/4" hole for 1" HS Cap Screws, total 4**

- **1/2" square**
  - Truss Axis
  - Truss Axis

- **Drill and tap thru chord plate for 1" HS cap screws, total 4 holes equally spaced**

**ES-6C**

**STATE OF CALIFORNIA**

**DEPARTMENT OF TRANSPORTATION**

**ELECTRICAL SYSTEMS**

(Lighting Standard, Types 5 and 10, Overhead Sign Mounted)

**NO SCALE**

**Signed:**

- Stanley P. Johnson
  - Registered Civil Engineer
  - C57793

Date:

- October 30, 2015

**Return to Table of Contents**
TYPE 31 ROUND TAPERED STEEL POLE
3½" x 10½" Min OD x 35'-0",
WALL THICKNESS 0.1793".

TYPE 31 ROUND TAPERED STEEL POLE
5½" x 10½" Min OD x 35'-0",
WALL THICKNESS 0.1793".

PROJECTED LENGTH OF LUMINAIRE MAST ARM
15'-0" UNLESS OTHERWISE NOTED

NOTE:
1. For slip base plate details, see Standard Plan ES-6F.
2. For Type 30 fixed base use Type 15 base plate and foundation shown on Standard Plan ES-6A. Use 1½" Dia x 3'-6" anchor bolts.
3. For Type 31 fixed base use Type 32 base plate, anchor bolts and foundation on Standard Plan ES-6D.
4. Handhole shall be located on the downstream side of traffic.
5. For additional notes and details, see Standard Plans ES-7M and ES-7N.
1. Handhole shall be located on the downstream side of traffic.
2. For additional notes and details, see Standard Plans ES-7M and ES-7N.

**Notes:**

- **Detail A:**
  - Provide removable rain tight cap
  - 2 1/4" hole for electrical conductors
  - 9/4" x 1" x 9/4"

- **Detail B:**
  - Metal sleeve at each weld joint
  - 1 1/4" hole for 1 1/4" anchor bolts, total 4

- **Detail C:**
  - Base plate detail
NOTES:
1. For additional notes, details and data for Type 15TS and Type 21TS Standards, see Standard Plan ES-6A.
2. Handhole shall be located on the downstream side of traffic.

DETAIL A
TYPE 15TS AND 21TS
ELEVATION A

DETAIL B
PUSH BUTTON ASSEMBLY POST

DETAIL C
COMBINED STREET SIGN

POLE DATA
<table>
<thead>
<tr>
<th>POLE TYPE</th>
<th>MIN. WD</th>
<th>WALL THICKNESS</th>
<th>DEC # BOLT CIRCLE</th>
<th>THICKNESS</th>
<th>ANCHOR BOLT SIZE</th>
<th>DEPTH</th>
</tr>
</thead>
<tbody>
<tr>
<td>15TS</td>
<td>30'-0&quot;</td>
<td>6&quot;</td>
<td>0.1793&quot;</td>
<td>1'-3&quot;</td>
<td>1'-0&quot;</td>
<td>2'</td>
</tr>
<tr>
<td>21TS</td>
<td>35'-0&quot;</td>
<td>9&quot;/6&quot;</td>
<td>1'-3&quot;</td>
<td>1'-2&quot;</td>
<td>1½&quot; # x 42&quot;</td>
<td>9'-6&quot;</td>
</tr>
</tbody>
</table>

ELEVATION
BASE PLATE

SECTION

PUSH BUTTON ASSEMBLY POST

COMBINED STREET SIGN

PUSH BUTTON ASSEMBLY POST

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

ELECTRICAL SYSTEMS
(SIGNAL AND LIGHTING STANDARD, TYPE TS, AND PUSH BUTTON ASSEMBLY POST)

NO SCALE

ES-7A

Return to Table of Contents
**Signal Mast Arm Connection**

**Detail D**

**Signal Mast Arm Data**

<table>
<thead>
<tr>
<th>Mast Arm Length</th>
<th>Height at Pole</th>
<th>B (TOP)</th>
<th>C (Bottom)</th>
<th>D (TOP)</th>
<th>E (Bottom)</th>
<th>Projected Length</th>
<th>Design Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>15'-0&quot;</td>
<td>3'-0&quot;</td>
<td>2'-6&quot;</td>
<td>1'-0&quot;</td>
<td>3'-0&quot;</td>
<td>2'-6&quot;</td>
<td>1'-0&quot;</td>
<td>15'-0&quot;</td>
</tr>
<tr>
<td>18'-6&quot;</td>
<td>3'-0&quot;</td>
<td>2'-6&quot;</td>
<td>1'-0&quot;</td>
<td>3'-0&quot;</td>
<td>2'-6&quot;</td>
<td>1'-0&quot;</td>
<td>18'-6&quot;</td>
</tr>
<tr>
<td>21'-0&quot;</td>
<td>3'-0&quot;</td>
<td>2'-6&quot;</td>
<td>1'-0&quot;</td>
<td>3'-0&quot;</td>
<td>2'-6&quot;</td>
<td>1'-0&quot;</td>
<td>21'-0&quot;</td>
</tr>
<tr>
<td>25'-0&quot;</td>
<td>3'-0&quot;</td>
<td>2'-6&quot;</td>
<td>1'-0&quot;</td>
<td>3'-0&quot;</td>
<td>2'-6&quot;</td>
<td>1'-0&quot;</td>
<td>25'-0&quot;</td>
</tr>
<tr>
<td>30'-0&quot;</td>
<td>3'-0&quot;</td>
<td>2'-6&quot;</td>
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<td>3'-0&quot;</td>
<td>2'-6&quot;</td>
<td>1'-0&quot;</td>
<td>30'-0&quot;</td>
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</table>

