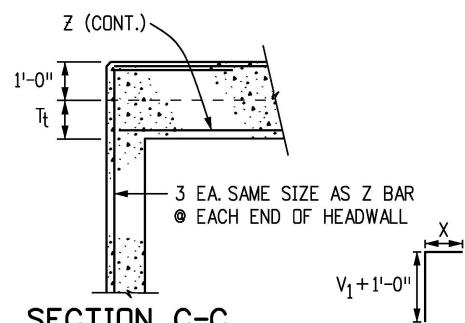
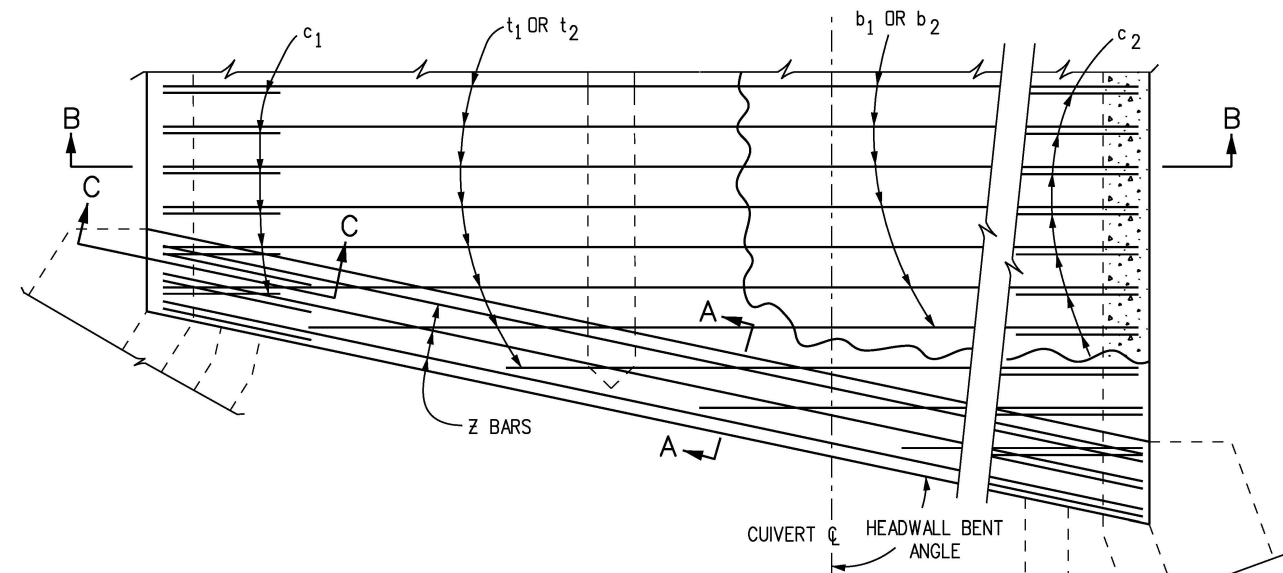


