Triple Reinforced Concrete Box Culvert Standards

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LATEST REVISION DATE

APPROVED BY BRIDGE ENGINEER

Standard Design

Triple Reinforced Concrete Box Culverts

July, 2020

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TRRCB G1-20

ENGLISHLRFDSIGNEDTRIPLECULVERTS.DGN - TRRCB G1-20 - THIS SHEET ISSUED 07-2020.

Triple Reinforced Concrete Box Culvert Standards

General Notes:

1. The RCB culvert sections are designed for HL-93 live load and earth fills of varying heights.
2. Vertical earth pressure, EV=0.120 kcf.
   Horizontal earth pressure, EHmax = 0.060 kcf max, EHmin = 0.030 kcf.
3. The RCB culvert sections are designed for Class 1 exposure conditions except:
   Class 2 exposure condition is utilized for the slab design in 0' fill instances.
4. 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.
5. The clear distance from face of concrete to near edge or end of reinforcing bar to be 2" unless otherwise noted.
6. Except for dowel bars 5r1 in slab, longitudinal reinforcing is not to extend thru the construction joints.
7. Floor of barrel is to be finished smooth. Sides of footing are to be formed to insure correct line and grade.
8. The permissible construction joint at the top of the walls may be lowered at the Contractor's option with Engineer's approval.
9. The reinforcement supplied for this structure shall be Grade 60 reinforcement in accordance with the Standard Specifications. The design stresses are based on ASTM A706 Grade 60 reinforcement.
10. 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	20"	24"	29"	34"	38"	47"

    This splice, if used, will be at the Contractor's expense.
11. Reinforcing bar clearances will be as follows:
    Edge clearances: 2" except
    Top of floor 2¼" to near transverse reinforcing bar
    Bottom of floor 3½" to near transverse reinforcing bar
    End clearances:
    Vertical top 2"
    Vertical bottom 3" or 3½" if overall height of the culvert is not to a full inch
    Transverse 2"
12. All construction joints shall be formed with a beveled keyway except at bell joints.
13. All beveled keyways shall be centered.
14. Keyway size shall be 2"x4" except as follows:
    Keyway between the floor and wall shall be 2"x6" when the wall is greater than 10 inches wide.
15. 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.
16. If 0' 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.
17. All dimensions are in feet and inches unless otherwise noted or shown.
18. See current Standard Specifications regarding concrete form removal.
19. These culvert standards label all reinforcing steel with English notation (5a1 is ⅝ 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

20. 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.

Specifications:

Design:
AASHTO LRFD Bridge Design Specifications, 8th Ed., Series of 2017.

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, 8th Ed., Series of 2017:
Reinforcing steel in accordance with AASHTO LRFD Section 5, Grade 60.
Concrete in accordance with AASHTO LRFD Section 5, f'c = 4.0 ksi.

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Standard Design

Triple Reinforced Concrete Box Culverts

July, 2020

General Notes & Specifications

TRRCB G2-20

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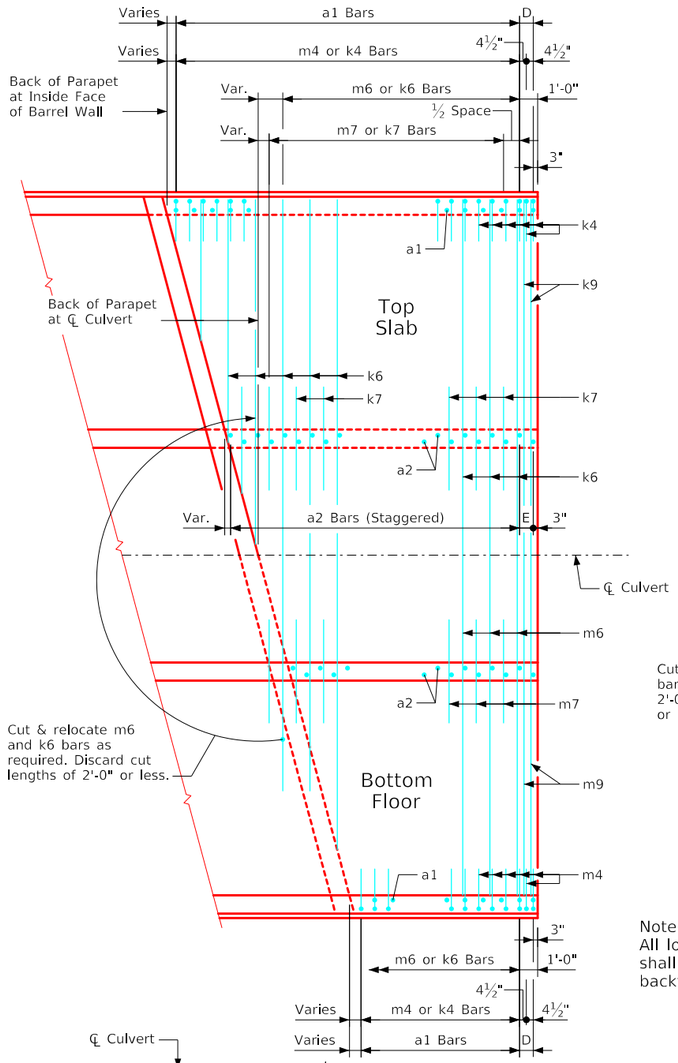
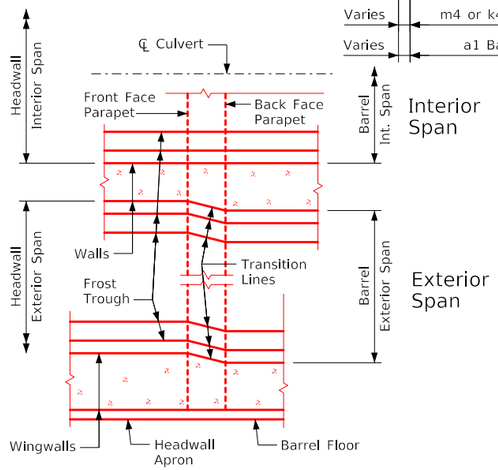


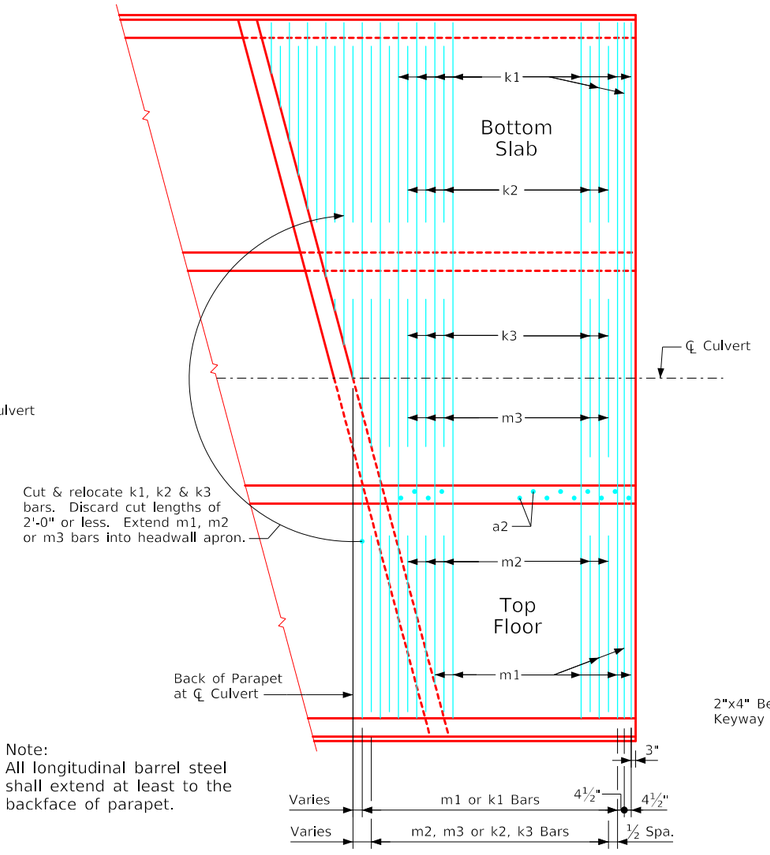
Interior Span



Exterior Span

Transition Wall Details

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:
All longitudinal barrel steel shall extend at least to the backface of parapet.

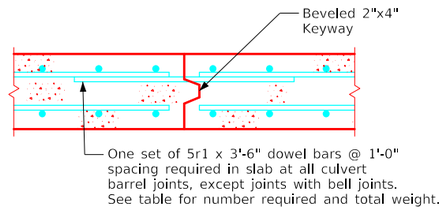
End Section Plan Views

(Keyways not shown)

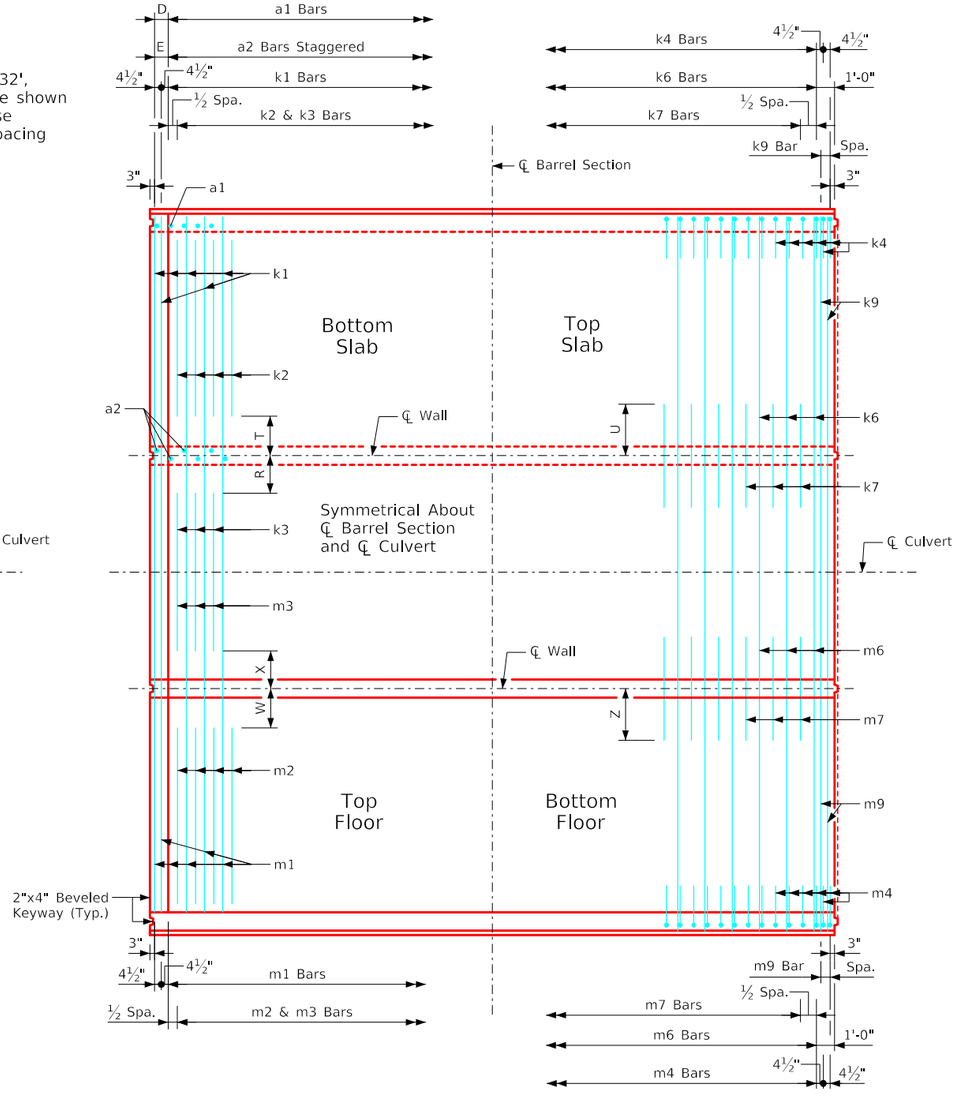
Note:
End section details shown are for a 15° skew barrel. Use for skews of 30° & 45° by increasing the number of transverse reinforcing bars required to be cut and relocated.

