

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

Dimensions	Variable Reinforcing			Estimated Quantities per ft. of wing length (2~Wings)
	W	X	Y	
Maximum Wingwall Height Hw	2'-6"	2'-5"	1'-0"	0.248
	3'-0"	2'-5"	1'-0"	0.261
	3'-6"	2'-5"	1'-0"	0.273
	4'-0"	2'-5"	1'-0"	0.285
	4'-6"	2'-2"	1'-6"	0.330
	5'-0"	2'-2"	1'-6"	0.343
	5'-6"	2'-2"	1'-6"	0.355
	6'-0"	2'-2"	1'-6"	0.367
	7'-0"	3'-8"	1'-9"	0.414
	8'-0"	4'-2"	2'-0"	0.486
	9'-0"	4'-8"	3'-1"	0.535
	10'-0"	5'-2"	2'-6"	0.584
	11'-0"	5'-8"	3'-2"	0.634
	12'-0"	6'-2"	3'-8"	0.721
	13'-0"	6'-8"	3'-2"	0.856
	14'-0"	7'-2"	3'-8"	0.959
	15'-0"	7'-8"	4'-0"	1.068
	16'-0"	8'-2"	4'-6"	1.234

TABLE OF WINGWALL REINFORCING (2~Wings)

Bar	Size	No.	Spa
DL	#5	~	1'-0"
DS	#5	~	1'-0"
E	#4	~	1'-0"
F	#4	~	1'-0"
G	#6	4	~
M	#4	4	~
P	#4	~	1'-0"
RS	#5	3	~
RL	#5	3	~
V	#4	~	1'-0"

TABLE OF ESTIMATED CULVERT TOEWALL QUANTITIES

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

WING DIMENSION CALCULATIONS:

Formulas: (All values are in Feet)

$Hw = H + T + C - 0.250'$

$A = (Hw - 0.333') (SL)$

$B = (A) [\text{Tangent } (0 - \theta)]$

$Lw = (A) \pm [\text{Cosine } (0 - \theta)]$

For Cost-in-place culverts:

$Ltw = [(N) (S) \cos \theta] + [(U)] (\cos \theta)$

For Precast culverts:

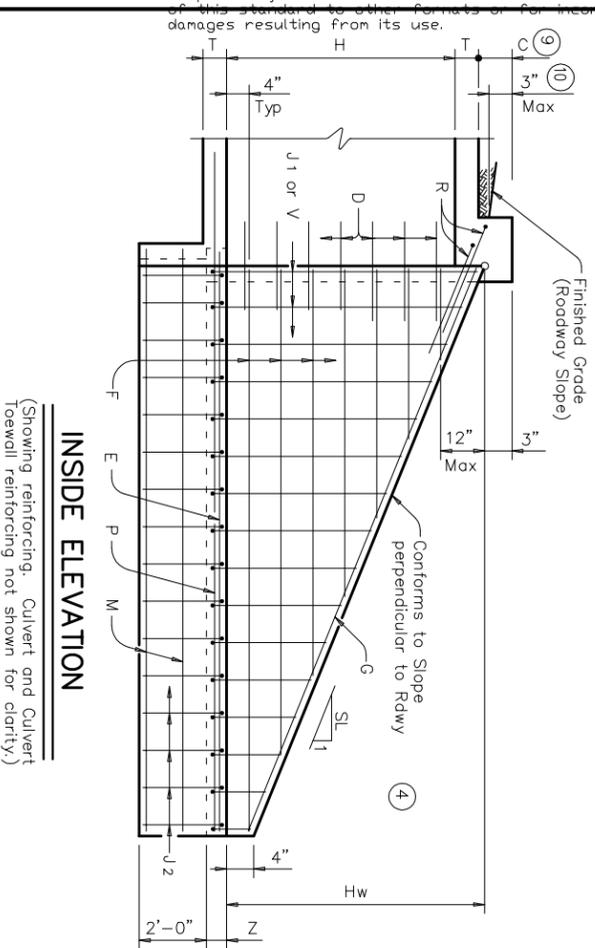
$Ltw = [(N) (2U) \cos \theta] + [(N) (0.5000)] (\cos \theta)$

Total Wingwall Area (Two Wings ~ S.F.) = $(Lw) (A) +$

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

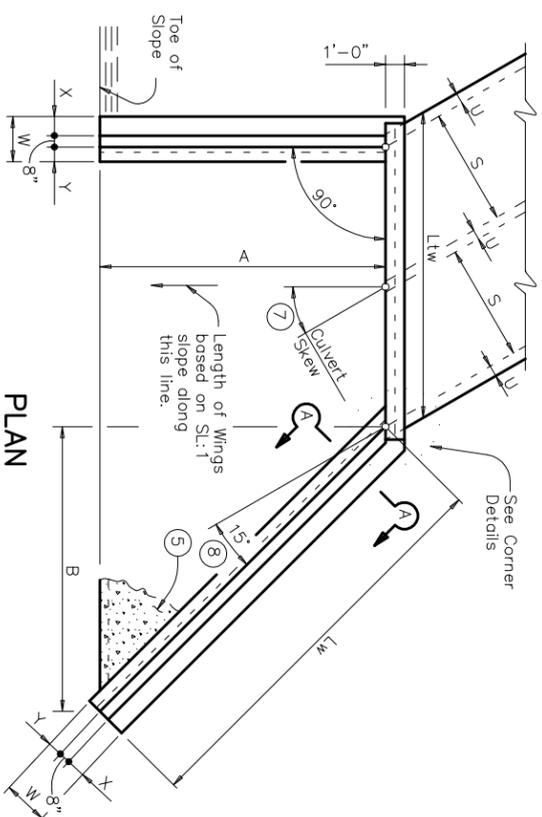
See applicable box culvert standard for H, S, T, and U values.

