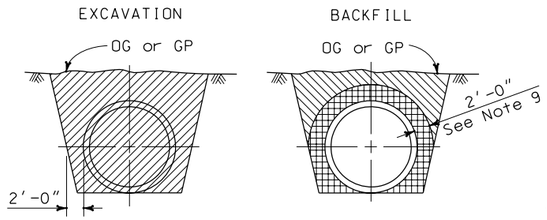
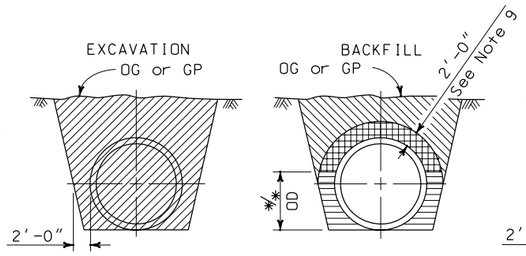
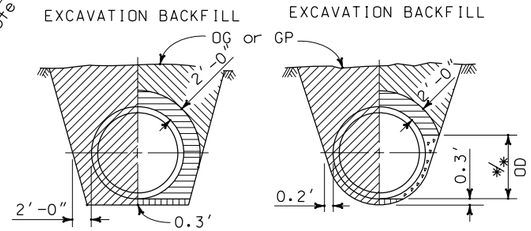


IN TRENCH

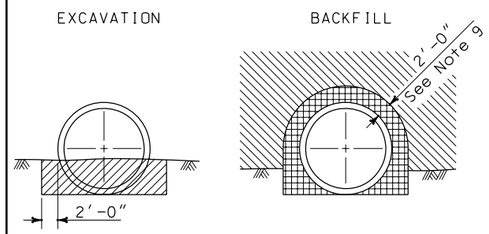


IN TRENCH

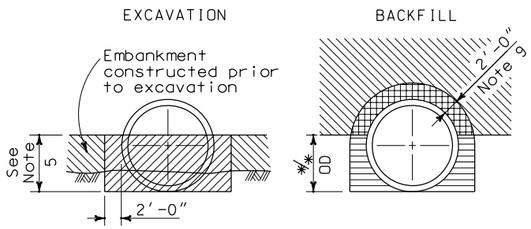


SAND BEDDING SOIL CEMENT BEDDING

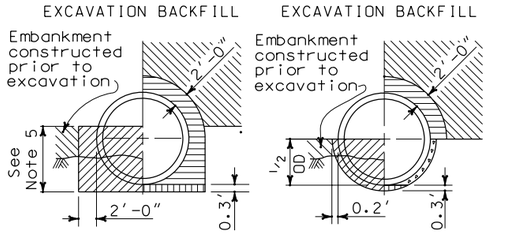
IN TRENCH



IN EMBANKMENT



IN EMBANKMENT



SAND BEDDING SOIL CEMENT BEDDING

A B

IN EMBANKMENT

MINIMUM ALLOWABLE CLASSES OF RCP FOR METHOD 1

COVER	MINIMUM CLASS AND D-LOAD
5.9'	Class ** 1000D
6.0' - 7.9'	Class *** 1350D
8.0' - 9.9'	Class *** Special 1700D
10.0' - 11.9'	Class ** 2000D
12.0' - 13.9'	Class ** Special 2500D
14.0' - 16.9'	Class * 3000D
17.0' - 20.0'	Class * Special 3600D

See Notes 6 and 9

METHOD 1

MINIMUM ALLOWABLE CLASSES OF RCP FOR METHOD 2

COVER	MINIMUM CLASS AND D-LOAD
15.9'	Class ** 1000D
16.0' - 19.9'	Class *** 1350D
20.0' - 24.9'	Class *** Special 1700D
25.0' - 27.9'	Class ** 2000D
28.0' - 34.9'	Class ** Special 2500D
35.0' - 41.9'	Class * 3000D
42.0' - 50.0'	Class * Special 3600D