Note:
Dimensions listed on this sheet to be used in conjunction with dimensions and quantities for barrel section sheets.

5r1 Bars - One Const. Jt.		
Span	No.	Weight (LB)
10'-0"	34	124
12'-0"	40	146



Top Slab Construction Joint Detail



Standard Section Plan View

(Keyway is to be omitted when bell joints are used)

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Standard Design

Triple Reinforced Concrete Box Culverts

July, 2020

Typical Culvert Barrel Details

TRRCB G3-20

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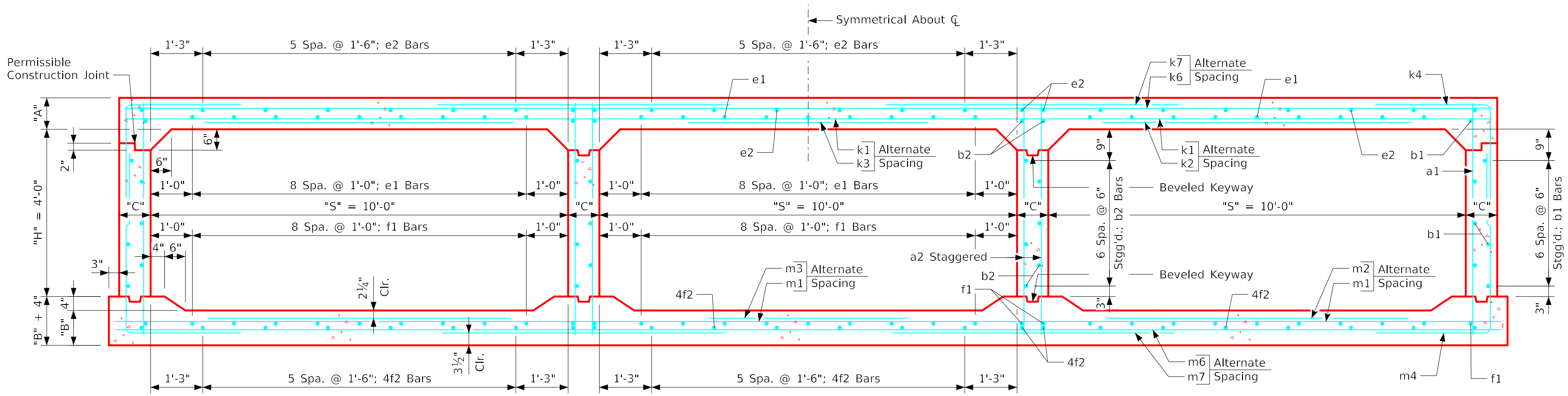
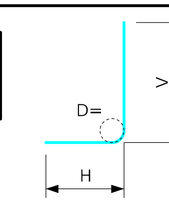


Triple 10' x 4' Barrel Section

Bent Bar Detail

Bars	D
4	3"
5	3¾"



k4 & m4

Note:
All dimensions are out to out.
D = pin diameter.

Notes:

1. Dimensions listed on this sheet to be used in conjunction with Sheet TRRCB G3-20.
2. Fill, dimensions "S" and "H" are in feet.
3. Dimensions "A", "B", "C", "D", and "Sp." listed in the bar list are in inches.
4. Dimensions "L", "H", "V" are in feet and inches.

Variable Dimensions and Quantities for Triple 10' x 4' Barrel Sections

Dimensions													
Fill	S	H	A	B	C	D	E	R	T	U	W	X	Z
0	10	4	13	10	9	9	9	0'-0	0'-0	6'-2	2'-9	3'-8	3'-11
1	10	4	12	10	9	6	9	0'-9	0'-5	6'-0	2'-10	3'-8	3'-11
2	10	4	9	10	9	6	9	0'-10	0'-10	4'-11	2'-6	3'-8	3'-9
3-6	10	4	8	10	9	9	9	1'-9	1'-6	3'-10	2'-9	3'-8	3'-8
7-8	10	4	8	10	9	9	9	2'-8	2'-3	3'-5	2'-2	3'-3	3'-4
9-10	10	4	8.5	10.5	9	9	9	2'-7	2'-2	3'-6	2'-1	3'-0	3'-5
11-12	10	4	9.5	11.5	9	6	9	2'-10	1'-10	3'-5	2'-0	3'-0	3'-5
13-15	10	4	11.5	13.5	9	9	9	2'-11	1'-10	3'-4	1'-10	3'-2	3'-6
16-17	10	4	12.5	14.5	9	9	9	2'-11	1'-5	3'-4	2'-0	3'-5	3'-4
18-19	10	4	13.5	15.5	9	9	9	3'-4	1'-8	3'-4	1'-10	3'-9	3'-4
20-21	10	4	14	16.5	9	9	9	3'-3	1'-6	3'-4	1'-5	3'-9	3'-5
22-23	10	4	15	17.5	9	9	9	4'-2	1'-5	3'-5	1'-5	3'-9	3'-6
24-25	10	4	17	18.5	9	9	9	4'-2	0'-11	3'-6	1'-2	3'-9	3'-7

	Bar List																							
	a1			a2			b1			b2			e1			e2			f1			f2		
Fill	Size	Sp.	L	Size	Sp.	L	Size	Sp.	No.	Size	Sp.	No.	Size	Sp.	No.	Size	Sp.	No.	Size	Sp.	No.	Size	Sp.	No.
0	4	12	5'-10	6	9	5'-10	4	6	16	4	6	18	4	12	27	4	18	24	4	12	33	4	18	24
1	4	6	5'-9	6	9	5'-9	4	6	16	4	6	18	4	12	27	4	18	24	4	12	33	4	18	24
2	4	6	5'-6	7	9	5'-6	4	6	16	4	6	18	4	12	27	4	18	24	4	12	33	4	18	24
3-6	5	12	5'-5	6	9	5'-5	4	6	16	4	6	18	4	12	27	4	18	24	4	12	33	4	18	24
7-8	4	12	5'-5	6	9	5'-5	4	6	16	4	6	18	4	12	27	4	18	24	4	12	33	4	18	24
9-10	4	12	5'-6	6	9	5'-6	4	6	16	4	6	18	4	12	27	4	18	24	4	12	33	4	18	24
11-12	4	6	5'-8	6	9	5'-8	4	6	16	4	6	18	4	12	27	4	18	24	4	12	33	4	18	24
13-15	5	12	6'-0	6	9	6'-0	4	6	16	4	6	18	4	12	27	4	18	24	4	12	33	4	18	24
16-17	5	12	6'-2	6	9	6'-2	4	6	16	4	6	18	4	12	27	4	18	24	4	12	33	4	18	24
18-19	4	9	6'-4	6	9	6'-4	4	6	16	4	6	18	4	12	27	4	18	24	4	12	33	4	18	24
20-21	4	9	6'-5	6	9	6'-5	4	6	16	4	6	18	4	12	27	4	18	24	4	12	33	4	18	24
22-23	4	12	6'-7	6	9	6'-7	4	6	16	4	6	18	4	12	27	4	18	24	4	12	33	4	18	24
24-25	4	12	6'-10	6	9	6'-10	4	6	16	4	6	18	4	12	27	4	18	24	4	12	33	4	18	24

	Bar List																			
	k1			k2			k3			k4					k6			k7		
Fill	Size	Sp.	L	Size	Sp.	L	Size	Sp.	L	Size	Sp.	L	H	V	Size	Sp.	L	Size	Sp.	L
0	6	18	32'-8	5	18	10'-11	4	18	10'-9	4	6	6'-4	3'-2	3'-2	4	12	32'-8	4	12	12'-4
1	6	18	32'-8	5	18	10'-6	4	18	9'-3	4	6	6'-2	3'-1	3'-1	4	12	32'-8	4	12	12'-2
2	6	18	32'-8	6	18	10'-0	5	18	9'-1	5	6	6'-4	3'-2	3'-2	5	18	32'-8	7	18	11'-8
3-6	6	18	32'-8	6	18	8'-6	5	18	7'-3	5	6	6'-2	3'-1	3'-1	5	12	32'-8	5	12	8'-1
7-8	5	12	32'-8	5	12	7'-2	4	12	5'-5	5	6	6'-2	3'-1	3'-1	5	12	32'-8	6	12	6'-11
9-10	5	12	32'-8	5	12	7'-5	4	12	5'-7	5	6	6'-2	3'-1	3'-1	4	12	32'-8	7	12	7'-1
11-12	5	12	32'-8	5	12	8'-2	4	12	5'-1	4	6	5'-8	2'-10	2'-10	4	12	32'-8	7	12	7'-0
13-15	5	12	32'-8	5	12	8'-5	4	12	4'-11	4	6	5'-2	2'-2	3'-0	4	12	32'-8	7	12	7'-0
16-17	5	12	32'-8	5	12	9'-4	4	12	4'-11	4	6	5'-3	2'-2	3'-1	4	12	32'-8	7	12	7'-0
18-19	5	9	32'-8	4	9	8'-9	4	9	4'-1	4	6	5'-4	2'-2	3'-2	4	12	32'-8	7	12	7'-1
20-21	5	9	32'-8	4	9	9'-5	4	9	4'-3	4	6	5'-5	2'-3	3'-2	5	9	32'-8	5	9	7'-2
22-23	7	18	32'-8	6	18	9'-6	4	18	2'-5	4	6	5'-6	2'-3	3'-3	5	9	32'-8	5	9	7'-4
24-25	5	9	32'-8	4	9	10'-0	4	9	2'-5	4	6	5'-9	2'-4	3'-5	5	12	32'-8	6	12	7'-7

	Bar List																										
	k9			m1			m2			m3			m4					m6			m7			m9			
Fill	Size	Sp.	L	Size	Sp.	L	Size	Sp.	L	Size	Sp.	L	Size	Sp.	L	H	V	Size	Sp.	L	Size	Sp.	L	Size	Sp.	L	
0	4	4.5	32'-8	5	12	33'-2	4	12	6'-0	4	12	3'-5	5	6	8'-6	4'-3	4'-3	5	18	33'-2	7	18	7'-9	7	4.5	33'-2	
1	4	4.5	32'-8	5	12	33'-2	4	12	5'-10	4	12	3'-5	4	6	7'-11	3'-8	4'-3	5	18	33'-2	7	18	7'-9	7	4.5	33'-2	
2	7	4.5	32'-8	5	12	33'-2	4	12	6'-8	4	12	3'-5	4	6	7'-3	3'-0	4'-3	5	18	33'-2	7	18	7'-7	7	4.5	33'-2	
3-6	5	4.5	32'-8	5	12	33'-2	4	12	6'-2	4	12	3'-5	4	6	7'-1	2'-10	4'-3	5	12	33'-2	5	12	7'-5	7	4.5	33'-2	
7-8	6	4.5	32'-8	5	12	33'-2	5	12	7'-1	4	12	4'-3	5	6	6'-11	2'-8	4'-3	5	12	33'-2	6	12	6'-9	6	4.5	33'-2	
9-10	7	4.5	32'-8	5	12	33'-2	5	12	7'-7	4	12	4'-9	5	6	6'-11	2'-7	4'-4	4	12	33'-2	7	12	6'-11	7	4.5	33'-2	
11-12	7	4.5	32'-8	5	12	33'-2	5	12	7'-10	4	12	4'-9	5	6	6'-10	2'-5	4'-5	4	12	33'-2	7	12	7'-0	7	4.5	33'-2	
13-15	7	4.5	32'-8	5	12	33'-2	5	12	8'-6	4	12	4'-5	4	6	6'-10	2'-3	4'-7	5	18	33'-2	8	18	7'-3	8	4.5	33'-2	
16-17	7	4.5	32'-8	5	9	33'-2	4	9	8'-3	4	9	3'-11	4	6	6'-10	2'-2	4'-8	5	12	33'-2	6	12	7'-0	6	4.5	33'-2	
18-19	7	4.5	32'-8	5	9	33'-2	4	9	8'-8	4	9	3'-3	4	6	7'-0	2'-3	4'-9	5	12	33'-2	6	12	7'-2	6	4.5	33'-2	
20-21	5	4.5	32'-8	5	9	33'-2	4	9	9'-7	4	9	3'-3	4	6	7'-1	2'-3	4'-10	5	12	33'-2	6	12	7'-4	6	4.5	33'-2	
22-23	5	4.5	32'-8	6	12	33'-2	5	12	9'-7	4	12	3'-3	4	6	7'-2	2'-3	4'-11	4	12	33'-2	7	12	7'-6	7	4.5	33'-2	
24-25	6	4.5	32'-8	6	12	33'-2	5	12	9'-10	4	12	3'-3	4	6	7'-4	2'-4	5'-0	4	12	33'-2	7	12	7'-8	7	4.5	33'-2	