**Luminaire Mast Arm**

<table>
<thead>
<tr>
<th>Mast Arm Length</th>
<th>Height at Pole</th>
<th>B (TOP)</th>
<th>C (Bottom)</th>
<th>D (TOP)</th>
<th>E (Bottom)</th>
<th>Projected Length</th>
<th>Design Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>15'-0&quot;</td>
<td>3'-0&quot;</td>
<td>2'-6&quot;</td>
<td>1'-0&quot;</td>
<td>3'-0&quot;</td>
<td>2'-6&quot;</td>
<td>1'-0&quot;</td>
<td>15'-0&quot;</td>
</tr>
<tr>
<td>18'-6&quot;</td>
<td>3'-0&quot;</td>
<td>2'-6&quot;</td>
<td>1'-0&quot;</td>
<td>3'-0&quot;</td>
<td>2'-6&quot;</td>
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<td>18'-6&quot;</td>
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<td>1'-0&quot;</td>
<td>3'-0&quot;</td>
<td>2'-6&quot;</td>
<td>1'-0&quot;</td>
<td>25'-0&quot;</td>
</tr>
<tr>
<td>30'-0&quot;</td>
<td>3'-0&quot;</td>
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<td>2'-6&quot;</td>
<td>1'-0&quot;</td>
<td>30'-0&quot;</td>
</tr>
</tbody>
</table>

**Base Plate Data**

- **Type 16-1-100, 18-1-100**
  - Height at Pole: 17'-6"
  - B: 17'-6"
  - C: 17'-6"
  - D: 17'-6"
  - E: 17'-6"
- **Type 19-1-100, 19A-1-100**
  - Height at Pole: 17'-6"
  - B: 17'-6"
  - C: 17'-6"
  - D: 17'-6"
  - E: 17'-6"

**Electrical Systems (Signal and Lighting Standard, Case 1 Signal Mast Arm Loading, Wind Velocity = 100 MPH and Signal Mast Arm Lengths 15' to 30')**

- **No Scale**

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**NOTES:**

- **Type 16-1-100, 18-1-100**
  - Height at Pole: 17'-6"
  - B: 17'-6"
  - C: 17'-6"
  - D: 17'-6"
  - E: 17'-6"
- **Type 19-1-100, 19A-1-100**
  - Height at Pole: 17'-6"
  - B: 17'-6"
  - C: 17'-6"
  - D: 17'-6"
  - E: 17'-6"

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**Diagram and Details**

- Diagram showing signal mast arm connection, base plate, and luminaire mast arm data.

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**State of California Department of Transportation**
This page contains a detailed engineering drawing related to signal mast arm connection details. The drawing includes various sections such as Elevation A, View A-A, Detail A, Detail B, and Elevation B. The content provides specifications for mast arm lengths, wind velocity, and other relevant parameters. The drawing is part of the 2015 Standard Plan ES-7G, specifically for signal mast arm loading, with a wind velocity of 100 MPH and signal mast arm lengths of 50' to 55'.
NOTES:
1. Handhole shall be located on the downstream side of traffic.
2. Install flashing beacons and sign frame. Flashing beacons shall be WA mounted on pipe tenon (See Standard Plan ES-7M, Detail 5).
3. Vertical clearance shall be 17'-0" minimum between roadway and bottom of signal panel or lighting fixture bracket.
4. Special provisions or plans will indicate when sign lighting fixture is required on Type 9A or 9B sign frames.
5. Type 9 sign frames shall be provided with a 3'-0" fluorescent fixture. For fluorescent lighting details, see Standard Plans ES-7L, Detail F and ES-15B.
7. For additional notes and details, see Standard Plan ES-7L, Detail B-3.
8. 12" flashing beacon with signal indication, standard visor and 5" x 5" backplate (total 2).
**ELECTRICAL SYSTEMS**

**(FLASHING BEACON WITH TYPE 9, 9A AND 9B SIGN)**

**NO SCALE**

- **Detail B-1**: Sign Frame Mounting Details
  - All Types
  - **Detail B**
    - **POLE TOP DETAIL**
      - **Detail E**
        - **SIGN LIGHTING FIXTURE**
          - **Type C Conduit Fitting**
          - **1/2" Close Nipple**
            - **Drill and Tap Mast Arm**
        - **Conduit Fitting Capped Elbow**
        - **Type C Conduit Fitting**
        - **Conduit Clamp**
        - **1/2" Plastic Strap**
        - **1/2" X 1/4" Strap**
        - **1/4" Close Nipple**
          - **Drill and Tap Mast Arm**
      - **Sign Panel**
    - **SIGN LIGHTING FIXTURE**
      - **Type C Conduit Fitting**
      - **1/2" Close Nipple**
        - **Drill and Tap Mast Arm**
      - **Conduit Fitting Capped Elbow**
    - **Conduit Clamp**
    - **1/2" Plastic Strap**
    - **1/2" X 1/4" Strap**
    - **1/4" Close Nipple**
      - **Drill and Tap Mast Arm**
  - **SIGN PANEL**
  - **Mast Arm**
  - **Mast Arm Plate**
  - **Conduit Clamp**
  - **Conduit Fitting Capped Elbow**
  - **Type C Conduit Fitting**
  - **1/2" Close Nipple**
    - **Drill and Tap Mast Arm**

