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COMMENTS:

LEVELS DISPLAYED

TABLE OF DIMENSIONS & REINFORCING STEEL  
(Wings for One Structure End)

Dimensions					Variable Reinforcing		Estimated Quantities per ft of wing length (2-Wings)	
Maximum Wingwall Height Hw	W	X	Y	Z	Bars J1	Bars J2	Reinf (Lb/Ft)	Conc (CY/Ft)
2'-6"	2'-5"	1'-0"	9"	7"	#4	1'-0"	33.73	0.248
3'-0"	2'-5"	1'-0"	9"	7"	#4	1'-0"	37.07	0.261
3'-6"	2'-5"	1'-0"	9"	7"	#4	1'-0"	37.74	0.273
4'-0"	2'-5"	1'-0"	9"	7"	#4	1'-0"	38.41	0.285
4'-6"	3'-2"	1'-6"	1'-0"	7"	#4	1'-0"	41.75	0.330
5'-0"	3'-2"	1'-6"	1'-0"	7"	#4	1'-0"	45.09	0.343
5'-6"	3'-2"	1'-6"	1'-0"	7"	#4	1'-0"	45.75	0.355
6'-0"	3'-2"	1'-6"	1'-0"	7"	#4	1'-0"	46.42	0.367
7'-0"	3'-8"	1'-9"	1'-3"	7"	#4	1'-0"	52.77	0.414
8'-0"	4'-2"	2'-0"	1'-6"	8"	#5	1'-0"	60.19	0.486
9'-0"	4'-8"	2'-3"	1'-9"	8"	#4	6"	81.49	0.535
10'-0"	5'-2"	2'-6"	2'-0"	8"	#5	6"	97.25	0.584
11'-0"	5'-8"	2'-9"	2'-3"	8"	#6	6"	133.65	0.634
12'-0"	6'-2"	3'-0"	2'-6"	9"	#7	6"	162.29	0.721
13'-0"	6'-8"	3'-3"	2'-9"	11"	#7	6"	178.80	0.856
14'-0"	7'-2"	3'-6"	3'-0"	1'-0"	#8	6"	216.78	0.959
15'-0"	7'-8"	4'-0"	3'-0"	1'-1"	#9	6"	283.06	1.068
16'-0"	8'-2"	4'-6"	3'-0"	1'-3"	#9	6"	297.02	1.234

TABLE OF WINGWALL REINFORCING  
(2-Wings)

Bar	Size	No.	Spa
D	#5	~	1'-0"
E	#4	~	1'-0"
F	#4	~	1'-0"
G	#6	4	~
M	#4	4	~
P	#4	~	1'-0"
R	#5	6	~
V	#4	~	1'-0"

TABLE OF ESTIMATED CULVERT TOEWALL QUANTITIES

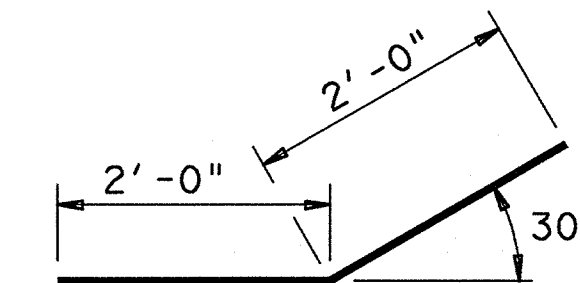
Bar	Size	No.	Spa
L	#4	~	1'-6"
Q	#4	1	~
Reinf (Lb/Ft)			2.45
Conc (CY/Ft)			0.037

WING DIMENSION CALCULATIONS:

