

REVISED 10-12 - DELETED THE REFERENCE TO THE DESIGN MANUAL IN NOTE 19 PERTAINING TO DETAILS IN THE DESIGN MANUAL.  
 REVISED 1-16 - UPDATED NOTE 17 PERTAINING TO CONCRETE FORMS. (OLD NOTE: REMAINING IN PLACE 5 DAYS OR LONGER, EXCEPT MIN. CONC. FLEXURAL STRENGTH BEFORE REMOVAL SHALL BE 575 PSI).  
 REVISED 07-2016 - ADDED THE DESIGN VERTICAL AND HORIZONTAL EARTH PRESSURES AND RENUMBERED THE GENERAL NOTES. CHANGED DISTANCE IN NOTE #20 FROM 20 INCHES TO 18.  
 ENGLISH LRFD SIGNED TWIN CULVERTS.DGN - TWRCB G1-12 - THIS SHEET ISSUED 04-12.



# TWIN REINFORCED CONCRETE BOX CULVERT STANDARDS

## GENERAL NOTES:

- THE RCB CULVERT SECTIONS ARE DESIGNED FOR HL-93 LIVE LOAD AND EARTH FILLS OF VARYING HEIGHTS.
- VERTICAL EARTH PRESSURE,  $E_v = 0.120$  kcf. HORIZONTAL EARTH PRESSURE,  $E_{hmax} = 0.060$  kcf MAX,  $E_{hmin} = 0.030$  kcf.
- THE RCB CULVERT SECTIONS ARE DESIGN FOR CLASS I EXPOSURE CONDITIONS EXCEPT: CLASS 2 EXPOSURE CONDITION IS UTILIZED FOR THE SLAB DESIGN IN O'FILL INSTANCES.
- ALL SLAB AND FLOOR REINFORCING STEEL IS TO BE SUPPORTED AT INTERVALS OF NOT MORE THAN 3'-0 IN EITHER DIRECTION AS OUTLINED IN THE STANDARD SPECIFICATIONS.
- THE CLEAR DISTANCE FROM FACE OF CONCRETE TO NEAR EDGE OR END OF REINFORCING BAR TO BE 2" UNLESS OTHERWISE NOTED.
- EXCEPT FOR DOWEL BARS 5r1 IN SLAB, LONGITUDINAL REINFORCING IS NOT TO EXTEND THRU THE CONSTRUCTION JOINTS.
- FLOOR OF BARREL IS TO BE FINISHED SMOOTH. SIDES OF FOOTING ARE TO BE FORMED TO INSURE CORRECT LINE AND GRADE.
- THE PERMISSIBLE CONSTRUCTION JOINT AT THE TOP OF THE WALLS MAY BE LOWERED AT THE CONTRACTOR'S OPTION WITH ENGINEER'S APPROVAL.
- THE REINFORCEMENT SUPPLIED FOR THIS STRUCTURE SHALL BE GRADE 60 REINFORCEMENT IN ACCORDANCE WITH THE STANDARD SPECIFICATIONS. THE DESIGN STRESSES ARE BASED ON GRADE 60 REINFORCEMENT.
- THE VERTICAL BARS IN THE WALLS MAY BE SPLICED ABOVE THE FOOTING AT THE CONTRACTOR'S OPTION AS FOLLOWS:

BAR SIZE NUMBER	4	5	6	7	8	9
MINIMUM SPLICE LENGTH	17"	21"	25"	31"	41"	51"

- THIS SPLICE, IF USED, WILL BE AT THE CONTRACTOR'S EXPENSE.
- REINFORCING BAR CLEARANCES WILL BE AS FOLLOWS:  
 EDGE CLEARANCES: 2" EXCEPT  
 TOP OF FLOOR 2 1/4" TO NEAR TRANSVERSE REINFORCING BAR  
 BOTTOM OF FLOOR 3 1/2" TO NEAR TRANSVERSE REINFORCING BAR  
 END CLEARANCES:  
 VERTICAL TOP 2"  
 VERTICAL BOTTOM 3" OR 3 1/2" IF OVERALL HEIGHT OF THE CULVERT IS NOT TO A FULL INCH  
 TRANSVERSE 2"
  - ALL CONSTRUCTION JOINTS SHALL BE FORMED WITH A BEVELED KEYWAY EXCEPT AT BELL JOINTS.
  - ALL BEVELED KEYWAYS SHALL BE CENTERED.
  - KEYWAY SIZE SHALL BE 2x4 EXCEPT AS FOLLOWS:  
 KEYWAY BETWEEN THE FLOOR AND WALL SHALL BE 2x6 WHEN THE WALL IS GREATER THAN 10 INCHES WIDE.
  - KEYWAY DIMENSIONS SHOWN ON THE PLANS ARE BASED ON NOMINAL DIMENSIONS UNLESS STATED OTHERWISE. IN ADDITION, THE BEVEL USED ON THE KEYWAY SHALL BE LIMITED TO A MAXIMUM OF 10 DEGREES FROM VERTICAL.
  - IF O' OF FILL IS SPECIFIED, DETAILS FOR PAVING NOTCH AND REFERENCE TO EPOXY COATING OF SLAB REINFORCING STEEL, IF APPLICABLE, SHALL BE INCLUDED IN THE FINAL PLANS.
  - ALL DIMENSIONS ARE IN FEET AND INCHES UNLESS OTHERWISE NOTED OR SHOWN.
  - SEE CURRENT STANDARD SPECIFICATIONS REGARDING CONCRETE FORM REMOVAL.
  - THESE CULVERT STANDARDS LABEL ALL REINFORCING STEEL WITH ENGLISH NOTATION (501 IS 3/8 INCH DIAMETER BAR). ENGLISH REINFORCING STEEL RECEIVED IN THE FIELD MAY DISPLAY THE FOLLOWING "BAR DESIGNATION". THE "BAR DESIGNATION" IS THE STAMPED IMPRESSION ON THE REINFORCING BARS, AND IS EQUIVALENT TO THE BAR DIAMETER IN MILLIMETERS.

ENGLISH SIZE	4	5	6	7	8	9
BAR DESIGNATION	13	16	19	22	25	29

- IN THE EVENT THE SLAB THICKNESS AT THE BARREL END SECTION EXCEEDS 18 INCHES, THE CULVERT PARAPET SHALL EXTEND A MINIMUM OF 6 INCHES ABOVE THE TOP OF THE CULVERT SLAB. REFER TO THE CULVERT DESIGN MANUAL FOR INSTRUCTIONS. THESE DETAILS ARE TO BE INCLUDED IN THE DESIGN PLANS TO ADDRESS THESE SITUATIONS.

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TWH 0-1-12	FLARED WING HEADWALLS, 0° SKEW, DIMENSION PLAN & TABLE
TWH 0-2-12	FLARED WING HEADWALLS, 0° SKEW, APRON & CURTAIN WALL DETAILS
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TWH 15-2-12	FLARED WING HEADWALLS, 15° SKEW, DIMENSION TABLE
TWH 15-3-12	FLARED WING HEADWALLS, 15° SKEW, APRON DETAILS
TWH 15-4-12	FLARED WING HEADWALLS, 15° SKEW, PARAPET & CURTAIN WALL DETAILS
TWH 15-5-12	FLARED WING HEADWALLS, 15° SKEW, WINGWALL DETAILS
TWH 15-6-12	FLARED WING HEADWALLS, 15° SKEW, QUANTITIES TABLE
TWH 15-7-12	FLARED WING HEADWALLS, 15° SKEW, QUANTITIES TABLE
TWH 15-8-12	FLARED WING HEADWALLS, 15° SKEW, QUANTITIES TABLE
TWH 15-9-12	FLARED WING HEADWALLS, 15° SKEW, QUANTITIES TABLE
TWH 30-1-12	FLARED WING HEADWALLS, 30° SKEW, DIMENSION PLAN
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TWH 30-3-12	FLARED WING HEADWALLS, 30° SKEW, APRON DETAILS
TWH 30-4-12	FLARED WING HEADWALLS, 30° SKEW, PARAPET & CURTAIN WALL DETAILS
TWH 30-5-12	FLARED WING HEADWALLS, 30° SKEW, WINGWALL DETAILS
TWH 30-6-12	FLARED WING HEADWALLS, 30° SKEW, QUANTITIES TABLE
TWH 30-7-12	FLARED WING HEADWALLS, 30° SKEW, QUANTITIES TABLE
TWH 30-8-12	FLARED WING HEADWALLS, 30° SKEW, QUANTITIES TABLE
TWH 30-9-12	FLARED WING HEADWALLS, 30° SKEW, QUANTITIES TABLE
TWH 45-1-12	FLARED WING HEADWALLS, 45° SKEW, DIMENSION PLAN
TWH 45-2-12	FLARED WING HEADWALLS, 45° SKEW, DIMENSION TABLE
TWH 45-3-12	FLARED WING HEADWALLS, 45° SKEW, APRON DETAILS
TWH 45-4-12	FLARED WING HEADWALLS, 45° SKEW, APRON DETAILS
TWH 45-5-12	FLARED WING HEADWALLS, 45° SKEW, PARAPET & CURTAIN WALL DETAILS
TWH 45-6-12	FLARED WING HEADWALLS, 45° SKEW, WINGWALL DETAILS
TWH 45-7-12	FLARED WING HEADWALLS, 45° SKEW, QUANTITIES TABLE
TWH 45-8-12	FLARED WING HEADWALLS, 45° SKEW, QUANTITIES TABLE
TWH 45-9-12	FLARED WING HEADWALLS, 45° SKEW, QUANTITIES TABLE
TWH 45-10-12	FLARED WING HEADWALLS, 45° SKEW, QUANTITIES TABLE
TWCBJ 1-12	CULVERT BELL JOINTS, 8' SPANS
TWCBJ 2-12	CULVERT BELL JOINTS, 10' & 12' SPANS
TWCBJ 3-12	CULVERT BELL JOINTS, ALL SPANS

## SPECIFICATIONS:

DESIGN:  
AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS, 5TH ED., SERIES OF 2010.

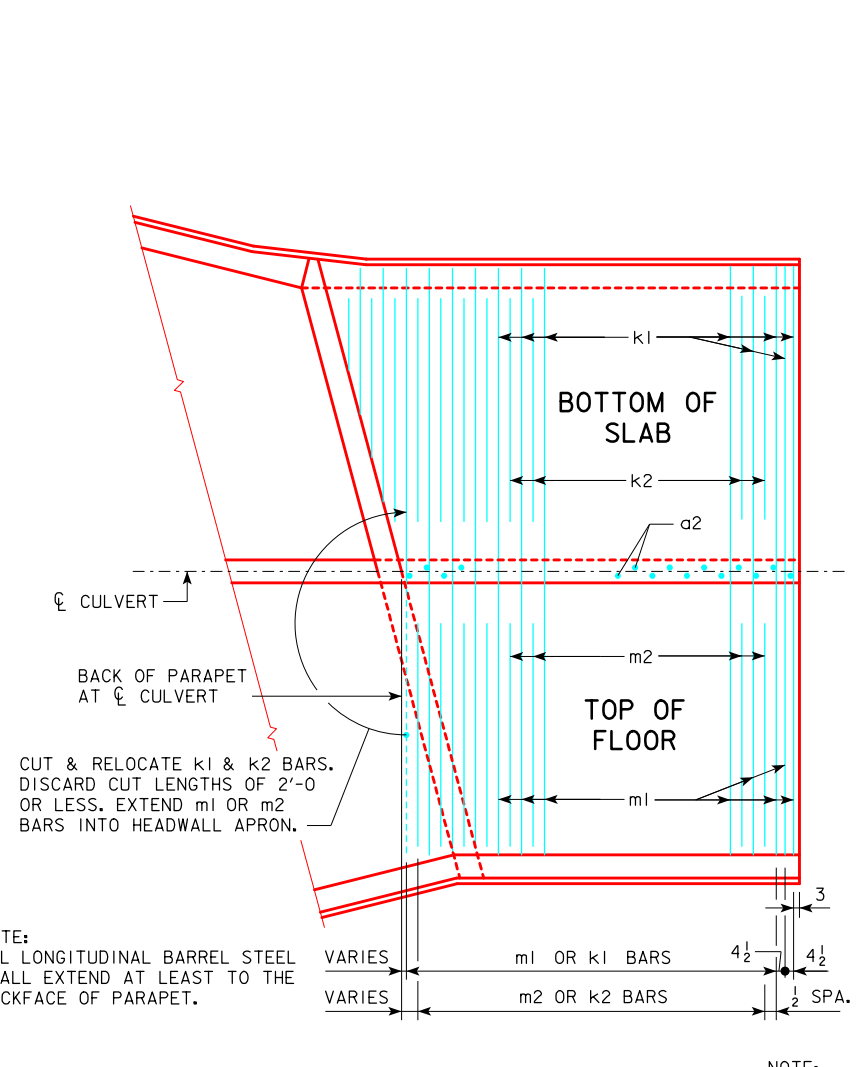
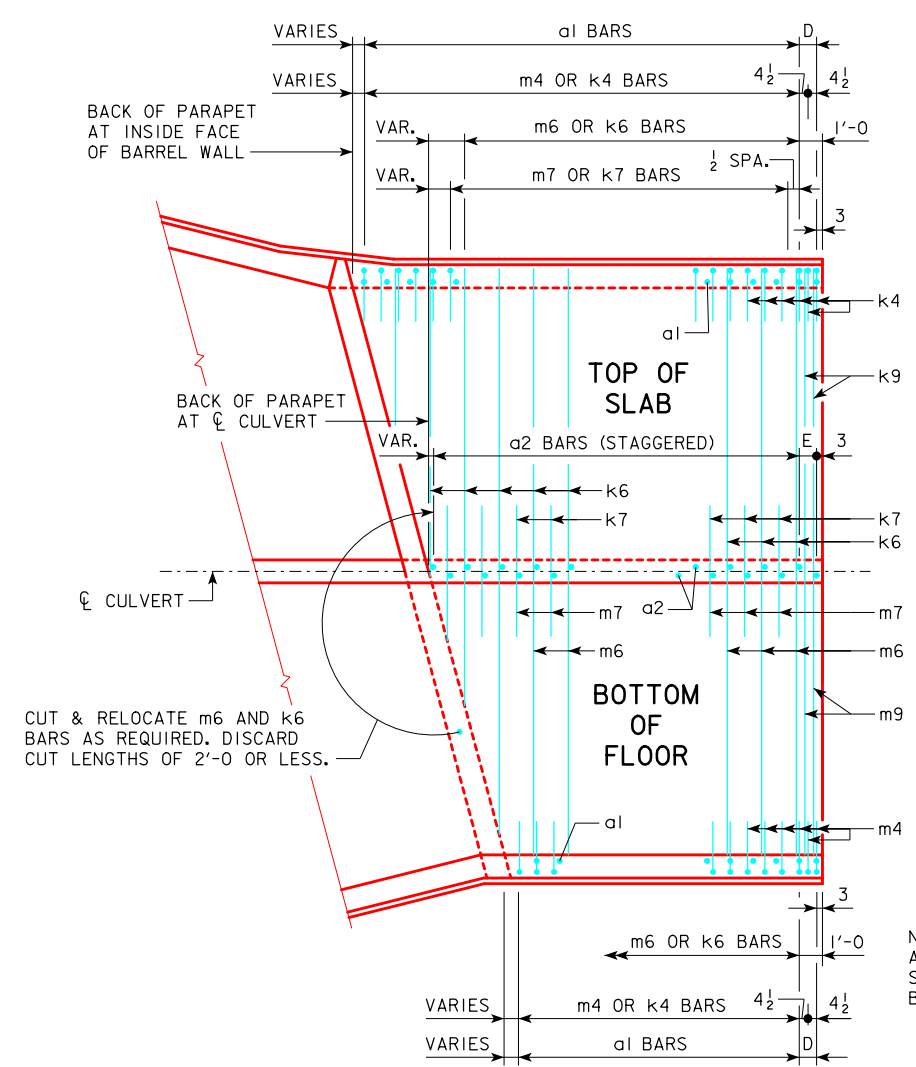
CONSTRUCTION:  
IOWA DEPARTMENT OF TRANSPORTATION STANDARD SPECIFICATIONS FOR HIGHWAY AND BRIDGE CONSTRUCTION, CURRENT SERIES, PLUS APPLICABLE GENERAL SUPPLEMENTAL SPECIFICATIONS, DEVELOPMENTAL SPECIFICATIONS, SUPPLEMENTAL SPECIFICATIONS AND SPECIAL PROVISIONS

## DESIGN STRESSES:

DESIGN STRESSES FOR THE FOLLOWING MATERIALS ARE IN ACCORDANCE WITH THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS, 5TH ED., SERIES OF 2010:  
 REINFORCING STEEL IN ACCORDANCE WITH AASHTO LRFD SECTION 5, GRADE 60.  
 CONCRETE IN ACCORDANCE WITH AASHTO LRFD SECTION 5,  $f'_c = 4.0$  KSI.

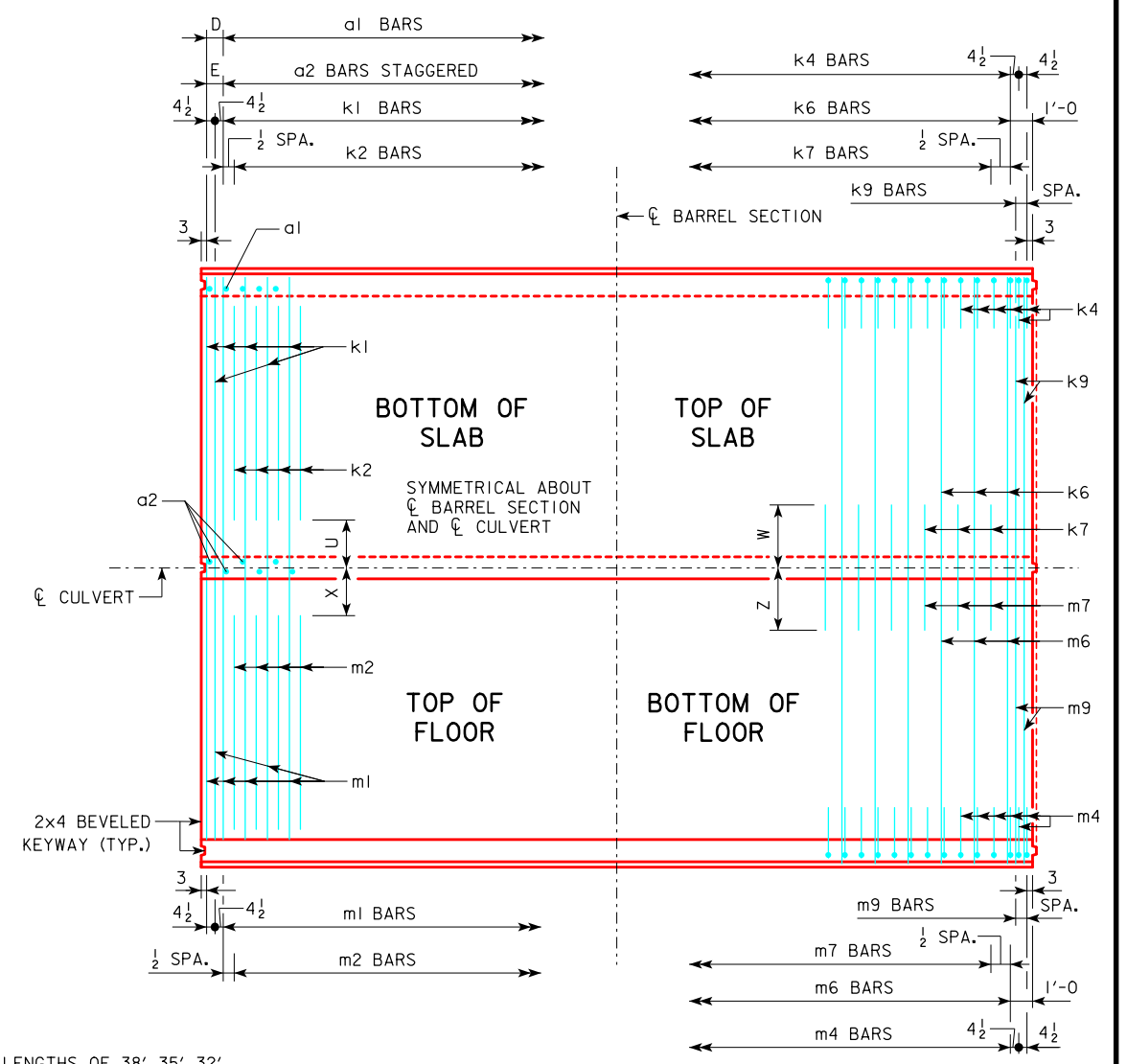
07-2016 LATEST REVISION DATE	 APPROVED BY BRIDGE ENGINEER		
		STANDARD DESIGN <b>TWIN REINFORCED CONCRETE BOX CULVERTS</b> APRIL, 2012	
		<b>INDEX &amp; GENERAL NOTES</b>	<b>TWRCB G1-12</b>

REVISED 07-14 - TRANSITION WALL DETAILS.  
 REVISED 12-2016 - EDITED KEYWAY NOTES IN PLAN VIEWS AND CORRECTED TYPINGS.  
 ENGLISHLRFDSIGNEDTWINCULVERTS.DGN - TWRCB G2-12 - THIS SHEET ISSUED 04-12.



**END SECTION PLAN VIEWS**  
 (KEYWAYS NOT SHOWN)

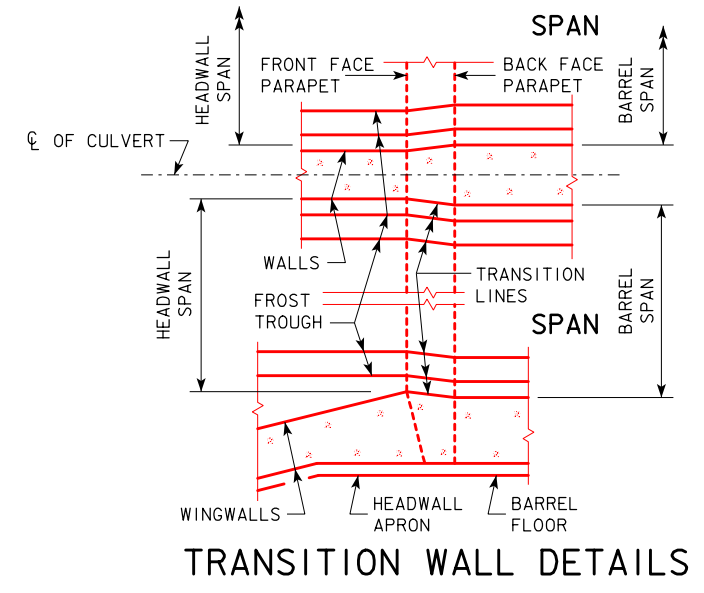
NOTE:  
 END SECTION DETAILS SHOWN ARE FOR A 15° SKEW BARREL.  
 USE FOR SKEWS OF 30° & 45° BY INCREASING THE NUMBER  
 OF TRANSVERSE REINFORCING BARS REQUIRED TO BE CUT  
 AND RELOCATED.



**STANDARD SECTION PLAN VIEW**  
 (KEYWAY IS TO BE OMITTED WHEN BELL JOINTS ARE USED)

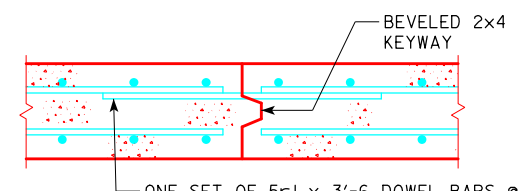
NOTE:  
 TYPICAL FOR LENGTHS OF 38', 35', 32',  
 29', AND 26'. THESE LENGTHS ARE SHOWN  
 AS TYPICAL BECAUSE ALL TRANSVERSE  
 AND VERTICAL REINFORCING STEEL SPACING  
 REPEATS IN 3'-0 INTERVALS.

NOTE:  
 DIMENSIONS LISTED ON THIS SHEET TO BE USED IN  
 CONJUNCTION WITH DIMENSIONS AND QUANTITIES FOR  
 BARREL SECTION SHEETS.



**TRANSITION WALL DETAILS**

5r1 BARS - ONE CONST. JT.		
SPAN	NO.	WEIGHT (LB)
8'-0	18	66
10'-0	22	80
12'-0	26	95



**TOP SLAB CONSTRUCTION JOINT DETAIL**

ONE SET OF 5r1 x 3'-6 DOWEL BARS @ 1'-0  
 SPACING REQUIRED IN SLAB AT ALL CULVERT  
 BARREL JOINTS, EXCEPT JOINTS WITH BELL JOINTS.  
 SEE TABLE FOR NUMBER REQUIRED AND TOTAL WEIGHT.

12-2016 LATEST REVISION DATE  <i>Thomas L. Mc Donald</i> APPROVED BY BRIDGE ENGINEER		
	STANDARD DESIGN <b>TWIN REINFORCED CONCRETE          BOX CULVERTS</b> APRIL, 2012	
	<b>TYPICAL CULVERT          BARREL DETAILS</b>	<b>TWRCB G2-12</b>













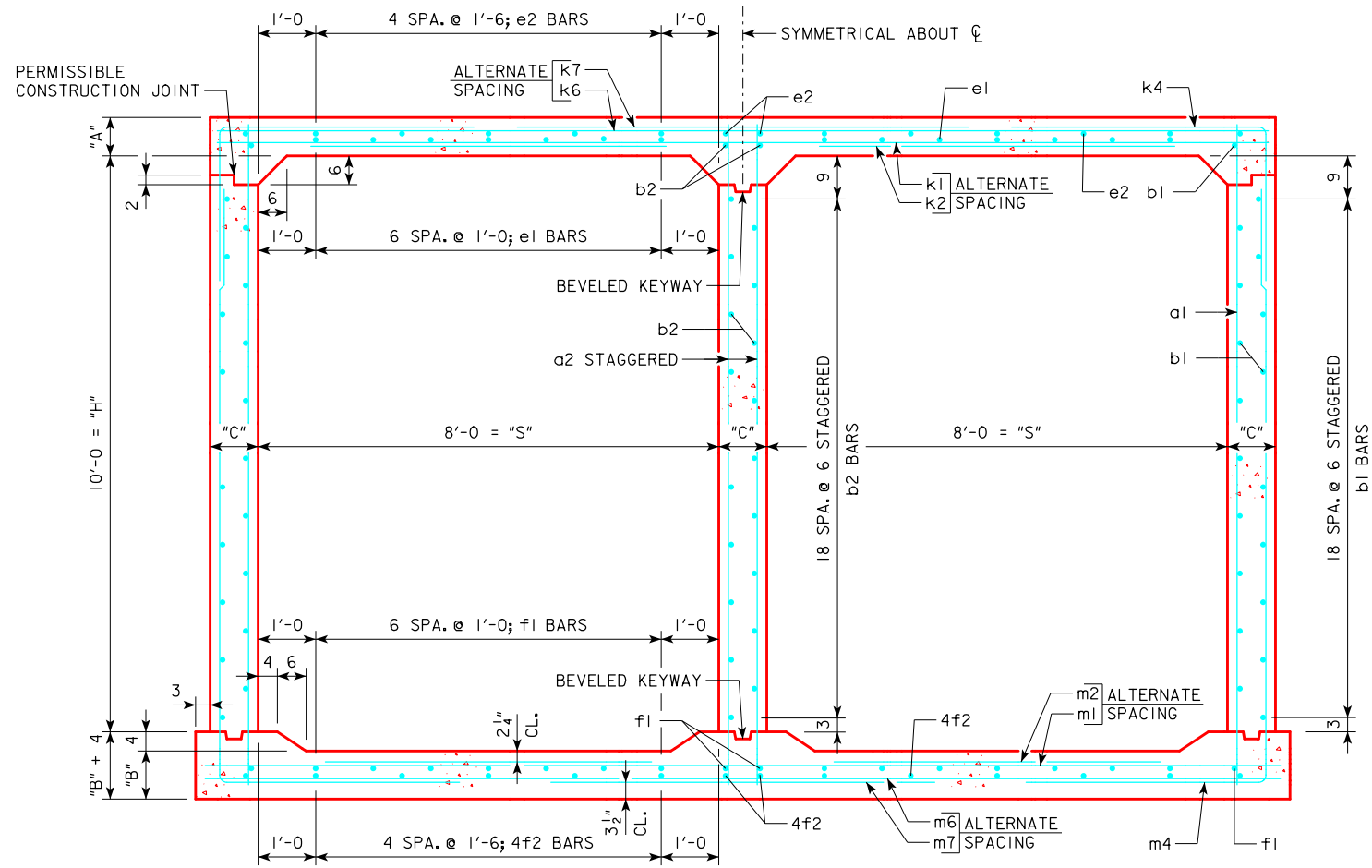




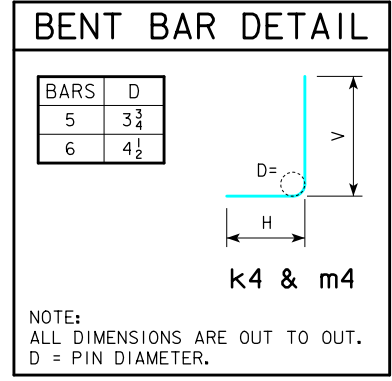
## VARIABLE DIMENSIONS AND QUANTITIES FOR TWIN 8 x 10 BARREL SECTIONS

DIMENSIONS													BAR LIST																																														
FILL	S	H	A	B	C	D	E	U	W	X	Z	a1			a2			b1			b2			e1			e2			f1			f2			k1			k2			k4			k6			k7			k9								
												SIZE	SP.	L	SIZE	SP.	L	SIZE	SP.	NO.	SIZE	SP.	NO.	SIZE	SP.	NO.	SIZE	SP.	NO.	SIZE	SP.	NO.	SIZE	SP.	NO.	SIZE	SP.	L	SIZE	SP.	L	SIZE	SP.	L	SIZE	SP.	L	SIZE	SP.	L	SIZE	SP.	L	SIZE	SP.	L	SIZE	SP.	L
0	8	10	13	11	10	6	9	0'-0	5'-4	1'-10	5'-6	4	6	11'-11	7	9	11'-11	4	6	40	4	6	21	5	12	14	4	18	14	4	12	18	4	18	14	6	18	18'-2	6	18	9'-1	5	9	8'-9	5'-6	3'-3	4	12	18'-2	4	12	10'-8	4	4.5	18'-2				
1	8	10	11.5	11	10	6	9	0'-8	5'-4	1'-10	5'-4	4	6	11'-9	7	9	11'-9	4	6	40	4	6	21	4	12	14	4	18	14	4	12	18	4	18	14	5	12	18'-2	4	12	8'-5	5	9	8'-8	5'-6	3'-2	4	12	18'-2	4	12	10'-8	4	4.5	18'-2				
2	8	10	8	10	10	6	9	0'-8	5'-6	1'-9	4'-2	4	6	11'-5	7	9	11'-5	4	6	40	4	6	21	5	12	14	4	18	14	4	12	18	4	18	14	6	18	18'-2	6	18	8'-1	5	9	8'-2	5'-4	2'-10	5	18	18'-2	6	18	11'-0	6	4.5	18'-2				
3	8	10	8	10	10	6	9	1'-5	5'-6	1'-7	3'-7	4	6	11'-5	7	9	11'-5	4	6	40	4	6	21	4	12	14	4	18	14	4	12	18	4	18	14	5	12	18'-2	4	12	6'-7	5	9	8'-2	5'-4	2'-10	5	18	18'-2	6	18	11'-0	6	4.5	18'-2				
4	8	10	8	10	10	9	9	1'-9	3'-11	2'-2	3'-4	5	12	11'-5	7	9	11'-5	4	6	40	4	6	21	4	12	14	4	18	14	4	12	18	4	18	14	6	18	18'-2	5	18	6'-2	5	9	7'-3	4'-5	2'-10	5	18	18'-2	6	18	7'-10	6	4.5	18'-2				
5-7	8	10	8	10	10	9	9	2'-0	3'-4	2'-3	2'-11	4	12	11'-5	7	9	11'-5	4	6	40	4	6	21	4	12	14	4	18	14	4	12	18	4	18	14	6	18	18'-2	5	18	5'-7	6	9	7'-6	4'-4	3'-2	4	12	18'-2	5	12	6'-8	5	4.5	18'-2				
8-10	8	10	8	10	10	9	9	2'-0	2'-11	2'-3	2'-11	4	9	11'-5	7	9	11'-5	4	6	40	4	6	21	4	12	14	4	18	14	4	12	18	4	18	14	6	18	18'-2	5	18	5'-10	6	9	7'-0	3'-10	3'-2	5	12	18'-2	5	12	5'-10	5	4.5	18'-2				
11-13	8	10	8.5	11	10	9	9	2'-0	2'-10	1'-9	3'-3	4	9	11'-6	7	9	11'-6	4	6	40	4	6	21	4	12	14	4	18	14	4	12	18	4	18	14	5	12	18'-2	4	12	5'-9	5	6	6'-5	3'-6	2'-11	4	9	18'-2	5	9	5'-8	5	4.5	18'-2				
14-16	8	10	9	12	10.5	9	9	1'-8	3'-0	1'-7	3'-3	5	12	11'-8	7	9	11'-8	4	6	40	4	6	21	4	12	14	4	18	14	4	12	18	4	18	14	4	9	18'-3	4	9	6'-7	5	6	6'-4	3'-5	2'-11	5	12	18'-3	6	12	6'-0	6	4.5	18'-3				
17-19	8	10	10	13	10.5	9	9	1'-9	2'-11	1'-9	3'-3	4	9	11'-10	7	9	11'-10	4	6	40	4	6	21	4	12	14	4	18	14	4	12	18	4	18	14	5	12	18'-3	4	12	6'-3	5	6	6'-6	3'-3	3'-3	5	12	18'-3	6	12	5'-10	6	4.5	18'-3				
20-22	8	10	11	14	11.5	9	9	1'-5	2'-11	1'-5	3'-3	5	12	12'-0	7	9	12'-0	4	6	40	4	6	21	4	12	14	4	18	14	4	12	18	4	18	14	4	9	18'-6	4	9	7'-1	5	6	6'-8	3'-4	3'-4	5	12	18'-6	6	12	5'-10	6	4.5	18'-6				
23-25	8	10	13.5	15.5	12	9	9	1'-2	3'-1	1'-3	3'-3	5	12	12'-4	7	9	12'-4	4	6	40	4	6	21	4	12	14	4	18	14	4	12	18	4	18	14	6	18	18'-8	6	18	7'-10	6	9	7'-4	3'-8	3'-8	4	12	18'-8	6	12	6'-2	6	4.5	18'-8				

DIMENSIONS													BAR LIST																		QUANTITIES					
FILL	S	H	A	B	C	D	E	U	W	X	Z	m1			m2			m4			m6			m7			m9			CONCRETE (CY/FT)				STEEL (LB/FT)		
												SIZE	SP.	L	SIZE	SP.	L	SIZE	SP.	L	H	V	SIZE	SP.	L	SIZE	SP.	L	SIZE	SP.	L	SLAB	FLOOR	WALLS	TOTAL	
0	5	12	18'-8	4	12	6'-3	5	9	15'-8	5'-4	10'-4	4	18	18'-8	6	18	11'-0	6	4.5	18'-8	0.803	0.707	0.887	2.397	329.29											
1	5	12	18'-8	4	12	6'-3	5	9	15'-10	5'-6	10'-4	5	18	18'-8	5	18	10'-8	5	4.5	18'-8	0.718	0.707	0.887	2.312	316.79											
2	5	12	18'-8	5	12	6'-6	5	9	16'-11	6'-8	10'-3	5	18	18'-8	6	18	8'-4	6	4.5	18'-8	0.518	0.649	0.887	2.054	339.53											
3	4	9	18'-8	4	9	6'-7	5	9	14'-7	4'-4	10'-3	5	18	18'-8	6	18	7'-2	6	4.5	18'-8	0.518	0.649	0.887	2.054	313.71											
4	5	12	18'-8	4	12	5'-6	5	9	14'-5	4'-2	10'-3	5	18	18'-8	6	18	6'-8	6	4.5	18'-8	0.518	0.649	0.887	2.054	300.66											
5-7	5	12	18'-8	4	12	5'-3	6	9	14'-4	4'-1	10'-3	4	9	18'-8	4	9	5'-10	4	4.5	18'-8	0.518	0.649	0.887	2.054	317.08											
8-10	5	12	18'-8	4	12	5'-7	6	9	14'-0	3'-9	10'-3	4	9	18'-8	5	9	5'-10	5	4.5	18'-8	0.518	0.649	0.887	2.054	328.45											
11-13	4	9	18'-8	4	9	6'-7	5	6	13'-11	3'-7	10'-4	5	18	18'-8	8	18	6'-6	8	4.5	18'-8	0.546	0.707	0.887	2.140	328.61											
14-16	5	12	18'-9	5	12	6'-11	5	6	14'-0	3'-7	10'-5	5	18	18'-9	8	18	6'-6	8	4.5	18'-9	0.580	0.770	0.934	2.284	344.92											
17-19	5	12	18'-9	4	12	6'-9	5	6	13'-11	3'-5	10'-6	5	18	18'-9	8	18	6'-6	8	4.5	18'-9	0.638	0.829	0.934	2.401	336.97											
20-22	6	18	19'-0	6	18	7'-8	5	6	14'-2	3'-7	10'-7	5	18	19'-0	8	18	6'-6	8	4.5	19'-0	0.708	0.902	1.022	2.632	351.61											
23-25	6	18	19'-2	6	18	7'-10	6	9	14'-5	3'-8	10'-9	4	9	19'-2	5	9	6'-6	5	4.5	19'-2	0.861	0.999	1.067	2.927	355.55											



**TWIN 8 x 10 BARREL SECTION**



**NOTES:**

1. DIMENSIONS LISTED ON THIS SHEET TO BE USED IN CONJUNCTION WITH SHEET TWRCB G2-12.
2. DIMENSIONS "A", "B", "C", "D", "E", AND "SP." LISTED IN THE BAR LIST ARE IN INCHES.

LATEST REVISION DATE	 APPROVED BY BRIDGE ENGINEER	 STANDARD DESIGN <b>TWIN REINFORCED CONCRETE BOX CULVERTS</b> APRIL, 2012	<b>TWRCB 8-10-12</b> 8 x 10 BARREL SECTIONS
<b>CULVERT BARREL DETAILS</b>			

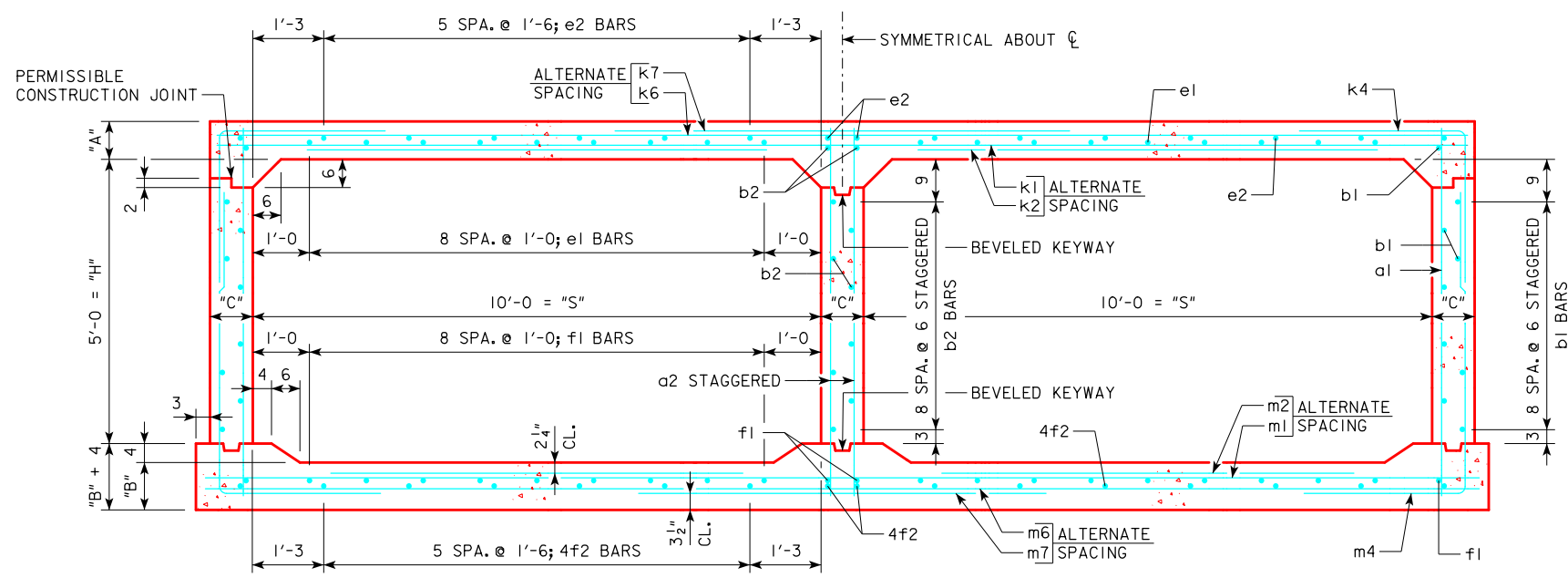
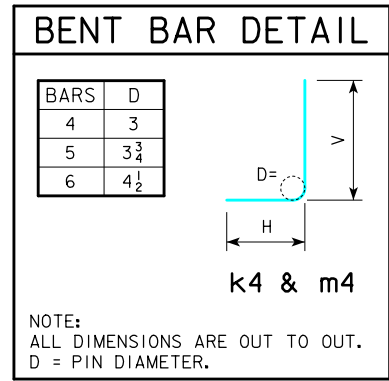
ENGLISHLRFDDESIGNEDTWINCULVERTS.DGN -- TWRCB 8-10-12 -- THIS SHEET ISSUED 04-12.



## VARIABLE DIMENSIONS AND QUANTITIES FOR TWIN 10 x 5 BARREL SECTIONS

DIMENSIONS												BAR LIST																																											
FILL	S	H	A	B	C	D	E	U	W	X	Z	a1			a2			b1			b2			e1			e2			f1			f2			k1			k2			k4			k6			k7			k9				
SIZE	SP.	SIZE	SP.	SIZE	SP.	SIZE	SP.	SIZE	SP.	SIZE	SP.	SIZE	SP.	L	SIZE	SP.	L	SIZE	SP.	NO.	SIZE	SP.	NO.	SIZE	SP.	NO.	SIZE	SP.	NO.	SIZE	SP.	NO.	SIZE	SP.	L	SIZE	SP.	L	SIZE	SP.	L	SIZE	SP.	L	SIZE	SP.	L	SIZE	SP.	L	SIZE	SP.	L		
0	10	5	13	11	9	9	9	0'-0	6'-3	2'-1	6'-3	4	12	6'-11	6	9	6'-11	4	6	20	4	6	11	4	12	18	4	18	16	4	12	22	4	18	16	6	18	21'-11	6	18	10'-11	5	9	6'-6	3'-3	3'-3	4	9	21'-11	4	9	12'-6	4	4.5	21'-11
1	10	5	12.5	11	9	9	9	0'-5	6'-3	2'-2	4'-11	4	12	6'-10	6	9	6'-10	4	6	20	4	6	11	4	12	18	4	18	16	4	12	22	4	18	16	6	18	21'-11	6	18	10'-6	5	9	6'-6	3'-3	3'-3	4	9	21'-11	4	9	12'-6	4	4.5	21'-11
2	10	5	9.5	10	9	9	9	0'-10	5'-10	2'-0	4'-3	4	12	6'-6	6	9	6'-6	4	6	20	4	6	11	4	12	18	4	18	16	4	12	22	4	18	16	6	18	21'-11	6	18	10'-1	5	6	6'-0	3'-0	3'-0	5	18	21'-11	7	18	11'-8	7	4.5	21'-11
3	10	5	9	10	9	9	9	1'-5	4'-11	2'-0	3'-10	4	12	6'-6	6	9	6'-6	4	6	20	4	6	11	4	12	18	4	18	16	4	12	22	4	18	16	5	12	21'-11	5	12	9'-1	5	6	5'-10	2'-11	2'-11	4	12	21'-11	6	12	9'-10	6	4.5	21'-11
4	10	5	8	10	9	6	9	1'-10	4'-0	2'-4	3'-7	4	6	6'-5	6	9	6'-5	4	6	20	4	6	11	4	12	18	4	18	16	4	12	22	4	18	16	5	12	8'-1	5	12	8'-1	5	6	5'-10	2'-11	2'-11	4	9	21'-11	5	9	8'-0	5	4.5	21'-11
5-7	10	5	8	10	9	6	9	2'-0	3'-10	2'-5	3'-9	4	6	6'-5	6	9	6'-5	4	6	20	4	6	11	4	12	18	4	18	16	4	12	22	4	18	16	5	12	21'-11	5	12	7'-8	5	9	5'-8	2'-10	2'-10	5	12	21'-11	6	12	7'-8	6	4.5	21'-11
8-10	10	5	9	11	9	6	9	2'-0	3'-6	2'-3	3'-5	4	6	6'-7	6	9	6'-7	4	6	20	4	6	11	4	12	18	4	18	16	4	12	22	4	18	16	5	12	21'-11	5	12	7'-9	6	9	6'-0	2'-9	3'-3	5	9	21'-11	5	9	7'-0	5	4.5	21'-11
11-13	10	5	11	13	9	9	9	1'-10	3'-7	2'-1	3'-7	4	9	6'-11	6	9	6'-11	4	6	20	4	6	11	4	12	18	4	18	16	4	12	22	4	18	16	6	18	21'-11	6	18	8'-8	4	6	5'-5	2'-4	3'-1	4	9	21'-11	6	9	7'-2	6	4.5	21'-11
14-16	10	5	12.5	14.5	9	9	9	1'-7	3'-8	1'-9	3'-8	4	12	7'-2	6	9	7'-2	4	6	20	4	6	11	4	12	18	4	18	16	4	12	22	4	18	16	6	18	21'-11	6	18	9'-4	6	12	5'-9	2'-3	3'-6	5	12	21'-11	7	12	7'-4	7	4.5	21'-11
17-19	10	5	14	16	9	9	9	1'-7	3'-9	1'-8	3'-10	4	12	7'-5	6	9	7'-5	4	6	20	4	6	11	4	12	18	4	18	16	4	12	22	4	18	16	5	12	21'-11	5	12	9'-4	6	12	5'-11	2'-3	3'-8	5	12	21'-11	7	12	7'-6	7	4.5	21'-11
20-22	10	5	15	16.5	9	9	9	1'-3	3'-10	1'-11	3'-10	4	12	7'-6	6	9	7'-6	4	6	20	4	6	11	4	12	18	4	18	16	4	12	22	4	18	16	5	12	21'-11	5	12	9'-8	6	12	6'-1	2'-4	3'-9	5	9	21'-11	6	9	7'-8	6	4.5	21'-11
23-25	10	5	16	18	9	9	9	1'-6	3'-10	1'-7	4'-0	4	12	7'-9	6	9	7'-9	4	6	20	4	6	11	4	12	18	4	18	16	4	12	22	4	18	16	5	9	21'-11	4	9	9'-5	4	6	5'-10	2'-4	3'-6	5	9	21'-11	6	9	7'-8	6	4.5	21'-11

FILL	BAR LIST																		QUANTITIES						
	m1			m2			m4			m6			m7			m9			CONCRETE (CY/FT)				STEEL (LB/FT)		
SIZE	SP.	L	SIZE	SP.	L	SIZE	SP.	L	SIZE	SP.	L	SIZE	SP.	L	SIZE	SP.	L	SIZE	SP.	L	SLAB	FLOOR	WALLS	TOTAL	(LB/FT)
0	4	9	22'-5	4	9	7'-10	6	9	11'-9	6'-5	5'-4	4	9	22'-5	4	9	12'-6	4	4.5	22'-5	0.950	0.831	0.382	2.163	302.18
1	4	9	22'-5	4	9	7'-9	6	9	9'-10	4'-6	5'-4	4	9	22'-5	4	9	9'-10	4	4.5	22'-5	0.915	0.831	0.382	2.128	290.68
2	5	12	22'-5	5	12	7'-8	5	6	8'-3	3'-0	5'-3	4	12	22'-5	6	12	8'-6	6	4.5	22'-5	0.709	0.761	0.382	1.852	300.18
3	5	12	22'-5	5	12	7'-9	5	6	8'-2	2'-11	5'-3	4	9	22'-5	5	9	7'-8	5	4.5	22'-5	0.675	0.761	0.382	1.818	296.24
4	5	12	22'-5	5	12	7'-3	4	6	8'-1	2'-10	5'-3	4	9	22'-5	5	9	7'-2	5	4.5	22'-5	0.606	0.761	0.382	1.749	288.13
5-7	5	12	22'-5	5	12	7'-3	5	9	8'-0	2'-9	5'-3	4	12	22'-5	7	12	7'-6	7	4.5	22'-5	0.606	0.761	0.382	1.749	288.03
8-10	5	12	22'-5	5	12	7'-7	5	9	7'-10	2'-6	5'-4	5	9	22'-5	5	9	6'-10	5	4.5	22'-5	0.675	0.831	0.382	1.888	309.89
11-13	5	12	22'-5	5	12	8'-3	4	6	7'-10	2'-4	5'-6	5	9	22'-5	5	9	7'-2	5	4.5	22'-5	0.812	0.972	0.382	2.166	291.61
14-16	5	12	22'-5	5	12	9'-1	6	12	7'-11	2'-3	5'-8	5	12	22'-5	7	12	7'-4	7	4.5	22'-5	0.915	1.077	0.382	2.374	305.79
17-19	5	12	22'-5	5	12	9'-4	6	12	8'-1	2'-4	5'-9	5	12	22'-5	7	12	7'-8	7	4.5	22'-5	1.018	1.182	0.382	2.582	309.45
20-22	5	9	22'-5	4	9	9'-0	6	12	8'-2	2'-4	5'-10	5	9	22'-5	6	9	7'-8	6	4.5	22'-5	1.087	1.218	0.382	2.687	327.16
23-25	5	9	22'-5	4	9	9'-5	4	6	8'-3	2'-4	5'-11	5	9	22'-5	6	9	8'-0	6	4.5	22'-5	1.156	1.323	0.382	2.861	325.32



TWIN 10 x 5 BARREL SECTION

- NOTES:**
1. DIMENSIONS LISTED ON THIS SHEET TO BE USED IN CONJUNCTION WITH SHEET TWRCB G2-12.
  2. DIMENSIONS "A", "B", "C", "D", "E", AND "SP." LISTED IN THE BAR LIST ARE IN INCHES.

LATEST REVISION DATE	 APPROVED BY BRIDGE ENGINEER	 STANDARD DESIGN <b>TWIN REINFORCED CONCRETE BOX CULVERTS</b> APRIL, 2012	<b>TWRCB 10-5-12</b> 10 x 5 BARREL SECTIONS
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ENGLISH.LRFD.SIGNED.TWIN.CULVERTS.DGN -- TWRCB 10-5-12 -- THIS SHEET ISSUED 04-12.







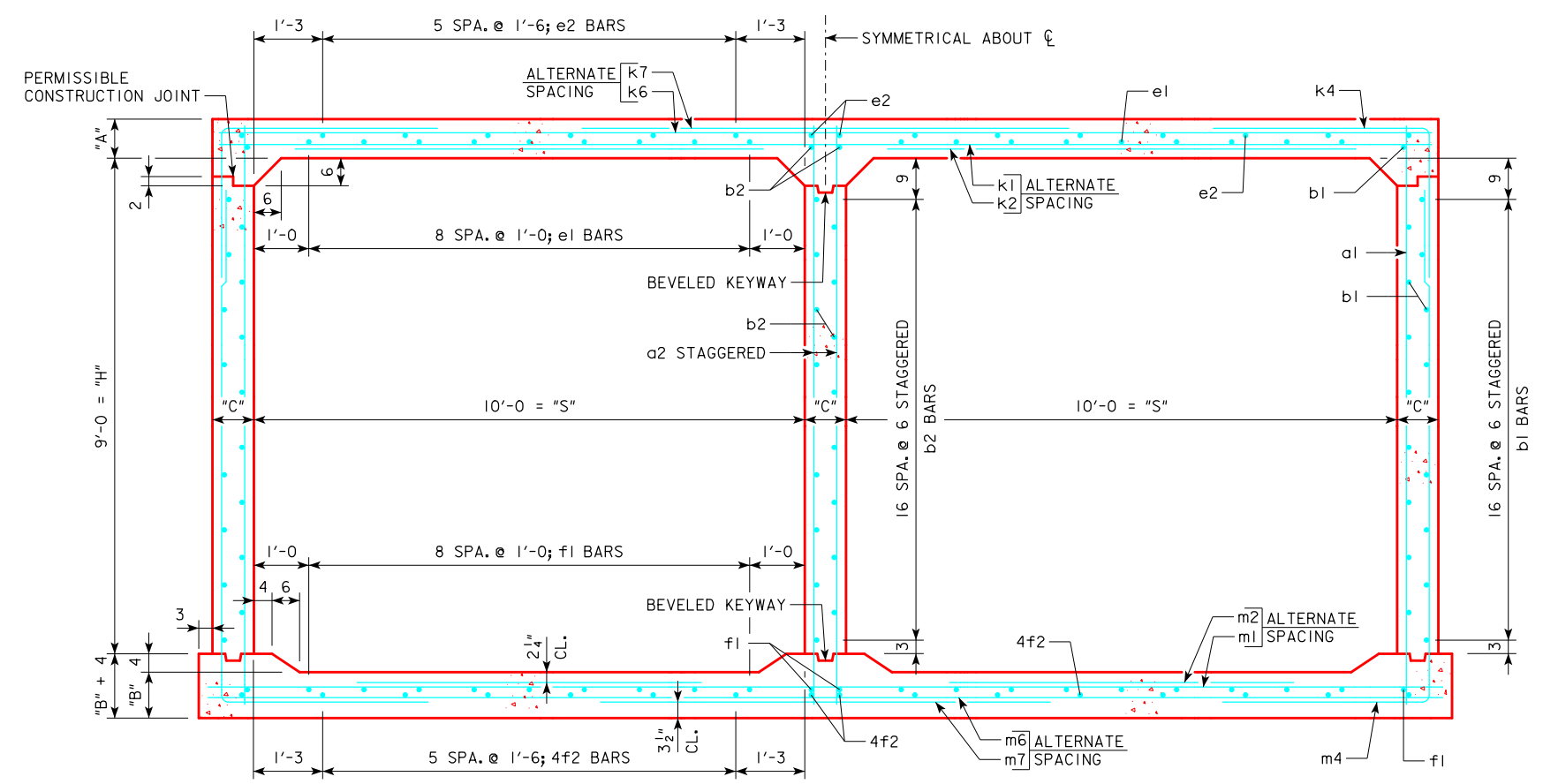
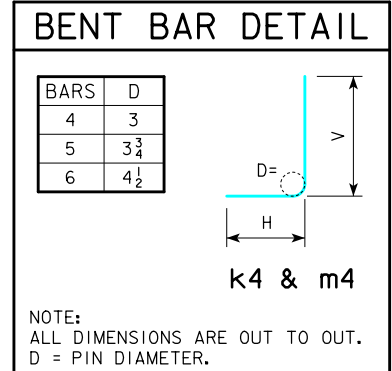


## VARIABLE DIMENSIONS AND QUANTITIES FOR TWIN 10 x 9 BARREL SECTIONS

DIMENSIONS												BAR LIST																																												
FILL	S	H	A	B	C	D	E	U	W	X	Z	a1			a2			b1			b2			e1			e2			f1			f2			k1			k2			k4			k6			k7			k9					
SIZE	SP.	L	SIZE	SP.	L	SIZE	SP.	NO.	SIZE	SP.	NO.	SIZE	SP.	NO.	SIZE	SP.	NO.	SIZE	SP.	NO.	SIZE	SP.	NO.	SIZE	SP.	NO.	SIZE	SP.	NO.	SIZE	SP.	NO.	SIZE	SP.	NO.	SIZE	SP.	L	SIZE	SP.	L	SIZE	SP.	L	SIZE	SP.	L	SIZE	SP.	L	SIZE	SP.	L	SIZE	SP.	L
0	10	9	13.5	11.5	9	9	9	0'-0	6'-3	2'-0	6'-8	4	12	11'-0	6	9	11'-0	4	6	36	4	6	19	4	12	18	4	18	16	4	12	22	4	18	16	6	18	21'-11	6	18	10'-5	4	6	9'-8	6'-5	3'-3	4	9	21'-11	4	9	12'-6	4	4.5	21'-11	
1	10	9	13	11.5	9	9	9	0'-6	6'-3	2'-0	6'-3	4	12	10'-11	6	9	10'-11	4	6	36	4	6	19	4	12	18	4	18	16	4	12	22	4	18	16	6	18	21'-11	6	18	10'-5	5	9	9'-8	6'-5	3'-3	4	9	21'-11	4	9	12'-6	4	4.5	21'-11	
2	10	9	9.5	10	9	9	9	1'-11	6'-8	2'-8	4'-10	4	12	10'-6	6	9	10'-6	4	6	36	4	6	19	5	12	18	4	18	16	4	12	22	4	18	16	5	9	21'-11	4	9	8'-3	5	6	9'-0	6'-0	3'-0	5	18	21'-11	7	18	13'-4	7	4.5	21'-11	
3	10	9	9.5	10	9	9	9	1'-11	5'-10	2'-8	4'-1	4	12	10'-6	6	9	10'-6	4	6	36	4	6	19	4	12	18	4	18	16	4	12	22	4	18	16	5	9	21'-11	4	9	8'-0	5	6	7'-5	4'-5	3'-0	5	12	21'-11	5	12	11'-8	5	4.5	21'-11	
4	10	9	8.5	10	9	9	9	1'-9	4'-5	3'-0	4'-1	4	12	10'-5	6	9	10'-5	4	6	36	4	6	19	4	12	18	4	18	16	4	12	22	4	18	16	5	12	21'-11	5	12	8'-6	5	6	6'-10	3'-11	2'-11	4	9	21'-11	5	9	8'-10	5	4.5	21'-11	
5-7	10	9	8.5	10	9	9	9	1'-11	4'-1	3'-2	3'-9	4	12	10'-5	6	9	10'-5	4	6	36	4	6	19	4	12	18	4	18	16	4	12	22	4	18	16	5	12	21'-11	5	12	8'-0	5	6	6'-7	3'-8	2'-11	5	12	21'-11	6	12	8'-2	6	4.5	21'-11	
8-10	10	9	9.5	11.5	9	9	9	2'-2	3'-10	2'-3	3'-7	4	12	10'-8	6	9	10'-8	4	6	36	4	6	19	4	12	18	4	18	16	4	12	22	4	18	16	5	12	21'-11	5	12	7'-10	5	6	6'-3	3'-4	2'-11	4	12	21'-11	7	12	7'-8	7	4.5	21'-11	
11-13	10	9	11.5	13.5	9	9	9	1'-10	3'-7	2'-1	3'-8	4	12	11'-0	6	9	11'-0	4	6	36	4	6	19	4	12	18	4	18	16	4	12	22	4	18	16	6	18	21'-11	6	18	8'-9	5	6	6'-8	3'-4	3'-4	5	9	21'-11	5	9	7'-2	5	4.5	21'-11	
14-16	10	9	13	15	9	9	9	1'-9	3'-8	2'-0	3'-9	4	12	11'-3	6	9	11'-3	4	6	36	4	6	19	4	12	18	4	18	16	4	12	22	4	18	16	6	18	21'-11	6	18	9'-2	6	9	6'-10	3'-3	3'-7	4	9	21'-11	6	9	7'-4	6	4.5	21'-11	
17-19	10	9	14	16	10	9	9	1'-6	3'-9	1'-11	3'-10	4	9	11'-5	7	9	11'-5	4	6	36	4	6	19	4	12	18	4	18	16	4	12	22	4	18	16	5	12	22'-2	5	12	9'-7	6	9	7'-0	3'-4	3'-8	5	12	22'-2	7	12	7'-6	7	4.5	22'-2	
20-22	10	9	15	17	10.5	9	9	1'-6	3'-10	1'-11	3'-11	5	12	11'-7	7	9	11'-7	4	6	36	4	6	19	4	12	18	4	18	16	4	12	22	4	18	16	5	12	22'-3	5	12	9'-7	6	9	7'-2	3'-5	3'-9	5	12	22'-3	7	12	7'-8	7	4.5	22'-3	
23-25	10	9	16	18.5	10.5	9	9	1'-8	3'-10	1'-9	4'-0	5	12	11'-9	7	9	11'-9	4	6	36	4	6	19	4	12	18	4	18	16	4	12	22	4	18	16	5	9	22'-3	4	9	9'-4	5	6	7'-0	3'-6	3'-6	5	12	22'-3	7	12	7'-8	7	4.5	22'-3	

DIMENSIONS												BAR LIST																											QUANTITIES												
FILL	S	H	A	B	C	D	E	U	W	X	Z	m1			m2			m4			m6			m7			m9			CONCRETE (CY/FT)					STEEL (LB/FT)																
SIZE	SP.	L	SIZE	SP.	L	SIZE	SP.	NO.	SIZE	SP.	NO.	SIZE	SP.	NO.	SIZE	SP.	NO.	SIZE	SP.	NO.	SIZE	SP.	NO.	SIZE	SP.	NO.	SIZE	SP.	NO.	SIZE	SP.	NO.	SIZE	SP.	NO.	SIZE	SP.	NO.	SIZE	SP.	NO.	SIZE	SP.	NO.	SIZE	SP.	NO.	SLAB	FLOOR	WALLS	TOTAL
0	5	12	22'-5	5	12	8'-4	5	6	15'-5	6'-0	9'-5	5	18	22'-5	7	18	13'-4	7	4.5	22'-5	0.984	0.866	0.715	2.565	368.66																										
1	5	12	22'-5	5	12	8'-0	6	9	15'-10	6'-5	9'-5	4	9	22'-5	4	9	12'-6	4	4.5	22'-5	0.950	0.866	0.715	2.531	363.95																										
2	6	12	22'-5	5	12	6'-7	5	6	13'-11	4'-8	9'-3	5	18	22'-5	8	18	9'-8	8	4.5	22'-5	0.709	0.761	0.715	2.185	393.29																										
3	6	12	22'-5	5	12	6'-7	5	6	13'-2	3'-11	9'-3	5	12	22'-5	6	12	8'-2	6	4.5	22'-5	0.709	0.761	0.715	2.185	375.53																										
4	5	9	22'-5	4	9	6'-3	5	6	13'-0	3'-9	9'-3	5	18	22'-5	8	18	8'-2	8	4.5	22'-5	0.641	0.761	0.715	2.117	356.21																										
5-7	5	9	22'-5	4	9	6'-0	5	6	12'-10	3'-7	9'-3	4	9	22'-5	6	9	7'-6	6	4.5	22'-5	0.641	0.761	0.715	2.117	359.16																										
8-10	5	12	22'-5	5	12	7'-10	5	6	12'-9	3'-4	9'-5	4	9	22'-5	6	9	7'-2	6	4.5	22'-5	0.709	0.866	0.715	2.290	351.71																										
11-13	5	12	22'-5	5	12	8'-5	5	6	12'-11	3'-4	9'-7	5	9	22'-5	5	9	7'-4	5	4.5	22'-5	0.847	1.007	0.715	2.569	371.39																										
14-16	5	12	22'-5	5	12	9'-0	6	9	13'-0	3'-4	9'-8	5	12	22'-5	7	12	7'-6	7	4.5	22'-5	0.950	1.112	0.715	2.777	369.26																										
17-19	5	9	22'-8	4	9	8'-8	6	9	13'-2	3'-5	9'-9	5	12	22'-8	7	12	7'-8	7	4.5	22'-8	1.033	1.198	0.795	3.026	396.42																										
20-22	5	9	22'-9	4	9	9'-1	6	9	13'-3	3'-5	9'-10	5	12	22'-9	7	12	7'-10	7	4.5	22'-9	1.110	1.275	0.837	3.222	404.03																										
23-25	5	9	22'-9	4	9	9'-5	5	6	13'-5	3'-5	10'-0	5	9	22'-9	6	9	8'-0	6	4.5	22'-9	1.180	1.382	0.837	3.399	416.58																										



**TWIN 10 x 9 BARREL SECTION**

- NOTES:**
- DIMENSIONS LISTED ON THIS SHEET TO BE USED IN CONJUNCTION WITH SHEET TWRCB G2-12.
  - DIMENSIONS "A", "B", "C", "D", "E", AND "SP." LISTED IN THE BAR LIST ARE IN INCHES.

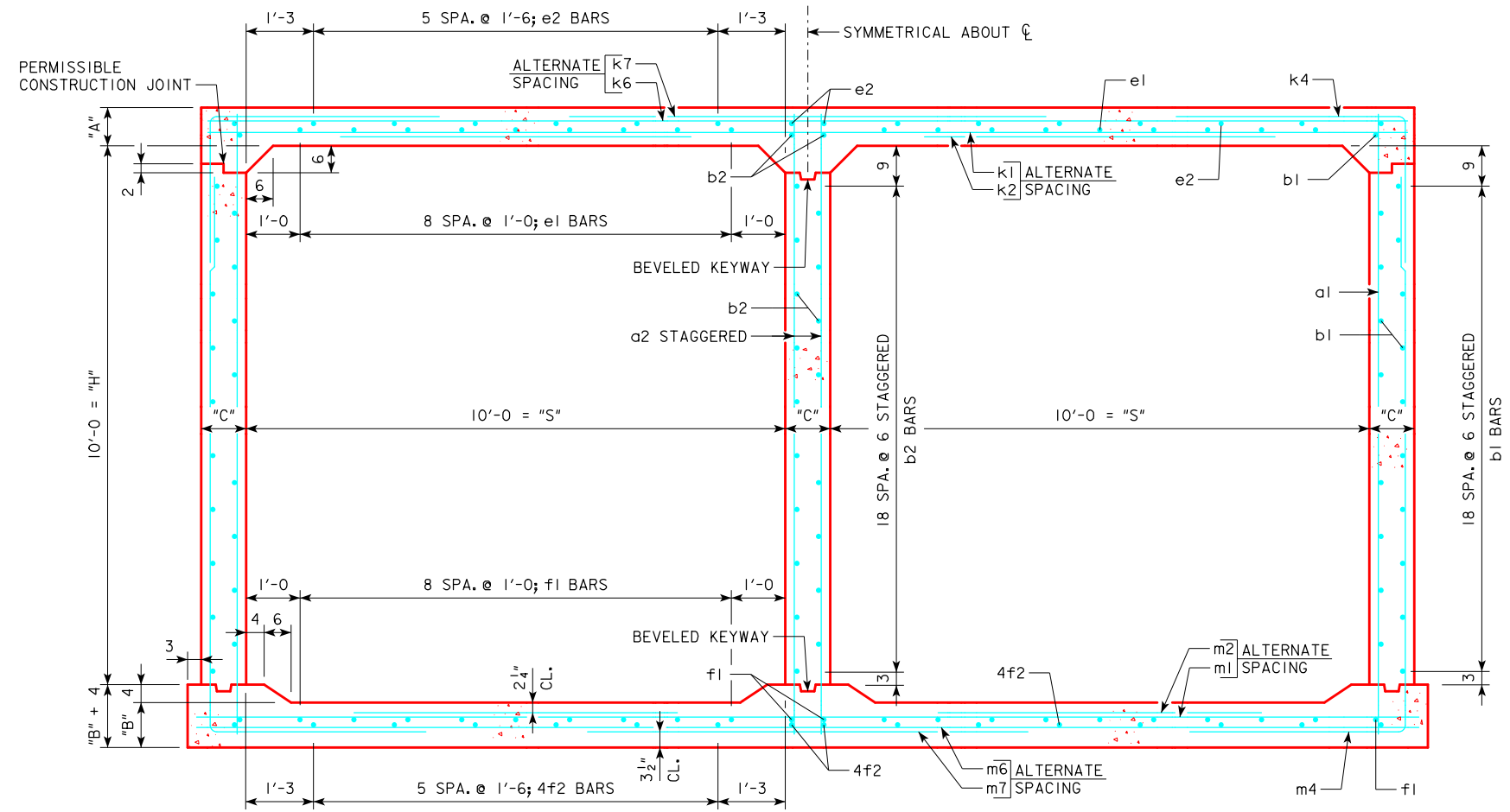
LATEST REVISION DATE	 APPROVED BY BRIDGE ENGINEER	 STANDARD DESIGN <b>TWIN REINFORCED CONCRETE BOX CULVERTS</b> APRIL, 2012	<b>TWRCB 10-9-12</b> 10 x 9 BARREL SECTIONS
		<b>CULVERT BARREL DETAILS</b>	
		10 x 9 BARREL SECTIONS	

ENGLISHLRFDSIGNEDTWINCULVERTS.DGN -- TWRCB 10-9-12 -- THIS SHEET ISSUED 04-12.

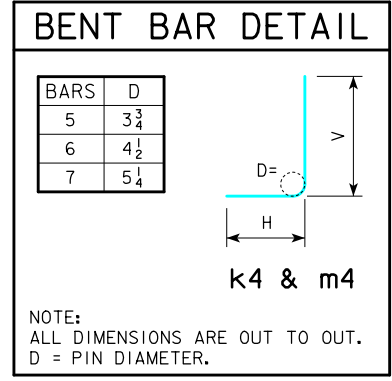
# VARIABLE DIMENSIONS AND QUANTITIES FOR TWIN 10 x 10 BARREL SECTIONS

DIMENSIONS													BAR LIST																																														
FILL	S	H	A	B	C	D	E	U	W	X	Z	a1			a2			b1			b2			e1			e2			f1			f2			k1			k2			k4			k6			k7			k9								
												SIZE	SP.	L	SIZE	SP.	L	SIZE	SP.	NO.	SIZE	SP.	NO.	SIZE	SP.	NO.	SIZE	SP.	NO.	SIZE	SP.	NO.	SIZE	SP.	NO.	SIZE	SP.	NO.	SIZE	SP.	NO.	SIZE	SP.	L	SIZE	SP.	L	SIZE	SP.	L	SIZE	SP.	L	SIZE	SP.	L	SIZE	SP.	L
0	10	10	13.5	12	10	9	9	0'-0	6'-4	1'-10	6'-4	4	12	12'-0	7	9	12'-0	4	6	40	4	6	21	4	12	18	4	18	16	4	12	22	4	18	16	6	18	22'-2	6	18	11'-1	6	12	22'-2	5	12	12'-8	5	4.5	22'-2									
1	10	10	13	11.5	10	9	9	0'-6	6'-4	2'-0	6'-9	4	12	11'-11	7	9	11'-11	4	6	40	4	6	21	4	12	18	4	18	16	4	12	22	4	18	16	6	18	22'-2	6	18	10'-7	5	6	9'-9	6'-6	3'-3	4	9	22'-2	4	9	12'-8	4	4.5	22'-2				
2	10	10	9.5	10.5	10	9	9	1'-2	6'-9	2'-10	4'-5	4	12	11'-7	7	9	11'-7	4	6	40	4	6	21	4	12	18	4	18	16	4	12	22	4	18	16	5	12	22'-2	5	12	9'-11	5	6	9'-0	6'-1	2'-11	5	18	22'-2	7	18	13'-6	7	4.5	22'-2				
3	10	10	9	10.5	10	9	9	2'-0	5'-7	2'-10	4'-5	4	12	11'-6	7	9	11'-6	4	6	40	4	6	21	4	12	18	4	18	16	4	12	22	4	18	16	5	9	22'-2	4	9	7'-11	5	6	7'-8	4'-9	2'-11	4	12	22'-2	6	12	11'-2	6	4.5	22'-2				
4	10	10	8.5	10	10	9	9	1'-10	4'-5	3'-0	4'-1	4	12	11'-5	7	9	11'-5	4	6	40	4	6	21	4	12	18	4	18	16	4	12	22	4	18	16	5	12	22'-2	5	12	8'-5	5	6	7'-2	4'-3	2'-11	4	12	22'-2	6	12	8'-10	6	4.5	22'-2				
5-7	10	10	8.5	10	10	9	9	2'-0	4'-0	3'-1	3'-7	4	12	11'-5	7	9	11'-5	4	6	40	4	6	21	4	12	18	4	18	16	4	12	22	4	18	16	5	12	22'-2	5	12	7'-10	5	6	7'-0	4'-1	2'-11	5	12	22'-2	6	12	8'-0	6	4.5	22'-2				
8-10	10	10	9	11.5	10	9	9	2'-1	3'-6	2'-2	3'-6	4	9	11'-7	7	9	11'-7	4	6	40	4	6	21	4	12	18	4	18	16	4	12	22	4	18	16	5	12	22'-2	5	12	7'-10	6	9	7'-1	3'-10	3'-3	5	9	22'-2	5	9	7'-0	5	4.5	22'-2				
11-13	10	10	11	13.5	10	9	9	1'-9	3'-6	2'-1	3'-8	4	9	11'-11	7	9	11'-11	4	6	40	4	6	21	4	12	18	4	18	16	4	12	22	4	18	16	6	18	22'-2	6	18	8'-10	6	9	7'-4	3'-8	3'-8	5	9	22'-2	5	9	7'-0	5	4.5	22'-2				
14-16	10	10	12.5	15	10.5	9	9	1'-9	3'-8	2'-0	3'-9	4	9	12'-2	7	9	12'-2	4	6	40	4	6	21	4	12	18	4	18	16	4	12	22	4	18	16	6	18	22'-3	6	18	9'-2	5	6	6'-11	3'-8	3'-3	4	9	22'-3	6	9	7'-4	6	4.5	22'-3				
17-19	10	10	14	16	11	6	9	1'-6	3'-9	2'-3	3'-10	4	6	12'-5	7	9	12'-5	4	6	40	4	6	21	4	12	18	4	18	16	4	12	22	4	18	16	5	12	22'-5	5	12	9'-7	6	9	7'-6	3'-9	3'-9	5	12	22'-5	7	12	7'-6	7	4.5	22'-5				
20-22	10	10	14.5	17	11.5	6	9	1'-6	3'-9	1'-11	3'-11	4	6	12'-6	7	9	12'-6	4	6	40	4	6	21	4	12	18	4	18	16	4	12	22	4	18	16	5	12	22'-6	5	12	9'-7	6	9	7'-6	3'-9	3'-9	5	12	22'-6	7	12	7'-6	7	4.5	22'-6				
23-25	10	10	16	18	12	6	9	1'-8	3'-10	1'-9	4'-0	4	6	12'-9	7	9	12'-9	4	6	40	4	6	21	4	12	18	4	18	16	4	12	22	4	18	16	5	9	22'-8	4	9	9'-5	6	9	7'-8	3'-10	3'-10	5	12	22'-8	7	12	7'-8	7	4.5	22'-8				

DIMENSIONS													BAR LIST																											QUANTITIES				
FILL	S	H	A	B	C	D	E	U	W	X	Z	m1			m2			m4			m6			m7			m9			CONCRETE (CY/FT)				STEEL										
												SIZE	SP.	L	SIZE	SP.	L	SIZE	SP.	L	H	V	SIZE	SP.	L	SIZE	SP.	L	SIZE	SP.	L	SLAB	FLOOR	WALLS	TOTAL	(LB/FT)								
0	6	18	22'-8	6	18	8'-9	7	12	16'-11	6'-6	10'-5	4	9	22'-8	4	9	12'-8	4	4.5	22'-8	0.998	0.914	0.887	2.799	395.21																			
1	5	12	22'-8	5	12	8'-0	5	6	16'-6	6'-1	10'-5	5	18	22'-8	7	18	13'-6	7	4.5	22'-8	0.964	0.878	0.887	2.729	404.05																			
2	5	9	22'-8	4	9	6'-6	5	6	15'-4	5'-0	10'-4	4	9	22'-8	5	9	8'-10	5	4.5	22'-8	0.721	0.807	0.887	2.415	398.16																			
3	5	9	22'-8	4	9	6'-6	5	6	14'-7	4'-3	10'-4	5	18	22'-8	8	18	8'-10	8	4.5	22'-8	0.686	0.807	0.887	2.380	389.61																			
4	5	9	22'-8	4	9	6'-0	5	6	14'-3	4'-0	10'-3	5	18	22'-8	8	18	8'-2	8	4.5	22'-8	0.651	0.772	0.887	2.310	376.45																			
5-7	5	9	22'-8	4	9	5'-10	5	6	14'-1	3'-10	10'-3	5	9	22'-8	5	9	7'-2	5	4.5	22'-8	0.651	0.772	0.887	2.310	387.21																			
8-10	5	12	22'-8	5	12	7'-11	6	9	14'-3	3'-10	10'-5	5	9	22'-8	5	9	7'-0	5	4.5	22'-8	0.686	0.878	0.887	2.451	395.21																			
11-13	5	12	22'-8	5	12	8'-5	6	9	14'-4	3'-9	10'-7	5	9	22'-8	5	9	7'-4	5	4.5	22'-8	0.825	1.020	0.887	2.732	401.32																			
14-16	5	12	22'-9	5	12	9'-0	5	6	14'-5	3'-9	10'-8	4	9	22'-9	6	9	7'-6	6	4.5	22'-9	0.936	1.132	0.934	3.002	393.79																			
17-19	5	9	22'-11	4	9	8'-4	6	9	14'-6	3'-9	10'-9	5	12	22'-11	7	12	7'-8	7	4.5	22'-11	1.048	1.211	0.978	3.237	424.21																			
20-22	5	9	23'-0	4	9	9'-1	6	9	14'-8	3'-10	10'-10	5	12	23'-0	7	12	7'-10	7	4.5	23'-0	1.091	1.291	1.022	3.404	427.34																			
23-25	5	9	23'-2	4	9	9'-5	6	9	14'-8	3'-9	10'-11	5	9	23'-2	6	9	8'-0	6	4.5	23'-2	1.205	1.372	1.067	3.644	441.92																			



**TWIN 10 x 10 BARREL SECTION**



- NOTES:**
- DIMENSIONS LISTED ON THIS SHEET TO BE USED IN CONJUNCTION WITH SHEET TWRCB G2-12.
  - DIMENSIONS "A", "B", "C", "D", "E", AND "SP." LISTED IN THE BAR LIST ARE IN INCHES.