- **Detail C**: Base Plate and Anchorage Detail
  - **Detail D**: Sign Lighting Details
    - **Types 9A and 9B**
      - **Detail D**
        - **Conduit Clamp**
        - **1/2" Plastic Strap**
        - **1/2" X 1/4" Strap**
        - **1/4" Close Nipple**
          - **Drill and Tap Mast Arm**
  - **Fluorescent Lighting Fixture**
  - **Type C Conduit Fitting**
  - **Conduit Fitting Capped Elbow**
  - **Type C Conduit Fitting**
  - **Conduit Clamp**

- **Detail B-2**: Flashing Beacon Mast Arm Connection Details
  - **Flash Beacon Mast Arm**
  - **Connection Details**
  - **DETAIL B-2**
  - **POLE TOP DETAIL**
    - **Detail E**
      - **SIGN LIGHTING FIXTURE**
        - **Type C Conduit Fitting**
        - **1/2" Close Nipple**
          - **Drill and Tap Mast Arm**
        - **Conduit Fitting Capped Elbow**
    - **Conduit Clamp**
    - **1/2" Plastic Strap**
    - **1/2" X 1/4" Strap**
    - **1/4" Close Nipple**
      - **Drill and Tap Mast Arm**
  - **FLUSH MOUNT**
  - **Type C Conduit Fitting**
  - **Type C Close Nipple**
    - **Drill and Tap Mast Arm**
  - **Conduit Fitting Capped Elbow**
  - **Type C Conduit Fitting**
  - **Conduit Clamp**

- **Detail B-3**: Sign Panel Mounting Details
  - **All Types**
  - **Detail B**
    - **POLE TOP DETAIL**
      - **Detail E**
        - **SIGN LIGHTING FIXTURE**
          - **Type C Conduit Fitting**
          - **1/2" Close Nipple**
            - **Drill and Tap Mast Arm**
          - **Conduit Fitting Capped Elbow**
      - **Conduit Clamp**
      - **1/2" Plastic Strap**
      - **1/2" X 1/4" Strap**
      - **1/4" Close Nipple**
        - **Drill and Tap Mast Arm**
      - **Fluorescent Lighting Fixture**
      - **Type C Conduit Fitting**
      - **Conduit Fitting Capped Elbow**
      - **Type C Conduit Fitting**
      - **Conduit Clamp**

- **Detail B-4**: Sign Panel Mounting Details
  - **All Types**
  - **Detail B**
    - **POLE TOP DETAIL**
      - **Detail E**
        - **SIGN LIGHTING FIXTURE**
          - **Type C Conduit Fitting**
          - **1/2" Close Nipple**
            - **Drill and Tap Mast Arm**
          - **Conduit Fitting Capped Elbow**
      - **Conduit Clamp**
      - **1/2" Plastic Strap**
      - **1/2" X 1/4" Strap**
      - **1/4" Close Nipple**
        - **Drill and Tap Mast Arm**
      - **Fluorescent Lighting Fixture**
      - **Type C Conduit Fitting**
      - **Conduit Fitting Capped Elbow**
      - **Type C Conduit Fitting**
      - **Conduit Clamp**

- **Detail B-5**: Sign Panel Mounting Details
  - **All Types**
  - **Detail B**
    - **POLE TOP DETAIL**
      - **Detail E**
        - **SIGN LIGHTING FIXTURE**
          - **Type C Conduit Fitting**
          - **1/2" Close Nipple**
            - **Drill and Tap Mast Arm**
          - **Conduit Fitting Capped Elbow**
      - **Conduit Clamp**
      - **1/2" Plastic Strap**
      - **1/2" X 1/4" Strap**
      - **1/4" Close Nipple**
        - **Drill and Tap Mast Arm**
      - **Fluorescent Lighting Fixture**
      - **Type C Conduit Fitting**
      - **Conduit Fitting Capped Elbow**
      - **Type C Conduit Fitting**
      - **Conduit Clamp**

- **Detail B-6**: Sign Panel Mounting Details
  - **All Types**
  - **Detail B**
    - **POLE TOP DETAIL**
      - **Detail E**
        - **SIGN LIGHTING FIXTURE**
          - **Type C Conduit Fitting**
          - **1/2" Close Nipple**
            - **Drill and Tap Mast Arm**
          - **Conduit Fitting Capped Elbow**
      - **Conduit Clamp**
      - **1/2" Plastic Strap**
      - **1/2" X 1/4" Strap**
      - **1/4" Close Nipple**
        - **Drill and Tap Mast Arm**
      - **Fluorescent Lighting Fixture**
      - **Type C Conduit Fitting**
      - **Conduit Fitting Capped Elbow**
      - **Type C Conduit Fitting**
      - **Conduit Clamp**

**NOTE:** Tighten front hex nuts first, then tighten back hex nuts.
4" x 6½" ROUNDED RECTANGLE HANDHOLE REINFORCED WITH HINGED LID TO OUTSIDE OF POLE. SEE NOTE 4, "A" COVER PLATE.