	Quantities				
	Concrete (CY/FT)				Steel
Fill	Slab	Floor	Walls	Total	(LB/FT)
0	1.405	1.115	0.396	2.916	371.11
1	1.303	1.115	0.396	2.814	361.55
2	0.998	1.115	0.396	2.509	404.66
3-6	0.896	1.115	0.396	2.407	386.58
7-8	0.896	1.115	0.396	2.407	403.11
9-10	0.947	1.167	0.396	2.510	400.50
11-12	1.049	1.270	0.396	2.715	399.32
13-15	1.252	1.477	0.396	3.125	388.84
16-17	1.354	1.581	0.396	3.331	402.82
18-19	1.456	1.684	0.396	3.536	410.66
20-21	1.507	1.787	0.396	3.690	425.58
22-23	1.609	1.891	0.396	3.896	433.21
24-25	1.813	1.994	0.396	4.203	426.32

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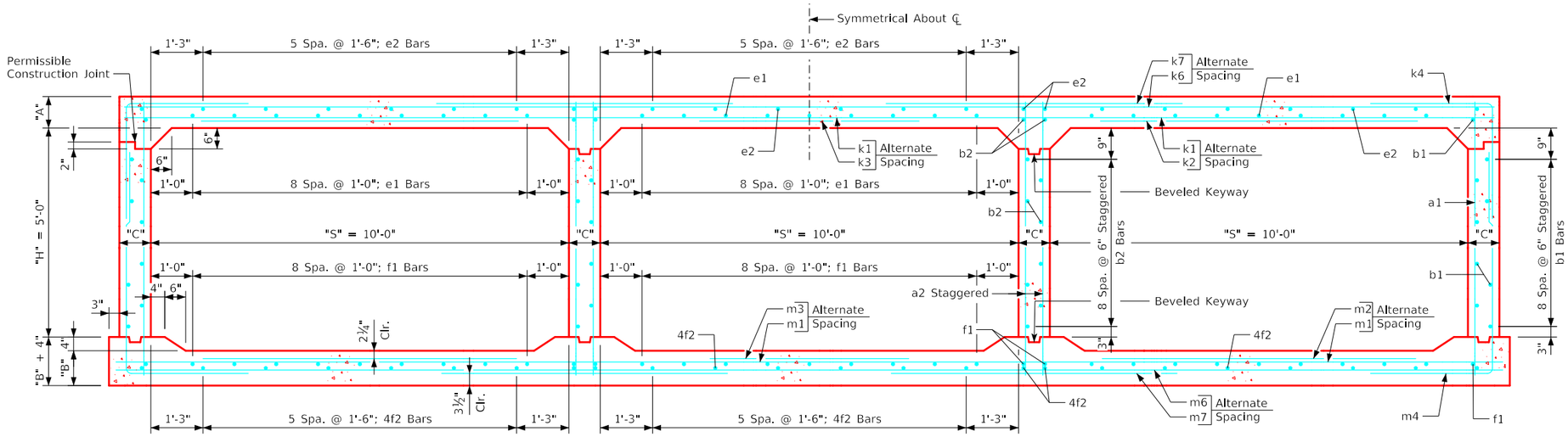
Standard Design
Triple Reinforced Concrete Box Culverts
July, 2020

Culvert Barrel Details
10' x 4' Barrel Sections

TRRCB 10-4-20



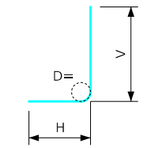
Triple 10' x 5' Barrel Section

Notes:

1. Dimensions listed on this sheet to be used in conjunction with Sheet TRRCB G3-20.
2. Fill, dimensions "S" and "H" are in feet.
3. Dimensions "A", "B", "C", "D", and "Sp." listed in the bar list are in inches.
4. Dimensions "L", "H", "V" are in feet and inches.

Bent Bar Detail

Bars	D
4	3"
5	3¾"



k4 & m4

Note:
All dimensions are out to out.
D = pin diameter.

Variable Dimensions and Quantities for Triple 10' x 5' Barrel Sections

Fill	Dimensions S	H	A	B	C	D	E	R	T	U	W	X	Z
0	10	5	13	10.5	9	6	9	0'-0	0'-0	6'-2	2'-10	4'-2	3'-11
1	10	5	12.5	10	9	6	9	0'-8	0'-3	6'-2	2'-9	3'-8	3'-10
2	10	5	9.5	10	9	6	9	1'-0	0'-10	4'-10	2'-1	3'-8	3'-9
3-6	10	5	8	10	9	9	9	2'-1	1'-8	3'-11	2'-8	3'-8	3'-8
7-8	10	5	8	10	9	6	9	2'-11	2'-3	3'-5	2'-2	3'-6	3'-4
9-10	10	5	9	11	9	6	9	2'-11	2'-2	3'-4	2'-1	3'-3	3'-6
11-12	10	5	9.5	11.5	9	6	9	2'-10	1'-10	3'-5	2'-9	4'-2	3'-5
13-15	10	5	11.5	13.5	9	9	9	3'-2	1'-10	3'-4	2'-3	3'-6	3'-3
16-17	10	5	12.5	14.5	9	9	9	3'-5	1'-10	3'-4	2'-1	3'-5	3'-4
18-19	10	5	13.5	15.5	9	9	9	3'-4	1'-8	3'-4	1'-10	3'-9	3'-4
20-21	10	5	14.5	16.5	9	9	9	4'-2	1'-5	3'-4	1'-7	3'-9	3'-5
22-23	10	5	15	17.5	9	9	9	4'-2	1'-5	3'-5	1'-5	3'-9	3'-6
24-25	10	5	17	18.5	9	9	9	4'-1	0'-11	3'-6	1'-3	3'-9	3'-6

Fill	Bar List a1 Size	a1 Sp.	a1 L	a2 Size	a2 Sp.	a2 L	b1 Size	b1 Sp.	b1 No.	b2 Size	b2 Sp.	b2 No.	e1 Size	e1 Sp.	e1 No.	e2 Size	e2 Sp.	e2 No.	f1 Size	f1 Sp.	f1 No.	f2 Size	f2 Sp.	f2 No.	k1 Size	k1 Sp.	k1 L	k2 Size	k2 Sp.	k2 L	k3 Size	k3 Sp.	k3 L	k4 Size	k4 Sp.	k4 L	k4 H	k4 V	k6 Size	k6 Sp.	k6 L	k7 Size	k7 Sp.	k7 L
0	4	6	6'-10	6	9	6'-10	4	6	20	4	6	22	4	12	27	4	18	24	4	12	33	4	18	24	6	18	32'-8	5	18	10'-11	4	18	10'-9	4	6	6'-6	3'-3	3'-3	4	12	32'-8	4	12	12'-4
1	4	6	6'-9	6	9	6'-9	4	6	20	4	6	22	4	12	27	4	18	24	4	12	33	4	18	24	6	18	32'-8	5	18	10'-8	4	18	9'-5	4	6	6'-6	3'-3	3'-3	4	12	32'-8	4	12	12'-4
2	4	6	6'-6	6	9	6'-6	4	6	20	4	6	22	4	12	27	4	18	24	4	12	33	4	18	24	6	18	32'-8	6	18	10'-1	5	18	8'-9	5	6	6'-6	3'-3	3'-3	4	9	32'-8	4	9	11'-0
3-6	6	12	6'-5	6	9	6'-5	4	6	20	4	6	22	4	12	27	4	18	24	4	12	33	4	18	24	5	12	32'-8	5	12	8'-1	4	12	6'-7	5	6	6'-2	3'-1	3'-1	5	12	32'-8	5	12	8'-3
7-8	4	6	6'-5	6	9	6'-5	4	6	20	4	6	22	4	12	27	4	18	24	4	12	33	4	18	24	5	12	32'-8	5	12	7'-3	4	12	4'-11	4	6	5'-6	2'-9	2'-9	5	12	32'-8	6	12	6'-11
9-10	4	6	6'-7	6	9	6'-7	4	6	20	4	6	22	4	12	27	4	18	24	4	12	33	4	18	24	5	12	32'-8	5	12	7'-6	4	12	4'-11	4	6	5'-8	2'-10	2'-10	5	12	32'-8	6	12	6'-10
11-12	4	6	6'-8	6	9	6'-8	4	6	20	4	6	22	4	12	27	4	18	24	4	12	33	4	18	24	5	12	32'-8	5	12	8'-2	4	12	5'-1	4	6	5'-8	2'-10	2'-10	4	12	32'-8	7	12	7'-1
13-15	4	9	7'-0	6	9	7'-0	4	6	20	4	6	22	4	12	27	4	18	24	4	12	33	4	18	24	5	12	32'-8	5	12	8'-9	4	12	4'-5	4	6	5'-3	2'-3	3'-0	4	12	32'-8	7	12	7'-0
16-17	4	9	7'-2	6	9	7'-2	4	6	20	4	6	22	4	12	27	4	18	24	4	12	33	4	18	24	5	9	32'-8	4	9	8'-5	4	9	3'-11	4	6	5'-4	2'-3	3'-1	4	12	32'-8	7	12	7'-0
18-19	4	9	7'-4	6	9	7'-4	4	6	20	4	6	22	4	12	27	4	18	24	4	12	33	4	18	24	5	9	32'-8	4	9	8'-10	4	9	4'-1	4	6	5'-5	2'-3	3'-2	4	12	32'-8	7	12	7'-1
20-21	4	12	7'-6	6	9	7'-6	4	6	20	4	6	22	4	12	27	4	18	24	4	12	33	4	18	24	5	9	32'-8	4	9	9'-6	4	9	2'-5	4	6	5'-7	2'-4	3'-3	4	12	32'-8	7	12	7'-2
22-23	4	12	7'-7	6	9	7'-7	4	6	20	4	6	22	4	12	27	4	18	24	4	12	33	4	18	24	6	12	32'-8	5	12	9'-6	4	12	2'-5	4	6	5'-7	2'-4	3'-3	5	9	32'-8	5	9	7'-4
24-25	4	12	7'-10	6	9	7'-10	4	6	20	4	6	22	4	12	27	4	18	24	4	12	33	4	18	24	7	18	32'-8	6	18	10'-0	4	18	2'-7	4	6	5'-10	2'-5	3'-5	5	12	32'-8	6	12	7'-7