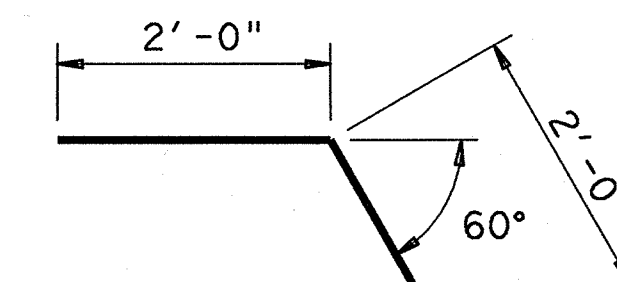
Formulas: (All values are in Feet)  
 $Hw = H + T + C - 0.250'$   
 $A = (Hw - 0.333') (SL)$   
 $B = (A) \text{ Tangent } (30^\circ)$   
 $Lw = (A) \div \text{Cosine } (30^\circ)$   
For Cast-in-place culverts:  
 $Ltw = (N) (S) + (N+1) (U)$   
For Precast culverts:  
 $Ltw = (N) (2U+S) + (N-1) (0.500')$   
Total Wingwall Area (Two Wings ~ S.F.) =  $(Hw + 0.333') (Lw)$

Hw = Height of Wingwall  
SL:1 = Side Slope Ratio (Horizontal:1 Vertical)  
Lw = Length of Wingwall  
Ltw = Culvert Toewall Length  
N = Number of Culvert Spans

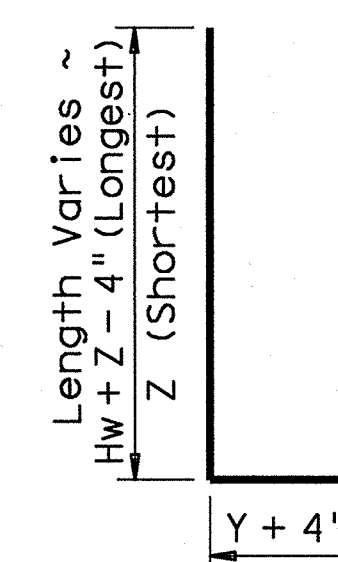
See applicable box culvert standard for H, S, T, and U values.



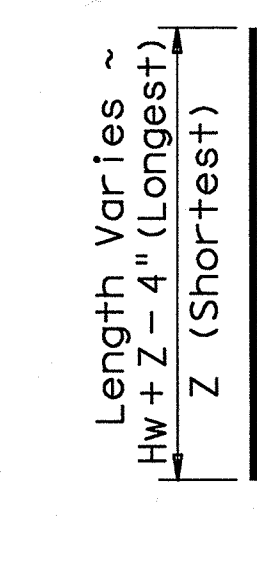
BARS D



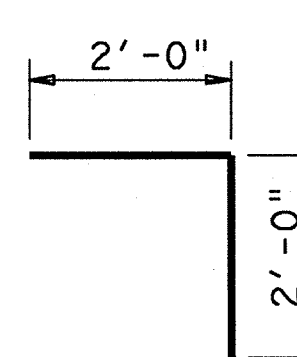
BARS R



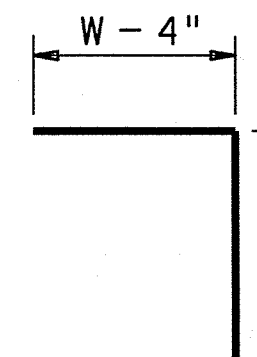
BARS J1



BARS V



BARS L



BARS J2

- Extend Bars P 3'-0" minimum into bottom slab of Box Culvert.
- Adjust to fit as necessary to maintain 1 1/4" clear cover and 4" minimum between bars.
- Quantities shown are based on an average wing height for two wings (one structure end). To determine total quantities for two wings multiply the tabulated values by Lw.
- Recommended values of Slope are: 2:1, 3:1, 4:1, & 6:1.
- When shown elsewhere on the plans, a 5" deep concrete riprap shall be constructed. Unless otherwise shown on the plans or directed by the Engineer, the riprap shall have a 6" wide by 1'-6" deep reinforced concrete toewall along all edges adjacent to natural ground; the toewall shall be reinforced by extending typical riprap reinforcing into the toewall; construction joints or grooved joints, oriented in the direction of flow, shall extend across the full distance of the riprap, at intervals of approximately 20'. When such riprap is provided, the culvert toewall shown in SECTION B-B will not be required. Payment for riprap shall be as required by Item 432, "Riprap".
- At Contractor's option, Culvert Toewall may be ended flush with Wingwall Toewall. Adjust reinforcing from that shown as necessary.
- 0" min to 5'-0" max. For T6 or C6 Rail, see T6-CM standard for additional details. For all other rail types, refer to the RAC standard. For curbs without rail and greater than 1'-0" high, see ECD standard for additional details. Estimated curb heights are shown elsewhere in the plans.
- For vehicle safety, curb heights and wall heights shall be reduced, if necessary, to provide a maximum 3" projection above finished grade. No changes will be made in quantities and no additional compensation will be allowed for this work.