FOR NON-SLIP POLES ATTACH BONDING LUG INSIDE POLE OR TAP HOLE IN REINFORCING FOR BONDING BOLT. ANCHOR BOLT THREAD TOP .150" AND SANDBLAST 1"-0".

FINISHED GRADE

ANCHOR PLATE

DRAIN HOLE

ANCHOR BOLTS

SIZE OF ANCHOR BOLTS IS .085" x 0.75" REFER TO TABLES ON STANDARD PLANS.

HANDHOLE AND ANCHORAGE

DETAIL A

ALLEN HEAD SOCKET FLAT HEAD CAP SCREW, 1/2" - 13 INSERT WITH COVER. ALLEN WRENCH SIZE 5/16".

DETAIL B-1

DETAIL B-2

ALTERNATIVE DETAIL

HIGH TENSION CABLE COVER

2 NPS PIPE, INSIDE GROOVE MOUNTED TO RING FOR WIRE PROTECTION

2 NPS PIPE CHASED FOR WIRE PROTECTION

SECTION A-A

TYPICAL DETAIL

SIDE TENON DETAIL S-1

WELD WALL SIZE THICKNESS

¥" 0.1196" ¥" 0.1793" ¥" 0.2391" ¥" 0.3125"

Handhole reinforcement ring shall be ¥" x 2" for 0.1196" to 0.2391" thick poles, ¥" x 2" for 0.3125" thick poles.

Handholes shall be located on downstream side of traffic.

Details S, fatigue resistant weld, is required at socket welded signal mast arm near the base plate.

5. Handholes shall be located on the downstream side of traffic.

6. Details S, fatigue resistant weld, is required at socket welded signal mast arm plate and pole base plate.

7. Cap screws shall be tightened by the turn-of-nut method. Turn cap screws 1'-3".

8. Outside diameter, wall thickness, and corresponding section properties of poles and mast arms as shown in the Standard Plans are minimums.

9. Wind Loading (3 seconds gusts) 100 mph

10. Unit Stresses (Structural steel): fy = 58,000 psi (tapered steel tube and anchor bolts)

11. Unit Stresses (Reinforced concrete): fy = 60,000 psi

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

ELECTRICAL SYSTEMS
(SIGNAL AND LIGHTING STANDARD, DETAIL No. 1)

NO SCALE

ES-7M
NOTES:

1. Pipe post to be set 1'-6" back from face of curb unless otherwise specified.

2. Where barricade posts are installed in existing concrete sidewalk, the post may be anchored to the sidewalk as shown in the "Post Anchorage Detail". Bolt circle diameter shall be 4" minimum for Type I barricade and 5" minimum for Type II barricade.

3. Steel sleeve shall be constructed with an inside diameter 1/8" larger than the post's outside diameter. Wall thickness of sleeve shall be same as post or larger.

4. Alternative details may be submitted for approval by the Engineer.
**NOTES:**

1. Exact mounting location of miscellaneous attachment and bracket shall be approved by the Engineer per manufacturer's recommendation.
2. Location of cable entrances on signal pole shall be a minimum of 1' from any flange or base plate.
3. Hybrid cable entrances on signal pole shall be drilled for weathertight coupling as required.
4. Hybrid cable shall have a drip loop at the entrance into signal pole, luminaire mast arm and signal mast arm.
5. A single hybrid cable shall run continuous and shall not be twisted from the miscellaneous attachment to the controller cabinet. No splices shall be allowed.
6. Use the manufacturer's Effective Projected Area (EPA) for miscellaneous attachment. The maximum EPA for each miscellaneous attachment shall be 1.6 square feet with 10 lb Max.
7. Maximum of two miscellaneous attachments per traffic signal standard.
8. Maximum of one miscellaneous attachment per mast arm.
9. Miscellaneous attachment shall be mounted using clamping devices.
**SECTION A-A**

**WEIGHT PULL BOX**

**No. 3**

**TYPICAL COVER CAPTIVE BOLT**

- **ELECTRICAL SYSTEMS**
  - **WEIGHT**
  - **DIMENSION TABLE**

<table>
<thead>
<tr>
<th>PULL BOX</th>
<th>MINIMUM DEPTH BOX</th>
<th>MINIMUM DEPTH EXTENSION</th>
<th>MINIMUM WEIGHT</th>
<th>WT Min</th>
<th>TE</th>
<th>D</th>
<th>L</th>
<th>W</th>
<th>MINIMUM WEIGHT</th>
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<tbody>
<tr>
<td>No. 3½</td>
<td>12&quot;</td>
<td>N/A</td>
<td>40 lb</td>
<td>1&quot; - 3&quot;</td>
<td>9&quot;</td>
<td>13/4&quot;</td>
<td>1½&quot;</td>
<td>1½&quot; - 1½&quot;</td>
<td>10&quot; - 10½&quot;</td>
</tr>
<tr>
<td>No. 5</td>
<td>12&quot;</td>
<td>10&quot;</td>
<td>55 lb</td>
<td>1&quot; - 4&quot;</td>
<td>9&quot;</td>
<td>2&quot;</td>
<td>2&quot;</td>
<td>2&quot;</td>
<td>6½&quot;</td>
</tr>
<tr>
<td>No. 6</td>
<td>12&quot;</td>
<td>10&quot;</td>
<td>70 lb</td>
<td>2&quot; - 6½&quot;</td>
<td>1½&quot; - 3½&quot;</td>
<td>2&quot;</td>
<td>2&quot;</td>
<td>2&quot;-6½&quot;</td>
<td>1½&quot; - 4½&quot;</td>
</tr>
</tbody>
</table>