SECTION B-B

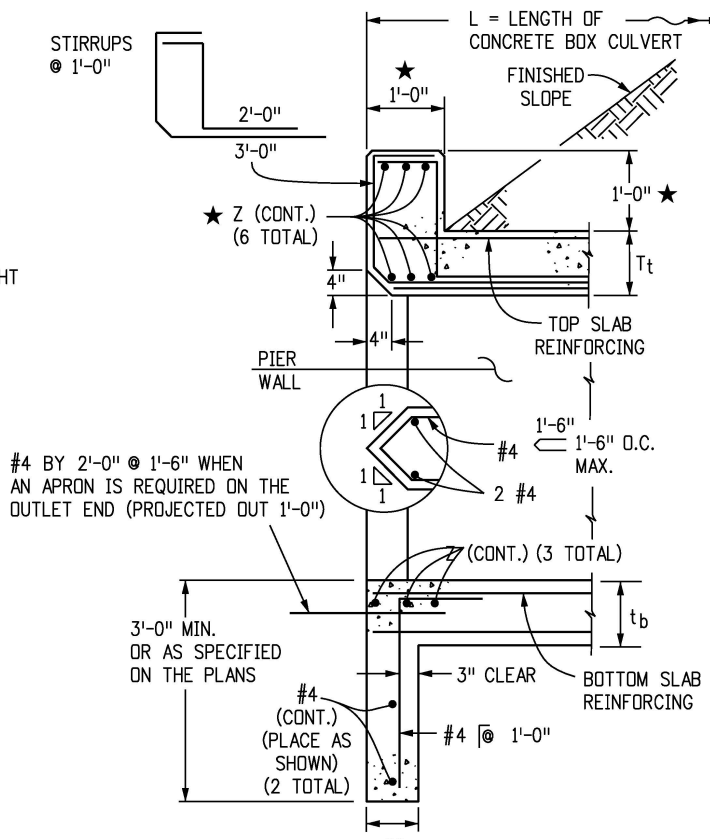


SECTION C-C

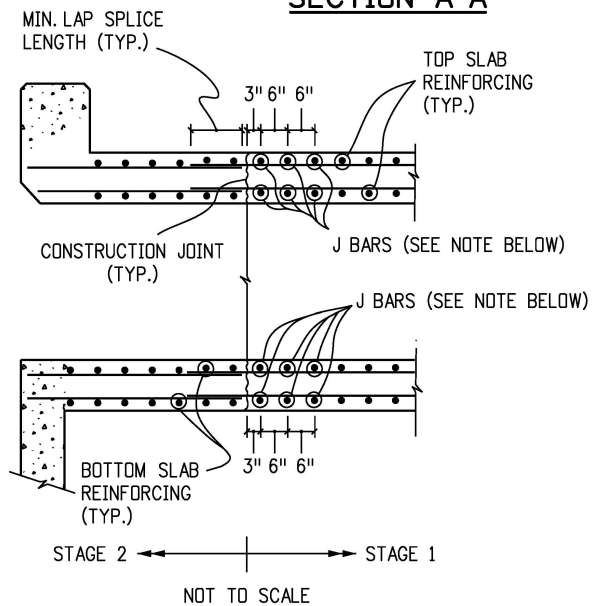
HEADWALL CORNER REINFORCING DETAIL

REINFORCING PLAN

BAR SIZE (#)	EPOXY X (FT.-IN.)	BLACK X (FT.-IN.)
4	2-4	1-11
5	2-10	2-4
6	3-5	2-10
7	4-1	3-3
8	5-3	4-3
9	6-8	5-5



SECTION A-A



NOT TO SCALE

CONSTRUCTION JOINT DETAIL FOR STAGED CONSTRUCTION

NOTE: THIS DETAIL IS FOR CONSTRUCTION JOINTS INSTALLED PERPENDICULAR TO THE ϕ OF THE BOX ONLY. THE CONTRACTOR CAN DESIGN AND INSTALL J BARS AT HIS EXPENSE TO SUPPORT TEMPORARY LIVE LOADS DURING STAGE 1 CONSTRUCTION. J BARS SHALL BE THE SAME SIZE AS THE TOP AND BOTTOM SLAB REINFORCING WHEN THERE ARE NO TEMPORARY LIVE LOADS TO SUPPORT.

GENERAL NOTES

1. ALL CONCRETE SHALL BE CLASS D (BOX CULVERT).
2. ALL CONSTRUCTION JOINTS SHALL BE THOROUGHLY CLEANED BEFORE FRESH CONCRETE IS PLACED.
3. ALL CONSTRUCTION JOINTS NOT SHOWN ON THE PLANS SHALL BE CONSTRUCTED ONLY IF APPROVED BY THE ENGINEER.
4. THE CONTRACTOR SHALL MAINTAIN THE STABILITY OF THE STRUCTURE DURING CONSTRUCTION.
5. STRUCTURE EXCAVATION AND BACKFILL SHALL BE IN ACCORDANCE WITH STANDARD PLAN M-206-1.
6. FOR ANY CULVERT SPAN 20 FT. OR GREATER, A FOUNDATION INVESTIGATION AND REPORT ARE REQUIRED.
7. BACKFILL SHALL NOT BEGIN UNTIL TOP SLAB HAS REACHED DESIGN STRENGTH, f'_c .
8. SPLICE QUANTITIES FOR LONGITUDINAL AND TRANSVERSE BARS ARE NOT INCLUDED.
9. REINFORCING STEEL SHALL BE GRADE 60.
10. THE MINIMUM LAP SPLICE LENGTH FOR EPOXY COATED REINFORCING BARS SHALL BE:

BAR SIZE:	#4	#5	#6	#7	#8	#9	#10	#11
SPLICE LENGTH:	1'-3"	1'-7"	2'-5"	2'-10"	3'-8"	4'-8"	5'-11"	7'-3"

THE MINIMUM LAP SPLICE LENGTH FOR BLACK REINFORCING BARS SHALL BE:

BAR SIZE:	#4	#5	#6	#7	#8	#9	#10	#11
SPLICE LENGTH:	1'-1"	1'-4"	1'-7"	1'-11"	2'-6"	3'-1"	3'-11"	4'-10"

THE ABOVE SPLICE LENGTHS ARE FOR CLASS B SPLICES.

11. ALL DIMENSIONS ARE PERPENDICULAR TO THE CENTERLINE OF THE BOX.
12. WINGWALLS SHALL BE TIED TO CONCRETE BOX CULVERT IN ACCORDANCE WITH STANDARD PLAN M-601-20.
13. ALL TRANSVERSE REINFORCING SHALL BE NORMAL TO THE CENTERLINE OF THE BOX.
14. THE FILL HEIGHT IS THE DISTANCE MEASURED FROM THE TOP OF THE TOP SLAB TO THE TOP OF PAVEMENT.
15. ALL EXPOSED CONCRETE CORNERS SHALL BE CHAMFERED $\frac{3}{4}$ IN.
16. FOR FILL HIEGHTS LESS THAN 2 FT, A WATERPROOFING MEMBRANE SHALL BE PROVIDED FOR THE TOP OF THE TOP SLAB AND 18" DOWN ALONG THE TOPS OF THE EXTERIOR WALLS.
- ▲ 17. FOR FILL HIEGHTS LESS THAN 2 FT. THE d_1 BARS FOR THE BOTTOM MAT OF THE TOP SLAB SHALL BE AS FOLLOWS:

S	8, 9, 10	14, 16, 18	20
BAR SIZE:	#5	#6	#7
SPACING	1'-0"	1'-0"	1'-0"

DESIGN DATA: 7TH EDITION, 2014, OF THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS

RATING DATA: 2ND EDITION, 2011, OF THE AASHTO MANUAL FOR BRIDGE EVALUATION

 $f_y = 60,000 \text{ psi.}$

LOADING DATA: $f'_c = 4,500$ psi.,

LIVE LOAD = AASHTO LRFD, HL-93 TRUCK, HL-93 TANDEM, COLORADO PERMIT TRUCK AND NRL

DEAD LOAD CASE 1: VERTICAL EARTH LOAD = 120 LBS./CU. FT.
HORIZONTAL EARTH LOAD = 30 LBS./CU.FT.

DEAD LOAD CASE 2: VERTICAL EARTH LOAD = 120 LBS./CU. FT.
HORIZONTAL EARTH LOAD = 60 LBS./CU. FT.

WEARING SURFACE - 12 IN. THICK CONCRETE PAVEMENT.

DEAD LOAD - TYPE 7 BARRIER.

THRUST IS NOT CONSIDERED IN THIS STANDARD, I.E. THRUST = 0.

EXTREME HEADWATER TO DEPTH RATIO IS IN ACCORDANCE WITH THE CDOT DRAINAGE MANUAL.

EXTREME HEADWATER TO DEPTH RATIO WAS INCLUDED IN THE CULVERT DESIGNS BUT EXCLUDED FROM THE RATINGS AS PER THE AASHTO MANUAL FOR BRIDGE EVALUATION.