GENERAL NOTES:

Designed according to current AASHTO Standard and Interim Specifications.  
All reinforcing steel shall be Grade 60.  
All concrete shall be Class "C" and shall have a minimum compressive strength of 3600 psi.  
All reinforcing bars shall be adjusted to provide a minimum of 1 1/4" clear cover.  
When structure is founded on solid rock, depth of toewalls for culverts and wingwalls may be reduced or eliminated as directed by the Engineer.  
See BCS sheet for additional dimensions and information.  
The quantities for concrete and reinforcing steel resulting from the formulas given on this sheet are for Contractor's information only.

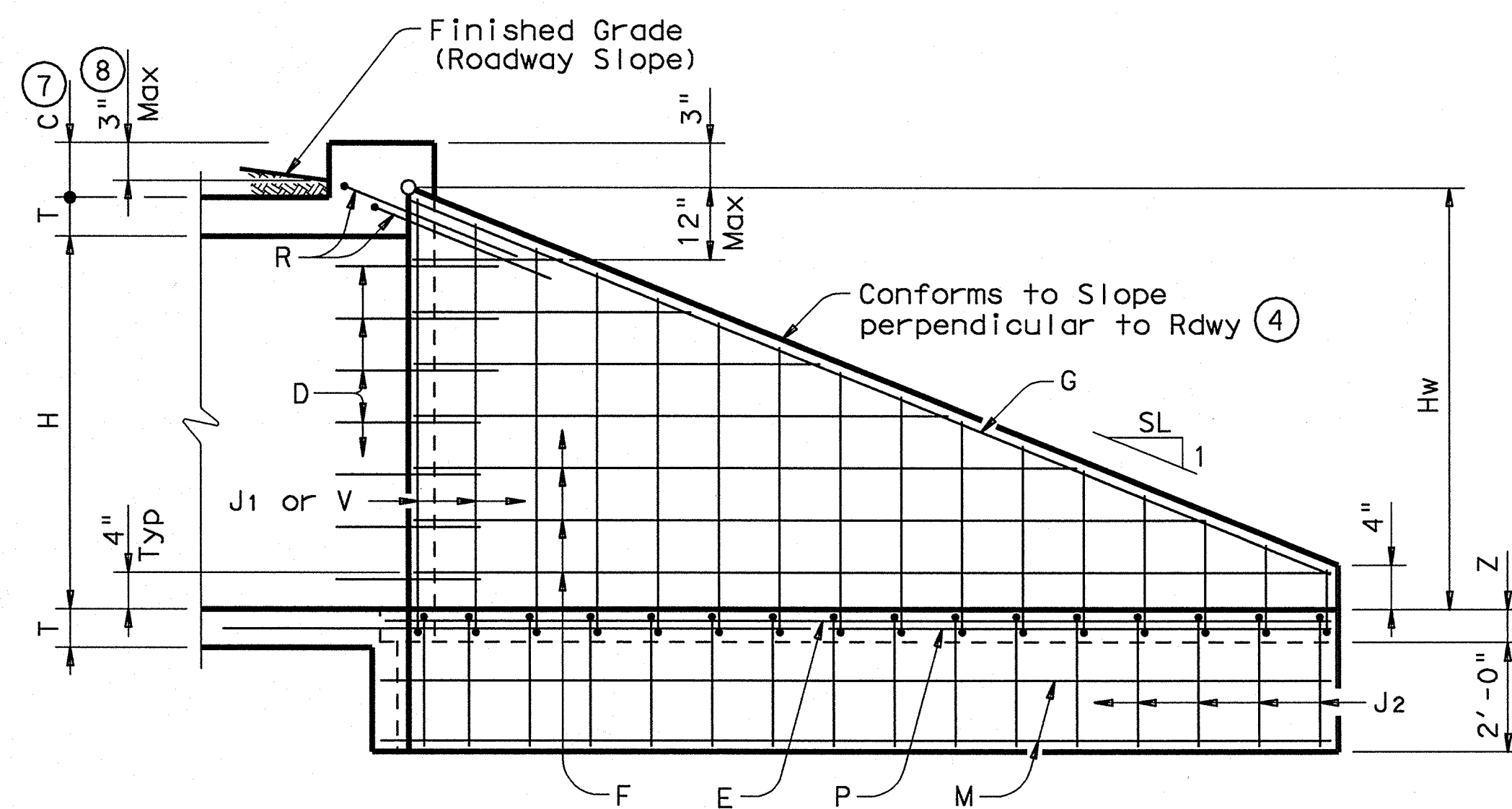
RECORD DRAWING  
THIS RECORD DRAWING HEREIN REFLECTS TO THE BEST OF THE DESIGN ENGINEER'S KNOWLEDGE, THE APPROXIMATE LOCATION OF THE CONSTRUCTED WORK, USING INFORMATION AS PROVIDED BY THE CONTRACTORS AND SURVEYED GRADES.

