

**GENERAL NOTES**

**QUANTITIES:** Quantities are for the sloped invert slab and do not include splices in the longitudinal bars, nor temperature reinforcement for exposed top culvert, nor concrete or reinforcement for parapets or cutoff walls.

**SPECIAL COVERAGE:** Box standard plans are not to be used for culverts in a corrosive environment or where there is a severe abrasive flow condition.

**DESIGNATION:** Show on plans as span x height-strength classification x length ( e.g. 4 x 4-A x 60' ), followed by alternatives.

**ALTERNATIVES:** Invert will be sloped unless "Trapezoidal Invert", "Flat Invert" or "V Invert" is included in designation. Ends of culvert will be rounded unless "Square Ends" are designated. Parapets will be as shown unless "\_\_\_ ft. parapet" is designated in plans. Such designations may be different for inlet and outlet ends.

**REINFORCEMENT PLACEMENT:** Main Reinforcement is positioned transverse or, for curved culverts, radial. When radial, reinforcing spacing is measured along C/L.

**CONSTRUCTION NOTES**

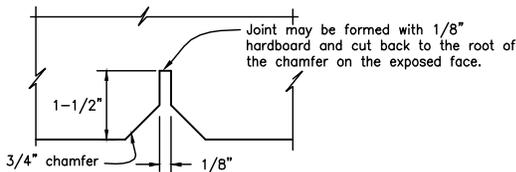
**CONCRETE:** Bottom slab & walls shall be Class 560-B-3250. Top slab shall be Class 560-C-3250.

**EXPANSION JOINTS:** Bottom Slab - No expansion joints shall be placed.

Top Slab and Walls - When cover is less than span length, place 1/2" expansion joint filler at 50± centers outside the paved roadway lanes and place weakened plane joints per Detail A of Weakened Planes Detail 3-2 of C-15 at 30± centers under paved roadway lanes. When cover depth is greater than span length, place 1/2" expansion joint filler at 30± centers and additional 1/2" expansion joints at locations of change of foundation character as directed by the Engineer.

**CONSTRUCTION LOADS:** Not permitted until concrete has reached a strength of 3,000 p.s.i. or age of 28 days, whichever occurs first, and falsework plans have been submitted by the Contractor to the Engineer and approved.

**CONSTRUCTION JOINTS:** Temporary joints may be permitted if normal ( or radial ) to C/L of RCB. Otherwise, the Contractor is to submit a proposal for consideration.



**DETAIL A OF WEAKENED PLANES DETAIL 3-2**  
(Portion of Standard Drawing C-15)

**DESIGN NOTES**

**SPECIFICATIONS**

**DESIGN:** AASHTO's publication titled A Policy on Geometric Design of Highways, dated 1984, with revisions as supplemented by State of California Bridge Planning and Design Manual.

Sections designed for culvert in a trench on hard foundation or culvert untrenched on yielding foundation. Special design will be required for culverts on piles or rock foundations.

**LOADING**

**LIVE LOAD:** For legal highway loads, use HS20-44 or alternative with 30% impact for all cover depths with no impact on invert.

**COVER LESS THAN 2':** Wheel load distribution on the top slab is  $E=0.175S+3.2'$  longitudinally and concentrated along the span. Wheel load distribution on the invert slab is 7.5' longitudinally and uniformly over the breadth of the culvert.

**COVER 2' OR MORE:** Wheel loads distributed uniformly over a square, the sides of which are 1.75 times the depth of cover, but not less longitudinally than E on the top slab, or 7.5' on the invert slab when such areas from several wheel concentrations overlap. The total load shall be considered as uniformly distributed over the area defined by the outside limits of the individual areas, but the overall longitudinal dimension shall not exceed the total length of the supporting slab. Neglect live load, on single spans when cover is more than 8' and exceeds span, and on multiple spans when cover exceeds distance between exterior walls.

**DEAD LOAD:** Earth load of 120 pcf and an equivalent fluid pressure of 36 pcf, reduced to 84 pcf and 25 pcf respectively for clear spans of 20' or less.

**UNIT STRESSES:**  $F_s = 20,000$  psi,  $N = 10$   
 $F_c = 1,200$  psi

Reinforcement embedment is 1-1/2 dia. clear, min 1" and in 1/4" increments, except as noted.

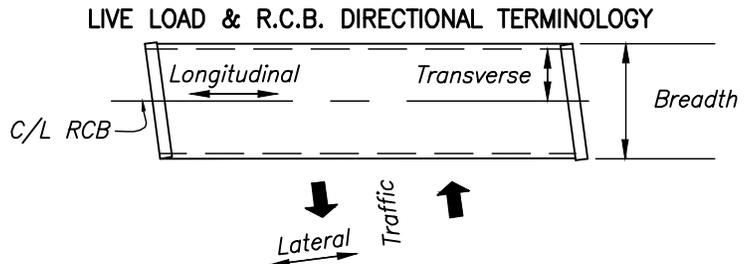
Distribution "d" bars expressed as a percent of main positive reinforcement.

Classification "A" top slab =  $\frac{100}{\sqrt{SPAN}}$ , max. 50% ( unless traffic longitudinal )

Classification "B" to "E": Top and bottom slabs #4 @ 18" max.

**USE OF STANDARD DRAWING**

"Strength Classification," as symbolized by the letters ("A", "B", "C" or "D") at the top of the data table is merely a convenient designation for a particular structural section for a culvert of any given opening. It is dictated by the cover or depth of fill over the the top slab.



Revision	By	Approved	Date
ORIGINAL		Kercheval	12/75
Add Metric		T. Stanton	03/03
Reviewed		T. Stanton	04/06
Edited	S.S.	T. Regello	03/11

**SAN DIEGO REGIONAL STANDARD DRAWING**

**BOX CULVERT**  
**MISCELLANEOUS DETAILS No. 1**

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

*T. Stanton* 7/26/2012

Chairperson R.C.E. 19246 Date

DRAWING NUMBER **D-81A**