LATEST REVISION DATE	APPROVED BY BRIDGE ENGINEER	STANDARD DESIGN <b>TWIN REINFORCED CONCRETE BOX CULVERTS</b> APRIL, 2012	<b>TWRCB 10-10-12</b> 10 x 10 BARREL SECTIONS
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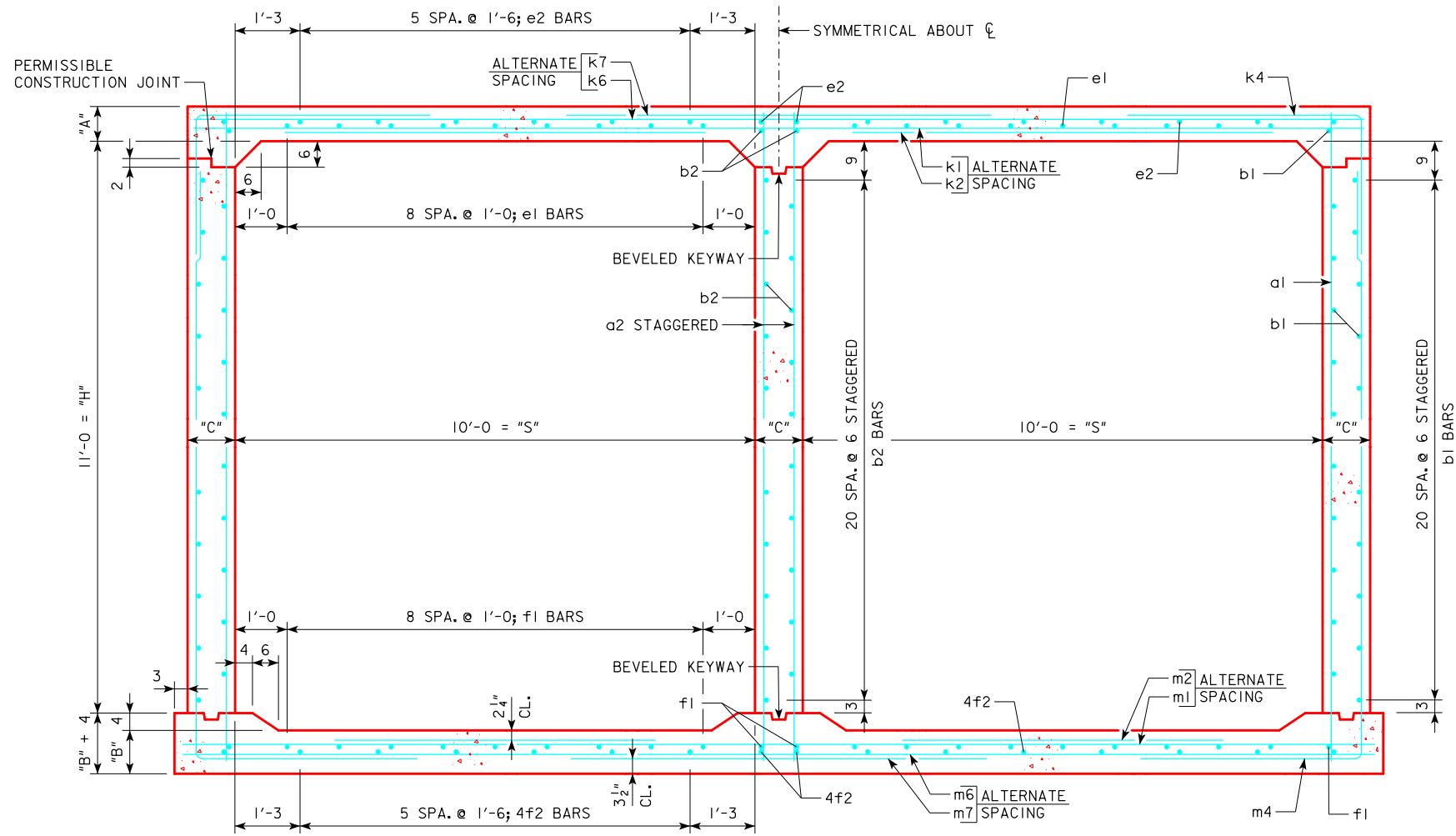
ENGLISH.LRFD.SIGNED.TWIN.CULVERTS.DGN - TWRCB 10-10-12 - THIS SHEET ISSUED 04-12-



# VARIABLE DIMENSIONS AND QUANTITIES FOR TWIN 10 x 11 BARREL SECTIONS

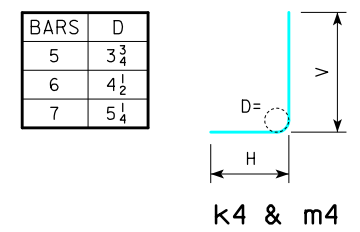
DIMENSIONS													BAR LIST																																																	
FILL	S	H	A	B	C	D	E	U	W	X	Z	a1			a2			b1			b2			e1			e2			f1			f2			k1			k2			k4			k6			k7			k9											
												SIZE	SP.	L	SIZE	SP.	L	SIZE	SP.	NO.	SIZE	SP.	NO.	SIZE	SP.	NO.	SIZE	SP.	NO.	SIZE	SP.	NO.	SIZE	SP.	NO.	SIZE	SP.	L	SIZE	SP.	L	SIZE	SP.	L	SIZE	SP.	L	SIZE	SP.	L	SIZE	SP.	L	SIZE	SP.	L	SIZE	SP.	L	SIZE	SP.	L
0	10	11	13	12	11	9	9	0'-0	6'-4	1'-10	6'-4	4	12	13'-0	7	9	13'-0	4	6	44	4	6	23	4	12	18	4	18	16	4	12	22	4	18	16	6	18	22'-5	6	18	11'-2	6	9	10'-2	6'-7	3'-7	4	9	22'-5	4	9	12'-8	4	4.5	22'-5							
1	10	11	12.5	12	11	9	9	0'-6	6'-4	2'-1	6'-4	4	9	12'-11	7	9	12'-11	4	6	44	4	6	23	4	12	18	4	18	16	4	12	22	4	18	16	6	18	22'-5	6	18	10'-8	6	9	10'-2	6'-7	3'-7	4	9	22'-5	4	9	12'-8	4	4.5	22'-5							
2	10	11	9.5	10.5	11	9	9	1'-2	6'-9	2'-11	4'-2	4	9	12'-7	7	9	12'-7	4	6	44	4	6	23	4	12	18	4	18	16	4	12	22	4	18	16	5	12	22'-5	5	12	10'-0	6	9	9'-9	6'-6	3'-3	5	18	22'-5	7	18	13'-6	7	4.5	22'-5							
3	10	11	9	10.5	11	9	9	2'-1	5'-3	2'-10	4'-3	4	9	12'-6	7	9	12'-6	4	6	44	4	6	23	4	12	18	4	18	16	4	12	22	4	18	16	5	9	22'-5	4	9	7'-8	6	9	8'-6	5'-3	3'-3	5	12	22'-5	5	12	10'-6	5	4.5	22'-5							
4	10	11	8	10	11	9	9	1'-10	4'-1	3'-0	4'-0	4	9	12'-5	7	9	12'-5	4	6	44	4	6	23	4	12	18	4	18	16	4	12	22	4	18	16	5	12	22'-5	5	12	8'-1	5	6	7'-4	4'-6	2'-10	4	9	22'-5	5	9	8'-2	5	4.5	22'-5							
5-7	10	11	8	10	11	9	9	1'-11	3'-11	3'-1	3'-6	4	12	12'-5	7	9	12'-5	4	6	44	4	6	23	4	12	18	4	18	16	4	12	22	4	18	16	5	12	22'-5	5	12	7'-10	5	6	7'-1	4'-3	2'-10	5	12	22'-5	6	12	7'-10	6	4.5	22'-5							
8-10	10	11	9.5	11.5	11	9	9	1'-11	3'-9	2'-2	3'-6	5	12	12'-8	7	9	12'-8	4	6	44	4	6	23	4	12	18	4	18	16	4	12	22	4	18	16	6	18	22'-5	6	18	8'-2	6	9	7'-5	4'-2	3'-3	4	12	22'-5	7	12	7'-6	7	4.5	22'-5							
11-13	10	11	13.5	11	11	6	9	2'-0	3'-8	2'-0	3'-8	4	6	12'-11	7	9	12'-11	4	6	44	4	6	23	4	12	18	4	18	16	4	12	22	4	18	16	6	18	22'-5	6	18	8'-6	6	9	7'-6	4'-1	3'-5	4	12	22'-5	7	12	7'-4	7	4.5	22'-5							
14-16	10	11	12.5	15	11.5	9	9	1'-9	3'-8	1'-11	3'-9	5	9	13'-2	7	9	13'-2	4	6	44	4	6	23	4	12	18	4	18	16	4	12	22	4	18	16	6	18	22'-6	6	18	8'-11	6	9	7'-8	4'-1	3'-7	5	9	22'-6	5	9	7'-4	5	4.5	22'-6							
17-19	10	11	13.5	16	12.5	9	9	1'-9	3'-8	2'-3	3'-10	6	9	13'-4	7	9	13'-4	4	6	44	4	6	23	4	12	18	4	18	16	4	12	22	4	18	16	5	12	22'-9	5	12	9'-3	6	9	7'-9	4'-1	3'-8	5	12	22'-9	7	12	7'-4	7	4.5	22'-9							
20-22	10	11	14.5	17	12.5	9	9	1'-5	3'-9	1'-10	3'-11	6	12	13'-6	7	9	13'-6	4	6	44	4	6	23	4	12	18	4	18	16	4	12	22	4	18	16	5	12	22'-9	5	12	9'-3	5	6	7'-6	4'-1	3'-5	5	12	22'-9	7	12	7'-6	7	4.5	22'-9							
23-25	10	11	16	18	13	9	6	1'-8	3'-10	1'-9	4'-0	4	9	13'-9	6	6	13'-9	4	6	44	4	6	23	4	12	18	4	18	16	4	12	22	4	18	16	5	9	22'-11	4	9	9'-5	7	9	8'-5	4'-0	4'-5	5	12	22'-11	7	12	7'-8	7	4.5	22'-11							

DIMENSIONS													BAR LIST																											QUANTITIES				
FILL	S	H	A	B	C	D	E	U	W	X	Z	m1			m2			m4			m6			m7			m9			CONCRETE (CY/FT)				STEEL										
												SIZE	SP.	L	SIZE	SP.	L	SIZE	SP.	L	H	V	SIZE	SP.	L	SIZE	SP.	L	SIZE	SP.	L	SLAB	FLOOR	WALLS	TOTAL	(LB/FT)								
0	6	18	22'-11	6	18	8'-9	6	9	18'-0	6'-7	11'-5	4	9	22'-11	4	9	12'-8	4	4.5	22'-11	0.978	0.924	1.080	2.982	416.92																			
1	4	9	22'-11	4	9	8'-3	6	9	18'-0	6'-7	11'-5	4	12	22'-11	5	12	12'-8	5	4.5	22'-11	0.943	0.924	1.080	2.947	411.39																			
2	5	9	22'-11	4	9	6'-5	6	9	16'-6	5'-2	11'-4	4	9	22'-11	5	9	8'-4	5	4.5	22'-11	0.732	0.816	1.080	2.628	419.16																			
3	5	9	22'-11	4	9	6'-7	6	9	16'-0	4'-8	11'-4	5	18	22'-11	8	18	8'-6	8	4.5	22'-11	0.697	0.816	1.080	2.593	413.55																			
4	5	9	22'-11	4	9	6'-2	5	6	15'-6	4'-3	11'-3	5	18	22'-11	8	18	8'-0	8	4.5	22'-11	0.627	0.780	1.080	2.487	398.11																			
5-7	5	9	22'-11	4	9	6'-0	6	6	15'-6	4'-3	11'-3	5	9	22'-11	5	9	7'-0	5	4.5	22'-11	0.627	0.780	1.080	2.487	431.66																			
8-10	5	12	22'-11	5	12	7'-10	6	9	15'-6	4'-1	11'-5	5	9	22'-11	5	9	7'-0	5	4.5	22'-11	0.732	0.888	1.080	2.700	408.87																			
11-13	5	12	22'-11	5	12	8'-6	6	9	15'-9	4'-2	11'-7	5	9	22'-11	5	9	7'-4	5	4.5	22'-11	0.837	1.032	1.080	2.949	420.45																			
14-16	5	12	23'-0	5	12	9'-1	6	9	15'-10	4'-2	11'-8	4	9	23'-0	6	9	7'-6	6	4.5	23'-0	0.950	1.147	1.129	3.226	430.18																			
17-19	5	9	23'-3	4	9	8'-4	6	9	15'-11	4'-2	11'-9	5	12	23'-3	7	12	7'-8	7	4.5	23'-3	1.035	1.234	1.227	3.496	459.00																			
20-22	5	9	23'-3	4	9	9'-2	5	6	16'-0	4'-2	11'-10	5	12	23'-3	7	12	7'-10	7	4.5	23'-3	1.106	1.307	1.227	3.640	450.53																			
23-25	5	9	23'-5	4	9	9'-5	7	9	16'-0	4'-1	11'-11	5	9	23'-5	6	9	8'-0	6	4.5	23'-5	1.221	1.388	1.275	3.884	489.89																			



**TWIN 10 x 11 BARREL SECTION**

### BENT BAR DETAIL



NOTE:  
ALL DIMENSIONS ARE OUT TO OUT.  
D = PIN DIAMETER.

### NOTES:

1. DIMENSIONS LISTED ON THIS SHEET TO BE USED IN CONJUNCTION WITH SHEET TWRCB G2-12.
2. DIMENSIONS "A", "B", "C", "D", "E", AND "SP." LISTED IN THE BAR LIST ARE IN INCHES.

LATEST REVISION DATE	 APPROVED BY BRIDGE ENGINEER	 STANDARD DESIGN <b>TWIN REINFORCED CONCRETE BOX CULVERTS</b> APRIL, 2012	
		<b>CULVERT BARREL DETAILS</b> 10 x 11 BARREL SECTIONS	<b>TWRCB 10-11-12</b>

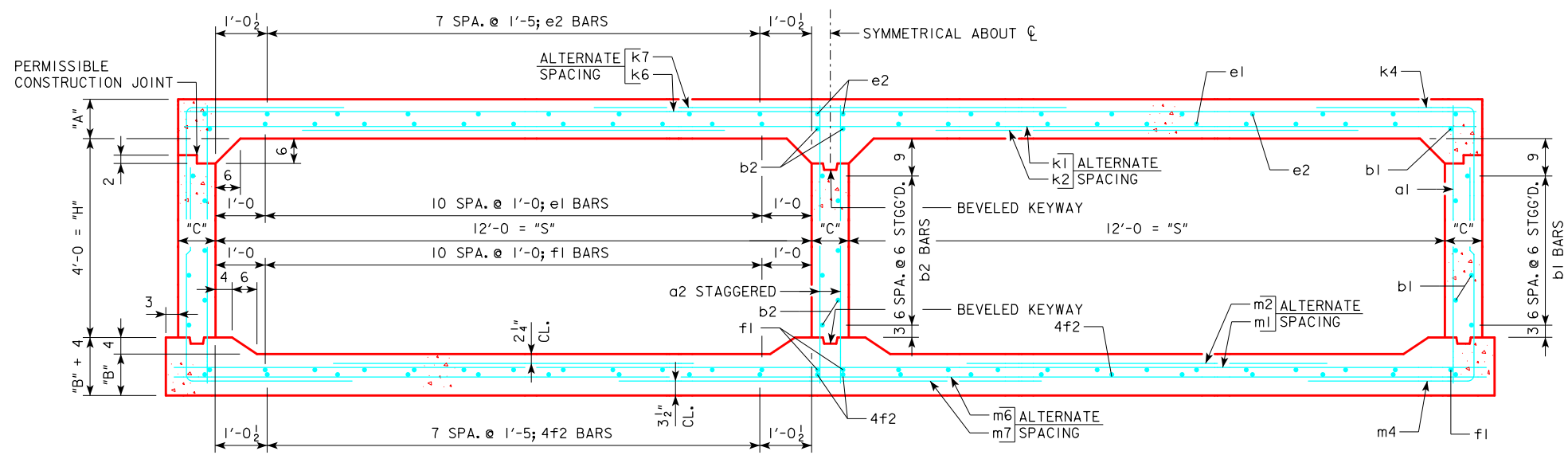
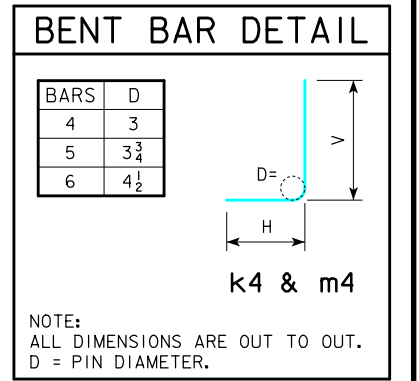
ENGLISHLRFDSIGNEDTWINCULVERTS.DGN - TWRCB 10-11-12 - THIS SHEET ISSUED 04-12.



# VARIABLE DIMENSIONS AND QUANTITIES FOR TWIN 12 x 4 BARREL SECTIONS

DIMENSIONS												BAR LIST																																											
FILL	S	H	A	B	C	D	E	U	W	X	Z	a1			a2			b1			b2			e1			e2			f1			f2			k1			k2			k4			k6			k7			k9				
SIZE	SP.	L	SIZE	SP.	L	SIZE	SP.	L	SIZE	SP.	L	SIZE	SP.	L	SIZE	SP.	L	SIZE	SP.	L	SIZE	SP.	L	SIZE	SP.	L	SIZE	SP.	L	SIZE	SP.	L	SIZE	SP.	L	SIZE	SP.	L	SIZE	SP.	L	SIZE	SP.	L	SIZE	SP.	L	SIZE	SP.	L					
0	12	4	14	11.5	9	9	9	0'-1	7'-8	2'-7	5'-6	5	12	6'-0	7	9	6'-0	4	6	16	4	6	9	4	12	22	4	17	20	4	12	26	4	17	20	5	12	25'-11	5	12	12'-4	6	9	6'-4	2'-9	3'-7	5	12	25'-11	5	12	14'-6	5	4.5	25'-11
1	12	4	13.5	11.5	9	9	9	0'-7	7'-3	2'-7	5'-4	4	9	6'-0	7	9	6'-0	4	6	16	4	6	9	4	12	22	4	17	20	4	12	26	4	17	20	5	9	25'-11	4	9	10'-0	5	6	6'-4	3'-4	3'-0	5	12	25'-11	6	12	12'-0	6	4.5	25'-11
2	12	4	10	10	9	6	9	2'-0	6'-0	3'-3	4'-6	4	6	5'-7	7	9	5'-7	4	6	16	4	6	9	4	12	22	4	17	20	4	12	26	4	17	20	5	9	25'-11	4	9	10'-0	5	6	6'-4	3'-4	3'-0	5	12	25'-11	6	12	12'-0	6	4.5	25'-11
3	12	4	10	10	9	6	9	2'-4	5'-6	3'-0	4'-5	4	6	5'-7	7	9	5'-7	4	6	16	4	6	9	4	12	22	4	17	20	4	12	26	4	17	20	6	12	25'-11	5	12	9'-4	5	6	6'-6	3'-3	3'-3	5	9	25'-11	5	9	11'-0	5	4.5	25'-11
4	12	4	9.5	10	9	9	9	2'-9	4'-9	3'-3	4'-3	5	12	5'-6	6	9	5'-6	4	6	16	4	6	9	4	12	22	4	17	20	4	12	26	4	17	20	5	9	25'-11	4	9	8'-6	5	6	6'-4	3'-2	3'-2	5	9	25'-11	5	9	9'-6	5	4.5	25'-11
5-7	12	4	10	11	9	9	9	3'-1	4'-6	3'-4	4'-1	4	9	5'-8	6	9	5'-8	4	6	16	4	6	9	4	12	22	4	17	20	4	12	26	4	17	20	5	9	25'-11	4	9	8'-1	6	9	6'-4	3'-0	3'-4	5	9	25'-11	6	9	9'-0	6	4.5	25'-11
8-10	12	4	11	13	9	9	9	3'-2	4'-2	3'-2	4'-1	4	12	5'-11	6	9	5'-11	4	6	16	4	6	9	4	12	22	4	17	20	4	12	26	4	17	20	5	9	25'-11	4	9	8'-2	5	6	5'-8	2'-7	3'-1	5	9	25'-11	6	9	8'-4	6	4.5	25'-11
11-13	12	4	13	14.5	9	9	9	2'-6	4'-3	3'-1	4'-3	4	12	6'-2	6	9	6'-2	4	6	16	4	6	9	4	12	22	4	17	20	4	12	26	4	17	20	5	9	25'-11	4	9	9'-7	5	6	5'-7	2'-4	3'-3	4	9	25'-11	7	9	8'-6	7	4.5	25'-11
14-16	12	4	14.5	16.5	9	9	9	2'-5	4'-4	2'-5	4'-5	4	9	6'-6	6	9	6'-6	4	6	16	4	6	9	4	12	22	4	17	20	4	12	26	4	17	20	6	12	25'-11	5	12	9'-11	4	6	5'-8	2'-4	3'-4	5	12	25'-11	8	12	8'-8	8	4.5	25'-11
17-19	12	4	16	18	9	9	9	2'-2	4'-6	2'-3	4'-6	4	12	6'-9	6	9	6'-9	4	6	16	4	6	9	4	12	22	4	17	20	4	12	26	4	17	20	6	12	25'-11	5	12	10'-9	6	12	6'-3	2'-5	3'-10	5	9	25'-11	7	9	9'-0	7	4.5	25'-11
20-22	12	4	18	20	9.5	9	6	1'-8	4'-7	1'-9	4'-9	4	12	7'-1	5	6	7'-1	4	6	16	4	6	9	4	12	22	4	17	20	4	12	26	4	17	20	6	12	26'-0	5	12	11'-4	5	9	6'-2	2'-6	3'-8	5	9	26'-0	7	9	9'-2	7	4.5	26'-0
23-25	12	4	19.5	21.5	9.5	9	6	1'-5	4'-9	1'-6	4'-10	4	9	7'-4	5	6	7'-4	4	6	16	4	6	9	4	12	22	4	17	20	5	12	26	4	17	20	7	18	26'-0	7	18	11'-7	5	12	6'-4	2'-7	3'-9	5	9	26'-0	7	9	9'-6	7	4.5	26'-0

FILL	BAR LIST																											QUANTITIES				
	m1			m2			m4			m6			m7			m9			CONCRETE (CY/FT)					STEEL								
	SIZE	SP.	L	SIZE	SP.	L	SIZE	SP.	L	H	V	SIZE	SP.	L	SIZE	SP.	L	SIZE	SP.	L	SLAB	FLOOR	WALLS	TOTAL	(LB/FT)							
0	5	12	26'-5	5	12	8'-10	6	9	9'-2	4'-9	4'-5	4	12	26'-5	6	12	11'-0	6	4.5	26'-5	1.191	1.008	0.299	2.498	350.58							
1	5	12	26'-5	5	12	8'-9	6	9	8'-3	3'-10	4'-5	4	12	26'-5	6	12	10'-8	6	4.5	26'-5	1.151	1.008	0.299	2.458	343.68							
2	6	12	26'-5	5	12	7'-8	5	6	7'-8	3'-5	4'-3	5	9	26'-5	5	9	9'-0	5	4.5	26'-5	0.867	0.885	0.299	2.051	373.71							
3	5	9	26'-5	5	9	7'-9	5	6	7'-8	3'-5	4'-3	5	12	26'-5	7	12	8'-10	7	4.5	26'-5	0.867	0.885	0.299	2.051	386.03							
4	6	12	26'-5	5	12	7'-3	5	6	7'-7	3'-4	4'-3	5	12	26'-5	7	12	8'-6	7	4.5	26'-5	0.826	0.885	0.299	2.010	364.84							
5-7	5	9	26'-5	4	9	7'-4	6	9	7'-5	3'-1	4'-4	5	9	26'-5	6	9	8'-2	6	4.5	26'-5	0.867	0.967	0.299	2.133	367.39							
8-10	5	9	26'-5	4	9	8'-3	5	6	7'-0	2'-6	4'-6	5	9	26'-5	6	9	8'-2	6	4.5	26'-5	0.948	1.132	0.299	2.379	362.21							
11-13	6	12	26'-5	5	12	8'-7	5	6	7'-1	2'-5	4'-8	4	9	26'-5	7	9	8'-6	7	4.5	26'-5	1.110	1.256	0.299	2.665	363.16							
14-16	6	12	26'-5	5	12	10'-0	4	6	7'-3	2'-5	4'-10	4	9	26'-5	7	9	8'-10	7	4.5	26'-5	1.232	1.421	0.299	2.952	365.53							
17-19	6	12	26'-5	5	12	10'-9	6	12	7'-4	2'-5	4'-11	5	9	26'-5	7	9	9'-0	7	4.5	26'-5	1.353	1.545	0.299	3.197	397.13							
20-22	6	12	26'-6	5	12	11'-4	5	9	7'-7	2'-6	5'-1	5	9	26'-6	7	9	9'-6	7	4.5	26'-6	1.524	1.720	0.315	3.559	399.26							
23-25	7	18	26'-6	7	18	11'-7	5	12	7'-10	2'-7	5'-3	5	9	26'-6	7	9	9'-8	7	4.5	26'-6	1.646	1.844	0.315	3.805	417.89							



- NOTES:**
- DIMENSIONS LISTED ON THIS SHEET TO BE USED IN CONJUNCTION WITH SHEET TWRCB G2-12.
  - DIMENSIONS "A", "B", "C", "D", "E", AND "SP." LISTED IN THE BAR LIST ARE IN INCHES.

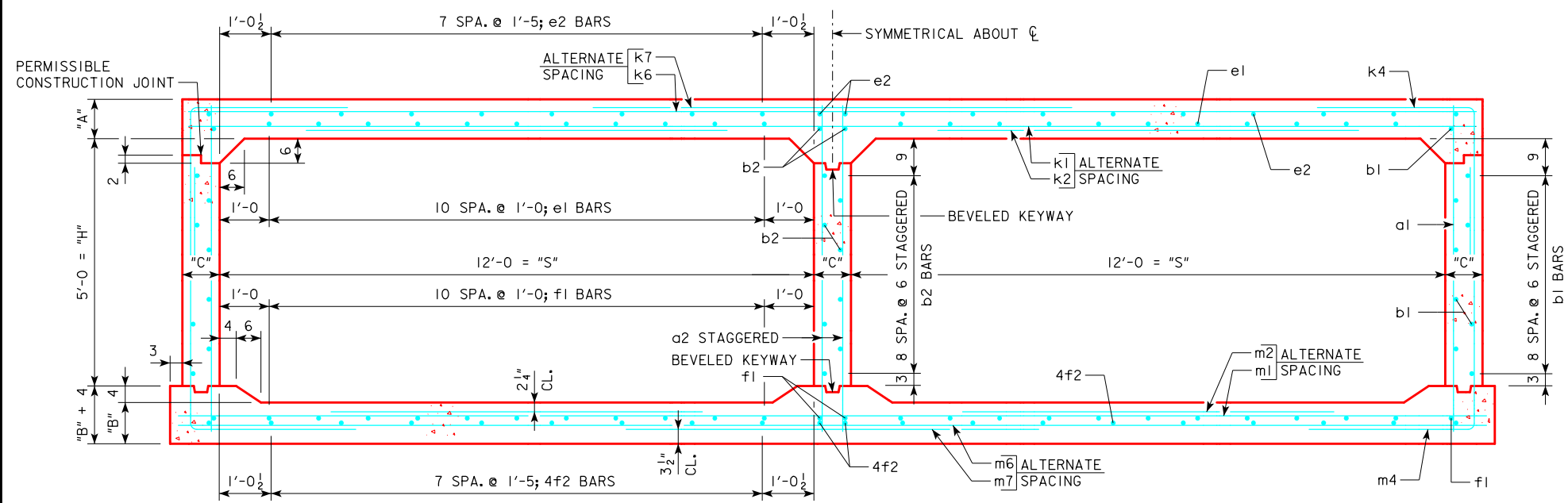
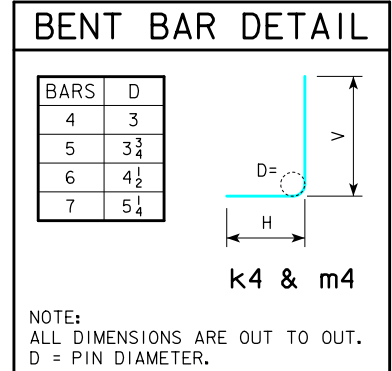
LATEST REVISION DATE	 APPROVED BY BRIDGE ENGINEER	 STANDARD DESIGN <b>TWIN REINFORCED CONCRETE BOX CULVERTS</b> APRIL, 2012	<b>TWRCB 12-4-12</b>
		<b>CULVERT BARREL DETAILS</b> 12 x 4 BARREL SECTIONS	

ENGLISH.LRFD.SIGNED.TWIN.CULVERTS.DGN - TWRCB 12-4-12 - THIS SHEET ISSUED 04-12.

## VARIABLE DIMENSIONS AND QUANTITIES FOR TWIN 12 x 5 BARREL SECTIONS

DIMENSIONS												BAR LIST																																											
FILL	S	H	A	B	C	D	E	U	W	X	Z	a1			a2			b1			b2			e1			e2			f1			f2			k1			k2			k4			k6			k7			k9				
SIZE	SP.	L	SIZE	SP.	L	SIZE	SP.	NO.	SIZE	SP.	NO.	SIZE	SP.	NO.	SIZE	SP.	NO.	SIZE	SP.	NO.	SIZE	SP.	NO.	SIZE	SP.	NO.	SIZE	SP.	NO.	SIZE	SP.	L	SIZE	SP.	L	SIZE	SP.	L	SIZE	SP.	L	SIZE	SP.	L	SIZE	SP.	L	SIZE	SP.	L	SIZE	SP.	L		
0	12	5	14.5	12	9	9	9	0'-0	7'-8	2'-6	5'-10	4	12	7'-1	7	9	7'-1	4	6	20	4	6	11	4	12	22	5	17	20	4	12	26	4	17	20	5	12	25'-11	5	12	12'-11	5	9	6'-6	3'-1	3'-5	5	18	25'-11	7	18	15'-4	7	4.5	25'-11
1	12	5	13.5	12	9	9	9	0'-5	7'-8	2'-7	5'-11	4	12	7'-0	6	9	7'-0	4	6	20	4	6	11	4	12	22	4	17	20	4	12	26	4	17	20	6	12	25'-11	5	12	10'-1	5	6	6'-4	3'-4	3'-0	5	12	25'-11	6	12	12'-6	6	4.5	25'-11
2	12	5	10	10	9	9	9	2'-0	6'-3	3'-0	4'-7	5	12	6'-7	7	9	6'-7	4	6	20	4	6	11	5	12	22	4	17	20	4	12	26	4	17	20	6	12	25'-11	5	12	10'-1	5	6	6'-4	3'-4	3'-0	5	12	25'-11	6	12	12'-6	6	4.5	25'-11
3	12	5	10.5	10	9	6	9	2'-3	5'-10	3'-0	4'-4	4	6	6'-7	6	9	6'-7	4	6	20	4	6	11	4	12	22	4	17	20	4	12	26	4	17	20	6	12	25'-11	5	12	9'-10	5	6	6'-2	3'-1	3'-1	4	12	25'-11	7	12	11'-8	7	4.5	25'-11
4	12	5	9.5	10	9	6	9	2'-9	4'-10	3'-3	4'-2	4	6	6'-6	6	9	6'-6	4	6	20	4	6	11	4	12	22	4	17	20	4	12	26	4	17	20	5	9	25'-11	4	9	8'-6	6	9	6'-8	3'-4	3'-4	5	9	25'-11	5	9	9'-8	5	4.5	25'-11
5-7	12	5	10	11	9	9	9	2'-1	4'-8	3'-3	4'-2	4	9	6'-8	6	9	6'-8	4	6	20	4	6	11	4	12	22	4	17	20	4	12	26	4	17	20	5	12	25'-11	5	12	9'-11	6	9	6'-4	3'-0	3'-4	5	12	25'-11	7	12	9'-4	7	4.5	25'-11
8-10	12	5	11.5	13	9	9	9	3'-1	4'-3	3'-2	4'-2	4	12	6'-11	6	9	6'-11	4	6	20	4	6	11	4	12	22	4	17	20	4	12	26	4	17	20	5	9	25'-11	4	9	8'-5	5	6	5'-7	2'-5	3'-2	5	9	25'-11	6	9	8'-6	6	4.5	25'-11
11-13	12	5	13	15	9	9	9	2'-10	4'-3	3'-0	4'-4	5	12	7'-3	6	9	7'-3	4	6	20	4	6	11	4	12	22	4	17	20	4	12	26	4	17	20	5	9	25'-11	4	9	9'-4	4	6	5'-8	2'-5	3'-3	4	9	25'-11	7	9	8'-6	7	4.5	25'-11
14-16	12	5	14.5	16.5	9	9	9	2'-5	4'-4	2'-5	4'-5	4	9	7'-6	6	9	7'-6	4	6	20	4	6	11	4	12	22	4	17	20	4	12	26	4	17	20	6	12	25'-11	5	12	10'-0	4	6	5'-9	2'-5	3'-4	5	12	25'-11	8	12	8'-8	8	4.5	25'-11
17-19	12	5	16	18	9	9	9	2'-2	4'-5	2'-1	4'-6	4	12	7'-9	6	9	7'-9	4	6	20	4	6	11	4	12	22	4	17	20	4	12	26	4	17	20	6	12	25'-11	5	12	10'-9	6	12	6'-4	2'-6	3'-10	5	9	25'-11	7	9	8'-10	7	4.5	25'-11
20-22	12	5	18	20	9	9	9	1'-8	4'-7	1'-7	4'-8	4	12	8'-1	6	9	8'-1	4	6	20	4	6	11	4	12	22	4	17	20	4	12	26	4	17	20	6	12	25'-11	5	12	11'-3	6	12	6'-7	2'-7	4'-0	5	9	25'-11	7	9	9'-2	7	4.5	25'-11
23-25	12	5	19.5	21.5	9.5	9	6	1'-5	4'-8	1'-6	4'-10	4	9	8'-4	5	6	8'-4	4	6	20	4	6	11	4	12	22	4	17	20	5	12	26	4	17	20	7	18	26'-0	7	18	11'-7	5	12	6'-5	2'-8	3'-9	5	9	26'-0	7	9	9'-4	7	4.5	26'-0

FILL	BAR LIST																		QUANTITIES						
	m1			m2			m4			m6			m7			m9			CONCRETE (CY/FT)				STEEL (LB/FT)		
SIZE	SP.	L	SIZE	SP.	L	SIZE	SP.	L	H	V	SIZE	SP.	L	SIZE	SP.	L	SIZE	SP.	L	SLAB	FLOOR	WALLS	TOTAL	(LB/FT)	
0	5	12	26'-5	5	12	9'-0	6	9	10'-10	5'-5	5'-5	5	12	26'-5	5	12	11'-8	5	4.5	26'-5	1.232	1.050	0.382	2.664	366.29
1	5	12	26'-5	5	12	8'-11	7	12	9'-10	4'-5	5'-5	5	18	26'-5	7	18	11'-10	7	4.5	26'-5	1.151	1.050	0.382	2.583	350.76
2	5	9	26'-5	5	9	7'-11	5	6	8'-9	3'-6	5'-3	4	9	26'-5	6	9	9'-2	6	4.5	26'-5	0.867	0.885	0.382	2.134	396.61
3	5	9	26'-5	5	9	8'-0	5	6	8'-8	3'-5	5'-3	5	9	26'-5	6	9	8'-8	6	4.5	26'-5	0.907	0.885	0.382	2.174	394.45
4	6	12	26'-5	5	12	7'-6	6	9	8'-7	3'-4	5'-3	5	9	26'-5	6	9	8'-4	6	4.5	26'-5	0.826	0.885	0.382	2.093	388.82
5-7	6	12	26'-5	5	12	7'-8	6	9	8'-5	3'-1	5'-4	5	9	26'-5	6	9	8'-4	6	4.5	26'-5	0.867	0.967	0.382	2.216	378.21
8-10	5	9	26'-5	4	9	8'-4	5	6	8'-1	2'-7	5'-6	5	9	26'-5	6	9	8'-4	6	4.5	26'-5	0.989	1.132	0.382	2.503	375.00
11-13	6	12	26'-5	5	12	9'-2	4	6	8'-1	2'-5	5'-8	5	9	26'-5	6	9	8'-8	6	4.5	26'-5	1.110	1.297	0.382	2.789	366.55
14-16	6	12	26'-5	5	12	10'-4	4	6	8'-4	2'-6	5'-10	4	9	26'-5	7	9	8'-10	7	4.5	26'-5	1.232	1.421	0.382	3.035	377.29
17-19	7	18	26'-5	7	18	10'-11	6	12	8'-5	2'-6	5'-11	5	9	26'-5	7	9	9'-0	7	4.5	26'-5	1.353	1.545	0.382	3.280	413.21
20-22	7	18	26'-5	7	18	11'-5	6	12	8'-8	2'-7	6'-1	5	9	26'-5	7	9	9'-4	7	4.5	26'-5	1.515	1.710	0.382	3.607	419.92
23-25	7	18	26'-6	7	18	11'-7	5	12	8'-11	2'-8	6'-3	5	9	26'-6	7	9	9'-8	7	4.5	26'-6	1.646	1.844	0.403	3.893	427.97



- NOTES:**
- DIMENSIONS LISTED ON THIS SHEET TO BE USED IN CONJUNCTION WITH SHEET TWRCB G2-12.
  - DIMENSIONS "A", "B", "C", "D", "E", AND "SP." LISTED IN THE BAR LIST ARE IN INCHES.

LATEST REVISION DATE	 APPROVED BY BRIDGE ENGINEER	 STANDARD DESIGN <b>TWIN REINFORCED CONCRETE BOX CULVERTS</b> APRIL, 2012	<b>TWRCB 12-5-12</b> 12 x 5 BARREL SECTIONS
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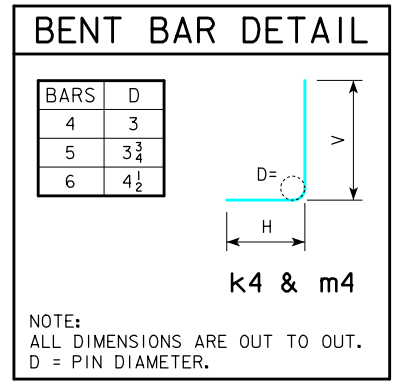
ENGLISH.LRFD.SIGNED.TWIN.CULVERTS.DGN -- TWRCB 12-5-12 -- THIS SHEET ISSUED 04-12.



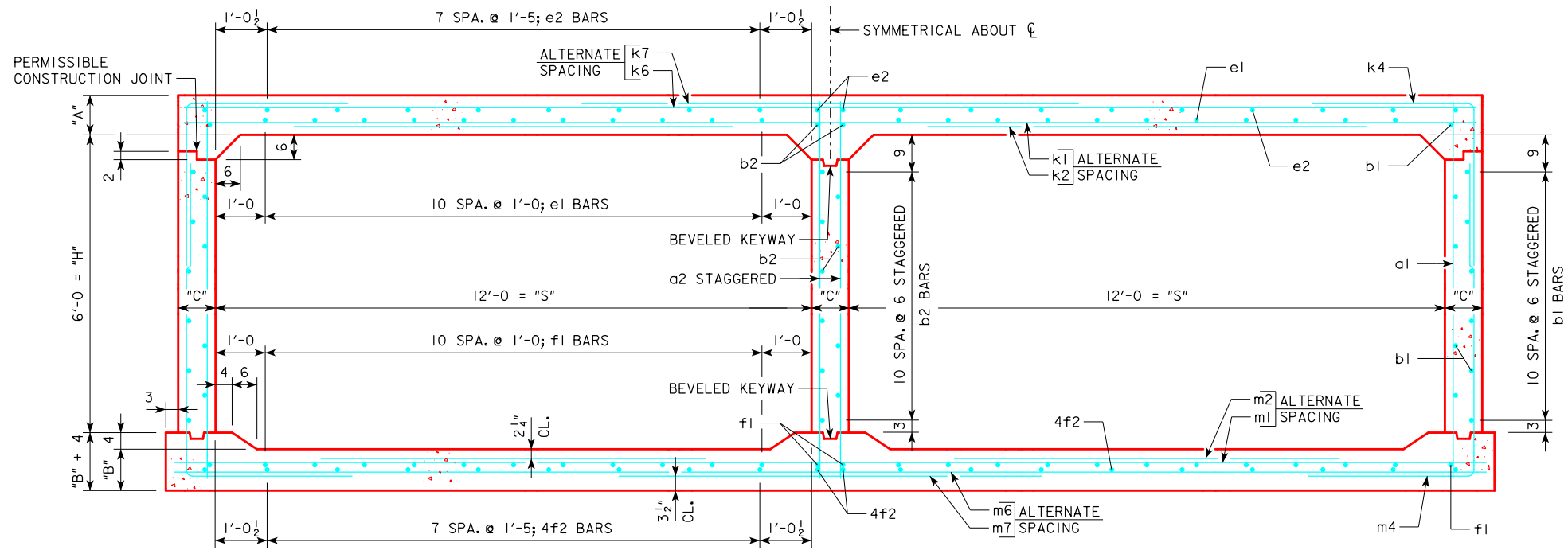
# VARIABLE DIMENSIONS AND QUANTITIES FOR TWIN 12 x 6 BARREL SECTIONS

DIMENSIONS												BAR LIST																																																	
FILL	S	H	A	B	C	D	E	U	W	X	Z	a1			a2			b1			b2			e1			e2			f1			f2			k1			k2			k4			k6			k7			k9										
SIZE	SP.	L	SIZE	SP.	L	SIZE	SP.	NO.	SIZE	SP.	NO.	SIZE	SP.	NO.	SIZE	SP.	NO.	SIZE	SP.	NO.	SIZE	SP.	NO.	SIZE	SP.	NO.	SIZE	SP.	NO.	SIZE	SP.	NO.	SIZE	SP.	NO.	SIZE	SP.	NO.	SIZE	SP.	NO.	SIZE	SP.	NO.	SIZE	SP.	NO.	SIZE	SP.	NO.	SIZE	SP.	NO.								
0	12	6	14.5	12	9	9	9	0'-0	7'-8	2'-6	6'-3	4	12	8'-1	6	9	8'-1	4	6	24	4	6	13	4	12	22	4	17	20	4	12	26	4	17	20	4	12	26	4	17	20	6	18	25'-11	5	12	12'-11	5	9	7'-2	3'-7	3'-7	5	18	25'-11	7	18	15'-4	7	4.5	25'-11
1	12	6	13.5	12	9	9	9	0'-9	7'-8	2'-6	5'-11	4	12	8'-0	6	9	8'-0	4	6	24	4	6	13	4	12	22	4	17	20	4	12	26	4	17	20	6	18	25'-11	6	18	12'-2	5	9	7'-2	3'-7	3'-7	5	18	25'-11	7	18	15'-4	7	4.5	25'-11						
2	12	6	10	10	9	6	9	2'-0	6'-5	3'-0	4'-9	4	6	7'-7	6	9	7'-7	4	6	24	4	6	13	5	12	22	4	17	20	4	12	26	4	17	20	6	12	25'-11	5	12	10'-4	6	9	6'-10	3'-5	3'-5	5	12	25'-11	6	12	12'-10	6	4.5	25'-11						
3	12	6	10.5	10	9	6	9	2'-3	5'-11	2'-8	4'-5	4	6	7'-7	6	9	7'-7	4	6	24	4	6	13	4	12	22	4	17	20	4	12	26	4	17	20	6	12	25'-11	5	12	9'-10	5	6	6'-4	3'-2	3'-2	4	12	25'-11	7	12	11'-10	7	4.5	25'-11						
4	12	6	9.5	10	9	9	9	2'-9	5'-0	3'-0	4'-3	5	12	7'-6	6	9	7'-6	4	6	24	4	6	13	4	12	22	4	17	20	4	12	26	4	17	20	6	12	25'-11	5	12	8'-10	6	9	6'-8	3'-4	3'-4	5	9	25'-11	5	9	10'-0	5	4.5	25'-11						
5-7	12	6	10	11	9	9	9	2'-9	4'-9	3'-3	4'-2	4	9	7'-8	6	9	7'-8	4	6	24	4	6	13	4	12	22	4	17	20	4	12	26	4	17	20	5	9	25'-11	4	9	8'-6	6	9	6'-4	3'-0	3'-4	5	12	25'-11	7	12	9'-6	7	4.5	25'-11						
8-10	12	6	11.5	13	9	9	9	3'-1	4'-3	3'-3	4'-2	4	12	7'-11	6	9	7'-11	4	6	24	4	6	13	4	12	22	4	17	20	4	12	26	4	17	20	5	9	25'-11	4	9	8'-6	5	6	5'-9	2'-7	3'-2	5	9	25'-11	6	9	8'-6	6	4.5	25'-11						
11-13	12	6	13	15	9	9	9	2'-10	4'-3	3'-0	4'-4	5	12	8'-3	6	9	8'-3	4	6	24	4	6	13	4	12	22	4	17	20	4	12	26	4	17	20	5	9	25'-11	4	9	9'-5	4	6	5'-9	2'-6	3'-3	4	9	25'-11	7	9	8'-6	7	4.5	25'-11						
14-16	12	6	14.5	16.5	9	9	9	2'-5	4'-4	2'-5	4'-5	4	9	8'-6	6	9	8'-6	4	6	24	4	6	13	4	12	22	4	17	20	4	12	26	4	17	20	6	12	25'-11	5	12	10'-0	4	6	5'-10	2'-6	3'-4	5	12	25'-11	8	12	8'-8	8	4.5	25'-11						
17-19	12	6	16.5	18.5	9	9	9	2'-2	4'-6	2'-3	4'-7	4	12	8'-10	6	9	8'-10	4	6	24	4	6	13	4	12	22	4	17	20	4	12	26	4	17	20	6	12	25'-11	5	12	10'-9	6	12	6'-5	2'-7	3'-10	5	12	25'-11	8	12	9'-0	8	4.5	25'-11						
20-22	12	6	18	20	9	9	9	1'-6	4'-7	1'-7	4'-8	4	12	9'-1	6	9	9'-1	4	6	24	4	6	13	4	12	22	4	17	20	4	12	26	4	17	20	7	18	25'-11	7	18	11'-5	6	12	6'-8	2'-8	4'-0	5	9	25'-11	7	9	9'-2	7	4.5	25'-11						
23-25	12	6	19.5	21.5	9	9	9	1'-4	4'-8	1'-6	4'-10	4	12	9'-4	6	9	9'-4	4	6	24	4	6	13	4	12	22	4	17	20	5	12	26	4	17	20	7	18	25'-11	7	18	11'-7	6	12	6'-10	2'-9	4'-1	5	9	25'-11	7	9	9'-4	7	4.5	25'-11						

FILL	BAR LIST																		QUANTITIES						
	m1			m2			m4			m6			m7			m9			CONCRETE (CY/FT)				STEEL (LB/FT)		
SIZE	SP.	L	SIZE	SP.	L	SIZE	SP.	L	H	V	SIZE	SP.	L	SIZE	SP.	L	SIZE	SP.	L	SLAB	FLOOR	WALLS	TOTAL	(LB/FT)	
0	5	12	26'-5	5	12	9'-1	6	9	12'-3	5'-10	6'-5	4	12	26'-5	6	12	12'-6	6	4.5	26'-5	1.232	1.050	0.465	2.747	374.42
1	5	12	26'-5	5	12	9'-1	6	9	11'-3	4'-10	6'-5	5	12	26'-5	5	12	11'-10	5	4.5	26'-5	1.151	1.050	0.465	2.666	362.87
2	5	9	26'-5	5	9	7'-10	6	9	9'-9	3'-6	6'-3	5	12	26'-5	7	12	9'-6	7	4.5	26'-5	0.867	0.885	0.465	2.217	417.00
3	5	9	26'-5	5	9	8'-3	5	6	9'-8	3'-5	6'-3	5	9	26'-5	6	9	8'-10	6	4.5	26'-5	0.907	0.885	0.465	2.257	409.37
4	5	9	26'-5	5	9	7'-9	6	9	9'-7	3'-4	6'-3	5	9	26'-5	6	9	8'-6	6	4.5	26'-5	0.826	0.885	0.465	2.176	407.05
5-7	6	12	26'-5	5	12	7'-8	6	9	9'-6	3'-2	6'-4	5	9	26'-5	6	9	8'-4	6	4.5	26'-5	0.867	0.967	0.465	2.299	394.13
8-10	6	12	26'-5	5	12	8'-3	5	6	9'-2	2'-8	6'-6	5	9	26'-5	6	9	8'-4	6	4.5	26'-5	0.989	1.132	0.465	2.586	394.42
11-13	6	12	26'-5	5	12	9'-2	4	6	9'-3	2'-7	6'-8	4	9	26'-5	7	9	8'-8	7	4.5	26'-5	1.110	1.297	0.465	2.872	372.87
14-16	6	12	26'-5	5	12	10'-5	4	6	9'-5	2'-7	6'-10	5	12	26'-5	8	12	8'-10	8	4.5	26'-5	1.232	1.421	0.465	3.118	393.68
17-19	6	12	26'-5	5	12	10'-9	6	12	9'-8	2'-8	7'-0	5	12	26'-5	8	12	9'-2	8	4.5	26'-5	1.394	1.586	0.465	3.445	405.89
20-22	7	18	26'-5	7	18	11'-5	6	12	9'-10	2'-9	7'-1	5	9	26'-5	7	9	9'-4	7	4.5	26'-5	1.515	1.710	0.465	3.690	437.00
23-25	7	18	26'-5	7	18	11'-6	6	12	10'-1	2'-10	7'-3	5	9	26'-5	7	9	9'-8	7	4.5	26'-5	1.637	1.834	0.465	3.936	450.79



ENGLISH.LRFD.SIGNED.TWIN.CULVERTS.DGN -- TWRCB 12-6-12 -- THIS SHEET ISSUED 04-12.



**TWIN 12 x 6 BARREL SECTION**

- NOTES:**
- DIMENSIONS LISTED ON THIS SHEET TO BE USED IN CONJUNCTION WITH SHEET TWRCB G2-12.
  - DIMENSIONS "A", "B", "C", "D", "E", AND "SP." LISTED IN THE BAR LIST ARE IN INCHES.

LATEST REVISION DATE	 APPROVED BY BRIDGE ENGINEER	 STANDARD DESIGN <b>TWIN REINFORCED CONCRETE BOX CULVERTS</b> APRIL, 2012	<b>TWRCB 12-6-12</b>
		<b>CULVERT BARREL DETAILS</b> 12 x 6 BARREL SECTIONS	

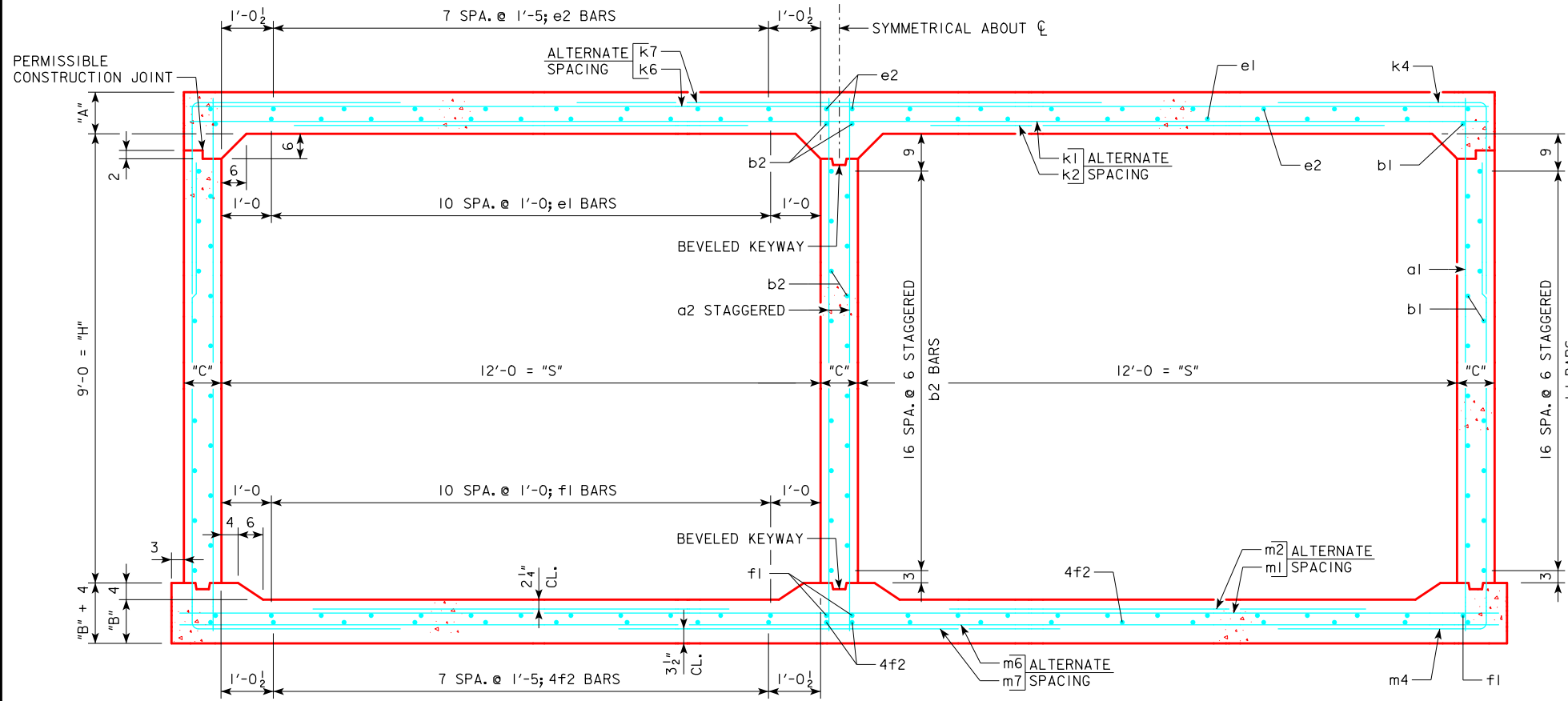




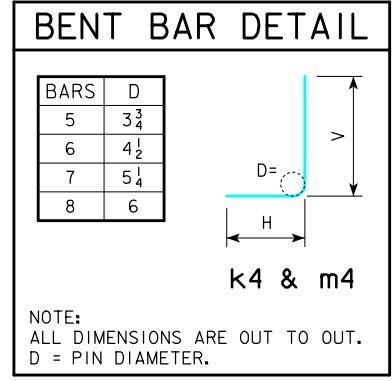
# VARIABLE DIMENSIONS AND QUANTITIES FOR TWIN 12 x 9 BARREL SECTIONS

DIMENSIONS													BAR LIST																																																	
FILL	S	H	A	B	C	D	E	U	W	X	Z	a1			a2			b1			b2			e1			e2			f1			f2			k1			k2			k4			k6			k7			k9											
												SIZE	SP.	L	SIZE	SP.	L	SIZE	SP.	NO.	SIZE	SP.	NO.	SIZE	SP.	NO.	SIZE	SP.	NO.	SIZE	SP.	NO.	SIZE	SP.	NO.	SIZE	SP.	NO.	SIZE	SP.	NO.	SIZE	SP.	NO.	SIZE	SP.	NO.	SIZE	SP.	NO.	SIZE	SP.	NO.	SIZE	SP.	NO.	SIZE	SP.	NO.	SIZE	SP.	NO.
0	12	9	14.5	12.5	9	9	9	0'-2	7'-8	3'-2	7'-3	4	12	11'-2	6	9	11'-2	4	6	36	4	6	19	4	12	22	5	17	20	4	12	26	4	17	20	5	12	25'-11	5	12	12'-9	5	9	10'-4	7	18	15'-4	7	18	15'-4	7	4.5	25'-11									
1	12	9	13.5	12	9	9	9	0'-7	7'-8	3'-1	7'-6	4	9	11'-0	6	9	11'-0	4	6	36	4	6	19	4	12	22	4	17	20	4	12	26	4	17	20	6	12	25'-11	5	12	10'-7	7	12	8'-9	4'-10	3'-11	5	12	25'-11	6	12	14'-10	6	4.5	25'-11							
2	12	9	10.5	10.5	9	9	9	1'-11	7'-5	2'-8	5'-1	4	12	10'-8	6	9	10'-8	4	6	36	4	6	19	5	12	22	4	17	20	4	12	26	4	17	20	6	12	25'-11	5	12	10'-7	7	12	8'-9	4'-10	3'-11	5	12	25'-11	6	12	14'-10	6	4.5	25'-11							
3	12	9	10.5	11	9	9	9	1'-9	6'-5	2'-7	4'-11	4	12	10'-8	6	9	10'-8	4	6	36	4	6	19	4	12	22	4	17	20	4	12	26	4	17	20	7	12	25'-11	5	12	11'-0	7	12	8'-4	4'-5	3'-11	4	12	25'-11	7	12	12'-10	7	4.5	25'-11							
4	12	9	10	10.5	9	9	9	2'-8	5'-3	3'-0	4'-5	4	12	10'-7	6	9	10'-7	4	6	36	4	6	19	4	12	22	4	17	20	4	12	26	4	17	20	6	12	25'-11	5	12	9'-1	7	12	8'-2	4'-1	4'-1	5	9	25'-11	5	9	10'-6	5	4.5	25'-11							
5-7	12	9	10	12	9	9	9	2'-10	4'-9	3'-2	4'-5	4	12	10'-9	6	9	10'-9	4	6	36	4	6	19	4	12	22	4	17	20	4	12	26	4	17	20	5	9	25'-11	4	9	8'-6	5	6	6'-9	3'-9	3'-0	5	9	25'-11	6	9	9'-6	6	4.5	25'-11							
8-10	12	9	11.5	13.5	9	9	9	3'-0	4'-3	3'-2	4'-3	4	12	11'-0	6	9	11'-0	4	6	36	4	6	19	4	12	22	4	17	20	4	12	26	4	17	20	5	9	25'-11	4	9	8'-7	5	6	6'-8	3'-4	3'-4	5	9	25'-11	6	9	8'-6	6	4.5	25'-11							
11-13	12	9	13	15	9	9	9	2'-9	4'-3	2'-11	4'-3	4	9	11'-3	6	9	11'-3	4	6	36	4	6	19	4	12	22	4	17	20	4	12	26	4	17	20	5	9	25'-11	4	9	9'-6	6	9	6'-10	3'-3	3'-7	4	9	25'-11	7	9	8'-6	7	4.5	25'-11							
14-16	12	9	15	17	9	9	9	2'-5	4'-4	2'-8	4'-5	4	9	11'-7	6	9	11'-7	4	6	36	4	6	19	4	12	22	4	17	20	4	12	26	4	17	20	7	18	25'-11	6	18	10'-6	6	9	7'-1	3'-4	3'-9	4	9	25'-11	7	9	8'-8	7	4.5	25'-11							
17-19	12	9	16.5	18.5	10	9	9	2'-1	4'-6	2'-2	4'-7	4	9	11'-10	7	9	11'-10	4	6	36	4	6	19	4	12	22	4	17	20	4	12	26	4	17	20	6	12	26'-2	5	12	11'-0	6	9	7'-3	3'-5	3'-10	5	12	26'-2	8	12	9'-0	8	4.5	26'-2							
20-22	12	9	18.5	20.5	10.5	9	9	1'-11	4'-7	2'-0	4'-9	4	12	12'-2	7	9	12'-2	4	6	36	4	6	19	4	12	22	4	17	20	4	12	26	4	17	20	6	12	26'-3	5	12	11'-2	5	6	7'-4	3'-8	3'-8	4	9	26'-3	7	9	9'-2	7	4.5	26'-3							
23-25	12	9	19	21.5	11	9	9	1'-4	4'-8	1'-6	4'-10	4	9	12'-3	7	9	12'-3	4	6	36	4	6	19	4	12	22	4	17	20	5	12	26	4	17	20	7	18	26'-5	7	18	11'-10	6	9	7'-8	3'-7	4'-1	5	9	26'-5	7	9	9'-4	7	4.5	26'-5							

BAR LIST													QUANTITIES												
FILL	SIZE	SP.	L	SIZE	SP.	L	SIZE	SP.	L	H	V	m6			m7			m9			CONCRETE (CY/FT)				STEEL (LB/FT)
												SIZE	SP.	L	SIZE	SP.	L	SIZE	SP.	L	SLAB	FLOOR	WALLS	TOTAL	
0	5	9	26'-5	4	9	8'-3	6	9	16'-11	7'-5	9'-6	5	12	26'-5	5	12	14'-6	5	4.5	26'-5	1.232	1.091	0.715	3.038	434.74
1	5	9	26'-5	4	9	8'-3	6	9	16'-7	7'-2	9'-5	4	9	26'-5	5	9	15'-0	5	4.5	26'-5	1.151	1.050	0.715	2.916	446.16
2	5	9	26'-5	5	9	8'-8	8	12	14'-2	4'-10	9'-4	4	9	26'-5	6	9	10'-2	6	4.5	26'-5	0.907	0.926	0.715	2.548	481.16
3	5	9	26'-5	5	9	8'-10	8	12	13'-8	4'-4	9'-4	5	12	26'-5	7	12	9'-10	7	4.5	26'-5	0.907	0.967	0.715	2.589	475.66
4	5	9	26'-5	5	9	8'-4	8	12	13'-5	4'-1	9'-4	5	9	26'-5	6	9	8'-10	6	4.5	26'-5	0.867	0.926	0.715	2.508	472.18
5-7	6	12	26'-5	5	12	8'-3	5	6	13'-2	3'-9	9'-5	5	9	26'-5	6	9	8'-10	6	4.5	26'-5	0.867	1.050	0.715	2.632	439.92
8-10	6	12	26'-5	5	12	8'-9	5	6	13'-0	3'-5	9'-7	5	9	26'-5	6	9	8'-6	6	4.5	26'-5	0.989	1.174	0.715	2.878	438.32
11-13	6	12	26'-5	5	12	9'-3	6	9	13'-0	3'-4	9'-8	4	9	26'-5	7	9	8'-6	7	4.5	26'-5	1.110	1.297	0.715	3.122	435.74
14-16	6	12	26'-5	5	12	10'-3	6	9	13'-3	3'-5	9'-10	4	9	26'-5	7	9	8'-10	7	4.5	26'-5	1.272	1.463	0.715	3.450	448.95
17-19	6	12	26'-8	5	12	10'-11	6	9	13'-6	3'-6	10'-0	5	12	26'-8	8	12	9'-2	8	4.5	26'-8	1.410	1.604	0.795	3.809	478.66
20-22	6	12	26'-9	5	12	11'-2	5	6	13'-10	3'-8	10'-2	5	9	26'-9	7	9	9'-6	7	4.5	26'-9	1.583	1.778	0.837	4.198	482.45
23-25	7	18	26'-11	7	18	11'-9	6	9	13'-11	3'-8	10'-3	5	9	26'-11	7	9	9'-8	7	4.5	26'-11	1.634	1.871	0.876	4.381	526.74



**TWIN 12 x 9 BARREL SECTION**



- NOTES:**
- DIMENSIONS LISTED ON THIS SHEET TO BE USED IN CONJUNCTION WITH SHEET TWRCB G2-12.
  - DIMENSIONS "A", "B", "C", "D", "E", AND "SP." LISTED IN THE BAR LIST ARE IN INCHES.

LATEST REVISION DATE	 APPROVED BY BRIDGE ENGINEER		
		STANDARD DESIGN <b>TWIN REINFORCED CONCRETE                  BOX CULVERTS</b> APRIL, 2012	
		<b>CULVERT BARREL                  DETAILS</b> 12 x 9 BARREL SECTIONS	<b>TWRCB 12-9-12</b>

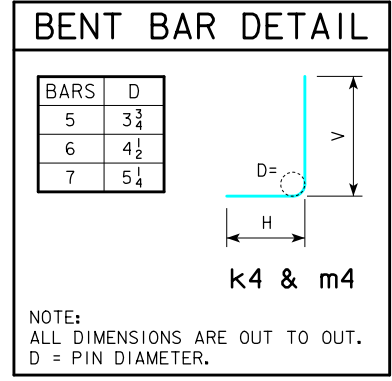
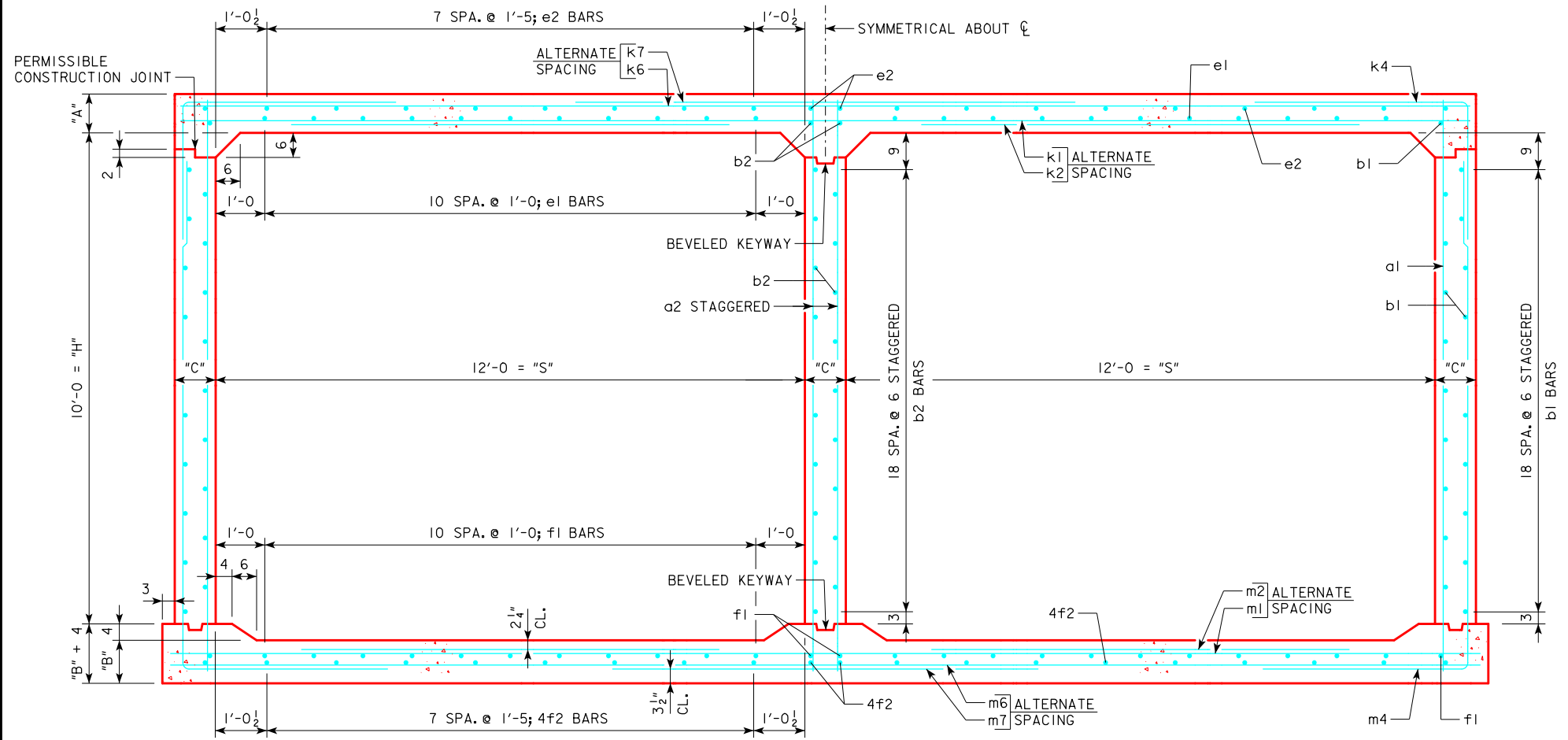
ENGLISH.LRFD.SIGNED.TWIN.CULVERTS.DGN - TWRCB 12-9-12 - THIS SHEET ISSUED 04-12.



