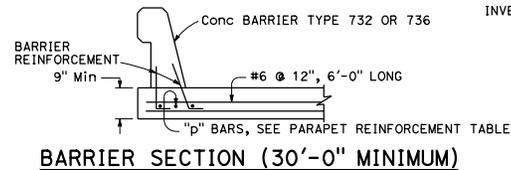


**DESIGN NOTES:**

**Design Specifications:**  
 AASHTO LRFD Bridge Design Specifications, 4th Edition with California Amendments.  
**Loading:**  
 Live load: (AASHTO LRFD 3.6.1.2)  
 HL-93 consists of design truck or design tandem and design lane load.  
**Impact Factor:** (Apply to roof slab only)  
 $IM = 33(1.0 - 0.125D_c) \geq 0\%$  (AASHTO LRFD 3.6.2.2)  
 $D_c$  = minimum depth of earth cover  
**Earth loads:**  
 Earth pressure for two conditions:  
 140 pcf vertical, 42 pcf horizontal  
 140 pcf vertical, 140 pcf horizontal  
**Load Factors:**  
 AASHTO LRFD Table 3.4.1.1 & Table 3.4.1.2  
**Unit stresses:**  
 $f'_c = 3600$  psi  
 $f_y = 60,000$  psi  
**Distribution "d" bars:**  
 Up to and including 10'-0" cover  
 Express as a percentage of main positive reinforcement required:  $\frac{100}{\sqrt{s}}$ , Max 50%,  
 Over 10'-0" cover,  
 # 4 @ 12 maximum  
**Shear:**  
 $V_c = \{2.14\sqrt{f'_c} + 4600 \frac{A_s V_u d_c}{b_w d_u}\} b_w d_c \leq 4.0 \sqrt{f'_c} b_w d_c$  (Pounds)  
 $V_c$  shall not be less than  $3.00 \sqrt{f'_c} b_w d_c$  for frame members and  $2.5 \sqrt{f'_c} b_w d_c$  for simply supported members.  
**Exclusion:**  
 Compressive reinforcement and negative moment reduction (for continuity) do not apply.  
 Axial loading on members has not been considered.

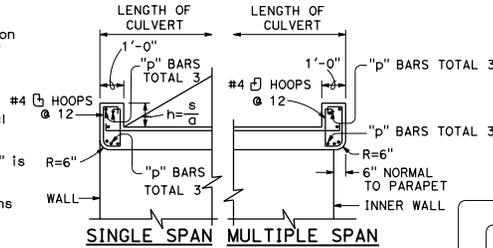
**CONSTRUCTION NOTES:**

**Construction loads:**  
 Strutting required as shown on Standard Plan D88. Strutting may be required on culvert extensions when existing parapet is removed.  
**Expansion joints:**  
 Invert:  
 No expansion joints shall be permitted.  
**Roof and Walls:**  
 When cover is less than span length-  
 Place 1/2" preformed expansion joint filler at 30'-0" ± centers outside the paved roadway lanes and place Bridge Detail 3-2, Standard Plan B0-3, at 30'-0" centers under paved roadway lanes.  
 When cover is more than span length-  
 Place 1/2" preformed expansion joint filler at 30'-0" ± centers and additional 1/2" preformed expansion joints at locations of change in foundation character, as directed by the Engineer.  
**Construction joints:**  
 Temporary joints may be permitted if normal (or radial) to centerline of RC. Otherwise, the contractor is to submit a proposal for consideration.  
**Cutoff walls:**  
 4'-0" cutoff walls are to be provided at inlet and/or outlet unless adjacent channel is lined and unless otherwise shown. These walls are to be extended if scour conditions warrant.  
**Earthwork:**  
 See Standard Plan A62E.  
**Backfill:**  
 See Standard Specifications, except that the difference in level of backfill (against outside walls) shall not exceed 2'-0".



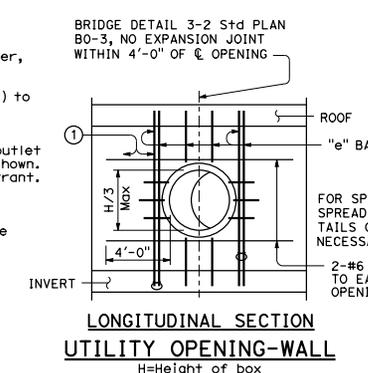
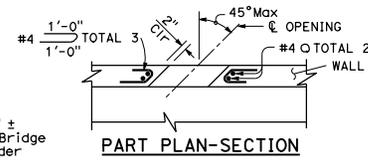
**GENERAL NOTES:**