See Notes 8 and 9

METHOD 2

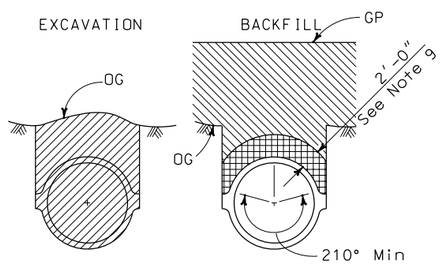
REINFORCED CONCRETE PIPE

See Notes 1, 2, 7 and 10

MINIMUM ALLOWABLE CLASSES OF RCP FOR METHOD 3

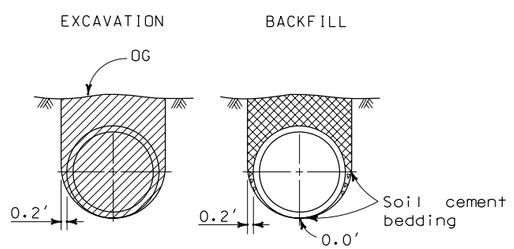
COVER	MINIMUM CLASS AND D-LOAD
25.9'	Class ** 1000D
26.0' - 31.9'	Class *** 1350D
32.0' - 37.9'	Class *** Special 1700D
38.0' - 44.9'	Class ** 2000D
45.0' - 55.9'	Class ** Special 2500D
56.0' - 67.9'	Class * 3000D
68.0' - 80.0'	Class * Special 3600D

METHOD 3



IN TRENCH ONLY

CAST-IN-PLACE



IN TRENCH ONLY

PRECAST

See Notes 7 and 11

NON-REINFORCED CONCRETE PIPE

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 method of backfill to be used, provided the height of cover does not exceed the value shown for the RCP selected.
   Example:
   2'-0" RCP culvert with maximum cover of 19'-0" the options are:
   a) Class * Special or stronger with Method 1.
   b) Class *** or stronger with Method 2.
   c) Class ** or stronger with Method 3.
   Cover is defined as the maximum vertical distance from top of pipe to finished grade within the length of any given culvert.
2. The class of RCP, method of backfill and bedding 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) Successive drainage structures (inlets, junction boxes, headwalls, etc.
   b) A drainage structure and the inlet or outlet end of the culvert.
   c) The inlet and outlet end of the culvert when there are no intervening drainage structures.
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", I D = 2'-6"
   Pipe sizes 4'-0" to 7'-0", I D = * OD
   Pipe sizes larger than 7'-0", I D = 5'-0"
6. The maximum size for all classes of RCP placed under Method 1 is 78" ID.
7. Non-reinforced precast pipe sizes 3'-0" or smaller may also be placed under Methods 1, 2 or 3.
8. Oval or arch shaped RCP shall be placed under Method 2 only.
9. Embankment compaction requirements govern over the 90% relative compaction backfill requirement within 2'-6" of finished grade.
10. Backfill shall be placed full width of excavation except where dimensions are shown for backfill width or thickness. Dimensions shown are minimums.
11. Where the precast non-reinforced concrete pipe is used as a substitute for the cast-in-place pipe, both the wall thickness and the concrete strength shall be at least as great as that specified for the cast-in-place pipe. The fill height allowed shall not exceed that shown for the cast-in-place pipe.

LEGEND

- Structure Excavation (Culvert)
- Structure Backfill (Culvert) 95% relative compaction
- Structure Backfill (Culvert) 90% relative compaction
- Loose Backfill
- Sand Bedding
- Soil Cement Bedding
- Roadway Embankment
- Original Ground

OD = Outside diameter for circular pipes and maximum vertical dimension for other shapes