# VARIABLE DIMENSIONS AND QUANTITIES FOR TWIN 12 x 10 BARREL SECTIONS

DIMENSIONS													BAR LIST																																										
FILL	S	H	A	B	C	D	E	U	W	X	Z	a1			a2			b1			b2			e1			e2			f1			f2			k1			k2			k4			k6			k7			k9				
0	1	2	3	4	5-7	8-10	11-13	14-16	17-19	20-22	23-25	SIZE	SP.	L	SIZE	SP.	L	SIZE	SP.	NO.	SIZE	SP.	NO.	SIZE	SP.	NO.	SIZE	SP.	NO.	SIZE	SP.	NO.	SIZE	SP.	L	SIZE	SP.	L	SIZE	SP.	L	SIZE	SP.	L	SIZE	SP.	L	SIZE	SP.	L	SIZE	SP.	L		
0	12	10	14	12.5	10	9	9	0'-2	7'-4	2'-11	7'-6	4	9	12'-1	7	9	12'-1	4	6	40	4	6	21	4	12	22	4	17	20	4	12	26	4	17	20	5	12	12'-11	6	9	11'-2	7'-6	3'-8	5	12	26'-2	5	12	14'-8	5	4.5	26'-2			
1	12	10	13.5	12.5	10	9	9	0'-7	7'-9	2'-5	7'-4	4	9	12'-1	7	9	12'-1	4	6	40	4	6	21	4	12	22	4	17	20	4	12	26	4	17	20	6	18	26'-2	6	18	12'-6	6	9	11'-0	7'-5	3'-7	5	18	26'-2	7	18	15'-6	7	4.5	26'-2
2	12	10	10.5	11	10	6	9	1'-11	8'-2	3'-0	5'-2	4	6	11'-8	7	9	11'-8	4	6	40	4	6	21	5	12	22	4	17	20	4	12	26	4	17	20	6	12	26'-2	5	12	10'-8	6	9	9'-0	5'-7	3'-5	5	18	26'-2	8	18	16'-4	8	4.5	26'-2
3	12	10	10.5	10.5	10	9	9	2'-3	6'-4	2'-8	4'-6	4	9	11'-8	7	9	11'-8	4	6	40	4	6	21	4	12	22	4	17	20	4	12	26	4	17	20	6	12	26'-2	5	12	10'-0	6	9	8'-1	4'-9	3'-4	4	12	26'-2	7	12	12'-8	7	4.5	26'-2
4	12	10	9.5	10.5	10	9	9	2'-9	5'-1	3'-0	4'-4	5	12	11'-7	7	9	11'-7	4	6	40	4	6	21	4	12	22	4	17	20	4	12	26	4	17	20	6	12	26'-2	5	12	8'-11	5	6	7'-3	4'-4	2'-11	5	9	26'-2	5	9	10'-2	5	4.5	26'-2
5-7	12	10	10	11.5	10	9	9	2'-10	4'-9	3'-2	4'-3	5	12	11'-8	7	9	11'-8	4	6	40	4	6	21	4	12	22	4	17	20	4	12	26	4	17	20	5	9	26'-2	4	9	8'-6	6	9	7'-6	4'-2	3'-4	5	12	26'-2	7	12	9'-6	7	4.5	26'-2
8-10	12	10	11.5	13.5	10	9	9	3'-0	4'-3	3'-2	4'-2	5	12	12'-0	7	9	12'-0	4	6	40	4	6	21	4	12	22	4	17	20	4	12	26	4	17	20	5	9	26'-2	4	9	8'-8	6	9	7'-2	3'-9	3'-5	5	9	26'-2	6	9	8'-6	6	4.5	26'-2
11-13	12	10	13	15	10	6	9	2'-9	4'-3	2'-11	4'-3	4	6	12'-3	7	9	12'-3	4	6	40	4	6	21	4	12	22	4	17	20	4	12	26	4	17	20	5	9	26'-2	4	9	9'-6	6	9	7'-4	3'-8	3'-8	4	9	26'-2	7	9	8'-6	7	4.5	26'-2
14-16	12	10	14.5	17	10.5	9	9	2'-8	4'-4	2'-8	4'-5	4	9	12'-6	7	9	12'-6	4	6	40	4	6	21	4	12	22	4	17	20	4	12	26	4	17	20	6	12	26'-3	5	12	9'-9	5	6	7'-4	3'-8	3'-8	4	9	26'-3	7	9	8'-8	7	4.5	26'-3
17-19	12	10	16.5	18.5	11	6	9	2'-1	4'-6	2'-2	4'-7	4	6	12'-10	7	9	12'-10	4	6	40	4	6	21	4	12	22	4	17	20	4	12	26	4	17	20	6	12	26'-5	5	12	11'-0	6	9	7'-8	3'-10	3'-10	4	9	26'-5	7	9	9'-0	7	4.5	26'-5
20-22	12	10	18	20.5	12	9	9	1'-11	4'-7	1'-7	4'-9	5	9	13'-1	7	9	13'-1	4	6	40	4	6	21	4	12	22	4	17	20	4	12	26	4	17	20	6	12	26'-8	5	12	11'-5	6	9	8'-0	4'-0	4'-0	4	9	26'-8	7	9	9'-2	7	4.5	26'-8
23-25	12	10	20	22	12.5	6	9	1'-3	4'-9	1'-5	4'-11	4	6	13'-5	7	9	13'-5	4	6	40	4	6	21	4	12	22	4	17	20	5	12	26	4	17	20	7	18	26'-9	7	18	12'-1	6	9	8'-4	4'-2	4'-2	4	9	26'-9	7	9	9'-6	7	4.5	26'-9

DIMENSIONS													BAR LIST																											QUANTITIES				
FILL	S	H	A	B	C	D	E	U	W	X	Z	m1			m2			m4			m6			m7			m9			CONCRETE (CY/FT)				STEEL										
0	1	2	3	4	5-7	8-10	11-13	14-16	17-19	20-22	23-25	SIZE	SP.	L	SIZE	SP.	L	SIZE	SP.	L	H	V	SIZE	SP.	L	SIZE	SP.	L	SIZE	SP.	L	SLAB	FLOOR	WALLS	TOTAL	(LB/FT)								
0	5	9	26'-8	4	9	8'-6	6	9	18'-2	7'-8	10'-6	4	12	26'-8	6	12	15'-0	6	4.5	26'-8	1.206	1.104	0.887	3.197	471.29																			
1	5	12	26'-8	5	12	9'-10	6	9	18'-0	7'-6	10'-6	5	12	26'-8	5	12	14'-8	5	4.5	26'-8	1.165	1.104	0.887	3.156	466.16																			
2	6	12	26'-8	5	12	8'-5	6	9	15'-2	4'-10	10'-4	4	12	26'-8	7	12	10'-4	7	4.5	26'-8	0.920	0.979	0.887	2.786	490.47																			
3	5	9	26'-8	5	9	8'-9	7	9	14'-9	4'-5	10'-4	5	9	26'-8	6	9	9'-0	6	4.5	26'-8	0.920	0.937	0.887	2.744	497.87																			
4	5	9	26'-8	5	9	8'-5	5	6	14'-6	4'-2	10'-4	5	9	26'-8	6	9	8'-8	6	4.5	26'-8	0.838	0.937	0.887	2.662	476.11																			
5-7	6	12	26'-8	5	12	8'-3	6	9	14'-6	4'-1	10'-5	5	9	26'-8	6	9	8'-6	6	4.5	26'-8	0.879	1.020	0.887	2.786	466.53																			
8-10	6	12	26'-8	5	12	8'-6	6	9	14'-5	3'-10	10'-7	5	9	26'-8	6	9	8'-4	6	4.5	26'-8	1.002	1.187	0.887	3.076	471.68																			
11-13	6	12	26'-8	5	12	9'-4	6	9	14'-5	3'-9	10'-8	4	9	26'-8	7	9	8'-6	7	4.5	26'-8	1.124	1.312	0.887	3.323	472.61																			
14-16	6	12	26'-9	5	12	10'-3	5	6	14'-8	3'-10	10'-10	4	9	26'-9	7	9	8'-10	7	4.5	26'-9	1.255	1.485	0.934	3.674	476.03																			
17-19	6	12	26'-11	5	12	11'-0	6	9	14'-10	3'-10	11'-0	5	12	26'-11	8	12	9'-2	8	4.5	26'-11	1.427	1.619	0.978	4.024	502.11																			
20-22	7	18	27'-2	7	18	11'-9	6	9	15'-2	4'-0	11'-2	5	12	27'-2	8	12	9'-6	8	4.5	27'-2	1.569	1.806	1.067	4.442	518.32																			
23-25	7	18	27'-3	7	18	12'-0	6	9	15'-4	4'-1	11'-3	5	9	27'-3	7	9	9'-10	7	4.5	27'-3	1.746	1.943	1.111	4.800	547.79																			



- NOTES:**
- DIMENSIONS LISTED ON THIS SHEET TO BE USED IN CONJUNCTION WITH SHEET TWRCB G2-12.
  - DIMENSIONS "A", "B", "C", "D", "E", AND "SP." LISTED IN THE BAR LIST ARE IN INCHES.

LATEST REVISION DATE		STANDARD DESIGN <b>TWIN REINFORCED CONCRETE BOX CULVERTS</b> APRIL, 2012
APPROVED BY BRIDGE ENGINEER 	<b>CULVERT BARREL DETAILS</b> 12 x 10 BARREL SECTIONS	
		TWRCB 12-10-12

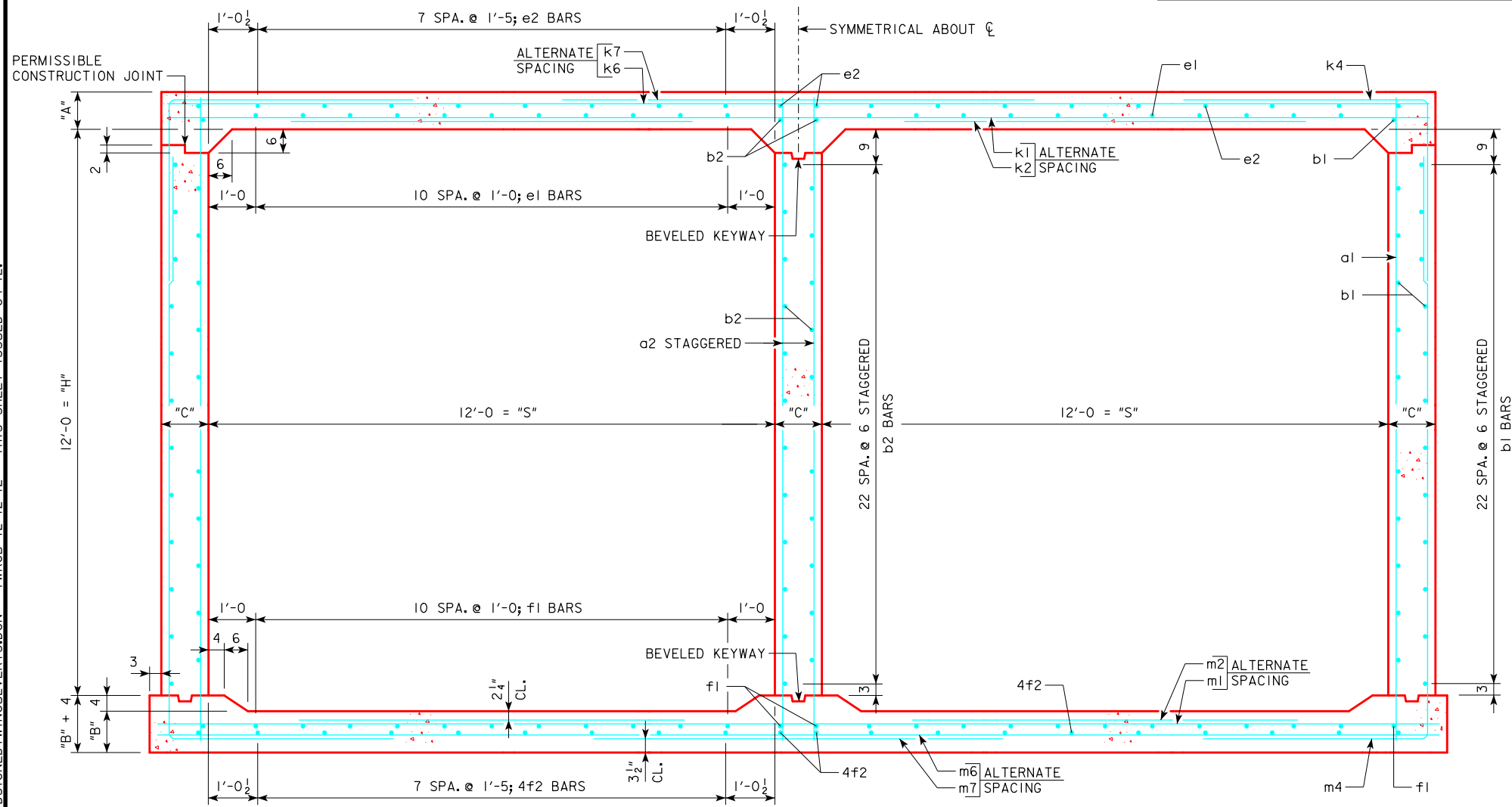
ENGLISHLRFDSDIGNEDTWINCULVERTS.DGN - TWRCB 12-10-12 - THIS SHEET ISSUED 04-12-



# VARIABLE DIMENSIONS AND QUANTITIES FOR TWIN 12 x 12 BARREL SECTIONS

DIMENSIONS												BAR LIST																																																	
FILL	S	H	A	B	C	D	E	U	W	X	Z	a1			a2			b1			b2			e1			e2			f1			f2			k1			k2			k4			k6			k7			k9										
												SIZE	SP.	L	SIZE	SP.	L	SIZE	SP.	NO.	SIZE	SP.	NO.	SIZE	SP.	NO.	SIZE	SP.	NO.	SIZE	SP.	NO.	SIZE	SP.	NO.	SIZE	SP.	L	SIZE	SP.	L	SIZE	SP.	L	SIZE	SP.	L	SIZE	SP.	L	SIZE	SP.	L	SIZE	SP.	L					
0	12	12	14.5	13	12	9	9	0'-3	7'-10	2'-6	7'-5	4	12	14'-2	7	9	14'-2	4	6	48	4	6	25	4	12	22	5	17	20	4	12	26	4	17	20	4	12	26	4	17	20	6	18	26'-8	5	12	13'-1	6	9	11'-4	7'-7	3'-9	5	18	26'-8	7	18	15'-8	7	4.5	26'-8
1	12	12	13.5	12.5	12	6	9	0'-11	7'-10	2'-6	5'-6	4	6	14'-1	7	9	14'-1	4	6	48	4	6	25	4	12	22	4	17	20	4	12	26	4	17	20	6	12	26'-8	5	12	10'-3	7	9	10'-2	6'-4	3'-10	5	12	26'-8	6	12	14'-0	6	4.5	26'-8						
2	12	12	10	10.5	12	9	9	2'-0	7'-0	2'-9	4'-6	4	9	13'-7	7	9	13'-7	4	6	48	4	6	25	5	12	22	4	17	20	4	12	26	4	17	20	6	12	26'-8	5	12	10'-3	7	9	10'-2	6'-4	3'-10	5	12	26'-8	6	12	14'-0	6	4.5	26'-8						
3	12	12	10.5	10.5	12	9	9	2'-4	5'-11	2'-9	4'-4	4	12	13'-8	7	9	13'-8	4	6	48	4	6	25	4	12	22	4	17	20	4	12	26	4	17	20	6	12	26'-8	5	12	10'-0	7	9	9'-10	5'-11	3'-11	5	12	26'-8	6	12	11'-10	6	4.5	26'-8						
4	12	12	9.5	10.5	12	9	9	2'-10	5'-0	3'-1	4'-4	4	12	13'-7	7	9	13'-7	4	6	48	4	6	25	4	12	22	4	17	20	4	12	26	4	17	20	6	12	26'-8	5	12	10'-3	7	9	9'-0	5'-2	3'-10	4	12	26'-8	7	12	10'-0	7	4.5	26'-8						
5-7	12	12	9.5	11.5	12	9	9	2'-10	4'-8	3'-2	4'-3	4	9	13'-8	7	9	13'-8	4	6	48	4	6	25	4	12	22	4	17	20	4	12	26	4	17	20	5	9	26'-8	4	9	8'-6	7	9	8'-9	4'-11	3'-10	5	12	26'-8	7	12	9'-4	7	4.5	26'-8						
8-10	12	12	11	13.5	12	9	9	3'-0	4'-2	3'-2	4'-2	5	9	13'-11	7	9	13'-11	4	6	48	4	6	25	4	12	22	4	17	20	4	12	26	4	17	20	5	9	26'-8	4	9	8'-6	5	6	7'-7	4'-6	3'-1	5	9	26'-8	6	9	8'-4	6	4.5	26'-8						
11-13	12	12	12.5	15	12	9	9	2'-10	4'-3	2'-11	4'-3	4	9	14'-2	7	9	14'-2	4	6	48	4	6	25	4	12	22	4	17	20	4	12	26	4	17	20	5	9	26'-8	4	9	9'-0	7	9	8'-7	4'-6	4'-1	4	9	26'-8	7	9	8'-6	7	4.5	26'-8						
14-16	12	12	14.5	17	12.5	9	9	2'-7	4'-4	2'-8	4'-5	6	9	14'-6	7	9	14'-6	4	6	48	4	6	25	4	12	22	4	17	20	4	12	26	4	17	20	5	9	26'-9	4	9	9'-11	5	6	7'-11	4'-6	3'-5	4	9	26'-9	7	9	8'-8	7	4.5	26'-9						
17-19	12	12	16	18.5	13.5	9	6	2'-2	4'-5	2'-2	4'-7	5	12	14'-9	6	6	14'-9	4	6	48	4	6	25	4	12	22	4	17	20	4	12	26	4	17	20	6	12	27'-0	5	12	10'-6	7	9	9'-0	4'-6	4'-6	4	9	27'-0	7	9	8'-10	7	4.5	27'-0						
20-22	12	12	18	20.5	14	9	9	1'-11	4'-7	1'-10	4'-9	5	12	15'-1	8	9	15'-1	4	6	48	4	6	25	4	12	22	4	17	20	4	12	26	4	17	20	6	12	27'-2	5	12	11'-4	6	6	8'-8	4'-8	4'-0	4	9	27'-2	7	9	9'-2	7	4.5	27'-2						
23-25	12	12	19.5	22.5	15	6	9	1'-4	4'-9	1'-5	4'-11	4	6	15'-5	8	9	15'-5	4	6	48	4	6	25	4	12	22	4	17	20	5	12	26	4	17	20	7	18	27'-5	7	18	12'-4	7	9	9'-6	4'-9	4'-9	4	9	27'-5	7	9	9'-6	7	4.5	27'-5						

FILL	BAR LIST																		QUANTITIES						
	m1			m2			m4			m6			m7			m9			CONCRETE (CY/FT)				STEEL		
	SIZE	SP.	L	SIZE	SP.	L	SIZE	SP.	L	H	V	SIZE	SP.	L	SIZE	SP.	L	SLAB	FLOOR	WALLS	TOTAL	(LB/FT)			
0	5	12	27'-2	5	12	9'-9	7	9	20'-2	7'-8	12'-6	5	12	27'-2	5	12	14'-10	5	4.5	27'-2	1.277	1.169	1.289	3.735	529.97
1	5	12	27'-2	5	12	9'-8	6	9	19'-2	6'-8	12'-6	4	12	27'-2	6	12	11'-0	6	4.5	27'-2	1.194	1.127	1.289	3.610	495.66
2	5	9	27'-2	5	9	8'-7	7	9	17'-6	5'-2	12'-4	4	9	27'-2	6	9	9'-0	6	4.5	27'-2	0.902	0.957	1.289	3.148	555.74
3	5	9	27'-2	5	9	8'-8	7	9	17'-3	4'-11	12'-4	5	9	27'-2	6	9	8'-8	6	4.5	27'-2	0.944	0.957	1.289	3.190	548.00
4	5	9	27'-2	5	9	8'-2	7	9	17'-1	4'-9	12'-4	5	12	27'-2	7	12	8'-8	7	4.5	27'-2	0.861	0.957	1.289	3.107	524.92
5-7	6	12	27'-2	5	12	8'-2	7	9	17'-2	4'-9	12'-5	5	9	27'-2	6	9	8'-6	6	4.5	27'-2	0.861	1.042	1.289	3.192	537.50
8-10	6	12	27'-2	5	12	8'-6	5	6	17'-2	4'-7	12'-7	5	9	27'-2	6	9	8'-4	6	4.5	27'-2	0.986	1.212	1.289	3.487	514.84
11-13	6	12	27'-2	5	12	9'-5	7	9	17'-2	4'-6	12'-8	4	9	27'-2	7	9	8'-6	7	4.5	27'-2	1.111	1.339	1.289	3.739	536.13
14-16	6	12	27'-3	5	12	9'-11	5	6	17'-5	4'-7	12'-10	4	9	27'-3	7	9	8'-10	7	4.5	27'-3	1.285	1.517	1.342	4.144	534.68
17-19	6	12	27'-6	5	12	11'-1	7	9	17'-7	4'-7	13'-0	4	9	27'-6	7	9	9'-2	7	4.5	27'-6	1.427	1.662	1.449	4.538	570.24
20-22	7	18	27'-8	7	18	11'-9	6	6	17'-11	4'-9	13'-2	5	12	27'-8	8	12	9'-6	8	4.5	27'-8	1.605	1.844	1.503	4.952	607.47
23-25	5	9	27'-11	5	9	12'-4	7	9	18'-2	4'-10	13'-4	4	9	27'-11	7	9	9'-10	7	4.5	27'-11	1.752	2.037	1.610	5.399	627.61



### BENT BAR DETAIL

BARS	D
5	3 3/4
6	4 1/2
7	5 1/4

**k4 & m4**

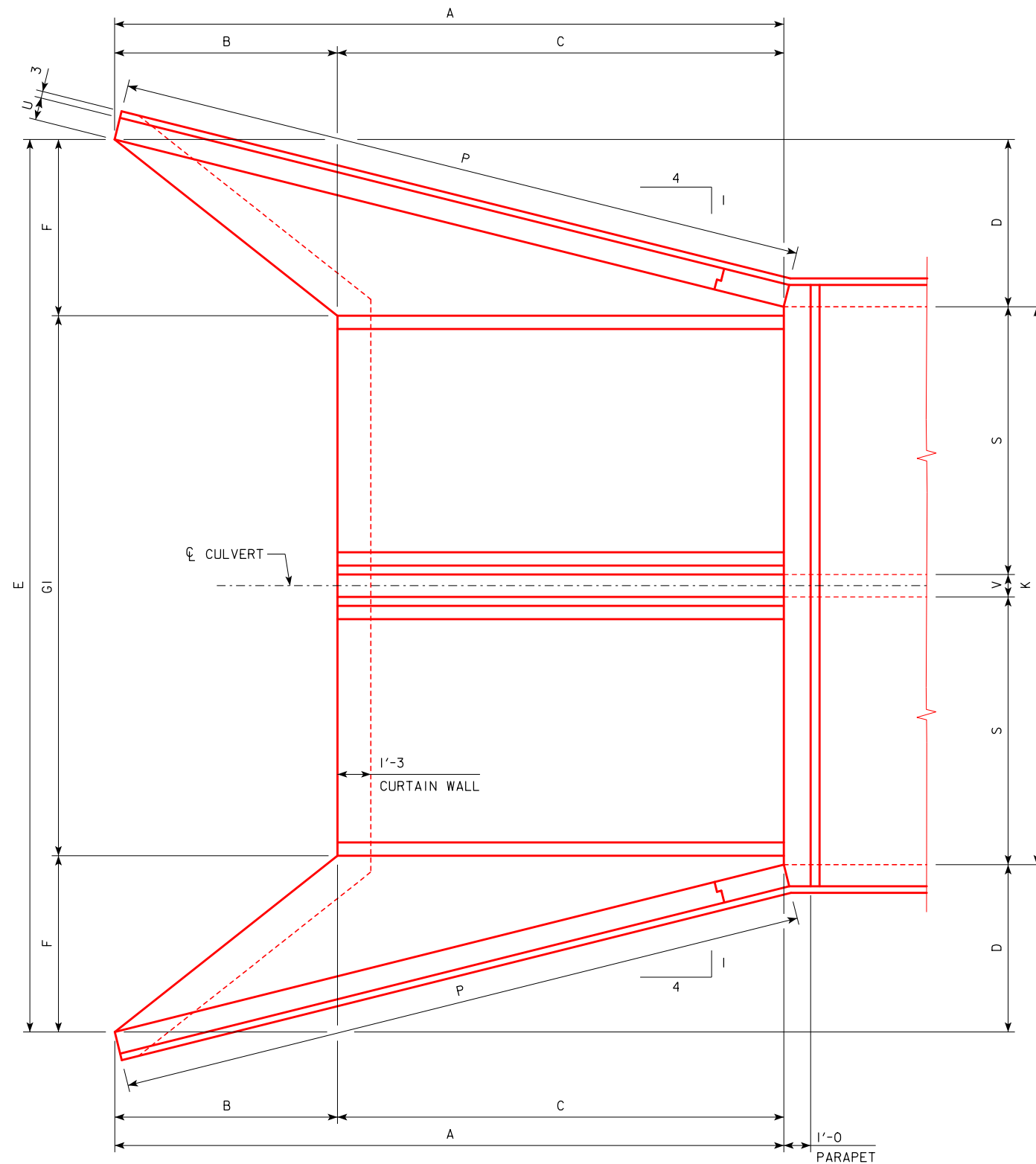
NOTE:  
ALL DIMENSIONS ARE OUT TO OUT.  
D = PIN DIAMETER.

- NOTES:**
- DIMENSIONS LISTED ON THIS SHEET TO BE USED IN CONJUNCTION WITH SHEET TWRCB G2-12.
  - DIMENSIONS "A", "B", "C", "D", "E", AND "SP." LISTED IN THE BAR LIST ARE IN INCHES.

LATEST REVISION DATE	 APPROVED BY BRIDGE ENGINEER	 STANDARD DESIGN <b>TWIN REINFORCED CONCRETE BOX CULVERTS</b> APRIL, 2012
<b>CULVERT BARREL DETAILS</b> 12 x 12 BARREL SECTIONS		<b>TWRCB 12-12-12</b>

ENGLISHLRFDSTWNCULVERTS.DGN - TWRCB 12-12-12 - THIS SHEET ISSUED 04-12.

REVISED 12-2016: REMOVED NOTE STATING LOCATION FOR HEADWALL NOTES. ENGLISHLRFDSIGNEDTWINCULVERTS.DGN - TWH 0-1-12 - THIS SHEET ISSUED 04-12.



PLAN VIEW

DIMENSION TABLE

S X H	12' X 12'	12' X 11'	12' X 10'	12' X 9'	12' X 8'	12' X 7'	12' X 6'	12' X 5'	12' X 4'	10' X 12'	10' X 11'	10' X 10'	10' X 9'	S X H
A	37'-0	34'-0	31'-0	28'-0	25'-0	22'-0	19'-0	16'-0	13'-0	37'-0	34'-0	31'-0	28'-0	A
B	12'-4	11'-4	10'-4	9'-4	8'-4	7'-4	6'-4	5'-4	4'-4	12'-4	11'-4	10'-4	9'-4	B
C	24'-8	22'-8	20'-8	18'-8	16'-8	14'-8	12'-8	10'-8	8'-8	24'-8	22'-8	20'-8	18'-8	C
D	9'-3	8'-6	7'-9	7'-0	6'-3	5'-6	4'-9	4'-0	3'-3	9'-3	8'-6	7'-9	7'-0	D
E	43'-6	41'-11	40'-4	38'-10	37'-4	35'-9	34'-3	32'-9	31'-3	39'-6	37'-11	36'-4	34'-10	E
F	9'-7	8'-10	8'-1	7'-4	6'-7	5'-10	5'-1	4'-4	3'-7	9'-7	8'-10	8'-1	7'-4	F
G1	24'-4	24'-3	24'-2	24'-2	24'-2	24'-1	24'-1	24'-1	24'-1	20'-4	20'-3	20'-2	20'-2	G1
G2	25'-6 <sup>3</sup> / <sub>4</sub>	25'-5 <sup>5</sup> / <sub>8</sub>	25'-4 <sup>5</sup> / <sub>8</sub>	25'-4 <sup>5</sup> / <sub>8</sub>	25'-4 <sup>1</sup> / <sub>2</sub>	25'-3 <sup>1</sup> / <sub>2</sub>	25'-3 <sup>3</sup> / <sub>8</sub>	25'-3 <sup>1</sup> / <sub>4</sub>	25'-3 <sup>1</sup> / <sub>8</sub>	21'-6 <sup>3</sup> / <sub>4</sub>	21'-5 <sup>5</sup> / <sub>8</sub>	21'-4 <sup>5</sup> / <sub>8</sub>	21'-4 <sup>5</sup> / <sub>8</sub>	G2
G3	15'-7 <sup>3</sup> / <sub>8</sub>	14'-4 <sup>3</sup> / <sub>8</sub>	13'-1 <sup>3</sup> / <sub>8</sub>	11'-10 <sup>3</sup> / <sub>8</sub>	10'-7 <sup>3</sup> / <sub>8</sub>	9'-4 <sup>1</sup> / <sub>2</sub>	8'-1 <sup>1</sup> / <sub>2</sub>	6'-10 <sup>1</sup> / <sub>2</sub>	5'-7 <sup>1</sup> / <sub>2</sub>	15'-7 <sup>3</sup> / <sub>8</sub>	14'-4 <sup>3</sup> / <sub>8</sub>	13'-1 <sup>3</sup> / <sub>8</sub>	11'-10 <sup>3</sup> / <sub>8</sub>	G3
G4	16'-5 <sup>7</sup> / <sub>8</sub>	15'-0 <sup>1</sup> / <sub>2</sub>	13'-7	12'-4	11'-1	9'-7 <sup>5</sup> / <sub>8</sub>	8'-4 <sup>3</sup> / <sub>8</sub>	7'-1 <sup>7</sup> / <sub>8</sub>	5'-11	16'-5 <sup>7</sup> / <sub>8</sub>	15'-0 <sup>1</sup> / <sub>2</sub>	13'-7	12'-4	G4
G5	0'-3 <sup>1</sup> / <sub>8</sub>	0'-5 <sup>3</sup> / <sub>8</sub>	0'-7 <sup>3</sup> / <sub>4</sub>	0'-7 <sup>3</sup> / <sub>8</sub>	0'-7 <sup>5</sup> / <sub>8</sub>	0'-9 <sup>5</sup> / <sub>8</sub>	0'-9 <sup>3</sup> / <sub>4</sub>	0'-9 <sup>3</sup> / <sub>4</sub>	0'-9 <sup>5</sup> / <sub>8</sub>	0'-3 <sup>1</sup> / <sub>8</sub>	0'-5 <sup>3</sup> / <sub>8</sub>	0'-7 <sup>3</sup> / <sub>4</sub>	0'-7 <sup>5</sup> / <sub>8</sub>	G5
K	25'-0	24'-11	24'-10	24'-10	24'-10	24'-9	24'-9	24'-9	24'-9	21'-0	20'-11	20'-10	20'-10	K
P	38'-1 <sup>5</sup> / <sub>8</sub>	35'-0 <sup>1</sup> / <sub>2</sub>	31'-11 <sup>1</sup> / <sub>2</sub>	28'-10 <sup>3</sup> / <sub>8</sub>	25'-9 <sup>1</sup> / <sub>4</sub>	22'-8 <sup>1</sup> / <sub>8</sub>	19'-7	16'-5 <sup>1</sup> / <sub>8</sub>	13'-4 <sup>3</sup> / <sub>4</sub>	38'-1 <sup>5</sup> / <sub>8</sub>	35'-0 <sup>1</sup> / <sub>2</sub>	31'-11 <sup>1</sup> / <sub>2</sub>	28'-10 <sup>3</sup> / <sub>8</sub>	P
R1	40'-1	36'-10	33'-7	30'-4	27'-1	23'-10	20'-7	17'-4	14'-1	40'-1	36'-10	33'-7	30'-4	R1
R2	27'-0 <sup>1</sup> / <sub>8</sub>	24'-9 <sup>1</sup> / <sub>4</sub>	22'-6 <sup>1</sup> / <sub>2</sub>	20'-3 <sup>3</sup> / <sub>4</sub>	18'-0 <sup>7</sup> / <sub>8</sub>	15'-10 <sup>1</sup> / <sub>8</sub>	13'-7 <sup>3</sup> / <sub>8</sub>	11'-4 <sup>3</sup> / <sub>4</sub>	9'-2	27'-0 <sup>1</sup> / <sub>8</sub>	24'-9 <sup>1</sup> / <sub>4</sub>	22'-6 <sup>1</sup> / <sub>2</sub>	20'-3 <sup>3</sup> / <sub>4</sub>	R2
T	1'-2	1'-2	1'-2	1'-2	1'-2	1'-2	1'-2	1'-2	1'-2	1'-1	1'-1	1'-1	1'-1	T
U	1'-0	0'-11	0'-10	0'-10	0'-10	0'-9	0'-9	0'-9	0'-9	1'-0	0'-11	0'-10	0'-10	U
V	1'-0	0'-11	0'-10	0'-10	0'-10	0'-9	0'-9	0'-9	0'-9	1'-0	0'-11	0'-10	0'-10	V
W	5'-0	4'-9	4'-6	4'-3	4'-0	3'-9	3'-6	3'-6	3'-6	5'-0	4'-9	4'-6	4'-3	W

S X H	10' X 8'	10' X 7'	10' X 6'	10' X 5'	10' X 4'	8' X 10'	8' X 9'	8' X 8'	8' X 7'	8' X 6'	8' X 5'	8' X 4'	S X H
A	25'-0	22'-0	19'-0	16'-0	13'-0	31'-0	28'-0	25'-0	22'-0	19'-0	16'-0	13'-0	A
B	8'-4	7'-4	6'-4	5'-4	4'-4	10'-4	9'-4	8'-4	7'-4	6'-4	5'-4	4'-4	B
C	16'-8	14'-8	12'-8	10'-8	8'-8	20'-8	18'-8	16'-8	14'-8	12'-8	10'-8	8'-8	C
D	6'-3	5'-6	4'-9	4'-0	3'-3	7'-9	7'-0	6'-3	5'-6	4'-9	4'-0	3'-3	D
E	33'-4	31'-9	30'-3	28'-9	27'-3	32'-4	30'-10	29'-4	27'-9	26'-3	24'-9	23'-3	E
F	6'-7	5'-10	5'-1	4'-4	3'-7	8'-1	7'-4	6'-7	5'-10	5'-1	4'-4	3'-7	F
G1	20'-2	20'-1	20'-1	20'-1	20'-1	16'-2	16'-2	16'-2	16'-1	16'-1	16'-1	16'-1	G1
G2	21'-4 <sup>1</sup> / <sub>2</sub>	21'-3 <sup>1</sup> / <sub>2</sub>	21'-3 <sup>3</sup> / <sub>8</sub>	21'-3 <sup>1</sup> / <sub>4</sub>	21'-3 <sup>1</sup> / <sub>8</sub>	17'-4 <sup>5</sup> / <sub>8</sub>	17'-4 <sup>5</sup> / <sub>8</sub>	17'-4 <sup>1</sup> / <sub>2</sub>	17'-3 <sup>1</sup> / <sub>2</sub>	17'-3 <sup>3</sup> / <sub>8</sub>	17'-3 <sup>1</sup> / <sub>4</sub>	17'-3 <sup>1</sup> / <sub>8</sub>	G2
G3	10'-7 <sup>3</sup> / <sub>8</sub>	9'-4 <sup>1</sup> / <sub>2</sub>	8'-1 <sup>1</sup> / <sub>2</sub>	6'-10 <sup>1</sup> / <sub>2</sub>	5'-7 <sup>1</sup> / <sub>2</sub>	13'-1 <sup>3</sup> / <sub>8</sub>	11'-10 <sup>3</sup> / <sub>8</sub>	10'-7 <sup>3</sup> / <sub>8</sub>	9'-4 <sup>1</sup> / <sub>2</sub>	8'-1 <sup>1</sup> / <sub>2</sub>	6'-10 <sup>1</sup> / <sub>2</sub>	5'-7 <sup>1</sup> / <sub>2</sub>	G3
G4	11'-1	9'-7 <sup>5</sup> / <sub>8</sub>	8'-4 <sup>3</sup> / <sub>4</sub>	7'-1 <sup>7</sup> / <sub>8</sub>	5'-11	13'-7	12'-4	11'-1	9'-7 <sup>5</sup> / <sub>8</sub>	8'-4 <sup>3</sup> / <sub>4</sub>	7'-1 <sup>7</sup> / <sub>8</sub>	5'-11	G4
G5	0'-7 <sup>5</sup> / <sub>8</sub>	0'-9 <sup>7</sup> / <sub>8</sub>	0'-9 <sup>3</sup> / <sub>4</sub>	0'-9 <sup>3</sup> / <sub>4</sub>	0'-9 <sup>5</sup> / <sub>8</sub>	0'-7 <sup>3</sup> / <sub>4</sub>	0'-7 <sup>5</sup> / <sub>8</sub>	0'-7 <sup>5</sup> / <sub>8</sub>	0'-9 <sup>7</sup> / <sub>8</sub>	0'-9 <sup>3</sup> / <sub>4</sub>	0'-9 <sup>3</sup> / <sub>4</sub>	0'-9 <sup>5</sup> / <sub>8</sub>	G5
K	20'-10	20'-9	20'-9	20'-9	20'-9	16'-10	16'-10	16'-10	16'-9	16'-9	16'-9	16'-9	K
P	25'-9 <sup>1</sup> / <sub>4</sub>	22'-8 <sup>1</sup> / <sub>8</sub>	19'-7	16'-5 <sup>7</sup> / <sub>8</sub>	13'-4 <sup>3</sup> / <sub>4</sub>	31'-11 <sup>1</sup> / <sub>2</sub>	28'-10 <sup>3</sup> / <sub>8</sub>	25'-9 <sup>1</sup> / <sub>4</sub>	22'-8 <sup>1</sup> / <sub>8</sub>	19'-7	16'-5 <sup>7</sup> / <sub>8</sub>	13'-4 <sup>3</sup> / <sub>4</sub>	P
R1	27'-1	23'-10	20'-7	17'-4	14'-1	33'-7	30'-4	27'-1	23'-10	20'-7	17'-4	14'-1	R1
R2	18'-0 <sup>7</sup> / <sub>8</sub>	15'-10 <sup>1</sup> / <sub>8</sub>	13'-7 <sup>3</sup> / <sub>8</sub>	11'-4 <sup>3</sup> / <sub>4</sub>	9'-2	22'-6 <sup>1</sup> / <sub>2</sub>	20'-3 <sup>3</sup> / <sub>4</sub>	18'-0 <sup>7</sup> / <sub>8</sub>	15'-10 <sup>1</sup> / <sub>8</sub>	13'-7 <sup>3</sup> / <sub>8</sub>	11'-4 <sup>3</sup> / <sub>4</sub>	9'-2	R2
T	1'-1	1'-1	1'-1	1'-1	1'-1	1'-0	1'-0	1'-0	1'-0	1'-0	1'-0	1'-0	T
U	0'-10	0'-9	0'-9	0'-9	0'-9	0'-10	0'-10	0'-10	0'-9	0'-9	0'-9	0'-9	U
V	0'-10	0'-9	0'-9	0'-9	0'-9	0'-10	0'-10	0'-10	0'-9	0'-9	0'-9	0'-9	V
W	4'-0	3'-9	3'-6	3'-6	3'-6	4'-6	4'-3	4'-0	3'-9	3'-6	3'-6	3'-6	W

NOTES:

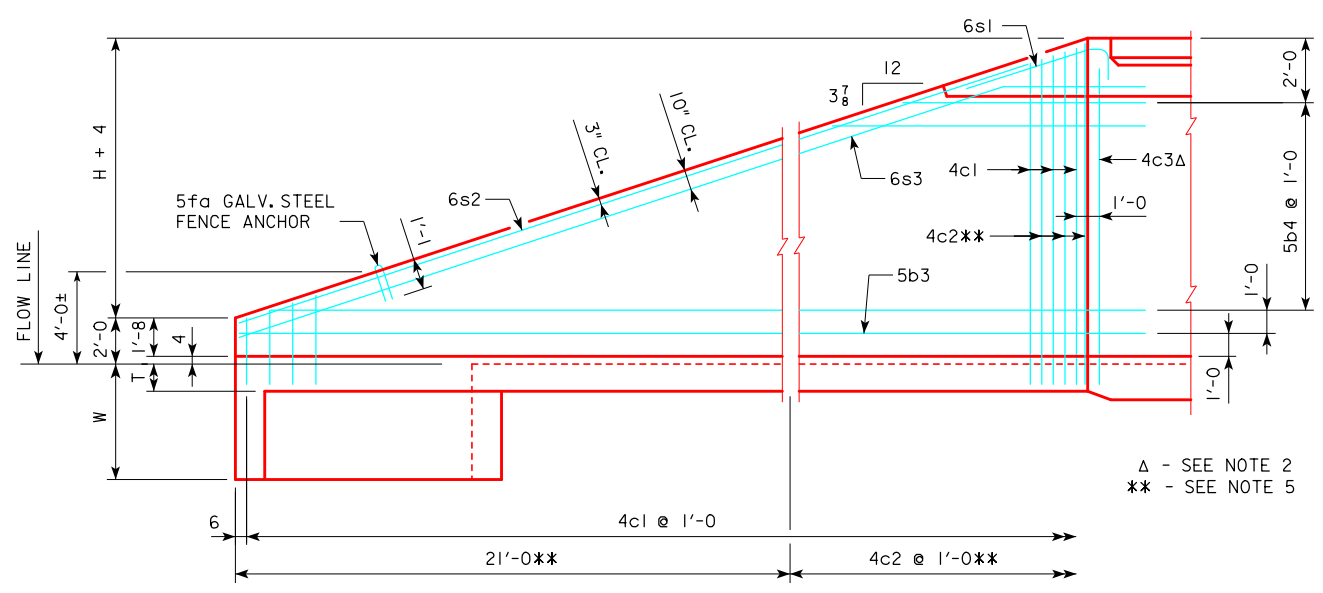
- SEE SHEET TWRCB G1-12 FOR GENERAL INFORMATION, SPECIFICATIONS, AND DESIGN STRESSES.
- SEE SHEETS TWH 0-2-12 & TWH 0-3-12 FOR LOCATION OF CERTAIN DIMENSIONS TABULATED

12-2016 LATEST REVISION DATE  <i>Thomas L. Mc Donald</i> APPROVED BY BRIDGE ENGINEER		
	STANDARD DESIGN <b>TWIN REINFORCED CONCRETE          BOX CULVERTS</b> APRIL, 2012	
	<b>FLARED WING          HEADWALLS</b> 0° SKEW	<b>TWH 0-1-12</b>

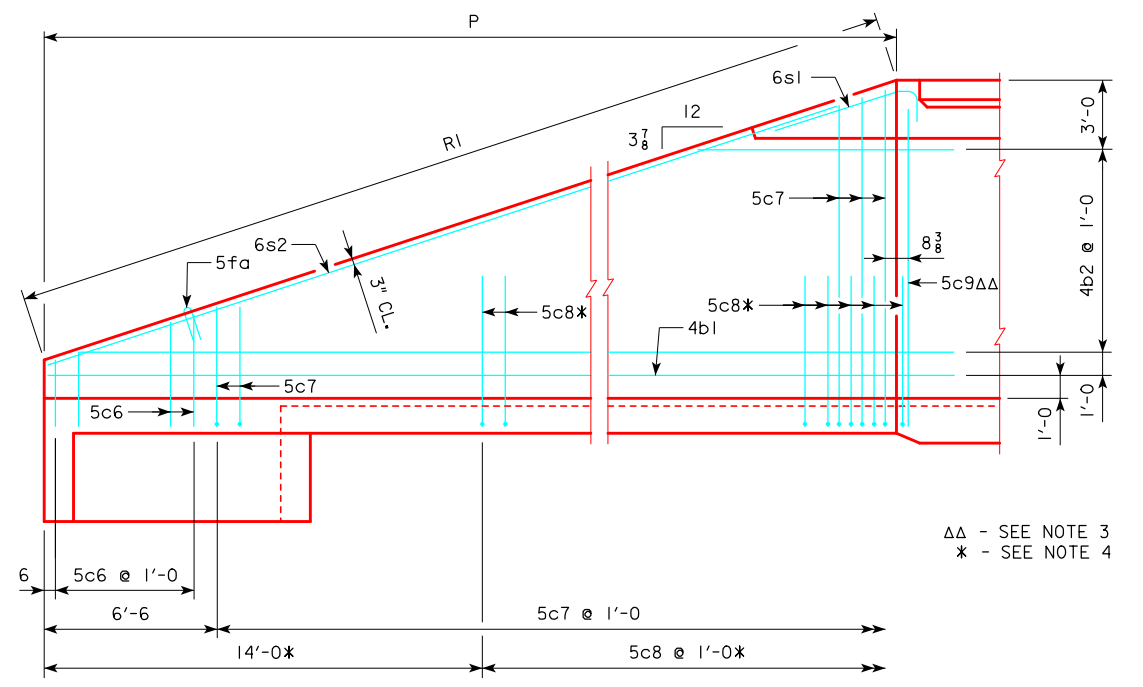




REVISED 05-13 - CHANGED 19'-0" DIMENSION TO 21'-0" IN TYPICAL VIEW - FRONT FACE REINFORCING DETAIL.  
 REVISED 07-2016 - REMOVED 1'-8" VERTICAL DIMENSION FROM 6s3 BAR TO TOP OF PARAPET. THIS ALLOWS FOR THE VARIABLE VERTICAL LOCATION OF THE HORIZONTAL LEG IN THE SLAB.  
 THIS VARIANCE IN LOCATION IS CAUSED BY THE DIFFERING WING SIZES OF DIFFERENT SIZED R.C.B. CULVERTS.  
 ENGLISH LRFD SIGNED TWIN CULVERTS.DGN - TWH 0-3-12 - THIS SHEET ISSUED 04-12.

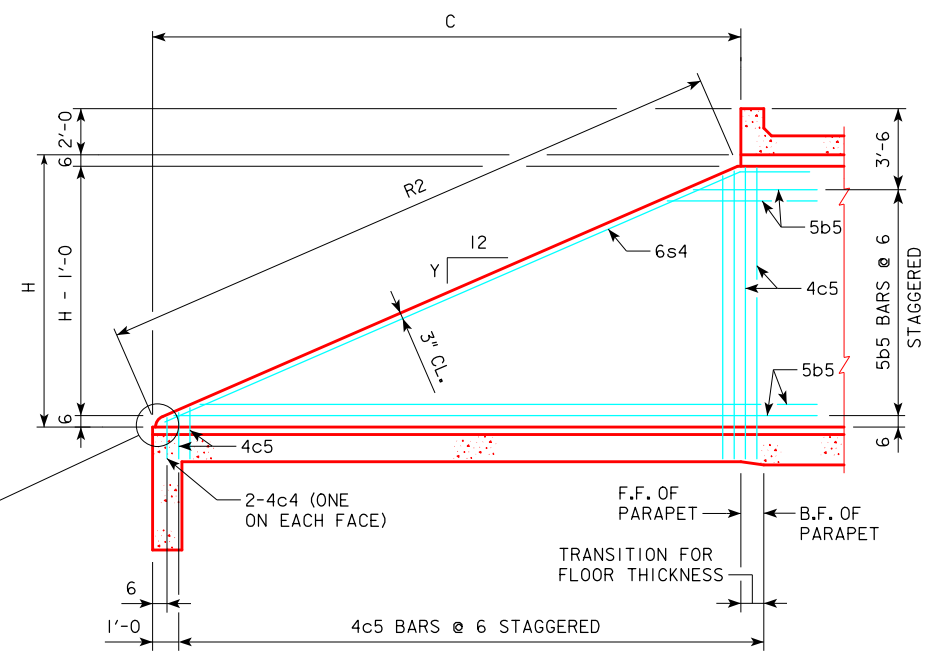


TYPICAL VIEW - FRONT FACE REINFORCING

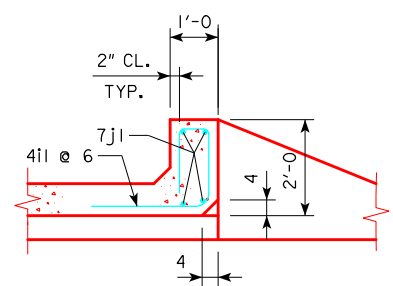


TYPICAL VIEW - BACK FACE REINFORCING

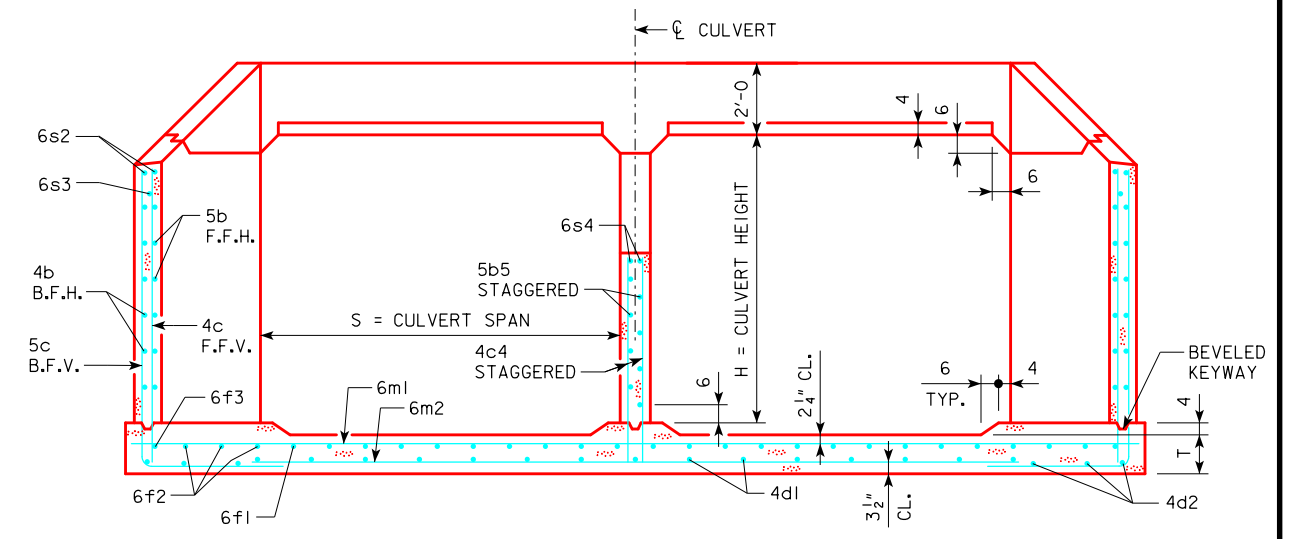
CULVERT HEIGHT (H)	SLOPE Y INCHES
4'	4 1/8
5'	4 1/2
6'	4 3/4
7'	4 5/8
8'	5 1/8
9'	5 1/4
10'	5 1/2
11'	5 5/8
12'	5 3/4



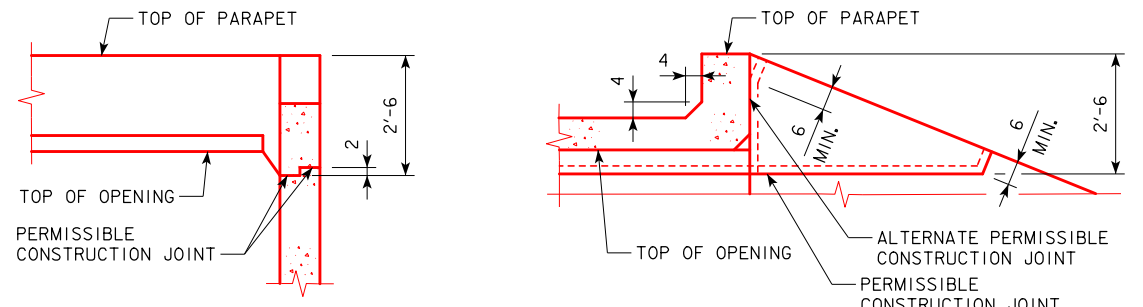
TYPICAL VIEW - INTERIOR WALL



SECTION THRU PARAPET



TYPICAL SECTION - NEAR CENTER OF APRON



TOP OF WINGWALL DETAILS

- NOTES:**
1. BAR SPACING AND POSITIONS SHOWN ARE SIMILAR FOR ALL SIZES OF HEADWALL IN THIS STANDARD.
  2. TWO 4c3 BARS FOR 4', 5', 11' & 12' HEIGHT HEADWALLS. ONE 4c3 BAR FOR 6' THRU 10' HEIGHT HEADWALLS.
  3. TWO 5c9 BARS FOR 4', 5', 11' & 12' HEIGHT HEADWALLS. ONE 5c9 BAR FOR 6' THRU 10' HEIGHT HEADWALLS.
  4. NOT APPLICABLE FOR 4' & 5' HEIGHT HEADWALLS.
  5. NOT APPLICABLE FOR 4' THRU 8' HEIGHT HEADWALLS.
  6. FOR DIMENSION TABLE SEE SHEET TWH 0-1-12.

07-2016 LATEST REVISION DATE	 APPROVED BY BRIDGE ENGINEER	 STANDARD DESIGN <b>TWIN REINFORCED CONCRETE BOX CULVERTS</b> APRIL, 2012	
		<b>FLARED WING HEADWALLS</b> 0° SKEW	<b>TWH 0-3-12</b>

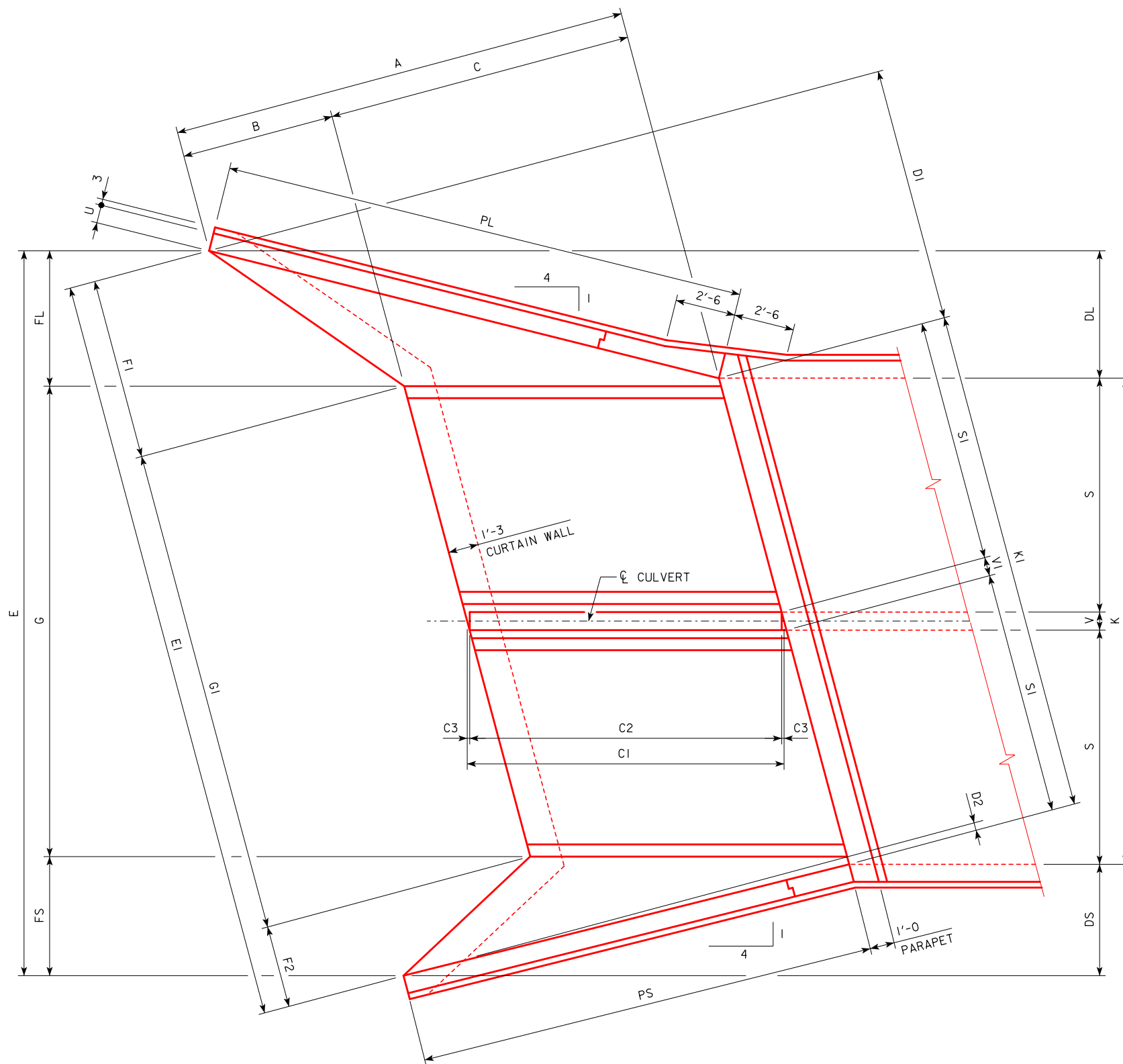








REVISED 12-2016: REMOVED NOTE STATING LOCATION FOR HEADWALL NOTES.  
 ENGLISHLRFDDESIGNEDTWINCULVERTS.DGN - TWH 15-1-12 - THIS SHEET ISSUED 04-12.



PLAN VIEW

**NOTES:**

1. SEE SHEET TWRCB G1-12 FOR GENERAL INFORMATION, SPECIFICATIONS, AND DESIGN STRESSES.
2. SEE SHEET TWH 15-2-12 FOR DIMENSION TABLE.

12-2016 LATEST REVISION DATE  <i>Thomas L. Mc Donald</i> APPROVED BY BRIDGE ENGINEER		
	STANDARD DESIGN <b>TWIN REINFORCED CONCRETE          BOX CULVERTS</b> APRIL, 2012	
	<b>FLARED WING          HEADWALLS</b> 15° SKEW	<b>TWH 15-1-12</b>

DIMENSION TABLE

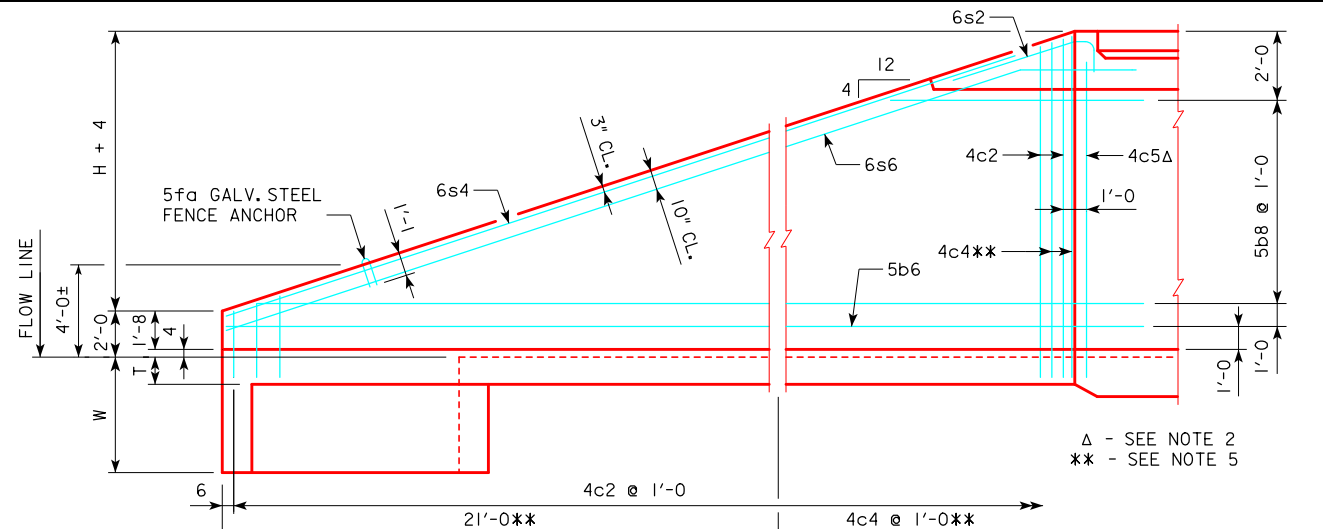
S X H	12' X 12'	12' X 11'	12' X 10'	12' X 9'	12' X 8'	12' X 7'	12' X 6'	12' X 5'	12' X 4'	10' X 12'	10' X 11'	10' X 10'	10' X 9'	10' X 8'	10' X 7'	10' X 6'	10' X 5'	10' X 4'	8' X 10'	8' X 9'	8' X 8'	8' X 7'	8' X 6'	8' X 5'	8' X 4'	S X H
A	37'-0	34'-0	31'-0	28'-0	25'-0	22'-0	19'-0	16'-0	13'-0	37'-0	34'-0	31'-0	28'-0	25'-0	22'-0	19'-0	16'-0	13'-0	31'-0	28'-0	25'-0	22'-0	19'-0	16'-0	13'-0	A
B	12'-4	11'-4	10'-4	9'-4	8'-4	7'-4	6'-4	5'-4	4'-4	12'-4	11'-4	10'-4	9'-4	8'-4	7'-4	6'-4	5'-4	4'-4	10'-4	9'-4	8'-4	7'-4	6'-4	5'-4	4'-4	B
C	24'-8	22'-8	20'-8	18'-8	16'-8	14'-8	12'-8	10'-8	8'-8	24'-8	22'-8	20'-8	18'-8	16'-8	14'-8	12'-8	10'-8	8'-8	20'-8	18'-8	16'-8	14'-8	12'-8	10'-8	8'-8	C
C1	25'-6 <sup>1</sup> / <sub>2</sub>	23'-5 <sup>5</sup> / <sub>8</sub>	21'-4 <sup>3</sup> / <sub>4</sub>	19'-3 <sup>7</sup> / <sub>8</sub>	17'-3	15'-2 <sup>1</sup> / <sub>4</sub>	13'-1 <sup>3</sup> / <sub>8</sub>	11'-0 <sup>1</sup> / <sub>2</sub>	8'-11 <sup>5</sup> / <sub>8</sub>	25'-6 <sup>1</sup> / <sub>2</sub>	23'-5 <sup>5</sup> / <sub>8</sub>	21'-4 <sup>3</sup> / <sub>4</sub>	19'-3 <sup>7</sup> / <sub>8</sub>	17'-3	15'-2 <sup>1</sup> / <sub>4</sub>	13'-1 <sup>3</sup> / <sub>8</sub>	11'-0 <sup>1</sup> / <sub>2</sub>	8'-11 <sup>5</sup> / <sub>8</sub>	21'-4 <sup>3</sup> / <sub>4</sub>	19'-3 <sup>7</sup> / <sub>8</sub>	17'-3	15'-2 <sup>1</sup> / <sub>4</sub>	13'-1 <sup>3</sup> / <sub>8</sub>	11'-0 <sup>1</sup> / <sub>2</sub>	8'-11 <sup>5</sup> / <sub>8</sub>	C1
C2	25'-3 <sup>1</sup> / <sub>4</sub>	23'-2 <sup>5</sup> / <sub>8</sub>	21'-2 <sup>1</sup> / <sub>8</sub>	19'-1 <sup>1</sup> / <sub>4</sub>	17'-0 <sup>3</sup> / <sub>8</sub>	14'-11 <sup>3</sup> / <sub>4</sub>	12'-11	10'-10 <sup>1</sup> / <sub>8</sub>	8'-9 <sup>1</sup> / <sub>4</sub>	25'-3 <sup>1</sup> / <sub>4</sub>	23'-2 <sup>5</sup> / <sub>8</sub>	21'-2 <sup>1</sup> / <sub>8</sub>	19'-1 <sup>1</sup> / <sub>4</sub>	17'-0 <sup>3</sup> / <sub>8</sub>	14'-11 <sup>3</sup> / <sub>4</sub>	12'-11	10'-10 <sup>1</sup> / <sub>8</sub>	8'-9 <sup>1</sup> / <sub>4</sub>	21'-2 <sup>1</sup> / <sub>8</sub>	19'-1 <sup>1</sup> / <sub>4</sub>	17'-0 <sup>3</sup> / <sub>8</sub>	14'-11 <sup>3</sup> / <sub>4</sub>	12'-11	10'-10 <sup>1</sup> / <sub>8</sub>	8'-9 <sup>1</sup> / <sub>4</sub>	C2
C3	0'-1 <sup>5</sup> / <sub>8</sub>	0'-1 <sup>1</sup> / <sub>2</sub>	0'-1 <sup>3</sup> / <sub>8</sub>	0'-1 <sup>3</sup> / <sub>8</sub>	0'-1 <sup>3</sup> / <sub>8</sub>	0'-1 <sup>3</sup> / <sub>8</sub>	0'-1 <sup>3</sup> / <sub>8</sub>	0'-1 <sup>3</sup> / <sub>8</sub>	0'-1 <sup>3</sup> / <sub>8</sub>	0'-1 <sup>5</sup> / <sub>8</sub>	0'-1 <sup>1</sup> / <sub>2</sub>	0'-1 <sup>3</sup> / <sub>8</sub>	0'-1 <sup>3</sup> / <sub>8</sub>	0'-1 <sup>3</sup> / <sub>8</sub>	0'-1 <sup>3</sup> / <sub>8</sub>	0'-1 <sup>3</sup> / <sub>8</sub>	0'-1 <sup>3</sup> / <sub>8</sub>	0'-1 <sup>3</sup> / <sub>8</sub>	0'-1 <sup>3</sup> / <sub>8</sub>	0'-1 <sup>3</sup> / <sub>8</sub>	0'-1 <sup>3</sup> / <sub>8</sub>	0'-1 <sup>3</sup> / <sub>8</sub>	0'-1 <sup>3</sup> / <sub>8</sub>	0'-1 <sup>3</sup> / <sub>8</sub>	0'-1 <sup>3</sup> / <sub>8</sub>	C3
DL	10'-3 <sup>1</sup> / <sub>8</sub>	9'-5 <sup>1</sup> / <sub>8</sub>	8'-7 <sup>1</sup> / <sub>4</sub>	7'-9 <sup>1</sup> / <sub>4</sub>	6'-11 <sup>1</sup> / <sub>4</sub>	6'-11 <sup>1</sup> / <sub>4</sub>	5'-3 <sup>1</sup> / <sub>4</sub>	4'-5 <sup>1</sup> / <sub>4</sub>	3'-7 <sup>1</sup> / <sub>4</sub>	10'-3 <sup>1</sup> / <sub>8</sub>	9'-5 <sup>1</sup> / <sub>8</sub>	8'-7 <sup>1</sup> / <sub>4</sub>	7'-9 <sup>1</sup> / <sub>4</sub>	6'-11 <sup>1</sup> / <sub>4</sub>	6'-11 <sup>1</sup> / <sub>4</sub>	5'-3 <sup>1</sup> / <sub>4</sub>	4'-5 <sup>1</sup> / <sub>4</sub>	3'-7 <sup>1</sup> / <sub>4</sub>	8'-7 <sup>1</sup> / <sub>4</sub>	7'-9 <sup>1</sup> / <sub>4</sub>	6'-11 <sup>1</sup> / <sub>4</sub>	6'-11 <sup>1</sup> / <sub>4</sub>	5'-3 <sup>1</sup> / <sub>4</sub>	4'-5 <sup>1</sup> / <sub>4</sub>	3'-7 <sup>1</sup> / <sub>4</sub>	DL
DS	8'-11 <sup>3</sup> / <sub>4</sub>	8'-3	7'-6 <sup>1</sup> / <sub>4</sub>	6'-9 <sup>1</sup> / <sub>2</sub>	6'-0 <sup>3</sup> / <sub>4</sub>	5'-4	4'-7 <sup>1</sup> / <sub>4</sub>	3'-10 <sup>5</sup> / <sub>8</sub>	3'-1 <sup>7</sup> / <sub>8</sub>	8'-11 <sup>3</sup> / <sub>4</sub>	8'-3	7'-6 <sup>1</sup> / <sub>4</sub>	6'-9 <sup>1</sup> / <sub>2</sub>	6'-0 <sup>3</sup> / <sub>4</sub>	5'-4	4'-7 <sup>1</sup> / <sub>4</sub>	3'-10 <sup>5</sup> / <sub>8</sub>	3'-1 <sup>7</sup> / <sub>8</sub>	7'-6 <sup>1</sup> / <sub>4</sub>	6'-9 <sup>1</sup> / <sub>2</sub>	6'-0 <sup>3</sup> / <sub>4</sub>	5'-4	4'-7 <sup>1</sup> / <sub>4</sub>	3'-10 <sup>5</sup> / <sub>8</sub>	3'-1 <sup>7</sup> / <sub>8</sub>	DS
DI	20'-6 <sup>1</sup> / <sub>2</sub>	18'-10 <sup>1</sup> / <sub>2</sub>	17'-2 <sup>1</sup> / <sub>2</sub>	15'-6 <sup>1</sup> / <sub>2</sub>	13'-10 <sup>1</sup> / <sub>2</sub>	12'-2 <sup>1</sup> / <sub>2</sub>	10'-6 <sup>5</sup> / <sub>8</sub>	8'-10 <sup>5</sup> / <sub>8</sub>	7'-2 <sup>5</sup> / <sub>8</sub>	20'-6 <sup>1</sup> / <sub>2</sub>	18'-10 <sup>1</sup> / <sub>2</sub>	17'-2 <sup>1</sup> / <sub>2</sub>	15'-6 <sup>1</sup> / <sub>2</sub>	13'-10 <sup>1</sup> / <sub>2</sub>	12'-2 <sup>1</sup> / <sub>2</sub>	10'-6 <sup>5</sup> / <sub>8</sub>	8'-10 <sup>5</sup> / <sub>8</sub>	7'-2 <sup>5</sup> / <sub>8</sub>	17'-2 <sup>1</sup> / <sub>2</sub>	15'-6 <sup>1</sup> / <sub>2</sub>	13'-10 <sup>1</sup> / <sub>2</sub>	12'-2 <sup>1</sup> / <sub>2</sub>	10'-6 <sup>5</sup> / <sub>8</sub>	8'-10 <sup>5</sup> / <sub>8</sub>	7'-2 <sup>5</sup> / <sub>8</sub>	DI
D2	0'-7 <sup>1</sup> / <sub>2</sub>	0'-6 <sup>7</sup> / <sub>8</sub>	0'-6 <sup>1</sup> / <sub>4</sub>	0'-5 <sup>5</sup> / <sub>8</sub>	0'-5	0'-4 <sup>1</sup> / <sub>2</sub>	0'-3 <sup>7</sup> / <sub>8</sub>	0'-3 <sup>1</sup> / <sub>4</sub>	0'-2 <sup>5</sup> / <sub>8</sub>	0'-7 <sup>1</sup> / <sub>2</sub>	0'-6 <sup>7</sup> / <sub>8</sub>	0'-6 <sup>1</sup> / <sub>4</sub>	0'-5 <sup>5</sup> / <sub>8</sub>	0'-5	0'-4 <sup>1</sup> / <sub>2</sub>	0'-3 <sup>7</sup> / <sub>8</sub>	0'-3 <sup>1</sup> / <sub>4</sub>	0'-2 <sup>5</sup> / <sub>8</sub>	0'-6 <sup>1</sup> / <sub>4</sub>	0'-5 <sup>5</sup> / <sub>8</sub>	0'-5	0'-4 <sup>1</sup> / <sub>2</sub>	0'-3 <sup>7</sup> / <sub>8</sub>	0'-3 <sup>1</sup> / <sub>4</sub>	0'-2 <sup>5</sup> / <sub>8</sub>	D2
E	44'-2 <sup>7</sup> / <sub>8</sub>	42'-7 <sup>1</sup> / <sub>8</sub>	40'-11 <sup>3</sup> / <sub>8</sub>	39'-4 <sup>3</sup> / <sub>4</sub>	37'-10	36'-2 <sup>1</sup> / <sub>4</sub>	34'-7 <sup>1</sup> / <sub>2</sub>	33'-0 <sup>7</sup> / <sub>8</sub>	31'-6 <sup>1</sup> / <sub>8</sub>	40'-2 <sup>7</sup> / <sub>8</sub>	38'-7 <sup>1</sup> / <sub>8</sub>	36'-11 <sup>3</sup> / <sub>8</sub>	35'-4 <sup>3</sup> / <sub>4</sub>	33'-10	32'-2 <sup>1</sup> / <sub>4</sub>	30'-7 <sup>1</sup> / <sub>2</sub>	29'-0 <sup>7</sup> / <sub>8</sub>	27'-6 <sup>1</sup> / <sub>8</sub>	32'-11 <sup>3</sup> / <sub>8</sub>	31'-4 <sup>3</sup> / <sub>4</sub>	29'-10	28'-2 <sup>1</sup> / <sub>4</sub>	26'-7 <sup>1</sup> / <sub>2</sub>	25'-0 <sup>7</sup> / <sub>8</sub>	23'-6 <sup>1</sup> / <sub>8</sub>	E
E1	45'-9 <sup>5</sup> / <sub>8</sub>	44'-1 <sup>1</sup> / <sub>8</sub>	42'-4 <sup>3</sup> / <sub>4</sub>	40'-9 <sup>3</sup> / <sub>8</sub>	39'-2	37'-5 <sup>3</sup> / <sub>8</sub>	35'-10 <sup>1</sup> / <sub>4</sub>	34'-2 <sup>7</sup> / <sub>8</sub>	32'-7 <sup>1</sup> / <sub>2</sub>	41'-7 <sup>7</sup> / <sub>8</sub>	39'-11 <sup>1</sup> / <sub>2</sub>	38'-3 <sup>1</sup> / <sub>8</sub>	36'-7 <sup>3</sup> / <sub>4</sub>	35'-0 <sup>3</sup> / <sub>8</sub>	33'-3 <sup>7</sup> / <sub>8</sub>	31'-8 <sup>1</sup> / <sub>2</sub>	30'-1 <sup>1</sup> / <sub>8</sub>	28'-5 <sup>3</sup> / <sub>4</sub>	34'-1 <sup>3</sup> / <sub>8</sub>	32'-6	30'-10 <sup>5</sup> / <sub>8</sub>	29'-2 <sup>1</sup> / <sub>4</sub>	27'-6 <sup>7</sup> / <sub>8</sub>	25'-11 <sup>1</sup> / <sub>2</sub>	24'-4 <sup>1</sup> / <sub>8</sub>	E1
FL	10'-7 <sup>1</sup> / <sub>8</sub>	9'-9 <sup>1</sup> / <sub>8</sub>	8'-11 <sup>1</sup> / <sub>4</sub>	8'-1 <sup>1</sup> / <sub>4</sub>	7'-3 <sup>1</sup> / <sub>4</sub>	6'-5 <sup>1</sup> / <sub>4</sub>	5'-7 <sup>1</sup> / <sub>4</sub>	4'-9 <sup>1</sup> / <sub>4</sub>	3'-11 <sup>1</sup> / <sub>4</sub>	10'-7 <sup>1</sup> / <sub>8</sub>	9'-9 <sup>1</sup> / <sub>8</sub>	8'-11 <sup>1</sup> / <sub>4</sub>	8'-1 <sup>1</sup> / <sub>4</sub>	7'-3 <sup>1</sup> / <sub>4</sub>	6'-5 <sup>1</sup> / <sub>4</sub>	5'-7 <sup>1</sup> / <sub>4</sub>	4'-9 <sup>1</sup> / <sub>4</sub>	3'-11 <sup>1</sup> / <sub>4</sub>	8'-11 <sup>1</sup> / <sub>4</sub>	8'-1 <sup>1</sup> / <sub>4</sub>	7'-3 <sup>1</sup> / <sub>4</sub>	6'-5 <sup>1</sup> / <sub>4</sub>	5'-7 <sup>1</sup> / <sub>4</sub>	4'-9 <sup>1</sup> / <sub>4</sub>	3'-11 <sup>1</sup> / <sub>4</sub>	FL
FS	9'-3 <sup>3</sup> / <sub>4</sub>	8'-7	7'-10 <sup>1</sup> / <sub>4</sub>	7'-1 <sup>1</sup> / <sub>2</sub>	6'-4 <sup>3</sup> / <sub>4</sub>	5'-8	4'-11 <sup>1</sup> / <sub>4</sub>	4'-2 <sup>5</sup> / <sub>8</sub>	3'-5 <sup>5</sup> / <sub>8</sub>	9'-3 <sup>3</sup> / <sub>4</sub>	8'-7	7'-10 <sup>1</sup> / <sub>4</sub>	7'-1 <sup>1</sup> / <sub>2</sub>	6'-4 <sup>3</sup> / <sub>4</sub>	5'-8	4'-11 <sup>1</sup> / <sub>4</sub>	4'-2 <sup>5</sup> / <sub>8</sub>	3'-5 <sup>5</sup> / <sub>8</sub>	7'-10 <sup>1</sup> / <sub>4</sub>	7'-1 <sup>1</sup> / <sub>2</sub>	6'-4 <sup>3</sup> / <sub>4</sub>	5'-8	4'-11 <sup>1</sup> / <sub>4</sub>	4'-2 <sup>5</sup> / <sub>8</sub>	3'-5 <sup>5</sup> / <sub>8</sub>	FS
F1	14'-3 <sup>1</sup> / <sub>4</sub>	13'-1 <sup>3</sup> / <sub>4</sub>	12'-0 <sup>1</sup> / <sub>4</sub>	10'-10 <sup>5</sup> / <sub>8</sub>	9'-9 <sup>1</sup> / <sub>8</sub>	8'-7 <sup>1</sup> / <sub>2</sub>	7'-6	6'-4 <sup>3</sup> / <sub>8</sub>	5'-2 <sup>7</sup> / <sub>8</sub>	14'-3 <sup>1</sup> / <sub>4</sub>	13'-1 <sup>3</sup> / <sub>4</sub>	12'-0 <sup>1</sup> / <sub>4</sub>	10'-10 <sup>5</sup> / <sub>8</sub>	9'-9 <sup>1</sup> / <sub>8</sub>	8'-7 <sup>1</sup> / <sub>2</sub>	7'-6	6'-4 <sup>3</sup> / <sub>8</sub>	5'-2 <sup>7</sup> / <sub>8</sub>	12'-0 <sup>1</sup> / <sub>4</sub>	10'-10 <sup>5</sup> / <sub>8</sub>	9'-9 <sup>1</sup> / <sub>8</sub>	8'-7 <sup>1</sup> / <sub>2</sub>	7'-6	6'-4 <sup>3</sup> / <sub>8</sub>	5'-2 <sup>7</sup> / <sub>8</sub>	F1
F2	6'-4	5'-10 <sup>1</sup> / <sub>8</sub>	5'-4 <sup>3</sup> / <sub>8</sub>	4'-10 <sup>1</sup> / <sub>2</sub>	4'-4 <sup>5</sup> / <sub>8</sub>	3'-10 <sup>7</sup> / <sub>8</sub>	3'-5	2'-11 <sup>1</sup> / <sub>4</sub>	2'-5 <sup>3</sup> / <sub>8</sub>	6'-4	5'-10 <sup>1</sup> / <sub>8</sub>	5'-4 <sup>3</sup> / <sub>8</sub>	4'-10 <sup>1</sup> / <sub>2</sub>	4'-4 <sup>5</sup> / <sub>8</sub>	3'-10 <sup>7</sup> / <sub>8</sub>	3'-5	2'-11 <sup>1</sup> / <sub>4</sub>	2'-5 <sup>3</sup> / <sub>8</sub>	5'-4 <sup>3</sup> / <sub>8</sub>	4'-10 <sup>1</sup> / <sub>2</sub>	4'-4 <sup>5</sup> / <sub>8</sub>	3'-10 <sup>7</sup> / <sub>8</sub>	3'-5	2'-11 <sup>1</sup> / <sub>4</sub>	2'-5 <sup>3</sup> / <sub>8</sub>	F2
G	24'-4	24'-3	24'-2	24'-2	24'-2	24'-1	24'-1	24'-1	24'-1	20'-4	20'-3	20'-2	20'-2	20'-2	20'-1	20'-1	20'-1	20'-1	16'-2	16'-2	16'-2	16'-1	16'-1	16'-1	16'-1	G
G1	25'-2 <sup>1</sup> / <sub>4</sub>	25'-1 <sup>1</sup> / <sub>4</sub>	25'-0 <sup>1</sup> / <sub>4</sub>	25'-0 <sup>1</sup> / <sub>4</sub>	25'-0 <sup>1</sup> / <sub>4</sub>	24'-11 <sup>1</sup> / <sub>4</sub>	24'-11 <sup>1</sup> / <sub>4</sub>	24'-11 <sup>1</sup> / <sub>4</sub>	24'-11 <sup>1</sup> / <sub>4</sub>	21'-0 <sup>5</sup> / <sub>8</sub>	20'-11 <sup>5</sup> / <sub>8</sub>	20'-10 <sup>1</sup> / <sub>2</sub>	20'-10 <sup>1</sup> / <sub>2</sub>	20'-10 <sup>1</sup> / <sub>2</sub>	20'-9 <sup>1</sup> / <sub>2</sub>	20'-9 <sup>1</sup> / <sub>2</sub>	20'-9 <sup>1</sup> / <sub>2</sub>	20'-9 <sup>1</sup> / <sub>2</sub>	16'-8 <sup>7</sup> / <sub>8</sub>	16'-8 <sup>7</sup> / <sub>8</sub>	16'-8 <sup>7</sup> / <sub>8</sub>	16'-7 <sup>3</sup> / <sub>4</sub>	16'-7 <sup>3</sup> / <sub>4</sub>	16'-7 <sup>3</sup> / <sub>4</sub>	16'-7 <sup>3</sup> / <sub>4</sub>	G1
G2	26'-5	26'-4	26'-2 <sup>7</sup> / <sub>8</sub>	26'-2 <sup>7</sup> / <sub>8</sub>	26'-2 <sup>7</sup> / <sub>8</sub>	26'-1 <sup>3</sup> / <sub>4</sub>	26'-1 <sup>3</sup> / <sub>4</sub>	26'-1 <sup>3</sup> / <sub>4</sub>	26'-1 <sup>3</sup> / <sub>4</sub>	22'-3 <sup>3</sup> / <sub>8</sub>	22'-2 <sup>1</sup> / <sub>4</sub>	22'-1 <sup>1</sup> / <sub>4</sub>	22'-1 <sup>1</sup> / <sub>4</sub>	22'-1 <sup>1</sup> / <sub>4</sub>	22'-0	21'-11 <sup>7</sup> / <sub>8</sub>	21'-11 <sup>7</sup> / <sub>8</sub>	21'-11 <sup>7</sup> / <sub>8</sub>	17'-11 <sup>1</sup> / <sub>2</sub>	17'-11 <sup>1</sup> / <sub>2</sub>	17'-11 <sup>1</sup> / <sub>2</sub>	17'-10 <sup>3</sup> / <sub>8</sub>	17'-10 <sup>3</sup> / <sub>8</sub>	17'-10 <sup>3</sup> / <sub>8</sub>	17'-10	G2
G3	18'-10 <sup>3</sup> / <sub>8</sub>	17'-4 <sup>1</sup> / <sub>4</sub>	15'-10 <sup>1</sup> / <sub>8</sub>	14'-4 <sup>1</sup> / <sub>8</sub>	12'-10	11'-3 <sup>7</sup> / <sub>8</sub>	9'-9 <sup>3</sup> / <sub>4</sub>	8'-3 <sup>5</sup> / <sub>8</sub>	6'-9 <sup>5</sup> / <sub>8</sub>	18'-10 <sup>3</sup> / <sub>8</sub>	17'-4 <sup>1</sup> / <sub>4</sub>	15'-10 <sup>1</sup> / <sub>8</sub>	14'-4 <sup>1</sup> / <sub>8</sub>	12'-10	11'-3 <sup>7</sup> / <sub>8</sub>	9'-9 <sup>3</sup> / <sub>4</sub>	8'-3 <sup>5</sup> / <sub>8</sub>	6'-9 <sup>5</sup> / <sub>8</sub>	15'-10 <sup>1</sup> / <sub>8</sub>	14'-4 <sup>1</sup> / <sub>8</sub>	12'-10	11'-3 <sup>7</sup> / <sub>8</sub>	9'-9 <sup>3</sup> / <sub>4</sub>	8'-3 <sup>5</sup> / <sub>8</sub>	6'-9 <sup>5</sup> / <sub>8</sub>	G3
G4	19'-6 <sup>5</sup> / <sub>8</sub>	17'-9 <sup>5</sup> / <sub>8</sub>	16'-0 <sup>5</sup> / <sub>8</sub>	14'-6 <sup>5</sup> / <sub>8</sub>	13'-0 <sup>1</sup> / <sub>2</sub>	11'-3 <sup>5</sup> / <sub>8</sub>	9'-9 <sup>5</sup> / <sub>8</sub>	8'-3 <sup>2</sup> / <sub>4</sub>	6'-9 <sup>5</sup> / <sub>8</sub>	19'-6 <sup>5</sup> / <sub>8</sub>	17'-9 <sup>5</sup> / <sub>8</sub>	16'-0 <sup>5</sup> / <sub>8</sub>	14'-6 <sup>5</sup> / <sub>8</sub>	13'-0 <sup>1</sup> / <sub>2</sub>	11'-3 <sup>5</sup> / <sub>8</sub>	9'-9 <sup>5</sup> / <sub>8</sub>	8'-3 <sup>2</sup> / <sub>4</sub>	6'-9 <sup>5</sup> / <sub>8</sub>	16'-0 <sup>5</sup> / <sub>8</sub>	14'-6 <sup>5</sup> / <sub>8</sub>	13'-0 <sup>1</sup> / <sub>2</sub>	11'-3 <sup>5</sup> / <sub>8</sub>	9'-9 <sup>5</sup> / <sub>8</sub>	8'-3 <sup>2</sup> / <sub>4</sub>	6'-9 <sup>5</sup> / <sub>8</sub>	G4
G5	13'-10 <sup>3</sup> / <sub>8</sub>	12'-9	11'-7 <sup>3</sup> / <sub>4</sub>	10'-6 <sup>3</sup> / <sub>8</sub>	9'-5	8'-3 <sup>3</sup> / <sub>4</sub>	7'-2 <sup>3</sup> / <sub>8</sub>	6'-1	4'-11 <sup>3</sup> / <sub>4</sub>	13'-10 <sup>3</sup> / <sub>8</sub>	12'-9	11'-7 <sup>3</sup> / <sub>4</sub>	10'-6 <sup>3</sup> / <sub>8</sub>	9'-5	8'-3 <sup>3</sup> / <sub>4</sub>	7'-2 <sup>3</sup> / <sub>8</sub>	6'-1	4'-11 <sup>3</sup> / <sub>4</sub>	11'-7 <sup>3</sup> / <sub>4</sub>	10'-6 <sup>3</sup> / <sub>8</sub>	9'-5	8'-3 <sup>3</sup> / <sub>4</sub>	7'-2 <sup>3</sup> / <sub>8</sub>	6'-1	4'-11 <sup>3</sup> / <sub>4</sub>	G5
G6	14'-11 <sup>1</sup> / <sub>4</sub>	13'-7 <sup>7</sup> / <sub>8</sub>	12'-4 <sup>3</sup> / <sub>8</sub>	11'-3 <sup>1</sup> / <sub>8</sub>	10'-1 <sup>3</sup> / <sub>4</sub>	8'-10 <sup>3</sup> / <sub>8</sub>	7'-9 <sup>1</sup> / <sub>8</sub>	6'-7 <sup>7</sup> / <sub>8</sub>	5'-6 <sup>5</sup> / <sub>8</sub>	14'-11 <sup>1</sup> / <sub>4</sub>	13'-7 <sup>7</sup> / <sub>8</sub>	12'-4 <sup>3</sup> / <sub>8</sub>	11'-3 <sup>1</sup> / <sub>8</sub>	10'-1 <sup>3</sup> / <sub>4</sub>	8'-10 <sup>3</sup> / <sub>8</sub>	7'-9 <sup>1</sup> / <sub>8</sub>	6'-7 <sup>7</sup> / <sub>8</sub>	5'-6 <sup>5</sup> / <sub>8</sub>	12'-4 <sup>3</sup> / <sub>8</sub>	11'-3 <sup>1</sup> / <sub>8</sub>	10'-1 <sup>3</sup> / <sub>4</sub>	8'-10 <sup>3</sup> / <sub>8</sub>	7'-9 <sup>1</sup> / <sub>8</sub>	6'-7 <sup>7</sup> / <sub>8</sub>	5'-6 <sup>5</sup> / <sub>8</sub>	G6
G7	0'-2 <sup>5</sup> / <sub>8</sub>	0'-5 <sup>3</sup> / <sub>8</sub>	0'-8 <sup>1</sup> / <sub>8</sub>	0'-8 <sup>1</sup> / <sub>8</sub>	0'-8 <sup>1</sup> / <sub>8</sub>	0'-10 <sup>1</sup> / <sub>4</sub>	0'-10 <sup>5</sup> / <sub>8</sub>	0'-10 <sup>5</sup> / <sub>8</sub>	0'-10 <sup>1</sup> / <sub>2</sub>	0'-2 <sup>5</sup> / <sub>8</sub>	0'-5 <sup>3</sup> / <sub>8</sub>	0'-8 <sup>1</sup> / <sub>8</sub>	0'-8 <sup>1</sup> / <sub>8</sub>	0'-8 <sup>1</sup> / <sub>8</sub>	0'-10 <sup>1</sup> / <sub>4</sub>	0'-10 <sup>5</sup> / <sub>8</sub>	0'-10 <sup>5</sup> / <sub>8</sub>	0'-10 <sup>1</sup> / <sub>2</sub>	0'-8 <sup>1</sup> / <sub>8</sub>	0'-8 <sup>1</sup> / <sub>8</sub>	0'-8 <sup>1</sup> / <sub>8</sub>	0'-10 <sup>1</sup> / <sub>4</sub>	0'-10 <sup>5</sup> / <sub>8</sub>	0'-10 <sup>5</sup> / <sub>8</sub>	0'-10 <sup>1</sup> / <sub>2</sub>	G7
G8	0'-3 <sup>1</sup> / <sub>4</sub>	0'-5 <sup>5</sup> / <sub>8</sub>	0'-7 <sup>1</sup> / <sub>2</sub>	0'-7 <sup>1</sup> / <sub>2</sub>	0'-7 <sup>1</sup> / <sub>2</sub>	0'-9 <sup>1</sup> / <sub>4</sub>	0'-9 <sup>1</sup> / <sub>4</sub>	0'-9 <sup>1</sup> / <sub>4</sub>	0'-9 <sup>1</sup> / <sub>4</sub>	0'-3 <sup>1</sup> / <sub>4</sub>	0'-5 <sup>5</sup> / <sub>8</sub>	0'-7 <sup>1</sup> / <sub>2</sub>	0'-7 <sup>1</sup> / <sub>2</sub>	0'-7 <sup>1</sup> / <sub>2</sub>	0'-9 <sup>1</sup> / <sub>4</sub>	0'-9 <sup>1</sup> / <sub>4</sub>	0'-9 <sup>1</sup> / <sub>4</sub>	0'-9 <sup>1</sup> / <sub>4</sub>	0'-7 <sup>1</sup> / <sub>2</sub>	0'-7 <sup>1</sup> / <sub>2</sub>	0'-7 <sup>1</sup> / <sub>2</sub>	0'-9 <sup>1</sup> / <sub>4</sub>	0'-9 <sup>1</sup> / <sub>4</sub>	0'-9 <sup>1</sup> / <sub>4</sub>	0'-9 <sup>1</sup> / <sub>4</sub>	G8
K	25'-0	24'-11	24'-10	24'-10	24'-10	24'-9	24'-9	24'-9	24'-9	21'-0	20'-11	20'-10	20'-10	20'-10	20'-9	20'-9	20'-9	20'-9	16'-10	16'-10	16'-10	16'-9	16'-9	16'-9	16'-9	K
KI	25'-10 <sup>3</sup> / <sub>8</sub>	25'-9 <sup>1</sup> / <sub>2</sub>	25'-8 <sup>1</sup> / <sub>2</sub>	25'-8 <sup>1</sup> / <sub>2</sub>	25'-8 <sup>1</sup> / <sub>2</sub>	25'-7 <sup>1</sup> / <sub>2</sub>	25'-7 <sup>1</sup>																			