**NOTES:**

1. Pull box covers shall be marked as follows: "SERVICE" - Service circuits.
2. Pull box covers shall be interchangeable with California standard male and female covers.
3. Covers and boxes shall be interchangeable with California standard male and female covers.
4. Dimensions for the cover are nominal values.
### Notes:
1. Traffic pull box shall be provided with steel cover and special concrete footing. Steel cover shall have embossed non-skid pattern.
2. Steel reinforcing shall be as regularly used in the standard products of the respective manufacturer.
3. Pull box covers shall be marked as follows: "SERVICE" Service circuits between service point and service disconnect. "SPRINKLER-CONTROL" Sprinkler control circuits, 50 V or less. "CALTRANS" on all pull boxes, except pull boxes marked "SPRINKLER-CONTROL" and "TELEPHONE" TELEPHONE service.

#### Diagram:
- **SECTION A-A**
- No. 3½(T), No. 5(T) AND No. 6(T) TRAFFIC PULL BOX

#### Dimension Table

<table>
<thead>
<tr>
<th>Pull Box</th>
<th>Minimum W</th>
<th>Minimum Depth Box and Extension</th>
<th>LO</th>
<th>LI</th>
<th>HD</th>
<th>BD</th>
<th>L **</th>
<th>W **</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. 3½(T)</td>
<td>1½&quot;</td>
<td>1&quot;-9/16&quot;</td>
<td>1½&quot;-10&quot;</td>
<td>1½&quot;-11&quot;</td>
<td>1½&quot;-12&quot;</td>
<td>1½&quot;-13&quot;</td>
<td>1½&quot;-14&quot;</td>
<td>1½&quot;-15&quot;</td>
</tr>
<tr>
<td>No. 5(T)</td>
<td>1⅛&quot;</td>
<td>1¾&quot;-15/16&quot;</td>
<td>2&quot;-1&quot;</td>
<td>2&quot;-2&quot;</td>
<td>2&quot;-3&quot;</td>
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<td>2&quot;-6&quot;</td>
</tr>
<tr>
<td>No. 6(T)</td>
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<td>2&quot;-2&quot;</td>
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<td>2&quot;-5&quot;</td>
<td>2&quot;-6&quot;</td>
<td>2&quot;-7&quot;</td>
</tr>
</tbody>
</table>

* Excluding Conduit Web  ** Top Dimension
CONDUIT TERMINATION

DETAIL A

CONDUIT TERMINATION

DETAIL C

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

ELECTRICAL SYSTEMS
(STRUCTURE PULL BOX INSTALLATIONS)

NO SCALE

ES-9A
No. 7 CEILING PULL BOX

See Note 6

No. 8 PULL BOX

No. 9 STRUCTURE PULL BOX

See Note 7

No. 9A STRUCTURE PULL BOX

No. 7 CEILING PULL BOX

No. 8 PULL BOX

No. 9 STRUCTURE PULL BOX

No. 9A STRUCTURE PULL BOX
No. 3½, 5, or 6 Pull Box Installation
Detail A

No. 9 Pull Box Installation
Detail B

Installation in Sloping Parapets
Detail D

No. 9A Pull Box Installation
Detail C

Notes:
1. Axis of pull box shall be parallel to top of barrier, sidewalk or railing.
2. See rolling sheet for reinforcement and structural details of electrolytes and pull boxes.
3. Top of pull boxes in sidewalk areas shall be flush with sidewalk. Modify base of pull box as required.
4. Boxes inside vertical barrier or railing shall be closed during pouring of PCC with 1/4" plywood or sufficient size to provide top panel on 3 sides of cover. Upper edge of plywood shall fit against lower edge of parapet. Each.
5. Use drain as center if box is horizontal, or at low and if box is inclined. When box is mounted in sloping parapet, drain hole inside of cover or near end as required for drainage.
6. For electrolyte anchorage bolts and grouting details, see Standard Plan ES-6A.

State of California
Department of Transportation

Electrical Systems
(Structure Pull Box Installations)

No Scale

ES-9D
**SECTION A-A**

**FLUSH-MOUNTED SOFFIT LUMINAIRE INSTALLATION**

**DETAIL F**

- Plug unused hubs
- Conduit hub, install plug or reducer and conduit as required
- No. 10 ceiling pull box with ballast and fused splice connectors
- Anchor ring
- Refractor and frame assembly
- 1:1 slope
- Face of concrete where structure is not horizontal

**PENDANT SOFFIT LUMINAIRE INSTALLATION**

**DETAIL P**

- Center between girders
- Deck slab
- Conduit
- Conduit straps
- No. 8 pull box
- Metal ball type flex fixture hanger
- Wall- or ceiling-mounted fixture
- 6" x 6" x 6" wall-mounted fixture
- 6" x 6" x 6" wall-mounted fixture
- 3/4" NEMA Type 4 (0.125") junction box (see notes below)
- 3/4" liquid-tight hub
- 3/4" knockout
- Hole for the anchors shall be drilled with Non-percussion Type Drill. When reinforcing steel is encountered, the anchor shall be relocated and abandoned. Hole plugged with color matching PCC mortar.
- Junction box or extension ring
- Surface mounted conduit on existing structure
- Galvanized nut and washer