Texas Department of Transportation  
Bridge Division

CONCRETE WINGWALLS  
WITH FLARED WINGS FOR  
0° SKEW BOX CULVERTS

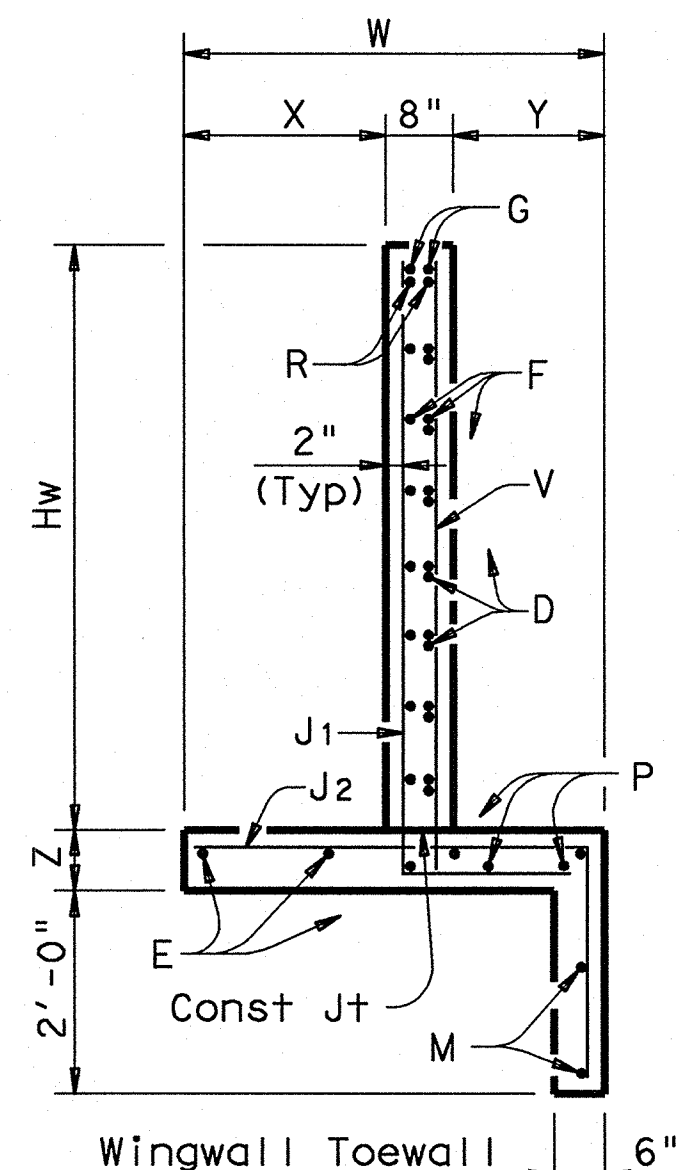
FW-0

FILE: fw-0std.dgn	DN: GAF	CK: CAT	DW: TxDOT	CK: GAF
© TxDOT May 2005	DISTRICT	FEDERAL AID PROJECT	SHEET	
REVISIONS	COUNTY	CONTROL	SECT	JOB
				HIGHWAY