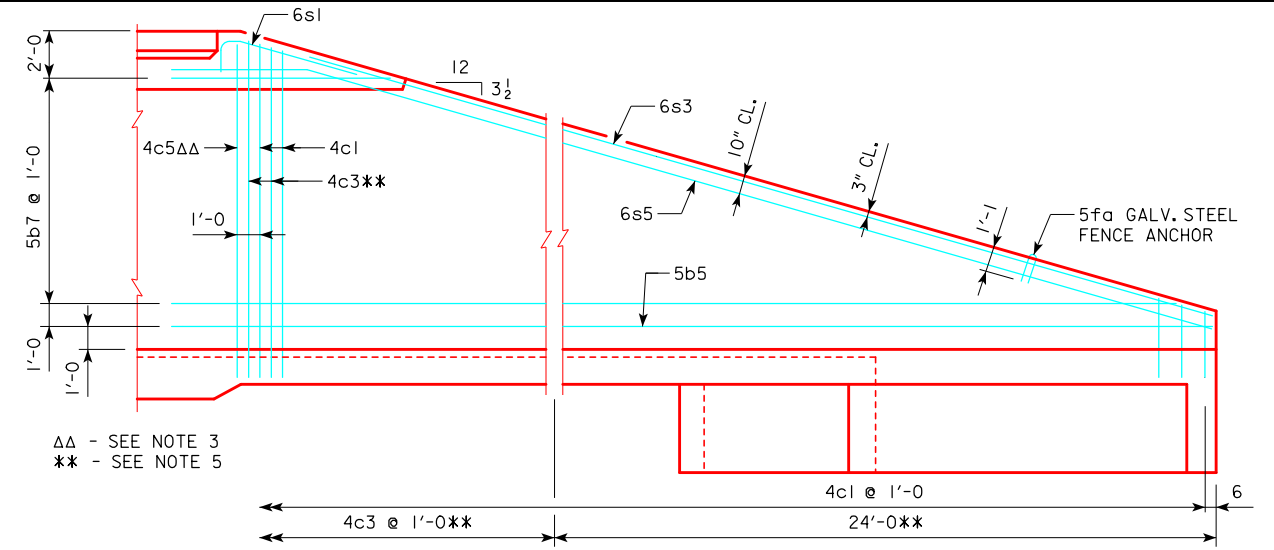




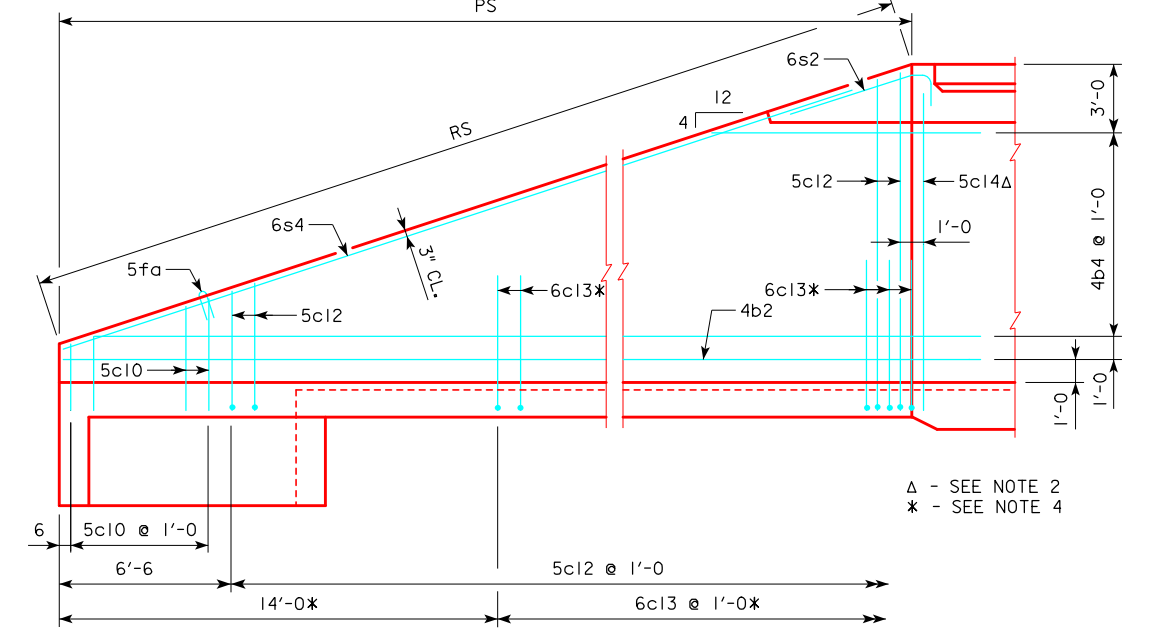
REVISED 05-13 - CHANGED BAR MARK 6c3 TO 6c13 IN TYPICAL VIEW - BACK FACE REINFORCING LONG WINGWALL DETAIL.  
 REVISED 07-2016 - REMOVED 1'-8" VERTICAL DIMENSION FROM 6s5 & 6s6 BARS TO TOP OF PARAPET. THIS ALLOWS FOR THE VARIABLE VERTICAL LOCATION OF THE HORIZONTAL LEG IN THE SLAB.  
 THIS VARIANCE IN LOCATION IS CAUSED BY THE DIFFERING WING SIZES OF DIFFERENT SIZED R.C.B. CULVERTS.  
 ENGLISHLRFDSDIGNEDTWINCULVERTS.DGN - TWH 15-5-12 - THIS SHEET ISSUED 04-12.



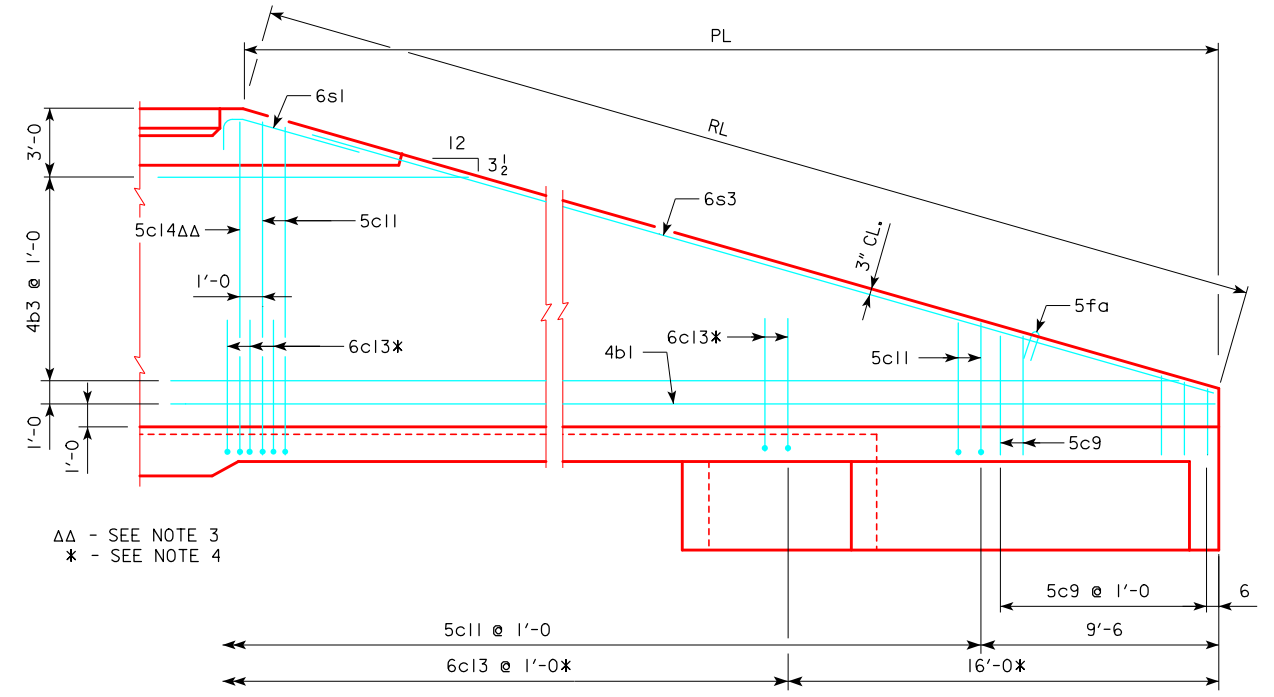
TYPICAL VIEW - FRONT FACE REINFORCING SHORT WINGWALL



TYPICAL VIEW - FRONT FACE REINFORCING LONG WINGWALL

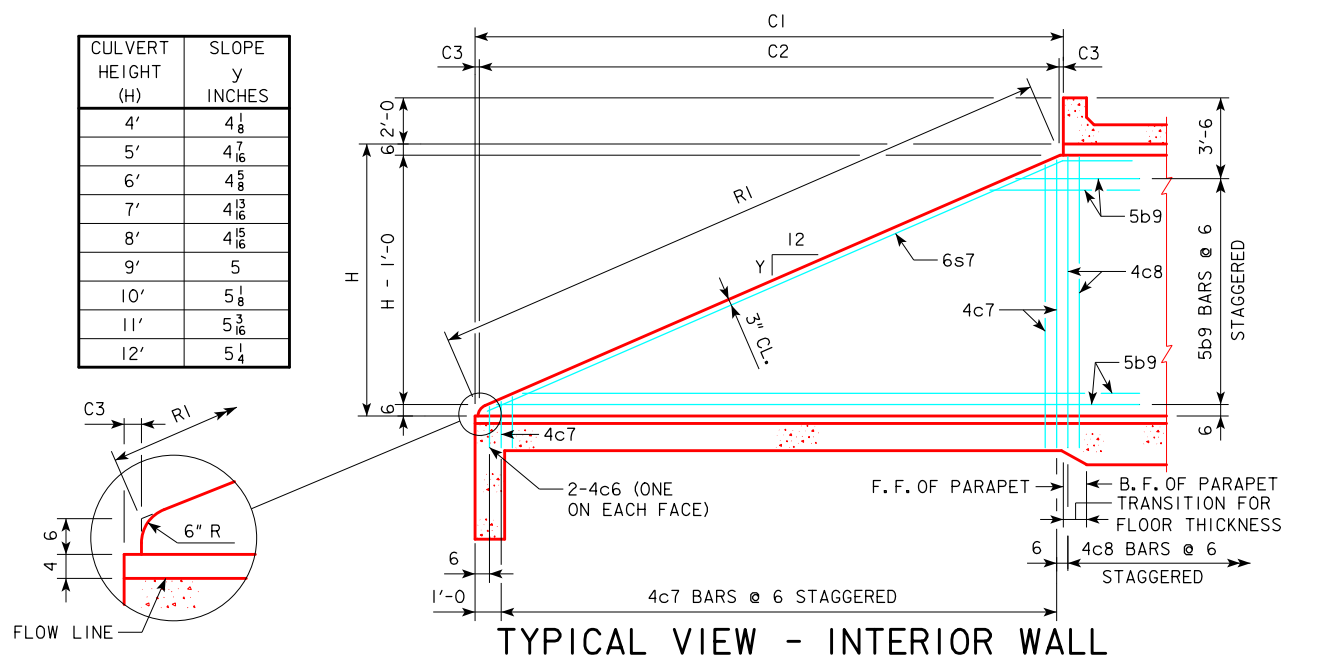


TYPICAL VIEW - BACK FACE REINFORCING SHORT WINGWALL



TYPICAL VIEW - BACK FACE REINFORCING LONG WINGWALL

CULVERT HEIGHT (H)	SLOPE Y INCHES
4'	4 1/8
5'	4 7/16
6'	4 3/8
7'	4 1/2
8'	4 5/8
9'	5
10'	5 1/8
11'	5 3/8
12'	5 1/2



TYPICAL VIEW - INTERIOR WALL

**NOTES:**

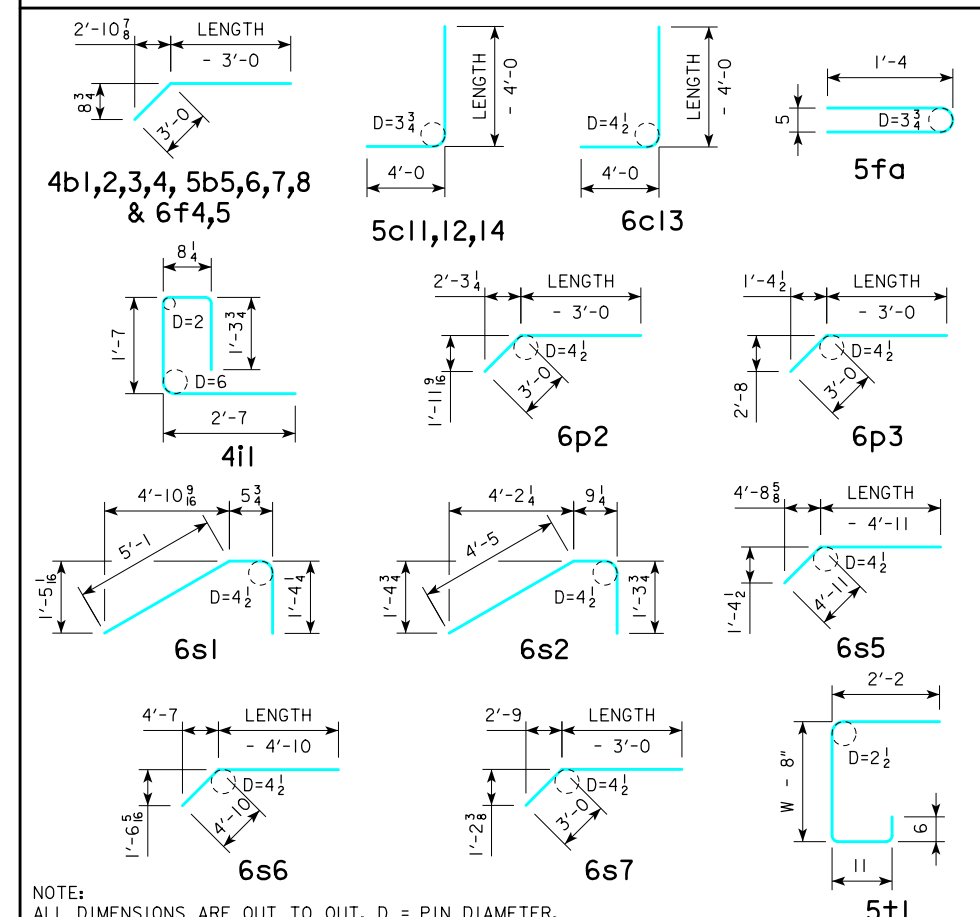
1. BAR SPACINGS AND POSITIONS SHOWN ARE SIMILAR FOR ALL SIZES OF HEADWALLS IN THIS STANDARD.
2. TWO 4c5 & TWO 5c14 BARS FOR ALL HEADWALLS.
3. TWO 4c5 & TWO 5c14 BARS FOR 4', 5', 7', 9', 10' & 12' HEIGHT HEADWALLS. ONE 4c5 & ONE 5c14 BAR FOR 6', 8' & 11' HEIGHT HEADWALLS.
4. NOT APPLICABLE FOR 4' & 5' HEADWALLS.
5. NOT APPLICABLE FOR 4' THRU 8' HEIGHT HEADWALLS.
6. FOR DIMENSION TABLE SEE SHEET TWH 15-2-12.

07-2016 LATEST REVISION DATE  APPROVED BY BRIDGE ENGINEER [Signature]	<b>IOWADOT</b> Highway Division	
	STANDARD DESIGN <b>TWIN REINFORCED CONCRETE BOX CULVERTS</b> APRIL, 2012	
	<b>FLARED WING HEADWALLS</b> 15° SKEW	<b>TWH 15-5-12</b>

**BILL OF REINFORCING FOR ONE HEADWALL 15° SKEW CULVERT SPAN x CULVERT HEIGHT**

BAR	LOCATION	SHAPE	12' x 12'		12' x 11'		12' x 10'		12' x 9'		12' x 8'		12' x 7'		12' x 6'		BAR							
			NO.	LENGTH	WT.	NO.	LENGTH	WT.	NO.	LENGTH	WT.	NO.	LENGTH	WT.	NO.	LENGTH		WT.						
5fa	FENCE ANCHOR (GALV.)		2	2'-10	6	2'-10	6	2'-10	6	2'-10	6	2'-10	6	2'-10	6	2'-10	6	5fa						
4b1	WINGWALL, B.F.H. LONG		1	45'-0	32	41'-7	29	38'-2	25	34'-9	23	31'-4	21	27'-11	19	24'-6	16	4b1						
4b2	WINGWALL, B.F.H. SHORT		1	39'-8	26	36'-9	25	33'-9	23	30'-9	21	27'-9	19	24'-9	17	21'-9	15	4b2						
4b3	WINGWALL, B.F.H. LONG		10 VAR.	12'-7 TO 43'-5	189	12'-7 TO 40'-0	158	12'-7 TO 36'-7	131	12'-7 TO 33'-2	107	12'-7 TO 29'-9	85	12'-7 TO 26'-4	65	12'-7 TO 22'-11	47	4b3						
4b4	WINGWALL, B.F.H. SHORT		10 VAR.	11'-4 TO 38'-4	166	11'-4 TO 35'-4	140	11'-4 TO 32'-4	117	11'-4 TO 29'-4	95	11'-4 TO 26'-4	75	11'-4 TO 23'-4	58	11'-4 TO 20'-4	42	4b4						
5b5	WINGWALL, F.F.H. LONG		1	45'-1	49	41'-8	46	38'-3	40	34'-10	36	31'-4	33	27'-11	29	24'-6	26	5b5						
5b6	WINGWALL, F.F.H. SHORT		1	39'-9	41	36'-9	38	33'-9	35	30'-9	32	27'-9	29	24'-9	26	21'-9	23	5b6						
5b7	WINGWALL, F.F.H. LONG		11 VAR.	9'-3 TO 43'-6	307	9'-3 TO 40'-1	260	9'-3 TO 36'-8	216	9'-3 TO 33'-3	177	9'-3 TO 29'-10	143	9'-3 TO 26'-4	111	9'-3 TO 22'-11	84	5b7						
5b8	WINGWALL, F.F.H. SHORT		11 VAR.	8'-5 TO 38'-5	269	8'-5 TO 35'-5	229	8'-5 TO 32'-5	192	8'-5 TO 29'-5	158	8'-5 TO 26'-5	127	8'-5 TO 23'-5	100	8'-5 TO 20'-5	75	5b8						
5b9	INTERIOR WALL, BOTH F.H.		21 VAR.	5'-1 TO 28'-1	363	5'-1 TO 26'-0	308	5'-1 TO 23'-11	257	5'-2 TO 21'-10	211	5'-2 TO 19'-9	169	5'-3 TO 17'-9	132	5'-4 TO 15'-8	99	5b9						
4c1	WINGWALL, F.F.V. LONG		42	2'-10 TO 14'-10	248	2'-10 TO 13'-11	218	2'-10 TO 12'-9	182	2'-10 TO 11'-11	158	2'-10 TO 11'-0	134	2'-10 TO 9'-10	106	2'-10 TO 9'-0	87	4c1						
4c2	WINGWALL, F.F.V. SHORT		37 VAR.	2'-10 TO 14'-10	218	2'-10 TO 13'-10	189	2'-10 TO 12'-10	162	2'-10 TO 11'-10	137	2'-10 TO 10'-10	114	2'-10 TO 9'-10	93	2'-10 TO 8'-10	74	4c2						
4c3	WINGWALL, F.F.V. LONG		19	9'-8 TO 14'-11	156	9'-8 TO 14'-1	127	9'-8 TO 12'-10	91	9'-8 TO 12'-0	65	---	---	---	---	---	---	4c3						
4c4	WINGWALL, F.F.V. SHORT		17	9'-8 TO 15'-0	140	9'-8 TO 14'-0	111	9'-8 TO 13'-0	83	9'-8 TO 12'-0	58	---	---	---	---	---	---	4c4						
4c5	WINGWALL, F.F.V. LONG		2	13'-9	18	12'-9	9	11'-9	16	10'-9	14	9'-9	7	8'-9	12	7'-9	5	4c5						
4c5	WINGWALL, F.F.V. SHORT		2	13'-9	18	12'-9	17	11'-9	16	10'-9	14	9'-9	13	8'-9	12	7'-9	10	4c5						
4c6	INTERIOR WALL, BOTH F.V.		2	1'-9	2	1'-9	2	1'-9	2	1'-9	2	1'-9	2	1'-9	2	1'-9	2	4c6						
4c7	INTERIOR WALL, BOTH F.V.		49	2'-0 TO 12'-5	236	1'-11 TO 11'-5	200	1'-11 TO 10'-5	169	1'-11 TO 9'-6	141	1'-11 TO 8'-6	115	1'-11 TO 7'-4	87	1'-11 TO 6'-4	66	4c7						
4c8	INTERIOR WALL, BOTH F.V.		2	12'-7	17	11'-7	15	10'-7	14	9'-7	13	8'-7	11	7'-7	10	6'-7	9	4c8						
5c9	WINGWALL, B.F.V. LONG		9	2'-10 TO 5'-2	38	2'-10 TO 5'-2	38	2'-10 TO 5'-2	38	2'-10 TO 5'-2	38	2'-10 TO 5'-2	38	2'-10 TO 5'-2	38	2'-10 TO 5'-2	38	5c9						
5c10	WINGWALL, B.F.V. SHORT		6	2'-10 TO 4'-6	23	2'-10 TO 4'-6	23	2'-10 TO 4'-6	23	2'-10 TO 4'-6	23	2'-10 TO 4'-6	23	2'-10 TO 4'-6	23	2'-10 TO 4'-6	23	5c10						
5c11	WINGWALL, B.F.V. LONG		33	9'-6 TO 18'-10	488	9'-6 TO 17'-11	429	9'-6 TO 16'-9	356	9'-6 TO 15'-11	305	9'-6 TO 15'-0	256	9'-6 TO 13'-10	195	9'-6 TO 13'-0	153	5c11						
5c12	WINGWALL, B.F.V. SHORT		31	8'-10 TO 18'-10	447	8'-10 TO 17'-10	389	8'-10 TO 16'-10	335	8'-10 TO 15'-10	283	8'-10 TO 14'-10	235	8'-10 TO 13'-10	189	8'-10 TO 12'-10	147	5c12						
6c13	WINGWALL, B.F.V. LONG		27	10'-6	426	10'-6	379	10'-6	315	10'-6	268	10'-6	221	10'-6	158	10'-6	110	6c13						
6c13	WINGWALL, B.F.V. SHORT		24	10'-6	379	10'-6	331	10'-6	284	10'-6	237	10'-6	189	10'-6	142	10'-6	95	6c13						
5c14	WINGWALL, B.F.V. LONG		2	17'-9	37	16'-9	17	15'-9	33	14'-9	31	13'-9	14	12'-9	27	11'-9	12	5c14						
5c14	WINGWALL, B.F.V. SHORT		2	17'-9	37	16'-9	35	15'-9	33	14'-9	31	13'-9	29	12'-9	27	11'-9	25	5c14						
4d1	APRON, LONGIT., BOTT.		17	28'-5	323	17	26'-4	299	17	24'-4	276	17	22'-3	253	17	18'-1	205	17	16'-0	182	4d1			
4d2	APRON, LONGIT., BOTT. LONG		3	39'-7	79	36'-2	72	32'-9	66	29'-5	59	26'-0	52	22'-7	45	19'-3	39	4d2						
4d3	APRON, LONGIT., BOTT. SHORT		3	35'-0	70	32'-0	64	29'-0	58	26'-1	52	23'-1	46	20'-2	40	17'-3	35	4d3						
6f1	APRON, LONGIT., TOP		24	28'-5	1024	24	26'-4	949	24	24'-4	877	24	22'-3	802	24	20'-2	727	24	16'-0	577	6f1			
6f2	APRON, LONGIT., TOP LONG		9	5'-5 TO 25'-7	210	5'-10 TO 23'-6	176	6'-3 TO 21'-5	145	6'-8 TO 19'-5	118	7'-2 TO 17'-4	92	7'-7 TO 15'-3	69	5'-6 TO 13'-2	56	6f2						
6f3	APRON, LONGIT., TOP SHORT		8	5'-5 TO 25'-8	187	6'-3 TO 23'-8	157	6'-7 TO 21'-7	129	6'-11 TO 19'-6	110	5'-9 TO 17'-5	87	4'-7 TO 15'-4	66	4'-5 TO 13'-3	53	6f3						
6f4	APRON, LONGIT., TOP LONG		1	45'-1	71	41'-8	66	38'-3	57	34'-10	52	31'-4	47	27'-11	42	24'-6	37	6f4						
6f5	APRON, LONGIT., TOP SHORT		1	39'-9	60	36'-9	55	33'-9	51	30'-9	46	27'-9	42	24'-9	37	21'-9	33	6f5						
4i1	PARAPET, VERTICAL		51	6'-2	210	49	6'-2	202	49	6'-2	202	49	6'-2	202	49	6'-2	202	4i1						
7j1	PARAPET, HORIZONTAL		4	27'-7	226	4	27'-4	223	4	27'-1	221	4	27'-1	221	4	26'-9	219	7j1						
6m1	APRON, TRANS., TOP		6	27'-10 TO 28'-9	255	27'-7 TO 28'-6	253	27'-4 TO 28'-3	250	27'-4 TO 28'-3	250	27'-4 TO 28'-3	250	27'-1 TO 28'-0	248	27'-1 TO 28'-0	248	6m1						
6m2	APRON, TRANS., TOP		25	29'-1 TO 38'-1	1261	28'-10 TO 36'-9	1084	28'-7 TO 35'-4	912	28'-7 TO 34'-7	806	28'-7 TO 33'-5	652	28'-4 TO 32'-1	499	28'-4 TO 30'-11	356	6m2						
6m3	APRON, TRANS., TOP		9	8'-0 TO 28'-11	250	8'-0 TO 28'-10	249	7'-11 TO 28'-10	248	5'-5 TO 26'-4	215	5'-7 TO 26'-5	216	5'-7 TO 26'-5	216	5'-8 TO 26'-7	218	6m3						
6m4	APRON, TRANS., BOTT.		24	21'-6 TO 33'-10	997	21'-6 TO 32'-8	892	21'-3 TO 31'-6	792	21'-3 TO 30'-5	698	21'-3 TO 29'-4	608	21'-2 TO 28'-2	519	21'-2 TO 27'-2	436	6m4						
6p1	CURTAIN, HORIZONTAL		4	26'-2	157	4	26'-1	157	4	25'-11	156	4	25'-11	156	4	25'-10	155	4	25'-10	155	6p1			
6p2	CURTAIN, HORIZONTAL LONG		4	21'-9	131	4	20'-3	122	4	18'-9	113	4	17'-3	104	4	15'-9	95	4	14'-2	85	4	12'-8	76	6p2
6p3	CURTAIN, HORIZONTAL SHORT		4	16'-10	101	4	15'-9	95	4	14'-7	88	4	13'-6	81	4	12'-5	75	4	11'-3	68	4	10'-2	61	6p3
6s1	WING SLOPE, BOTH F. LONG		2	6'-11	21	2	6'-11	21	2	6'-11	21	2	6'-11	21	2	6'-11	21	2	6'-11	21	2	6'-11	21	6s1
6s2	WING SLOPE, BOTH F. SHORT		2	6'-6	20	2	6'-6	20	2	6'-6	20	2	6'-6	20	2	6'-6	20	2	6'-6	20	2	6'-6	20	6s2
6s3	WING SLOPE, BOTH F. LONG		2	41'-9	132	2	38'-2	115	2	34'-7	104	2	31'-0	93	2	27'-5	82	2	23'-10	72	2	20'-3	61	6s3
6s4	WING SLOPE, BOTH F. SHORT		2	37'-4	112	2	34'-2	103	2	31'-0	93	2	27'-10	84	2	24'-8	74	2	21'-6	65	2	18'-4	55	6s4
6s5	WING SLOPE, F.F. LONG		1	45'-11	72	1	42'-4	67	1	38'-9	58	1	35'-2	53	1	31'-8	48	1	28'-1	42	1	24'-6	37	6s5
6s6	WING SLOPE, F.F. SHORT		1	41'-2	65	1	38'-0	57	1	34'-10	52	1	31'-8	48	1	28'-6	43	1	25'-4	38	1	22'-2	33	6s6
6s7	INTERIOR WALL, BOTH F.H.		2	30'-4	91	2	28'-1	84	2	25'-10	78	2	23'-6	71	2	21'-3	64	2	18'-11	57	2	16'-8	50	6s7
5t1	CURTAIN, VERTICAL		42	7'-11	347	40	7'-8	320	38	7'-5	294	37	7'-2	277	35	6'-11	252	30	6'-8	209	28	6'-5	187	5t1
ESTIMATED QUANTITIES ONE HEADWALL			REINF. STEEL		10,848 LB		9670 LB		8555 LB		7576 LB		6509 LB		5575 LB		4736 LB							
			CONCRETE		2.9 PARAPET Δ 29.5 WINGWALLS 60.0 FOOTING *		2.8 23.2 47.2		2.8 17.9 41.8		2.8 14.8 36.5		2.7 12.1 31.2		2.7 8.6 26.5		2.7 6.6 26.5							
					92.4 CY		79.4 CY		67.9 CY		59.4 CY		51.4 CY		42.5 CY		35.8 CY							

**BENT BAR DETAILS**



**BILL OF REINFORCING FOR ONE HEADWALL 15° SKEW CULVERT SPAN x CULVERT HEIGHT**

BAR	LOCATION	SHAPE	12' x 5'			12' x 4'			10' x 12'			10' x 11'			10' x 10'			10' x 9'			10' x 8'			BAR
			NO.	LENGTH	WT.	NO.	LENGTH	WT.	NO.	LENGTH	WT.	NO.	LENGTH	WT.	NO.	LENGTH	WT.	NO.	LENGTH	WT.	NO.	LENGTH	WT.	
5fa	FENCE ANCHOR (GALV.)		2	2'-10	6	2	2'-10	6	2	2'-10	6	2	2'-10	6	2	2'-10	6	2	2'-10	6	2	2'-10	6	5fa
4b1	WINGWALL, B.F.H. LONG		1	21'-0	14	1	17'-7	12	1	45'-0	32	1	41'-7	29	1	38'-2	25	1	34'-9	23	1	31'-4	21	4b1
4b2	WINGWALL, B.F.H. SHORT		1	18'-9	13	1	15'-9	11	1	39'-8	26	1	36'-9	25	1	33'-9	23	1	30'-9	21	1	27'-9	19	4b2
4b3	WINGWALL, B.F.H. LONG		3	12'-7 TO 19'-6	32	3	12'-7 TO 16'-0	19	10	12'-7 TO 43'-5	189	9	12'-7 TO 40'-0	158	8	12'-7 TO 36'-7	131	7	12'-7 TO 33'-2	107	6	12'-7 TO 29'-9	85	4b3
4b4	WINGWALL, B.F.H. SHORT		3	11'-4 TO 17'-4	29	2	11'-4 TO 17'-4	17	10	11'-4 TO 38'-4	166	9	11'-4 TO 35'-4	140	8	11'-4 TO 32'-4	117	7	11'-4 TO 29'-4	95	6	11'-4 TO 26'-4	75	4b4
5b5	WINGWALL, F.F.H. LONG		1	21'-1	22	1	17'-8	18	1	45'-1	49	1	41'-8	46	1	38'-3	40	1	34'-10	36	1	31'-4	33	5b5
5b6	WINGWALL, F.F.H. SHORT		1	18'-9	20	1	15'-9	16	1	39'-9	41	1	36'-9	38	1	33'-9	35	1	30'-9	32	1	27'-9	29	5b6
5b7	WINGWALL, F.F.H. LONG		4	9'-3 TO 19'-6	60	3	9'-3 TO 16'-1	40	11	9'-3 TO 43'-6	307	10	9'-3 TO 40'-1	260	9	9'-3 TO 36'-8	216	8	9'-3 TO 33'-3	177	7	9'-3 TO 29'-10	143	5b7
5b8	WINGWALL, F.F.H. SHORT		4	8'-5 TO 17'-5	54	3	8'-5 TO 14'-5	36	11	8'-5 TO 38'-5	269	10	8'-5 TO 35'-5	229	9	8'-5 TO 32'-5	192	8	8'-5 TO 29'-5	158	7	8'-5 TO 26'-5	127	5b8
5b9	INTERIOR WALL, BOTH F.H.		7	5'-5 TO 13'-7	69	5	5'-1 TO 11'-5	44	21	5'-1 TO 28'-1	363	19	5'-1 TO 26'-0	308	17	5'-2 TO 23'-11	257	15	5'-2 TO 21'-10	211	13	5'-2 TO 19'-9	169	5b9
4c1	WINGWALL, F.F.V. LONG		18	2'-10 TO 7'-10	64	15	2'-10 TO 6'-11	49	42	2'-9 TO 14'-9	245	39	2'-9 TO 13'-10	216	35	2'-9 TO 12'-8	180	32	2'-9 TO 11'-10	156	29	2'-9 TO 10'-11	132	4c1
4c2	WINGWALL, F.F.V. SHORT		16	2'-10 TO 7'-10	57	13	2'-10 TO 6'-10	42	37	2'-9 TO 14'-9	216	34	2'-9 TO 13'-9	187	31	2'-9 TO 12'-9	160	28	2'-9 TO 11'-9	136	25	2'-9 TO 10'-9	113	4c2
4c3	WINGWALL, F.F.V. LONG		---	---	---	---	---	---	19	9'-7 TO 14'-10	155	16	9'-7 TO 14'-10	126	12	9'-7 TO 12'-10	90	9	9'-7 TO 11'-11	65	---	---	---	4c3
4c4	WINGWALL, F.F.V. SHORT		---	---	---	---	---	---	17	9'-7 TO 14'-11	139	14	9'-7 TO 13'-11	110	11	9'-7 TO 12'-11	83	8	9'-7 TO 11'-11	57	---	---	---	4c4
4c5	WINGWALL, F.F.V. LONG		2	6'-9	9	2	5'-9	8	2	13'-8	18	2	12'-8	17	2	11'-8	16	2	10'-8	14	1	9'-8	6	4c5
4c5	WINGWALL, F.F.V. SHORT		2	6'-9	9	2	5'-9	8	2	13'-8	18	2	12'-8	17	2	11'-8	16	2	10'-8	14	2	9'-8	13	4c5
4c6	INTERIOR WALL, BOTH F.V.		2	1'-9	2	2	1'-8	2	2	1'-8	2	2	1'-8	2	2	1'-8	2	2	1'-8	2	2	1'-8	2	4c6
4c7	INTERIOR WALL, BOTH F.V.		20	1'-11 TO 5'-5	49	16	1'-10 TO 4'-5	33	49	1'-11 TO 12'-4	233	45	1'-10 TO 11'-4	198	41	1'-10 TO 10'-4	167	37	1'-10 TO 9'-5	139	33	1'-10 TO 8'-5	113	4c7
4c8	INTERIOR WALL, BOTH F.V.		2	5'-7	7	2	4'-7	6	2	12'-6	17	2	11'-6	15	2	10'-6	14	2	9'-6	13	2	8'-6	11	4c8
5c9	WINGWALL, B.F.V. LONG		9	2'-10 TO 5'-2	38	9	2'-10 TO 5'-2	38	9	2'-9 TO 5'-1	37	9	2'-9 TO 5'-1	37	9	2'-9 TO 5'-1	37	9	2'-9 TO 5'-1	37	9	2'-9 TO 5'-1	37	5c9
5c10	WINGWALL, B.F.V. SHORT		6	2'-10 TO 4'-6	23	6	2'-10 TO 4'-6	23	6	2'-9 TO 4'-5	22	6	2'-9 TO 4'-5	22	6	2'-9 TO 4'-5	22	6	2'-9 TO 4'-5	22	6	2'-9 TO 4'-5	22	5c10
5c11	WINGWALL, B.F.V. LONG		9	9'-6 TO 11'-10	100	6	9'-6 TO 10'-11	64	33	9'-5 TO 18'-9	485	30	9'-5 TO 17'-10	426	26	9'-5 TO 16'-8	354	23	9'-5 TO 15'-10	303	20	9'-5 TO 14'-11	254	5c11
5c12	WINGWALL, B.F.V. SHORT		10	8'-10 TO 11'-10	108	7	8'-10 TO 10'-10	72	31	8'-9 TO 18'-9	445	28	8'-9 TO 17'-9	387	25	8'-9 TO 16'-9	332	22	8'-9 TO 15'-9	281	19	8'-9 TO 14'-9	233	5c12
6c13	WINGWALL, B.F.V. LONG		---	---	---	---	---	---	27	10'-6	426	24	10'-6	379	20	10'-6	315	17	10'-6	268	14	10'-6	221	6c13
6c13	WINGWALL, B.F.V. SHORT		---	---	---	---	---	---	24	10'-6	379	21	10'-6	331	18	10'-6	284	15	10'-6	237	12	10'-6	189	6c13
5c14	WINGWALL, B.F.V. LONG		2	10'-9	22	2	9'-9	20	2	17'-8	37	1	16'-8	17	2	15'-8	33	2	14'-8	31	1	13'-8	19	5c14
5c14	WINGWALL, B.F.V. SHORT		2	10'-9	22	2	9'-9	20	2	17'-8	37	2	16'-8	35	2	15'-8	33	2	14'-8	31	2	13'-8	24	5c14
4d1	APRON, LONGIT., BOTT.		17	13'-11	158	17	11'-11	135	15	28'-5	285	13	26'-4	229	13	24'-4	211	13	22'-3	193	13	20'-2	175	4d1
4d2	APRON, LONGIT., BOTT. LONG		3	15'-11	32	3	12'-7	25	3	39'-7	79	3	36'-2	72	3	32'-9	66	3	29'-5	59	3	26'-0	52	4d2
4d3	APRON, LONGIT., BOTT. SHORT		3	14'-4	29	3	11'-5	23	3	35'-0	70	3	32'-0	64	3	29'-0	58	3	26'-1	52	3	23'-1	46	4d3
6f1	APRON, LONGIT., TOP		24	13'-11	502	24	11'-11	430	20	28'-5	854	20	26'-4	791	20	24'-4	731	20	22'-3	668	20	20'-2	606	6f1
6f2	APRON, LONGIT., TOP LONG		3	5'-11 TO 11'-1	38	2	6'-5 TO 9'-0	23	9	5'-5 TO 25'-7	210	8	5'-10 TO 23'-6	176	7	6'-3 TO 21'-5	145	6	6'-8 TO 19'-5	118	5	7'-2 TO 17'-4	92	6f2
6f3	APRON, LONGIT., TOP SHORT		3	5'-3 TO 11'-2	37	2	6'-2 TO 9'-1	23	8	5'-5 TO 25'-8	187	7	6'-3 TO 23'-8	157	6	7'-0 TO 21'-7	129	6	4'-11 TO 19'-6	110	5	5'-9 TO 17'-5	87	6f3
6f4	APRON, LONGIT., TOP LONG		1	21'-1	32	1	17'-8	27	1	45'-1	71	1	41'-8	66	1	38'-3	57	1	34'-10	52	1	31'-4	47	6f4
6f5	APRON, LONGIT., TOP SHORT		1	18'-9	28	1	15'-9	24	1	39'-9	60	1	36'-9	55	1	33'-9	51	1	30'-9	46	1	27'-9	42	6f5
4i1	PARAPET, VERTICAL		49	6'-2	202	49	6'-2	202	43	6'-2	177	41	6'-2	169	41	6'-2	169	41	6'-2	169	41	6'-2	169	4i1
7ji	PARAPET, HORIZONTAL		4	26'-9	219	4	23'-5	219	4	23'-5	191	4	22'-11	189	4	22'-11	187	4	22'-11	187	4	22'-11	187	7ji
6m1	APRON, TRANS., TOP		6	27'-1 TO 28'-0	248	6	27'-1 TO 28'-0	248	5	23'-8 TO 24'-5	181	5	23'-5 TO 24'-2	179	5	23'-2 TO 23'-11	177	5	23'-2 TO 23'-11	177	5	23'-2 TO 23'-11	177	6m1
6m2	APRON, TRANS., TOP		6	28'-4 TO 30'-2	264	3	28'-4 TO 29'-1	129	27	24'-9 TO 34'-6	1201	24	24'-6 TO 33'-1	1038	21	24'-2 TO 31'-8	881	18	24'-2 TO 30'-7	740	16	24'-2 TO 29'-10	649	6m2
6m3	APRON, TRANS., TOP		8	5'-9 TO 24'-0	179	9	3'-3 TO 24'-2	185	7	8'-9 TO 24'-5	174	7	8'-9 TO 24'-5	174	8	6'-1 TO 24'-4	183	8	6'-2 TO 24'-6	184	7	6'-4 TO 22'-0	149	6m3
6m4	APRON, TRANS., BOTT.		10	21'-2 TO 26'-1	355	8	21'-2 TO 25'-0	277	24	17'-4 TO 29'-8	847	22	17'-3 TO 28'-6	756	20	17'-2 TO 27'-5	670	18	17'-2 TO 26'-4	588	16	17'-2 TO 25'-3	510	6m4
6p1	CURTAIN, HORIZONTAL		4	25'-10	155	4	25'-10	155	4	22'-0	132	4	21'-11	132	4	21'-10	131	4	21'-10	131	4	21'-10	131	6p1
6p2	CURTAIN, HORIZONTAL LONG		4	11'-2	67	4	9'-8	58	4	21'-9	131	4	20'-3	122	4	18'-9	113	4	17'-3	104	4	15'-9	95	6p2
6p3	CURTAIN, HORIZONTAL SHORT		4	9'-1	55	4	7'-11	48	4	16'-10	101	4	15'-9	95	4	14'-7	88	4	13'-6	81	4	12'-5	75	6p3
6s1	WING SLOPE, BOTH F. LONG		2	6'-11	21	2	6'-11	21	2	6'-11	21	2	6'-11	21	2	6'-11	21	2	6'-11	21	2	6'-11	21	6s1
6s2	WING SLOPE, BOTH F. SHORT		2	6'-6	20	2	6'-6	20	2	6'-6	20	2	6'-6	20	2	6'-6	20	2	6'-6	20	2	6'-6	20	6s2
6s3	WING SLOPE, BOTH F. LONG		2	16'-9	50	2	13'-2	40	2	41'-9	132	2	38'-2	115	2	34'-7	104	2	31'-0	93	2	27'-5	82	6s3
6s4	WING SLOPE, BOTH F. SHORT		2	15'-2	46	2	12'-0	36	2	37'-4	112	2	34'-2	103	2	31'-0	93	2	27'-10	84	2	24'-8	74	6s4
6s5	WING SLOPE, F.F. LONG		1	20'-11	31	1	17'-4	26	1	45'-11	72	1	42'-4	67	1	38'-9	58	1</						



**BILL OF REINFORCING FOR ONE HEADWALL 15° SKEW CULVERT SPAN x CULVERT HEIGHT**

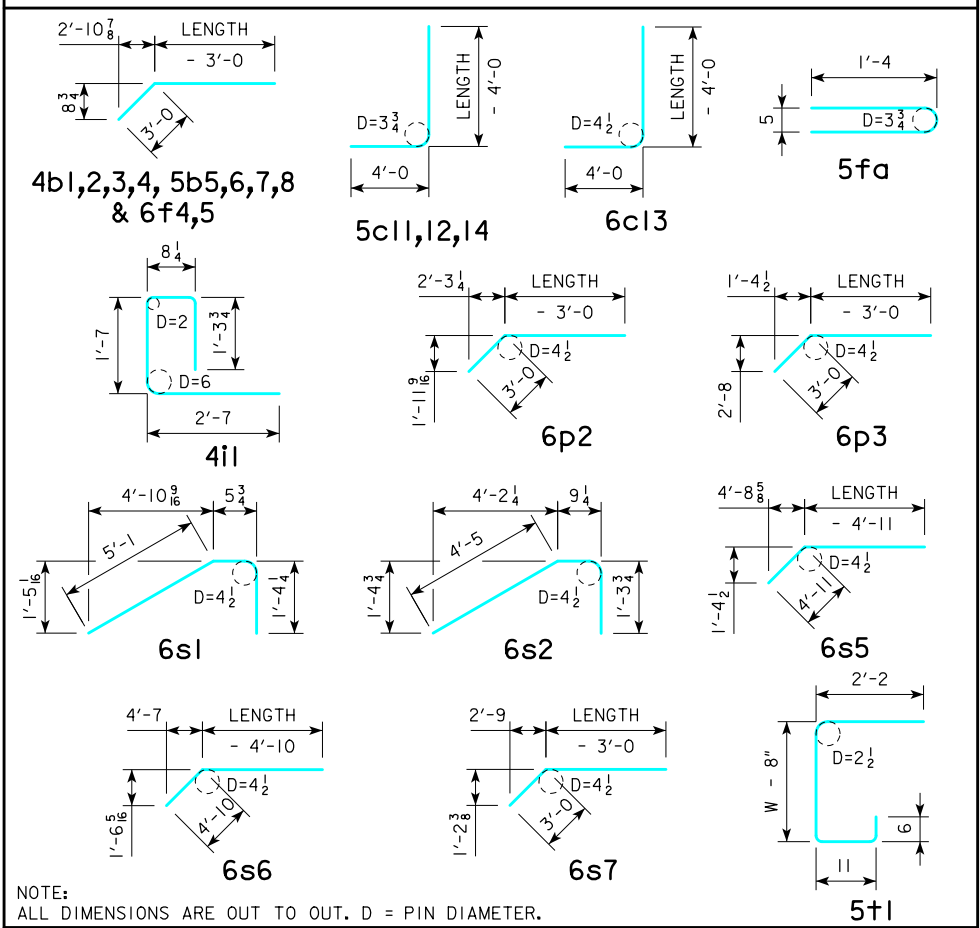
BAR	LOCATION	SHAPE	10' x 7'		10' x 6'		10' x 5'		10' x 4'		8' x 10'		8' x 9'		8' x 8'		BAR							
			NO.	LENGTH	WT.	NO.	LENGTH	WT.	NO.	LENGTH	WT.	NO.	LENGTH	WT.	NO.	LENGTH		WT.	NO.	LENGTH	WT.			
5fa	FENCE ANCHOR (GALV.)		2	2'-10	6	2	2'-10	6	2	2'-10	6	2	2'-10	6	2	2'-10	6	2	2'-10	6	5fa			
4b1	WINGWALL, B.F.H. LONG		1	27'-11	19	1	24'-6	16	1	21'-0	14	1	17'-7	12	1	38'-2	25	1	34'-9	23	1	31'-4	21	4b1
4b2	WINGWALL, B.F.H. SHORT		1	24'-9	17	1	21'-9	15	1	18'-9	13	1	15'-9	11	1	33'-9	23	1	30'-9	21	1	27'-9	19	4b2
4b3	WINGWALL, B.F.H. LONG		5	12'-7 TO 26'-4	65	4	12'-7 TO 22'-11	47	3	12'-7 TO 19'-6	32	2	12'-7 TO 16'-0	19	8	12'-7 TO 36'-7	131	7	12'-7 TO 33'-2	107	6	12'-7 TO 29'-9	85	4b3
4b4	WINGWALL, B.F.H. SHORT		5	11'-4 TO 23'-4	58	4	11'-4 TO 20'-4	42	3	11'-4 TO 17'-4	29	2	11'-4 TO 14'-4	17	8	11'-4 TO 32'-4	117	7	11'-4 TO 29'-4	95	6	11'-4 TO 26'-4	75	4b4
5b5	WINGWALL, F.F.H. LONG		1	27'-11	29	1	24'-6	26	1	21'-1	22	1	17'-8	18	1	38'-3	40	1	34'-10	36	1	31'-4	33	5b5
5b6	WINGWALL, F.F.H. SHORT		1	24'-9	26	1	21'-9	23	1	18'-9	20	1	15'-9	16	1	33'-9	35	1	30'-9	32	1	27'-9	29	5b6
5b7	WINGWALL, F.F.H. LONG		6	9'-3 TO 26'-4	111	5	9'-3 TO 22'-11	84	4	9'-3 TO 19'-6	60	3	9'-3 TO 16'-1	40	9	9'-3 TO 36'-8	216	8	9'-3 TO 33'-3	177	7	9'-3 TO 29'-10	143	5b7
5b8	WINGWALL, F.F.H. SHORT		6	8'-5 TO 23'-5	100	5	8'-5 TO 20'-5	75	4	8'-5 TO 17'-5	54	3	8'-5 TO 14'-5	36	9	8'-5 TO 32'-5	192	8	8'-5 TO 29'-5	158	7	8'-5 TO 26'-5	127	5b8
5b9	INTERIOR WALL, BOTH F.H.		11	5'-3 TO 17'-9	132	9	5'-4 TO 15'-8	99	7	5'-4 TO 13'-7	69	5	5'-4 TO 11'-5	44	17	5'-2 TO 23'-11	257	15	5'-2 TO 21'-10	211	13	5'-2 TO 19'-9	169	5b9
4c1	WINGWALL, F.F.V. LONG		25	2'-9 TO 9'-9	104	22	2'-9 TO 8'-11	86	18	2'-9 TO 7'-9	63	15	2'-9 TO 6'-10	48	35	2'-8 TO 12'-7	178	32	2'-8 TO 11'-9	154	29	2'-8 TO 10'-10	131	4c1
4c2	WINGWALL, F.F.V. SHORT		22	2'-9 TO 9'-9	92	19	2'-9 TO 8'-9	73	16	2'-9 TO 7'-9	56	13	2'-9 TO 6'-9	41	31	2'-8 TO 12'-8	159	28	2'-8 TO 11'-8	134	25	2'-8 TO 10'-8	111	4c2
4c3	WINGWALL, F.F.V. LONG		---	---	---	---	---	---	---	---	---	---	---	---	12	9'-6 TO 12'-9	89	9	9'-6 TO 11'-10	64	---	---	---	4c3
4c4	WINGWALL, F.F.V. SHORT		---	---	---	---	---	---	---	---	---	---	---	---	11	9'-6 TO 12'-10	82	8	9'-6 TO 11'-10	57	---	---	---	4c4
4c5	WINGWALL, F.F.V. LONG		2	8'-8	12	1	7'-8	5	2	6'-8	9	2	5'-8	8	2	11'-7	15	2	10'-7	14	1	9'-7	6	4c5
4c5	WINGWALL, F.F.V. SHORT		2	8'-8	12	2	7'-8	10	2	6'-8	9	2	5'-8	8	2	11'-7	15	2	10'-7	14	2	9'-7	13	4c5
4c6	INTERIOR WALL, BOTH F.V.		2	1'-8	2	2	1'-8	2	2	1'-8	2	2	1'-7	2	2	1'-7	2	2	1'-7	2	2	1'-7	2	4c6
4c7	INTERIOR WALL, BOTH F.V.		28	1'-10 TO 7'-3	85	24	1'-10 TO 6'-3	65	20	1'-10 TO 5'-4	48	16	1'-9 TO 4'-4	33	41	1'-9 TO 10'-3	164	37	1'-9 TO 9'-4	137	33	1'-9 TO 8'-4	111	4c7
4c8	INTERIOR WALL, BOTH F.V.		2	7'-6	10	2	6'-6	9	2	5'-6	7	2	4'-6	6	2	10'-5	14	2	9'-5	13	2	8'-5	11	4c8
5c9	WINGWALL, B.F.V. LONG		9	2'-9 TO 5'-1	37	9	2'-9 TO 5'-1	37	9	2'-9 TO 5'-1	37	9	2'-9 TO 5'-1	37	9	2'-8 TO 5'-0	36	9	2'-8 TO 5'-0	36	9	2'-8 TO 5'-0	36	5c9
5c10	WINGWALL, B.F.V. SHORT		6	2'-9 TO 4'-5	22	6	2'-9 TO 4'-5	22	6	2'-9 TO 4'-5	22	6	2'-9 TO 4'-5	22	6	2'-8 TO 4'-4	22	6	2'-8 TO 4'-4	22	6	2'-8 TO 4'-4	22	5c10
5c11	WINGWALL, B.F.V. LONG		16	9'-5 TO 13'-9	193	13	9'-5 TO 12'-11	151	9	9'-5 TO 11'-9	99	6	9'-5 TO 10'-10	63	26	9'-4 TO 16'-7	351	23	9'-4 TO 15'-9	301	20	9'-4 TO 14'-10	252	5c11
5c12	WINGWALL, B.F.V. SHORT		16	8'-9 TO 13'-9	188	13	8'-9 TO 12'-9	146	10	8'-9 TO 11'-9	107	7	8'-9 TO 10'-9	71	25	8'-8 TO 16'-8	330	22	8'-8 TO 15'-8	279	19	8'-8 TO 14'-8	231	5c12
6c13	WINGWALL, B.F.V. LONG		10	10'-6	158	7	10'-6	110	---	---	---	---	---	---	20	10'-6	315	17	10'-6	268	14	10'-6	221	6c13
6c13	WINGWALL, B.F.V. SHORT		9	10'-6	142	6	10'-6	95	---	---	---	---	---	---	18	10'-6	284	15	10'-6	237	12	10'-6	189	6c13
5c14	WINGWALL, B.F.V. LONG		2	12'-8	26	1	11'-8	12	2	10'-8	22	2	9'-8	20	2	15'-7	33	2	14'-7	30	1	13'-7	14	5c14
5c14	WINGWALL, B.F.V. SHORT		2	12'-8	26	2	11'-8	24	2	10'-8	22	2	9'-8	20	2	15'-7	33	2	14'-7	30	2	13'-7	28	5c14
4d1	APRON, LONGIT., BOTT.		13	18'-1	157	13	16'-0	139	13	13'-11	121	13	11'-11	103	11	24'-4	179	11	22'-3	163	11	20'-2	148	4d1
4d2	APRON, LONGIT., BOTT. LONG		3	22'-7	45	3	19'-3	39	3	15'-11	32	3	12'-7	25	3	32'-9	66	3	29'-5	59	3	26'-0	52	4d2
4d3	APRON, LONGIT., BOTT. SHORT		3	20'-2	40	3	17'-3	35	3	14'-4	29	3	11'-5	23	3	29'-0	58	3	26'-1	52	3	23'-1	46	4d3
6f1	APRON, LONGIT., TOP		20	18'-1	543	20	16'-0	481	20	13'-11	418	20	11'-11	358	16	24'-4	585	16	22'-3	535	16	20'-2	485	6f1
6f2	APRON, LONGIT., TOP LONG		4	7'-7 TO 15'-3	69	4	5'-6 TO 13'-2	56	3	5'-11 TO 11'-1	38	2	6'-3 TO 9'-0	23	7	6'-3 TO 21'-5	145	6	6'-8 TO 19'-5	118	5	7'-2 TO 17'-4	92	6f2
6f3	APRON, LONGIT., TOP SHORT		4	6'-7 TO 15'-4	66	4	4'-5 TO 13'-3	53	3	5'-3 TO 11'-2	37	2	6'-2 TO 9'-1	23	6	7'-0 TO 21'-7	129	6	4'-11 TO 19'-6	110	5	5'-9 TO 17'-5	87	6f3
6f4	APRON, LONGIT., TOP LONG		1	27'-11	42	1	24'-6	37	1	21'-1	32	1	17'-8	27	1	38'-3	57	1	34'-10	52	1	31'-4	47	6f4
6f5	APRON, LONGIT., TOP SHORT		1	24'-9	37	1	21'-9	33	1	18'-9	28	1	15'-9	24	1	33'-9	51	1	30'-9	46	1	27'-9	42	6f5
4i1	PARAPET, VERTICAL		41	6'-2	169	41	6'-2	169	41	6'-2	169	41	6'-2	169	33	6'-2	136	33	6'-2	136	33	6'-2	136	4i1
7ji	PARAPET, HORIZONTAL		4	22'-8	185	4	22'-8	185	4	22'-8	185	4	18'-9	153	4	18'-9	153	4	18'-9	153	4	18'-9	153	7ji
6m1	APRON, TRANS., TOP		5	22'-11 TO 23'-8	175	5	22'-11 TO 23'-8	175	5	22'-11 TO 23'-8	175	5	22'-11 TO 23'-8	175	4	19'-0 TO 19'-7	116	4	19'-0 TO 19'-7	116	4	19'-0 TO 19'-7	116	6m1
6m2	APRON, TRANS., TOP		13	23'-11 TO 28'-5	511	10	23'-11 TO 27'-4	385	7	23'-11 TO 26'-2	263	5	23'-11 TO 25'-5	185	23	19'-10 TO 28'-1	828	20	19'-10 TO 26'-11	702	17	19'-10 TO 25'-10	583	6m2
6m3	APRON, TRANS., TOP		7	6'-3 TO 21'-11	148	8	3'-9 TO 22'-1	155	8	3'-11 TO 22'-2	157	7	4'-0 TO 19'-8	124	6	6'-10 TO 19'-11	121	6	6'-11 TO 20'-0	121	6	7'-1 TO 20'-1	122	6m3
6m4	APRON, TRANS., BOTT.		14	17'-1 TO 24'-1	433	12	17'-1 TO 23'-0	361	10	17'-1 TO 21'-11	293	8	17'-1 TO 20'-10	228	20	13'-0 TO 23'-3	544	18	13'-0 TO 22'-2	475	16	13'-0 TO 21'-1	410	6m4
6p1	CURTAIN, HORIZONTAL		4	21'-9	131	4	21'-9	131	4	21'-8	130	4	21'-8	130	4	17'-8	106	4	17'-8	106	4	17'-8	106	6p1
6p2	CURTAIN, HORIZONTAL LONG		4	14'-2	85	4	12'-8	76	4	11'-2	67	4	9'-8	58	4	18'-9	113	4	17'-3	104	4	15'-9	95	6p2
6p3	CURTAIN, HORIZONTAL SHORT		4	11'-3	68	4	10'-2	61	4	9'-1	55	4	7'-11	48	4	14'-7	88	4	13'-6	81	4	12'-5	75	6p3
6s1	WING SLOPE, BOTH F. LONG		2	6'-11	21	2	6'-11	21	2	6'-11	21	2	6'-11	21	2	6'-11	21	2	6'-11	21	2	6'-11	21	6s1
6s2	WING SLOPE, BOTH F. SHORT		2	6'-6	20	2	6'-6	20	2	6'-6	20	2	6'-6	20	2	6'-6	20	2	6'-6	20	2	6'-6	20	6s2
6s3	WING SLOPE, BOTH F. LONG		2	23'-10	72	2	20'-3	61	2	16'-9	50	2	13'-2	40	2	34'-7	104	2	31'-0	93	2	27'-5	82	6s3
6s4	WING SLOPE, BOTH F. SHORT		2	21'-6	65	2	18'-4	55	2	15'-2	46	2	12'-0	36	2	31'-0	93	2	27'-10	84	2	24'-8	74	6s4
6s5	WING SLOPE, F.F. LONG		1	28'-1	42	1	24'-6	37	1	20'-11	31	1	17'-4	26	1	38'-9	58	1	35'-2	53	1	31'-8	48	6s5
6s6	WING SLOPE, F.F. SHORT		1	25'-4	38	1	22'-2	33	1	19'-0	29													



**BILL OF REINFORCING FOR ONE HEADWALL 15° SKEW CULVERT SPAN x CULVERT HEIGHT**

BAR	LOCATION	SHAPE	8' x 7'			8' x 6'			8' x 5'			8' x 4'			BAR		
			NO.	LENGTH	WT.	NO.	LENGTH	WT.	NO.	LENGTH	WT.	NO.	LENGTH	WT.			
5fa	FENCE ANCHOR (GALV.)		2	2'-10	6	2	2'-10	6	2	2'-10	6	2	2'-10	6	5fa		
4b1	WINGWALL, B.F.H. LONG		1	27'-11	19	1	24'-6	16	1	21'-0	14	1	17'-7	12	4b1		
4b2	WINGWALL, B.F.H. SHORT		1	24'-9	17	1	21'-9	15	1	18'-9	13	1	15'-9	11	4b2		
4b3	WINGWALL, B.F.H. LONG		5 VAR.	12'-7 TO 26'-4	65	4 VAR.	12'-7 TO 22'-11	47	3 VAR.	12'-7 TO 19'-6	32	2 VAR.	12'-7 TO 16'-0	19	4b3		
4b4	WINGWALL, B.F.H. SHORT		5 VAR.	11'-4 TO 23'-4	58	4 VAR.	11'-4 TO 20'-4	42	3 VAR.	11'-4 TO 17'-4	29	2 VAR.	11'-4 TO 14'-4	17	4b4		
5b5	WINGWALL, F.F.H. LONG		1	27'-11	29	1	24'-6	26	1	21'-1	22	1	17'-8	18	5b5		
5b6	WINGWALL, F.F.H. SHORT		1	24'-9	26	1	21'-9	23	1	18'-9	20	1	15'-9	16	5b6		
5b7	WINGWALL, F.F.H. LONG		6 VAR.	9'-3 TO 26'-4	111	5 VAR.	9'-3 TO 22'-11	84	4 VAR.	9'-3 TO 19'-6	60	3 VAR.	9'-2 TO 16'-1	40	5b7		
5b8	WINGWALL, F.F.H. SHORT		6 VAR.	8'-5 TO 23'-5	100	5 VAR.	8'-5 TO 20'-5	75	4 VAR.	8'-5 TO 17'-5	54	3 VAR.	8'-5 TO 14'-5	36	5b8		
5b9	INTERIOR WALL, BOTH F.H.		11 VAR.	5'-3 TO 17'-9	132	9 VAR.	5'-4 TO 15'-8	99	7 VAR.	5'-5 TO 13'-7	69	5 VAR.	5'-7 TO 11'-5	44	5b9		
4c1	WINGWALL, F.F.V. LONG		25 VAR.	2'-8 TO 9'-8	103	22 VAR.	2'-8 TO 8'-10	85	18 VAR.	2'-8 TO 7'-8	62	15 VAR.	2'-8 TO 6'-9	47	4c1		
4c2	WINGWALL, F.F.V. SHORT		22 VAR.	2'-8 TO 9'-8	91	19 VAR.	2'-8 TO 8'-8	72	16 VAR.	2'-8 TO 7'-8	55	13 VAR.	2'-8 TO 6'-8	41	4c2		
4c3	WINGWALL, F.F.V. LONG		---	---	---	---	---	---	---	---	---	---	---	---	4c3		
4c4	WINGWALL, F.F.V. SHORT		---	---	---	---	---	---	---	---	---	---	---	---	4c4		
4c5	WINGWALL, F.F.V. LONG		2	8'-7	11	1	7'-7	5	2	6'-7	9	2	5'-7	7	4c5		
4c5	WINGWALL, F.F.V. SHORT		2	8'-7	11	2	7'-7	10	2	6'-7	9	2	5'-7	7	4c5		
4c6	INTERIOR WALL, BOTH F.V.		2	1'-7	2	2	1'-7	2	2	1'-7	2	2	1'-6	2	4c6		
4c7	INTERIOR WALL, BOTH F.V.		28 VAR.	1'-9 TO 7'-2	83	24 VAR.	1'-9 TO 6'-2	63	20 VAR.	1'-9 TO 5'-3	47	16 VAR.	1'-8 TO 4'-3	32	4c7		
4c8	INTERIOR WALL, BOTH F.V.		2	7'-5	10	2	6'-5	9	2	5'-5	7	2	4'-5	6	4c8		
5c9	WINGWALL, B.F.V. LONG		9 VAR.	2'-8 TO 5'-0	36	9 VAR.	2'-8 TO 5'-0	36	9 VAR.	2'-8 TO 5'-0	36	9 VAR.	2'-8 TO 5'-0	36	5c9		
5c10	WINGWALL, B.F.V. SHORT		6 VAR.	2'-8 TO 4'-4	22	6 VAR.	2'-8 TO 4'-4	22	6 VAR.	2'-8 TO 4'-4	22	6 VAR.	2'-8 TO 4'-4	22	5c10		
5c11	WINGWALL, B.F.V. LONG		16 VAR.	9'-4 TO 13'-8	192	13 VAR.	9'-4 TO 12'-10	150	9 VAR.	9'-4 TO 11'-8	99	6 VAR.	9'-4 TO 10'-9	63	5c11		
5c12	WINGWALL, B.F.V. SHORT		16 VAR.	8'-8 TO 13'-8	186	13 VAR.	8'-8 TO 12'-8	145	10 VAR.	8'-8 TO 11'-8	106	7 VAR.	8'-8 TO 10'-8	71	5c12		
6c13	WINGWALL, B.F.V. LONG		10	10'-6	158	7	10'-6	110	---	---	---	---	---	---	6c13		
6c13	WINGWALL, B.F.V. SHORT		9	10'-6	142	6	10'-6	95	---	---	---	---	---	---	6c13		
5c14	WINGWALL, B.F.V. LONG		2	12'-7	26	1	11'-7	12	2	10'-7	22	2	9'-7	20	5c14		
5c14	WINGWALL, B.F.V. SHORT		2	12'-7	26	2	11'-7	24	2	10'-7	22	2	9'-7	20	5c14		
4d1	APRON, LONGIT., BOT.		11	18'-1	133	11	16'-0	118	11	13'-11	102	11	11'-11	88	4d1		
4d2	APRON, LONGIT., BOT. LONG		3	22'-7	45	3	19'-3	39	3	15'-11	32	3	12'-7	25	4d2		
4d3	APRON, LONGIT., BOT. SHORT		3	20'-2	40	3	17'-3	35	3	14'-4	29	3	11'-5	23	4d3		
6f1	APRON, LONGIT., TOP		16	18'-1	435	16	16'-0	385	16	13'-11	334	16	11'-11	286	6f1		
6f2	APRON, LONGIT., TOP LONG		4 VAR.	7'-7 TO 15'-3	69	4 VAR.	5'-6 TO 13'-2	56	3 VAR.	5'-11 TO 11'-1	38	3 VAR.	6'-5 TO 9'-0	23	6f2		
6f3	APRON, LONGIT., TOP SHORT		4 VAR.	6'-7 TO 15'-4	66	4 VAR.	4'-5 TO 13'-3	53	3 VAR.	5'-3 TO 11'-2	37	2 VAR.	6'-2 TO 9'-1	23	6f3		
6f4	APRON, LONGIT., TOP LONG		1	27'-11	42	1	24'-6	37	1	21'-1	32	1	17'-8	27	6f4		
6f5	APRON, LONGIT., TOP SHORT		1	24'-9	37	1	21'-9	33	1	18'-9	28	1	15'-9	24	6f5		
4i1	PARAPET, VERTICAL		33	6'-2	136	33	6'-2	136	33	6'-2	136	33	6'-2	136	4i1		
7j1	PARAPET, HORIZONTAL		4	18'-6	151	4	18'-6	151	4	18'-6	151	4	18'-6	151	7j1		
6m1	APRON, TRANS., TOP		4 VAR.	18'-9 TO 19'-4	114	4 VAR.	18'-9 TO 19'-4	114	4 VAR.	18'-9 TO 19'-4	114	4 VAR.	18'-9 TO 19'-4	114	6m1		
6m2	APRON, TRANS., TOP		15 VAR.	19'-7 TO 24'-10	500	12 VAR.	19'-7 TO 23'-8	390	9 VAR.	19'-7 TO 22'-7	285	6 VAR.	19'-7 TO 21'-5	185	6m2		
6m3	APRON, TRANS., TOP		6 VAR.	4'-5 TO 17'-6	99	6 VAR.	4'-6 TO 17'-7	100	6 VAR.	4'-8 TO 17'-8	101	6 VAR.	4'-9 TO 17'-10	102	6m3		
6m4	APRON, TRANS., BOT.		14 VAR.	12'-11 TO 19'-11	345	12 VAR.	12'-11 TO 18'-10	286	10 VAR.	12'-11 TO 17'-9	230	8 VAR.	12'-11 TO 16'-8	178	6m4		
6p1	CURTAIN, HORIZONTAL		4	17'-7	106	4	17'-7	106	4	17'-7	106	4	17'-7	106	6p1		
6p2	CURTAIN, HORIZONTAL LONG		4	14'-2	85	4	12'-8	76	4	11'-2	67	4	9'-8	58	6p2		
6p3	CURTAIN, HORIZONTAL SHORT		4	11'-3	68	4	10'-2	61	4	9'-1	55	4	7'-11	48	6p3		
6s1	WING SLOPE, BOTH F. LONG		2	6'-11	21	2	6'-11	21	2	6'-11	21	2	6'-11	21	6s1		
6s2	WING SLOPE, BOTH F. SHORT		2	6'-6	20	2	6'-6	20	2	6'-6	20	2	6'-6	20	6s2		
6s3	WING SLOPE, BOTH F. LONG		2	23'-10	72	2	20'-3	61	2	16'-9	50	2	13'-2	40	6s3		
6s4	WING SLOPE, BOTH F. SHORT		2	21'-6	65	2	18'-4	55	2	15'-2	46	2	12'-0	36	6s4		
6s5	WING SLOPE, F.F. LONG		1	28'-1	42	1	24'-6	37	1	20'-11	31	1	17'-4	26	6s5		
6s6	WING SLOPE, F.F. SHORT		1	25'-4	38	1	22'-2	33	1	19'-0	29	1	15'-10	24	6s6		
6s7	INTERIOR WALL, BOTH F.H.		2	18'-11	57	2	16'-8	50	2	14'-4	43	2	12'-1	36	6s7		
5t1	CURTAIN, VERTICAL		24	6'-8	167	22	6'-5	147	20	6'-5	134	18	6'-5	120	5t1		
ESTIMATED QUANTITIES ONE HEADWALL			REINF. STEEL			4615 LB			3873 LB			3068 LB			2513 LB		
			CONCRETE			2.1			2.1			2.1			2.1		
			PARAPET Δ			2.1			2.1			2.1			2.1		
			WINGWALLS			8.6			6.6			4.9			3.3		
			FOOTING *			22.4			18.8			15.9			13.1		
			33.1 CY			27.5 CY			22.9 CY			18.5 CY					

**BENT BAR DETAILS**



Δ INCLUDES TOP OF WINGWALL QUANTITIES.  
\* ASSUMES APRON AND FLOOR ARE EQUAL THICKNESS, ADJUST CONCRETE QUANTITIES FOR TRANSITION WHERE APRON AND FLOOR THICKNESS ARE NOT EQUAL.