DISCLAIMER: The use of this standard is governed by the 'Texas Engineering Practice Act'. No warranty of any kind is made by TxDOT for any purpose whatsoever. TxDOT assumes no responsibility for the conversion of this standard to other formats or for incorrect damages resulting from its use.



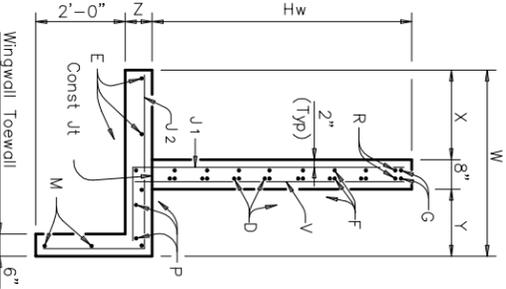
INSIDE ELEVATION

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

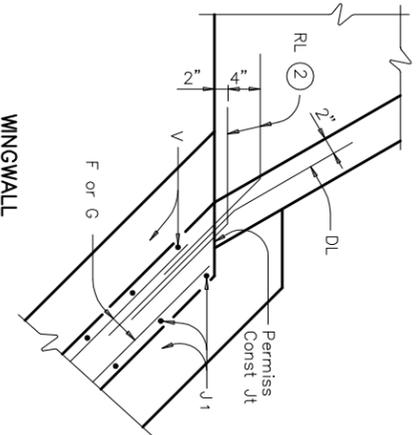


PLAN

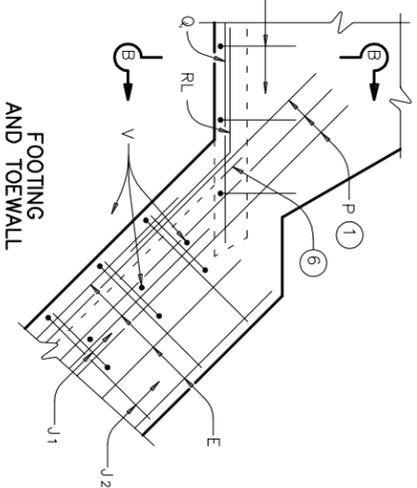
(Showing dimensions and 30° Skew.)



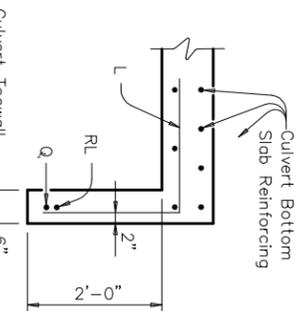
SECTION A-A



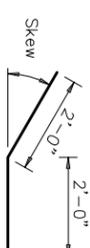
WINGWALL



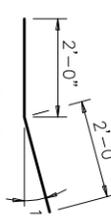
FOOTING AND TOEWALL



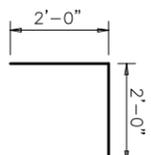
SECTION B-B



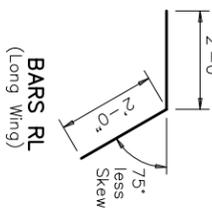
BARS DS
(Short Wing)



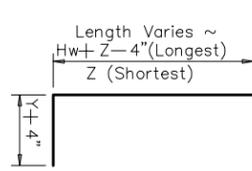
BARS DL
(Long Wing)



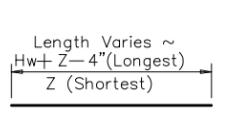
BARS RS
(Short Wing)



BARS RL
(Long Wing)



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 0.5 x (A+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. Payment for riprap shall be as required by Item 432, Riprap. 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 SECTION B-B will not be required.
- At Contractor's option, Culvert Toewall may be ended flush with Wingwall Toewall. Adjust reinforcing from that shown as necessary.
- Applicable values of Skew are: 15°, 30°, and 45°.
- Typical wingwall angle for all skews.
- 0" min to 5'-0" max. Estimated curb heights are shown elsewhere in the plans. For structures with pedestrian rail, bicycle roll or curbs taller than 1'-0", refer to ECD standard. For structures with 16 bridge rail, refer to T6-CM standard. For structures with traffic rail, other than T6, refer to RAC standard.
- 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 AASHTO LRFD Specifications. All reinforcing steel shall be Grade 60. Synthetic fibers listed on the "Fibers for Concrete" Material Producer List (MPL) may be used in lieu of steel reinforcing in riprap concrete unless noted otherwise. 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.

Texas Department of Transportation
 Bridges Division Standard

CONCRETE WINGWALLS WITH FLARED WINGS FOR SKEWED BOX CULVERTS

FW-S

DATE:
FILE:

FILE: fw-sstdt-dgn	PK: GAF	CK: CAT	DW: TxDOT	CK: GAF
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REVISONS	DIST:	COUNTY:	SHEET NO:	