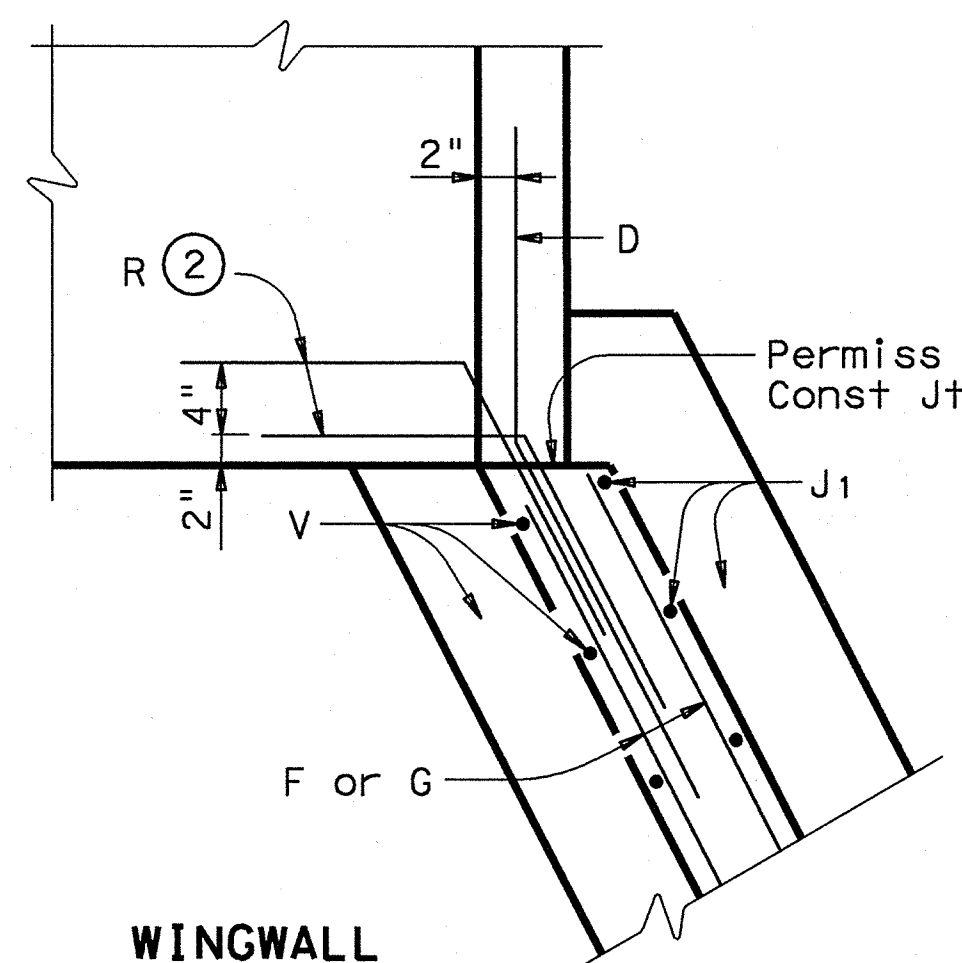


INSIDE ELEVATION

(Showing reinforcing. Culvert and Culvert Toewall reinforcing not shown for clarity.)