NOTE:  
WEIGHT OF BARS OVER 40'-0 LONG INCLUDES AN ALLOWANCE OF 2'-3 FOR LAP. LENGTHS SHOWN FOR BARS OVER 40'-0 LONG DO NOT INCLUDE LAP.

"SHORT" DENOTES SHORT WINGWALL  
"LONG" DENOTES LONG WINGWALL

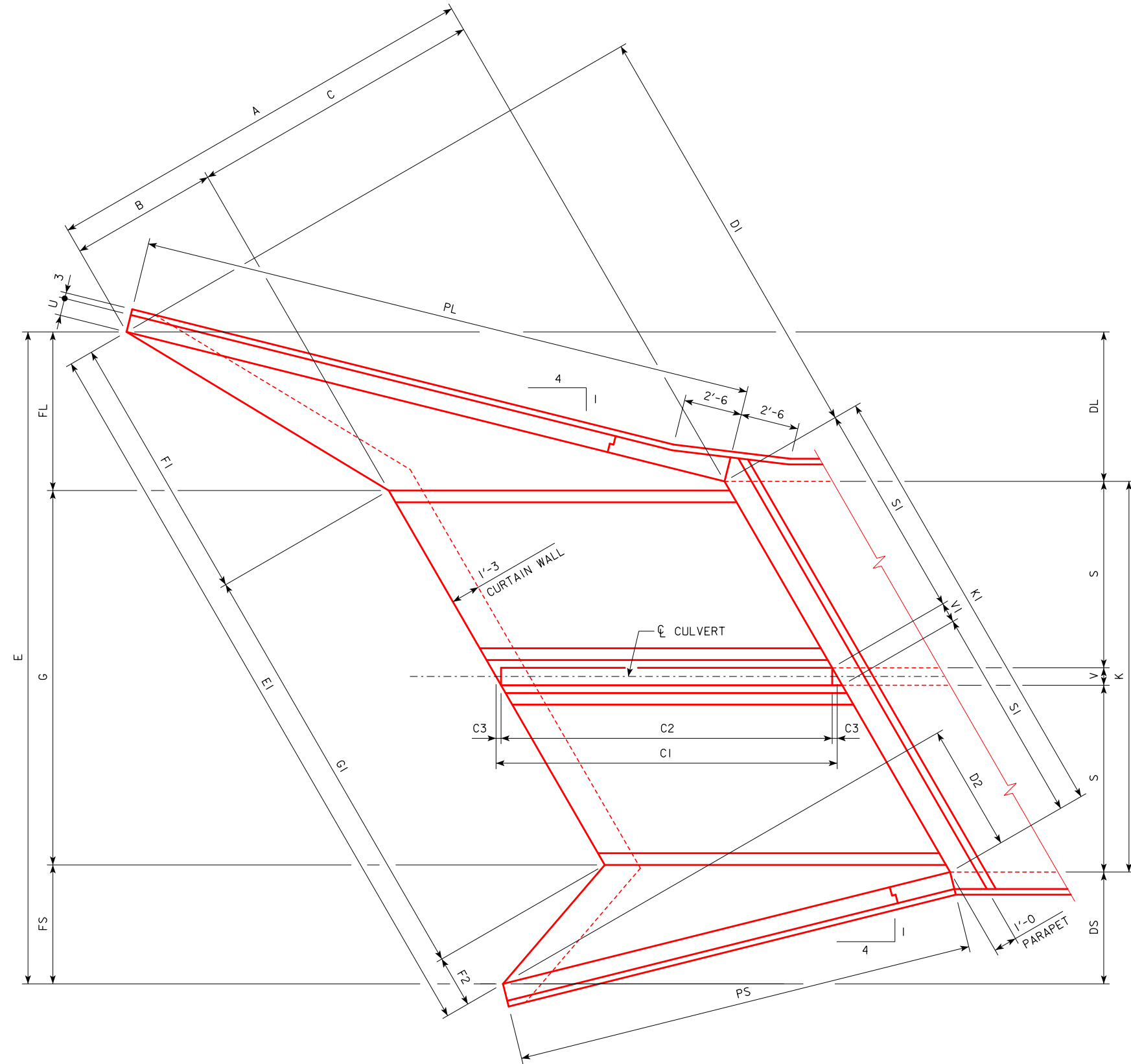
**HEADWALL NOTES:**

- SEE DRAWING TWRCB G1-12 FOR GENERAL INFORMATION, SPECIFICATIONS, AND DESIGN STRESSES.
- THIS HEADWALL IS BASED ON A 3:1 SLOPE NORMAL TO CENTERLINE OF ROADWAY.
- THE SIDES OF THE FOOTING ARE TO BE FORMED TO INSURE CORRECT LINE AND GRADE.
- ALL SLAB AND FLOOR REINFORCING STEEL IS TO BE SUPPORTED BY BAR CHAIRS AT INTERVALS OF NOT MORE THAN 3'-0 IN EITHER DIRECTION AS OUTLINED IN THE STANDARD SPECIFICATIONS.
- CLEAR DISTANCE FROM FACE OF CONCRETE TO NEAR REINFORCING BAR IS TO BE 2" UNLESS OTHERWISE NOTED OR SHOWN. CLEARANCE TO THE BOTTOM ENDS OF VERTICAL BARS SHALL BE 3 INCHES.
- CONCRETE QUANTITIES ARE ESTIMATED FROM BACK OF PARAPET.
- HORIZONTAL TAILS OF BARS "b" & "s" ESTIMATED TO EXTEND 2'-0 BEYOND BACK OF PARAPET (INTO END OF BARREL). LONGITUDINAL BARS "d", "6f1", AND "6f3" ESTIMATED TO PROJECT INTO END SECTION OF BARREL A MINIMUM OF 2'-0 BEYOND BACK OF PARAPET.
- THE "LENGTH" COLUMN REFLECTS TOTAL NUMBER OF FEET NECESSARY TO MEET THESE REQUIREMENTS.

LATEST REVISION DATE	<i>Thomas L. Mc Donald</i> APPROVED BY BRIDGE ENGINEER	<b>IOWADOT</b> Highway Division	
		STANDARD DESIGN	
		TWIN REINFORCED CONCRETE BOX CULVERTS APRIL, 2012	
FLARED WING HEADWALLS		TWH 15-9-12	
15° SKEW			

ENGLISH.LRFD.SIGNED.TWIN.CULVERTS.DGN - TWH 15-9-12 - THIS SHEET ISSUED 04-12.

REVISED 12-2016: REMOVED NOTE STATING LOCATION FOR HEADWALL NOTES.  
 ENGLISHLRFDSTWNCULVERTS.DGN - TWH 30-1-12 - THIS SHEET ISSUED 04-12.



PLAN VIEW

**NOTES:**

1. SEE SHEET TWRCB G1-12 FOR GENERAL INFORMATION, SPECIFICATIONS, AND DESIGN STRESSES.
2. SEE SHEET TWH 30-2-12 FOR DIMENSION TABLE.

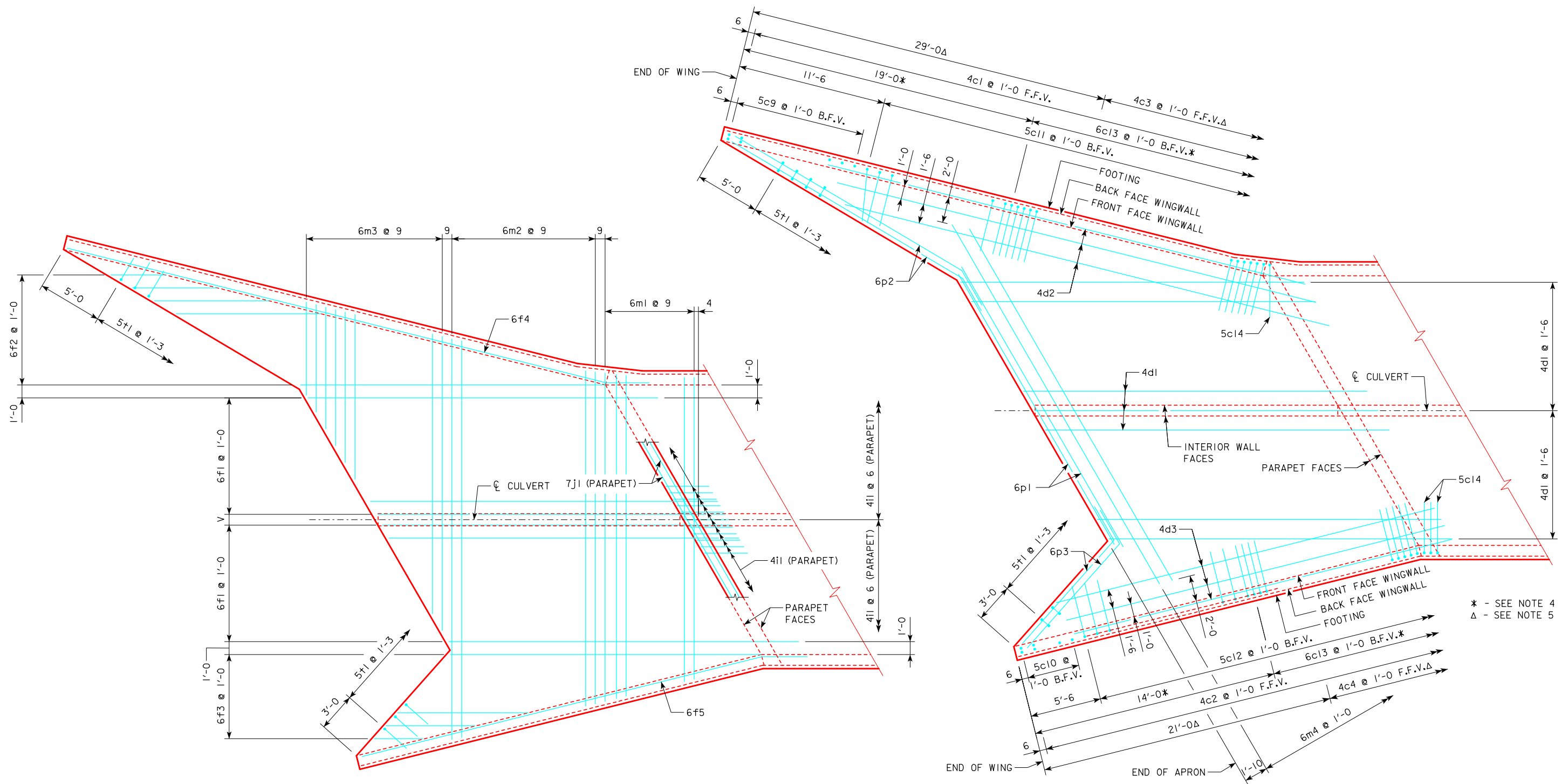
12-2016 LATEST REVISION DATE  <i>Thomas L. Mc Donald</i> APPROVED BY BRIDGE ENGINEER		
	STANDARD DESIGN <b>TWIN REINFORCED CONCRETE                  BOX CULVERTS</b> APRIL, 2012	
	<b>FLARED WING                  HEADWALLS</b> 30° SKEW	<b>TWH 30-1-12</b>

REVISED 12-2016: REMOVED NOTE STATING LOCATION FOR HEADWALL NOTES. ENGLISHLRFDSIGNEDTWINCULVERTS.DGN - TWH 30-2-12 - THIS SHEET ISSUED 04-12.

### DIMENSION TABLE

S X H	12' X 12'	12' X 11'	12' X 10'	12' X 9'	12' X 8'	12' X 7'	12' X 6'	12' X 5'	12' X 4'	10' X 12'	10' X 11'	10' X 10'	10' X 9'	10' X 8'	10' X 7'	10' X 6'	10' X 5'	10' X 4'	8' X 10'	8' X 9'	8' X 8'	8' X 7'	8' X 6'	8' X 5'	8' X 4'	S X H
A	37'-0	34'-0	31'-0	28'-0	25'-0	22'-0	19'-0	16'-0	13'-0	37'-0	34'-0	31'-0	28'-0	25'-0	22'-0	19'-0	16'-0	13'-0	31'-0	28'-0	25'-0	22'-0	19'-0	16'-0	13'-0	A
B	12'-4	11'-4	10'-4	9'-4	8'-4	7'-4	6'-4	5'-4	4'-4	12'-4	11'-4	10'-4	9'-4	8'-4	7'-4	6'-4	5'-4	4'-4	10'-4	9'-4	8'-4	7'-4	6'-4	5'-4	4'-4	B
C	24'-8	22'-8	20'-8	18'-8	16'-8	14'-8	12'-8	10'-8	8'-8	24'-8	22'-8	20'-8	18'-8	16'-8	14'-8	12'-8	10'-8	8'-8	20'-8	18'-8	16'-8	14'-8	12'-8	10'-8	8'-8	C
C1	28'-5 <sup>3</sup> / <sub>8</sub>	26'-2 <sup>1</sup> / <sub>8</sub>	23'-10 <sup>3</sup> / <sub>8</sub>	21'-6 <sup>5</sup> / <sub>8</sub>	19'-3	16'-11 <sup>1</sup> / <sub>4</sub>	14'-7 <sup>1</sup> / <sub>2</sub>	12'-3 <sup>3</sup> / <sub>4</sub>	10'-0 <sup>1</sup> / <sub>8</sub>	28'-5 <sup>3</sup> / <sub>8</sub>	26'-2 <sup>1</sup> / <sub>8</sub>	23'-10 <sup>3</sup> / <sub>8</sub>	21'-6 <sup>5</sup> / <sub>8</sub>	19'-3	16'-11 <sup>1</sup> / <sub>4</sub>	14'-7 <sup>1</sup> / <sub>2</sub>	12'-3 <sup>3</sup> / <sub>4</sub>	10'-0 <sup>1</sup> / <sub>8</sub>	23'-10 <sup>3</sup> / <sub>8</sub>	21'-6 <sup>5</sup> / <sub>8</sub>	19'-3	16'-11 <sup>1</sup> / <sub>4</sub>	14'-7 <sup>1</sup> / <sub>2</sub>	12'-3 <sup>3</sup> / <sub>4</sub>	10'-0 <sup>1</sup> / <sub>8</sub>	C1
C2	27'-10 <sup>7</sup> / <sub>8</sub>	25'-7 <sup>3</sup> / <sub>4</sub>	23'-4 <sup>5</sup> / <sub>8</sub>	21'-0 <sup>7</sup> / <sub>8</sub>	18'-9 <sup>1</sup> / <sub>8</sub>	16'-6	14'-2 <sup>3</sup> / <sub>8</sub>	11'-10 <sup>5</sup> / <sub>8</sub>	9'-6 <sup>7</sup> / <sub>8</sub>	27'-10 <sup>7</sup> / <sub>8</sub>	25'-7 <sup>3</sup> / <sub>4</sub>	23'-4 <sup>5</sup> / <sub>8</sub>	21'-0 <sup>7</sup> / <sub>8</sub>	18'-9 <sup>1</sup> / <sub>8</sub>	16'-6	14'-2 <sup>3</sup> / <sub>8</sub>	11'-10 <sup>5</sup> / <sub>8</sub>	9'-6 <sup>7</sup> / <sub>8</sub>	23'-4 <sup>5</sup> / <sub>8</sub>	21'-0 <sup>7</sup> / <sub>8</sub>	18'-9 <sup>1</sup> / <sub>8</sub>	16'-6	14'-2 <sup>3</sup> / <sub>8</sub>	11'-10 <sup>5</sup> / <sub>8</sub>	9'-6 <sup>7</sup> / <sub>8</sub>	C2
C3	0'-3 <sup>1</sup> / <sub>2</sub>	0'-3 <sup>1</sup> / <sub>8</sub>	0'-2 <sup>1</sup> / <sub>8</sub>	0'-2 <sup>1</sup> / <sub>8</sub>	0'-2 <sup>1</sup> / <sub>8</sub>	0'-2 <sup>1</sup> / <sub>8</sub>	0'-2 <sup>1</sup> / <sub>8</sub>	0'-2 <sup>1</sup> / <sub>8</sub>	0'-2 <sup>1</sup> / <sub>8</sub>	0'-3 <sup>1</sup> / <sub>2</sub>	0'-3 <sup>1</sup> / <sub>8</sub>	0'-2 <sup>1</sup> / <sub>8</sub>	0'-2 <sup>1</sup> / <sub>8</sub>	0'-2 <sup>1</sup> / <sub>8</sub>	0'-2 <sup>1</sup> / <sub>8</sub>	0'-2 <sup>1</sup> / <sub>8</sub>	0'-2 <sup>1</sup> / <sub>8</sub>	0'-2 <sup>1</sup> / <sub>8</sub>	0'-2 <sup>1</sup> / <sub>8</sub>	0'-2 <sup>1</sup> / <sub>8</sub>	0'-2 <sup>1</sup> / <sub>8</sub>	0'-2 <sup>1</sup> / <sub>8</sub>	0'-2 <sup>1</sup> / <sub>8</sub>	0'-2 <sup>1</sup> / <sub>8</sub>	0'-2 <sup>1</sup> / <sub>8</sub>	C3
DL	12'-5 <sup>3</sup> / <sub>2</sub>	11'-5 <sup>1</sup> / <sub>8</sub>	10'-5 <sup>1</sup> / <sub>2</sub>	9'-5 <sup>1</sup> / <sub>8</sub>	8'-5 <sup>1</sup> / <sub>4</sub>	7'-5 <sup>1</sup> / <sub>8</sub>	6'-4 <sup>3</sup> / <sub>8</sub>	5'-4 <sup>3</sup> / <sub>8</sub>	4'-4 <sup>3</sup> / <sub>8</sub>	12'-5 <sup>3</sup> / <sub>2</sub>	11'-5 <sup>1</sup> / <sub>8</sub>	10'-5 <sup>1</sup> / <sub>2</sub>	9'-5 <sup>1</sup> / <sub>8</sub>	8'-5 <sup>1</sup> / <sub>4</sub>	7'-5 <sup>1</sup> / <sub>8</sub>	6'-4 <sup>3</sup> / <sub>8</sub>	5'-4 <sup>3</sup> / <sub>8</sub>	4'-4 <sup>3</sup> / <sub>8</sub>	10'-5 <sup>1</sup> / <sub>2</sub>	9'-5 <sup>1</sup> / <sub>8</sub>	8'-5 <sup>1</sup> / <sub>4</sub>	7'-5 <sup>1</sup> / <sub>8</sub>	6'-4 <sup>3</sup> / <sub>8</sub>	5'-4 <sup>3</sup> / <sub>8</sub>	4'-4 <sup>3</sup> / <sub>8</sub>	DL
DS	9'-4	8'-6 <sup>7</sup> / <sub>8</sub>	7'-9 <sup>1</sup> / <sub>8</sub>	7'-0 <sup>3</sup> / <sub>4</sub>	6'-3 <sup>5</sup> / <sub>8</sub>	5'-6 <sup>5</sup> / <sub>8</sub>	4'-9 <sup>1</sup> / <sub>2</sub>	4'-0 <sup>3</sup> / <sub>8</sub>	3'-3 <sup>3</sup> / <sub>8</sub>	9'-4	8'-6 <sup>7</sup> / <sub>8</sub>	7'-9 <sup>1</sup> / <sub>8</sub>	7'-0 <sup>3</sup> / <sub>4</sub>	6'-3 <sup>5</sup> / <sub>8</sub>	5'-6 <sup>5</sup> / <sub>8</sub>	4'-9 <sup>1</sup> / <sub>2</sub>	4'-0 <sup>3</sup> / <sub>8</sub>	3'-3 <sup>3</sup> / <sub>8</sub>	7'-9 <sup>1</sup> / <sub>8</sub>	7'-0 <sup>3</sup> / <sub>4</sub>	6'-3 <sup>5</sup> / <sub>8</sub>	5'-6 <sup>5</sup> / <sub>8</sub>	4'-9 <sup>1</sup> / <sub>2</sub>	4'-0 <sup>3</sup> / <sub>8</sub>	3'-3 <sup>3</sup> / <sub>8</sub>	DS
DI	35'-9 <sup>1</sup> / <sub>4</sub>	32'-10 <sup>1</sup> / <sub>2</sub>	29'-11 <sup>3</sup> / <sub>4</sub>	27'-0 <sup>7</sup> / <sub>8</sub>	24'-2 <sup>1</sup> / <sub>8</sub>	21'-3 <sup>1</sup> / <sub>4</sub>	18'-4 <sup>1</sup> / <sub>2</sub>	15'-5 <sup>5</sup> / <sub>8</sub>	12'-6 <sup>7</sup> / <sub>8</sub>	35'-9 <sup>1</sup> / <sub>4</sub>	32'-10 <sup>1</sup> / <sub>2</sub>	29'-11 <sup>3</sup> / <sub>4</sub>	27'-0 <sup>7</sup> / <sub>8</sub>	24'-2 <sup>1</sup> / <sub>8</sub>	21'-3 <sup>1</sup> / <sub>4</sub>	18'-4 <sup>1</sup> / <sub>2</sub>	15'-5 <sup>5</sup> / <sub>8</sub>	12'-6 <sup>7</sup> / <sub>8</sub>	29'-11 <sup>3</sup> / <sub>4</sub>	27'-0 <sup>7</sup> / <sub>8</sub>	24'-2 <sup>1</sup> / <sub>8</sub>	21'-3 <sup>1</sup> / <sub>4</sub>	18'-4 <sup>1</sup> / <sub>2</sub>	15'-5 <sup>5</sup> / <sub>8</sub>	12'-6 <sup>7</sup> / <sub>8</sub>	DI
D2	10'-7	9'-8 <sup>3</sup> / <sub>4</sub>	8'-10 <sup>3</sup> / <sub>8</sub>	8'-0 <sup>1</sup> / <sub>8</sub>	7'-1 <sup>7</sup> / <sub>8</sub>	6'-3 <sup>1</sup> / <sub>2</sub>	5'-5 <sup>1</sup> / <sub>4</sub>	4'-6 <sup>1</sup> / <sub>8</sub>	3'-8 <sup>5</sup> / <sub>8</sub>	10'-7	9'-8 <sup>3</sup> / <sub>4</sub>	8'-10 <sup>3</sup> / <sub>8</sub>	8'-0 <sup>1</sup> / <sub>8</sub>	7'-1 <sup>7</sup> / <sub>8</sub>	6'-3 <sup>1</sup> / <sub>2</sub>	5'-5 <sup>1</sup> / <sub>4</sub>	4'-6 <sup>1</sup> / <sub>8</sub>	3'-8 <sup>5</sup> / <sub>8</sub>	8'-10 <sup>3</sup> / <sub>8</sub>	8'-0 <sup>1</sup> / <sub>8</sub>	7'-1 <sup>7</sup> / <sub>8</sub>	6'-3 <sup>1</sup> / <sub>2</sub>	5'-5 <sup>1</sup> / <sub>4</sub>	4'-6 <sup>1</sup> / <sub>8</sub>	3'-8 <sup>5</sup> / <sub>8</sub>	D2
E	46'-9 <sup>3</sup> / <sub>4</sub>	44'-11 <sup>5</sup> / <sub>8</sub>	43'-1 <sup>1</sup> / <sub>8</sub>	41'-4 <sup>1</sup> / <sub>8</sub>	39'-6 <sup>7</sup> / <sub>8</sub>	37'-8 <sup>3</sup> / <sub>8</sub>	35'-11 <sup>3</sup> / <sub>8</sub>	34'-2 <sup>1</sup> / <sub>4</sub>	32'-5	42'-9 <sup>3</sup> / <sub>4</sub>	40'-11 <sup>5</sup> / <sub>8</sub>	39'-1 <sup>1</sup> / <sub>8</sub>	37'-4 <sup>1</sup> / <sub>8</sub>	35'-6 <sup>7</sup> / <sub>8</sub>	33'-8 <sup>3</sup> / <sub>8</sub>	31'-11 <sup>3</sup> / <sub>8</sub>	30'-2 <sup>1</sup> / <sub>4</sub>	28'-5	35'-1 <sup>1</sup> / <sub>8</sub>	33'-4 <sup>1</sup> / <sub>8</sub>	31'-6 <sup>7</sup> / <sub>8</sub>	29'-8 <sup>3</sup> / <sub>8</sub>	27'-11 <sup>3</sup> / <sub>8</sub>	26'-2 <sup>1</sup> / <sub>4</sub>	24'-5	E
E1	54'-0 <sup>3</sup> / <sub>4</sub>	51'-11	49'-9 <sup>3</sup> / <sub>8</sub>	47'-8 <sup>7</sup> / <sub>8</sub>	45'-8 <sup>3</sup> / <sub>8</sub>	43'-6 <sup>3</sup> / <sub>4</sub>	41'-6 <sup>1</sup> / <sub>8</sub>	39'-5 <sup>5</sup> / <sub>8</sub>	37'-5 <sup>1</sup> / <sub>8</sub>	49'-5 <sup>1</sup> / <sub>4</sub>	47'-3 <sup>5</sup> / <sub>8</sub>	45'-2	43'-1 <sup>1</sup> / <sub>2</sub>	41'-0 <sup>7</sup> / <sub>8</sub>	38'-11 <sup>1</sup> / <sub>4</sub>	36'-10 <sup>3</sup> / <sub>4</sub>	34'-10 <sup>1</sup> / <sub>4</sub>	32'-9 <sup>3</sup> / <sub>4</sub>	40'-6 <sup>1</sup> / <sub>2</sub>	38'-6	36'-5 <sup>1</sup> / <sub>2</sub>	34'-3 <sup>7</sup> / <sub>8</sub>	32'-3 <sup>3</sup> / <sub>8</sub>	30'-2 <sup>1</sup> / <sub>8</sub>	28'-2 <sup>1</sup> / <sub>4</sub>	E1
FL	12'-9 <sup>3</sup> / <sub>4</sub>	11'-9 <sup>5</sup> / <sub>8</sub>	10'-9 <sup>1</sup> / <sub>2</sub>	9'-9 <sup>3</sup> / <sub>8</sub>	8'-9 <sup>1</sup> / <sub>4</sub>	7'-9 <sup>1</sup> / <sub>8</sub>	6'-8 <sup>7</sup> / <sub>8</sub>	5'-8 <sup>3</sup> / <sub>4</sub>	4'-8 <sup>5</sup> / <sub>8</sub>	12'-9 <sup>3</sup> / <sub>4</sub>	11'-9 <sup>5</sup> / <sub>8</sub>	10'-9 <sup>1</sup> / <sub>2</sub>	9'-9 <sup>3</sup> / <sub>8</sub>	8'-9 <sup>1</sup> / <sub>4</sub>	7'-9 <sup>1</sup> / <sub>8</sub>	6'-8 <sup>7</sup> / <sub>8</sub>	5'-8 <sup>3</sup> / <sub>4</sub>	4'-8 <sup>5</sup> / <sub>8</sub>	10'-9 <sup>1</sup> / <sub>2</sub>	9'-9 <sup>3</sup> / <sub>8</sub>	8'-9 <sup>1</sup> / <sub>4</sub>	7'-9 <sup>1</sup> / <sub>8</sub>	6'-8 <sup>7</sup> / <sub>8</sub>	5'-8 <sup>3</sup> / <sub>4</sub>	4'-8 <sup>5</sup> / <sub>8</sub>	FL
FS	9'-8	8'-10 <sup>1</sup> / <sub>8</sub>	8'-1 <sup>1</sup> / <sub>8</sub>	7'-4 <sup>3</sup> / <sub>8</sub>	6'-7 <sup>5</sup> / <sub>8</sub>	5'-10 <sup>3</sup> / <sub>8</sub>	5'-1 <sup>1</sup> / <sub>2</sub>	4'-4 <sup>3</sup> / <sub>8</sub>	3'-7 <sup>3</sup> / <sub>8</sub>	9'-8	8'-10 <sup>1</sup> / <sub>8</sub>	8'-1 <sup>1</sup> / <sub>8</sub>	7'-4 <sup>3</sup> / <sub>8</sub>	6'-7 <sup>5</sup> / <sub>8</sub>	5'-10 <sup>3</sup> / <sub>8</sub>	5'-1 <sup>1</sup> / <sub>2</sub>	4'-4 <sup>3</sup> / <sub>8</sub>	3'-7 <sup>3</sup> / <sub>8</sub>	8'-1 <sup>1</sup> / <sub>8</sub>	7'-4 <sup>3</sup> / <sub>8</sub>	6'-7 <sup>5</sup> / <sub>8</sub>	5'-10 <sup>3</sup> / <sub>8</sub>	5'-1 <sup>1</sup> / <sub>2</sub>	4'-4 <sup>3</sup> / <sub>8</sub>	3'-7 <sup>3</sup> / <sub>8</sub>	FS
F1	21'-11	20'-2 <sup>1</sup> / <sub>8</sub>	18'-5 <sup>1</sup> / <sub>8</sub>	16'-8 <sup>1</sup> / <sub>8</sub>	14'-11 <sup>1</sup> / <sub>4</sub>	13'-2 <sup>1</sup> / <sub>4</sub>	11'-5 <sup>3</sup> / <sub>8</sub>	9'-8 <sup>3</sup> / <sub>8</sub>	7'-11 <sup>3</sup> / <sub>8</sub>	21'-11	20'-2 <sup>1</sup> / <sub>8</sub>	18'-5 <sup>1</sup> / <sub>8</sub>	16'-8 <sup>1</sup> / <sub>8</sub>	14'-11 <sup>1</sup> / <sub>4</sub>	13'-2 <sup>1</sup> / <sub>4</sub>	11'-5 <sup>3</sup> / <sub>8</sub>	9'-8 <sup>3</sup> / <sub>8</sub>	7'-11 <sup>3</sup> / <sub>8</sub>	18'-5 <sup>1</sup> / <sub>8</sub>	16'-8 <sup>1</sup> / <sub>8</sub>	14'-11 <sup>1</sup> / <sub>4</sub>	13'-2 <sup>1</sup> / <sub>4</sub>	11'-5 <sup>3</sup> / <sub>8</sub>	9'-8 <sup>3</sup> / <sub>8</sub>	7'-11 <sup>3</sup> / <sub>8</sub>	F1
F2	4'-0 <sup>1</sup> / <sub>2</sub>	3'-9	3'-5 <sup>3</sup> / <sub>8</sub>	3'-1 <sup>7</sup> / <sub>8</sub>	2'-10 <sup>1</sup> / <sub>4</sub>	2'-6 <sup>3</sup> / <sub>4</sub>	2'-3 <sup>1</sup> / <sub>8</sub>	1'-11 <sup>5</sup> / <sub>8</sub>	1'-8	4'-0 <sup>1</sup> / <sub>2</sub>	3'-9	3'-5 <sup>3</sup> / <sub>8</sub>	3'-1 <sup>7</sup> / <sub>8</sub>	2'-10 <sup>1</sup> / <sub>4</sub>	2'-6 <sup>3</sup> / <sub>4</sub>	2'-3 <sup>1</sup> / <sub>8</sub>	1'-11 <sup>5</sup> / <sub>8</sub>	1'-8	3'-5 <sup>3</sup> / <sub>8</sub>	3'-1 <sup>7</sup> / <sub>8</sub>	2'-10 <sup>1</sup> / <sub>4</sub>	2'-6 <sup>3</sup> / <sub>4</sub>	2'-3 <sup>1</sup> / <sub>8</sub>	1'-11 <sup>5</sup> / <sub>8</sub>	1'-8	F2
G	24'-4	24'-3	24'-2	24'-2	24'-2	24'-1	24'-1	24'-1	24'-1	20'-4	20'-3	20'-2	20'-2	20'-2	20'-1	20'-1	20'-1	20'-1	16'-2	16'-2	16'-2	16'-1	16'-1	16'-1	16'-1	G
G1	28'-1 <sup>1</sup> / <sub>8</sub>	28'-0	27'-10 <sup>7</sup> / <sub>8</sub>	27'-10 <sup>7</sup> / <sub>8</sub>	27'-10 <sup>7</sup> / <sub>8</sub>	27'-9 <sup>3</sup> / <sub>4</sub>	27'-9 <sup>3</sup> / <sub>4</sub>	27'-9 <sup>3</sup> / <sub>4</sub>	27'-9 <sup>3</sup> / <sub>4</sub>	23'-5 <sup>3</sup> / <sub>4</sub>	23'-4 <sup>5</sup> / <sub>8</sub>	23'-3 <sup>1</sup> / <sub>2</sub>	23'-3 <sup>1</sup> / <sub>2</sub>	23'-3 <sup>1</sup> / <sub>2</sub>	23'-2 <sup>1</sup> / <sub>4</sub>	23'-2 <sup>1</sup> / <sub>4</sub>	23'-2 <sup>1</sup> / <sub>4</sub>	23'-2 <sup>1</sup> / <sub>4</sub>	18'-8	18'-8	18'-8	18'-6 <sup>7</sup> / <sub>8</sub>	18'-6 <sup>7</sup> / <sub>8</sub>	18'-6 <sup>7</sup> / <sub>8</sub>	18'-6 <sup>7</sup> / <sub>8</sub>	G1
G2	29'-4	29'-2 <sup>3</sup> / <sub>4</sub>	29'-1 <sup>5</sup> / <sub>8</sub>	29'-1 <sup>1</sup> / <sub>2</sub>	29'-1 <sup>1</sup> / <sub>2</sub>	29'-0 <sup>1</sup> / <sub>4</sub>	29'-0 <sup>1</sup> / <sub>4</sub>	29'-0 <sup>1</sup> / <sub>4</sub>	28'-11 <sup>7</sup> / <sub>8</sub>	24'-8 <sup>1</sup> / <sub>2</sub>	24'-7 <sup>3</sup> / <sub>8</sub>	24'-6 <sup>1</sup> / <sub>8</sub>	24'-6 <sup>1</sup> / <sub>8</sub>	24'-6	24'-4 <sup>7</sup> / <sub>8</sub>	24'-4 <sup>3</sup> / <sub>8</sub>	24'-4 <sup>3</sup> / <sub>8</sub>	24'-4 <sup>3</sup> / <sub>8</sub>	19'-10 <sup>3</sup> / <sub>4</sub>	19'-10 <sup>3</sup> / <sub>4</sub>	19'-10 <sup>3</sup> / <sub>4</sub>	19'-9 <sup>3</sup> / <sub>8</sub>	19'-9 <sup>3</sup> / <sub>8</sub>	19'-9 <sup>3</sup> / <sub>8</sub>	19'-9 <sup>3</sup> / <sub>8</sub>	G2
G3	25'-1 <sup>3</sup> / <sub>4</sub>	23'-1 <sup>3</sup> / <sub>8</sub>	21'-1 <sup>1</sup> / <sub>2</sub>	19'-1 <sup>1</sup> / <sub>8</sub>	17'-1 <sup>1</sup> / <sub>4</sub>	15'-1 <sup>1</sup> / <sub>8</sub>	13'-1	11'-0 <sup>3</sup> / <sub>4</sub>	9'-0 <sup>5</sup> / <sub>8</sub>	25'-1 <sup>3</sup> / <sub>4</sub>	23'-1 <sup>3</sup> / <sub>8</sub>	21'-1 <sup>1</sup> / <sub>2</sub>	19'-1 <sup>1</sup> / <sub>8</sub>	17'-1 <sup>1</sup> / <sub>4</sub>	15'-1 <sup>1</sup> / <sub>8</sub>	13'-1	11'-0 <sup>3</sup> / <sub>4</sub>	9'-0 <sup>5</sup> / <sub>8</sub>	21'-1 <sup>1</sup> / <sub>2</sub>	19'-1 <sup>1</sup> / <sub>8</sub>	17'-1 <sup>1</sup> / <sub>4</sub>	15'-1 <sup>1</sup> / <sub>8</sub>	13'-1	11'-0 <sup>3</sup> / <sub>4</sub>	9'-0 <sup>5</sup> / <sub>8</sub>	G3
G4	25'-7 <sup>7</sup> / <sub>8</sub>	23'-4 <sup>1</sup> / <sub>4</sub>	21'-0 <sup>5</sup> / <sub>8</sub>	19'-0 <sup>1</sup> / <sub>2</sub>	17'-0 <sup>3</sup> / <sub>8</sub>	14'-8 <sup>3</sup> / <sub>8</sub>	12'-8 <sup>3</sup> / <sub>4</sub>	10'-8 <sup>3</sup> / <sub>4</sub>	8'-8 <sup>3</sup> / <sub>4</sub>	25'-7 <sup>7</sup> / <sub>8</sub>	23'-4 <sup>1</sup> / <sub>4</sub>	21'-0 <sup>5</sup> / <sub>8</sub>	19'-0 <sup>1</sup> / <sub>2</sub>	17'-0 <sup>3</sup> / <sub>8</sub>	14'-8 <sup>3</sup> / <sub>8</sub>	12'-8 <sup>3</sup> / <sub>4</sub>	10'-8 <sup>3</sup> / <sub>4</sub>	8'-8 <sup>3</sup> / <sub>4</sub>	21'-0 <sup>5</sup> / <sub>8</sub>	19'-0 <sup>1</sup> / <sub>2</sub>	17'-0 <sup>3</sup> / <sub>8</sub>	14'-8 <sup>3</sup> / <sub>8</sub>	12'-8 <sup>3</sup> / <sub>4</sub>	10'-8 <sup>3</sup> / <sub>4</sub>	8'-8 <sup>3</sup> / <sub>4</sub>	G4
G5	12'-11 <sup>3</sup> / <sub>4</sub>	11'-11 <sup>1</sup> / <sub>4</sub>	10'-10 <sup>3</sup> / <sub>4</sub>	9'-10 <sup>1</sup> / <sub>4</sub>	8'-9 <sup>3</sup> / <sub>4</sub>	7'-9 <sup>1</sup> / <sub>4</sub>	6'-8 <sup>3</sup> / <sub>4</sub>	5'-8 <sup>1</sup> / <sub>4</sub>	4'-7 <sup>3</sup> / <sub>4</sub>	12'-11 <sup>3</sup> / <sub>4</sub>	11'-11 <sup>1</sup> / <sub>4</sub>	10'-10 <sup>3</sup> / <sub>4</sub>	9'-10 <sup>1</sup> / <sub>4</sub>	8'-9 <sup>3</sup> / <sub>4</sub>	7'-9 <sup>1</sup> / <sub>4</sub>	6'-8 <sup>3</sup> / <sub>4</sub>	5'-8 <sup>1</sup> / <sub>4</sub>	4'-7 <sup>3</sup> / <sub>4</sub>	10'-10 <sup>3</sup> / <sub>4</sub>	9'-10 <sup>1</sup> / <sub>4</sub>	8'-9 <sup>3</sup> / <sub>4</sub>	7'-9 <sup>1</sup> / <sub>4</sub>	6'-8 <sup>3</sup> / <sub>4</sub>	5'-8 <sup>1</sup> / <sub>4</sub>	4'-7 <sup>3</sup> / <sub>4</sub>	G5
G6	14'-3 <sup>1</sup> / <sub>4</sub>	13'-0 <sup>7</sup> / <sub>8</sub>	11'-10 <sup>5</sup> / <sub>8</sub>	10'-10 <sup>1</sup> / <sub>8</sub>	9'-9 <sup>5</sup> / <sub>8</sub>	8'-7 <sup>3</sup> / <sub>8</sub>	7'-7	6'-6 <sup>1</sup> / <sub>2</sub>	5'-6 <sup>1</sup> / <sub>8</sub>	14'-3 <sup>1</sup> / <sub>4</sub>	13'-0 <sup>7</sup> / <sub>8</sub>	11'-10 <sup>5</sup> / <sub>8</sub>	10'-10 <sup>1</sup> / <sub>8</sub>	9'-9 <sup>5</sup> / <sub>8</sub>	8'-7 <sup>3</sup> / <sub>8</sub>	7'-7	6'-6 <sup>1</sup> / <sub>2</sub>	5'-6 <sup>1</sup> / <sub>8</sub>	11'-10 <sup>5</sup> / <sub>8</sub>	10'-10 <sup>1</sup> / <sub>8</sub>	9'-9 <sup>5</sup> / <sub>8</sub>	8'-7 <sup>3</sup> / <sub>8</sub>	7'-7	6'-6 <sup>1</sup> / <sub>2</sub>	5'-6 <sup>1</sup> / <sub>8</sub>	G6
G7	0'-2 <sup>1</sup> / <sub>4</sub>	0'-5 <sup>1</sup> / <sub>2</sub>	0'-8 <sup>1</sup> / <sub>8</sub>	0'-8 <sup>7</sup> / <sub>8</sub>	0'-8 <sup>7</sup> / <sub>8</sub>	1'-0 <sup>1</sup> / <sub>8</sub>	1'-0	1'-0	0'-11 <sup>7</sup> / <sub>8</sub>	0'-2 <sup>1</sup> / <sub>4</sub>	0'-5 <sup>1</sup> / <sub>2</sub>	0'-8 <sup>1</sup> / <sub>8</sub>	0'-8 <sup>7</sup> / <sub>8</sub>	0'-8 <sup>7</sup> / <sub>8</sub>	1'-0 <sup>1</sup> / <sub>8</sub>	1'-0	1'-0	0'-11 <sup>7</sup> / <sub>8</sub>	0'-8 <sup>7</sup> / <sub>8</sub>	0'-8 <sup>7</sup> / <sub>8</sub>	0'-8 <sup>7</sup> / <sub>8</sub>	1'-0 <sup>1</sup> / <sub>8</sub>	1'-0	1'-0	0'-11 <sup>7</sup> / <sub>8</sub>	G7
G8	0'-4 <sup>5</sup> / <sub>8</sub>	0'-6 <sup>1</sup> / <sub>8</sub>	0'-7 <sup>5</sup> / <sub>8</sub>	0'-7 <sup>5</sup> / <sub>8</sub>	0'-7 <sup>5</sup> / <sub>8</sub>	0'-9	0'-9	0'-9	0'-9	0'-4 <sup>5</sup> / <sub>8</sub>	0'-6 <sup>1</sup> / <sub>8</sub>	0'-7 <sup>5</sup> / <sub>8</sub>	0'-7 <sup>5</sup> / <sub>8</sub>	0'-7 <sup>5</sup> / <sub>8</sub>	0'-9	0'-9	0'-9	0'-9	0'-7 <sup>5</sup> / <sub>8</sub>	0'-7 <sup>5</sup> / <sub>8</sub>	0'-7 <sup>5</sup> / <sub>8</sub>	0'-9	0'-9	0'-9	0'-9	G8
K	25'-0	24'-11	24'-10	24'-10	24'-10	24'-9	24'-9	24'-9	24'-9	21'-0	20'-11	20'-10	20'-10	20'-10	20'-9	20'-9	20'-9	20'-9	16'-10	16'-10	16'-10	16'-9	16'-9	16'-9	16'-9	K
KI	28'-10 <sup>3</sup> / <sub>8</sub>	28'-9 <sup>1</sup> / <sub>4</sub>	28'-8 <sup>1</sup> / <sub>8</sub>	28'-8 <sup>1</sup> / <sub>8</sub>	28'-8 <sup>1</sup> / <sub></sub>																					

ENGLISHLRFDSIGNEDTWINCULVERTS.DGN - TWH 30-3-12 - THIS SHEET ISSUED 04-12.



PLAN VIEW - TOP OF APRON REINFORCING BARS

PLAN VIEW - BOTTOM OF APRON REINFORCING BARS

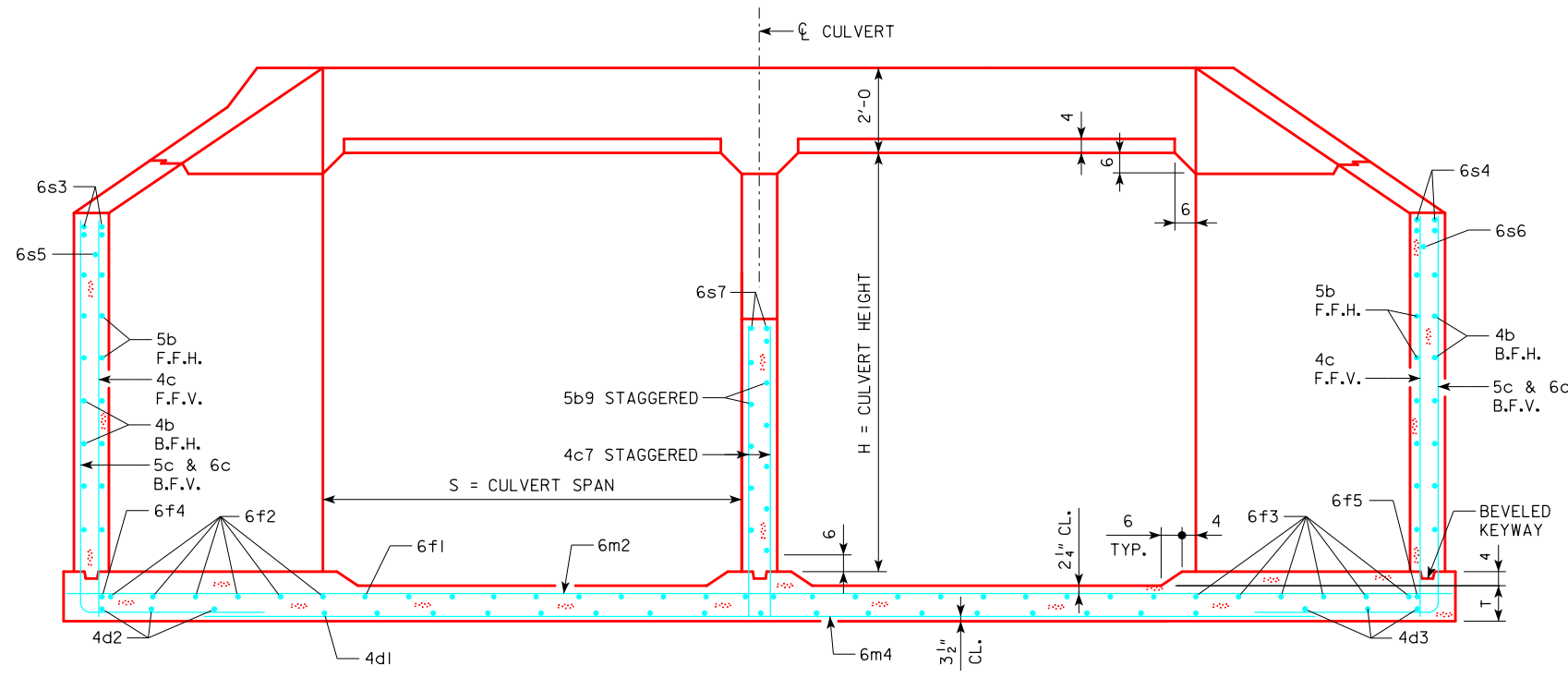
\* - SEE NOTE 4  
 Δ - SEE NOTE 5

- NOTES:**
1. BAR SPACINGS AND POSITIONS SHOWN ARE SIMILAR FOR ALL SIZES OF HEADWALLS IN THIS STANDARD.
  2. WINGWALL BARS CONSISTENTLY REFERENCED FROM END OF WING FOR ALL HEADWALLS.
  3. TOP TRANSVERSE FLOOR BARS ARE REFERENCED APPROXIMATELY 4" FROM THE BACK OF THE PARAPET FOR ALL HEADWALLS.
  4. THERE ARE NO 6c13 BARS IN THE 4' & 5' HEIGHT HEADWALLS.
  5. 4c3 & 4c4 BARS USED ONLY IN THE 9', 10', 11' & 12' HEIGHT HEADWALLS.
  6. FOR DIMENSION TABLE SEE SHEET TWH 30-2-12.
  7. FOR REINFORCING IN CURTAIN WALL SEE CURTAIN WALL DETAILS ON SHEET TWH 30-4-12.

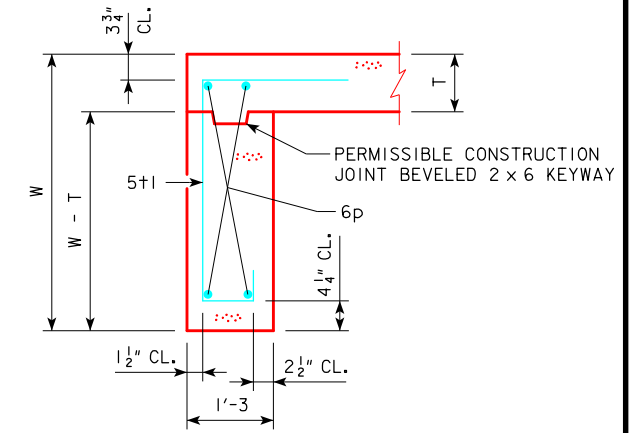
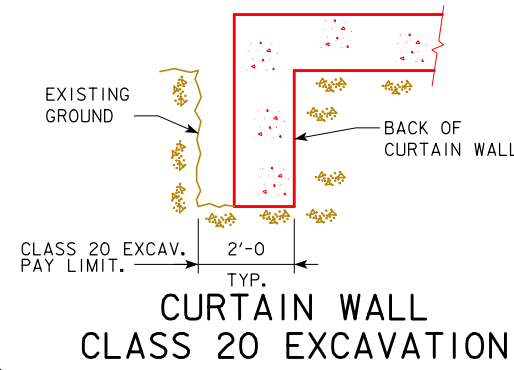
LATEST REVISION DATE	 APPROVED BY BRIDGE ENGINEER		
		STANDARD DESIGN <b>TWIN REINFORCED CONCRETE                  BOX CULVERTS</b> APRIL, 2012	
		<b>FLARED WING                  HEADWALLS</b> 30° SKEW	<b>TWH 30-3-12</b>



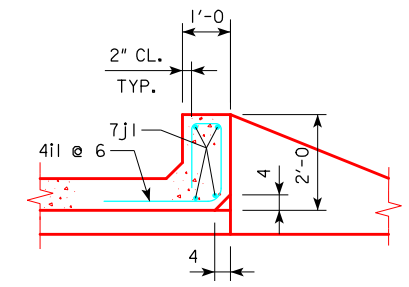
REVISED 12-2016: ADDED CURTAIN WALL CLASS 20 EXCAVATION DETAIL. ENGLISHLRFDDESIGNEDTWINCULVERTS.DGN - TWH 30-4-12 - THIS SHEET ISSUED 04-12.



TYPICAL SECTION - NEAR CENTER OF APRON

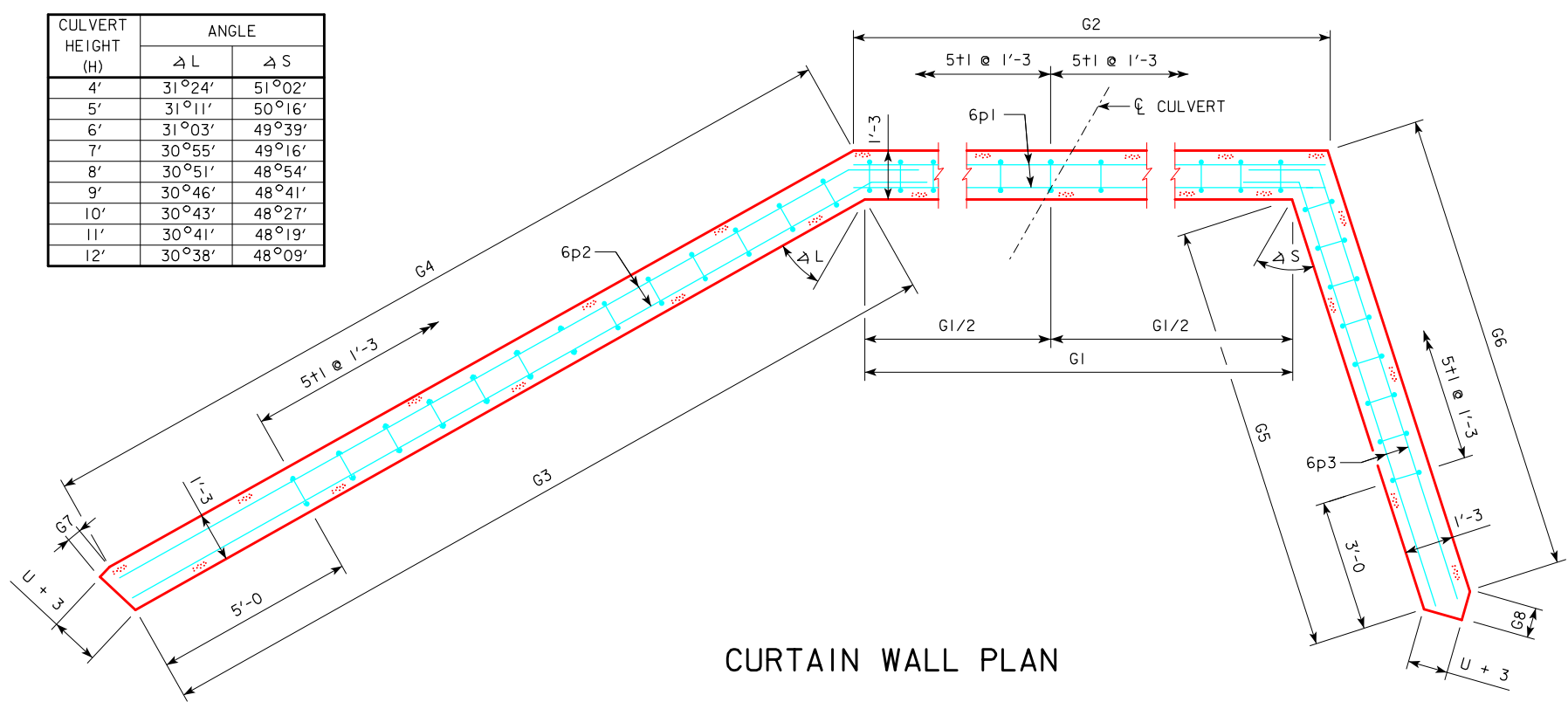


SECTION THRU CURTAIN WALL

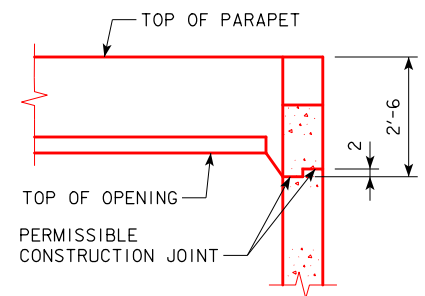


SECTION THRU PARAPET

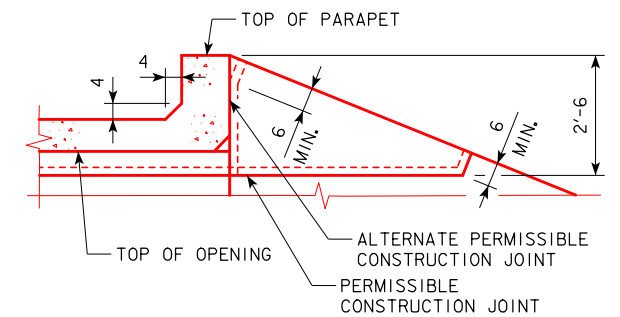
CULVERT HEIGHT (H)	ANGLE	
	$\Delta L$	$\Delta S$
4'	31°24'	51°02'
5'	31°11'	50°16'
6'	31°03'	49°39'
7'	30°55'	49°16'
8'	30°51'	48°54'
9'	30°46'	48°41'
10'	30°43'	48°27'
11'	30°41'	48°19'
12'	30°38'	48°09'



CURTAIN WALL PLAN



TOP OF WINGWALL DETAILS

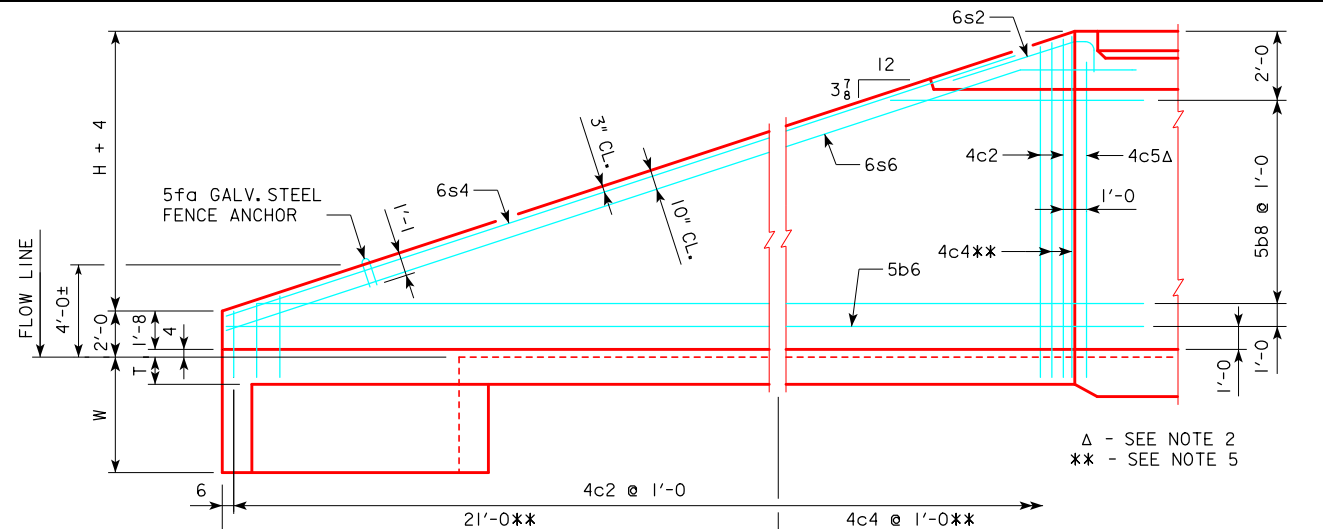


**NOTES:**

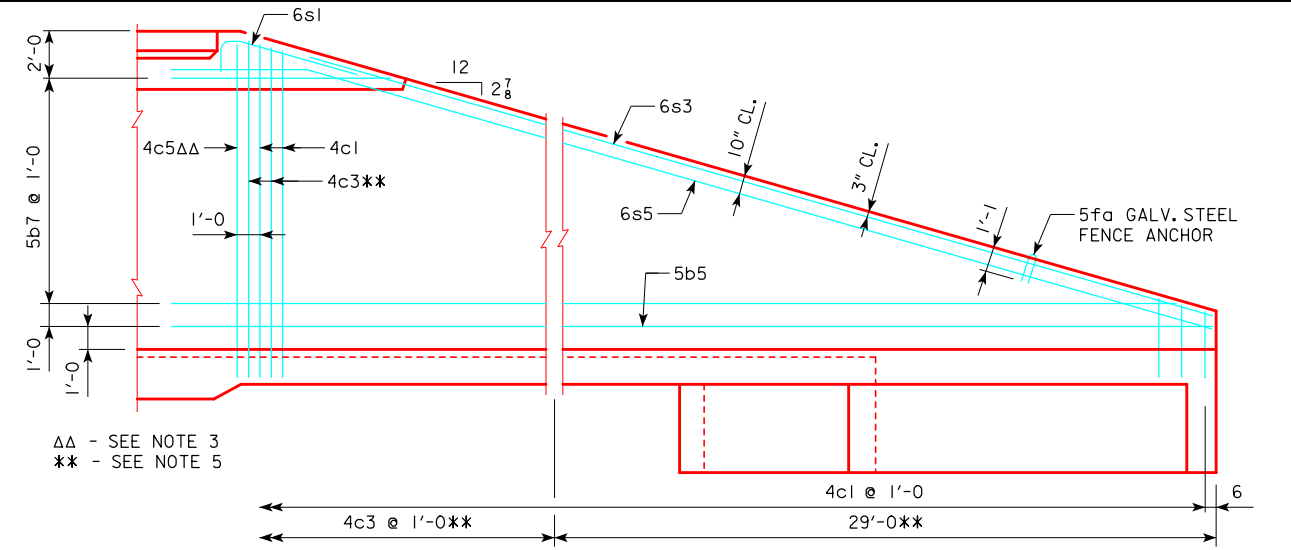
- SEE SHEET TWRCB G1-12 FOR GENERAL INFORMATION, SPECIFICATIONS, AND DESIGN STRESSES.
- FOR DIMENSION TABLE SEE SHEET TWH 30-2-12.

12-2016 LATEST REVISION DATE  <i>Thomas L. Mc Donald</i> APPROVED BY BRIDGE ENGINEER		
	STANDARD DESIGN <b>TWIN REINFORCED CONCRETE BOX CULVERTS</b> APRIL, 2012	
	<b>FLARED WING HEADWALLS</b> 30° SKEW	<b>TWH 30-4-12</b>

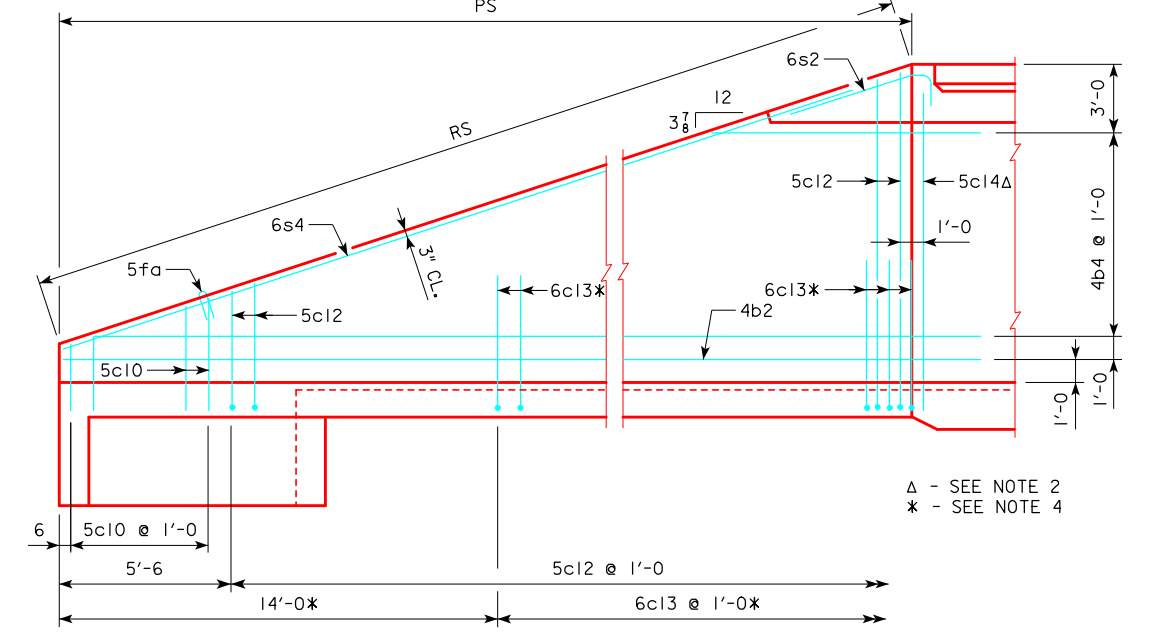
REVISED 05-13 - CHANGED DIMENSIONS WHEN TO BEGIN PLACING BARS 4c3, 4c4, 5c11, 5c12, & 6c13 IN WINGWALLS.  
 REVISED 07-2016 - REMOVED 1'-8" VERTICAL DIMENSION FROM 6s5 & 6s6 BARS TO TOP OF PARAPET. THIS ALLOWS FOR THE VARIABLE VERTICAL LOCATION OF THE HORIZONTAL LEG IN THE SLAB.  
 THIS VARIANCE IN LOCATION IS CAUSED BY THE DIFFERING WING SIZES OF DIFFERENT SIZED R.C.B. CULVERTS.  
 ENGLISHLRFDSDIGNEDTWINCULVERTS.DGN - TWH 30-5-12 - THIS SHEET ISSUED 04-12.