Fill	Bar List k9 Size	k9 Sp.	k9 L	m1 Size	m1 Sp.	m1 L	m2 Size	m2 Sp.	m2 L	m3 Size	m3 Sp.	m3 L	m4 Size	m4 Sp.	m4 L	m4 H	m4 V	m6 Size	m6 Sp.	m6 L	m7 Size	m7 Sp.	m7 L	m9 Size	m9 Sp.	m9 L	Quantities Concrete (CY/FT) Slab	Floor	Walls	Total	Steel (LB/FT)
0	4	4.5	32'-8	5	12	33'-2	4	12	6'-5	4	12	2'-5	4	6	9'-11	4'-7	5'-4	5	18	33'-2	7	18	7'-10	7	4.5	33'-2	1.405	1.167	0.507	3.079	382.18
1	4	4.5	32'-8	5	12	33'-2	4	12	6'-2	4	12	3'-5	4	6	9'-3	4'-0	5'-3	5	18	33'-2	7	18	7'-8	7	4.5	33'-2	1.354	1.115	0.507	2.976	378.79
2	4	4.5	32'-8	4	9	33'-2	4	9	7'-4	4	9	3'-5	4	6	8'-3	3'-0	5'-3	5	18	33'-2	7	18	7'-7	7	4.5	33'-2	1.049	1.115	0.507	2.671	399.66
3-6	5	4.5	32'-8	5	12	33'-2	4	12	6'-5	4	12	3'-5	4	6	8'-2	2'-11	5'-3	5	12	33'-2	6	12	7'-5	7	4.5	33'-2	0.896	1.115	0.507	2.518	412.66
7-8	6	4.5	32'-8	5	12	33'-2	5	12	7'-2	4	12	3'-9	4	6	8'-0	2'-9	5'-3	5	12	33'-2	6	12	6'-9	6	4.5	33'-2	0.896	1.115	0.507	2.518	403.08
9-10	6	4.5	32'-8	5	12	33'-2	5	12	7'-8	4	12	4'-3	4	6	7'-10	2'-6	5'-4	5	18	33'-2	8	18	7'-3	8	4.5	33'-2	0.998	1.219	0.507	2.724	404.16
11-12	7	4.5	32'-8	5	9	33'-2	4	9	6'-8	4	9	2'-5	4	6	7'-10	2'-5	5'-5	4	12	33'-2	7	12	7'-0	7	4.5	33'-2	1.049	1.270	0.507	2.826	409.68
13-15	7	4.5	32'-8	5	9	33'-2	4	9	7'-10	4	9	3'-9	4	6	7'-11	2'-4	5'-7	5	12	33'-2	6	12	6'-10	6	4.5	33'-2	1.252	1.477	0.507	3.236	410.89
16-17	7	4.5	32'-8	5	9	33'-2	4	9	8'-3	4	9	3'-11	4	6	8'-0	2'-4	5'-8	5	12	33'-2	6	12	7'-0	6	4.5	33'-2	1.354	1.581	0.507	3.442	421.89
18-19	7	4.5	32'-8	5	9	33'-2	4	9	8'-9	4	9	3'-3	4	6	8'-1	2'-4	5'-9	5	12	33'-2	6	12	7'-2	6	4.5	33'-2	1.456	1.684	0.507	3.647	425.18
20-21	7	4.5	32'-8	6	12	33'-2	5	12	9'-4	4	12	3'-3	4	6	8'-2	2'-4	5'-10	5	12	33'-2	6	12	7'-4	6	4.5	33'-2	1.558	1.787	0.507	3.852	432.68
22-23	5	4.5	32'-8	6	12	33'-2	5	12	9'-7	4	12	3'-3	4	6	8'-4	2'-5	5'-11	4	12	33'-2	7	12	7'-6	7	4.5	33'-2	1.609	1.891	0.507	4.007	450.50
24-25	6	4.5	32'-8	6	12	33'-2	5	12	9'-9	4	12	3'-3	4	6	8'-5	2'-5	6'-0	4	12	33'-2	7	12	7'-7	7	4.5	33'-2	1.813	1.994	0.507	4.314	444.26

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IOWA DOT

Standard Design

Triple Reinforced Concrete Box Culverts

July, 2020

Culvert Barrel Details

10' x 5' Barrel Sections

TRRCB 10-5-20

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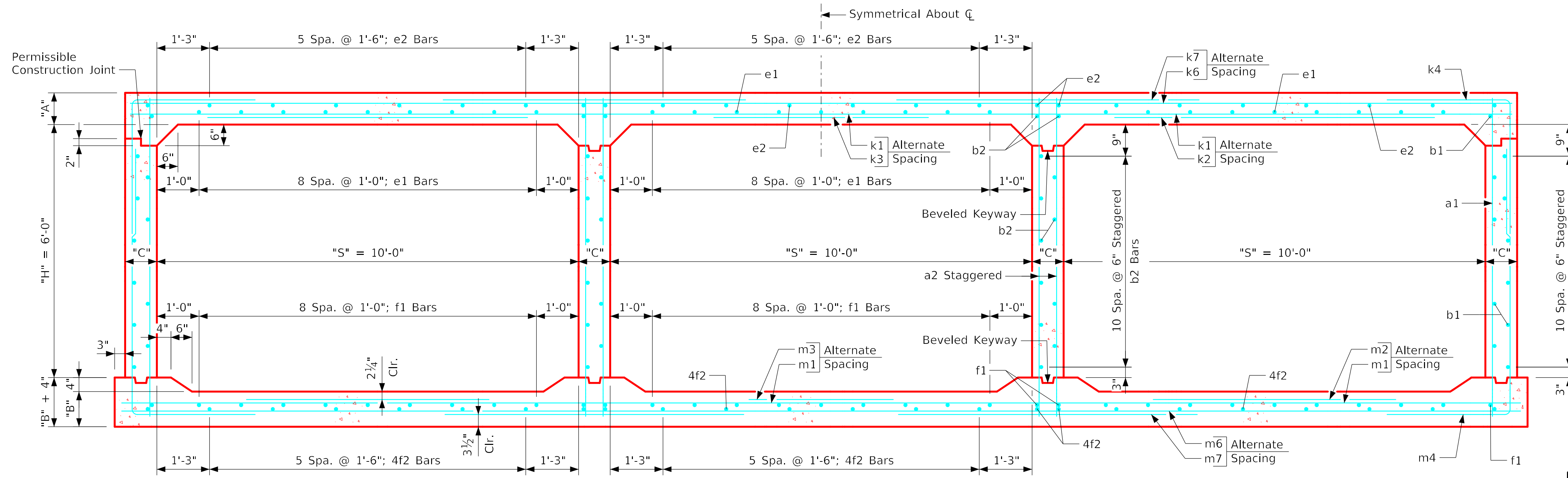
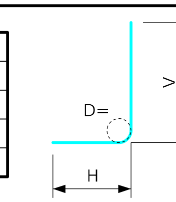


Triple 10' x 6' Barrel Section

Bent Bar Detail

Bars	D
4	3"
5	3¾"
6	4½"
7	5¼"



k4 & m4

Note:
All dimensions are out to out.
D = pin diameter.

Notes:

1. Dimensions listed on this sheet to be used in conjunction with Sheet TRRCB G3-20.
2. Fill, dimensions "S" and "H" are in feet.
3. Dimensions "A", "B", "C", "D", and "Sp." listed in the bar list are in inches.
4. Dimensions "L", "H", "V" are in feet and inches.

Variable Dimensions and Quantities for Triple 10' x 6' Barrel Sections

Dimensions													
Fill	S	H	A	B	C	D	E	R	T	U	W	X	Z
0	10	6	13	10.5	9	6	9	0'-0	0'-0	6'-2	2'-9	4'-2	3'-11
1	10	6	12.5	10	9	6	9	0'-8	0'-3	6'-2	2'-9	3'-8	3'-10
2	10	6	9	10	9	9	9	1'-4	0'-11	5'-2	2'-3	3'-8	3'-9
3-6	10	6	8	10	9	9	9	2'-0	1'-8	4'-0	2'-8	3'-8	3'-8
7-8	10	6	8	10	9	6	9	2'-11	2'-2	3'-5	2'-2	3'-5	3'-4
9-10	10	6	9	11	9	6	9	2'-11	2'-2	3'-4	2'-1	3'-5	3'-3
11-12	10	6	9.5	12	9	6	9	2'-10	1'-10	3'-5	2'-6	4'-2	3'-3
13-15	10	6	11.5	13.5	9	9	9	3'-2	1'-7	3'-3	2'-3	3'-6	3'-3
16-17	10	6	12.5	14.5	9	9	9	3'-5	2'-0	3'-4	2'-1	3'-5	3'-3
18-19	10	6	13.5	15.5	9	9	9	3'-4	1'-8	3'-4	1'-10	3'-9	3'-4
20-21	10	6	14.5	16.5	9	9	9	4'-2	1'-5	3'-4	1'-7	3'-9	3'-5
22-23	10	6	16	17.5	9	9	9	4'-2	1'-2	3'-5	1'-5	3'-9	3'-6
24-25	10	6	17	19	9	9	9	4'-2	1'-0	3'-6	1'-0	3'-9	3'-7

Bar List																								
	a1			a2			b1			b2			e1			e2			f1			f2		
Fill	Size	Sp.	L	Size	Sp.	L	Size	Sp.	No.	Size	Sp.	No.	Size	Sp.	No.	Size	Sp.	No.	Size	Sp.	No.	Size	Sp.	No.
0	4	6	7'-10	6	9	7'-10	4	6	24	4	6	26	4	12	27	4	18	24	4	12	33	4	18	24
1	4	6	7'-9	6	9	7'-9	4	6	24	4	6	26	4	12	27	4	18	24	4	12	33	4	18	24
2	5	12	7'-6	6	9	7'-6	4	6	24	4	6	26	4	12	27	4	18	24	4	12	33	4	18	24
3-6	4	9	7'-5	6	9	7'-5	4	6	24	4	6	26	4	12	27	4	18	24	4	12	33	4	18	24
7-8	4	6	7'-5	6	9	7'-5	4	6	24	4	6	26	4	12	27	4	18	24	4	12	33	4	18	24
9-10	4	6	7'-7	6	9	7'-7	4	6	24	4	6	26	4	12	27	4	18	24	4	12	33	4	18	24
11-12	4	6	7'-8	6	9	7'-8	4	6	24	4	6	26	4	12	27	4	18	24	4	12	33	4	18	24
13-15	5	12	8'-0	6	9	8'-0	4	6	24	4	6	26	4	12	27	4	18	24	4	12	33	4	18	24
16-17	5	12	8'-2	6	9	8'-2	4	6	24	4	6	26	4	12	27	4	18	24	4	12	33	4	18	24
18-19	4	9	8'-4	6	9	8'-4	4	6	24	4	6	26	4	12	27	4	18	24	4	12	33	4	18	24
20-21	4	9	8'-6	6	9	8'-6	4	6	24	4	6	26	4	12	27	4	18	24	4	12	33	4	18	24
22-23	4	9	8'-8	6	9	8'-8	4	6	24	4	6	26	4	12	27	4	18	24	4	12	33	4	18	24
24-25	4	12	8'-11	6	9	8'-11	4	6	24	4	6	26	4	12	27	4	18	24	4	12	33	4	18	24

Bar List																		
	k1			k2			k3			k4					k6			k7		
Fill	Size	Sp.	L	Size	Sp.	L	Size	Sp.	L	Size	Sp.	L	H	V	Size	Sp.	L	Size	Sp.	L
0	6	18	32'-8	5	18	10'-11	4	18	10'-9	4	6	7'-0	3'-11	3'-1	4	12	32'-8	4	12	12'-4
1	6	18	32'-8	5	18	10'-8	4	18	9'-5	4	6	7'-0	3'-11	3'-1	4	12	32'-8	4	12	12'-4
2	5	12	32'-8	5	12	9'-10	4	12	8'-1	5	6	6'-4	3'-2	3'-2	5	18	32'-8	7	18	11'-11
3-6	5	12	32'-8	5	12	8'-2	4	12	6'-9	7	12	7'-2	3'-3	3'-11	5	12	32'-8	5	12	8'-6
7-8	5	12	32'-8	5	12	7'-5	4	12	4'-11	4	6	5'-8	2'-10	2'-10	5	12	32'-8	6	12	7'-0
9-10	5	12	32'-8	5	12	7'-9	4	12	4'-11	4	6	5'-8	2'-10	2'-10	5	12	32'-8	6	12	6'-10
11-12	5	12	32'-8	5	12	8'-3	4	12	5'-1	4	6	5'-8	2'-10	2'-10	4	12	32'-8	7	12	7'-1
13-15	5	12	32'-8	5	12	9'-1	4	12	4'-5	4	6	5'-5	2'-5	3'-0	5	12	32'-8	6	12	6'-10
16-17	5	9	32'-8	4	9	8'-3	4	9	3'-11	4	6	5'-6	2'-5	3'-1	4	12	32'-8	7	12	7'-0
18-19	5	9	32'-8	4	9	8'-10	4	9	4'-1	4	6	5'-7	2'-5	3'-2	4	12	32'-8	7	12	7'-1
20-21	5	9	32'-8	4	9	9'-6	4	9	2'-5	4	6	5'-9	2'-6	3'-3	4	12	32'-8	7	12	7'-2
22-23	5	9	32'-8	4	9	9'-9	4	9	2'-5	4	6	5'-10	2'-6	3'-4	5	12	32'-8	6	12	7'-5
24-25	5	9	32'-8	4	9	9'-11	4	9	2'-5	4	6	6'-1	2'-7	3'-6	5	12	32'-8	6	12	7'-7