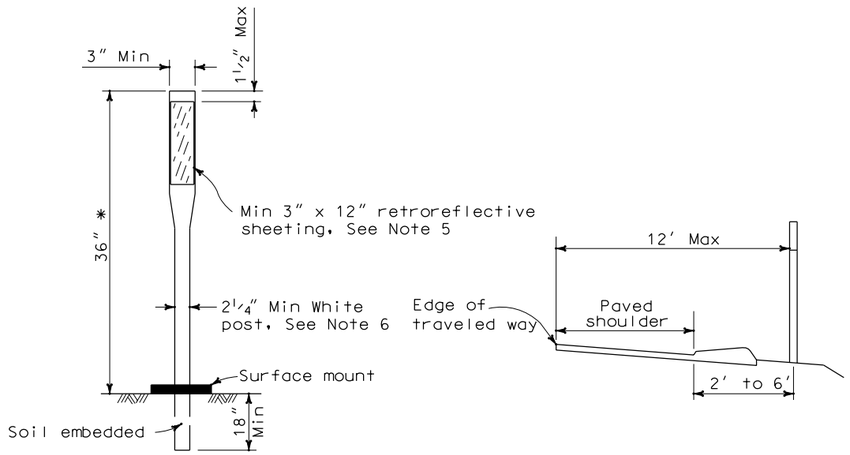
ID = Inside diameter for circular pipes and minimum vertical dimension for other shapes

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

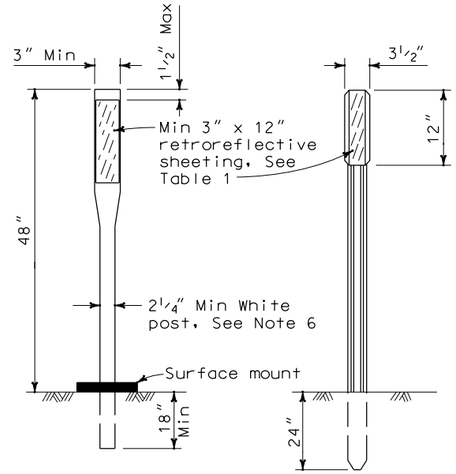
EXCAVATION AND BACKFILL CONCRETE PIPE CULVERTS

NO SCALE

A62D



DELINEATOR POSITIONING



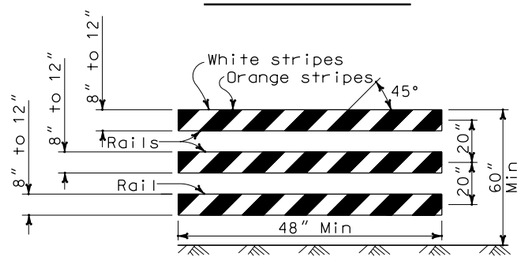
CLASS 1
FLEXIBLE POST

CLASS 2
METAL POST
See Note 4

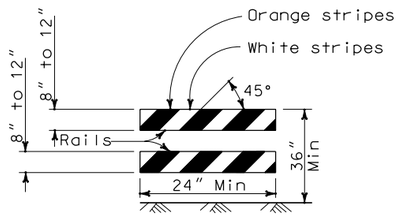
DELINEATORS

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

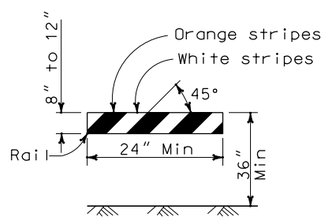
CHANNELIZERS



TYPE *** BARRICADE



TYPE ** BARRICADE



TYPE * BARRICADE
See Note A

BARRICADES (See Note 3)

Only face of rails shown. Barricade construction materials and supports as specified in the specifications.

TABLE 2 - BARRICADES			
BARRICADE	TYPE *	TYPE **	TYPE ***
Width of Rail	8" Min - 12" Max *	8" Min - 12" Max *	8" Min - 12" Max *
Length of Rail	24" Min	24" Min	48" Min
Width of Stripes * *	6"	6"	6"
Height	36" Min	36" Min	60" Min
Number of Retroreflective Rail Faces	2 (one each direction)	4 (two each direction)	3 if facing traffic in one direction 6 if facing traffic in two direction

* 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.