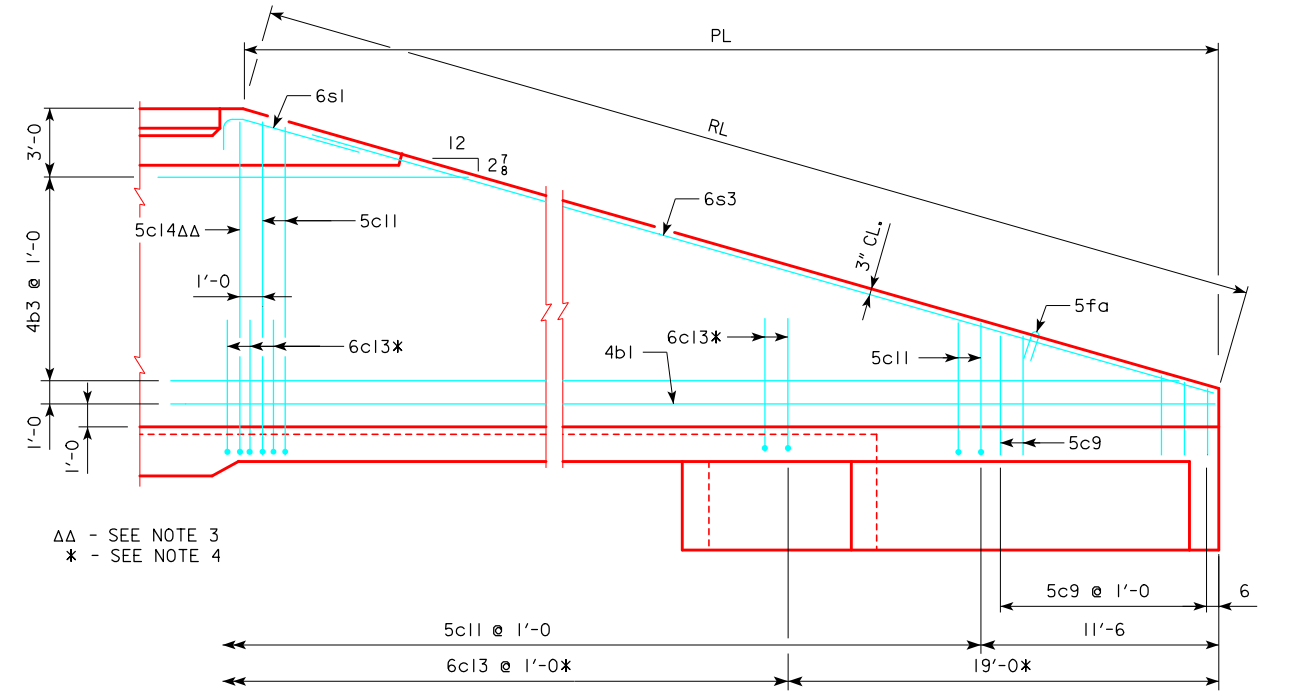
TYPICAL VIEW - FRONT FACE REINFORCING SHORT WINGWALL



TYPICAL VIEW - FRONT FACE REINFORCING LONG WINGWALL

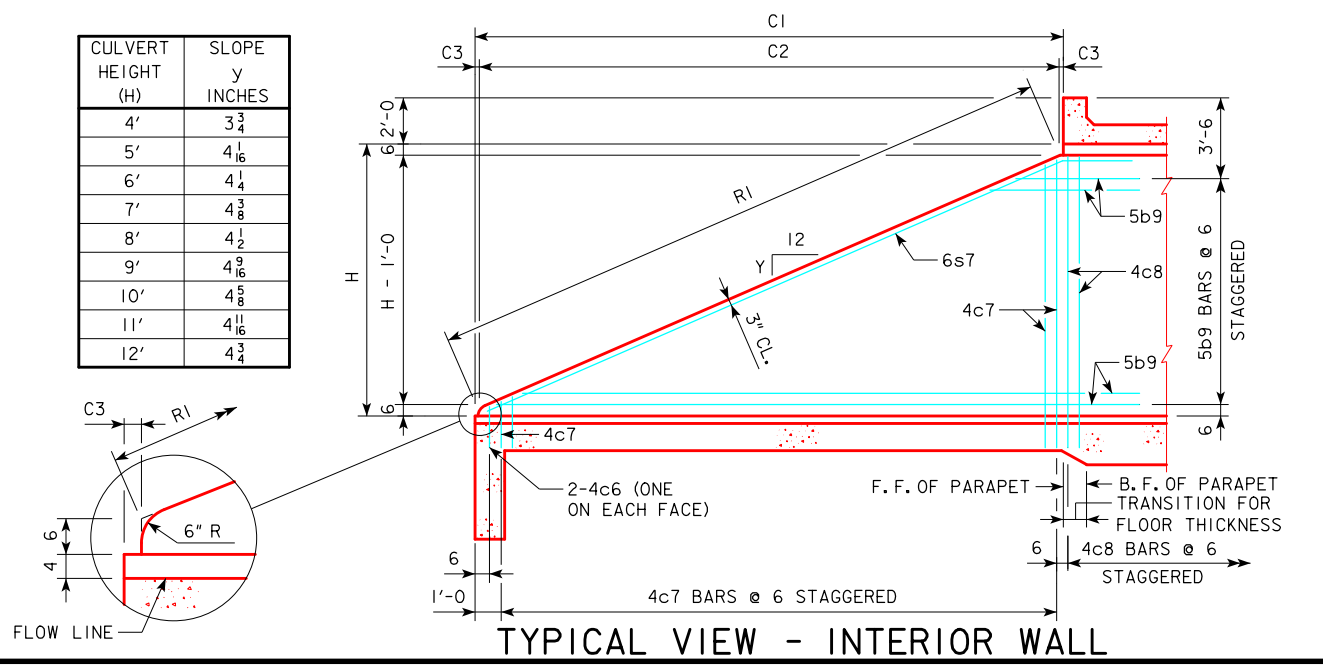


TYPICAL VIEW - BACK FACE REINFORCING SHORT WINGWALL



TYPICAL VIEW - BACK FACE REINFORCING LONG WINGWALL

CULVERT HEIGHT (H)	SLOPE Y INCHES
4'	3 3/4
5'	4 1/6
6'	4 1/4
7'	4 3/8
8'	4 1/2
9'	4 5/8
10'	4 3/4
11'	4 7/8
12'	4 3/4



TYPICAL VIEW - INTERIOR WALL

NOTES:

1. BAR SPACINGS AND POSITIONS SHOWN ARE SIMILAR FOR ALL SIZES OF HEADWALLS IN THIS STANDARD.
2. TWO 4c5 & TWO 5c14 BARS FOR 4', 8', 9', 10', 11' & 12' HEIGHT HEADWALLS. ONE 4c5 & ONE 5c14 BAR FOR 5', 6' & 7' HEIGHT HEADWALLS.
3. TWO 4c5 & TWO 5c14 BARS FOR 4', 5', 6', 10', 11' & 12' HEIGHT HEADWALLS. ONE 4c5 & ONE 5c14 BAR FOR 7', 8' & 9' HEIGHT HEADWALLS.
4. NOT APPLICABLE FOR 4' & 5' HEADWALLS.
5. NOT APPLICABLE FOR 4' THRU 8' HEIGHT HEADWALLS.
6. FOR DIMENSION TABLE SEE SHEET TWH 30-2-12.

07-2016 LATEST REVISION DATE	 APPROVED BY BRIDGE ENGINEER		
		STANDARD DESIGN <b>TWIN REINFORCED CONCRETE BOX CULVERTS</b> APRIL, 2012	
		<b>FLARED WING HEADWALLS</b> 30° SKEW	<b>TWH 30-5-12</b>

**BILL OF REINFORCING FOR ONE HEADWALL 30° SKEW CULVERT SPAN x CULVERT HEIGHT**

BAR	LOCATION	SHAPE	12' x 12'		12' x 11'		12' x 10'		12' x 9'		12' x 8'		12' x 7'		12' x 6'		BAR								
			NO.	LENGTH	WT.	NO.	LENGTH	WT.	NO.	LENGTH	WT.	NO.	LENGTH	WT.	NO.	LENGTH		WT.							
5fa	FENCE ANCHOR (GALV.)		2	2'-10	6	2'-10	6	2'-10	6	2'-10	6	2'-10	6	2'-10	6	2'-10	6	5fa							
4b1	WINGWALL, B.F.H. LONG		1	54'-2	38	1	50'-0	35	1	45'-10	32	1	41'-8	29	1	37'-6	25	1	33'-4	22	1	29'-2	19	4b1	
4b2	WINGWALL, B.F.H. SHORT		1	41'-2	29	1	38'-1	25	1	35'-0	23	1	31'-10	21	1	28'-9	19	1	25'-7	17	1	22'-6	15	4b2	
4b3	WINGWALL, B.F.H. LONG		10	14'-8 TO 52'-3	228	9	14'-8 TO 48'-1	192	8	14'-8 TO 43'-11	158	7	14'-8 TO 39'-9	127	6	14'-8 TO 35'-7	101	5	14'-8 TO 31'-5	77	4	14'-8 TO 27'-3	56	4b3	
4b4	WINGWALL, B.F.H. SHORT		10	11'-11 TO 39'-9	173	9	11'-11 TO 36'-8	146	8	11'-11 TO 33'-7	122	7	11'-11 TO 30'-5	99	6	11'-11 TO 27'-4	78	5	11'-11 TO 24'-3	60	4	11'-11 TO 21'-1	44	4b4	
5b5	WINGWALL, F.F.H. LONG		1	54'-3	59	1	50'-1	55	1	45'-11	50	1	41'-9	46	1	37'-7	39	1	33'-5	35	1	29'-2	30	5b5	
5b6	WINGWALL, F.F.H. SHORT		1	41'-3	45	1	38'-2	40	1	35'-0	37	1	31'-11	33	1	28'-9	30	1	25'-8	27	1	22'-6	23	5b6	
5b7	WINGWALL, F.F.H. LONG		11	10'-7 TO 52'-4	368	10	10'-7 TO 48'-2	311	9	10'-7 TO 43'-11	258	8	10'-7 TO 39'-9	210	7	10'-7 TO 35'-7	169	6	10'-7 TO 31'-5	131	5	10'-7 TO 27'-3	99	5b7	
5b8	WINGWALL, F.F.H. SHORT		11	8'-10 TO 39'-10	279	10	8'-10 TO 36'-9	238	9	8'-10 TO 33'-7	199	8	8'-10 TO 30'-6	164	7	8'-10 TO 27'-4	132	6	8'-10 TO 24'-3	103	5	8'-10 TO 21'-1	78	5b8	
5b9	INTERIOR WALL, BOTH F.H.		21	5'-7 TO 30'-11	400	19	5'-7 TO 28'-8	339	17	5'-7 TO 26'-4	283	15	5'-7 TO 24'-0	231	13	5'-8 TO 21'-9	186	11	5'-8 TO 19'-5	144	9	5'-9 TO 17'-1	107	5b9	
4c1	WINGWALL, F.F.V. LONG		51	2'-10 TO 14'-10	301	47	2'-10 TO 13'-10	262	43	2'-10 TO 12'-11	226	39	2'-10 TO 11'-11	192	35	2'-10 TO 11'-0	162	31	2'-10 TO 10'-0	133	26	2'-10 TO 8'-10	101	4c1	
4c2	WINGWALL, F.F.V. SHORT		38	2'-10 TO 14'-9	223	35	2'-10 TO 13'-9	194	32	2'-10 TO 12'-10	167	29	2'-10 TO 11'-10	142	26	2'-10 TO 10'-10	119	23	2'-10 TO 9'-11	98	20	2'-10 TO 8'-11	78	4c2	
4c3	WINGWALL, F.F.V. LONG		23	9'-8 TO 14'-11	189	19	9'-8 TO 14'-0	150	15	9'-8 TO 13'-0	114	11	9'-8 TO 12'-1	80	---	---	---	---	---	---	---	---	---	---	4c3
4c4	WINGWALL, F.F.V. SHORT		18	9'-5 TO 14'-11	146	15	9'-5 TO 13'-11	117	12	9'-5 TO 12'-11	90	9	9'-5 TO 12'-0	64	---	---	---	---	---	---	---	---	---	---	4c4
4c5	WINGWALL, F.F.V. LONG		2	13'-9	18	2	12'-9	17	2	11'-9	16	1	10'-9	7	1	9'-9	7	1	8'-9	6	2	7'-9	10	4c5	
4c5	WINGWALL, F.F.V. SHORT		2	13'-9	18	2	12'-9	17	2	11'-9	16	2	10'-9	14	2	9'-9	13	1	8'-9	6	1	7'-9	5	4c5	
4c6	INTERIOR WALL, BOTH F.V.		2	1'-9	2	2	1'-9	2	2	1'-9	2	2	1'-9	2	2	1'-9	2	2	1'-9	2	2	1'-8	2	4c6	
4c7	INTERIOR WALL, BOTH F.V.		54	1'-11 TO 12'-4	257	50	1'-11 TO 11'-6	224	45	1'-11 TO 10'-5	185	41	1'-11 TO 9'-6	156	36	1'-11 TO 8'-5	124	32	1'-11 TO 7'-6	101	27	1'-11 TO 6'-6	76	4c7	
4c8	INTERIOR WALL, BOTH F.V.		2	12'-7	17	2	11'-7	15	2	10'-7	14	2	9'-7	13	2	8'-7	11	2	7'-7	10	2	6'-7	9	4c8	
5c9	WINGWALL, B.F.V. LONG		11	2'-10 TO 5'-3	46	11	2'-10 TO 5'-3	46	11	2'-10 TO 5'-3	46	11	2'-10 TO 5'-3	46	11	2'-10 TO 5'-3	46	11	2'-10 TO 5'-3	46	11	2'-10 TO 5'-3	46	5c9	
5c10	WINGWALL, B.F.V. SHORT		5	2'-10 TO 4'-2	18	5	2'-10 TO 4'-2	18	5	2'-10 TO 4'-2	18	5	2'-10 TO 4'-2	18	5	2'-10 TO 4'-2	18	5	2'-10 TO 4'-2	18	5	2'-10 TO 4'-2	18	5c10	
5c11	WINGWALL, B.F.V. LONG		40	9'-6 TO 18'-10	591	36	9'-6 TO 17'-10	513	32	9'-6 TO 16'-11	441	28	9'-6 TO 15'-11	371	24	9'-6 TO 15'-0	307	20	9'-6 TO 14'-0	245	15	9'-6 TO 12'-10	175	5c11	
5c12	WINGWALL, B.F.V. SHORT		33	8'-6 TO 18'-9	469	30	8'-6 TO 17'-9	411	27	8'-6 TO 16'-10	357	24	8'-6 TO 15'-10	305	21	8'-6 TO 14'-10	256	18	8'-6 TO 13'-11	210	15	8'-6 TO 12'-11	168	5c12	
6c13	WINGWALL, B.F.V. LONG		33	10'-6	520	29	10'-6	457	25	10'-6	394	21	10'-6	331	17	10'-6	268	13	10'-6	205	8	10'-6	126	6c13	
6c13	WINGWALL, B.F.V. SHORT		25	10'-6	394	22	10'-6	347	19	10'-6	300	16	10'-6	252	13	10'-6	205	10	10'-6	158	7	10'-6	110	6c13	
5c14	WINGWALL, B.F.V. LONG		2	17'-9	37	2	16'-9	35	2	15'-9	33	1	14'-9	15	1	13'-9	14	1	12'-9	13	2	11'-9	25	5c14	
5c14	WINGWALL, B.F.V. SHORT		2	17'-9	37	2	16'-9	35	2	15'-9	33	2	14'-9	31	2	13'-9	29	1	12'-9	13	1	11'-9	12	5c14	
4d1	APRON, LONGIT., BOTT.		17	31'-6	358	17	29'-2	331	17	26'-10	305	17	24'-7	279	17	22'-3	253	17	19'-11	226	17	17'-8	201	4d1	
4d2	APRON, LONGIT., BOTT. LONG		3	48'-4	101	3	44'-2	93	3	40'-1	85	3	35'-11	72	3	31'-9	64	3	27'-8	55	3	23'-7	47	4d2	
4d3	APRON, LONGIT., BOTT. SHORT		3	36'-10	74	3	33'-9	68	3	30'-8	61	3	27'-7	55	3	24'-6	49	3	21'-5	43	3	18'-4	37	4d3	
6f1	APRON, LONGIT., TOP		24	31'-6	1136	24	29'-2	1051	24	26'-10	967	24	24'-7	886	24	22'-3	802	24	19'-11	718	24	17'-8	637	6f1	
6f2	APRON, LONGIT., TOP LONG		11	5'-4 TO 28'-6	279	10	5'-4 TO 26'-2	237	9	5'-4 TO 23'-10	197	8	5'-4 TO 21'-7	162	7	5'-3 TO 19'-3	129	6	5'-3 TO 16'-11	100	5	5'-3 TO 14'-7	74	6f2	
6f3	APRON, LONGIT., TOP SHORT		8	7'-0 TO 28'-8	214	7	7'-9 TO 26'-5	180	7	5'-5 TO 24'-1	155	6	6'-2 TO 21'-9	126	5	6'-11 TO 19'-6	99	4	7'-9 TO 17'-2	75	4	5'-5 TO 14'-10	61	6f3	
6f4	APRON, LONGIT., TOP LONG		1	54'-3	85	1	50'-1	79	1	45'-11	72	1	41'-9	66	1	37'-7	56	1	33'-5	50	1	29'-2	44	6f4	
6f5	APRON, LONGIT., TOP SHORT		1	41'-3	65	1	38'-2	57	1	35'-0	53	1	31'-11	48	1	28'-9	43	1	25'-8	39	1	22'-6	34	6f5	
4i1	PARAPET, VERTICAL		51	6'-4	216	49	6'-4	207	49	6'-4	207	49	6'-4	207	49	6'-4	207	49	6'-4	207	49	6'-4	207	4i1	
7j1	PARAPET, HORIZONTAL		4	30'-9	251	4	30'-6	249	4	30'-2	247	4	30'-2	247	4	29'-11	245	4	29'-11	245	4	29'-11	245	7j1	
6m1	APRON, TRANS., TOP		11	28'-9 TO 30'-8	491	11	28'-6 TO 30'-4	486	11	28'-3 TO 30'-1	482	11	28'-3 TO 30'-1	482	11	28'-3 TO 30'-1	482	11	28'-0 TO 29'-10	478	11	28'-0 TO 29'-10	478	6m1	
6m2	APRON, TRANS., TOP		19	30'-11 TO 37'-8	979	16	30'-8 TO 36'-3	804	13	30'-5 TO 34'-11	638	10	30'-5 TO 33'-9	482	7	30'-5 TO 32'-8	332	4	30'-2 TO 31'-3	184	1	30'-2 TO 30'-2	45	6m2	
6m3	APRON, TRANS., TOP		19	8'-8 TO 28'-8	533	19	7'-10 TO 27'-10	509	19	7'-1 TO 27'-1	488	19	6'-5 TO 26'-5	468	19	5'-9 TO 25'-9	449	18	6'-1 TO 24'-11	419	18	5'-5 TO 24'-3	401	6m3	
6m4	APRON, TRANS., BOTT.		24	23'-10 TO 39'-6	1142	22	23'-9 TO 38'-1	1022	20	23'-8 TO 36'-7	905	18	23'-8 TO 35'-3	796	16	23'-8 TO 33'-10	691	14	23'-7 TO 32'-5	589	12	23'-7 TO 31'-1	493	6m4	
6p1	CURTAIN, HORIZONTAL		4	29'-1	175	4	28'-11	174	4	28'-10	173	4	28'-10	173	4	28'-10	173	4	28'-9	173	4	28'-9	173	6p1	
6p2	CURTAIN, HORIZONTAL LONG		4	28'-0	168	4	26'-0	156	4	24'-0	144	4	22'-0	132	4	20'-0	120	4	18'-0	108	4	16'-0	96	6p2	
6p3	CURTAIN, HORIZONTAL SHORT		4	15'-11	96	4	14'-11	90	4	13'-10	83	4	12'-10	77	4	11'-9	71	4	10'-9	65	4	9'-8	58	6p3	
6s1	WING SLOPE, BOTH F. LONG		2	8'-0	24	2	8'-0	24	2	8'-0	24	2	8'-0	24	2	8'-0	24	2	8'-0	24	2	8'-0	24	6s1	
6s2	WING SLOPE, BOTH F. SHORT		2	6'-11	21	2	6'-11	21	2	6'-11	21	2	6'-11	21	2	6'-11	21	2	6'-11	21	2	6'-11	21	6s2	
6s3	WING SLOPE, BOTH F. LONG		2	49'-4	155	2	45'-0	142	2	40'-9	129	2	36'-5	109	2	32'-2	97	2	27'-10	84	2	23'-7	71	6s3	
6s4	WING SLOPE, BOTH F. SHORT		2	38'-6	116	2	35'-2	106	2	31'-11	96	2	28'-8	86	2	25'-4	76	2	22'-1	66	2	18'-10	57	6s4	
6s5	WING SLOPE, F.F. LONG		1	54'-7	85	1	50'-3	79	1																



**BILL OF REINFORCING FOR ONE HEADWALL 30° SKEW CULVERT SPAN x CULVERT HEIGHT**

BAR	LOCATION	SHAPE	12' x 5'			12' x 4'			10' x 12'			10' x 11'			10' x 10'			10' x 9'			10' x 8'			BAR
			NO.	LENGTH	WT.	NO.	LENGTH	WT.	NO.	LENGTH	WT.	NO.	LENGTH	WT.	NO.	LENGTH	WT.	NO.	LENGTH	WT.	NO.	LENGTH	WT.	
5fa	FENCE ANCHOR (GALV.)		2	2'-10	6	2	2'-10	6	2	2'-10	6	2	2'-10	6	2	2'-10	6	2	2'-10	6	2	2'-10	6	5fa
4b1	WINGWALL, B.F.H. LONG		1	25'-0	17	1	20'-10	14	1	54'-2	38	1	50'-0	35	1	45'-10	32	1	41'-8	29	1	37'-6	25	4b1
4b2	WINGWALL, B.F.H. SHORT		1	19'-5	13	1	16'-3	11	1	41'-2	29	1	38'-1	25	1	35'-0	23	1	31'-10	21	1	28'-9	19	4b2
4b3	WINGWALL, B.F.H. LONG		3	14'-8 TO 23'-1	38	2	14'-8 TO 18'-10	22	10	14'-8 TO 52'-3	228	9	14'-8 TO 48'-1	192	8	14'-8 TO 43'-11	158	7	14'-8 TO 39'-9	127	6	14'-8 TO 35'-7	101	4b3
4b4	WINGWALL, B.F.H. SHORT		3	11'-9 TO 18'-0	30	2	11'-9 TO 14'-10	18	10	11'-11 TO 39'-9	173	9	11'-11 TO 36'-8	146	8	11'-11 TO 33'-7	122	7	11'-10 TO 30'-5	99	6	11'-10 TO 27'-4	78	4b4
5b5	WINGWALL, F.F.H. LONG		1	25'-0	26	1	20'-10	22	1	54'-3	59	1	50'-1	55	1	45'-11	50	1	41'-9	46	1	37'-7	39	5b5
5b6	WINGWALL, F.F.H. SHORT		1	19'-5	20	1	16'-4	17	1	41'-3	45	1	38'-2	40	1	35'-0	37	1	31'-11	33	1	28'-9	30	5b6
5b7	WINGWALL, F.F.H. LONG		4	10'-7 TO 23'-1	70	3	10'-7 TO 18'-11	46	11	10'-7 TO 52'-4	368	10	10'-7 TO 48'-2	311	9	10'-7 TO 43'-11	258	8	10'-7 TO 39'-9	210	7	10'-7 TO 35'-7	169	5b7
5b8	WINGWALL, F.F.H. SHORT		4	8'-9 TO 18'-0	56	3	8'-8 TO 14'-11	37	11	8'-10 TO 39'-10	279	10	8'-10 TO 36'-9	238	9	8'-10 TO 33'-7	199	8	8'-10 TO 30'-6	164	7	8'-9 TO 27'-4	132	5b8
5b9	INTERIOR WALL, BOTH F.H.		7	5'-10 TO 14'-9	75	5	5'-7 TO 12'-5	48	21	5'-7 TO 30'-11	400	19	5'-7 TO 28'-8	339	17	5'-7 TO 26'-4	283	15	5'-7 TO 24'-0	231	13	5'-8 TO 21'-9	186	5b9
4c1	WINGWALL, F.F.V. LONG		22	2'-10 TO 7'-10	78	18	2'-10 TO 6'-11	59	51	2'-9 TO 14'-9	298	47	2'-9 TO 13'-9	259	43	2'-9 TO 12'-10	224	39	2'-9 TO 11'-10	190	35	2'-9 TO 10'-11	160	4c1
4c2	WINGWALL, F.F.V. SHORT		17	2'-10 TO 8'-0	62	14	2'-10 TO 7'-0	46	38	2'-9 TO 14'-8	221	35	2'-9 TO 13'-8	192	32	2'-9 TO 12'-9	166	29	2'-9 TO 11'-9	140	26	2'-9 TO 10'-9	117	4c2
4c3	WINGWALL, F.F.V. LONG		---	---	---	---	---	---	28	8'-4 TO 14'-10	217	24	8'-4 TO 13'-11	178	20	8'-4 TO 12'-0	142	16	8'-4 TO 11'-11	109	---	---	---	4c3
4c4	WINGWALL, F.F.V. SHORT		---	---	---	---	---	---	18	9'-4 TO 14'-10	145	15	9'-4 TO 13'-10	116	12	9'-4 TO 12'-10	89	9	9'-4 TO 11'-11	64	---	---	---	4c4
4c5	WINGWALL, F.F.V. LONG		2	6'-9	9	2	5'-9	8	2	13'-8	18	2	12'-8	17	2	11'-8	16	1	10'-8	7	1	9'-8	6	4c5
4c5	WINGWALL, F.F.V. SHORT		1	6'-9	5	2	5'-9	8	2	13'-8	18	2	12'-8	17	2	11'-8	16	2	10'-8	14	2	9'-8	13	4c5
4c6	INTERIOR WALL, BOTH F.V.		2	1'-8	2	2	1'-8	2	2	1'-8	2	2	1'-8	2	2	1'-8	2	2	1'-8	2	2	1'-8	2	4c6
4c7	INTERIOR WALL, BOTH F.V.		22	1'-10 TO 5'-5	53	18	1'-10 TO 4'-6	38	54	1'-10 TO 12'-3	254	50	1'-10 TO 11'-5	221	45	1'-10 TO 10'-4	183	41	1'-10 TO 9'-5	154	36	1'-10 TO 8'-4	122	4c7
4c8	INTERIOR WALL, BOTH F.V.		2	5'-7	7	2	4'-7	6	2	12'-6	17	2	11'-6	15	2	10'-6	14	2	9'-6	13	2	8'-6	11	4c8
5c9	WINGWALL, B.F.V. LONG		11	2'-10 TO 5'-3	46	11	2'-10 TO 5'-3	46	11	2'-9 TO 5'-2	45	11	2'-9 TO 5'-2	45	11	2'-9 TO 5'-2	45	11	2'-9 TO 5'-2	45	11	2'-9 TO 5'-2	45	5c9
5c10	WINGWALL, B.F.V. SHORT		5	2'-10 TO 4'-2	18	5	2'-10 TO 4'-2	18	5	2'-9 TO 4'-1	18	5	2'-9 TO 4'-1	18	5	2'-9 TO 4'-1	18	5	2'-9 TO 4'-1	18	5	2'-9 TO 4'-1	18	5c10
5c11	WINGWALL, B.F.V. LONG		11	9'-6 TO 11'-10	122	7	9'-6 TO 11'-10	75	40	9'-5 TO 18'-9	588	36	9'-5 TO 17'-9	510	32	9'-5 TO 16'-10	438	28	9'-5 TO 15'-10	369	24	9'-5 TO 14'-11	305	5c11
5c12	WINGWALL, B.F.V. SHORT		12	8'-6 TO 12'-0	128	9	8'-6 TO 11'-0	92	33	8'-5 TO 18'-8	466	30	8'-5 TO 17'-8	408	27	8'-5 TO 16'-9	354	24	8'-5 TO 15'-9	302	21	8'-5 TO 14'-9	254	5c12
6c13	WINGWALL, B.F.V. LONG		---	---	---	---	---	---	33	10'-6	520	29	10'-6	457	25	10'-6	394	21	10'-6	331	17	10'-6	268	6c13
6c13	WINGWALL, B.F.V. SHORT		---	---	---	---	---	---	25	10'-6	394	22	10'-6	347	19	10'-6	300	16	10'-6	252	13	10'-6	205	6c13
5c14	WINGWALL, B.F.V. LONG		2	10'-9	22	2	9'-9	20	2	17'-8	37	2	16'-8	35	2	15'-8	33	1	14'-8	15	1	13'-8	14	5c14
5c14	WINGWALL, B.F.V. SHORT		1	10'-9	11	2	9'-9	20	2	17'-8	37	2	16'-8	35	2	15'-8	33	2	14'-8	31	2	13'-8	29	5c14
4d1	APRON, LONGIT., BOT.		17	15'-4	174	17	13'-0	148	15	31'-6	316	13	29'-2	253	13	26'-10	233	13	24'-7	213	13	22'-3	193	4d1
4d2	APRON, LONGIT., BOT. LONG		3	19'-6	39	3	15'-5	31	3	48'-4	101	3	44'-2	93	3	40'-1	85	3	35'-11	72	3	31'-9	64	4d2
4d3	APRON, LONGIT., BOT. SHORT		3	15'-3	31	3	12'-3	25	3	36'-10	74	3	33'-9	68	3	30'-8	61	3	27'-7	55	3	24'-6	49	4d3
6f1	APRON, LONGIT., TOP		24	15'-4	553	24	13'-0	469	20	31'-6	946	20	29'-2	876	20	26'-10	806	20	24'-7	738	20	22'-3	668	6f1
6f2	APRON, LONGIT., TOP LONG		4	5'-3 TO 12'-4	53	3	5'-3 TO 10'-0	34	11	5'-4 TO 28'-6	279	10	5'-4 TO 26'-2	237	9	5'-4 TO 23'-10	197	8	5'-4 TO 21'-7	162	7	5'-3 TO 19'-3	129	6f2
6f3	APRON, LONGIT., TOP SHORT		3	6'-2 TO 12'-6	42	2	7'-0 TO 10'-3	26	8	7'-0 TO 28'-8	214	7	7'-0 TO 26'-5	180	7	5'-5 TO 24'-1	155	6	6'-2 TO 21'-9	126	5	6'-11 TO 19'-6	99	6f3
6f4	APRON, LONGIT., TOP LONG		1	25'-0	38	1	20'-10	31	1	54'-3	85	1	50'-1	79	1	45'-11	72	1	41'-9	66	1	37'-7	56	6f4
6f5	APRON, LONGIT., TOP SHORT		1	19'-5	29	1	16'-4	25	1	41'-3	65	1	38'-2	57	1	35'-0	53	1	31'-11	48	1	28'-9	43	6f5
4i1	PARAPET, VERTICAL		49	6'-4	207	49	6'-4	207	43	6'-4	182	41	6'-4	173	41	6'-4	173	41	6'-4	173	41	6'-4	173	4i1
7ji	PARAPET, HORIZONTAL		4	29'-11	245	4	29'-11	245	4	26'-2	214	4	25'-10	211	4	25'-7	209	4	25'-7	209	4	25'-7	209	7ji
6m1	APRON, TRANS., TOP		9	28'-0 TO 29'-6	389	6	28'-0 TO 28'-11	256	10	24'-6 TO 26'-2	381	10	24'-3 TO 25'-11	377	10	23'-11 TO 25'-8	372	10	23'-11 TO 25'-8	372	10	23'-11 TO 25'-8	372	6m1
6m2	APRON, TRANS., TOP		2	22'-7 TO 23'-11	70	5	18'-7 TO 23'-10	159	22	26'-6 TO 34'-5	1006	19	26'-3 TO 33'-0	845	15	26'-0 TO 31'-3	645	12	26'-0 TO 30'-2	506	9	26'-0 TO 29'-0	372	6m2
6m3	APRON, TRANS., TOP		16	4'-9 TO 21'-5	314	13	4'-1 TO 17'-5	210	15	9'-2 TO 24'-8	381	15	8'-4 TO 23'-11	363	16	7'-7 TO 24'-3	383	16	6'-11 TO 23'-7	366	16	6'-3 TO 22'-11	350	6m3
6m4	APRON, TRANS., BOT.		10	23'-7 TO 29'-8	400	8	23'-7 TO 28'-4	312	24	19'-3 TO 34'-11	976	22	19'-2 TO 33'-5	869	20	19'-1 TO 32'-0	767	18	19'-1 TO 30'-7	671	16	19'-0 TO 29'-3	580	6m4
6p1	CURTAIN, HORIZONTAL		4	28'-9	173	4	28'-8	172	4	24'-5	147	4	24'-4	146	4	24'-3	146	4	24'-3	146	4	24'-3	146	6p1
6p2	CURTAIN, HORIZONTAL LONG		4	13'-11	84	4	11'-11	72	4	28'-0	168	4	26'-0	156	4	24'-0	144	4	22'-0	132	4	20'-0	120	6p2
6p3	CURTAIN, HORIZONTAL SHORT		4	8'-8	52	4	7'-7	46	4	15'-11	96	4	14'-11	90	4	13'-10	83	4	12'-10	77	4	11'-9	71	6p3
6s1	WING SLOPE, BOTH F. LONG		2	8'-0	24	2	8'-0	24	2	8'-0	24	2	8'-0	24	2	8'-0	24	2	8'-0	24	2	8'-0	24	6s1
6s2	WING SLOPE, BOTH F. SHORT		2	6'-11	21	2	6'-11	21	2	6'-11	21	2	6'-11	21	2	6'-11	21	2	6'-11	21	2	6'-11	21	6s2
6s3	WING SLOPE, BOTH F. LONG		2	19'-3	58	2	15'-0	45	2	49'-4	151	2	45'-0	142	2	40'-9	129	2	36'-5	109	2	32'-2	97	6s3
6s4	WING SLOPE, BOTH F. SHORT		2	15'-7	47	2	12'-3	37	2	38'-6	116	2	35'-2	106	2	31'-11	96	2	28'-8	86	2	25'-4	76	6s4
6s5	WING SLOPE, F.F. LONG		1	24'-6	37	1	20'-3	30	1	54'-7	85	1												



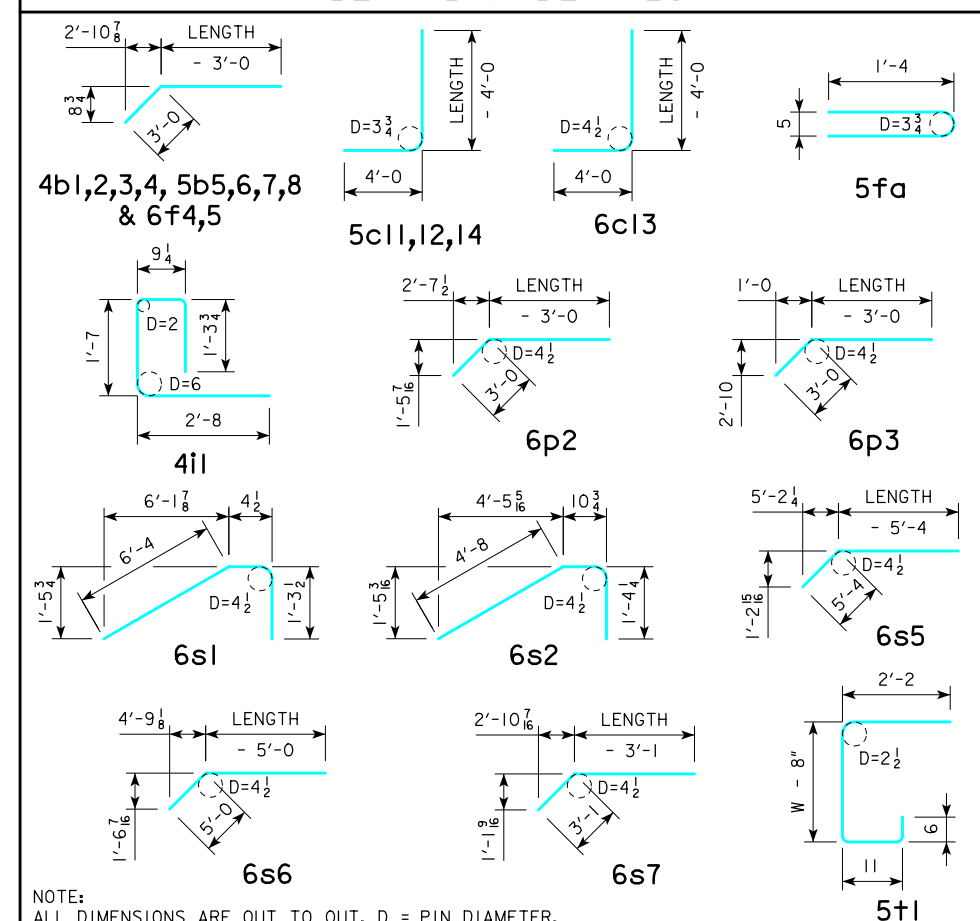
**BILL OF REINFORCING FOR ONE HEADWALL 30° SKEW CULVERT SPAN x CULVERT HEIGHT**

BAR	LOCATION	SHAPE	10' x 7'			10' x 6'			10' x 5'			10' x 4'			8' x 10'			8' x 9'			8' x 8'			BAR				
			NO.	LENGTH	WT.	NO.	LENGTH	WT.	NO.	LENGTH	WT.	NO.	LENGTH	WT.	NO.	LENGTH	WT.	NO.	LENGTH	WT.	NO.	LENGTH	WT.		NO.	LENGTH	WT.	
5fa	FENCE ANCHOR (GALV.)		2	2'-10	6	2	2'-10	6	2	2'-10	6	2	2'-10	6	2	2'-10	6	2	2'-10	6	2	2'-10	6	2	2'-10	6	5fa	
4b1	WINGWALL, B.F.H. LONG		1	33'-4	22	1	29'-2	19	1	25'-0	17	1	20'-10	14	1	45'-10	32	1	41'-8	29	1	37'-6	25	1	33'-4	22	4b1	
4b2	WINGWALL, B.F.H. SHORT		1	25'-7	17	1	22'-6	15	1	19'-5	13	1	16'-3	11	1	35'-0	23	1	31'-10	21	1	28'-9	19	1	25'-7	17	4b2	
4b3	WINGWALL, B.F.H. LONG		5	14'-8 TO 31'-5	77	4	14'-8 TO 27'-3	56	3	14'-8 TO 23'-1	38	2	14'-8 TO 18'-10	22	8	14'-8 TO 43'-11	158	7	14'-8 TO 39'-9	127	6	14'-8 TO 35'-7	101	5	14'-8 TO 31'-5	77	4b3	
4b4	WINGWALL, B.F.H. SHORT		5	11'-10 TO 24'-3	60	4	11'-10 TO 21'-1	44	3	11'-9 TO 18'-0	30	2	11'-9 TO 14'-10	18	8	11'-11 TO 33'-7	122	7	11'-10 TO 30'-5	99	6	11'-10 TO 27'-4	78	5	11'-10 TO 24'-3	60	4b4	
5b5	WINGWALL, F.F.H. LONG		1	33'-5	35	1	29'-2	30	1	25'-0	26	1	20'-10	22	1	45'-11	50	1	41'-9	46	1	37'-7	39	1	33'-5	35	5b5	
5b6	WINGWALL, F.F.H. SHORT		1	25'-8	27	1	22'-6	23	1	19'-5	20	1	16'-4	17	1	35'-0	37	1	31'-11	33	1	28'-9	30	1	25'-8	27	5b6	
5b7	WINGWALL, F.F.H. LONG		6	10'-7 TO 31'-5	131	5	10'-7 TO 27'-3	99	4	10'-7 TO 23'-1	70	3	10'-7 TO 18'-11	46	9	10'-7 TO 43'-11	258	8	10'-7 TO 39'-9	210	7	10'-7 TO 35'-7	169	6	10'-7 TO 31'-5	131	5b7	
5b8	WINGWALL, F.F.H. SHORT		6	8'-9 TO 24'-3	103	5	8'-9 TO 21'-1	78	4	8'-9 TO 18'-0	56	3	8'-9 TO 14'-11	37	9	8'-10 TO 33'-7	199	8	8'-10 TO 30'-6	164	7	8'-9 TO 27'-4	132	6	8'-9 TO 24'-3	103	5b8	
5b9	INTERIOR WALL, BOTH F.H.		11	5'-8 TO 19'-5	144	9	5'-8 TO 17'-1	107	7	5'-10 TO 14'-9	75	5	6'-1 TO 12'-5	48	17	5'-7 TO 26'-4	283	15	5'-7 TO 24'-0	231	13	5'-8 TO 21'-9	186	11	5'-8 TO 19'-5	144	5b9	
4c1	WINGWALL, F.F.V. LONG		31	2'-9 TO 9'-11	131	26	2'-9 TO 8'-9	100	22	2'-9 TO 7'-9	77	18	2'-9 TO 6'-10	58	43	2'-8 TO 12'-9	221	39	2'-8 TO 11'-9	188	35	2'-8 TO 10'-10	158	31	2'-9 TO 9'-11	131	4c1	
4c2	WINGWALL, F.F.V. SHORT		23	2'-9 TO 9'-10	97	20	2'-9 TO 8'-10	77	17	2'-9 TO 7'-11	61	14	2'-9 TO 6'-11	45	32	2'-8 TO 12'-8	164	29	2'-8 TO 11'-8	139	26	2'-8 TO 10'-8	116	23	2'-9 TO 9'-10	97	4c2	
4c3	WINGWALL, F.F.V. LONG		---	---	---	---	---	---	---	---	---	---	---	---	20	8'-3 TO 12'-10	141	16	8'-3 TO 11'-11	108	---	---	---	---	---	---	---	4c3
4c4	WINGWALL, F.F.V. SHORT		---	---	---	---	---	---	---	---	---	---	---	---	12	9'-3 TO 12'-9	88	9	9'-3 TO 11'-10	63	---	---	---	---	---	---	---	4c4
4c5	WINGWALL, F.F.V. LONG		1	8'-8	6	2	7'-8	10	2	6'-8	9	2	5'-8	8	2	11'-7	15	1	10'-7	7	1	9'-7	6	1	8'-8	6	4c5	
4c5	WINGWALL, F.F.V. SHORT		1	8'-8	6	1	7'-8	5	1	6'-8	4	2	5'-8	8	2	11'-7	15	2	10'-7	14	2	9'-7	13	1	8'-8	6	4c5	
4c6	INTERIOR WALL, BOTH F.V.		2	1'-8	2	2	1'-7	2	2	1'-7	2	2	1'-7	2	2	1'-7	2	2	1'-7	2	2	1'-7	2	2	1'-7	2	4c6	
4c7	INTERIOR WALL, BOTH F.V.		32	1'-10 TO 7'-5	99	27	1'-10 TO 6'-5	74	22	1'-9 TO 5'-4	52	18	1'-9 TO 4'-5	37	45	1'-9 TO 10'-3	180	41	1'-9 TO 9'-4	152	36	1'-9 TO 8'-3	120	32	1'-10 TO 7'-5	99	4c7	
4c8	INTERIOR WALL, BOTH F.V.		2	7'-6	10	2	6'-6	9	2	5'-6	7	2	4'-6	6	2	10'-5	14	2	9'-5	13	2	8'-5	11	2	7'-6	10	4c8	
5c9	WINGWALL, B.F.V. LONG		11	2'-9 TO 5'-2	45	11	2'-9 TO 5'-2	45	11	2'-9 TO 5'-2	45	11	2'-9 TO 5'-2	45	11	2'-8 TO 5'-1	44	11	2'-8 TO 5'-1	44	11	2'-8 TO 5'-1	44	11	2'-9 TO 5'-2	45	5c9	
5c10	WINGWALL, B.F.V. SHORT		5	2'-9 TO 4'-1	18	5	2'-9 TO 4'-1	18	5	2'-9 TO 4'-1	18	5	2'-9 TO 4'-1	18	5	2'-8 TO 4'-0	17	5	2'-8 TO 4'-0	17	5	2'-8 TO 4'-0	17	5	2'-9 TO 4'-1	18	5c10	
5c11	WINGWALL, B.F.V. LONG		20	9'-5 TO 13'-11	243	15	9'-5 TO 12'-9	173	11	9'-5 TO 11'-9	121	7	9'-5 TO 10'-10	74	32	9'-4 TO 16'-9	435	28	9'-4 TO 15'-9	366	24	9'-4 TO 14'-10	302	20	9'-5 TO 13'-11	243	5c11	
5c12	WINGWALL, B.F.V. SHORT		18	8'-5 TO 13'-10	209	15	8'-5 TO 12'-10	166	12	8'-5 TO 11'-11	127	9	8'-5 TO 10'-11	91	27	8'-4 TO 16'-8	352	24	8'-4 TO 15'-8	300	21	8'-4 TO 14'-8	252	18	8'-5 TO 13'-10	209	5c12	
6c13	WINGWALL, B.F.V. LONG		13	10'-6	205	8	10'-6	126	---	---	---	---	---	---	25	10'-6	394	21	10'-6	331	17	10'-6	268	13	10'-6	205	6c13	
6c13	WINGWALL, B.F.V. SHORT		10	10'-6	158	7	10'-6	110	---	---	---	---	---	---	19	10'-6	300	16	10'-6	252	13	10'-6	205	10	10'-6	158	6c13	
5c14	WINGWALL, B.F.V. LONG		1	12'-8	13	2	11'-8	24	2	10'-8	22	2	9'-8	20	2	15'-7	33	1	14'-7	15	1	13'-7	14	1	12'-8	13	5c14	
5c14	WINGWALL, B.F.V. SHORT		1	12'-8	13	1	11'-8	12	1	10'-8	11	2	9'-8	20	2	15'-7	33	2	14'-7	30	2	13'-7	28	1	12'-8	13	5c14	
4d1	APRON, LONGIT., BOT.		13	19'-11	173	13	17'-8	153	13	15'-4	133	13	13'-0	113	11	26'-10	197	11	24'-7	181	11	22'-3	163	13	19'-11	173	4d1	
4d2	APRON, LONGIT., BOT. LONG		3	27'-8	55	3	23'-7	47	3	19'-6	39	3	15'-5	31	3	40'-1	85	3	35'-11	72	3	31'-9	64	3	27'-8	55	4d2	
4d3	APRON, LONGIT., BOT. SHORT		3	21'-5	43	3	18'-4	37	3	15'-3	31	3	12'-3	25	3	30'-8	61	3	27'-7	55	3	24'-6	49	3	21'-5	43	4d3	
6f1	APRON, LONGIT., TOP		20	19'-11	598	20	17'-8	531	20	15'-4	461	20	13'-0	391	16	26'-10	645	16	24'-7	591	16	22'-3	535	20	19'-11	598	6f1	
6f2	APRON, LONGIT., TOP LONG		6	5'-3 TO 16'-11	100	5	5'-3 TO 14'-7	74	4	5'-3 TO 12'-4	53	3	5'-3 TO 10'-0	34	9	5'-4 TO 23'-10	197	8	5'-4 TO 21'-7	162	7	5'-3 TO 19'-3	129	6	5'-3 TO 16'-11	100	6f2	
6f3	APRON, LONGIT., TOP SHORT		4	7'-9 TO 17'-2	75	4	5'-5 TO 14'-10	61	3	6'-2 TO 12'-6	42	2	7'-0 TO 10'-3	26	7	5'-5 TO 24'-1	155	6	6'-2 TO 21'-9	126	5	6'-11 TO 19'-6	99	4	7'-9 TO 17'-2	75	6f3	
6f4	APRON, LONGIT., TOP LONG		1	33'-5	50	1	29'-2	44	1	25'-0	38	1	20'-10	31	1	45'-11	72	1	41'-9	66	1	37'-7	56	1	33'-5	50	6f4	
6f5	APRON, LONGIT., TOP SHORT		1	25'-8	39	1	22'-6	34	1	19'-5	29	1	16'-4	25	1	35'-0	53	1	31'-11	48	1	28'-9	43	1	25'-8	39	6f5	
4i1	PARAPET, VERTICAL		41	6'-4	173	41	6'-4	173	41	6'-4	173	41	6'-4	173	33	6'-4	140	33	6'-4	140	33	6'-4	140	41	6'-4	173	4i1	
7j1	PARAPET, HORIZONTAL		4	25'-3	206	4	25'-3	206	4	25'-3	206	4	25'-3	206	4	20'-11	171	4	20'-11	171	4	20'-11	171	4	25'-3	206	7j1	
6m1	APRON, TRANS., TOP		10	23'-8 TO 25'-5	369	10	23'-8 TO 25'-5	369	9	23'-8 TO 25'-2	330	7	23'-8 TO 24'-10	255	8	19'-8 TO 21'-0	244	8	19'-8 TO 21'-0	244	8	19'-8 TO 21'-0	244	10	23'-8 TO 25'-5	369	6m1	
6m2	APRON, TRANS., TOP		6	25'-9 TO 27'-8	241	3	25'-9 TO 26'-6	118	1	25'-5 TO 25'-5	38	3	17'-11 TO 20'-6	87	19	21'-3 TO 28'-0	703	16	21'-3 TO 26'-11	579	13	21'-3 TO 25'-9	459	6	25'-9 TO 27'-8	241	6m2	
6m3	APRON, TRANS., TOP		16	5'-5 TO 22'-2	331	16	4'-9 TO 21'-6	315	16	4'-1 TO 20'-10	299	13	3'-5 TO 16'-10	198	13	7'-0 TO 20'-4	267	13	6'-4 TO 19'-8	254	12	6'-9 TO 19'-0	232	16	5'-5 TO 22'-2	331	6m3	
6m4	APRON, TRANS., BOT.		14	18'-11 TO 27'-10	492	12	18'-11 TO 26'-5	409	10	18'-11 TO 25'-1	330	8	18'-11 TO 23'-9	256	20	14'-5 TO 27'-4	627	18	14'-5 TO 26'-0	546	16	14'-5 TO 24'-8	470	14	18'-11 TO 27'-10	492	6m4	
6p1	CURTAIN, HORIZONTAL		4	24'-1	145	4	24'-1	145	4	24'-1	145	4	24'-1	145	4	19'-7	118	4	19'-7	118	4	19'-7	118	4	24'-1	145	6p1	
6p2	CURTAIN, HORIZONTAL LONG		4	18'-0	108	4	16'-0	96	4	13'-11	84	4	11'-11	72	4	24'-0	144	4	22'-0	132	4	20'-0	120	4	18'-0	108	6p2	
6p3	CURTAIN, HORIZONTAL SHORT		4	10'-9	65	4	9'-8	58	4	8'-8	52	4	7'-7	46	4	13'-10	83	4										

**BILL OF REINFORCING FOR ONE HEADWALL 30° SKEW CULVERT SPAN x CULVERT HEIGHT**

BAR	LOCATION	SHAPE	8' x 7'		8' x 6'		8' x 5'		8' x 4'		BAR	
			NO.	LENGTH	WT.	NO.	LENGTH	WT.	NO.	LENGTH		WT.
5fa	FENCE ANCHOR (GALV.)		2	2'-10	6	2'-10	6	2'-10	6	2'-10	6	5fa
4b1	WINGWALL, B.F.H. LONG		1	33'-4	22	29'-2	19	25'-0	17	20'-10	14	4b1
4b2	WINGWALL, B.F.H. SHORT		1	25'-7	17	22'-6	15	19'-5	13	16'-3	11	4b2
4b3	WINGWALL, B.F.H. LONG		5 VAR.	14'-8 TO 31'-5	77	14'-8 TO 27'-3	56	14'-8 TO 23'-1	38	14'-8 TO 18'-10	22	4b3
4b4	WINGWALL, B.F.H. SHORT		5 VAR.	11'-10 TO 24'-3	60	11'-10 TO 21'-1	44	11'-9 TO 18'-0	30	11'-9 TO 14'-10	18	4b4
5b5	WINGWALL, F.F.H. LONG		1	33'-5	35	29'-2	30	25'-0	26	20'-10	22	5b5
5b6	WINGWALL, F.F.H. SHORT		1	25'-8	27	22'-6	23	19'-5	20	16'-4	17	5b6
5b7	WINGWALL, F.F.H. LONG		6 VAR.	10'-7 TO 31'-5	131	10'-7 TO 27'-3	99	10'-7 TO 23'-1	70	10'-7 TO 18'-11	46	5b7
5b8	WINGWALL, F.F.H. SHORT		6 VAR.	8'-9 TO 24'-3	103	8'-9 TO 21'-1	78	8'-9 TO 18'-0	56	8'-8 TO 14'-11	37	5b8
5b9	INTERIOR WALL, BOTH F.H.		11 VAR.	5'-8 TO 19'-5	144	5'-9 TO 17'-1	107	5'-10 TO 14'-9	75	6'-1 TO 12'-5	48	5b9
4c1	WINGWALL, F.F.V. LONG		31	2'-8 TO 9'-10	129	2'-8 TO 8'-8	98	2'-8 TO 7'-8	76	2'-8 TO 6'-9	57	4c1
4c2	WINGWALL, F.F.V. SHORT		23	2'-8 TO 9'-9	95	2'-8 TO 8'-9	76	2'-8 TO 7'-10	60	2'-8 TO 6'-10	44	4c2
4c3	WINGWALL, F.F.V. LONG		---	---	---	---	---	---	---	---	---	4c3
4c4	WINGWALL, F.F.V. SHORT		---	---	---	---	---	---	---	---	---	4c4
4c5	WINGWALL, F.F.V. LONG		1	8'-7	6	7'-7	10	6'-7	9	5'-7	7	4c5
4c5	WINGWALL, F.F.V. SHORT		1	8'-7	6	7'-7	5	6'-7	4	5'-7	7	4c5
4c6	INTERIOR WALL, BOTH F.V.		2	1'-7	2	1'-6	2	1'-6	2	1'-6	2	4c6
4c7	INTERIOR WALL, BOTH F.V.		32	1'-9 TO 7'-4	97	1'-9 TO 6'-4	73	1'-8 TO 5'-3	51	1'-8 TO 4'-4	36	4c7
4c8	INTERIOR WALL, BOTH F.V.		2	7'-5	10	6'-5	9	5'-5	7	4'-5	6	4c8
5c9	WINGWALL, B.F.V. LONG		11	2'-8 TO 5'-1	44	2'-8 TO 5'-1	44	2'-8 TO 5'-1	44	2'-8 TO 5'-1	44	5c9
5c10	WINGWALL, B.F.V. SHORT		5	2'-8 TO 4'-0	17	2'-8 TO 4'-0	17	2'-8 TO 4'-0	17	2'-8 TO 4'-0	17	5c10
5c11	WINGWALL, B.F.V. LONG		20	9'-4 TO 13'-10	242	9'-4 TO 12'-8	172	9'-4 TO 11'-8	120	9'-4 TO 10'-9	73	5c11
5c12	WINGWALL, B.F.V. SHORT		18	8'-4 TO 13'-9	207	8'-4 TO 12'-9	165	8'-4 TO 11'-10	126	8'-4 TO 10'-10	90	5c12
6c13	WINGWALL, B.F.V. LONG		13	10'-6	205	10'-6	126	---	---	---	---	6c13
6c13	WINGWALL, B.F.V. SHORT		10	10'-6	158	10'-6	110	---	---	---	---	6c13
5c14	WINGWALL, B.F.V. LONG		1	12'-7	13	11'-7	24	10'-7	22	9'-7	20	5c14
5c14	WINGWALL, B.F.V. SHORT		1	12'-7	13	11'-7	12	10'-7	11	9'-7	20	5c14
4d1	APRON, LONGIT., BOT.		11	19'-11	146	17'-8	130	15'-4	113	13'-0	96	4d1
4d2	APRON, LONGIT., BOT. LONG		3	27'-8	55	23'-7	47	19'-6	39	15'-5	31	4d2
4d3	APRON, LONGIT., BOT. SHORT		3	21'-5	43	18'-4	37	15'-3	31	12'-3	25	4d3
6f1	APRON, LONGIT., TOP		16	19'-11	479	17'-8	425	15'-4	368	13'-0	312	6f1
6f2	APRON, LONGIT., TOP LONG		6	5'-3 TO 16'-11	100	5'-3 TO 14'-7	74	5'-3 TO 12'-4	53	5'-3 TO 10'-0	34	6f2
6f3	APRON, LONGIT., TOP SHORT		4	7'-9 TO 17'-2	75	5'-5 TO 14'-10	61	6'-2 TO 12'-6	42	7'-0 TO 10'-3	26	6f3
6f4	APRON, LONGIT., TOP LONG		1	33'-5	50	29'-2	44	25'-0	38	20'-10	31	6f4
6f5	APRON, LONGIT., TOP SHORT		1	25'-8	39	22'-6	34	19'-5	29	16'-4	25	6f5
4i1	PARAPET, VERTICAL		33	6'-4	140	6'-4	140	6'-4	140	6'-4	140	4i1
7j1	PARAPET, HORIZONTAL		4	20'-8	169	20'-8	169	20'-8	169	20'-8	169	7j1
6m1	APRON, TRANS., TOP		8	19'-5 TO 20'-9	241	19'-5 TO 20'-9	241	19'-5 TO 20'-9	241	19'-5 TO 20'-9	241	6m1
6m2	APRON, TRANS., TOP		10	21'-0 TO 24'-5	341	21'-0 TO 23'-3	233	21'-0 TO 22'-2	130	21'-0 TO 21'-0	32	6m2
6m3	APRON, TRANS., TOP		12	6'-0 TO 18'-2	218	5'-4 TO 17'-6	206	4'-8 TO 16'-10	194	4'-0 TO 16'-2	182	6m3
6m4	APRON, TRANS., BOT.		14	14'-4 TO 23'-2	394	14'-4 TO 21'-10	326	14'-4 TO 20'-5	261	14'-4 TO 19'-1	201	6m4
6p1	CURTAIN, HORIZONTAL		4	19'-6	117	19'-6	117	19'-6	117	19'-6	117	6p1
6p2	CURTAIN, HORIZONTAL LONG		4	18'-0	108	16'-0	96	13'-11	84	11'-11	72	6p2
6p3	CURTAIN, HORIZONTAL SHORT		4	10'-9	65	9'-8	58	8'-8	52	7'-7	46	6p3
6s1	WING SLOPE, BOTH F. LONG		2	8'-0	24	8'-0	24	8'-0	24	8'-0	24	6s1
6s2	WING SLOPE, BOTH F. SHORT		2	6'-11	21	6'-11	21	6'-11	21	6'-11	21	6s2
6s3	WING SLOPE, BOTH F. LONG		2	27'-10	84	23'-7	71	19'-3	58	15'-0	45	6s3
6s4	WING SLOPE, BOTH F. SHORT		2	22'-1	66	18'-10	57	15'-7	47	12'-3	37	6s4
6s5	WING SLOPE, F.F. LONG		1	33'-1	50	28'-10	43	24'-6	37	20'-3	30	6s5
6s6	WING SLOPE, F.F. SHORT		1	26'-3	39	22'-11	34	19'-8	30	16'-5	25	6s6
6s7	INTERIOR WALL, BOTH F.H.		2	20'-5	61	17'-11	54	15'-5	46	12'-11	39	6s7
5t1	CURTAIN, VERTICAL		28	6'-8	195	6'-5	167	6'-5	154	6'-5	141	5t1
ESTIMATED QUANTITIES ONE HEADWALL	REINF. STEEL		5186 LB		4329 LB		3418 LB		2806 LB			
	CONCRETE	PARAPET Δ	2.3		2.3		2.3		2.3			
		WINGWALLS	9.7	37.7 CY	7.5	31.4 CY	5.5	26.0 CY	3.7	20.9 CY		
	FOOTING *	25.7		21.6		18.2		14.9				

**BENT BAR DETAILS**



NOTE: ALL DIMENSIONS ARE OUT TO OUT. D = PIN DIAMETER.

Δ INCLUDES TOP OF WINGWALL QUANTITIES.  
 \* ASSUMES APRON AND FLOOR ARE EQUAL THICKNESS, ADJUST CONCRETE QUANTITIES FOR TRANSITION WHERE APRON AND FLOOR THICKNESS ARE NOT EQUAL.

NOTE: WEIGHT OF BARS OVER 40'-0 LONG INCLUDES AN ALLOWANCE OF 2'-3 FOR LAP. LENGTHS SHOWN FOR BARS OVER 40'-0 LONG DO NOT INCLUDE LAP.

"SHORT" DENOTES SHORT WINGWALL  
 "LONG" DENOTES LONG WINGWALL

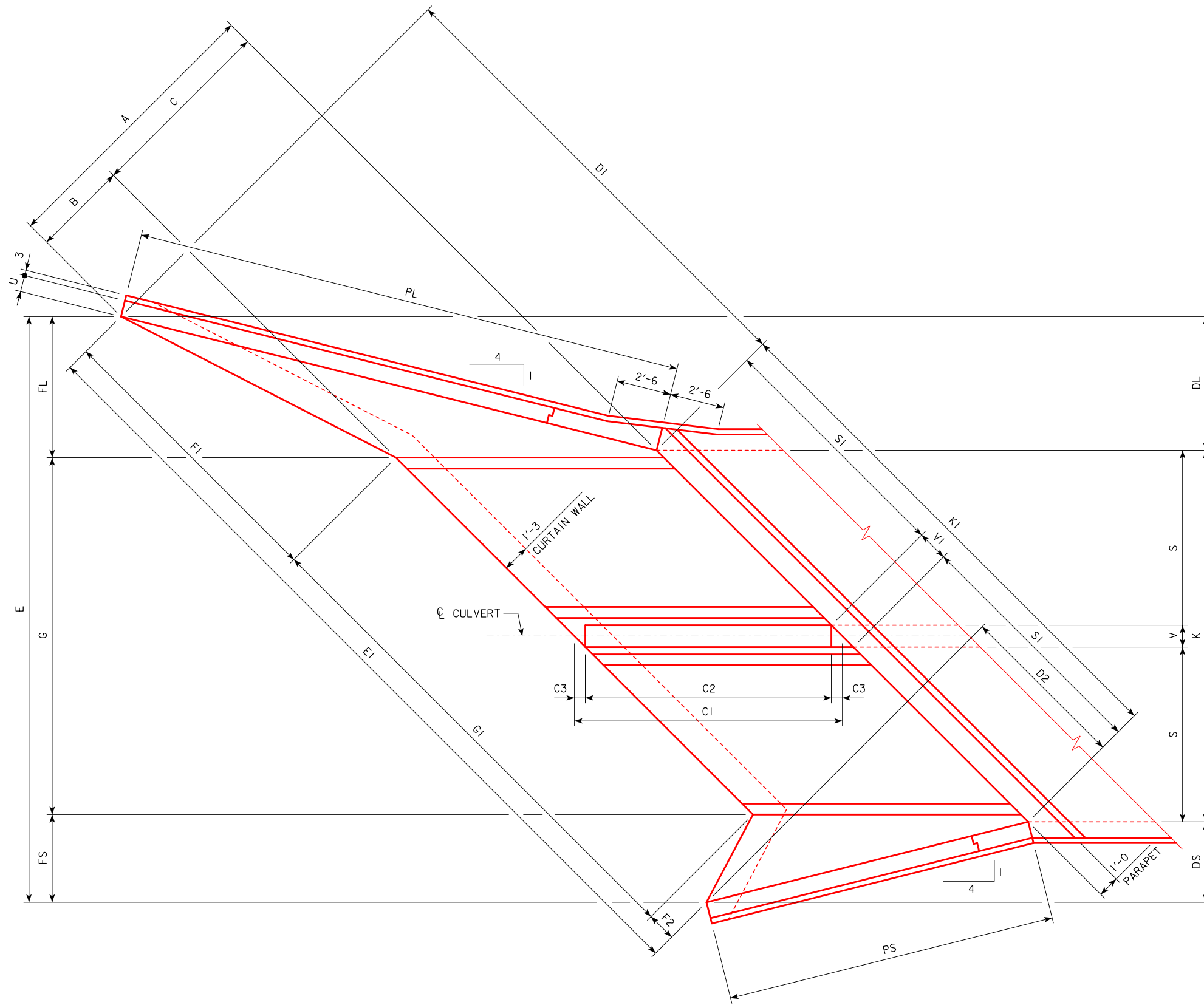
**HEADWALL NOTES:**

- SEE DRAWING TWRCB G1-12 FOR GENERAL INFORMATION, SPECIFICATIONS, AND DESIGN STRESSES.
- THIS HEADWALL IS BASED ON A 3:1 SLOPE NORMAL TO CENTERLINE OF ROADWAY.
- THE SIDES OF THE FOOTING ARE TO BE FORMED TO INSURE CORRECT LINE AND GRADE.
- ALL SLAB AND FLOOR REINFORCING STEEL IS TO BE SUPPORTED BY BAR CHAIRS AT INTERVALS OF NOT MORE THAN 3'-0 IN EITHER DIRECTION AS OUTLINED IN THE STANDARD SPECIFICATIONS.
- CLEAR DISTANCE FROM FACE OF CONCRETE TO NEAR REINFORCING BAR IS TO BE 2" UNLESS OTHERWISE NOTED OR SHOWN. CLEARANCE TO THE BOTTOM ENDS OF VERTICAL BARS SHALL BE 3 INCHES.
- CONCRETE QUANTITIES ARE ESTIMATED FROM BACK OF PARAPET.
- HORIZONTAL TAILS OF BARS "b" & "s" ESTIMATED TO EXTEND 2'-0 BEYOND BACK OF PARAPET (INTO END OF BARREL). LONGITUDINAL BARS "d", "6f1", AND "6f3" ESTIMATED TO PROJECT INTO END SECTION OF BARREL A MINIMUM OF 2'-0 BEYOND BACK OF PARAPET.
- THE "LENGTH" COLUMN REFLECTS TOTAL NUMBER OF FEET NECESSARY TO MEET THESE REQUIREMENTS.

LATEST REVISION DATE	<i>Thomas L. Mc Donald</i> APPROVED BY BRIDGE ENGINEER	<b>IOWADOT Highway Division</b>	
		STANDARD DESIGN	
		<b>TWIN REINFORCED CONCRETE BOX CULVERTS</b> APRIL, 2012	
		<b>FLARED WING HEADWALLS</b> 30° SKEW	<b>TWH 30-9-12</b>

ENGLISHLRFDSTWINGWALLVERTS.DGN - TWH 30-9-12 - THIS SHEET ISSUED 04-12.

REVISED 12-2016: REMOVED NOTE STATING LOCATION FOR HEADWALL NOTES.  
 ENGLISHLRFDSTWNCULVERTS.DGN - TWH 45-1-12 - THIS SHEET ISSUED 04-12.



PLAN VIEW

**NOTES:**

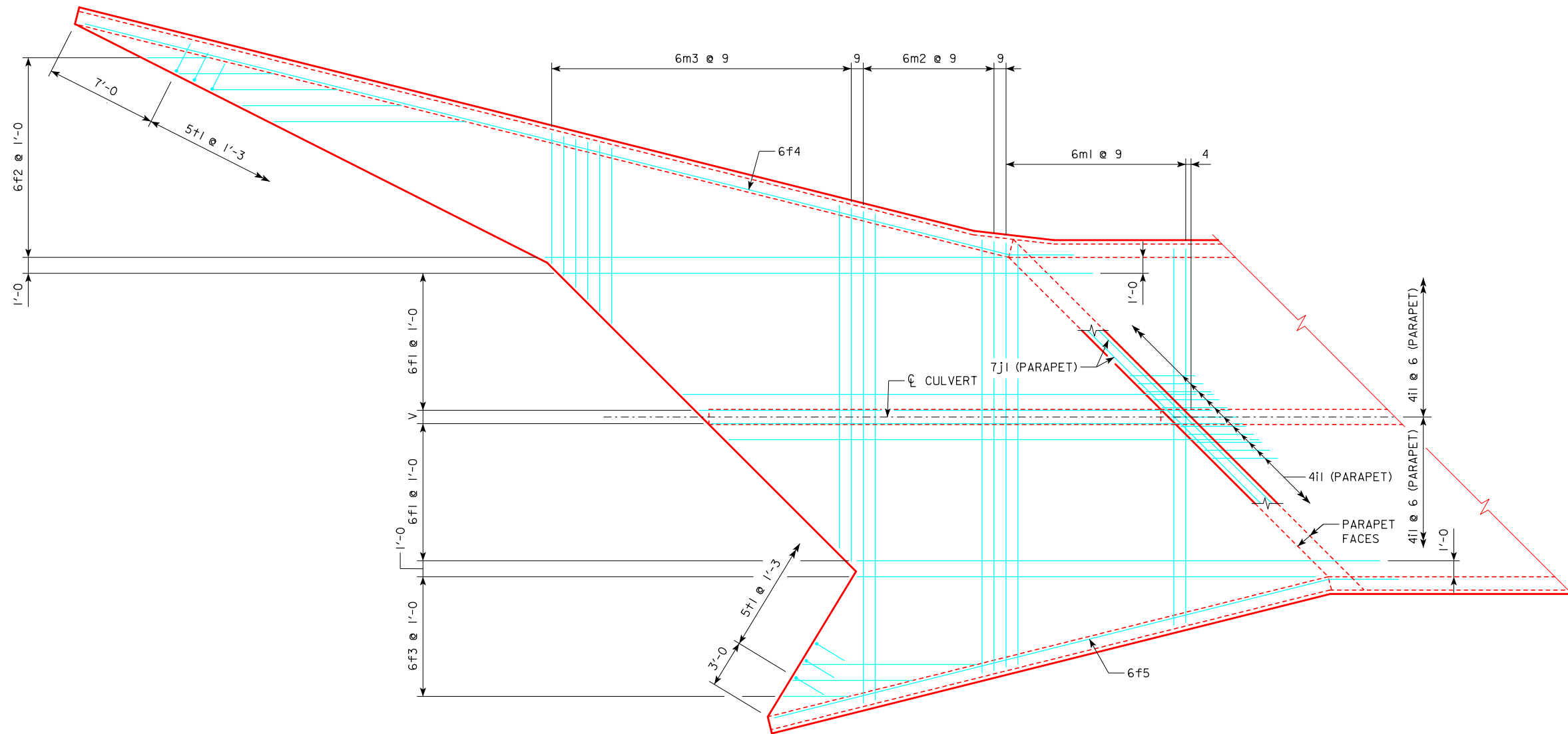
1. SEE SHEET TWRCB G1-12 FOR GENERAL INFORMATION, SPECIFICATIONS, AND DESIGN STRESSES.
2. SEE SHEET TWH 45-2-12 FOR DIMENSION TABLE.