Bar List																		
	k9			m1			m2			m3			m4				
Fill	Size	Sp.	L	Size	Sp.	L	Size	Sp.	L	Size	Sp.	L	Size	Sp.	L	H	V
0	4	4.5	32'-8	5	12	33'-2	4	12	6'-4	4	12	2'-5	4	6	11'-4	5'-0	6'-4
1	4	4.5	32'-8	5	12	33'-2	4	12	6'-4	4	12	3'-5	4	6	10'-8	4'-5	6'-3
2	7	4.5	32'-8	5	12	33'-2	5	12	7'-4	4	12	3'-5	4	6	9'-7	3'-4	6'-3
3-6	5	4.5	32'-8	5	12	33'-2	4	12	6'-6	4	12	3'-5	6	12	9'-4	3'-1	6'-3
7-8	6	4.5	32'-8	5	12	33'-2	5	12	7'-6	4	12	3'-11	4	6	9'-0	2'-9	6'-3
9-10	6	4.5	32'-8	5	12	33'-2	5	12	7'-8	4	12	3'-11	4	6	8'-11	2'-7	6'-4
11-12	7	4.5	32'-8	5	9	33'-2	4	9	7'-0	4	9	2'-5	4	6	8'-11	2'-6	6'-5
13-15	6	4.5	32'-8	5	9	33'-2	4	9	7'-9	4	9	3'-9	4	6	9'-1	2'-6	6'-7
16-17	7	4.5	32'-8	5	9	33'-2	4	9	8'-4	4	9	3'-11	4	6	9'-2	2'-6	6'-8
18-19	7	4.5	32'-8	5	9	33'-2	4	9	8'-10	4	9	3'-3	4	6	9'-3	2'-6	6'-9
20-21	7	4.5	32'-8	6	12	33'-2	5	12	9'-5	4	12	3'-3	4	6	9'-4	2'-6	6'-10
22-23	6	4.5	32'-8	6	12	33'-2	5	12	9'-7	4	12	3'-3	4	6	9'-6	2'-7	6'-11
24-25	6	4.5	32'-8	6	12	33'-2	5	12	10'-0	4	12	3'-3	4	6	9'-8	2'-8	7'-0

Bar List										Quantities				
	m6			m7			m9			Concrete (CY/FT)				Steel
Fill	Size	Sp.	L	Size	Sp.	L	Size	Sp.	L	Slab	Floor	Walls	Total	(LB/FT)
0	5	18	33'-2	7	18	7'-10	7	4.5	33'-2	1.405	1.167	0.618	3.190	399.24
1	5	18	33'-2	7	18	7'-8	7	4.5	33'-2	1.354	1.115	0.618	3.087	396.16
2	5	18	33'-2	7	18	7'-7	7	4.5	33'-2	0.998	1.115	0.618	2.731	428.55
3-6	5	12	33'-2	5	12	7'-6	7	4.5	33'-2	0.896	1.115	0.618	2.629	423.71
7-8	5	12	33'-2	6	12	6'-10	6	4.5	33'-2	0.896	1.115	0.618	2.629	419.79
9-10	5	12	33'-2	6	12	6'-9	6	4.5	33'-2	0.998	1.219	0.618	2.835	420.97
11-12	5	12	33'-2	6	12	6'-9	6	4.5	33'-2	1.049	1.322	0.618	2.989	427.66
13-15	5	12	33'-2	6	12	6'-10	6	4.5	33'-2	1.252	1.477	0.618	3.347	431.37
16-17	5	12	33'-2	6	12	6'-11	6	4.5	33'-2	1.354	1.581	0.618	3.553	439.05
18-19	5	12	33'-2	6	12	7'-2	6	4.5	33'-2	1.456	1.684	0.618	3.758	440.05
20-21	4	12	33'-2	7	12	7'-4	7	4.5	33'-2	1.558	1.787	0.618	3.963	448.05
22-23	4	12	33'-2	7	12	7'-6	7	4.5	33'-2	1.711	1.891	0.618	4.220	454.55
24-25	5	12	33'-2	6	12	7'-9	6	4.5	33'-2	1.813	2.046	0.618	4.477	458.16

LATEST REVISION DATE

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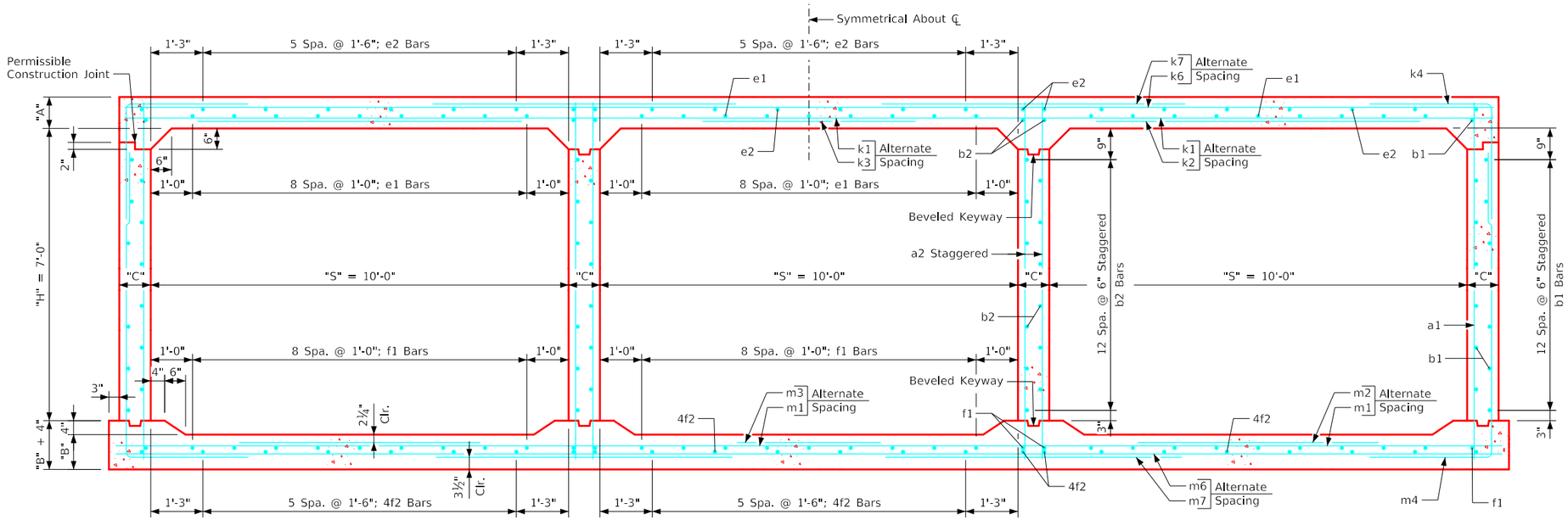
IOWA DOT

Standard Design
Triple Reinforced Concrete Box Culverts
July, 2020

Culvert Barrel Details
10' x 6' Barrel Sections

TRRCB 10-6-20



Triple 10' x 7' Barrel Section

Notes:

1. Dimensions listed on this sheet to be used in conjunction with Sheet TRRCB G3-20.
2. Fill, dimensions "S" and "H" are in feet.
3. Dimensions "A", "B", "C", "D", and "Sp." listed in the bar list are in inches.
4. Dimensions "L", "H", "V" are in feet and inches.

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IOWADOT

Standard Design

Triple Reinforced Concrete Box Culverts

July, 2020

Culvert Barrel Details

10' x 7' Barrel Sections

TRRCB 10-7-20

Sheet 1 of 2

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Variable Dimensions and Quantities for Triple 10' x 7' Barrel Sections

Dimensions

Fill	S	H	A	B	C	D	E	R	T	U	W	X	Z
0	10	7	13	10.5	9	6	9	0'-0	0'-0	6'-2	2'-8	3'-8	3'-11
1	10	7	12.5	10.5	9	9	9	0'-7	0'-3	6'-2	2'-9	4'-2	3'-8
2	10	7	9.5	10	9	6	9	1'-2	1'-0	5'-4	2'-2	4'-2	3'-6
3-6	10	7	8	10	9	9	9	1'-11	1'-7	4'-1	2'-4	3'-5	3'-8
7-8	10	7	8	10	9	9	9	2'-11	2'-2	3'-6	3'-1	4'-2	3'-6
9-10	10	7	9	11	9	6	9	3'-1	2'-2	3'-4	2'-10	4'-2	3'-3
11-12	10	7	9.5	12	9	6	9	3'-0	1'-9	3'-5	2'-6	4'-2	3'-3
13-15	10	7	11.5	14	9	9	9	3'-2	1'-10	3'-3	2'-3	3'-6	3'-5
16-17	10	7	12.5	14.5	9	6	9	3'-5	2'-1	3'-4	2'-0	3'-5	3'-3
18-19	10	7	13.5	15.5	9	6	9	3'-4	1'-11	3'-4	1'-10	3'-4	3'-4
20-21	10	7	14.5	16.5	9	6	9	4'-2	1'-5	3'-4	1'-7	3'-9	3'-5
22-23	10	7	16	17.5	9	6	9	4'-2	1'-2	3'-5	1'-4	3'-9	3'-6
24-25	10	7	17	19	9	9	9	3'-11	0'-11	3'-6	1'-2	3'-9	3'-7

Bar List

Fill	a1			a2			b1			b2			e1			e2			f1			f2		
	Size	Sp.	L	Size	Sp.	L	Size	Sp.	No.	Size	Sp.	No.	Size	Sp.	No.	Size	Sp.	No.	Size	Sp.	No.	Size	Sp.	No.
0	4	6	8'-10	6	9	8'-10	4	6	28	4	6	30	4	12	27	4	18	24	4	12	33	4	18	24
1	4	9	8'-10	6	9	8'-10	4	6	28	4	6	30	4	12	27	4	18	24	4	12	33	4	18	24
2	4	6	8'-6	6	9	8'-6	4	6	28	4	6	30	4	12	27	4	18	24	4	12	33	4	18	24
3-6	5	12	8'-5	6	9	8'-5	4	6	28	4	6	30	4	12	27	4	18	24	4	12	33	4	18	24
7-8	4	12	8'-5	6	9	8'-5	4	6	28	4	6	30	4	12	27	4	18	24	4	12	33	4	18	24
9-10	4	6	8'-7	6	9	8'-7	4	6	28	4	6	30	4	12	27	4	18	24	4	12	33	4	18	24
11-12	4	6	8'-8	6	9	8'-8	4	6	28	4	6	30	4	12	27	4	18	24	4	12	33	4	18	24
13-15	5	12	9'-0	6	9	9'-0	4	6	28	4	6	30	4	12	27	4	18	24	4	12	33	4	18	24
16-17	4	6	9'-2	6	9	9'-2	4	6	28	4	6	30	4	12	27	4	18	24	4	12	33	4	18	24
18-19	4	6	9'-4	6	9	9'-4	4	6	28	4	6	30	4	12	27	4	18	24	4	12	33	4	18	24
20-21	4	6	9'-6	6	9	9'-6	4	6	28	4	6	30	4	12	27	4	18	24	4	12	33	4	18	24
22-23	4	6	9'-8	6	9	9'-8	4	6	28	4	6	30	4	12	27	4	18	24	4	12	33	4	18	24
24-25	5	12	9'-11	6	9	9'-11	4	6	28	4	6	30	4	12	27	4	18	24	4	12	33	4	18	24