TABLE 1 - DELINEATORS		
TYPE	RETROREFLECTIVE SHEETING	
	FRONT	BACK
E	White	White (See Note 1)
F	White	None
G	Yellow	None
I	Yellow	Yellow (See Note 1)
J	Red	None

NOTES:

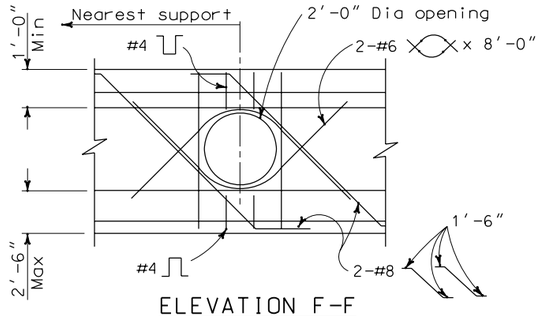
1. The retroreflective sheeting used on the back of delineator shall be a minimum size of 3" x 3".
2. The type of delineator to be installed will be designated on the plans.
3. All barricade stripes shall be retroreflective.
4. See Standard Plan A73B for Metal Post Details.
5. Unless shown otherwise 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.

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

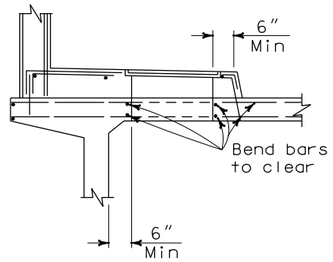
DELINEATORS, CHANNELIZERS AND BARRICADES

NO SCALE

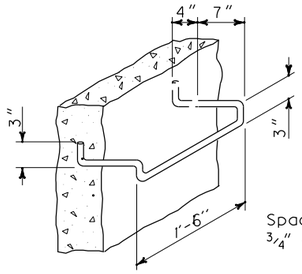
A73C



ELEVATION F-F



SECTION C-C

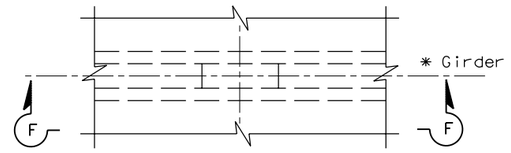


Space ladder rung @ 12
3/4" * Galvanize after fabrication

BAR STEP

LADDER RUNG DETAILS

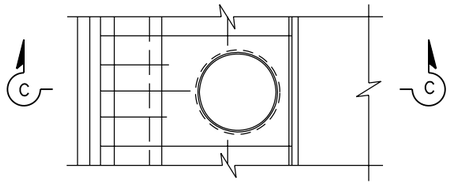
DETAIL U44



PART PLAN

GIRDER STEM ACCESS OPENING

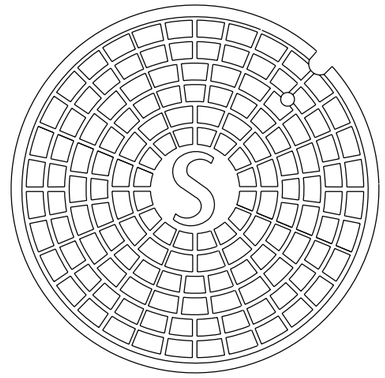
DETAIL U41



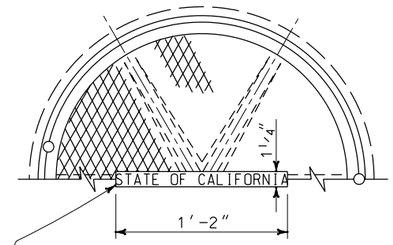
PART PLAN

SIDEWALK ACCESS OPENING

DETAIL U42

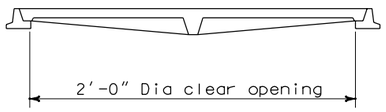


TOP OF MANHOLE COVER



Letters 1" high. No other inscription to appear on exposed surfaces.