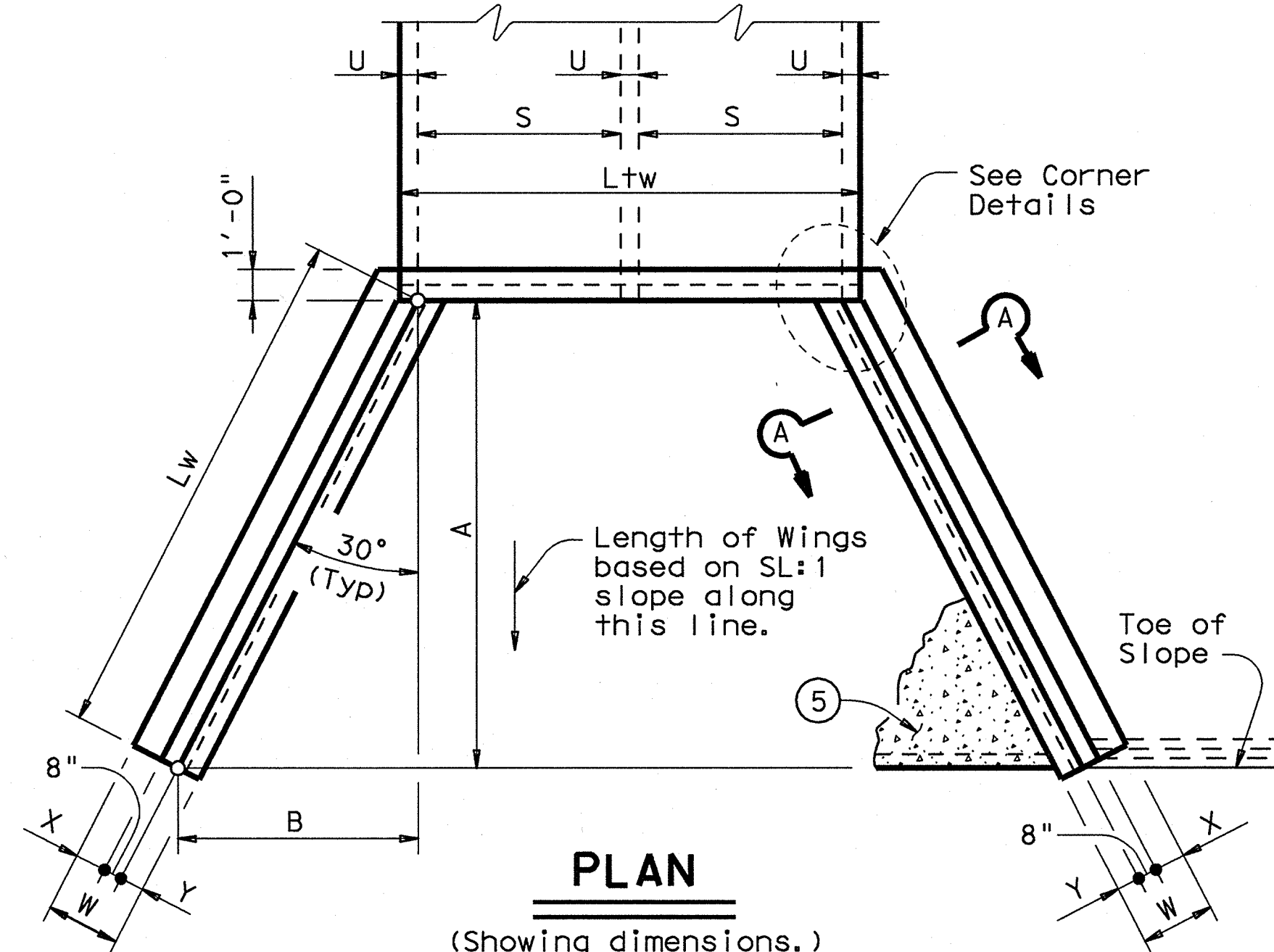
SECTION A-A



WINGWALL

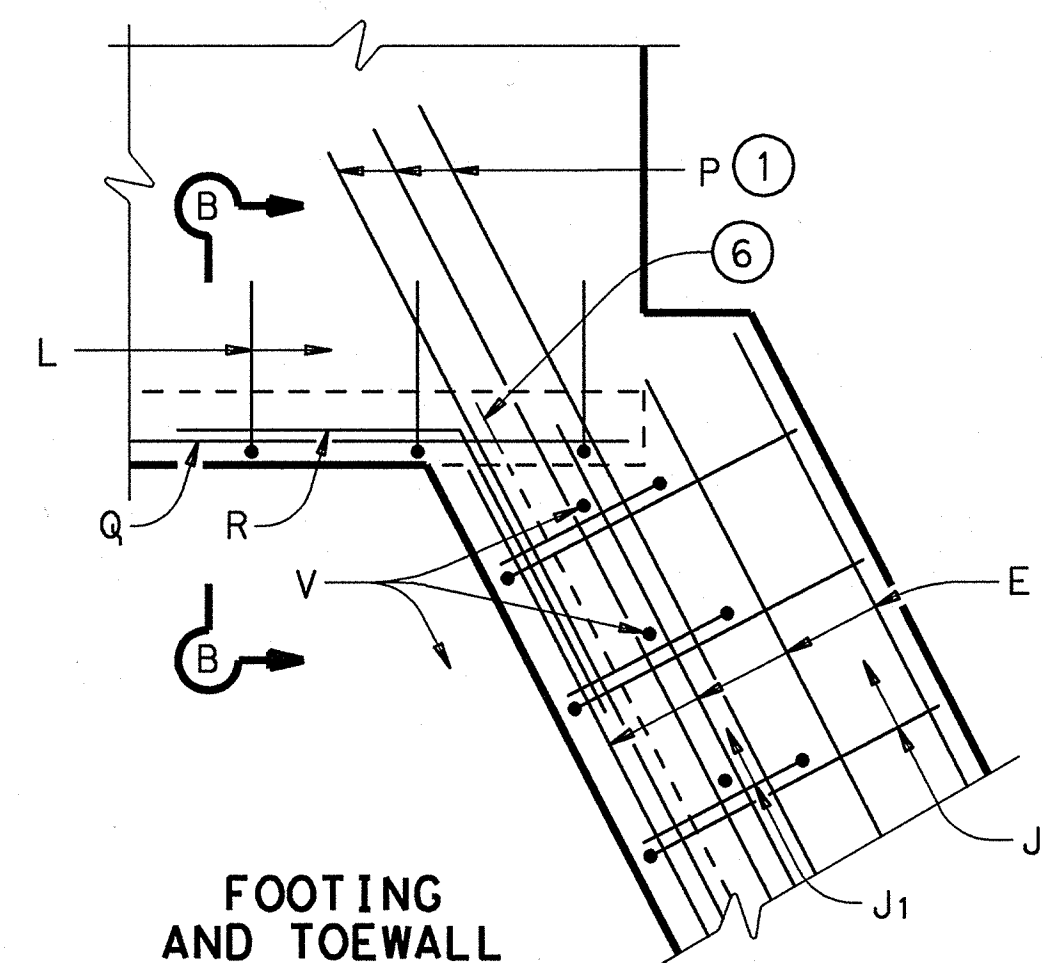
CORNER DETAILS

(Culvert and Culvert Toewall