Fill	k1			k2			k3			k4					k6			k7		
	Size	Sp.	L	Size	Sp.	L	Size	Sp.	L	Size	Sp.	L	H	V	Size	Sp.	L	Size	Sp.	L
0	6	18	32'-8	5	18	10'-11	4	18	10'-9	4	6	9'-6	6'-5	3'-1	4	12	32'-8	4	12	12'-4
1	6	18	32'-8	5	18	10'-8	4	18	9'-7	5	12	9'-10	6'-5	3'-5	4	12	32'-8	4	12	12'-4
2	5	12	32'-8	5	12	9'-10	4	12	8'-5	4	6	6'-6	3'-8	2'-10	4	9	32'-8	4	9	11'-6
3-6	5	12	32'-8	5	12	8'-4	4	12	6'-11	5	6	6'-8	3'-4	3'-4	5	12	32'-8	5	12	8'-9
7-8	5	12	32'-8	5	12	7'-5	4	12	4'-11	5	6	6'-2	3'-1	3'-1	5	12	32'-8	6	12	7'-1
9-10	5	12	32'-8	5	12	7'-10	4	12	4'-7	4	6	5'-8	2'-10	2'-10	5	12	32'-8	6	12	6'-11
11-12	5	12	32'-8	5	12	8'-5	4	12	4'-9	4	6	5'-8	2'-10	2'-10	4	12	32'-8	7	12	7'-1
13-15	5	12	32'-8	5	12	8'-6	4	12	4'-5	4	6	6'-0	3'-0	3'-0	5	12	32'-8	6	12	6'-10
16-17	5	9	32'-8	4	9	8'-3	4	9	3'-11	4	6	6'-1	3'-1	3'-1	4	12	32'-8	7	12	7'-0
18-19	5	9	32'-8	4	9	8'-7	4	9	4'-1	4	6	5'-10	2'-8	3'-2	4	12	32'-8	7	12	7'-1
20-21	5	9	32'-8	4	9	9'-6	4	9	2'-5	4	6	6'-0	2'-9	3'-3	4	12	32'-8	7	12	7'-2
22-23	5	9	32'-8	4	9	9'-9	4	9	2'-5	4	6	6'-2	2'-10	3'-4	5	12	32'-8	6	12	7'-5
24-25	5	9	32'-8	4	9	10'-0	4	9	2'-11	4	6	6'-4	2'-10	3'-6	5	12	32'-8	6	12	7'-7

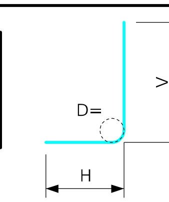
Bar List

Fill	k9			m1			m2			m3			m4				
	Size	Sp.	L	Size	Sp.	L	Size	Sp.	L	Size	Sp.	L	Size	Sp.	L	H	V
0	4	4.5	32'-8	5	12	33'-2	4	12	6'-9	4	12	3'-5	4	6	12'-10	5'-6	7'-4
1	4	4.5	32'-8	5	12	33'-2	4	12	6'-8	4	12	2'-5	6	12	12'-5	5'-1	7'-4
2	4	4.5	32'-8	5	12	33'-2	5	12	7'-6	4	12	2'-5	4	6	10'-11	3'-8	7'-3
3-6	5	4.5	32'-8	4	9	33'-2	4	9	7'-5	4	9	3'-11	4	6	10'-6	3'-3	7'-3
7-8	6	4.5	32'-8	5	9	33'-2	4	9	5'-8	4	9	2'-5	5	6	10'-2	2'-11	7'-3
9-10	6	4.5	32'-8	5	9	33'-2	4	9	6'-4	4	9	2'-5	4	6	10'-1	2'-9	7'-4
11-12	7	4.5	32'-8	5	9	33'-2	4	9	7'-1	4	9	2'-5	4	6	10'-1	2'-8	7'-5
13-15	6	4.5	32'-8	5	9	33'-2	4	9	8'-0	4	9	3'-9	4	6	10'-4	2'-9	7'-7
16-17	7	4.5	32'-8	5	9	33'-2	4	9	8'-5	4	9	3'-11	4	6	10'-5	2'-9	7'-8
18-19	7	4.5	32'-8	6	12	33'-2	5	12	8'-8	4	12	4'-1	4	6	10'-6	2'-9	7'-9
20-21	7	4.5	32'-8	6	12	33'-2	5	12	9'-5	4	12	3'-3	4	6	10'-7	2'-9	7'-10
22-23	6	4.5	32'-8	6	12	33'-2	5	12	9'-8	4	12	3'-3	4	6	10'-9	2'-10	7'-11
24-25	6	4.5	32'-8	6	12	33'-2	5	12	9'-10	4	12	3'-3	4	6	10'-11	2'-11	8'-0

Fill	m6			m7			m9			Quantities: Concrete (CY/FT)				Steel
	Size	Sp.	L	Size	Sp.	L	Size	Sp.	L	Slab	Floor	Walls	Total	(LB/FT)
0	5	18	33'-2	7	18	7'-10	7	4.5	33'-2	1.405	1.167	0.729	3.301	423.24
1	4	9	33'-2	4	9	7'-4	4	4.5	33'-2	1.354	1.167	0.729	3.250	409.00
2	5	12	33'-2	5	12	7'-1	5	4.5	33'-2	1.049	1.115	0.729	2.893	430.34
3-6	5	12	33'-2	5	12	7'-6	7	4.5	33'-2	0.896	1.115	0.729	2.740	432.50
7-8	4	12	33'-2	7	12	7'-1	7	4.5	33'-2	0.896	1.115	0.729	2.740	453.42
9-10	5	12	33'-2	6	12	6'-9	6	4.5	33'-2	0.998	1.219	0.729	2.946	442.34
11-12	5	12	33'-2	6	12	6'-9	6	4.5	33'-2	1.049	1.322	0.729	3.100	443.08
13-15	5	18	33'-2	8	18	7'-3	8	4.5	33'-2	1.252	1.529	0.729	3.510	445.24
16-17	5	12	33'-2	6	12	6'-11	6	4.5	33'-2	1.354	1.581	0.729	3.664	460.55
18-19	5	12	33'-2	6	12	7'-2	6	4.5	33'-2	1.456	1.684	0.729	3.869	470.61
20-21	4	12	33'-2	7	12	7'-4	7	4.5	33'-2	1.558	1.787	0.729	4.074	471.61
22-23	4	12	33'-2	7	12	7'-6	7	4.5	33'-2	1.711	1.891	0.729	4.331	478.63
24-25	5	12	33'-2	6	12	7'-9	6	4.5	33'-2	1.813	2.046	0.729	4.588	480.82

Bent Bar Detail

Bars	D
4	3"
5	3¾"
6	4½"



k4 & m4

Note:
All dimensions are out to out.
D = pin diameter.

Notes:

1. Dimensions listed on this sheet to be used in conjunction with Sheet TRRCB G3-20.
2. Fill, dimensions "S" and "H" are in feet.
3. Dimensions "A", "B", "C", "D", and "Sp." listed in the bar list are in inches.
4. Dimensions "L", "H", "V" are in feet and inches.

LATEST REVISION DATE

APPROVED BY BRIDGE ENGINEER

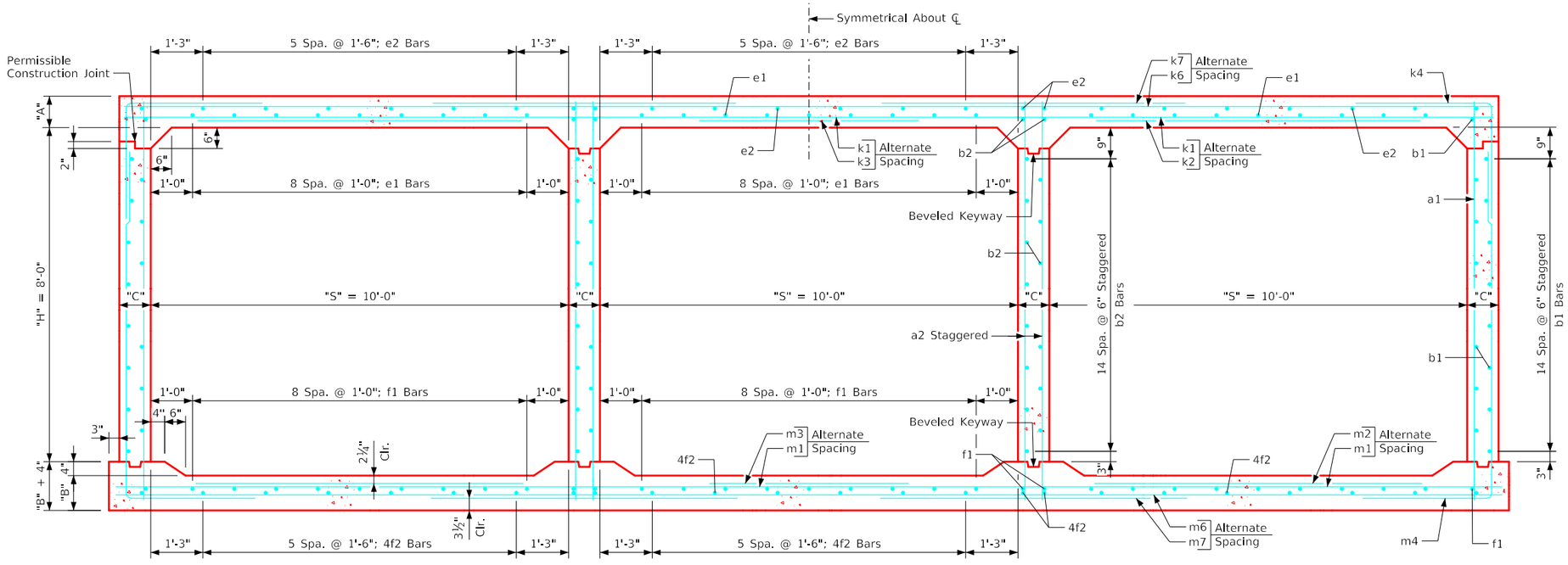
IOWA DOT

Standard Design
Triple Reinforced Concrete
Box Culverts
July, 2020

Culvert Barrel
Details
10' x 7' Barrel Sections

TRRCB
10-7-20
Sheet 2 of 2

ENGLISHLRFDSIGNEDTRIPLECULVERTS.DGN - TRRCB 10-7s2-20 - THIS SHEET ISSUED 07-2020.



Triple 10' x 8' Barrel Section

Notes:

1. Dimensions listed on this sheet to be used in conjunction with Sheet TRRCB G3-20.
2. Fill, dimensions "S" and "H" are in feet.
3. Dimensions "A", "B", "C", "D", and "Sp." listed in the bar list are in inches.
4. Dimensions "L", "H", "V" are in feet and inches.

LATEST REVISION DATE

APPROVED BY BRIDGE ENGINEER

IOWADOT

Standard Design

Triple Reinforced Concrete Box Culverts

July, 2020

Culvert Barrel Details

10' x 8' Barrel Sections

TRRCB 10-8-20

Sheet 1 of 2

Variable Dimensions and Quantities for Triple 10' x 8' Barrel Sections

Dimensions

Fill	S	H	A	B	C	D	E	R	T	U	W	X	Z
0	10	8	13	11	9	9	9	0'-0	0'-0	6'-2	2'-5	4'-2	3'-9
1	10	8	12.5	10.5	9	6	9	0'-10	0'-2	6'-2	2'-9	3'-8	3'-11
2	10	8	9	10	9	6	9	2'-2	1'-9	5'-9	2'-2	4'-2	3'-6
3-6	10	8	8	10	9	6	9	1'-11	1'-7	4'-2	2'-2	4'-2	3'-8
7-8	10	8	8	10	9	9	9	2'-11	2'-2	3'-6	3'-1	4'-2	3'-6
9-10	10	8	9	11	9	9	9	3'-1	1'-10	3'-4	2'-9	4'-2	3'-3
11-12	10	8	9.5	11.5	9	9	9	4'-2	2'-6	3'-5	2'-7	4'-2	3'-2
13-15	10	8	11.5	14	9	9	9	3'-2	1'-7	3'-3	2'-2	3'-6	3'-5
16-17	10	8	12.5	15	9	9	9	3'-5	2'-1	3'-4	2'-0	3'-5	3'-5
18-19	10	8	13.5	15.5	9	9	9	3'-4	1'-11	3'-4	2'-0	3'-4	3'-4
20-21	10	8	14.5	16.5	9.5	9	6	3'-3	1'-8	3'-4	1'-7	3'-3	3'-5
22-23	10	8	15.5	17.5	10	6	9	4'-2	1'-4	3'-5	1'-5	3'-10	3'-6
24-25	10	8	16.5	18.5	10	6	9	3'-1	0'-11	3'-6	1'-3	3'-10	3'-7