TOP OF MANHOLE FRAME & COVER



SECTION THROUGH FRAME & COVER

MANHOLE FRAME & COVER FOR SIDEWALKS

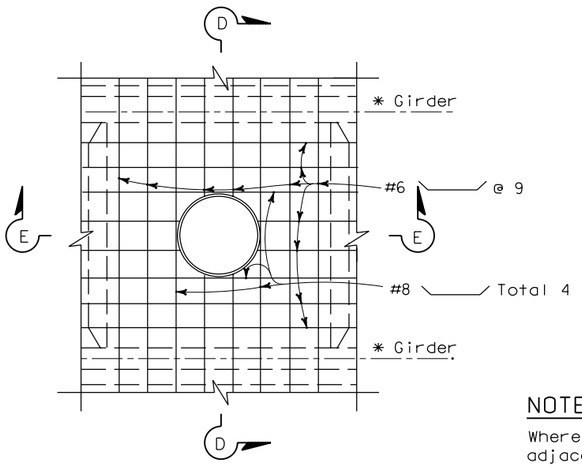
DETAIL U46

NOTES:

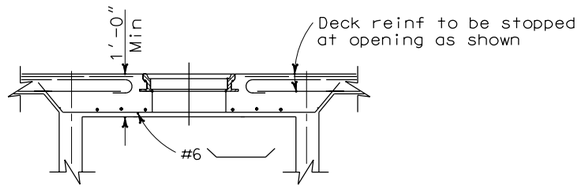
1. Frame and cover shall be cast iron. Weight for payment is 235 LBS.
2. Galvanize complete assembly after fabrication.
3. The weight shall not vary more than ten percent from the weight for payment.
4. Cover shall be supplied with bolt down or locking devices.

NOTES:

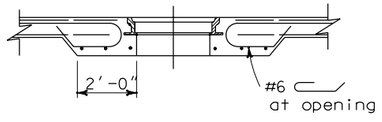
1. For exact location of openings see other sheets.
2. Location and size of manholes may be modified as directed by the Engineer, provided minimum dimensions are maintained.
3. All reinforcement detailed to be placed in addition to reinforcement shown on other sheets.



PART PLAN



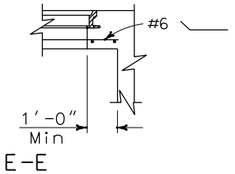
SECTION D-D



SECTION E-E

NOTE:

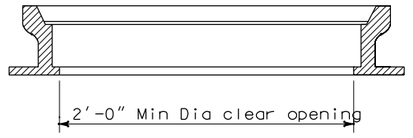
Where manhole is located adjacent to a diaphragm or abut, substitute half Section E-E on one side of Section E-E.



HALF SECTION E-E

DECK ACCESS OPENING

DETAIL U43



SECTION THROUGH FRAME

NON-ROCKING MANHOLE FRAME & COVER FOR DECKS

DETAIL U45

NOTES:

1. The manhole frame and cover shall be made of gray cast iron. Weight for payment is 435 LBS.
2. All parts of the manhole frame and cover except machined surfaces shall be coated with asphaltum paint.
3. The manhole frame and cover shall be tested for accuracy of fit and shall be marked in sets before delivery. The cover shall fit the frame snugly but not tightly.
4. Covers for use on sewer structures shall bear the letters "S"; on storm drain structures the letter "D"; on openings for utilities the letter "U".
5. The weight shall not vary more than ten percent from the weight for payment.
6. Step inserts may be substituted for the standard step detail. Step inserts shall comply with State Industrial Safety requirements.