reinforcing not shown for clarity.)

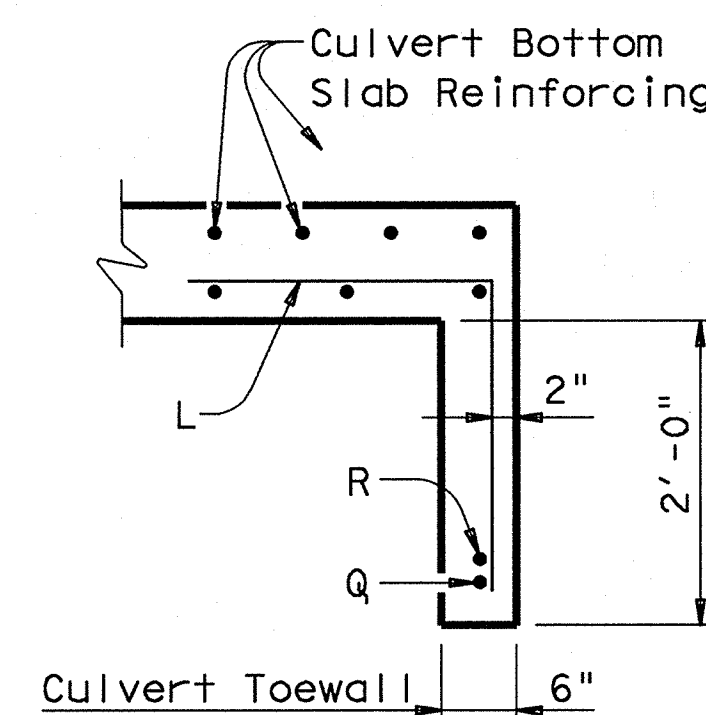


PLAN

(Showing dimensions.)



FOOTING  
AND TOEWALL



SECTION B-B