Bar List

Fill	a1 Size	a1 Sp.	a1 L	a2 Size	a2 Sp.	a2 L	b1 Size	b1 Sp.	b1 No.	b2 Size	b2 Sp.	b2 No.	e1 Size	e1 Sp.	e1 No.	e2 Size	e2 Sp.	e2 No.	f1 Size	f1 Sp.	f1 No.	f2 Size	f2 Sp.	f2 No.
0	5	12	9'-11	6	9	9'-11	4	6	32	4	6	34	4	12	27	4	18	24	4	12	33	4	18	24
1	4	6	9'-10	6	9	9'-10	4	6	32	4	6	34	4	12	27	4	18	24	4	12	33	4	18	24
2	4	6	9'-6	6	9	9'-6	4	6	32	4	6	34	5	12	27	4	18	24	4	12	33	4	18	24
3-6	4	6	9'-5	6	9	9'-5	4	6	32	4	6	34	4	12	27	4	18	24	4	12	33	4	18	24
7-8	4	12	9'-5	6	9	9'-5	4	6	32	4	6	34	4	12	27	4	18	24	4	12	33	4	18	24
9-10	4	12	9'-7	6	9	9'-7	4	6	32	4	6	34	4	12	27	4	18	24	4	12	33	4	18	24
11-12	4	12	9'-8	6	9	9'-8	4	6	32	4	6	34	4	12	27	4	18	24	4	12	33	4	18	24
13-15	4	12	10'-0	6	9	10'-0	4	6	32	4	6	34	4	12	27	4	18	24	4	12	33	4	18	24
16-17	4	12	10'-2	6	9	10'-2	4	6	32	4	6	34	4	12	27	4	18	24	4	12	33	4	18	24
18-19	4	12	10'-4	6	9	10'-4	4	6	32	4	6	34	4	12	27	4	18	24	4	12	33	4	18	24
20-21	4	12	10'-6	5	6	10'-6	4	6	32	4	6	34	4	12	27	4	18	24	4	12	33	4	18	24
22-23	4	6	10'-8	7	9	10'-8	4	6	32	4	6	34	4	12	27	4	18	24	4	12	33	4	18	24
24-25	4	6	10'-10	7	9	10'-10	4	6	32	4	6	34	4	12	27	4	18	24	4	12	33	4	18	24

Fill	k1 Size	k1 Sp.	k1 L	k2 Size	k2 Sp.	k2 L	k3 Size	k3 Sp.	k3 L	k4 Size	k4 Sp.	k4 L	k4 H	k4 V	k6 Size	k6 Sp.	k6 L	k7 Size	k7 Sp.	k7 L
0	6	18	32'-8	5	18	10'-11	4	18	10'-9	4	6	9'-7	6'-5	3'-2	4	12	32'-8	4	12	12'-4
1	6	18	32'-8	5	18	10'-9	4	18	9'-1	4	6	9'-6	6'-5	3'-1	4	12	32'-8	4	12	12'-4
2	5	9	32'-8	4	9	8'-1	4	9	6'-5	5	6	7'-5	4'-3	3'-2	5	18	32'-8	7	18	12'-6
3-6	5	12	32'-8	5	12	8'-5	4	12	6'-11	5	6	6'-10	3'-9	3'-1	5	12	32'-8	5	12	8'-11
7-8	5	12	32'-8	5	12	7'-5	4	12	4'-11	5	6	6'-2	3'-1	3'-1	5	12	32'-8	6	12	7'-2
9-10	5	12	32'-8	5	12	8'-2	4	12	4'-7	5	6	6'-4	3'-2	3'-2	5	12	32'-8	6	12	6'-11
11-12	5	9	32'-8	4	9	7'-0	4	9	2'-5	5	6	6'-4	3'-2	3'-2	4	12	32'-8	7	12	7'-1
13-15	5	12	32'-8	5	12	8'-10	4	12	4'-5	5	6	6'-4	2'-11	3'-5	5	12	32'-8	6	12	6'-10
16-17	5	9	32'-8	4	9	8'-2	4	9	3'-11	5	6	6'-5	2'-11	3'-6	4	12	32'-8	7	12	7'-0
18-19	5	9	32'-8	4	9	8'-7	4	9	4'-1	5	6	6'-5	2'-11	3'-6	4	12	32'-8	7	12	7'-1
20-21	5	9	32'-10	4	9	9'-4	4	9	4'-4	6	9	7'-0	3'-0	4'-0	5	12	32'-10	6	12	7'-2
22-23	5	9	33'-0	4	9	9'-9	4	9	2'-6	6	12	7'-2	3'-1	4'-1	4	12	33'-0	7	12	7'-4
24-25	7	18	33'-0	6	18	10'-2	4	18	4'-8	6	12	7'-4	3'-2	4'-2	4	12	33'-0	7	12	7'-6

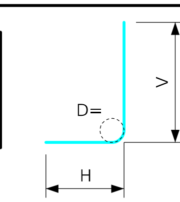
Bar List

Fill	k9 Size	k9 Sp.	k9 L	m1 Size	m1 Sp.	m1 L	m2 Size	m2 Sp.	m2 L	m3 Size	m3 Sp.	m3 L	m4 Size	m4 Sp.	m4 L	m4 H	m4 V
0	4	4.5	32'-8	5	12	33'-2	4	12	7'-1	4	12	2'-5	4	6	14'-6	6'-2	8'-4
1	4	4.5	32'-8	5	12	33'-2	4	12	6'-8	4	12	3'-5	4	6	13'-11	5'-7	8'-4
2	7	4.5	32'-8	5	12	33'-2	5	12	7'-6	4	12	2'-5	4	6	12'-5	4'-2	8'-3
3-6	5	4.5	32'-8	5	12	33'-2	5	12	7'-6	4	12	2'-5	4	6	11'-10	3'-7	8'-3
7-8	6	4.5	32'-8	5	9	33'-2	4	9	5'-9	4	9	2'-5	5	6	11'-4	3'-1	8'-3
9-10	6	4.5	32'-8	5	9	33'-2	4	9	6'-6	4	9	2'-5	5	6	11'-4	3'-0	8'-4
11-12	7	4.5	32'-8	6	12	33'-2	5	12	7'-2	4	12	2'-5	5	6	11'-4	2'-11	8'-5
13-15	6	4.5	32'-8	5	9	33'-2	4	9	8'-1	4	9	3'-9	5	6	11'-7	3'-0	8'-7
16-17	7	4.5	32'-8	5	9	33'-2	4	9	8'-6	4	9	3'-11	5	6	11'-8	3'-0	8'-8
18-19	7	4.5	32'-8	6	12	33'-2	5	12	8'-6	4	12	4'-1	5	6	11'-9	3'-0	8'-9
20-21	6	4.5	32'-10	6	12	33'-4	5	12	9'-5	4	12	4'-4	6	9	11'-11	3'-1	8'-10
22-23	7	4.5	33'-0	6	12	33'-6	5	12	9'-8	4	12	3'-2	6	12	12'-1	3'-2	8'-11
24-25	7	4.5	33'-0	6	12	33'-6	5	12	9'-10	4	12	3'-2	6	12	12'-3	3'-3	9'-0

Fill	m6 Size	m6 Sp.	m6 L	m7 Size	m7 Sp.	m7 L	m9 Size	m9 Sp.	m9 L	Concrete (CY/FT) Slab	Concrete (CY/FT) Floor	Concrete (CY/FT) Walls	Concrete (CY/FT) Total	Steel (LB/FT)
0	4	9	33'-2	4	9	7'-6	4	4.5	33'-2	1.405	1.219	0.840	3.464	428.50
1	5	18	33'-2	7	18	7'-10	7	4.5	33'-2	1.354	1.167	0.840	3.361	437.13
2	5	12	33'-2	5	12	7'-2	5	4.5	33'-2	0.998	1.115	0.840	2.953	487.29
3-6	4	12	33'-2	6	12	7'-6	7	4.5	33'-2	0.896	1.115	0.840	2.851	455.11
7-8	4	12	33'-2	7	12	7'-1	7	4.5	33'-2	0.896	1.115	0.840	2.851	469.42
9-10	5	12	33'-2	6	12	6'-9	6	4.5	33'-2	0.998	1.219	0.840	3.057	474.79
11-12	5	9	33'-2	5	9	6'-6	5	4.5	33'-2	1.049	1.270	0.840	3.159	493.92
13-15	5	18	33'-2	8	18	7'-3	8	4.5	33'-2	1.252	1.529	0.840	3.621	481.29
16-17	5	18	33'-2	8	18	7'-3	8	4.5	33'-2	1.354	1.632	0.840	3.826	489.00
18-19	5	12	33'-2	6	12	7'-2	6	4.5	33'-2	1.456	1.684	0.840	3.980	501.34
20-21	4	12	33'-4	7	12	7'-4	7	4.5	33'-4	1.568	1.798	0.887	4.253	511.37
22-23	4	12	33'-6	7	12	7'-6	7	4.5	33'-6	1.682	1.913	0.934	4.529	521.58
24-25	4	12	33'-6	7	12	7'-8	7	4.5	33'-6	1.784	2.017	0.934	4.735	531.82

Bent Bar Detail

Bars	D
4	3"
5	3¾"
6	4½"



k4 & m4

Note:
All dimensions are out to out.
D = pin diameter.

Notes:

1. Dimensions listed on this sheet to be used in conjunction with Sheet TRRCB G3-20.
2. Fill, dimensions "S" and "H" are in feet.
3. Dimensions "A", "B", "C", "D", and "Sp." listed in the bar list are in inches.
4. Dimensions "L", "H", "V" are in feet and inches.

LATEST REVISION DATE

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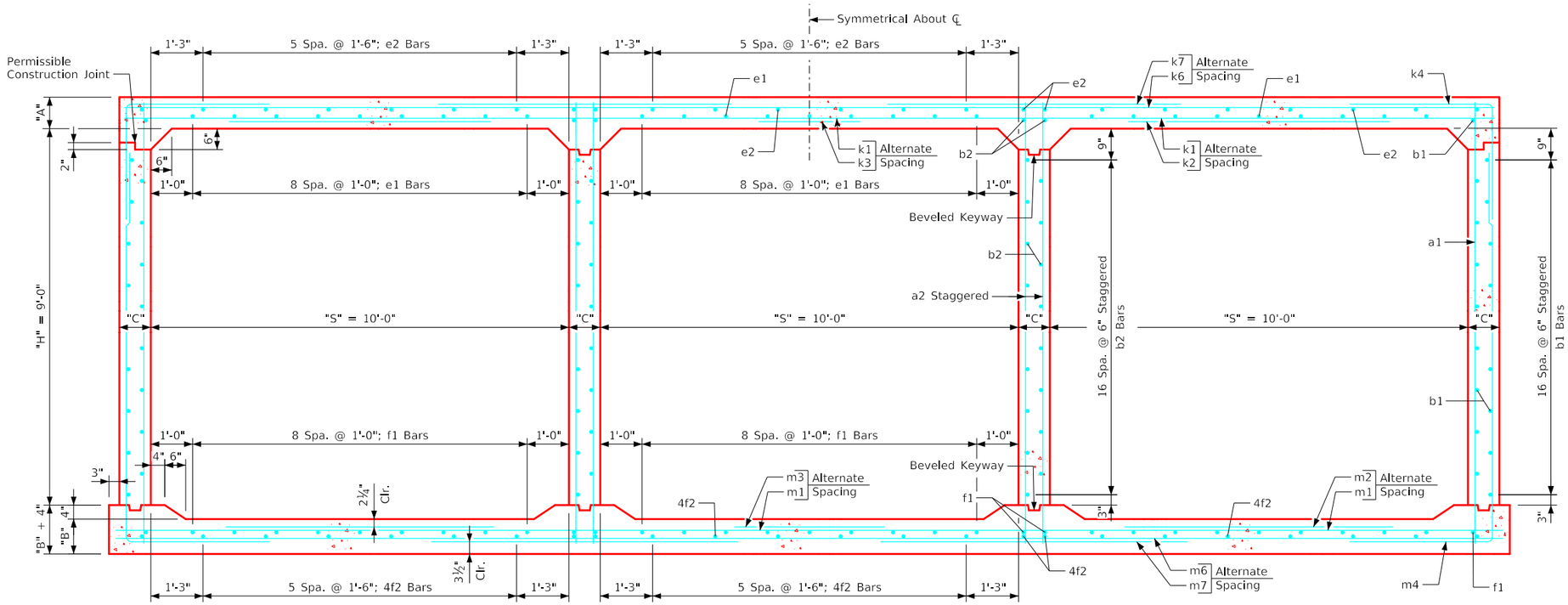
Standard Design
Triple Reinforced Concrete Box Culverts
July, 2020

Culvert Barrel Details
10' x 8' Barrel Sections

TRRCB 10-8-20
Sheet 2 of 2

ENGLISHLRFDSIGNEDTRIPLECULVERTS.DGN - TRRCB 10-8s2-20 - THIS SHEET ISSUED 07-2020.