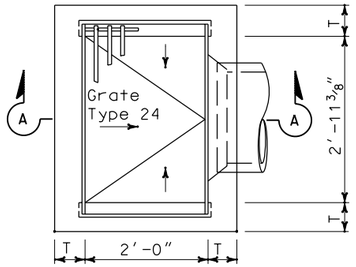
2006 STANDARD PLAN B7-11

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

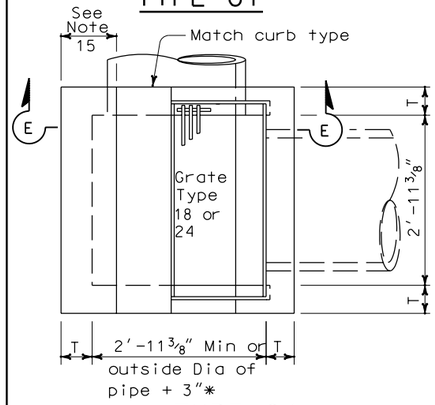
UTILITY DETAILS

NO SCALE

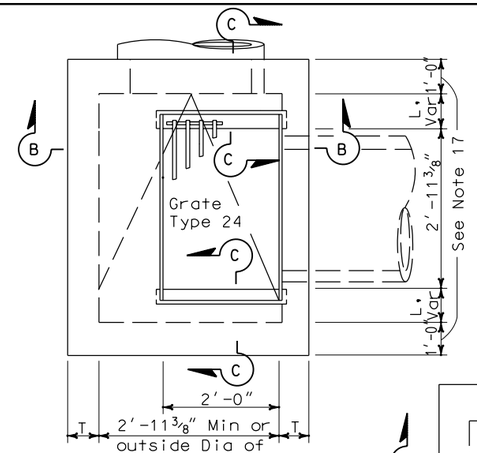
B7-11



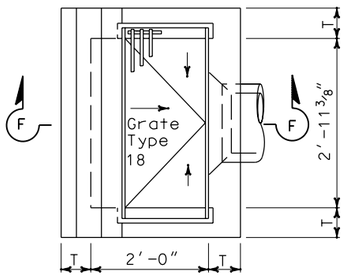
TYPE G1



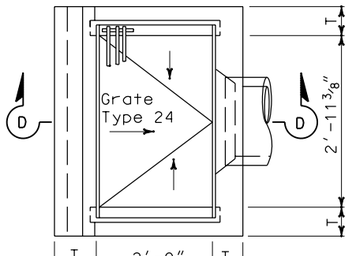
TYPE G4



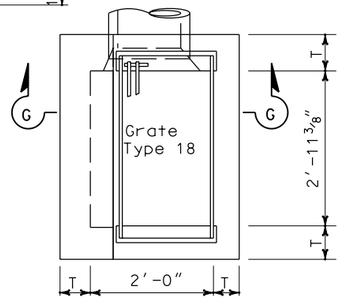
TYPE G2



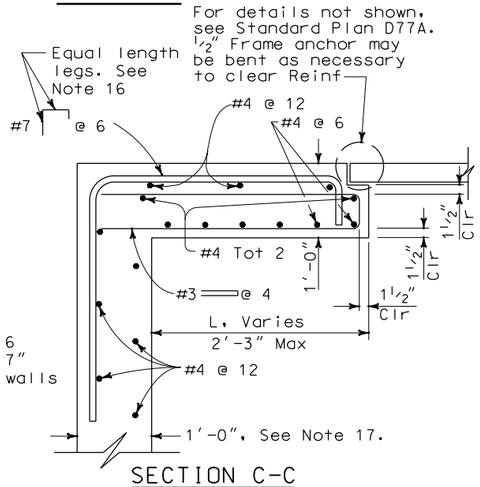
TYPE G5



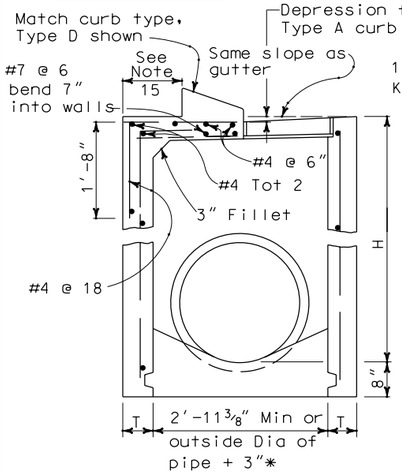
TYPE G3



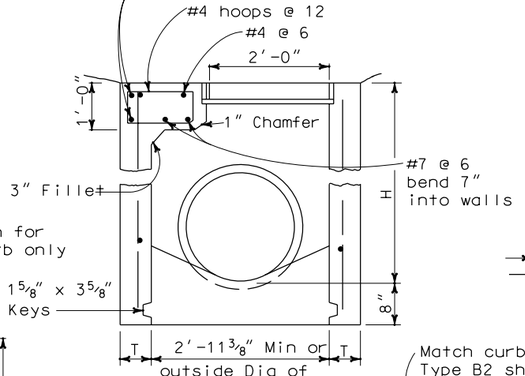
TYPE G6



SECTION C-C

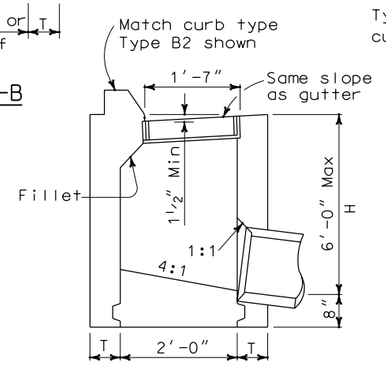


SECTION A-A

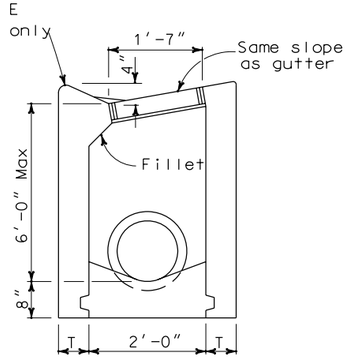


SECTION B-B

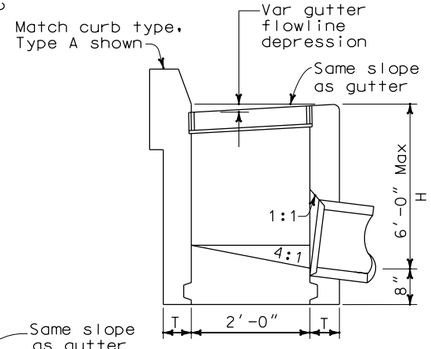
SECTION E-E



SECTION F-F



SECTION G-G



SECTION D-D

NOTES:

1. "H" is the difference in elevation between the outlet pipe flow line and the normal gutter grade line undepressed.
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 or length is 7'-0" or less. Walls exceeding these limits shall be reinforced with #4 bars @ 1'-6" * centers placed 1 1/2" clear to inside of box unless otherwise shown.
4. Inlet bottom reinforcing not required. See Standard Plan D74C for alternative reinforced bottom and alternative half round bottom.