**WALL-MOUNTED LUMINAIRE INSTALLATION**

**DETAIL W**

- Drill and tap for No. 10-20 machine screw
- Spot weld to pull box
- 1/4" x 0.075" steel

**SIDE VIEW**

**TERMINAL BLOCK MOUNTING BRACKET**

**DETAIL T**
TOGETHER IN EACH CORNER WITH FOUR SPOTWELDS.

PREFORM TWO SHEETS MILD STEEL AS SHOWN, SPOTWELD

SPOT WELD MOUNTING HOLES

TERMINAL BLOCK

INSULATION

THICK

OF LAMP TERMINAL BLOCK WITH QUICK DISCONNECT

STARTING AID HPS LAMP TERMINAL BLOCK WITH QUICK DISCONNECT

HPS LAMP TERMINAL BLOCKS (Typ)

OF LAMP

EXISTING REFLECTOR

70 W HPS LAMP BASE PORCELAIN SOCKET

2 ′ HEIGHT MOGUL SCREW BUSHING

INTERCONNECTING WIRE WITH RUBBER GROMMET

SLOT

BALLAST MOUNTING HOLES

MOUNTING BRACKET, SEE DETAIL ON THIS SHEET

FIVE SECTION TWIN SCREW TERMINAL BLOCK WITH QUICK DISCONNECT MALE BLADE TABS

FOR INTERCONNECTING WIRES

HOLES ON TOP PLATE FOR MOUNTING

1/4 ′ HOLE WITH RUBBER GROMMET FOR INTERCONNECTING WIRES

5 ′ SLOT AND 1/4 ′ # Holes on top plate for mounting

TOP VIEW

MOUNTING BRACKET DETAILS

SIDE VIEW

WIRING DIAGRAM

NOTES:

1. Use no. 8 # machine screws, lockwashers and nuts for mounting ballast and terminal strips.

2. In-line fuse as required on Standard Plan ES-13B.
Curves represent the minimum footcandle (FC).

NOTE:

Minimum footcandles for LED Luminaire 165 W, 235 W, and 300 W, and Low-Pressure Sodium Luminaire 180 W are provided. The luminaire positions and mounting heights are specified.

- LED Luminaire 165 W: 34' mounting height
- LED Luminaire 235 W: 40' mounting height
- LED Luminaire 300 W: 40' mounting height
- Low-Pressure Sodium Luminaire 180 W: 40' mounting height

Lamp operated at 33,000 lm.
Curves represent the minimum footcandle (FC).

- **Wall-Mounted Luminaire 70 W**
  - ANSI Designation S62
  - 15' Mounting Height
  - Lamp operated at 5,800 lm

- **Wall-Mounted Luminaire 100 W**
  - ANSI Designation S62
  - 15' Mounting Height
  - Lamp operated at 9,500 lm

- **Pendant Soffit Luminaire 70 W**
  - Type III Short
  - ANSI Designation S62
  - 17' Mounting Height
  - Lamp operated at 5,800 lm

- **Pendant Soffit Luminaire 70 W**
  - ANSI Designation S62
  - 17' Mounting Height
  - Lamp operated at 5,800 lm

- **Flush-Mounted Soffit Luminaire 70 W**
  - ANSI Designation S62
  - 17' Mounting Height
  - Lamp operated at 5,800 lm

- **Induction Sign Lighting Fixture 85 W**
  - ANSI Designation S62

---

**NOTE:**

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- Aziz Gabriel
- Theresa
- E15129
- 6-30-16

October 30, 2015

Curves represent the minimum footcandle (FC).
FOUNDATIONS ADJACENT TO ALL ROADWAYS EXCEPT IN SIDEWALK, MEDIAN AND ISLAND AREAS

1. A portion of the foundation is above grade, the top edges shall have a 1" chamfer.
2. Slopes shall be horizontal to vertical ratio (Horizontal : Vertical).
3. Horizontal setbacks on cut and fill slopes steeper than 4:1 shall not exceed the distance shown for fill sections.
4. CIDH embankment depth shall be increased beyond standard depths by the diameter of the CIDH.

DETAIL A

CUT SLOPES
STeeper than 4:1,
Less than 2:1
See Note 2 and 3

FILL SLOPES
STeeper than 4:1,
Less than 2:1
See Note 2 and 3

FLAT SECTIONS, CUT OR FILL SLOPES
4:1 OR FLATTER
See Note 2

MEDIAN, ISLAND
OR WIDE SIDEWALK
DETAIL B-1
1' Wide and wider

NARROW SIDEWALK
DETAIL B-2
Less than 1' wide

FOUNDATIONS IN SIDEWALK, MEDIAN AND ISLAND AREAS

NOTES:
**Notes:**

1. Dimensions are minimum.
2. Rubber tapes shall be rolled after application.
3. Between 1 free-end and 1 through conductor.
4. Between 2 free-end conductors.
5. Between 3 free-end conductors.
FUSE RATINGS FOR FUSED CONNECTORS

LOW PRESSURE SODIUM BALLAST

INDUCTION
SIGN LIGHTING
TRANSFORMERS (PRIMARY SIDE)

SINGLE PHASE (TWO WIRE)

VOLTAGE

CIRCUIT

FUSE
RATING

NPS LAMP BALLAST

LOW PRESSURE SODIUM BALLAST

INDUCTION
SIGN LIGHTING
TRANSFORMERS (PRIMARY SIDE)

SINGLE PHASE (TWO WIRE)

VOLTAGE

CIRCUIT

FUSE
RATING

NOTES:
1. Primary lines of multiple ballasts shall be provided with fused connectors.
2. Fuse ratings shall be as noted above.