12-2016 LATEST REVISION DATE  <i>Thomas L. McDaniel</i> APPROVED BY BRIDGE ENGINEER		
	STANDARD DESIGN <b>TWIN REINFORCED CONCRETE                  BOX CULVERTS</b> APRIL, 2012	
	<b>FLARED WING                  HEADWALLS</b> 45° SKEW	<b>TWH 45-1-12</b>

DIMENSION TABLE

S X H	12' X 12'	12' X 11'	12' X 10'	12' X 9'	12' X 8'	12' X 7'	12' X 6'	12' X 5'	12' X 4'	10' X 12'	10' X 11'	10' X 10'	10' X 9'	10' X 8'	10' X 7'	10' X 6'	10' X 5'	10' X 4'	8' X 10'	8' X 9'	8' X 8'	8' X 7'	8' X 6'	8' X 5'	8' X 4'	S X H
A	37'-0	34'-0	31'-0	28'-0	25'-0	22'-0	19'-0	16'-0	13'-0	37'-0	34'-0	31'-0	28'-0	25'-0	22'-0	19'-0	16'-0	13'-0	31'-0	28'-0	25'-0	22'-0	19'-0	16'-0	13'-0	A
B	12'-4	11'-4	10'-4	9'-4	8'-4	7'-4	6'-4	5'-4	4'-4	12'-4	11'-4	10'-4	9'-4	8'-4	7'-4	6'-4	5'-4	4'-4	10'-4	9'-4	8'-4	7'-4	6'-4	5'-4	4'-4	B
C	24'-8	22'-8	20'-8	18'-8	16'-8	14'-8	12'-8	10'-8	8'-8	24'-8	22'-8	20'-8	18'-8	16'-8	14'-8	12'-8	10'-8	8'-8	20'-8	18'-8	16'-8	14'-8	12'-8	10'-8	8'-8	C
C1	34'-10 <sup>5</sup> / <sub>8</sub>	32'-0 <sup>5</sup> / <sub>8</sub>	29'-2 <sup>3</sup> / <sub>4</sub>	26'-4 <sup>3</sup> / <sub>4</sub>	23'-6 <sup>7</sup> / <sub>8</sub>	20'-8 <sup>7</sup> / <sub>8</sub>	17'-11	15'-1	12'-3 <sup>1</sup> / <sub>8</sub>	34'-10 <sup>5</sup> / <sub>8</sub>	32'-0 <sup>5</sup> / <sub>8</sub>	29'-2 <sup>3</sup> / <sub>4</sub>	26'-4 <sup>3</sup> / <sub>4</sub>	23'-6 <sup>7</sup> / <sub>8</sub>	20'-8 <sup>7</sup> / <sub>8</sub>	17'-11	15'-1	12'-3 <sup>1</sup> / <sub>8</sub>	29'-2 <sup>3</sup> / <sub>4</sub>	26'-4 <sup>3</sup> / <sub>4</sub>	23'-6 <sup>7</sup> / <sub>8</sub>	20'-8 <sup>7</sup> / <sub>8</sub>	17'-11	15'-1	12'-3 <sup>1</sup> / <sub>8</sub>	C1
C2	33'-10 <sup>5</sup> / <sub>8</sub>	31'-1 <sup>5</sup> / <sub>8</sub>	28'-4 <sup>3</sup> / <sub>4</sub>	25'-6 <sup>3</sup> / <sub>4</sub>	22'-8 <sup>7</sup> / <sub>8</sub>	19'-11 <sup>7</sup> / <sub>8</sub>	17'-2	14'-4	11'-6 <sup>1</sup> / <sub>8</sub>	33'-10 <sup>5</sup> / <sub>8</sub>	31'-1 <sup>5</sup> / <sub>8</sub>	28'-4 <sup>3</sup> / <sub>4</sub>	25'-6 <sup>3</sup> / <sub>4</sub>	22'-8 <sup>7</sup> / <sub>8</sub>	19'-11 <sup>7</sup> / <sub>8</sub>	17'-2	14'-4	11'-6 <sup>1</sup> / <sub>8</sub>	28'-4 <sup>3</sup> / <sub>4</sub>	25'-6 <sup>3</sup> / <sub>4</sub>	22'-8 <sup>7</sup> / <sub>8</sub>	19'-11 <sup>7</sup> / <sub>8</sub>	17'-2	14'-4	11'-6 <sup>1</sup> / <sub>8</sub>	C2
C3	0'-6	0'-5 <sup>1</sup> / <sub>2</sub>	0'-5	0'-5	0'-5	0'-4 <sup>1</sup> / <sub>2</sub>	0'-4 <sup>1</sup> / <sub>2</sub>	0'-4 <sup>1</sup> / <sub>2</sub>	0'-4 <sup>1</sup> / <sub>2</sub>	0'-6	0'-5 <sup>1</sup> / <sub>2</sub>	0'-5	0'-5	0'-5	0'-4 <sup>1</sup> / <sub>2</sub>	0'-4 <sup>1</sup> / <sub>2</sub>	0'-4 <sup>1</sup> / <sub>2</sub>	0'-4 <sup>1</sup> / <sub>2</sub>	0'-5	0'-5	0'-5	0'-4 <sup>1</sup> / <sub>2</sub>	0'-4 <sup>1</sup> / <sub>2</sub>	0'-4 <sup>1</sup> / <sub>2</sub>	0'-4 <sup>1</sup> / <sub>2</sub>	C3
DL	17'-5 <sup>1</sup> / <sub>4</sub>	16'-0 <sup>3</sup> / <sub>8</sub>	14'-7 <sup>3</sup> / <sub>8</sub>	13'-2 <sup>3</sup> / <sub>8</sub>	11'-9 <sup>3</sup> / <sub>8</sub>	10'-4 <sup>1</sup> / <sub>2</sub>	8'-11 <sup>1</sup> / <sub>2</sub>	7'-6 <sup>1</sup> / <sub>2</sub>	6'-1 <sup>1</sup> / <sub>2</sub>	17'-5 <sup>1</sup> / <sub>4</sub>	16'-0 <sup>3</sup> / <sub>8</sub>	14'-7 <sup>3</sup> / <sub>8</sub>	13'-2 <sup>3</sup> / <sub>8</sub>	11'-9 <sup>3</sup> / <sub>8</sub>	10'-4 <sup>1</sup> / <sub>2</sub>	8'-11 <sup>1</sup> / <sub>2</sub>	7'-6 <sup>1</sup> / <sub>2</sub>	6'-1 <sup>1</sup> / <sub>2</sub>	14'-7 <sup>3</sup> / <sub>8</sub>	13'-2 <sup>3</sup> / <sub>8</sub>	11'-9 <sup>3</sup> / <sub>8</sub>	10'-4 <sup>1</sup> / <sub>2</sub>	8'-11 <sup>1</sup> / <sub>2</sub>	7'-6 <sup>1</sup> / <sub>2</sub>	6'-1 <sup>1</sup> / <sub>2</sub>	DL
DS	10'-5 <sup>5</sup> / <sub>8</sub>	9'-7 <sup>3</sup> / <sub>8</sub>	8'-9 <sup>1</sup> / <sub>4</sub>	7'-11	7'-0 <sup>7</sup> / <sub>8</sub>	6'-2 <sup>5</sup> / <sub>8</sub>	5'-4 <sup>1</sup> / <sub>2</sub>	4'-6 <sup>1</sup> / <sub>4</sub>	3'-8 <sup>1</sup> / <sub>8</sub>	10'-5 <sup>5</sup> / <sub>8</sub>	9'-7 <sup>3</sup> / <sub>8</sub>	8'-9 <sup>1</sup> / <sub>4</sub>	7'-11	7'-0 <sup>7</sup> / <sub>8</sub>	6'-2 <sup>5</sup> / <sub>8</sub>	5'-4 <sup>1</sup> / <sub>2</sub>	4'-6 <sup>1</sup> / <sub>4</sub>	3'-8 <sup>1</sup> / <sub>8</sub>	8'-9 <sup>1</sup> / <sub>4</sub>	7'-11	7'-0 <sup>7</sup> / <sub>8</sub>	6'-2 <sup>5</sup> / <sub>8</sub>	5'-4 <sup>1</sup> / <sub>2</sub>	4'-6 <sup>1</sup> / <sub>4</sub>	3'-8 <sup>1</sup> / <sub>8</sub>	DS
DI	61'-8	56'-8	51'-8	46'-8	41'-8	36'-8	31'-8	26'-8	21'-8	61'-8	56'-8	51'-8	46'-8	41'-8	36'-8	31'-8	26'-8	21'-8	51'-8	46'-8	41'-8	36'-8	31'-8	26'-8	21'-8	DI
D2	22'-2 <sup>3</sup> / <sub>8</sub>	20'-4 <sup>3</sup> / <sub>8</sub>	18'-7 <sup>1</sup> / <sub>4</sub>	16'-9 <sup>5</sup> / <sub>8</sub>	15'-0	13'-2 <sup>3</sup> / <sub>8</sub>	11'-4 <sup>3</sup> / <sub>8</sub>	9'-7 <sup>1</sup> / <sub>4</sub>	7'-9 <sup>5</sup> / <sub>8</sub>	22'-2 <sup>3</sup> / <sub>8</sub>	20'-4 <sup>3</sup> / <sub>8</sub>	18'-7 <sup>1</sup> / <sub>4</sub>	16'-9 <sup>5</sup> / <sub>8</sub>	15'-0	13'-2 <sup>3</sup> / <sub>8</sub>	11'-4 <sup>3</sup> / <sub>8</sub>	9'-7 <sup>1</sup> / <sub>4</sub>	7'-9 <sup>5</sup> / <sub>8</sub>	18'-7 <sup>1</sup> / <sub>4</sub>	16'-9 <sup>5</sup> / <sub>8</sub>	15'-0	13'-2 <sup>3</sup> / <sub>8</sub>	11'-4 <sup>3</sup> / <sub>8</sub>	9'-7 <sup>1</sup> / <sub>4</sub>	7'-9 <sup>5</sup> / <sub>8</sub>	D2
E	52'-10 <sup>7</sup> / <sub>8</sub>	50'-6 <sup>3</sup> / <sub>4</sub>	48'-2 <sup>5</sup> / <sub>8</sub>	45'-11 <sup>3</sup> / <sub>8</sub>	43'-8 <sup>1</sup> / <sub>4</sub>	41'-4 <sup>1</sup> / <sub>8</sub>	39'-1	36'-9 <sup>7</sup> / <sub>8</sub>	34'-6 <sup>5</sup> / <sub>8</sub>	48'-10 <sup>7</sup> / <sub>8</sub>	46'-6 <sup>3</sup> / <sub>4</sub>	44'-2 <sup>5</sup> / <sub>8</sub>	41'-11 <sup>3</sup> / <sub>8</sub>	39'-8 <sup>1</sup> / <sub>4</sub>	37'-4 <sup>1</sup> / <sub>8</sub>	35'-1	32'-9 <sup>7</sup> / <sub>8</sub>	30'-6 <sup>5</sup> / <sub>8</sub>	40'-2 <sup>5</sup> / <sub>8</sub>	37'-11 <sup>3</sup> / <sub>8</sub>	35'-8 <sup>1</sup> / <sub>4</sub>	33'-4 <sup>1</sup> / <sub>8</sub>	31'-1	28'-9 <sup>7</sup> / <sub>8</sub>	26'-6 <sup>5</sup> / <sub>8</sub>	E
E1	74'-9 <sup>7</sup> / <sub>8</sub>	71'-6	68'-2 <sup>1</sup> / <sub>4</sub>	64'-11 <sup>7</sup> / <sub>8</sub>	61'-9 <sup>3</sup> / <sub>8</sub>	58'-5 <sup>5</sup> / <sub>8</sub>	55'-3 <sup>1</sup> / <sub>4</sub>	52'-0 <sup>7</sup> / <sub>8</sub>	48'-10 <sup>3</sup> / <sub>8</sub>	69'-2	65'-10 <sup>1</sup> / <sub>8</sub>	62'-6 <sup>3</sup> / <sub>8</sub>	59'-4	56'-1 <sup>1</sup> / <sub>2</sub>	52'-9 <sup>3</sup> / <sub>4</sub>	49'-7 <sup>3</sup> / <sub>8</sub>	46'-5	43'-2 <sup>1</sup> / <sub>2</sub>	56'-10 <sup>1</sup> / <sub>2</sub>	53'-8 <sup>3</sup> / <sub>8</sub>	50'-5 <sup>5</sup> / <sub>8</sub>	47'-1 <sup>7</sup> / <sub>8</sub>	43'-11 <sup>1</sup> / <sub>2</sub>	40'-9	37'-6 <sup>5</sup> / <sub>8</sub>	E1
FL	17'-9 <sup>1</sup> / <sub>4</sub>	16'-4 <sup>3</sup> / <sub>8</sub>	14'-11 <sup>3</sup> / <sub>8</sub>	13'-6 <sup>3</sup> / <sub>8</sub>	12'-1 <sup>3</sup> / <sub>8</sub>	10'-8 <sup>1</sup> / <sub>2</sub>	9'-3 <sup>1</sup> / <sub>2</sub>	7'-10 <sup>1</sup> / <sub>2</sub>	6'-5 <sup>1</sup> / <sub>2</sub>	17'-9 <sup>1</sup> / <sub>4</sub>	16'-4 <sup>3</sup> / <sub>8</sub>	14'-11 <sup>3</sup> / <sub>8</sub>	13'-6 <sup>3</sup> / <sub>8</sub>	12'-1 <sup>3</sup> / <sub>8</sub>	10'-8 <sup>1</sup> / <sub>2</sub>	9'-3 <sup>1</sup> / <sub>2</sub>	7'-10 <sup>1</sup> / <sub>2</sub>	6'-5 <sup>1</sup> / <sub>2</sub>	14'-11 <sup>3</sup> / <sub>8</sub>	13'-6 <sup>3</sup> / <sub>8</sub>	12'-1 <sup>3</sup> / <sub>8</sub>	10'-8 <sup>1</sup> / <sub>2</sub>	9'-3 <sup>1</sup> / <sub>2</sub>	7'-10 <sup>1</sup> / <sub>2</sub>	6'-5 <sup>1</sup> / <sub>2</sub>	FL
FS	10'-9 <sup>3</sup> / <sub>8</sub>	9'-11 <sup>3</sup> / <sub>8</sub>	9'-1 <sup>1</sup> / <sub>4</sub>	8'-3	7'-4 <sup>1</sup> / <sub>8</sub>	6'-6 <sup>3</sup> / <sub>8</sub>	5'-8 <sup>1</sup> / <sub>2</sub>	4'-10 <sup>1</sup> / <sub>4</sub>	4'-0 <sup>3</sup> / <sub>8</sub>	10'-9 <sup>3</sup> / <sub>8</sub>	9'-11 <sup>3</sup> / <sub>8</sub>	9'-1 <sup>1</sup> / <sub>4</sub>	8'-3	7'-4 <sup>1</sup> / <sub>8</sub>	6'-6 <sup>3</sup> / <sub>8</sub>	5'-8 <sup>1</sup> / <sub>2</sub>	4'-10 <sup>1</sup> / <sub>4</sub>	4'-0 <sup>3</sup> / <sub>8</sub>	9'-1 <sup>1</sup> / <sub>4</sub>	8'-3	7'-4 <sup>1</sup> / <sub>8</sub>	6'-6 <sup>3</sup> / <sub>8</sub>	5'-8 <sup>1</sup> / <sub>2</sub>	4'-10 <sup>1</sup> / <sub>4</sub>	4'-0 <sup>3</sup> / <sub>8</sub>	FS
F1	37'-5 <sup>5</sup> / <sub>8</sub>	34'-5 <sup>5</sup> / <sub>8</sub>	31'-5 <sup>5</sup> / <sub>8</sub>	28'-5 <sup>5</sup> / <sub>8</sub>	25'-5 <sup>5</sup> / <sub>8</sub>	22'-5 <sup>5</sup> / <sub>8</sub>	19'-5 <sup>5</sup> / <sub>8</sub>	16'-5 <sup>5</sup> / <sub>8</sub>	13'-5 <sup>5</sup> / <sub>8</sub>	37'-5 <sup>5</sup> / <sub>8</sub>	34'-5 <sup>5</sup> / <sub>8</sub>	31'-5 <sup>5</sup> / <sub>8</sub>	28'-5 <sup>5</sup> / <sub>8</sub>	25'-5 <sup>5</sup> / <sub>8</sub>	22'-5 <sup>5</sup> / <sub>8</sub>	19'-5 <sup>5</sup> / <sub>8</sub>	16'-5 <sup>5</sup> / <sub>8</sub>	13'-5 <sup>5</sup> / <sub>8</sub>	31'-5 <sup>5</sup> / <sub>8</sub>	28'-5 <sup>5</sup> / <sub>8</sub>	25'-5 <sup>5</sup> / <sub>8</sub>	22'-5 <sup>5</sup> / <sub>8</sub>	19'-5 <sup>5</sup> / <sub>8</sub>	16'-5 <sup>5</sup> / <sub>8</sub>	13'-5 <sup>5</sup> / <sub>8</sub>	F1
F2	2'-11 <sup>1</sup> / <sub>4</sub>	2'-8 <sup>7</sup> / <sub>8</sub>	2'-6 <sup>1</sup> / <sub>2</sub>	2'-4	2'-1 <sup>5</sup> / <sub>8</sub>	1'-11 <sup>1</sup> / <sub>4</sub>	1'-8 <sup>7</sup> / <sub>8</sub>	1'-6 <sup>1</sup> / <sub>2</sub>	1'-4	2'-11 <sup>1</sup> / <sub>4</sub>	2'-8 <sup>7</sup> / <sub>8</sub>	2'-6 <sup>1</sup> / <sub>2</sub>	2'-4	2'-1 <sup>5</sup> / <sub>8</sub>	1'-11 <sup>1</sup> / <sub>4</sub>	1'-8 <sup>7</sup> / <sub>8</sub>	1'-6 <sup>1</sup> / <sub>2</sub>	1'-4	2'-6 <sup>1</sup> / <sub>2</sub>	2'-4	2'-1 <sup>5</sup> / <sub>8</sub>	1'-11 <sup>1</sup> / <sub>4</sub>	1'-8 <sup>7</sup> / <sub>8</sub>	1'-6 <sup>1</sup> / <sub>2</sub>	1'-4	F2
G	24'-4	24'-3	24'-2	24'-2	24'-2	24'-1	24'-1	24'-1	24'-1	20'-4	20'-3	20'-2	20'-2	20'-2	20'-1	20'-1	20'-1	20'-1	16'-2	16'-2	16'-2	16'-1	16'-1	16'-1	16'-1	G
G1	34'-5	34'-3 <sup>1</sup> / <sub>2</sub>	34'-2 <sup>1</sup> / <sub>8</sub>	34'-2 <sup>1</sup> / <sub>8</sub>	34'-2 <sup>1</sup> / <sub>8</sub>	34'-0 <sup>3</sup> / <sub>4</sub>	34'-0 <sup>3</sup> / <sub>4</sub>	34'-0 <sup>3</sup> / <sub>4</sub>	34'-0 <sup>3</sup> / <sub>4</sub>	28'-9 <sup>1</sup> / <sub>8</sub>	28'-7 <sup>5</sup> / <sub>8</sub>	28'-6 <sup>1</sup> / <sub>4</sub>	28'-6 <sup>1</sup> / <sub>4</sub>	28'-6 <sup>1</sup> / <sub>4</sub>	28'-4 <sup>7</sup> / <sub>8</sub>	28'-4 <sup>7</sup> / <sub>8</sub>	28'-4 <sup>7</sup> / <sub>8</sub>	28'-4 <sup>7</sup> / <sub>8</sub>	22'-10 <sup>3</sup> / <sub>8</sub>	22'-10 <sup>3</sup> / <sub>8</sub>	22'-10 <sup>3</sup> / <sub>8</sub>	22'-9	22'-9	22'-9	22'-9	G1
G2	35'-7 <sup>1</sup> / <sub>4</sub>	35'-5 <sup>3</sup> / <sub>4</sub>	35'-4 <sup>1</sup> / <sub>4</sub>	35'-4 <sup>1</sup> / <sub>4</sub>	35'-4 <sup>1</sup> / <sub>4</sub>	35'-2 <sup>5</sup> / <sub>8</sub>	35'-2 <sup>5</sup> / <sub>8</sub>	35'-2 <sup>5</sup> / <sub>8</sub>	35'-2 <sup>5</sup> / <sub>8</sub>	29'-11 <sup>3</sup> / <sub>8</sub>	29'-9 <sup>7</sup> / <sub>8</sub>	29'-8 <sup>3</sup> / <sub>8</sub>	29'-8 <sup>3</sup> / <sub>8</sub>	29'-8 <sup>3</sup> / <sub>8</sub>	29'-6 <sup>3</sup> / <sub>4</sub>	29'-6 <sup>3</sup> / <sub>4</sub>	29'-6 <sup>3</sup> / <sub>4</sub>	29'-6 <sup>3</sup> / <sub>4</sub>	24'-0 <sup>1</sup> / <sub>2</sub>	24'-0 <sup>1</sup> / <sub>2</sub>	24'-0 <sup>1</sup> / <sub>2</sub>	23'-10 <sup>7</sup> / <sub>8</sub>	23'-10 <sup>3</sup> / <sub>4</sub>	23'-10 <sup>5</sup> / <sub>8</sub>	23'-10 <sup>3</sup> / <sub>8</sub>	G2
G3	39'-5 <sup>3</sup> / <sub>8</sub>	36'-3 <sup>1</sup> / <sub>2</sub>	33'-1 <sup>1</sup> / <sub>2</sub>	29'-11 <sup>1</sup> / <sub>2</sub>	26'-9 <sup>5</sup> / <sub>8</sub>	23'-7 <sup>5</sup> / <sub>8</sub>	20'-5 <sup>3</sup> / <sub>4</sub>	17'-3 <sup>1</sup> / <sub>4</sub>	14'-1 <sup>7</sup> / <sub>8</sub>	39'-5 <sup>3</sup> / <sub>8</sub>	36'-3 <sup>1</sup> / <sub>2</sub>	33'-1 <sup>1</sup> / <sub>2</sub>	29'-11 <sup>1</sup> / <sub>2</sub>	26'-9 <sup>5</sup> / <sub>8</sub>	23'-7 <sup>5</sup> / <sub>8</sub>	20'-5 <sup>3</sup> / <sub>4</sub>	17'-3 <sup>1</sup> / <sub>4</sub>	14'-1 <sup>7</sup> / <sub>8</sub>	33'-1 <sup>1</sup> / <sub>2</sub>	29'-11 <sup>1</sup> / <sub>2</sub>	26'-9 <sup>5</sup> / <sub>8</sub>	23'-7 <sup>5</sup> / <sub>8</sub>	20'-5 <sup>3</sup> / <sub>4</sub>	17'-3 <sup>1</sup> / <sub>4</sub>	14'-1 <sup>7</sup> / <sub>8</sub>	G3
G4	39'-9 <sup>1</sup> / <sub>2</sub>	36'-3	32'-8 <sup>1</sup> / <sub>2</sub>	29'-6 <sup>3</sup> / <sub>8</sub>	26'-4 <sup>3</sup> / <sub>8</sub>	22'-10 <sup>1</sup> / <sub>4</sub>	19'-8 <sup>3</sup> / <sub>8</sub>	16'-6 <sup>1</sup> / <sub>2</sub>	13'-4 <sup>3</sup> / <sub>8</sub>	39'-9 <sup>1</sup> / <sub>2</sub>	36'-3	32'-8 <sup>1</sup> / <sub>2</sub>	29'-6 <sup>3</sup> / <sub>8</sub>	26'-4 <sup>3</sup> / <sub>8</sub>	22'-10 <sup>1</sup> / <sub>4</sub>	19'-8 <sup>3</sup> / <sub>8</sub>	16'-6 <sup>1</sup> / <sub>2</sub>	13'-4 <sup>3</sup> / <sub>8</sub>	32'-8 <sup>1</sup> / <sub>2</sub>	29'-6 <sup>3</sup> / <sub>8</sub>	26'-4 <sup>3</sup> / <sub>8</sub>	22'-10 <sup>1</sup> / <sub>4</sub>	19'-8 <sup>3</sup> / <sub>8</sub>	16'-6 <sup>1</sup> / <sub>2</sub>	13'-4 <sup>3</sup> / <sub>8</sub>	G4
G5	12'-8 <sup>1</sup> / <sub>8</sub>	11'-7 <sup>7</sup> / <sub>8</sub>	10'-7 <sup>5</sup> / <sub>8</sub>	9'-7 <sup>1</sup> / <sub>2</sub>	8'-7 <sup>1</sup> / <sub>4</sub>	7'-7	6'-6 <sup>3</sup> / <sub>4</sub>	5'-6 <sup>5</sup> / <sub>8</sub>	4'-6 <sup>3</sup> / <sub>8</sub>	12'-8 <sup>1</sup> / <sub>8</sub>	11'-7 <sup>7</sup> / <sub>8</sub>	10'-7 <sup>5</sup> / <sub>8</sub>	9'-7 <sup>1</sup> / <sub>2</sub>	8'-7 <sup>1</sup> / <sub>4</sub>	7'-7	6'-6 <sup>3</sup> / <sub>4</sub>	5'-6 <sup>5</sup> / <sub>8</sub>	4'-6 <sup>3</sup> / <sub>8</sub>	10'-7 <sup>5</sup> / <sub>8</sub>	9'-7 <sup>1</sup> / <sub>2</sub>	8'-7 <sup>1</sup> / <sub>4</sub>	7'-7	6'-6 <sup>3</sup> / <sub>4</sub>	5'-6 <sup>5</sup> / <sub>8</sub>	4'-6 <sup>3</sup> / <sub>8</sub>	G5
G6	14'-2 <sup>1</sup> / <sub>8</sub>	13'-0 <sup>1</sup> / <sub>2</sub>	11'-10 <sup>3</sup> / <sub>4</sub>	10'-10 <sup>1</sup> / <sub>2</sub>	9'-10 <sup>3</sup> / <sub>8</sub>	8'-8 <sup>3</sup> / <sub>4</sub>	7'-8 <sup>1</sup> / <sub>2</sub>	6'-8 <sup>3</sup> / <sub>8</sub>	5'-8 <sup>1</sup> / <sub>8</sub>	14'-2 <sup>1</sup> / <sub>8</sub>	13'-0 <sup>1</sup> / <sub>2</sub>	11'-10 <sup>3</sup> / <sub>4</sub>	10'-10 <sup>1</sup> / <sub>2</sub>	9'-10 <sup>3</sup> / <sub>8</sub>	8'-8 <sup>3</sup> / <sub>4</sub>	7'-8 <sup>1</sup> / <sub>2</sub>	6'-8 <sup>3</sup> / <sub>8</sub>	5'-8 <sup>1</sup> / <sub>8</sub>	11'-10 <sup>3</sup> / <sub>4</sub>	10'-10 <sup>1</sup> / <sub>2</sub>	9'-10 <sup>3</sup> / <sub>8</sub>	8'-8 <sup>3</sup> / <sub>4</sub>	7'-8 <sup>1</sup> / <sub>2</sub>	6'-8 <sup>3</sup> / <sub>8</sub>	5'-8 <sup>1</sup> / <sub>8</sub>	G6
G7	0'-1 <sup>5</sup> / <sub>8</sub>	0'-6 <sup>5</sup> / <sub>8</sub>	0'-10 <sup>1</sup> / <sub>2</sub>	0'-10 <sup>1</sup> / <sub>2</sub>	0'-10 <sup>1</sup> / <sub>2</sub>	1'-2 <sup>3</sup> / <sub>4</sub>	1'-2 <sup>3</sup> / <sub>4</sub>	1'-2 <sup>3</sup> / <sub>4</sub>	1'-2 <sup>3</sup> / <sub>4</sub>	0'-1 <sup>5</sup> / <sub>8</sub>	0'-6 <sup>5</sup> / <sub>8</sub>	0'-10 <sup>1</sup> / <sub>2</sub>	0'-10 <sup>1</sup> / <sub>2</sub>	0'-10 <sup>1</sup> / <sub>2</sub>	1'-2 <sup>3</sup> / <sub>4</sub>	1'-2 <sup>3</sup> / <sub>4</sub>	1'-2 <sup>3</sup> / <sub>4</sub>	1'-2 <sup>3</sup> / <sub>4</sub>	0'-10 <sup>1</sup> / <sub>2</sub>	0'-10 <sup>1</sup> / <sub>2</sub>	0'-10 <sup>1</sup> / <sub>2</sub>	1'-2 <sup>3</sup> / <sub>4</sub>	1'-2 <sup>3</sup> / <sub>4</sub>	1'-2 <sup>3</sup> / <sub>4</sub>	1'-2 <sup>3</sup> / <sub>4</sub>	G7
G8	0'-6 <sup>1</sup> / <sub>8</sub>	0'-7 <sup>1</sup> / <sub>8</sub>	0'-8 <sup>1</sup> / <sub>4</sub>	0'-8 <sup>1</sup> / <sub>4</sub>	0'-8 <sup>1</sup> / <sub>4</sub>	0'-9 <sup>1</sup> / <sub>4</sub>	0'-9 <sup>1</sup> / <sub>4</sub>	0'-9 <sup>1</sup> / <sub>4</sub>	0'-9 <sup>1</sup> / <sub>4</sub>	0'-6 <sup>1</sup> / <sub>8</sub>	0'-7 <sup>1</sup> / <sub>8</sub>	0'-8 <sup>1</sup> / <sub>4</sub>	0'-8 <sup>1</sup> / <sub>4</sub>	0'-8 <sup>1</sup> / <sub>4</sub>	0'-9 <sup>1</sup> / <sub>4</sub>	0'-9 <sup>1</sup> / <sub>4</sub>	0'-9 <sup>1</sup> / <sub>4</sub>	0'-9 <sup>1</sup> / <sub>4</sub>	0'-8 <sup>1</sup> / <sub>4</sub>	0'-8 <sup>1</sup> / <sub>4</sub>	0'-8 <sup>1</sup> / <sub>4</sub>	0'-9 <sup>1</sup> / <sub>4</sub>	0'-9 <sup>1</sup> / <sub>4</sub>	0'-9 <sup>1</sup> / <sub>4</sub>	0'-9 <sup>1</sup> / <sub>4</sub>	G8
K	25'-0	24'-11	24'-10	24'-10	24'-10	24'-9	24'-9	24'-9	24'-9	21'-0	20'-11	20'-10	20'-10	20'-10	20'-9	20'-9	20'-9	20'-9	16'-10	16'-10	16'-10	16'-9	16'-9	16'-9	16'-9	K
KI	35'-4 <sup>1</sup> / <sub>4</sub>	35'-2 <sup>7</sup> / <sub>8</sub>	35'-1 <sup>3</sup> / <sub>8</sub>	35'-1 <sup>3</sup> / <sub>8</sub>	35'-1 <sup>3</sup> / <sub>8</sub>	35'-0	35'-0	35'-0	35'-0	29'-8 <sup>3</sup> / <sub>8</sub>	29'-7	29'-5 <sup>1</sup> / <sub>2</sub>	29'-5 <sup>1</sup> / <sub>2</sub>	29'-5 <sup>1</sup> / <sub>2</sub>	29'-4 <sup>1</sup> / <sub>8</sub>	29'-4 <sup>1</sup> / <sub>8</sub>	29'-4 <sup>1</sup> / <sub>8</sub>	29'-4 <sup>1</sup> / <sub>8</sub>	23'-9 <sup>5</sup> / <sub>8</sub>	23'-9 <sup>5</sup> / <sub>8</sub>	23'-9 <sup>5</sup> / <sub>8</sub>	23'-8 <sup>1</sup> / <sub>4</sub>	23'-8 <sup>1</sup> / <sub>4</sub>	23'-8 <sup>1</sup> / <sub>4</sub>	23'-8 <sup>1</sup> / <sub>4</sub>	KI
PL	71'-11	66'-1																								






PLAN VIEW - TOP OF APRON REINFORCING BARS

**NOTES:**

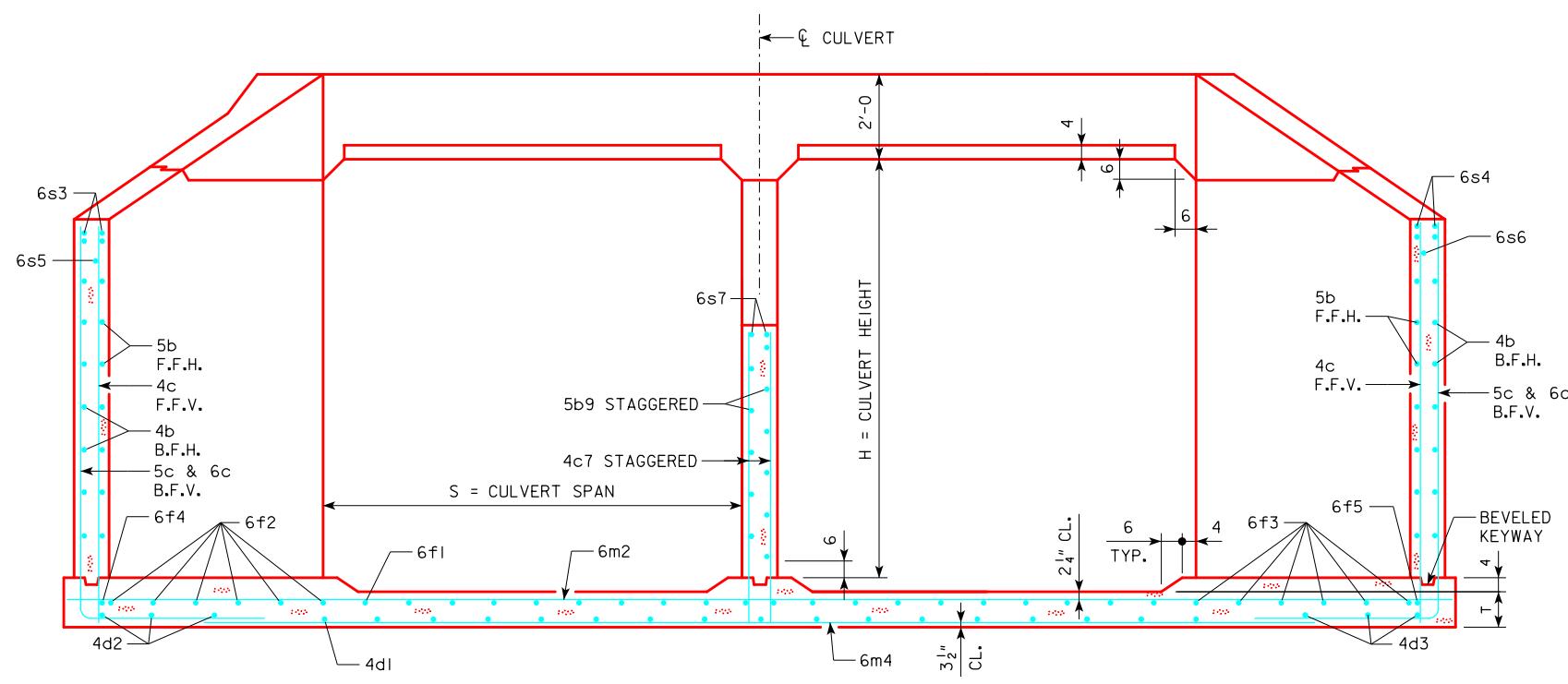
1. BAR SPACINGS AND POSITIONS SHOWN ARE SIMILAR FOR ALL SIZES OF HEADWALLS IN THIS STANDARD.
2. TOP TRANSVERSE FLOOR BARS ARE REFERENCED APPROXIMATELY 4" FROM THE BACK OF THE PARAPET FOR ALL HEADWALLS.
3. FOR DIMENSION TABLE SEE SHEET TWH 45-2-12.
4. FOR REINFORCING IN CURTAIN WALL SEE CURTAIN WALL DETAILS ON SHEET TWH 45-5-12.

ENGLISHLRFDSDIGNEDTWINCULVERTS.DGN - TWH 45-3-12 - THIS SHEET ISSUED 04-12.

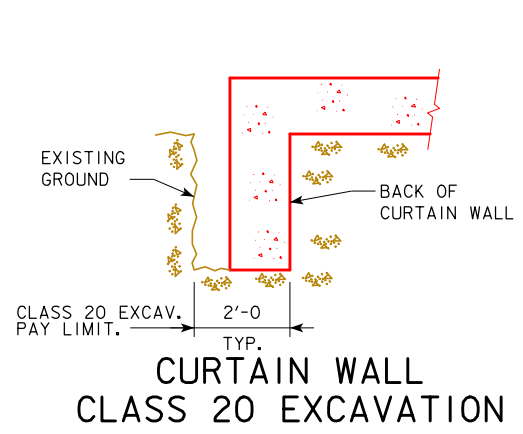
LATEST REVISION DATE  <i>Thomas L. Mc Donald</i> APPROVED BY BRIDGE ENGINEER	 STANDARD DESIGN <b>TWIN REINFORCED CONCRETE BOX CULVERTS</b> APRIL, 2012
<b>FLARED WING HEADWALLS</b> 45° SKEW	<b>TWH 45-3-12</b>



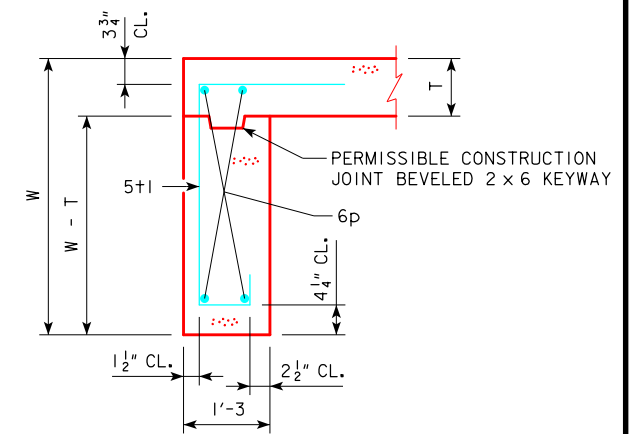
REVISED 12-2016: ADDED CURTAIN WALL CLASS 20 EXCAVATION DETAIL. ENGLISHLRFDSTWINGWALLS.DGN - TWH 45-5-12 - THIS SHEET ISSUED 04-12.



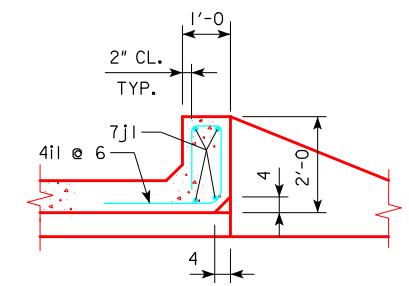
TYPICAL SECTION - NEAR CENTER OF APRON



CURTAIN WALL CLASS 20 EXCAVATION

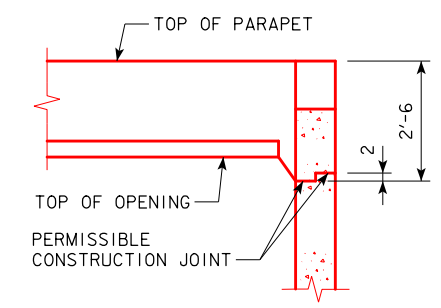


SECTION THRU CURTAIN WALL

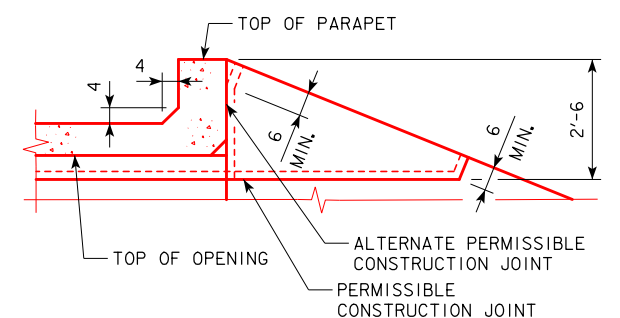


SECTION THRU PARAPET

CULVERT HEIGHT (H)	ANGLE	
	Δ L	Δ S
4'	27°10'	62°06'
5'	27°03'	61°07'
6'	26°59'	60°22'
7'	26°55'	59°48'
8'	26°53'	59°22'
9'	26°51'	59°02'
10'	26°49'	58°49'
11'	26°48'	58°35'
12'	26°47'	58°24'

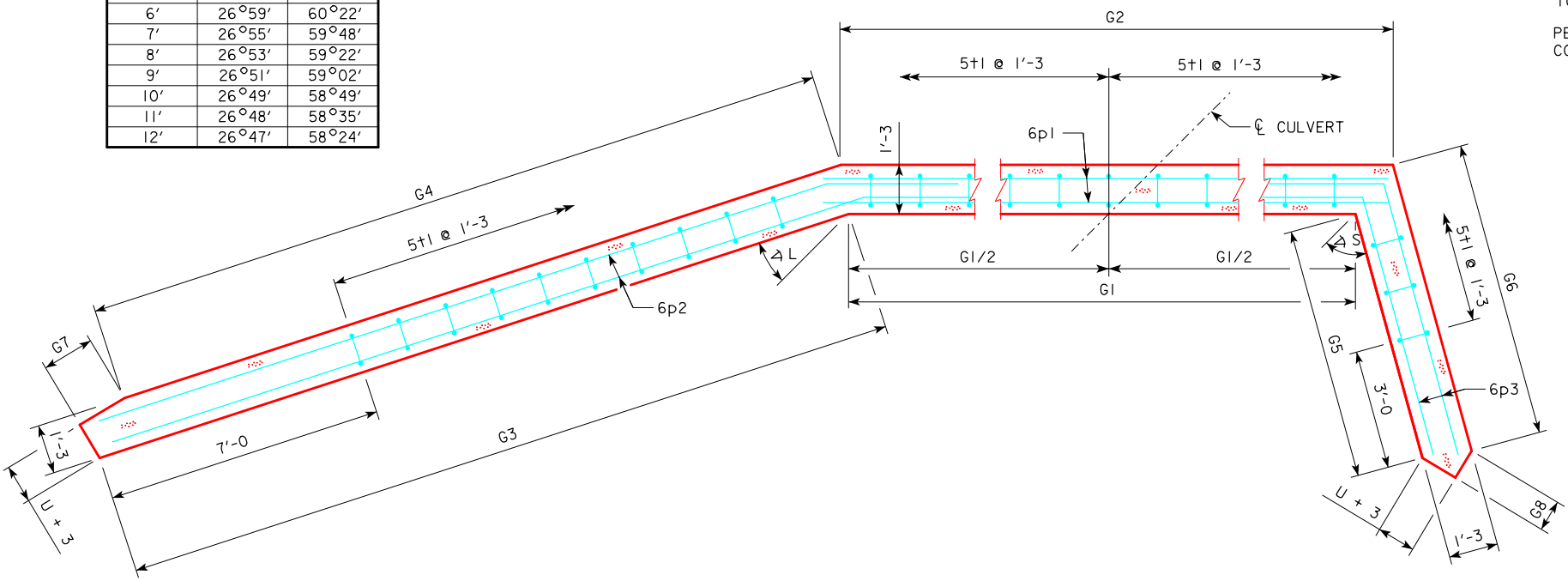


TOP OF WINGWALL DETAILS



NOTES:

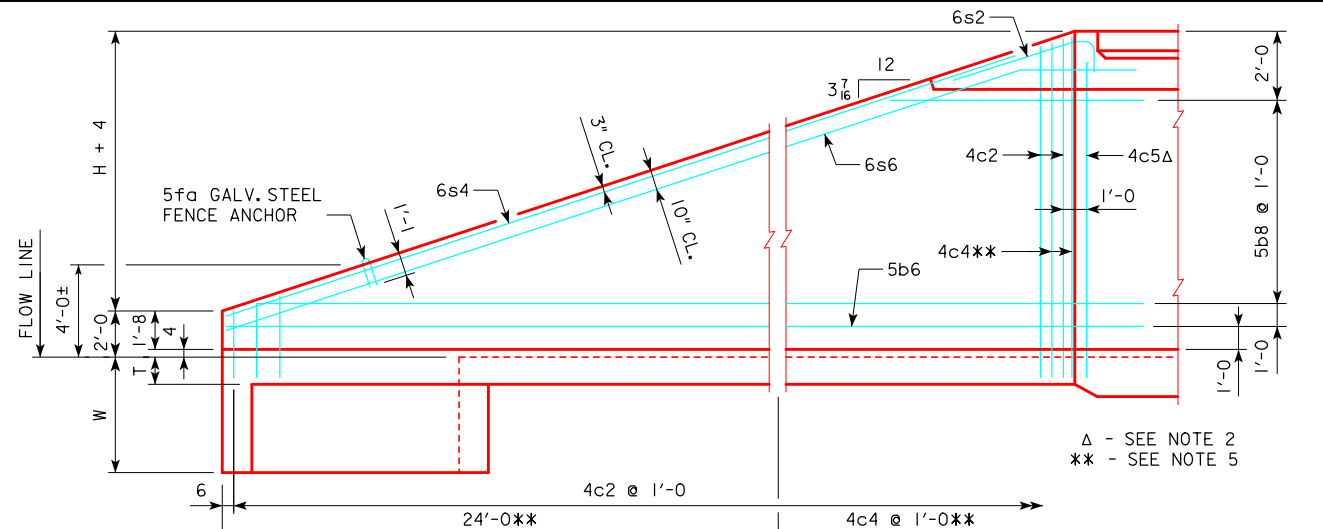
1. SEE SHEET TWRCB G1-12 FOR GENERAL INFORMATION, SPECIFICATIONS, AND DESIGN STRESSES.
2. FOR DIMENSION TABLE SEE SHEET TWH 45-2-12.



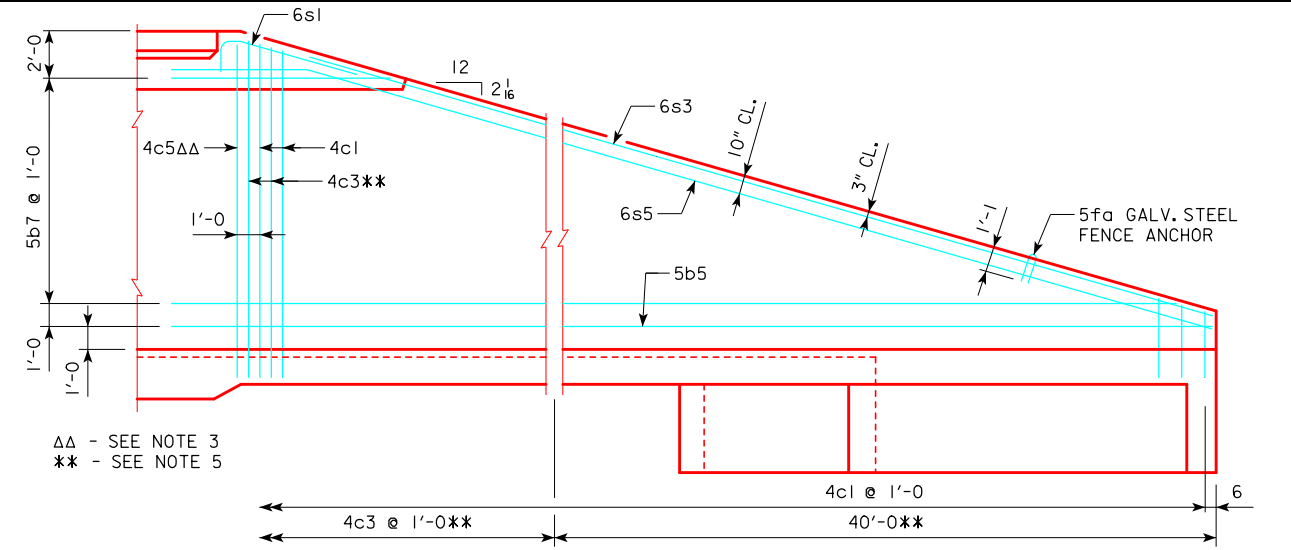
CURTAIN WALL PLAN

12-2016 LATEST REVISION DATE	<i>Thomas L. Mc Donald</i> APPROVED BY BRIDGE ENGINEER	<b>IOWADOT</b> Highway Division	
		STANDARD DESIGN <b>TWIN REINFORCED CONCRETE BOX CULVERTS</b> APRIL, 2012	
<b>FLARED WING HEADWALLS</b> 45° SKEW		<b>TWH 45-5-12</b>	

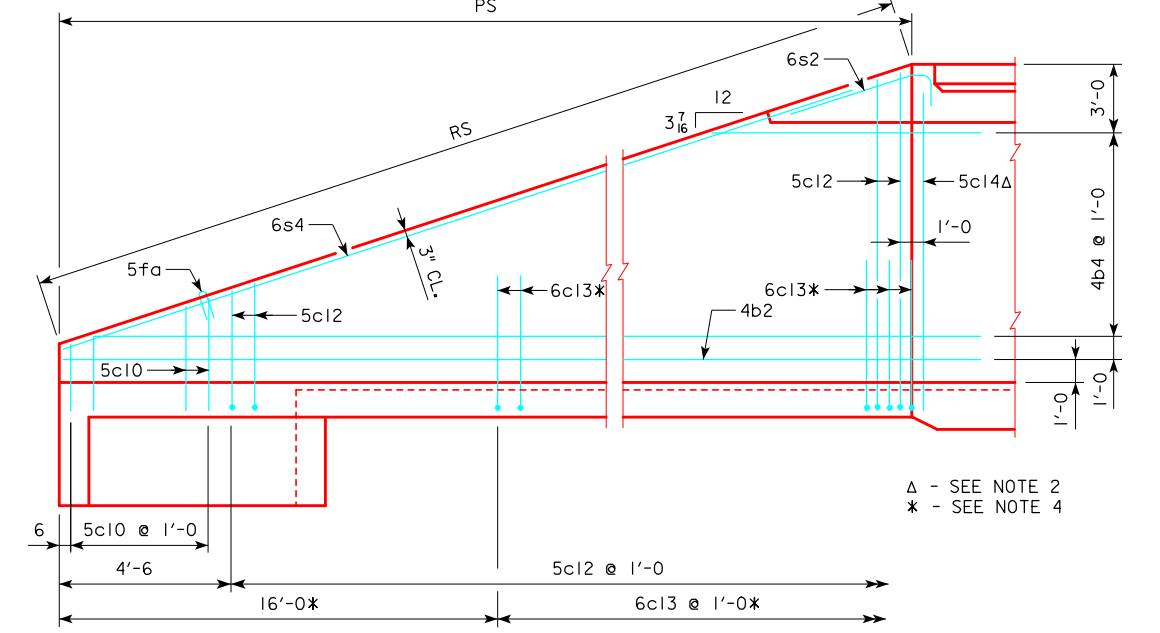
REVISED 05-13 - CHANGED DIMENSIONS WHEN TO BEGIN PLACING BARS 4c3, 4c4, 5c11, 5c12, & 6c13 IN WINGWALLS.  
 REVISED 07-2016 - REMOVED 1'-8" VERTICAL DIMENSION FROM 6s5 & 6s6 BARS TO TOP OF PARAPET. THIS ALLOWS FOR THE VARIABLE VERTICAL LOCATION OF THE HORIZONTAL LEG IN THE SLAB.  
 THIS VARIANCE IN LOCATION IS CAUSED BY THE DIFFERING WING SIZES OF DIFFERENT SIZED R.C.B. CULVERTS.  
 ENGLISHLRFDSIGNEDTWINCULVERTS.DGN - TWH 45-6-12 - THIS SHEET ISSUED 04-12.



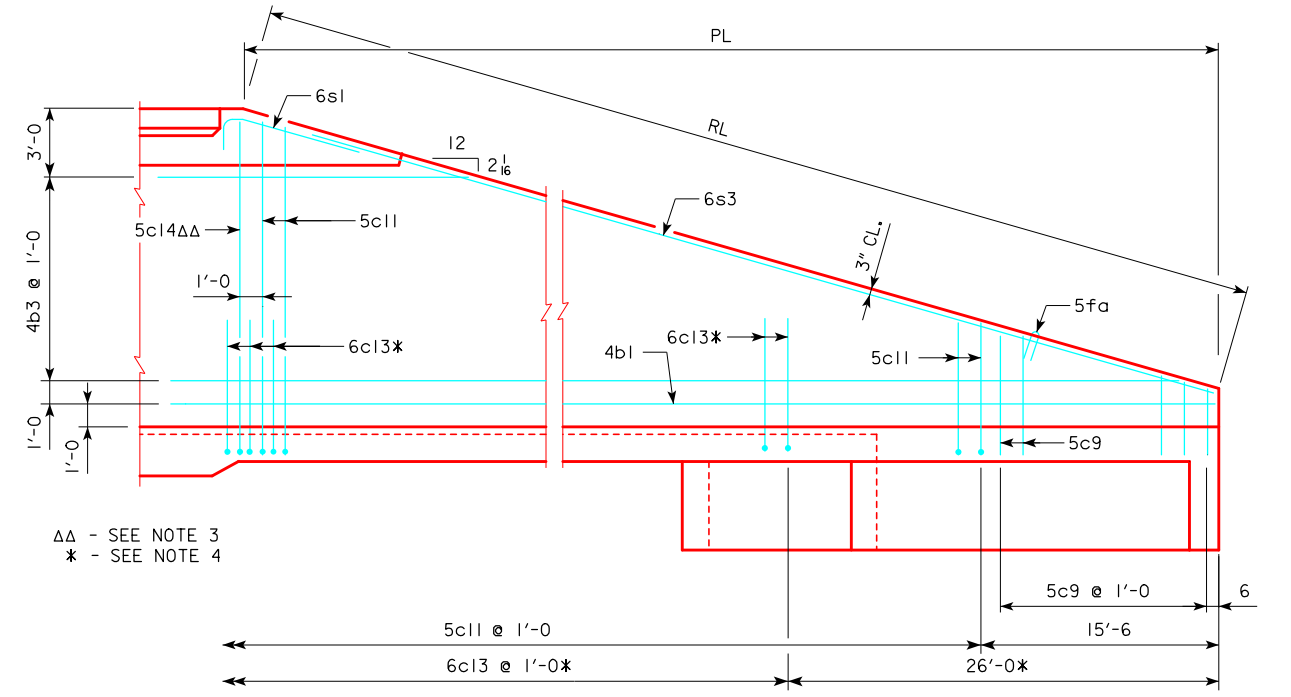
TYPICAL VIEW - FRONT FACE REINFORCING SHORT WINGWALL



TYPICAL VIEW - FRONT FACE REINFORCING LONG WINGWALL

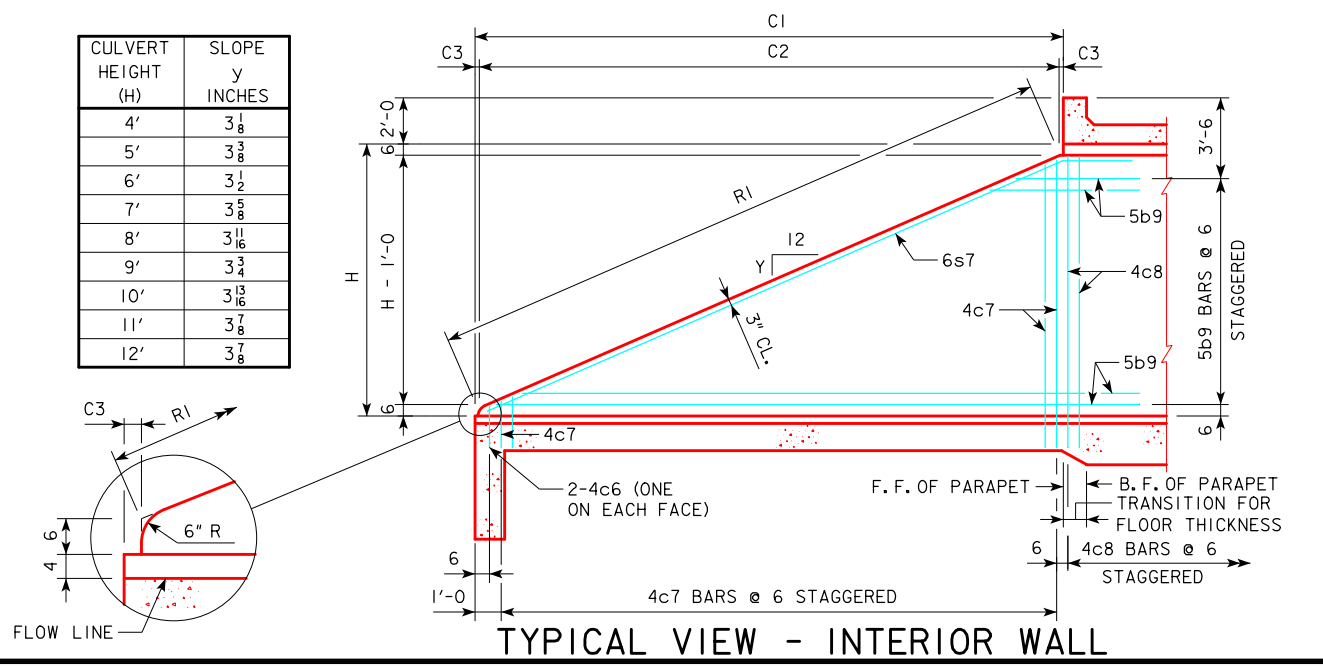


TYPICAL VIEW - BACK FACE REINFORCING SHORT WINGWALL



TYPICAL VIEW - BACK FACE REINFORCING LONG WINGWALL

CULVERT HEIGHT (H)	SLOPE Y INCHES
4'	3/8
5'	3/8
6'	3/8
7'	3/8
8'	3/8
9'	3/8
10'	3/8
11'	3/8
12'	3/8



TYPICAL VIEW - INTERIOR WALL

NOTES:

1. BAR SPACINGS AND POSITIONS SHOWN ARE SIMILAR FOR ALL SIZES OF HEADWALLS IN THIS STANDARD.
2. TWO 4c5 & TWO 5c14 BARS FOR 4', 6', 8', 10' & 12' HEIGHT HEADWALLS. ONE 4c5 & ONE 5c14 BAR FOR 5', 7', 9' & 11' HEIGHT HEADWALLS.
3. TWO 4c5 & TWO 5c14 BARS FOR 4', 5', 9', 10' & 11' HEIGHT HEADWALLS. ONE 4c5 & ONE 5c14 BAR FOR 6', 7', 8' & 12' HEIGHT HEADWALLS.
4. NOT APPLICABLE FOR 4' & 5' HEADWALLS.
5. NOT APPLICABLE FOR 4' THRU 8' HEIGHT HEADWALLS.
6. FOR DIMENSION TABLE SEE SHEET TWH 45-2-12.

07-2016 LATEST REVISION DATE	<i>Thomas L. Mc Donald</i> APPROVED BY BRIDGE ENGINEER		
		STANDARD DESIGN <b>TWIN REINFORCED CONCRETE BOX CULVERTS</b> APRIL, 2012	
		<b>FLARED WING HEADWALLS</b> 45° SKEW	<b>TWH 45-6-12</b>



**BILL OF REINFORCING FOR ONE HEADWALL 45° SKEW CULVERT SPAN x CULVERT HEIGHT**

BAR	LOCATION	SHAPE	12' x 12'		12' x 11'		12' x 10'		12' x 9'		12' x 8'		12' x 7'		12' x 6'		BAR								
			NO.	LENGTH	WT.	NO.	LENGTH	WT.	NO.	LENGTH	WT.	NO.	LENGTH	WT.	NO.	LENGTH		WT.							
5fa	FENCE ANCHOR (GALV.)		2	2'-10	6	2	2'-10	6	2	2'-10	6	2	2'-10	6	2	2'-10	6	5fa							
4b1	WINGWALL, B.F.H. LONG		1	74'-8	51	1	68'-10	47	1	63'-0	44	1	57'-2	40	1	51'-4	36	1	45'-6	32	1	39'-8	26	4b1	
4b2	WINGWALL, B.F.H. SHORT		1	45'-10	32	1	42'-4	30	1	38'-10	26	1	35'-5	24	1	31'-11	21	1	28'-5	19	1	24'-11	17	4b2	
4b3	WINGWALL, B.F.H. LONG		10	19'-6 TO 71'-10	314	9	19'-6 TO 66'-1	265	8	19'-6 TO 60'-3	219	7	19'-6 TO 54'-5	177	6	19'-6 TO 48'-7	139	5	19'-6 TO 42'-9	105	4	19'-5 TO 36'-11	75	4b3	
4b4	WINGWALL, B.F.H. SHORT		10	12'-10 TO 44'-3	194	9	12'-10 TO 40'-9	163	8	12'-10 TO 37'-3	134	7	12'-10 TO 33'-9	109	6	12'-10 TO 30'-3	86	5	12'-10 TO 26'-9	66	4	12'-10 TO 23'-3	48	4b4	
5b5	WINGWALL, F.F.H. LONG		1	74'-8	80	1	68'-10	74	1	63'-0	68	1	57'-2	62	1	51'-4	56	1	45'-6	50	1	39'-9	41	5b5	
5b6	WINGWALL, F.F.H. SHORT		1	45'-11	50	1	42'-5	47	1	38'-11	41	1	35'-5	37	1	31'-11	33	1	28'-5	30	1	24'-11	26	5b6	
5b7	WINGWALL, F.F.H. LONG		11	13'-9 TO 71'-11	506	10	13'-9 TO 66'-1	428	9	13'-9 TO 60'-3	357	8	13'-9 TO 54'-5	291	7	13'-9 TO 48'-7	232	6	13'-9 TO 42'-9	179	5	13'-8 TO 36'-11	132	5b7	
5b8	WINGWALL, F.F.H. SHORT		11	9'-5 TO 44'-4	313	10	9'-5 TO 40'-10	264	9	9'-5 TO 37'-4	219	8	9'-5 TO 33'-10	180	7	9'-5 TO 30'-4	145	6	9'-5 TO 26'-10	113	5	9'-4 TO 23'-4	85	5b8	
5b9	INTERIOR WALL, BOTH F.H.		21	6'-6 TO 37'-4	480	19	6'-6 TO 34'-6	406	17	6'-6 TO 31'-9	339	15	6'-6 TO 28'-11	277	13	6'-6 TO 26'-1	221	11	6'-6 TO 23'-3	171	9	6'-8 TO 20'-5	127	5b9	
4c1	WINGWALL, F.F.V. LONG		72	2'-9 TO 15'-0	427	66	2'-9 TO 13'-11	367	60	2'-9 TO 12'-11	314	54	2'-9 TO 11'-11	265	49	2'-9 TO 11'-0	225	43	2'-9 TO 10'-0	183	37	2'-9 TO 9'-0	145	4c1	
4c2	WINGWALL, F.F.V. SHORT		43	2'-10 TO 14'-10	254	40	2'-10 TO 14'-0	225	36	2'-10 TO 12'-10	188	33	2'-10 TO 12'-0	163	29	2'-10 TO 10'-10	132	26	2'-10 TO 10'-0	111	22	2'-10 TO 8'-10	86	4c2	
4c3	WINGWALL, F.F.V. LONG		33	9'-7 TO 15'-1	272	27	9'-7 TO 14'-1	213	21	9'-7 TO 13'-0	158	15	9'-7 TO 12'-0	108	---	---	---	---	---	---	---	---	---	---	4c3
4c4	WINGWALL, F.F.V. SHORT		20	9'-7 TO 15'-0	164	17	9'-7 TO 14'-1	134	13	9'-7 TO 13'-0	98	10	9'-7 TO 12'-1	72	---	---	---	---	---	---	---	---	---	---	4c4
4c5	WINGWALL, F.F.V. LONG		1	13'-9	9	2	12'-9	17	2	11'-9	16	2	10'-9	14	1	9'-9	7	1	8'-9	6	1	7'-9	5	4c5	
4c5	WINGWALL, F.F.V. SHORT		2	13'-9	18	1	12'-9	9	2	11'-9	16	1	10'-9	7	2	9'-9	13	1	8'-9	6	2	7'-9	10	4c5	
4c6	INTERIOR WALL, BOTH F.V.		2	1'-8	2	2	1'-8	2	2	1'-8	2	2	1'-8	2	2	1'-8	2	2	1'-8	2	2	1'-8	2	4c6	
4c7	INTERIOR WALL, BOTH F.V.		66	1'-10 TO 12'-5	314	61	1'-10 TO 11'-6	272	55	1'-10 TO 10'-5	225	50	1'-10 TO 9'-6	189	44	1'-10 TO 8'-6	152	38	1'-10 TO 7'-5	117	33	1'-10 TO 6'-6	92	4c7	
4c8	INTERIOR WALL, BOTH F.V.		3	12'-7	25	3	11'-7	23	3	10'-7	21	3	9'-7	19	3	8'-7	17	3	7'-7	15	3	6'-7	13	4c8	
5c9	WINGWALL, B.F.V. LONG		15	2'-9 TO 5'-2	62	15	2'-9 TO 5'-2	62	15	2'-9 TO 5'-2	62	15	2'-9 TO 5'-2	62	15	2'-9 TO 5'-2	62	15	2'-9 TO 5'-2	62	15	2'-9 TO 5'-2	62	5c9	
5c10	WINGWALL, B.F.V. SHORT		4	2'-10 TO 3'-8	14	4	2'-10 TO 3'-8	14	4	2'-10 TO 3'-8	14	4	2'-10 TO 3'-8	14	4	2'-10 TO 3'-8	14	4	2'-10 TO 3'-8	14	4	2'-10 TO 3'-8	14	5c10	
5c11	WINGWALL, B.F.V. LONG		57	9'-4 TO 19'-0	842	51	9'-4 TO 17'-11	725	45	9'-4 TO 16'-11	616	39	9'-4 TO 15'-11	514	34	9'-4 TO 15'-0	431	28	9'-4 TO 14'-0	341	22	9'-4 TO 13'-0	256	5c11	
5c12	WINGWALL, B.F.V. SHORT		39	8'-0 TO 18'-10	546	36	8'-0 TO 18'-0	488	32	8'-0 TO 16'-10	414	29	8'-0 TO 16'-0	363	25	8'-0 TO 14'-10	298	22	8'-0 TO 14'-0	252	18	8'-0 TO 12'-10	196	5c12	
6c13	WINGWALL, B.F.V. LONG		47	10'-6	741	41	10'-6	647	35	10'-6	552	29	10'-6	457	24	10'-6	379	18	10'-6	284	12	10'-6	189	6c13	
6c13	WINGWALL, B.F.V. SHORT		28	10'-6	442	25	10'-6	394	21	10'-6	331	18	10'-6	284	14	10'-6	221	11	10'-6	173	7	10'-6	110	6c13	
5c14	WINGWALL, B.F.V. LONG		1	17'-9	19	2	16'-9	35	2	15'-9	33	2	14'-9	31	1	13'-9	19	1	12'-9	13	1	11'-9	12	5c14	
5c14	WINGWALL, B.F.V. SHORT		2	17'-9	37	1	16'-9	17	2	15'-9	33	1	14'-9	15	2	13'-9	29	1	12'-9	13	2	11'-9	25	5c14	
4d1	APRON, LONGIT., BOT.		17	38'-1	432	17	35'-3	400	17	32'-5	368	17	29'-7	336	17	26'-9	304	17	24'-0	273	17	21'-2	240	4d1	
4d2	APRON, LONGIT., BOT. LONG		3	68'-5	142	3	62'-7	130	3	56'-8	118	3	50'-10	106	3	45'-0	95	3	39'-3	79	3	33'-6	67	4d2	
4d3	APRON, LONGIT., BOT. SHORT		3	42'-2	89	3	38'-8	77	3	35'-1	70	3	31'-7	63	3	28'-2	56	3	24'-8	49	3	21'-3	43	4d3	
6f1	APRON, LONGIT., TOP		24	38'-1	1373	24	35'-3	1271	24	32'-5	1169	24	29'-7	1066	24	26'-9	964	24	24'-0	865	24	21'-2	763	6f1	
6f2	APRON, LONGIT., TOP LONG		15	6'-6 TO 34'-10	466	14	5'-8 TO 32'-0	396	12	6'-11 TO 29'-2	325	11	6'-1 TO 26'-4	268	9	7'-3 TO 23'-6	208	8	6'-5 TO 20'-8	163	7	5'-7 TO 17'-10	123	6f2	
6f3	APRON, LONGIT., TOP SHORT		9	8'-1 TO 35'-2	292	8	8'-8 TO 32'-4	246	8	5'-9 TO 29'-6	212	7	6'-4 TO 26'-8	173	6	6'-10 TO 23'-10	138	5	7'-4 TO 21'-0	106	4	7'-11 TO 18'-2	78	6f3	
6f4	APRON, LONGIT., TOP LONG		1	74'-8	116	1	68'-10	107	1	63'-0	98	1	57'-2	89	1	51'-4	80	1	45'-6	72	1	39'-9	60	6f4	
6f5	APRON, LONGIT., TOP SHORT		1	45'-11	72	1	42'-5	67	1	38'-11	58	1	35'-5	53	1	31'-11	48	1	28'-5	43	1	24'-11	37	6f5	
4i1	PARAPET, VERTICAL		51	6'-8	227	49	6'-8	218	49	6'-8	218	49	6'-8	218	49	6'-8	218	49	6'-8	218	49	6'-8	218	4i1	
7j1	PARAPET, HORIZONTAL		4	37'-8	308	4	37'-4	305	4	37'-0	303	4	37'-0	303	4	36'-7	299	4	36'-7	299	4	36'-7	299	7j1	
6m1	APRON, TRANS., TOP		19	30'-0 TO 33'-5	905	18	29'-9 TO 32'-11	847	18	29'-6 TO 32'-8	840	17	29'-6 TO 32'-8	840	17	29'-6 TO 32'-6	792	13	29'-3 TO 31'-6	593	10	29'-3 TO 30'-11	452	6m1	
6m2	APRON, TRANS., TOP		13	33'-9 TO 38'-3	703	10	33'-2 TO 36'-6	523	7	32'-11 TO 35'-2	358	3	32'-11 TO 33'-8	150	1	24'-11 TO 24'-11	37	5	22'-0 TO 25'-0	176	8	19'-2 TO 24'-5	262	6m2	
6m3	APRON, TRANS., TOP		33	9'-11 TO 27'-11	938	33	9'-3 TO 27'-3	905	32	8'-6 TO 25'-11	827	32	7'-11 TO 25'-5	801	31	7'-4 TO 24'-3	735	28	6'-1 TO 21'-3	575	24	5'-6 TO 18'-6	433	6m3	
6m4	APRON, TRANS., BOT.		24	28'-11 TO 53'-5	1528	22	28'-10 TO 51'-2	1359	20	28'-8 TO 48'-11	1196	18	28'-8 TO 46'-10	1044	16	28'-8 TO 44'-8	898	14	28'-7 TO 42'-5	757	12	28'-7 TO 40'-4	624	6m4	
6p1	CURTAIN, HORIZONTAL		4	35'-4	212	4	35'-2	211	4	35'-1	211	4	35'-1	211	4	34'-11	210	4	34'-11	210	4	34'-11	210	6p1	
6p2	CURTAIN, HORIZONTAL LONG		4	42'-4	268	4	39'-2	235	4	36'-0	216	4	32'-10	197	4	29'-8	178	4	26'-6	159	4	23'-4	140	6p2	
6p3	CURTAIN, HORIZONTAL SHORT		4	15'-8	94	4	14'-7	88	4	13'-7	82	4	12'-7	76	4	11'-7	70	4	10'-7	64	4	9'-6	57	6p3	
6s1	WING SLOPE, BOTH F. LONG		2	8'-4	25	2	8'-4	25	2	8'-4	25	2	8'-4	25	2	8'-4	25	2	8'-4	25	2	8'-4	25	6s1	
6s2	WING SLOPE, BOTH F. SHORT		2	7'-11	24	2	7'-11	24	2	7'-11	24	2	7'-11	24	2	7'-11	24	2	7'-11	24	2	7'-11	24	6s2	
6s3	WING SLOPE, BOTH F. LONG		2	69'-0	214	2	63'-1	196	2	57'-2	178	2	51'-3	161	2	45'-4	143	2	39'-5	118	2	33'-6	101	6s3	
6s4	WING SLOPE, BOTH F. SHORT		2	42'-1	133	2	38'-6	116	2	34'-10	105	2	31'-2	94	2	27'-7	83	2	23'-11	72	2	20'-3	61	6s4	
6s5	WING SLOPE, F.F. LONG		1	74'-3	115	1	68'-4	106	1	62'-5															

**BILL OF REINFORCING FOR ONE HEADWALL 45° SKEW CULVERT SPAN x CULVERT HEIGHT**

BAR	LOCATION	SHAPE	12' x 5'			12' x 4'			10' x 12'			10' x 11'			10' x 10'			10' x 9'			10' x 8'			BAR
			NO.	LENGTH	WT.	NO.	LENGTH	WT.	NO.	LENGTH	WT.	NO.	LENGTH	WT.	NO.	LENGTH	WT.	NO.	LENGTH	WT.	NO.	LENGTH	WT.	
5fa	FENCE ANCHOR (GALV.)		2	2'-10	6	2	2'-10	6	2	2'-10	6	2	2'-10	6	2	2'-10	6	2	2'-10	6	2	2'-10	6	5fa
4b1	WINGWALL, B.F.H. LONG		1	33'-10	23	1	28'-0	19	1	74'-8	51	1	68'-10	47	1	63'-0	44	1	57'-2	40	1	51'-4	36	4b1
4b2	WINGWALL, B.F.H. SHORT		1	21'-5	14	1	17'-11	12	1	45'-10	32	1	42'-4	30	1	38'-10	26	1	35'-5	24	1	31'-11	21	4b2
4b3	WINGWALL, B.F.H. LONG		3	19'-5 TO 31'-1	51	2	19'-5 TO 25'-3	30	10	19'-6 TO 71'-10	314	9	19'-6 TO 66'-1	265	8	19'-6 TO 60'-3	219	7	19'-6 TO 54'-5	177	6	19'-6 TO 48'-7	139	4b3
4b4	WINGWALL, B.F.H. SHORT		3	12'-10 TO 19'-9	33	2	12'-10 TO 16'-3	19	10	12'-10 TO 44'-3	194	9	12'-10 TO 40'-9	163	8	12'-10 TO 37'-3	134	7	12'-10 TO 33'-9	109	6	12'-10 TO 30'-3	86	4b4
5b5	WINGWALL, F.F.H. LONG		1	33'-11	35	1	28'-1	29	1	74'-8	80	1	68'-10	74	1	63'-0	68	1	57'-2	62	1	51'-4	56	5b5
5b6	WINGWALL, F.F.H. SHORT		1	21'-5	22	1	17'-11	19	1	45'-11	50	1	42'-5	47	1	38'-11	41	1	35'-5	37	1	31'-11	33	5b6
5b7	WINGWALL, F.F.H. LONG		4	13'-8 TO 31'-1	93	3	13'-8 TO 25'-3	61	11	13'-9 TO 71'-11	506	10	13'-9 TO 66'-1	428	9	13'-9 TO 60'-3	357	8	13'-9 TO 54'-5	291	7	13'-8 TO 48'-7	232	5b7
5b8	WINGWALL, F.F.H. SHORT		4	9'-4 TO 19'-10	61	3	9'-4 TO 16'-4	40	11	9'-5 TO 44'-4	313	10	9'-5 TO 40'-10	264	9	9'-5 TO 37'-4	219	8	9'-5 TO 33'-10	180	7	9'-5 TO 30'-4	145	5b8
5b9	INTERIOR WALL, BOTH F.H.		7	6'-10 TO 17'-7	89	5	6'-10 TO 14'-8	56	21	6'-6 TO 37'-4	480	19	6'-6 TO 34'-6	406	17	6'-6 TO 31'-9	339	15	6'-6 TO 28'-11	277	13	6'-7 TO 26'-1	221	5b9
4c1	WINGWALL, F.F.V. LONG		31	2'-9 TO 7'-11	110	25	2'-9 TO 6'-11	81	72	2'-8 TO 14'-11	423	66	2'-8 TO 13'-10	364	60	2'-8 TO 12'-10	311	54	2'-8 TO 11'-10	262	49	2'-8 TO 10'-11	222	4c1
4c2	WINGWALL, F.F.V. SHORT		19	2'-10 TO 8'-0	69	15	2'-10 TO 6'-10	48	43	2'-9 TO 14'-9	251	40	2'-9 TO 13'-11	223	36	2'-9 TO 12'-9	186	33	2'-9 TO 11'-11	162	29	2'-9 TO 10'-9	131	4c2
4c3	WINGWALL, F.F.V. LONG		---	---	---	---	---	---	49	6'-9 TO 15'-0	356	43	6'-9 TO 13'-11	297	37	6'-9 TO 12'-11	243	31	6'-9 TO 11'-11	193	---	---	---	4c3
4c4	WINGWALL, F.F.V. SHORT		---	---	---	---	---	---	23	8'-7 TO 14'-11	181	20	8'-7 TO 14'-0	151	16	8'-7 TO 12'-11	115	13	8'-7 TO 12'-0	89	---	---	---	4c4
4c5	WINGWALL, F.F.V. LONG		2	6'-9	9	2	5'-9	8	1	13'-8	9	2	12'-8	17	2	11'-8	16	2	10'-8	14	1	9'-8	6	4c5
4c5	WINGWALL, F.F.V. SHORT		1	6'-9	5	2	5'-9	8	2	13'-8	18	1	12'-8	8	2	11'-8	16	1	10'-8	7	2	9'-8	13	4c5
4c6	INTERIOR WALL, BOTH F.V.		2	1'-8	2	2	1'-8	2	2	1'-7	2	2	1'-7	2	2	1'-7	2	2	1'-7	2	2	1'-7	2	4c6
4c7	INTERIOR WALL, BOTH F.V.		27	1'-10 TO 5'-5	65	22	1'-10 TO 4'-6	47	66	1'-9 TO 12'-4	310	61	1'-9 TO 11'-5	268	55	1'-9 TO 10'-4	222	50	1'-9 TO 9'-5	186	44	1'-9 TO 8'-5	149	4c7
4c8	INTERIOR WALL, BOTH F.V.		3	5'-7	11	3	4'-7	9	3	12'-6	25	3	11'-6	23	3	10'-6	21	3	9'-6	19	3	8'-6	17	4c8
5c9	WINGWALL, B.F.V. LONG		15	2'-9 TO 5'-2	62	15	2'-9 TO 5'-2	62	15	2'-8 TO 5'-1	61	15	2'-8 TO 5'-1	61	15	2'-8 TO 5'-1	61	15	2'-8 TO 5'-1	61	15	2'-8 TO 5'-1	61	5c9
5c10	WINGWALL, B.F.V. SHORT		4	2'-10 TO 3'-8	14	4	2'-10 TO 3'-8	14	4	2'-9 TO 3'-7	13	4	2'-9 TO 3'-7	13	4	2'-9 TO 3'-7	13	4	2'-9 TO 3'-7	13	4	2'-9 TO 3'-7	13	5c10
5c11	WINGWALL, B.F.V. LONG		16	9'-4 TO 11'-11	177	10	9'-4 TO 10'-11	106	57	9'-3 TO 18'-11	837	51	9'-3 TO 17'-10	720	45	9'-3 TO 16'-10	612	39	9'-3 TO 15'-10	510	34	9'-3 TO 14'-11	428	5c11
5c12	WINGWALL, B.F.V. SHORT		15	8'-0 TO 12'-0	156	11	8'-0 TO 10'-10	108	39	7'-11 TO 18'-9	542	36	7'-11 TO 17'-11	485	32	7'-11 TO 16'-9	412	29	7'-11 TO 15'-11	360	25	7'-11 TO 14'-9	296	5c12
6c13	WINGWALL, B.F.V. LONG		---	---	---	---	---	---	47	10'-6	741	41	10'-6	647	35	10'-6	552	29	10'-6	457	24	10'-6	379	6c13
6c13	WINGWALL, B.F.V. SHORT		---	---	---	---	---	---	28	10'-6	442	25	10'-6	394	21	10'-6	331	18	10'-6	284	14	10'-6	221	6c13
5c14	WINGWALL, B.F.V. LONG		2	10'-9	22	2	9'-9	20	1	17'-8	18	2	16'-8	35	2	15'-8	33	2	14'-8	31	1	13'-8	14	5c14
5c14	WINGWALL, B.F.V. SHORT		1	10'-9	11	2	9'-9	20	2	17'-8	37	1	16'-8	17	2	15'-8	33	1	14'-8	15	2	13'-8	29	5c14
4d1	APRON, LONGIT., BOTT.		17	18'-4	208	17	15'-6	176	15	38'-1	382	13	35'-3	306	13	32'-5	282	13	29'-7	257	13	26'-9	232	4d1
4d2	APRON, LONGIT., BOTT. LONG		3	27'-8	55	3	22'-0	44	3	68'-5	142	3	62'-7	130	3	56'-8	118	3	50'-10	106	3	45'-0	95	4d2
4d3	APRON, LONGIT., BOTT. SHORT		3	17'-10	36	3	14'-5	29	3	42'-2	89	3	38'-8	77	3	35'-1	70	3	31'-7	63	3	28'-2	56	4d3
6f1	APRON, LONGIT., TOP		24	18'-4	661	24	15'-6	559	20	38'-1	1144	20	35'-3	1059	20	32'-5	974	20	29'-7	889	20	26'-9	804	6f1
6f2	APRON, LONGIT., TOP LONG		5	6'-10 TO 15'-0	82	4	6'-0 TO 12'-2	55	15	6'-6 TO 34'-10	466	14	6'-6 TO 32'-0	396	12	6'-11 TO 29'-2	325	11	6'-1 TO 26'-4	268	9	7'-3 TO 23'-6	208	6f2
6f3	APRON, LONGIT., TOP SHORT		3	8'-6 TO 15'-4	54	2	9'-1 TO 12'-6	32	9	8'-1 TO 35'-2	292	8	8'-8 TO 32'-4	246	8	5'-9 TO 29'-6	212	7	6'-4 TO 26'-8	173	6	6'-10 TO 23'-10	138	6f3
6f4	APRON, LONGIT., TOP LONG		1	33'-11	51	1	28'-1	42	1	74'-8	116	1	68'-10	107	1	63'-0	98	1	57'-2	89	1	51'-4	80	6f4
6f5	APRON, LONGIT., TOP SHORT		1	21'-5	32	1	17'-11	27	1	45'-11	72	1	42'-5	67	1	38'-11	58	1	35'-5	53	1	31'-11	48	6f5
4i1	PARAPET, VERTICAL		49	6'-8	218	49	6'-8	218	43	6'-8	191	41	6'-8	183	41	6'-8	183	41	6'-8	183	41	6'-8	183	4i1
7ji	PARAPET, HORIZONTAL		4	36'-7	299	4	36'-7	299	4	32'-0	262	4	31'-8	259	4	31'-4	256	4	31'-4	256	4	31'-4	256	7ji
6m1	APRON, TRANS., TOP		6	29'-3 TO 30'-2	268	2	29'-3 TO 29'-5	88	16	25'-6 TO 28'-4	647	16	25'-3 TO 28'-1	641	16	25'-0 TO 27'-10	635	16	25'-0 TO 27'-10	635	16	25'-0 TO 27'-10	635	6m1
6m2	APRON, TRANS., TOP		12	16'-4 TO 24'-7	369	16	13'-6 TO 24'-9	460	19	28'-8 TO 35'-5	914	15	28'-5 TO 33'-8	699	11	28'-2 TO 31'-11	496	7	28'-2 TO 30'-5	308	4	28'-2 TO 29'-3	172	6m2
6m3	APRON, TRANS., TOP		20	4'-11 TO 15'-8	309	16	4'-4 TO 12'-10	206	27	10'-1 TO 24'-9	706	27	9'-5 TO 24'-0	678	27	8'-8 TO 23'-4	649	28	7'-7 TO 22'-9	638	27	7'-0 TO 21'-7	580	6m3
6m4	APRON, TRANS., BOTT.		10	28'-7 TO 38'-2	501	8	28'-7 TO 36'-0	388	24	23'-3 TO 47'-10	1308	22	23'-2 TO 45'-6	1155	20	23'-0 TO 43'-4	1010	18	23'-0 TO 41'-2	874	16	23'-0 TO 39'-0	745	6m4
6p1	CURTAIN, HORIZONTAL		4	34'-11	210	4	34'-11	210	4	29'-8	178	4	29'-6	177	4	29'-5	177	4	29'-5	177	4	29'-5	177	6p1
6p2	CURTAIN, HORIZONTAL LONG		4	20'-2	121	4	17'-0	102	4	42'-4	268	4	39'-2	235	4	36'-0	216	4	32'-10	197	4	29'-8	178	6p2
6p3	CURTAIN, HORIZONTAL SHORT		4	8'-6	51	4	7'-6	45	4	15'-8	94	4	14'-7	88	4	13'-7	82	4	12'-7	76	4	11'-7	70	6p3
6s1	WING SLOPE, BOTH F. LONG		2	8'-4	25	2	8'-4	25	2	8'-4	25	2	8'-4	25	2	8'-4	25	2	8'-4	25	2	8'-4	25	6s1
6s2	WING SLOPE, BOTH F. SHORT		2	7'-11	24	2	7'-11	24	2	7'-11	24	2	7'-11	24	2	7'-11	24	2	7'-11	24	2	7'-11	24	6s2
6s3	WING SLOPE, BOTH F. LONG		2	27'-7	83	2	21'-8	65	2	69'-0	214	2	63'-1	196	2	57'-2	178	2	51'-3	161	2	45'-4	143	6s3
6s4	WING SLOPE, BOTH F. SHORT		2	16'-8	50	2	13'-0	39	2	42'-1	133	2	38'-6	116	2	34'-10	105	2	31'-2	94	2	27'-7	83	6s4
6s5	WING SLOPE, F.F. LONG		1	32'-10	49	1	26'-11	40																