LIVE LOAD SURCHARGE ON EXTERIOR WALLS = 2 FT. OF EARTH

- ★ IF HEADWALL MOUNT GUARDRAIL IS USED (SEE STANDARD PLAN M-606-1, SHEET 19 AND NOTES BELOW):
- ALL REINFORCING STEEL SHALL BE ACCORDING TO THIS BOX CULVERT PLAN.
 - ANY SPECIAL DESIGN FOR STIRRUPS WILL NOT BE MEASURED AND PAID FOR SEPARATELY BUT SHALL BE INCLUDED IN THE WORK.
 - HEADWALL DIMENSION AND CONCRETE QUANTITY SHALL BE ACCORDING TO STANDARD PLAN M-606-1, SHEET 19.
 - POST ANCHORS SHALL BE PROVIDED ACCORDING TO STANDARD PLAN M-606-1, SHEET 19.
 - POST ANCHORS AND CONCRETE FOR HEADWALL MOUNT OF GUARDRAIL WILL NOT BE MEASURED AND PAID FOR SEPARATELY BUT SHALL BE INCLUDED IN THE WORK.
 - POST ANCHORS WHEN REQUIRED AND ENCASED IN HEADWALL CONCRETE, SHALL CONFORM TO ASTM A 36 OR AASHTO M 169 STEEL.

18. SEE M-603-3 FOR PRECAST CONCRETE BOX CULVERT DETAILS.

Computer File Information		(R-X) (R-X) (R-X) (R-X)	Sheet Revisions		Colorado Department of Transportation  2829 West Howard Place CDOT HQ, 3rd Floor Denver, CO 80204 Phone: 303-757-9021 FAX: 303-757-9868 Project Development Branch JBK		TRIPLE CONCRETE BOX CULVERT (CAST-IN-PLACE)		STANDARD PLAN NO.	
Date:	Comments		M-601-3							
			Standard Sheet No. 1 of 2							
Creation Date: 07/31/19							Issued by the Project Development Branch: July 31, 2019		Project Sheet Number:	
Designer Initials: JBE										
Last Modification Date: 07/31/19										
Detailer Initials: LTA										
CAD Ver.: MicroStation V8 Scale: Not to Scale Units: English										

TRIPLE CONCRETE BOX CULVERT DIMENSIONS, QUANTITIES & RATING FACTORS (EXCLUDING HEADWALL & TOEWALL QUANTITIES)