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 top 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. Steps inserts may be substituted for the bar steps. Step inserts shall comply with State Industrial Safety requirements. See Standard Plan D74C for step details.
6. Details shown apply to both metal and concrete pipe.
7. Pipe(s) can be placed in any wall.
8. Curb section shall match adjacent curb.
9. Basin floors shall have wood trowel finish and a minimum slope of 12:3 from all directions toward outlet pipe.
10. Galvanizing-See Standard Specifications or Special Provisions.
11. Cast-in-place or Precast alternative is optional with contractor. See Standard Specifications.
12. Set inlet so that grate bars are parallel to direction of principal surface flow.
13. See Standard Plans D77A and D77B for grate and frame details and weights of miscellaneous iron and steel.
14. See Standard Plan D78A for gutter depression details.
15. This dimenison will vary with different grates, curbs types, box width and wall thickness.
16. Bar may be rotated as necessary to clear opening. Where "L" is 6" or less, bar may be omitted.
17. Where "L" is 6" or less, wall thickness shall be as shown in Table A.
18. Cast-in-place inlets to be formed around all pipes/stubs intersecting the inlet, and concrete poured in one continuous operation. Precast inlets shall have mortared connections conforming to details for Type GCP Inlet shown on Standard Plan D75B. See Standard Specifications for mortar composition.