**BILL OF REINFORCING FOR ONE HEADWALL 45° SKEW CULVERT SPAN x CULVERT HEIGHT**

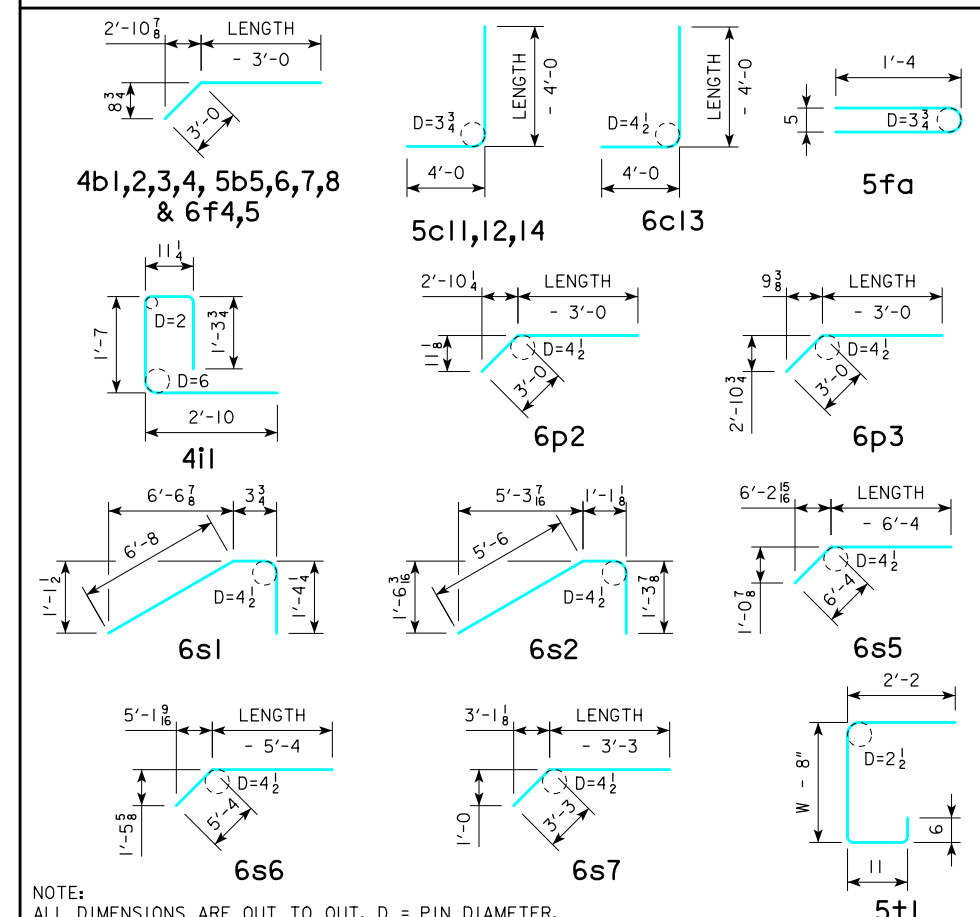
BAR	LOCATION	SHAPE	10' x 7'			10' x 6'			10' x 5'			10' x 4'			8' x 10'			8' x 9'			8' x 8'			BAR
			NO.	LENGTH	WT.	NO.	LENGTH	WT.	NO.	LENGTH	WT.	NO.	LENGTH	WT.	NO.	LENGTH	WT.	NO.	LENGTH	WT.	NO.	LENGTH	WT.	
5fa	FENCE ANCHOR (GALV.)		2	2'-10	6	2	2'-10	6	2	2'-10	6	2	2'-10	6	2	2'-10	6	2	2'-10	6	2	2'-10	6	5fa
4b1	WINGWALL, B.F.H. LONG		1	45'-6	32	1	39'-8	26	1	33'-0	23	1	28'-0	19	1	63'-0	44	1	57'-2	40	1	51'-4	36	4b1
4b2	WINGWALL, B.F.H. SHORT		1	28'-5	19	1	24'-11	17	1	21'-5	14	1	17'-11	12	1	38'-10	26	1	35'-5	24	1	31'-11	21	4b2
4b3	WINGWALL, B.F.H. LONG		5	19'-6 TO 42'-9	105	4	19'-5 TO 36'-11	75	3	19'-5 TO 31'-1	51	2	19'-5 TO 25'-3	30	8	19'-6 TO 60'-3	219	7	19'-6 TO 54'-5	177	6	19'-6 TO 48'-7	139	4b3
4b4	WINGWALL, B.F.H. SHORT		5	12'-10 TO 26'-9	66	4	12'-10 TO 23'-3	48	3	12'-10 TO 19'-9	33	2	12'-10 TO 16'-3	19	8	12'-10 TO 37'-3	134	7	12'-10 TO 33'-9	109	6	12'-10 TO 30'-3	86	4b4
5b5	WINGWALL, F.F.H. LONG		1	45'-6	50	1	39'-9	41	1	33'-11	35	1	28'-1	29	1	63'-0	68	1	57'-2	62	1	51'-4	56	5b5
5b6	WINGWALL, F.F.H. SHORT		1	28'-5	30	1	24'-11	26	1	21'-5	22	1	17'-11	19	1	38'-11	41	1	35'-5	37	1	31'-11	33	5b6
5b7	WINGWALL, F.F.H. LONG		6	13'-8 TO 42'-9	179	5	13'-8 TO 36'-11	132	4	13'-8 TO 31'-1	93	3	13'-8 TO 25'-3	61	9	13'-8 TO 60'-3	357	8	13'-8 TO 54'-5	291	7	13'-8 TO 48'-7	232	5b7
5b8	WINGWALL, F.F.H. SHORT		6	9'-4 TO 26'-10	113	5	9'-4 TO 23'-4	85	4	9'-4 TO 19'-10	61	3	9'-4 TO 16'-4	40	9	9'-5 TO 37'-4	219	8	9'-5 TO 33'-10	180	7	9'-5 TO 30'-4	145	5b8
5b9	INTERIOR WALL, BOTH F.H.		11	6'-7 TO 23'-3	171	9	6'-8 TO 20'-5	127	7	6'-8 TO 17'-7	89	5	6'-8 TO 14'-8	56	17	6'-6 TO 31'-9	339	15	6'-6 TO 28'-11	277	13	6'-7 TO 26'-1	221	5b9
4c1	WINGWALL, F.F.V. LONG		43	2'-8 TO 9'-11	181	37	2'-8 TO 8'-11	143	31	2'-8 TO 7'-10	109	25	2'-8 TO 6'-10	79	60	2'-7 TO 12'-9	307	54	2'-7 TO 11'-9	259	49	2'-7 TO 10'-10	220	4c1
4c2	WINGWALL, F.F.V. SHORT		26	2'-9 TO 9'-11	110	22	2'-9 TO 8'-9	85	19	2'-9 TO 7'-11	68	15	2'-9 TO 6'-9	48	36	2'-8 TO 12'-8	184	33	2'-8 TO 11'-10	160	29	2'-8 TO 10'-8	129	4c2
4c3	WINGWALL, F.F.V. LONG		---	---	---	---	---	---	---	---	---	---	---	---	37	6'-8 TO 12'-10	241	31	6'-8 TO 11'-10	192	---	---	---	4c3
4c4	WINGWALL, F.F.V. SHORT		---	---	---	---	---	---	---	---	---	---	---	---	16	8'-6 TO 12'-10	114	13	8'-6 TO 11'-11	89	---	---	---	4c4
4c5	WINGWALL, F.F.V. LONG		1	8'-8	6	1	7'-8	5	2	6'-8	9	2	5'-8	8	2	11'-7	15	2	10'-7	14	1	9'-7	6	4c5
4c5	WINGWALL, F.F.V. SHORT		1	8'-8	6	2	7'-8	10	1	6'-8	4	2	5'-8	8	2	11'-7	15	1	10'-7	7	2	9'-7	13	4c5
4c6	INTERIOR WALL, BOTH F.V.		2	1'-7	2	2	1'-7	2	2	1'-7	2	2	1'-7	2	2	1'-6	2	2	1'-6	2	2	1'-6	2	4c6
4c7	INTERIOR WALL, BOTH F.V.		38	1'-9 TO 7'-4	115	33	1'-9 TO 6'-5	90	27	1'-9 TO 5'-4	64	22	1'-9 TO 4'-5	45	55	1'-8 TO 10'-3	219	50	1'-8 TO 9'-4	184	44	1'-8 TO 8'-4	147	4c7
4c8	INTERIOR WALL, BOTH F.V.		3	7'-6	15	3	6'-6	13	3	5'-6	11	3	4'-6	9	3	10'-5	21	3	9'-5	19	3	8'-5	17	4c8
5c9	WINGWALL, B.F.V. LONG		15	2'-8 TO 5'-1	61	15	2'-8 TO 5'-1	61	15	2'-8 TO 5'-1	61	15	2'-8 TO 5'-1	61	15	2'-7 TO 5'-0	59	15	2'-7 TO 5'-0	59	15	2'-7 TO 5'-0	59	5c9
5c10	WINGWALL, B.F.V. SHORT		4	2'-9 TO 3'-7	13	4	2'-9 TO 3'-7	13	4	2'-9 TO 3'-7	13	4	2'-9 TO 3'-7	13	4	2'-8 TO 3'-6	13	4	2'-8 TO 3'-6	13	4	2'-8 TO 3'-6	13	5c10
5c11	WINGWALL, B.F.V. LONG		28	9'-3 TO 13'-11	338	22	9'-3 TO 12'-11	254	16	9'-3 TO 11'-10	176	10	9'-3 TO 10'-10	105	45	9'-2 TO 16'-9	608	39	9'-2 TO 15'-9	507	34	9'-2 TO 14'-10	426	5c11
5c12	WINGWALL, B.F.V. SHORT		22	7'-11 TO 13'-11	250	18	7'-11 TO 12'-9	194	15	7'-11 TO 11'-11	155	11	7'-11 TO 10'-9	107	32	7'-10 TO 16'-8	409	29	7'-10 TO 15'-10	358	25	7'-10 TO 14'-8	293	5c12
6c13	WINGWALL, B.F.V. LONG		18	10'-6	284	12	10'-6	189	---	---	---	---	---	---	35	10'-6	552	29	10'-6	457	24	10'-6	379	6c13
6c13	WINGWALL, B.F.V. SHORT		11	10'-6	173	7	10'-6	110	---	---	---	---	---	---	21	10'-6	331	18	10'-6	284	14	10'-6	221	6c13
5c14	WINGWALL, B.F.V. LONG		1	12'-8	13	1	11'-8	12	2	10'-8	22	2	9'-8	20	2	15'-7	33	2	14'-7	30	1	13'-7	14	5c14
5c14	WINGWALL, B.F.V. SHORT		1	12'-8	13	2	11'-8	24	1	10'-8	11	2	9'-8	20	2	15'-7	33	1	14'-7	15	2	13'-7	28	5c14
4d1	APRON, LONGIT., BOTT.		13	24'-0	208	13	21'-2	184	13	18'-4	159	13	15'-6	135	11	32'-5	238	11	29'-7	217	11	26'-9	197	4d1
4d2	APRON, LONGIT., BOTT. LONG		3	39'-3	79	3	33'-6	67	3	27'-8	55	3	22'-0	44	3	56'-8	118	3	50'-10	106	3	45'-0	95	4d2
4d3	APRON, LONGIT., BOTT. SHORT		3	24'-8	49	3	21'-3	43	3	17'-10	36	3	14'-5	29	3	35'-1	70	3	31'-7	63	3	28'-2	56	4d3
6f1	APRON, LONGIT., TOP		20	24'-0	721	20	21'-2	636	20	18'-4	551	20	15'-6	466	16	32'-5	779	16	29'-7	711	16	26'-9	643	6f1
6f2	APRON, LONGIT., TOP LONG		8	6'-5 TO 20'-8	163	7	5'-7 TO 17'-10	123	5	6'-10 TO 15'-0	82	4	6'-0 TO 12'-2	55	12	6'-11 TO 29'-2	325	11	6'-11 TO 26'-4	268	9	7'-3 TO 23'-6	208	6f2
6f3	APRON, LONGIT., TOP SHORT		5	7'-4 TO 21'-0	106	4	7'-11 TO 18'-2	78	3	8'-6 TO 15'-4	54	2	9'-1 TO 12'-6	32	8	5'-9 TO 29'-6	212	7	6'-4 TO 26'-8	173	6	6'-10 TO 23'-10	138	6f3
6f4	APRON, LONGIT., TOP LONG		1	45'-6	72	1	39'-9	60	1	33'-11	51	1	28'-1	42	1	63'-0	98	1	57'-2	89	1	51'-4	80	6f4
6f5	APRON, LONGIT., TOP SHORT		1	28'-5	43	1	24'-11	37	1	21'-5	32	1	17'-11	27	1	38'-11	58	1	35'-5	53	1	31'-11	48	6f5
4i1	PARAPET, VERTICAL		41	6'-8	183	41	6'-8	183	41	6'-8	183	41	6'-8	183	33	6'-8	147	33	6'-8	147	33	6'-8	147	4i1
7ji	PARAPET, HORIZONTAL		4	30'-11	253	4	30'-11	253	4	30'-11	253	4	30'-11	253	4	25'-8	210	4	25'-8	210	4	25'-8	210	7ji
6m1	APRON, TRANS., TOP		15	24'-9 TO 27'-4	587	12	24'-9 TO 26'-9	464	8	24'-9 TO 26'-0	305	5	24'-9 TO 25'-6	189	13	20'-6 TO 22'-9	422	13	20'-6 TO 22'-9	422	13	20'-6 TO 22'-9	422	6m1
6m2	APRON, TRANS., TOP		1	27'-6 TO 27'-6	41	4	18'-8 TO 20'-11	119	7	16'-7 TO 21'-1	198	11	13'-0 TO 20'-6	277	17	23'-0 TO 29'-0	664	13	23'-0 TO 27'-6	493	9	23'-0 TO 26'-0	331	6m2
6m3	APRON, TRANS., TOP		27	6'-3 TO 20'-11	551	23	5'-9 TO 18'-1	412	20	5'-2 TO 15'-10	315	16	4'-0 TO 12'-5	197	22	8'-4 TO 20'-2	471	22	7'-9 TO 19'-7	452	22	7'-2 TO 19'-0	432	6m3
6m4	APRON, TRANS., BOTT.		14	22'-11 TO 36'-9	627	12	22'-11 TO 34'-8	519	10	22'-11 TO 32'-6	416	8	22'-11 TO 30'-4	320	20	17'-4 TO 37'-8	826	18	17'-4 TO 35'-6	714	16	17'-4 TO 33'-4	609	6m4
6p1	CURTAIN, HORIZONTAL		4	29'-3	176	4	29'-3	176	4	29'-3	176	4	29'-3	176	4	23'-9	143	4	23'-9	143	4	23'-9	143	6p1
6p2	CURTAIN, HORIZONTAL LONG		4	26'-6	159	4	23'-4	140	4	20'-2	121	4	17'-0	102	4	36'-0	216	4	32'-10	197	4	29'-8	178	6p2
6p3	CURTAIN, HORIZONTAL SHORT		4	10'-7	64	4	9'-6	57	4	8'-6	51	4	7'-6	45	4	13'-7	82	4	12'-7	76	4	11'-7	70	6p3
6s1	WING SLOPE, BOTH F. LONG		2	8'-4	25	2	8'-4	25	2	8'-4	25	2	8'-4	25	2	8'-4	25	2	8'-4	25	2	8'-4	25	6s1
6s2	WING SLOPE, BOTH F. SHORT		2	7'-11	24	2	7'-11	24	2	7'-11	24	2	7'-11	24	2	7'-11	24	2	7'-11	24	2	7'-11	24	6s2
6s3	WING SLOPE, BOTH F. LONG		2	39'-5	118	2	33'-6	101	2	27'-7	83	2	21'-8	65	2	57'-2	178	2	51'-3	161	2	45'-4	143	6s3
6s4	WING SLOPE, BOTH F. SHORT		2	23'-11	72	2	20'-3	61	2	16'-8	50	2	13'-0	39	2	34'-10	105	2	31'-2	94	2	27'-7	83	6s4
6s5	WING SLOPE, F.F. LONG		1	44'-8	70	1	38'-9	58	1	32'-10	49	1	26'-11	40	1	62'-5	97	1	56'-6	88	1	50'-7		

ENGLISHLRFDSDIGNEDTWINCULVERTS.DGN - TWH 45-10-12 - THIS SHEET ISSUED 04-12.

**BILL OF REINFORCING FOR ONE HEADWALL 45° SKEW CULVERT SPAN x CULVERT HEIGHT**

BAR	LOCATION	SHAPE	8' x 7'		8' x 6'		8' x 5'		8' x 4'		BAR				
			NO.	LENGTH	WT.	NO.	LENGTH	WT.	NO.	LENGTH		WT.	NO.	LENGTH	WT.
5fa	FENCE ANCHOR (GALV.)		2	2'-10	6	2	2'-10	6	2	2'-10	6	5fa			
4b1	WINGWALL, B.F.H. LONG		1	45'-6	32	1	39'-8	26	1	33'-10	23	4b1			
4b2	WINGWALL, B.F.H. SHORT		1	28'-5	19	1	24'-11	17	1	21'-5	14	4b2			
4b3	WINGWALL, B.F.H. LONG		5 VAR.	19'-6 TO 42'-9	105	4 VAR.	19'-5 TO 36'-11	75	3 VAR.	19'-5 TO 31'-1	51	2 VAR.	19'-5 TO 25'-3	30	4b3
4b4	WINGWALL, B.F.H. SHORT		5 VAR.	12'-10 TO 26'-9	66	4 VAR.	12'-10 TO 23'-3	48	3 VAR.	12'-10 TO 19'-9	33	2 VAR.	12'-10 TO 16'-3	19	4b4
5b5	WINGWALL, F.F.H. LONG		1	45'-6	50	1	39'-9	41	1	33'-11	35	1	28'-1	29	5b5
5b6	WINGWALL, F.F.H. SHORT		1	28'-5	30	1	24'-11	26	1	21'-5	22	1	17'-11	19	5b6
5b7	WINGWALL, F.F.H. LONG		6 VAR.	13'-8 TO 42'-9	179	5 VAR.	13'-8 TO 36'-11	132	4 VAR.	13'-8 TO 31'-1	93	3 VAR.	13'-8 TO 25'-3	61	5b7
5b8	WINGWALL, F.F.H. SHORT		6 VAR.	9'-4 TO 26'-10	113	5 VAR.	9'-4 TO 23'-4	85	4 VAR.	9'-4 TO 19'-10	61	3 VAR.	9'-4 TO 16'-4	40	5b8
5b9	INTERIOR WALL, BOTH F.H.		11 VAR.	6'-7 TO 23'-3	171	9 VAR.	6'-8 TO 20'-5	127	7 VAR.	6'-10 TO 17'-7	89	5 VAR.	7'-0 TO 14'-8	56	5b9
4c1	WINGWALL, F.F.V. LONG		43 VAR.	2'-7 TO 9'-10	178	37 VAR.	2'-7 TO 8'-10	141	31 VAR.	2'-7 TO 7'-9	107	25 VAR.	2'-7 TO 6'-9	78	4c1
4c2	WINGWALL, F.F.V. SHORT		26 VAR.	2'-8 TO 9'-10	109	22 VAR.	2'-8 TO 8'-8	83	19 VAR.	2'-8 TO 7'-10	67	15 VAR.	2'-8 TO 6'-8	47	4c2
4c3	WINGWALL, F.F.V. LONG		---	---	---	---	---	---	---	---	---	---	---	---	4c3
4c4	WINGWALL, F.F.V. SHORT		---	---	---	---	---	---	---	---	---	---	---	---	4c4
4c5	WINGWALL, F.F.V. LONG		1	8'-7	6	1	7'-7	5	2	6'-7	9	2	5'-7	7	4c5
4c5	WINGWALL, F.F.V. SHORT		1	8'-7	6	2	7'-7	10	1	6'-7	4	2	5'-7	7	4c5
4c6	INTERIOR WALL, BOTH F.V.		2	1'-6	2	2	1'-6	2	2	1'-6	2	2	1'-6	2	4c6
4c7	INTERIOR WALL, BOTH F.V.		38 VAR.	1'-8 TO 7'-3	113	33 VAR.	1'-8 TO 6'-4	88	27 VAR.	1'-8 TO 5'-3	62	22 VAR.	1'-8 TO 4'-4	44	4c7
4c8	INTERIOR WALL, BOTH F.V.		3	7'-5	15	3	6'-5	13	3	5'-5	11	3	4'-5	9	4c8
5c9	WINGWALL, B.F.V. LONG		15 VAR.	2'-7 TO 5'-0	59	15 VAR.	2'-7 TO 5'-0	59	15 VAR.	2'-7 TO 5'-0	59	15 VAR.	2'-7 TO 5'-0	59	5c9
5c10	WINGWALL, B.F.V. SHORT		4 VAR.	2'-8 TO 3'-6	13	4 VAR.	2'-8 TO 3'-6	13	4 VAR.	2'-8 TO 3'-6	13	4 VAR.	2'-8 TO 3'-6	13	5c10
5c11	WINGWALL, B.F.V. LONG		28 VAR.	9'-2 TO 13'-10	336	22 VAR.	9'-2 TO 12'-10	252	16 VAR.	9'-2 TO 11'-9	175	10 VAR.	9'-2 TO 10'-9	104	5c11
5c12	WINGWALL, B.F.V. SHORT		22 VAR.	7'-10 TO 13'-10	249	18 VAR.	7'-10 TO 12'-8	192	15 VAR.	7'-10 TO 11'-10	154	11 VAR.	7'-10 TO 10'-8	106	5c12
6c13	WINGWALL, B.F.V. LONG		18	10'-6	284	12	10'-6	189	---	---	---	---	---	---	6c13
6c13	WINGWALL, B.F.V. SHORT		11	10'-6	173	7	10'-6	110	---	---	---	---	---	---	6c13
5c14	WINGWALL, B.F.V. LONG		1	12'-7	13	1	11'-7	12	2	10'-7	22	2	9'-7	20	5c14
5c14	WINGWALL, B.F.V. SHORT		1	12'-7	13	2	11'-7	24	1	10'-7	11	2	9'-7	20	5c14
4d1	APRON, LONGIT., BOT.		11	24'-0	176	11	21'-2	156	11	18'-4	135	11	15'-6	114	4d1
4d2	APRON, LONGIT., BOT. LONG		3	39'-3	79	3	33'-6	67	3	27'-8	55	3	22'-0	44	4d2
4d3	APRON, LONGIT., BOT. SHORT		3	24'-8	49	3	21'-3	43	3	17'-10	36	3	14'-5	29	4d3
6f1	APRON, LONGIT., TOP		16	24'-0	577	16	21'-2	509	16	18'-4	441	16	15'-6	372	6f1
6f2	APRON, LONGIT., TOP LONG		8 VAR.	6'-5 TO 20'-8	163	7 VAR.	5'-7 TO 17'-10	123	5 VAR.	6'-10 TO 15'-0	82	4 VAR.	6'-0 TO 12'-2	55	6f2
6f3	APRON, LONGIT., TOP SHORT		5 VAR.	7'-4 TO 21'-0	106	4 VAR.	7'-11 TO 18'-2	78	3 VAR.	8'-6 TO 15'-4	54	2 VAR.	9'-1 TO 12'-6	32	6f3
6f4	APRON, LONGIT., TOP LONG		1	45'-6	72	1	39'-9	60	1	33'-11	51	1	28'-1	42	6f4
6f5	APRON, LONGIT., TOP SHORT		1	28'-5	43	1	24'-11	37	1	21'-5	32	1	17'-11	27	6f5
7j1	PARAPET, VERTICAL		33	6'-8	147	33	6'-8	147	33	6'-8	147	33	6'-8	147	7j1
7j1	PARAPET, HORIZONTAL		4	25'-4	207	4	25'-4	207	4	25'-4	207	4	25'-4	207	7j1
6m1	APRON, TRANS., TOP		13 VAR.	20'-3 TO 22'-6	417	13 VAR.	20'-3 TO 22'-6	417	11 VAR.	20'-3 TO 22'-1	350	7 VAR.	20'-3 TO 21'-4	219	6m1
6m2	APRON, TRANS., TOP		6 VAR.	22'-9 TO 24'-8	214	2 VAR.	22'-9 TO 23'-2	69	2 VAR.	16'-1 TO 16'-10	49	6 VAR.	13'-3 TO 17'-0	136	6m2
6m3	APRON, TRANS., TOP		21 VAR.	6'-6 TO 17'-9	382	22 VAR.	5'-4 TO 17'-2	372	20 VAR.	4'-9 TO 15'-5	303	16 VAR.	4'-2 TO 12'-7	201	6m3
6m4	APRON, TRANS., BOT.		14 VAR.	17'-3 TO 31'-1	508	12 VAR.	17'-3 TO 29'-0	417	10 VAR.	17'-3 TO 26'-10	331	8 VAR.	17'-3 TO 24'-9	252	6m4
6p1	CURTAIN, HORIZONTAL		4	23'-7	142	4	23'-7	142	4	23'-7	142	4	23'-7	142	6p1
6p2	CURTAIN, HORIZONTAL LONG		4	26'-6	159	4	23'-4	140	4	20'-2	121	4	17'-0	102	6p2
6p3	CURTAIN, HORIZONTAL SHORT		4	10'-7	64	4	9'-6	57	4	8'-6	51	4	7'-6	45	6p3
6s1	WING SLOPE, BOTH F. LONG		2	8'-4	25	2	8'-4	25	2	8'-4	25	2	8'-4	25	6s1
6s2	WING SLOPE, BOTH F. SHORT		2	7'-11	24	2	7'-11	24	2	7'-11	24	2	7'-11	24	6s2
6s3	WING SLOPE, BOTH F. LONG		2	39'-5	118	2	33'-6	101	2	27'-7	83	2	21'-8	65	6s3
6s4	WING SLOPE, BOTH F. SHORT		2	23'-11	72	2	20'-3	61	2	16'-8	50	2	13'-0	39	6s4
6s5	WING SLOPE, F.F. LONG		1	44'-8	70	1	38'-9	58	1	32'-10	49	1	26'-11	40	6s5
6s6	WING SLOPE, F.F. SHORT		1	28'-11	43	1	25'-3	38	1	21'-7	32	1	18'-0	27	6s6
6s7	INTERIOR WALL, BOTH F.H.		2	23'-11	72	2	20'-11	63	2	17'-11	54	2	14'-11	45	6s7
5t1	CURTAIN, VERTICAL		37	6'-8	257	33	6'-5	221	31	6'-5	207	27	6'-5	181	5t1
ESTIMATED QUANTITIES ONE HEADWALL			REINF. STEEL		6526 LB		5408 LB		4234 LB		3419 LB				
			CONCRETE	PARAPET Δ	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8			
				WINGWALLS	12.3	9.4	6.9	6.9	6.9	6.9	6.9	6.9			
				FOOTING *	33.9	28.2	23.6	23.6	23.6	23.6	23.6	23.6			
				49.0 CY	40.4 CY	33.3 CY	33.3 CY	33.3 CY	33.3 CY	33.3 CY	33.3 CY	33.3 CY			

**BENT BAR DETAILS**



Δ INCLUDES TOP OF WINGWALL QUANTITIES.  
\* ASSUMES APRON AND FLOOR ARE EQUAL THICKNESS, ADJUST CONCRETE QUANTITIES FOR TRANSITION WHERE APRON AND FLOOR THICKNESS ARE NOT EQUAL.

NOTE:  
WEIGHT OF BARS OVER 40'-0 LONG INCLUDES AN ALLOWANCE OF 2'-3 FOR LAP. LENGTHS SHOWN FOR BARS OVER 40'-0 LONG DO NOT INCLUDE LAP.

"SHORT" DENOTES SHORT WINGWALL  
"LONG" DENOTES LONG WINGWALL

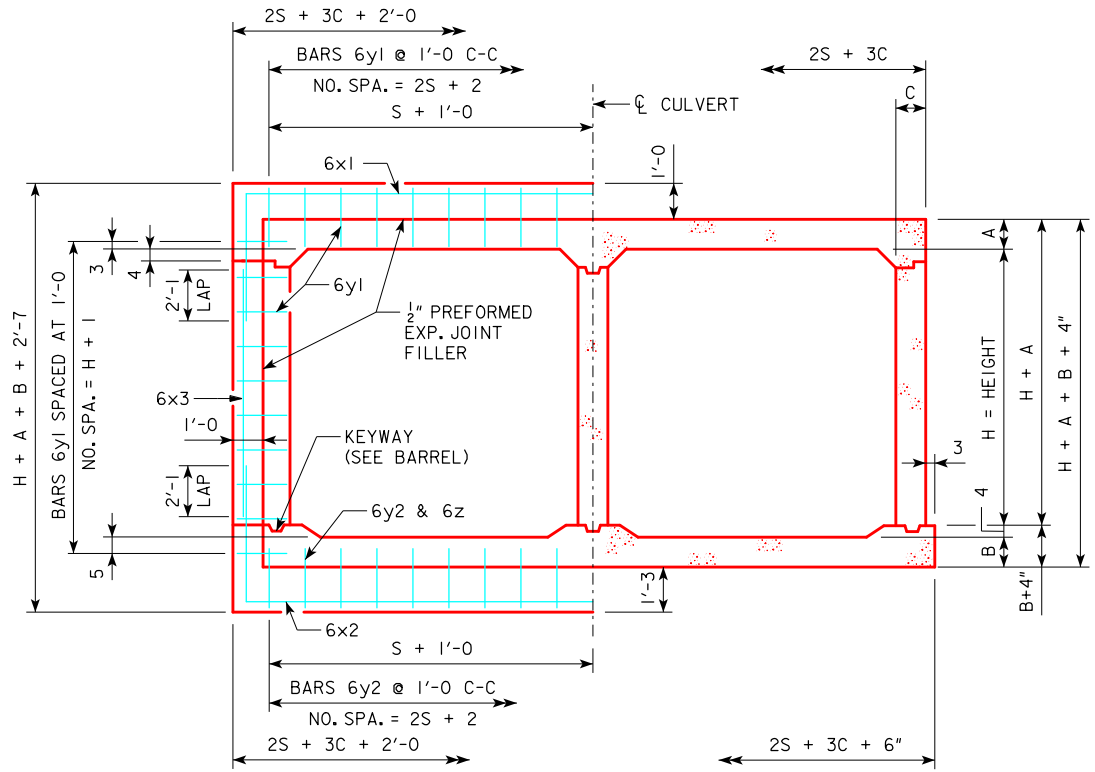
**HEADWALL NOTES:**

- SEE DRAWING TWRCB G1-12 FOR GENERAL INFORMATION, SPECIFICATIONS, AND DESIGN STRESSES.
- THIS HEADWALL IS BASED ON A 3:1 SLOPE NORMAL TO CENTERLINE OF ROADWAY.
- THE SIDES OF THE FOOTING ARE TO BE FORMED TO INSURE CORRECT LINE AND GRADE.
- ALL SLAB AND FLOOR REINFORCING STEEL IS TO BE SUPPORTED BY BAR CHAIRS AT INTERVALS OF NOT MORE THAN 3'-0 IN EITHER DIRECTION AS OUTLINED IN THE STANDARD SPECIFICATIONS.
- CLEAR DISTANCE FROM FACE OF CONCRETE TO NEAR REINFORCING BAR IS TO BE 2" UNLESS OTHERWISE NOTED OR SHOWN. CLEARANCE TO THE BOTTOM ENDS OF VERTICAL BARS SHALL BE 3 INCHES.
- CONCRETE QUANTITIES ARE ESTIMATED FROM BACK OF PARAPET.
- HORIZONTAL TAILS OF BARS "b" & "s" ESTIMATED TO EXTEND 2'-0 BEYOND BACK OF PARAPET (INTO END OF BARREL). LONGITUDINAL BARS "d", "6f1", AND "6f3" ESTIMATED TO PROJECT INTO END SECTION OF BARREL A MINIMUM OF 2'-0 BEYOND BACK OF PARAPET.
- THE "LENGTH" COLUMN REFLECTS TOTAL NUMBER OF FEET NECESSARY TO MEET THESE REQUIREMENTS.

LATEST REVISION DATE	 APPROVED BY BRIDGE ENGINEER	 STANDARD DESIGN <b>TWIN REINFORCED CONCRETE BOX CULVERTS</b> APRIL, 2012		<b>TWH 45-10-12</b> 45° SKEW
		<b>FLARED WING HEADWALLS</b>		



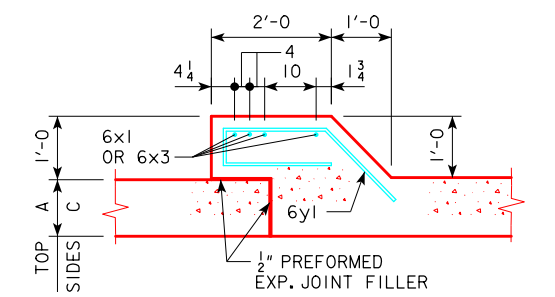
REVISED 07-13 - THE m9 BARS WERE ADDED TO NOTE NUMBER 7. ENGLISH LRFDSIGNEDTWINCULVERTS.DGN - TWCBJ 1-12 - THIS SHEET ISSUED 04-12.



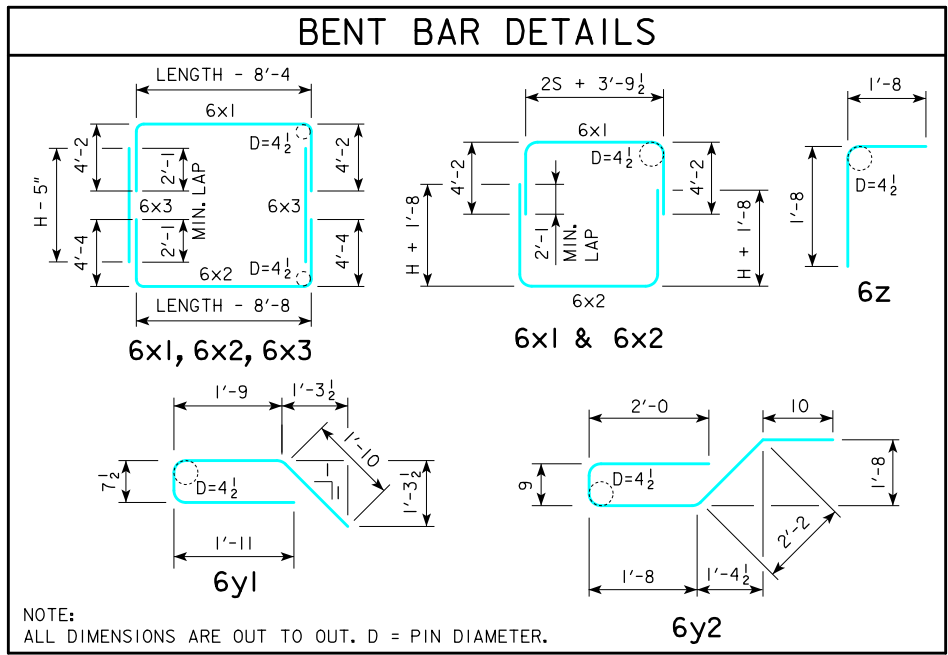
**JOINT DETAIL SECTION THRU BARREL**

ESTIMATE OF QUANTITIES - ONE JOINT - 8' SPAN																	
BILL OF REINFORCING STEEL			8' x 4'		8' x 5'		8' x 6'		8' x 7'		8' x 8'		8' x 9'		8' x 10'		
BAR	LOCATION	SHAPE	NO.	LENGTH	WEIGHT	NO.	LENGTH	WEIGHT	NO.	LENGTH	WEIGHT	NO.	LENGTH	WEIGHT	NO.	LENGTH	WEIGHT
6x1	SLAB & WALLS		4	28'-2"	169	4	28'-2"	169	4	28'-2"	169	4	28'-2"	169	4	28'-6"	171
6x2	FLOOR & WALLS		4	31'-2"	187	4	33'-2"	199	4	28'-6"	171	4	28'-6"	171	4	28'-10"	173
6x3	WALLS		--	--	--	--	--	--	8	5'-7"	67	8	6'-7"	79	8	8'-7"	103
6y1	TOP & SIDES		31	6'-2"	287	33	6'-2"	306	35	6'-2"	324	37	6'-2"	343	39	6'-2"	361
6y2	BOTTOM		19	7'-5"	212	19	7'-5"	212	19	7'-5"	212	19	7'-5"	212	19	7'-5"	212
6z	BOTTOM & FLOOR		19	3'-4"	95	19	3'-4"	95	19	3'-4"	95	19	3'-4"	95	19	3'-4"	95
TOTAL WEIGHT (LB)					950			981			1038			1069			1130
TOTAL CONCRETE (CY)					5.2			5.4			5.6			5.8			6.0

BARREL SIZE	BARREL DIMENSION			BELL JOINT QUANTITIES (CY)		
	A	B	C	FOOTING	WALLS	SLAB
8' x 4'	9.5	11.5	9	2.535	0.668	2.039
8' x 5'	9.5	11.5	9	2.535	0.850	2.039
8' x 6'	9.5	12	9	2.543	1.032	2.039
8' x 7'	9.5	12	9	2.543	1.214	2.039
8' x 8'	9.5	12	9	2.543	1.396	2.039
8' x 9'	9.5	12	9	2.543	1.578	2.039
8' x 10'	9	12	10.5	2.586	1.760	2.066

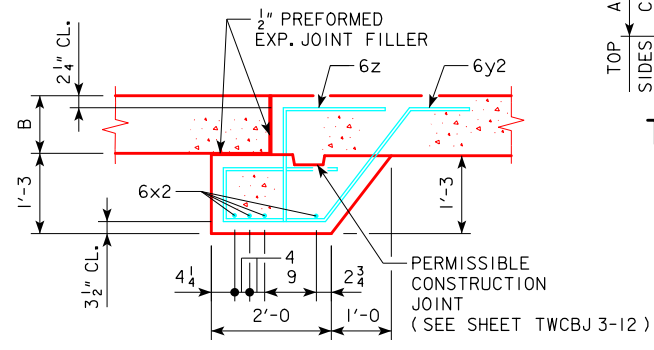


**TOP & SIDES - BARS 6y1**

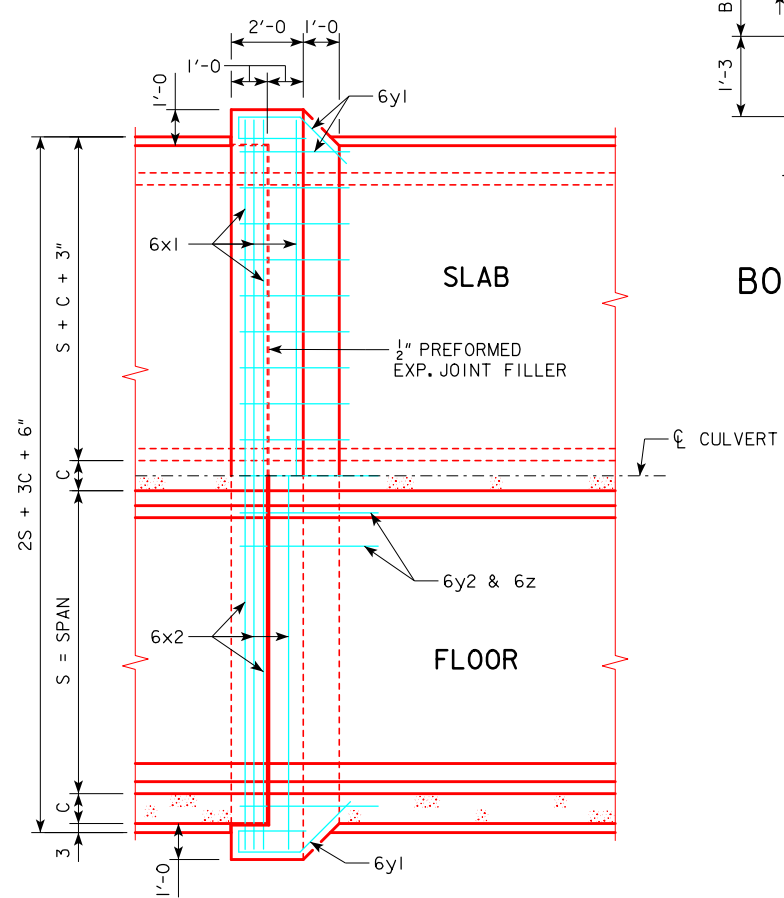


**NOTES:**

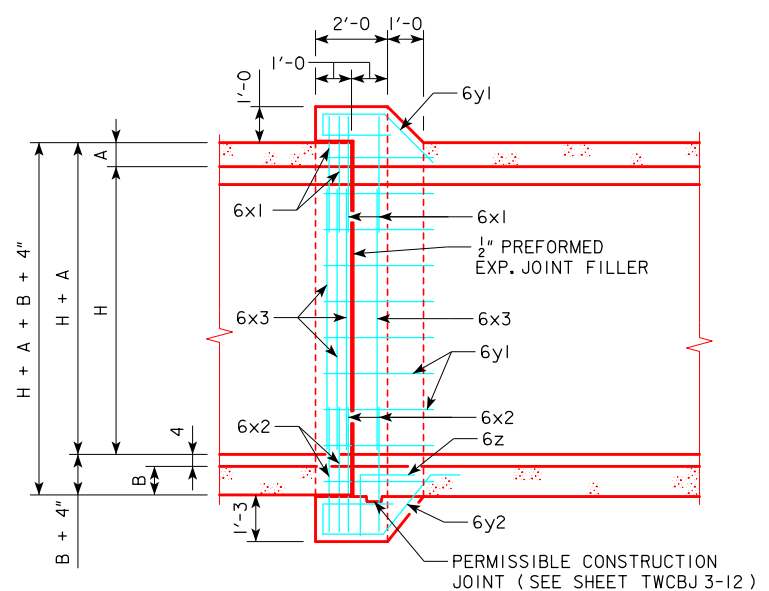
- DIMENSIONS AND QUANTITIES SHOWN ARE BASED ON SLAB, FLOOR, AND WALL THICKNESSES (A, B, AND C, RESPECTIVELY). VALUES FOR THESE DIMENSIONS, UNDER VARYING FILL CONDITIONS, CAN BE FOUND ON THE TWRCB CULVERT BARREL DETAIL SHEETS.
- CHANGE LENGTHS OF BARS 6x1, 6x2, 6z, AND ADJUST REINFORCING STEEL AND CONCRETE QUANTITIES ACCORDINGLY FOR SLAB, WALL AND FLOOR THICKNESSES OTHER THAN SHOWN.
- ALL BAR LENGTHS ARE ESTIMATED WITH A 2" CLEARANCE FROM CONCRETE EDGE TO OUTSIDE OF BAR, EXCEPT AS NOTED.
- MATERIAL AND CONSTRUCTION TO BE IN ACCORDANCE WITH THE CURRENT STANDARD SPECIFICATIONS OF I.D.O.T.
- SEE SHEET TWRCB G1-12 FOR GENERAL INFORMATION, SPECIFICATIONS AND DESIGN STRESSES.
- BARS 6x1 & 6x2 MAY BE FURNISHED IN TWO EQUAL LENGTHS ADDING 2'-3" TO THE OVERALL LENGTH TO OBTAIN A 2'-3" MIN. LAP. THE ABOVE IS TO BE PERFORMED AT NO ADDITIONAL COST TO THE CONTRACTING AUTHORITY.
- BARREL FLOOR BARS m1 & m9 ARE TO BE SHORTENED 6" IN LENGTH AT BELL JOINTS.



**BOTTOM - BARS 6y2 & 6z**



**PLAN VIEW**



**LONGITUDINAL SECTION**

LATEST REVISION DATE 07-13 APPROVED BY BRIDGE ENGINEER 	 STANDARD DESIGN <b>TWIN REINFORCED CONCRETE BOX CULVERTS</b> APRIL, 2012
	<b>CULVERT BELL JOINTS</b>
	<b>TWCBJ 1-12</b> 8' SPAN

### ESTIMATE OF QUANTITIES - ONE JOINT - 10' SPAN

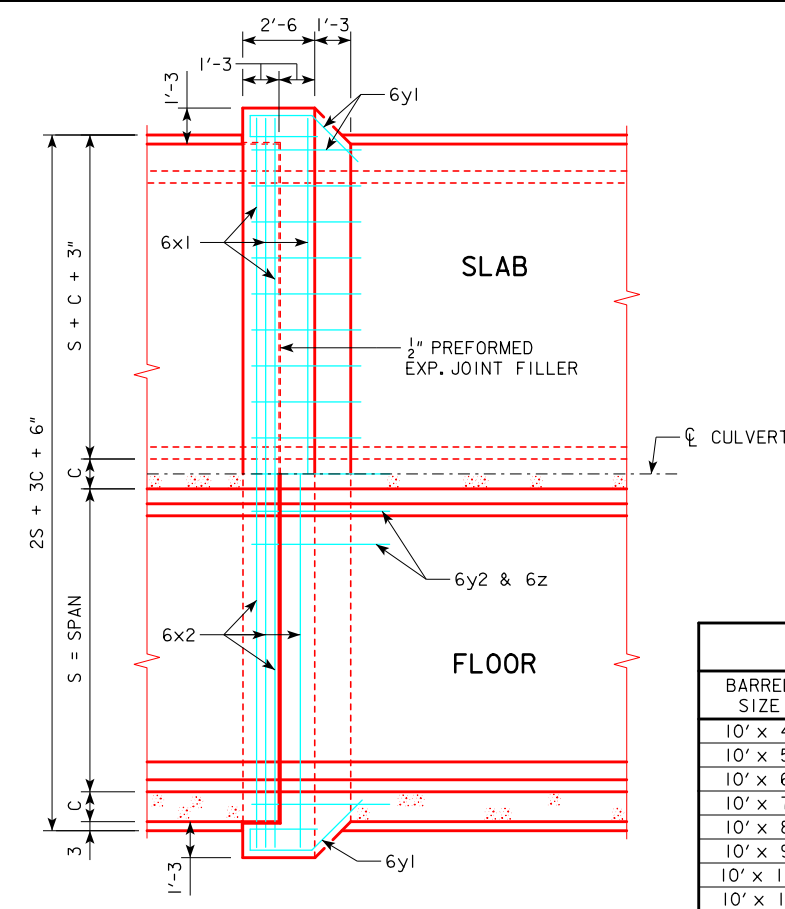
BILL OF REINFORCING STEEL			10' x 4'		10' x 5'		10' x 6'		10' x 7'		10' x 8'		10' x 9'		10' x 10'		10' x 11'		10' x 12'				
BAR	LOCATION	SHAPE	NO.	LENGTH	WEIGHT	NO.	LENGTH	WEIGHT	NO.	LENGTH	WEIGHT	NO.	LENGTH	WEIGHT	NO.	LENGTH	WEIGHT	NO.	LENGTH	WEIGHT			
6x1	SLAB & WALLS		4	34'-6"	207	4	34'-6"	207	4	34'-6"	207	4	34'-6"	207	4	34'-10"	209	4	35'-1"	211	4	35'-4"	212
6x2	FLOOR & WALLS		4	36'-8"	220	4	38'-8"	232	4	34'-4"	206	4	34'-4"	206	4	34'-8"	208	4	34'-11"	210	4	35'-2"	211
6x3	WALLS		--	--	--	--	--	--	8	5'-4"	64	8	6'-4"	76	8	7'-4"	88	8	8'-4"	100	8	9'-4"	112
6y1	TOP & SIDES		35	8'-0"	421	37	8'-0"	445	39	8'-0"	469	41	8'-0"	493	43	8'-0"	517	45	8'-0"	541	47	8'-0"	565
6y2	BOTTOM		23	9'-6"	328	23	9'-6"	328	23	9'-6"	328	23	9'-7"	331	23	9'-7"	331	23	9'-7"	331	23	9'-7"	331
6z	BOTTOM & FLOOR		23	3'-11"	135	23	3'-11"	135	23	3'-11"	135	23	3'-11"	135	23	3'-11"	135	23	3'-11"	135	23	3'-11"	135
TOTAL WEIGHT (LB)					1311			1347			1409			1448			1484			1520			1560
TOTAL CONCRETE (CY)					9.6			9.9			10.2			10.5			10.8			11.1			11.5

### ESTIMATE OF QUANTITIES - ONE JOINT - 12' SPAN

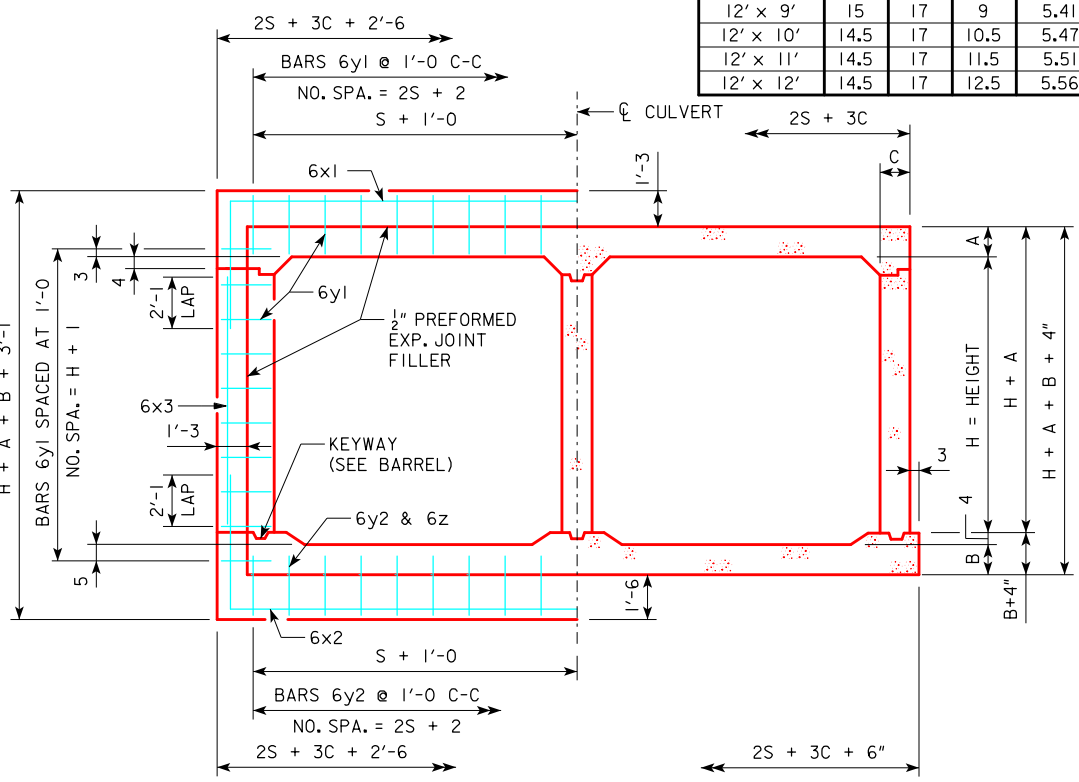
BILL OF REINFORCING STEEL			12' x 4'		12' x 5'		12' x 6'		12' x 7'		12' x 8'		12' x 9'		12' x 10'		12' x 11'		12' x 12'				
BAR	LOCATION	SHAPE	NO.	LENGTH	WEIGHT	NO.	LENGTH	WEIGHT	NO.	LENGTH	WEIGHT	NO.	LENGTH	WEIGHT	NO.	LENGTH	WEIGHT	NO.	LENGTH	WEIGHT			
6x1	SLAB & WALLS		4	38'-6"	231	4	38'-6"	231	4	38'-6"	231	4	38'-6"	231	4	38'-10"	233	4	39'-1"	235	4	39'-4"	236
6x2	FLOOR & WALLS		4	40'-8"	244	4	42'-8"	256	4	38'-4"	230	4	38'-4"	230	4	38'-8"	232	4	38'-11"	234	4	39'-2"	235
6x3	WALLS		--	--	--	--	--	--	8	5'-4"	64	8	6'-4"	76	8	7'-4"	88	8	8'-4"	100	8	9'-4"	112
6y1	TOP & SIDES		39	8'-0"	469	41	8'-0"	493	43	8'-0"	517	45	8'-0"	541	47	8'-0"	565	49	8'-0"	589	51	8'-0"	613
6y2	BOTTOM		27	9'-9"	395	27	9'-9"	395	27	9'-7"	389	27	9'-10"	399	27	9'-10"	399	27	9'-10"	399	27	9'-10"	399
6z	BOTTOM & FLOOR		27	3'-11"	159	27	3'-11"	159	27	3'-11"	159	27	3'-11"	159	27	3'-11"	159	27	3'-11"	159	27	3'-11"	159
TOTAL WEIGHT (LB)					1498			1534			1590			1636			1672			1708			1748
TOTAL CONCRETE (CY)					11.0			11.3			11.5			11.8			12.1			12.4			12.8

### CONCRETE PLACEMENT

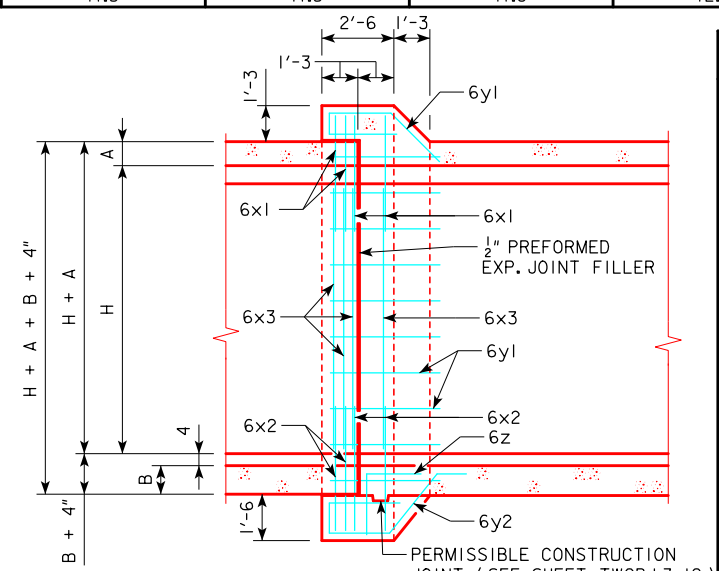
BARREL SIZE	BARREL DIMENSION			BELL JOINT QUANTITIES (CY)		
	A	B	C	FOOTING	WALLS	SLAB
10' x 4'	12.5	14.5	9	4.665	1.047	3.906
10' x 5'	12.5	14.5	9	4.665	1.332	3.906
10' x 6'	12.5	14.5	9	4.665	1.618	3.906
10' x 7'	12.5	15	9	4.677	1.903	3.906
10' x 8'	13	15	9	4.677	2.189	3.918
10' x 9'	13	15	9	4.677	2.474	3.918
10' x 10'	12.5	15	10.5	4.741	2.760	3.960
10' x 11'	12.5	15	11.5	4.784	3.045	3.995
10' x 12'	12.5	15	12.5	4.827	3.331	4.031
12' x 4'	14.5	16.5	9	5.399	1.047	4.525
12' x 5'	14.5	16.5	9	5.399	1.332	4.525
12' x 6'	13	15	9	5.364	1.618	4.489
12' x 7'	14.5	17	9	5.411	1.903	4.525
12' x 8'	15	17	9	5.411	2.189	4.537
12' x 9'	15	17	9	5.411	2.474	4.537
12' x 10'	14.5	17	10.5	5.476	2.760	4.578
12' x 11'	14.5	17	11.5	5.518	3.045	4.614
12' x 12'	14.5	17	12.5	5.561	3.331	4.650



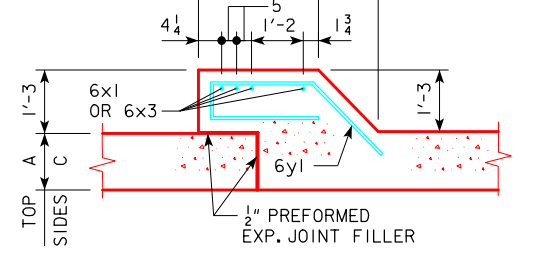
PLAN VIEW



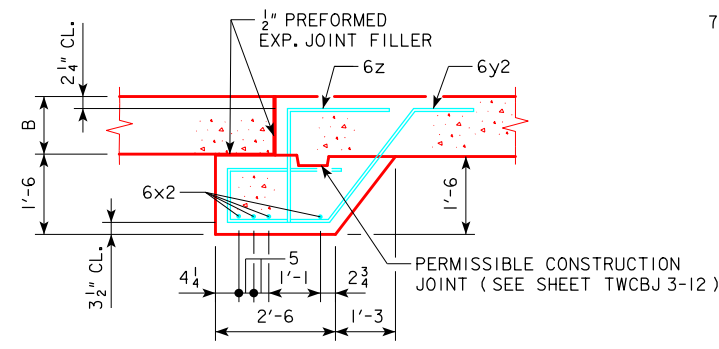
JOINT DETAIL SECTION THRU BARREL



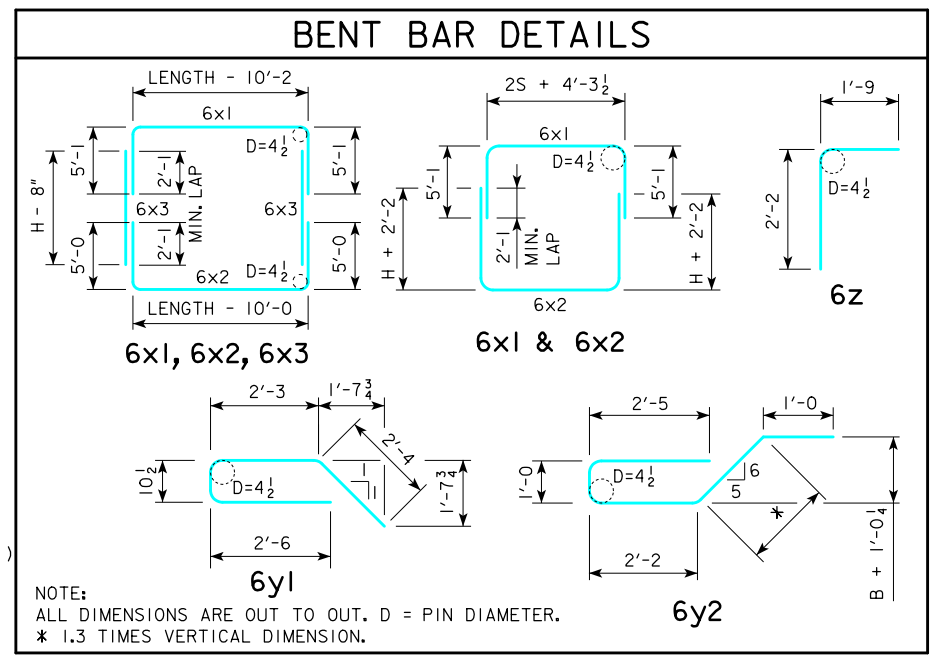
LONGITUDINAL SECTION



TOP & SIDES - BARS 6y1



BOTTOM - BARS 6y2 & 6z

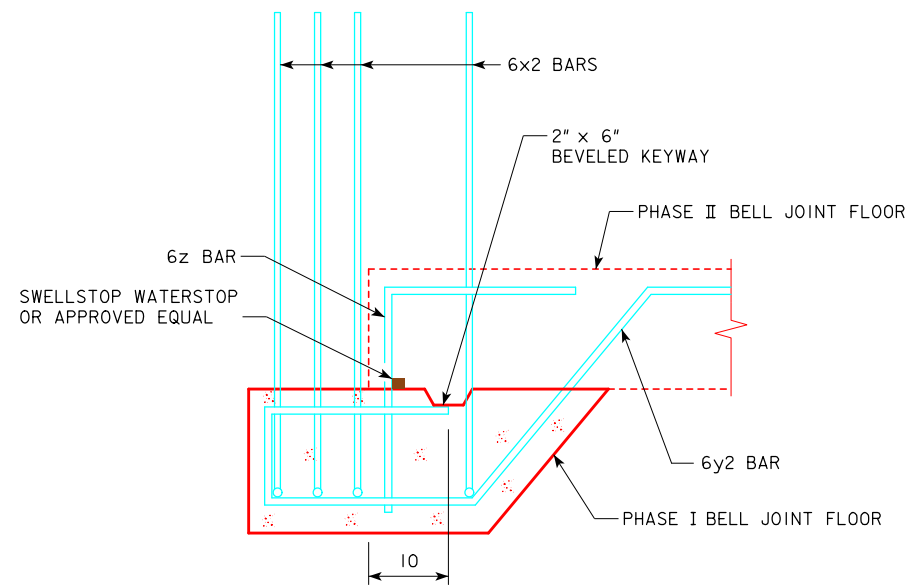


- NOTE:  
ALL DIMENSIONS ARE OUT TO OUT. D = PIN DIAMETER.  
\* 1.3 TIMES VERTICAL DIMENSION.
- DIMENSIONS AND QUANTITIES SHOWN ARE BASED ON SLAB, FLOOR, AND WALL THICKNESSES (A, B, AND C, RESPECTIVELY). VALUES FOR THESE DIMENSIONS, UNDER VARYING FILL CONDITIONS, CAN BE FOUND ON THE TWRCB CULVERT BARREL DETAIL SHEETS.
  - CHANGE LENGTHS OF BARS 6x1, 6x2, 6z, AND ADJUST REINFORCING STEEL AND CONCRETE QUANTITIES ACCORDINGLY FOR SLAB, WALL AND FLOOR THICKNESSES OTHER THAN SHOWN.
  - ALL BAR LENGTHS ARE ESTIMATED WITH A 2" CLEARANCE FROM CONCRETE EDGE TO OUTSIDE OF BAR, EXCEPT AS NOTED.
  - MATERIAL AND CONSTRUCTION TO BE IN ACCORDANCE WITH THE CURRENT STANDARD SPECIFICATIONS OF I.D.O.T.
  - SEE SHEET TWRCB G1-12 FOR GENERAL INFORMATION, SPECIFICATIONS AND DESIGN STRESSES.
  - BARS 6x1 & 6x2 MAY BE FURNISHED IN TWO EQUAL LENGTHS ADDING 2'-3" TO THE OVERALL LENGTH TO OBTAIN A 2'-3" MIN. LAP. THE ABOVE IS TO BE PERFORMED AT NO ADDITIONAL COST TO THE CONTRACTING AUTHORITY.
  - BARREL FLOOR BARS m1 & m9 ARE TO BE SHORTENED 6" IN LENGTH AT BELL JOINTS.

### NOTES:

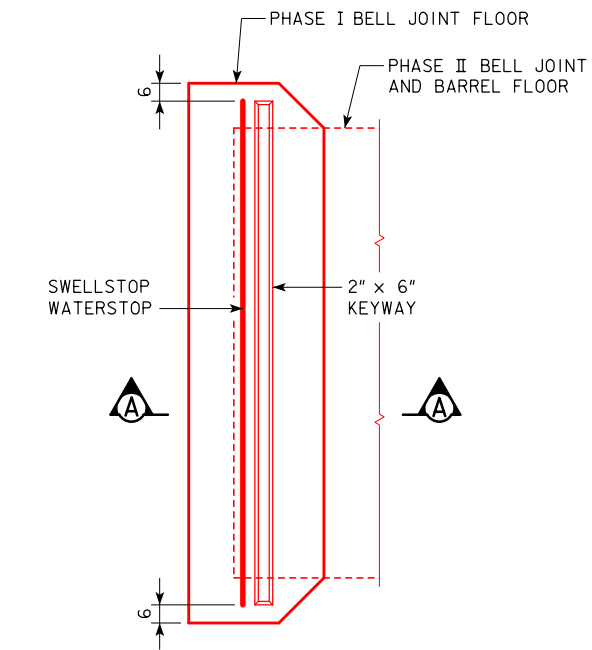
REVISED 07-13 - THE m9 BARS WERE ADDED TO NOTE NUMBER 7. ENGLISH LRFD SIGNED TWIN CULVERTS: DGN = TWCBJ 2-12 - THIS SHEET ISSUED 04-12.

07-13 LATEST REVISION DATE  Approved by: <i>Thomas L. Mc Donald</i> APPROVED BY BRIDGE ENGINEER	
	STANDARD DESIGN <b>TWIN REINFORCED CONCRETE BOX CULVERTS</b> APRIL, 2012
	<b>CULVERT BELL JOINTS</b> TWCBJ 2-12 10' & 12' SPANS



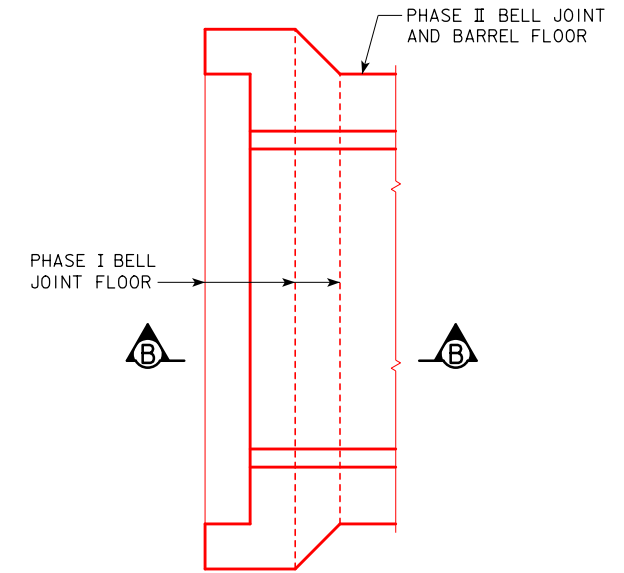
**SECTION A-A**  
BELL JOINT AT FLOOR

COST FOR WATERSTOP CONSIDERED INCIDENTAL TO THE PROJECT.



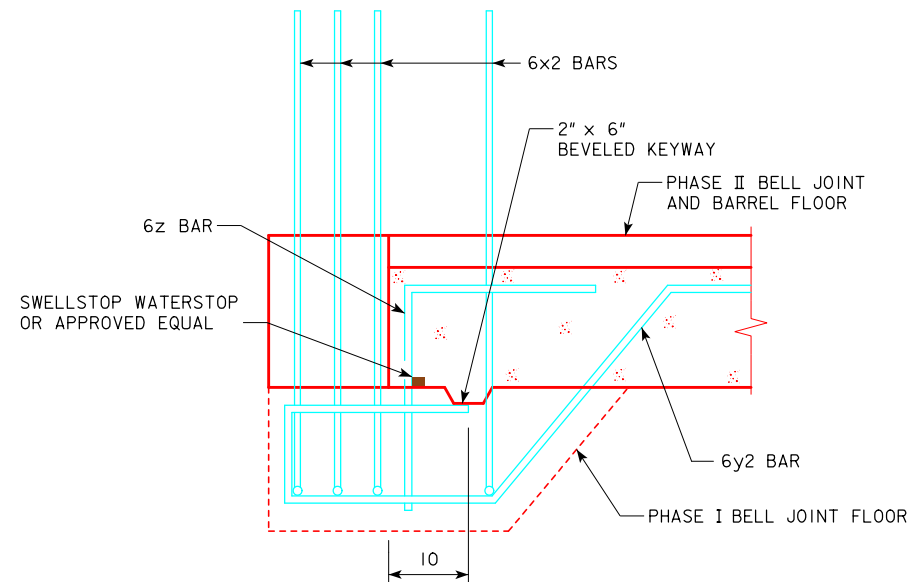
**PLAN VIEW - PHASE I**

( SHOWING PHASE I OF FLOOR BELL JOINT CONSTRUCTION )



**PLAN VIEW - PHASE II**

( SHOWING PHASE II OF FLOOR BELL JOINT AND BARREL FLOOR CONSTRUCTION )



**SECTION B-B**  
BELL JOINT AT FLOOR

COST FOR WATERSTOP CONSIDERED INCIDENTAL TO THE PROJECT.

**NOTES:**

1. THE DETAILS SHOWN ON THIS SHEET ARE AN OPTION FOR THE CONTRACTOR TO CONSTRUCT THE FLOOR OF THE BELL JOINT WITH A PERMISSIBLE CONSTRUCTION JOINT AS SHOWN.
2. REINFORCING STEEL WILL BE PLACED PRIOR TO PLACING THE PHASE I CONCRETE.
3. THE COST OF THE WATERSTOP IS CONSIDERED INCIDENTAL TO THE PROJECT.
4. A 2" x 6" BEVELED KEYWAY WILL BE FORMED TO THE DISTANCE SHOWN AND LOCATION NOTED BEFORE PLACING THE CONCRETE.
5. FOR DETAILS AND DIMENSIONS OF THE BELL JOINT REFER TO THE BELL JOINT STANDARD SHEETS.

LATEST REVISION DATE	 APPROVED BY BRIDGE ENGINEER	 STANDARD DESIGN <b>TWIN REINFORCED CONCRETE BOX CULVERTS</b> APRIL, 2012	
		CULVERT BELL JOINTS	TWCBJ 3-12
		ALL SPANS	

ENGLISHLRFDSIGNEDTWINCULVERTS.DGN - TWCBJ 3-12 - THIS SHEET ISSUED 04-12.