KINKING DETAIL FOR
SLIP BASE STANDARDS

DETAIL A

TYPICAL BANDING OF CONDUCTOR ENDS

DETAIL B

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

ELECTRICAL SYSTEMS
(FUSE RATING, KINKING AND
BANDING DETAIL)

NO SCALE

ES-13B

RETURN TO TABLE OF CONTENTS
NOTES:
1. Sheet metal shall be 1/16".
2. Welds shall be continuous.
3. Powder coat all internal and external surfaces black.
4. The door frame shall utilize two gas spring lift arms and two latching devices to maintain an open position.
5. See Wiring Notes and Symbols on Standard Plan ES-14B, Detail A.

1. Sheet metal shall be 1/16".
2. Welds shall be continuous.

CROSS-SECTION OF SIGN

ISOMETRIC VIEW

TYPICAL FRONT VIEW OF SIGN UNIT

PRESENT TO STOP
**FLASHER UNIT**

**SOLID STATE**

**SIGN ON**

**DIM**

**CONTROL**

**TEST**

**SIGN TEST**

**DIM**

**EMS SIGN UNIT**

**120 V**

**STATE OF CALIFORNIA**

**DEPARTMENT OF TRANSPORTATION**

**BEACON 1**

**BEACON 2**

**CABINET**

**FROM CONTROLLER**

**CONTROLLED ON SIGN POST**

**WITH NEMA 3R ENCLOSURE**

**DIMMING AND SIGN CONTROL UNITS**

**CIRCUIT BREAKER**

**15 A, 2P**

**WITHIN SIGN HOUSING**

**TERMINAL BLOCK MOUNTED**

**ES-14B**

**WIRING DIAGRAMS**

**CONTROL ASSEMBLY**

**ELECTRICAL SYSTEMS**

**CONNECTOR SOCKET**

**SOLID STATE FLASHER UNIT**

**THE FLASHER SHALL MATE WITH A CINCH-JONES SOCKET S-406-58 OR EQUAL AND CONNECTED AS FOLLOWS:**

<table>
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<th>PIN</th>
<th>CIRCUIT</th>
<th>PIN</th>
<th>CIRCUIT</th>
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<td>1</td>
<td>LOAD</td>
<td>10</td>
<td>NEUTRAL</td>
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<td>11</td>
<td>LINE</td>
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<tr>
<td>12</td>
<td>CHASSIS GROUND</td>
<td>12</td>
<td>NOT USED</td>
</tr>
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**WIRING DIAGRAM**

**LED EXTINGUISHABLE MESSAGE SIGN**

**DETAIL A**

**WIRING DIAGRAM**

**LED FLASHING BEACON CONTROL ASSEMBLY**

**DETAIL B**

**STATE OF CALIFORNIA**

**DEPARTMENT OF TRANSPORTATION**

**ELECTRICAL SYSTEMS**

**(CONTROL ASSEMBLY)**

**WIRING DIAGRAMS**

**NO SCALE**

**ES-14B**

**Return to Table of Contents**
CANTILEVER

ELEVATION A

EMS WITH FLASHING BEACONS

ELEVATION A

CANTILEVER 30'-0" Max

8'-0" 2'-0" 8'-0" 2'-0" SEE DETAIL A

1/2" FLASHING BEACON WITH SIGNAL INDICATION, VISOR AND BACKPLATE

48" x 8'-0" EXTINGUISHABLE MESSAGE SIGN, SEE DETAIL C FOR FLEXIBLE CONDUIT INSTALLATION

8'-0" 3'-0" 8'-0" 1'-0" 1/2" NPS PIPE THREAD

TOP VIEW

SECTION A-A

POLE PLATE

DETAIL A

POLE PLATE, SEE NOTE 2 AND DETAIL A

90° ELBOW

DETAIL B

SECOND EMS

FIRST EMS

EMS WITHOUT FLASHING BEACONS

ELEVATION B

CANTILEVER 24'-0" Max

8'-0" 3'-0" 8'-0" 1'-0"

MIN MIN

48" x 8'-0" EXTINGUISHABLE MESSAGE SIGN, SEE DETAIL C FOR FLEXIBLE CONDUIT INSTALLATION

488

FLEXIBLE CONDUIT INSTALLATION

DETAIL C

Back view of sign

TOP TS

TYPE 4 CONDUCT

METAL STRAPS, TYPE

ALTERNATIVE LOCATION

TOP TS

BOTTOM TS

1/2" NPS PIPE THREAD

CHASED EDGES FOR ELECTRICAL CONDUCTORS

CHASED EDGES FOR ELECTRICAL CONDUCTORS

1/2" GALvanized STEEL BOLTS (HORIZONTAL)

POLE PLATE, SEE DETAIL A

1/2" NPS PIPE

90° ELBOW, SEE DETAIL B

SLOTS, 1/2" x 1/4"

1/4" FLAT WASHERS

1/4" FLAT WASHERS

HANDBOle, SEE NOTE 4

HANDBOle, SEE NOTE 4

1/2" NPS PIPE

1/2" NPS PIPE

VISOR AND BACKPLATE WITH SIGNAL INDICATION, 12" FLASHING BEACON (HORIZONTAL)

FOR FLEXIBLE CONDUIT INSTALLATION

VISOR AND BACKPLATE

WITH SIGNAL INDICATION

FOR FLEXIBLE CONDUIT INSTALLATION

FOR FLEXIBLE CONDUIT INSTALLATION

NOTES:

1. Pole plate shall be bronze or galvanized ductile iron.
2. For structural information, see Standard Plan S50.
3. Wind loading (3-second gust): 100 mph.
4. Handhole shall be located on the downstream side of traffic.