TABLE A

CONCRETE QUANTITIES

Type	H=3'-0" to 8'-0" (T=6")		H=8'-1" to 20'-0" (T=8")	
	H=3'-0" (CY)	Additional PCC per foot (CY)	H=8'-1" (CY)	Additional PCC per foot (CY)
G-1	0.95	0.220	See Note A	See Note A
G-2*	1.31	0.255	3.50	0.357
G-3	1.03	0.220	See Note A	See Note A
G-4* (Type 24)	1.27	0.255	3.48	0.357
G-4* (Type 18)	1.30	0.255	3.50	0.357
G-5	1.02	0.220	See Note A	See Note A
G-6	1.04	0.220	See Note A	See Note A

Table based on 8" floor slab. No deductions are to be made to these quantities because of pipe openings, different floor alternatives or different curb types. * Quantities for type G-2 and G-4 inlets based on the minimum interior dimensions.

NOTE A:

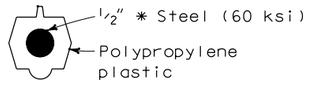
Maximum allowable height 6'-0".

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

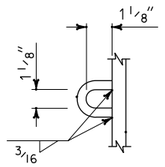
DRAINAGE INLETS

NO SCALE

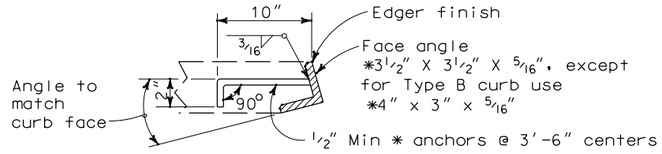
D73



TYPICAL SECTION
(STEP INSERT)

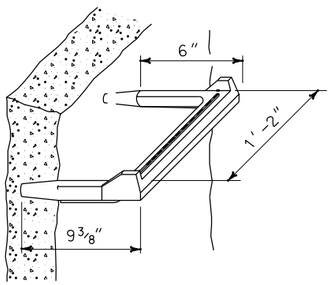


STIRRUP

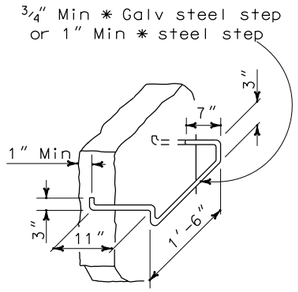


FACE ANGLE ANCHOR DETAIL A

FACE ANGLE DETAIL A	
Length of Curb Opening	No of Anchors
3'-6" or Less	2
7'-0"	3
10'-0"	4
14'-0"	5
21'-0"	7

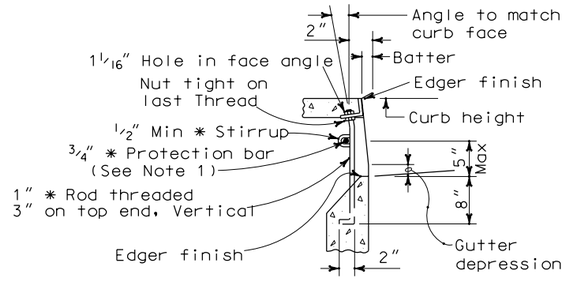


STEP INSERT

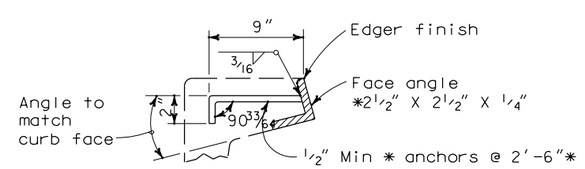


BAR STEP

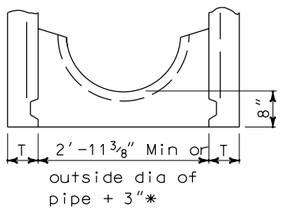
STEP DETAILS



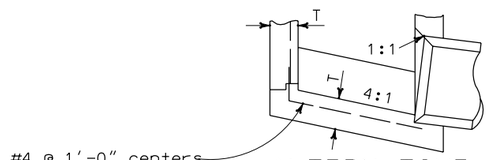
CURB SUPPORT DETAIL
See Note 2



FACE ANGLE ANCHOR DETAIL B



ALTERNATIVE
HALF ROUND BOTTOM



ALTERNATIVE
REINFORCED BOTTOM

NOTES:

1. When shown on the project plans, place a 3/4" * 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

D74C