BOX SIZE				FILL HEIGHT ALLOWED	SLAB & WALL THICKNESS (INCHES)			BAR SIZES										d1▲	DIMENSIONS					QUANTITIES			RATING FACTORS				
S	R	HT.	WIDTH		Tt	Tb	TW&TW	t1*	t2	b1	b2	w1*	w2	w3*	w4	c1*	c2		NO.	h1	h2	v1	v2	v3	CONCRETE	REBAR STL	WATERPROOFING	HL-93 INVENTORY	HL-93 OPERATING	COLORADO PERMIT	NRL VEHICLE
FT	FT	FT-IN	FT-IN	FT-FT	Tt	Tb	TW&TW	#	#	#	#	#	#	#	#	#	#	NO.	FT-IN	FT-IN	FT-IN	FT-IN	FT-IN	CY/LF	LBS/LF	SY/LF					
8	6	7-10.5	27-4	< 2	12.5	10	10	5	6	5	6	4	4	4	5	5	168	3-5	2-4	6-10	2-4	1-11	2,639	531	3,370	1.21	1.57	1.82	1.69		
		7-9.5	27-4	2 TO 8	10.5	11	10	4	5	4	5	4	4	4	5	5	168	2-6	2-4	6-8	3-2	2-0	2,555	429		1.47	1.90	2.07	1.83		
		8-0	27-4	8 TO 12	11	13	10	4	5	4	5	4	4	4	5	5	168	2-6	2-4	6-9	3-4	2-2	2,765	432		3.38	4.39	4.80	5.22		
		8-0	27-4	12 TO 16	11	13	10	5	4	4	4	4	5	5	5	5	168	2-6	2-4	6-9	3-4	2-2	2,765	462		6.80	8.81	9.35	8.63		
		8-0	27-4	16 TO 20	11	13	10	5	4	5	4	5	5	5	5	5	168	2-4	2-4	6-9	3-5	2-2	2,765	482		1.69	2.19	2.20	2.27		
		8-3.5	27-4	20 TO 25.9	13	14.5	10	5	5	5	5	5	5	5	5	5	168	2-6	2-4	6-11	2-4	2-3	3,061	523		6.80	8.82	8.50	5.95		
		8-4.5	27-10	26 TO 30	13.5	15	11.5	5	6	5	6	5	5	5	5	5	168	3-3	2-6	6-11	3-6	2-4	3,300	587		◆	◆	◆	◆		
		9-10.5	27-4	< 2	12.5	10	10	5	6	5	6	4	4	4	5	5	184	3-5	2-4	8-10	3-1	1-11	2,886	566	3,370	1.21	1.57	1.82	1.65		
	8	9-9.5	27-4	2 TO 8	10.5	11	10	4	5	4	5	4	4	4	5	5	175	2-6	2-4	8-8	3-2	2-0	2,801	461		1.46	1.89	2.00	1.82		
		10-0	27-4	8 TO 12	11	13	10	4	5	4	5	4	4	4	5	5	184	2-6	2-4	8-9	3-4	2-2	3,012	464		3.45	4.47	4.89	5.12		
		10-0	27-4	12 TO 16	11	13	10	5	4	4	5	4	4	4	5	5	184	2-6	2-4	8-9	2-4	2-2	3,012	460		2.53	3.27	3.47	3.73		
		10-4	27-4	16 TO 20	13.5	14.5	10	5	4	5	5	4	4	4	5	5	184	3-3	2-4	8-11	3-5	2-2	3,350	490		3.07	3.98	3.84	2.72		
		10-4	27-6	20 TO 25.9	13.5	14.5	10.5	5	6	5	5	5	6	6	5	5	184	3-3	2-4	8-11	3-6	2-3	3,414	675		1.78	2.32	2.23	1.56		
		10-4.5	27-10	26 TO 30	13.5	15	11.5	5	5	5	5	5	5	5	5	5	184	3-3	2-6	8-11	3-6	2-4	3,584	578		◆	◆	◆	◆		
		10	6	8-0	33-4	< 2	14	10	10	6	7	6	7	5	5	5	5	5	192	3-5	2-4	6-11	3-1	1-11	3,210	796	4,037	1.20	1.55	1.44	1.37
				7-9	33-4	2 TO 8	11	10	10	6	7	6	7	5	5	5	5	5	192	2-6	2-4	6-9	2-4	1-11	2,901	774		1.56	2.02	1.81	1.73
8-1	33-4			8 TO 12	11.5	13.5	10	5	7	5	7	5	5	5	5	5	192	2-6	2-4	6-9	3-4	2-2	3,313	721		2.81	3.65	3.73	4.04		
8-2.5	33-4			12 TO 16	12	14.5	10	6	6	5	7	5	5	5	5	5	192	2-6	2-4	6-10	3-7	2-4	3,467	720		2.67	3.47	3.58	3.84		
8-6	33-4			16 TO 22	14	16	10	6	5	6	5	5	5	5	5	5	192	2-6	2-4	7-0	3-7	2-5	3,827	658		2.44	3.17	3.04	3.14		
10-0	33-6			< 2	14	10	10.5	6	7	6	7	5	5	5	5	5	208	3-5	2-4	8-11	3-1	1-11	3,519	840	4,056	1.20	1.56	1.40	1.33		
9-11.5	33-4			2 TO 6	11.5	12	10	6	7	6	7	5	5	5	5	5	208	2-6	2-4	8-9	2-4	2-0	3,405	817		1.65	2.14	2.44	2.39		