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

ELECTRICAL SYSTEMS
(EXTINGUISHABLE MESSAGE SIGN ON A FULL CANTILEVER)

NO SCALE

ES-14C

Return to Table of Contents
Conduit shall be secured to nearest member using one-hole galvanized mallable iron or steel straps at 5'-0" maximum centers and brass machine screws tapped into the member. An alternative cover design shall be submitted for approval.

**NOTES:**

1. Conduit shall be secured to nearest member using one-hole galvanized mallable iron or steel straps at 5'-0" maximum centers and brass machine screws tapped into the member.

2. Ballasts and terminal boards shall be marked with legible symbols. Conductors shall be tagged and their identification marked on the corresponding terminal on the terminal board as shown on the typical fixture wiring diagram.

3. Each ballast shall be fused with 1/4" x 1/4" slow-blow glass tube fuse.

4. Fuseholder shall be a panel mounted type.

5. Fixtures shall have an integral ballast.

6. The fixture shall have an integral ballast.

**SECTION-LIGHTING FIXTURE**

**ELECTRICAL SYSTEMS**

36" FLUORESCENT SIGN ILLUMINATION EQUIPMENT

NO SCALE

STATE OF CALIFORNIA

DEPARTMENT OF TRANSPORTATION

Aziz Gabriel

E15129

October 30, 2015
NOTES:
1. Type 4 conduit shall be secured to the nearest walkway bracket using one-hole galvanized malleable iron or steel straps and brass machine screws tapped into the bracket.
2. See Overhead Signs Standard Plans for overhead sign and frame juncture details for photoelectric unit installation.
3. Enclosures and straps shall be secured by ¾” maximum size screws.
4. The Contactor and test switch enclosures shall be readily accessible from the sign walkway.
NOTE:
1. Type SC1A, SC2A, SC3A controls are similar to Types SC1, SC2 and SC controls respectively except test switch and wiring are not required.

TYPE LC1 CONTROL
For 120 V unswitched circuit with no more than 1000 W load.

TYPE LC2 CONTROL
For 120 V unswitched circuit

TYPE LC3 CONTROL
For 240 V unswitched circuit

TYPE LC4 CONTROL
For 480 V unswitched circuit

STATE OF CALIFORNIA
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ES-15D
2015 STANDARD PLANS

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THE ACCURACY OR COMPLETENESS OF SCANNED

October 30, 2015

Register Electrical Engineer

No. 8-22-15

Dist. No.

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Return to Table of Contents
CCTV MOUNTING ADAPTER DETAIL SHALL BE SUBMITTED BY THE CONTRACTOR FOR THE ENGINEER'S APPROVAL, SEE DETAIL D

CLOSED CIRCUIT TELEVISION MOUNTING ADAPTER

NOTES:
1. Verify controlling field dimensions before ordering or fabricating any material.
2. Bolt hole locations may vary at the discretion of the Engineer.
4. Wind Loadings (3-second gust) = 100 mph.
5. Unit Stresses (Structural Steel):
   a. fy = 50,000 psi (tapered steel tube)
   b. fy = 50,000 psi (unless otherwise noted)

STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION

ELECTRICAL SYSTEMS
(CLOSED CIRCUIT TELEVISION, 5' TO 15' OVERHEAD SIGN MOUNTED POLE)

NO SCALE

ES-16A

RETURN TO TABLE OF CONTENTS
The image contains a detailed engineering drawing and associated tables and notes. The drawing includes various annotations, dimensions, and symbols. The tables provide specific data such as pole types, base plate data, and spread footing details. The notes section contains instructions and specifications, including:

1. All steel shall be galvanized after fabrication.
2. The foundation shall be treated as level ground condition if the slope inclination is flatter than 4:1 (Horizontal: Vertical).
3. For devices mounted and mounting heights, see Table B.
5. Wind Loadings: 100 mph (3-second gust).
6. Unit Stresses (Structural Steel): 
   a. \( f_y = 55,000 \) psi
   b. \( f'c = 3,600 \) psi
7. Anchor bolts: \( f_y = 55,000 \) psi
8. Unit Stresses (Reinforced Concrete): 
   a. \( f'c = 3,000 \) psi
   b. \( f_y = 4,000 \) psi
9. Verify all controlling field dimension before ordering or fabricating any material.
10. When no barriers are used, the NEMA 3R enclosure shall be located on the downstream side and perpendicular to the roadway.
11. 1'-3" (Max) for sloped finished grade.
12. Bottom of base plate.
13. Top plate level.
14. Top plate level.
15. U-channel with bracket.
16. Use the manufacturer's Effective Projected Area (EPA) for attachments. Assign attachments to nearest level and sum each level, see Table D for limitations.

The drawing is part of the 2015 Standard Plan ES-16D for Electrical Systems (Closed Circuit Television with Vehicle Detection System, 30' to 40' Pole).
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