**Designation:**  
 Standard single or multiple box culverts are shown on plans as span times height with maximum cover over roof thus: 8' x 5' RCB with 10' or double 10' x 5' RCB with 20', followed by alternatives.  
**Alternatives:**  
 Single cell: Invert will be sloped unless "trapezoidal invert", "flat invert" or "V invert" is included in designation.  
 Multiple cell: Invert will be vee unless "flat invert" is specified. Ends of culvert will be rounded unless "square ends" are designated. Parapets will be as shown unless designated in plans. Such designations may be different for inlet and outlet ends.  
**Quantities:**  
 Quantities do not include the following:  
 • Concrete for parapet, paving notches and cut-off wall.  
 • Reinforcement for 2% splices, parapets, paving notches, cut-off wall and additional required bars for exposed top slab (D-80, Note 9).  
**Reinforcement placement:**  
 Main reinforcement is to be placed transversely or, for curved culverts, radially. When radial, reinforcing spacing of the "a", "f" and "g" bars is measured along the centerline. Stagger splices not shown. Hooks may be rotated or fillet, as necessary, for clearance.  
**Special reinforcement coverage:**  
 Box standard plans are not to be used for culverts in a corrosive environment or where there is a severe abrasive flow condition or in freeze-thaw locations.  
**Special design:**  
 Required for culverts with conditions, loads, design bearing pressures or sizes greater than those given on this plan or Standard Plans D80 & D81. Also required for multiple cell culverts with unequal spans. For culverts with railroad loading, see the current AREMA design specification.  
 3 or more cells:  
 For culverts with more than two cells, use dimensions and reinforcement for the standard "double box culvert" and adjust quantities accordingly.

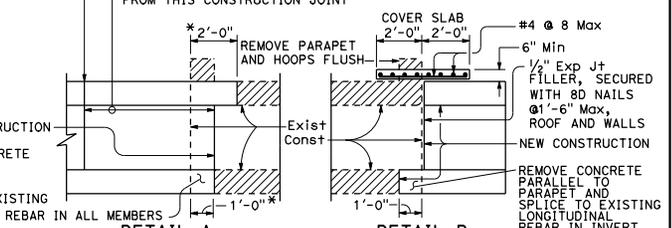
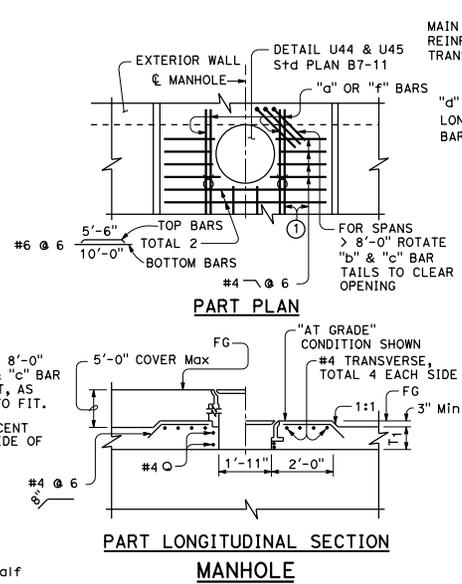


**PARAPET REINFORCEMENT**

SPAN	PARAPET "p" BARS		
	SKW TO 0°	TO 16°	TO 31°
4'	#4	#4	#4
6'	#4	#4	#5
8'	#4	#5	#6
10'	#5	#6	#7
12'	#6	#7	#8
14'	#7	#8	#9



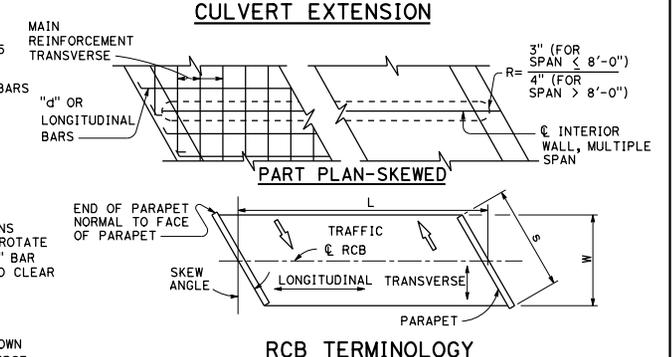
① Adjacent to each side of the opening, place additional bars equivalent to half the interrupted main reinforcement.



**CULVERT EXTENSION**

20° maximum skew as shown. If existing longitudinal and transverse reinforcing bars in top slab are lap spliced with new longitudinal and transverse reinforcing bars, the 20° skew may be exceeded. Lap splicing may require removal of top slab in excess of 2'-0" shown.

Single cell only, no skew allowed, 1'-0" minimum cover.  
 \* Measured perpendicular to parapet



**CAST-IN-PLACE REINFORCED CONCRETE BOX CULVERT MISCELLANEOUS DETAILS**

NO SCALE

STATE OF CALIFORNIA  
 DEPARTMENT OF TRANSPORTATION

RSP D82 DATED JULY 18, 2014 SUPERSEDES STANDARD PLAN D82  
 DATED MAY 20, 2011 - PAGE 174 OF THE STANDARD PLANS BOOK DATED 2010.

**REVISED STANDARD PLAN RSP D82**

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET TOTAL SHEETS

REGISTERED CIVIL ENGINEER  
 Cori N. Duan  
 No. C59976  
 Exp. 6-30-16  
 CIVIL

July 18, 2014  
 PLANS APPROVAL DATE

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2010 REVISED STANDARD PLAN RSP D82