10-1	33-4			6 TO 8	11.5	13.5	10	5	7	5	7	5	5	5	5	5	208	2-6	2-4	8-9	3-3	2-0	3,560	760		3.11	4.04	3.99	4.60		
8	10-1		33-4	8 TO 12	11.5	13.5	10	5	7	5	7	5	5	5	5	5	208	2-6	2-4	8-9	3-5	2-2	3,560	763		2.85	3.69	3.76	4.07		
	10-5		33-4	12 TO 16	13.5	15.5	10	5	7	5	7	5	5	5	5	5	208	2-6	2-4	8-11	3-7	2-4	3,971	768		3.36	4.36	4.60	4.04		
	10-6		33-4	16 TO 22	14	16	10	6	7	6	7	5	5	5	5	5	208	2-6	2-4	9-0	3-7	2-5	4,074	831		2.37	3.08	2.93	2.10		
	12-0		33-6	< 2	14	10	10.5	6	7	6	7	5	5	5	5	5	224	3-5	2-4	10-11	2-4	1-11	3,778	879	4,056	1.17	1.52	1.36	1.30		
	11-10.5		33-6	2 TO 8	11.5	11	10.5	6	7	6	7	5	5	5	5	5	224	2-6	2-4	10-9	3-2	2-0	3,623	864		1.65	2.14	2.15	2.06		
	12-0.5		33-8	8 TO 12	11.5	13	11	5	7	5	7	5	5	5	5	5	224	2-6	2-5	10-9	3-4	2-2	3,904	808		3.09	4.00	3.92	3.08		
	12-3		33-4	12 TO 14	12.5	14.5	10	5	5	5	5	5	5	5	5	5	224	2-6	2-4	10-10	3-6	2-3	4,012	675		1.68	2.17	2.10	1.50		
	12-5		33-6	14 TO 16	13.5	15.5	10.5	5	7	5	7	5	5	5	5	5	224	2-6	2-4	10-11	3-7	2-4	4,295	812		1.59	2.06	1.99	1.41		
12	6	12-6	34-0	16 TO 22	14	16	12	6	7	6	7	5	5	6	6	224	2-10	2-8	11-0	2-4	2-5	4,630	914		1.40	1.82	1.75	1.24			
		8-1	39-6	< 2	15	10	10.5	6	7	6	7	5	5	5	5	5	216	3-9	2-4	7-0	3-1	1-11	3,826	905	4,722	1.03	1.33	1.14	1.15		
		7-11.5	39-4	2 TO 4	12.5	11	10	6	7	6	7	5	5	5	5	5	203	2-6	2-4	6-10	3-2	2-0	3,594	881		1.34	1.74	1.46	1.55		
		8-2	39-4	4 TO 8	13.5	12.5	10	5	7	5	7	5	5	5	5	5	216	2-6	2-4	6-11	3-7	2-5	3,897	818		1.10	1.42	1.27	1.36		
		8-6.5	39-4	8 TO 10	14.5	16	10	5	7	5	7	5	5	5	5	5	216	3-3	2-4	7-0	3-7	2-5	4,443	823		2.22	2.88	2.82	3.06		
		8-8	39-6	10 TO 12	16	16	10.5	6	5	6	5	5	5	5	5	5	216	3-3	2-4	7-2	2-4	2-3	4,679	735		3.48	4.51	4.97	5.27		
		8-8	39-8	12 TO 16	16	16	11	6	5	6	5	5	5	5	5	5	216	3-3	2-5	7-2	3-7	2-5	4,733	745		2.48	3.22	3.40	3.59		
		8-11	39-8	16 TO 18	17	18	11	6	5	6	5	5	5	5	5	5	216	3-3	2-4	7-3	3-9	2-7	5,100	748		2.09	2.71	2.79	2.86		
	8	10-1.5	39-6	< 2	15	10.5	10.5	6	7	6	7	5	5	6	6	232	3-9	2-8	9-0	3-5	1-11	4,146	984	4,722	1.07	1.39	1.19	1.20			
		9-11.5	39-4	2 TO 4	12.5	11	10	6	7	6	7	5	5	5	5	5	232	2-6	2-4	8-10	3-2	2-0	3,841	923		1.31	1.70	1.44	1.52		
		10-2.5	39-4	4 TO 8	13.5	13	10	5	5	5	5	5	5	5	5	5	232	2-6	2-4	8-11	2-4	2-2	4,205	695		1.15	1.50	1.34	1.43		
		10-9.5	39-8	8 TO 12	16	17.5	11	5	5	5	5	5	5	5	5	5	232	3-3	2-5	9-2	3-9	2-6	5,188	716		2.51	3.26	2.93	3.11		
		10-11	39-8	12 TO 18	17	18	11	6	5	6	5	5	5	5	5	5	232	3-3	2-5	9-3	3-9	2-7	5,371	790		1.98	2.57	2.63	2.71		
		12-3	39-6	< 2	16	11	10.5	6	7	6	7	5	5	6	6	248	4-4	2-8	11-1	2-8	2-0	4,588	1030	4,722	1.11	1.44	1.23	1.24			
		11-11.5	39-4	2 TO 4	12.5	11	10	6	7	6	7	5	5	5	5	5	248	2-6	2-4	10-10	3-2	2-0	4,087	964							