Triple 10' x 9' Barrel Section

Notes:

1. Dimensions listed on this sheet to be used in conjunction with Sheet TRRCB G3-20.
2. Fill, dimensions "S" and "H" are in feet.
3. Dimensions "A", "B", "C", "D", and "Sp." listed in the bar list are in inches.
4. Dimensions "L", "H", "V" are in feet and inches.

LATEST REVISION DATE

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Standard Design

Triple Reinforced Concrete Box Culverts

July, 2020

Culvert Barrel Details	TRRCB 10-9-20
10' x 9' Barrel Sections	Sheet 1 of 2

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Variable Dimensions and Quantities for Triple 10' x 9' Barrel Sections

Dimensions

Fill	S	H	A	B	C	D	E	R	T	U	W	X	Z
0	10	9	13	11	9	6	9	0'-0	0'-0	6'-2	2'-5	4'-2	4'-1
1	10	9	12.5	10.5	9	6	9	0'-10	0'-2	6'-2	2'-4	3'-8	3'-11
2	10	9	9	10	9	6	9	2'-1	1'-8	6'-3	2'-2	4'-2	3'-8
3-6	10	9	8	10	9	9	9	2'-8	1'-6	4'-6	2'-2	4'-1	3'-5
7-8	10	9	8	10	9	9	9	2'-10	2'-1	3'-6	3'-0	4'-2	3'-6
9-10	10	9	9	11	9	9	9	3'-2	1'-10	3'-5	2'-9	4'-2	3'-5
11-12	10	9	9.5	12	9	9	9	4'-2	2'-6	3'-5	2'-5	4'-2	3'-3
13-15	10	9	11.5	14	9	9	9	3'-5	1'-7	3'-3	2'-2	3'-6	3'-5
16-17	10	9	12.5	15	9.5	9	6	4'-2	2'-1	3'-3	2'-0	3'-5	3'-5
18-19	10	9	13.5	15.5	10	9	9	3'-4	1'-11	3'-4	2'-0	3'-5	3'-5
20-21	10	9	14.5	16.5	10.5	9	9	3'-3	1'-8	3'-5	1'-9	3'-4	3'-6
22-23	10	9	15.5	17.5	11	9	9	3'-3	1'-4	3'-6	1'-5	3'-3	3'-7
24-25	10	9	16.5	18.5	11.5	9	9	3'-1	1'-2	3'-7	1'-3	3'-11	3'-8

Bar List

Fill	a1			a2			b1			b2			e1			e2			f1			f2		
	Size	Sp.	L	Size	Sp.	L	Size	Sp.	No.	Size	Sp.	No.	Size	Sp.	No.	Size	Sp.	No.	Size	Sp.	No.	Size	Sp.	No.
0	4	6	10'-11	6	9	10'-11	4	6	36	4	6	38	4	12	27	4	18	24	4	12	33	4	18	24
1	4	6	10'-10	6	9	10'-10	4	6	36	4	6	38	4	12	27	4	18	24	4	12	33	4	18	24
2	4	6	10'-6	6	9	10'-6	4	6	36	4	6	38	5	12	27	4	18	24	4	12	33	4	18	24
3-6	4	12	10'-5	6	9	10'-5	4	6	36	4	6	38	4	12	27	4	18	24	4	12	33	4	18	24
7-8	4	12	10'-5	6	9	10'-5	4	6	36	4	6	38	4	12	27	4	18	24	4	12	33	4	18	24
9-10	4	12	10'-7	6	9	10'-7	4	6	36	4	6	38	4	12	27	4	18	24	4	12	33	4	18	24
11-12	4	12	10'-8	6	9	10'-8	4	6	36	4	6	38	4	12	27	4	18	24	4	12	33	4	18	24
13-15	4	12	11'-0	6	9	11'-0	4	6	36	4	6	38	4	12	27	4	18	24	4	12	33	4	18	24
16-17	4	12	11'-2	5	6	11'-2	4	6	36	4	6	38	4	12	27	4	18	24	4	12	33	4	18	24
18-19	4	9	11'-4	7	9	11'-4	4	6	36	4	6	38	4	12	27	4	18	24	4	12	33	4	18	24
20-21	4	12	11'-6	7	9	11'-6	4	6	36	4	6	38	4	12	27	4	18	24	4	12	33	4	18	24
22-23	4	9	11'-8	7	9	11'-8	4	6	36	4	6	38	4	12	27	4	18	24	4	12	33	4	18	24
24-25	4	12	11'-10	7	9	11'-10	4	6	36	4	6	38	4	12	27	4	18	24	4	12	33	4	18	24

Fill	k1			k2			k3			k4					k6			k7		
	Size	Sp.	L	Size	Sp.	L	Size	Sp.	L	Size	Sp.	L	H	V	Size	Sp.	L	Size	Sp.	L
0	6	18	32'-8	5	18	10'-11	4	18	10'-9	4	6	9'-7	6'-5	3'-2	4	12	32'-8	4	12	12'-4
1	6	18	32'-8	5	18	10'-9	4	18	9'-1	4	6	9'-6	6'-5	3'-1	4	12	32'-8	4	12	12'-4
2	5	9	32'-8	4	9	8'-3	4	9	6'-7	6	9	8'-9	5'-2	3'-7	5	18	32'-8	7	18	13'-0
3-6	5	12	32'-8	5	12	8'-7	4	12	5'-5	6	9	7'-10	4'-4	3'-6	4	12	32'-8	6	12	9'-6
7-8	5	12	32'-8	5	12	7'-7	4	12	5'-1	5	6	6'-10	3'-5	3'-5	5	12	32'-8	6	12	7'-2
9-10	5	12	32'-8	5	12	8'-3	4	12	4'-5	5	6	6'-6	3'-3	3'-3	5	12	32'-8	6	12	7'-0
11-12	5	9	32'-8	4	9	7'-0	4	9	2'-5	5	6	6'-6	3'-3	3'-3	4	12	32'-8	7	12	7'-1
13-15	5	12	32'-8	5	12	8'-10	4	12	3'-11	6	9	7'-1	3'-3	3'-10	5	12	32'-8	6	12	6'-10
16-17	5	9	32'-10	4	9	8'-2	4	9	2'-6	6	9	7'-2	3'-3	3'-11	5	12	32'-10	6	12	6'-11
18-19	5	9	33'-0	4	9	8'-6	4	9	4'-2	6	9	7'-3	3'-4	3'-11	5	12	33'-0	6	12	7'-1
20-21	5	9	33'-2	4	9	9'-0	4	9	4'-4	5	6	7'-2	3'-7	3'-7	5	12	33'-2	6	12	7'-3
22-23	5	9	33'-4	4	9	9'-8	4	9	4'-5	6	9	7'-6	3'-5	4'-1	5	12	33'-4	6	12	7'-5
24-25	5	9	33'-6	4	9	10'-1	4	9	4'-10	5	6	7'-6	3'-9	3'-9	5	12	33'-6	6	12	7'-7

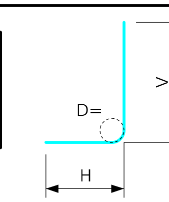
Bar List

Fill	k9			m1			m2			m3			m4				
	Size	Sp.	L	Size	Sp.	L	Size	Sp.	L	Size	Sp.	L	Size	Sp.	L	H	V
0	4	4.5	32'-8	5	12	33'-2	4	12	7'-2	4	12	2'-5	4	6	17'-10	8'-6	9'-4
1	4	4.5	32'-8	4	9	33'-2	4	9	7'-6	4	9	3'-5	4	6	15'-6	6'-2	9'-4
2	7	4.5	32'-8	5	12	33'-2	5	12	7'-8	4	12	2'-5	5	9	13'-11	4'-8	9'-3
3-6	6	4.5	32'-8	5	12	33'-2	5	12	7'-7	4	12	2'-7	6	9	13'-4	4'-1	9'-3
7-8	6	4.5	32'-8	5	9	33'-2	4	9	5'-11	4	9	2'-5	5	6	12'-8	3'-5	9'-3
9-10	6	4.5	32'-8	5	9	33'-2	4	9	6'-7	4	9	2'-5	5	6	12'-7	3'-3	9'-4
11-12	7	4.5	32'-8	5	9	33'-2	4	9	7'-4	4	9	2'-5	5	6	12'-8	3'-3	9'-5
13-15	6	4.5	32'-8	5	9	33'-2	4	9	8'-2	4	9	3'-9	6	9	12'-11	3'-4	9'-7
16-17	6	4.5	32'-10	5	9	33'-4	4	9	8'-6	4	9	4'-0	6	9	13'-0	3'-4	9'-8
18-19	6	4.5	33'-0	6	12	33'-6	5	12	8'-6	4	12	4'-0	6	9	13'-1	3'-4	9'-9
20-21	6	4.5	33'-2	6	12	33'-8	5	12	8'-11	4	12	4'-2	5	6	13'-3	3'-5	9'-10
22-23	6	4.5	33'-4	6	12	33'-10	5	12	9'-9	4	12	4'-5	6	9	13'-5	3'-6	9'-11
24-25	6	4.5	33'-6	6	12	34'-0	5	12	10'-1	4	12	3'-2	5	6	13'-7	3'-7	10'-0

Fill	m6			m7			m9			Quantities: Concrete (CY/FT)				Steel (LB/FT)
	Size	Sp.	L	Size	Sp.	L	Size	Sp.	L	Slab	Floor	Walls	Total	
0	5	18	33'-2	7	18	8'-1	7	4.5	33'-2	1.405	1.219	0.952	3.576	462.08
1	5	18	33'-2	7	18	7'-10	7	4.5	33'-2	1.354	1.167	0.952	3.473	451.97
2	4	12	33'-2	6	12	7'-6	6	4.5	33'-2	0.998	1.115	0.952	3.065	510.26
3-6	4	9	33'-2	5	9	7'-0	5	4.5	33'-2	0.896	1.115	0.952	2.963	480.63
7-8	4	12	33'-2	7	12	7'-1	7	4.5	33'-2	0.896	1.115	0.952	2.963	489.29
9-10	4	12	33'-2	7	12	7'-0	7	4.5	33'-2	0.998	1.219	0.952	3.169	489.63
11-12	5	12	33'-2	6	12	6'-9	6	4.5	33'-2	1.049	1.322	0.952	3.323	496.97
13-15	5	18	33'-2	8	18	7'-3	8	4.5	33'-2	1.252	1.529	0.952	3.733	499.89
16-17	5	18	33'-4	8	18	7'-3	8	4.5	33'-4	1.364	1.642	1.004	4.010	511.66
18-19	5	12	33'-6	6	12	7'-2	6	4.5	33'-6	1.476	1.704	1.057	4.237	546.26
20-21	5	12	33'-8	6	12	7'-5	6	4.5	33'-8	1.589	1.816	1.113	4.518	547.71
22-23	5	12	33'-10	6	12	7'-7	6	4.5	33'-10	1.703	1.932	1.166	4.801	560.00
24-25	4	12	34'-0	7	12	7'-9	7	4.5	34'-0	1.818	2.049	1.218	5.085	558.00

Bent Bar Detail

Bars	D
4	3"
5	3¾"
6	4½"



k4 & m4

Note:
All dimensions are out to out.
D = pin diameter.

Notes:

1. Dimensions listed on this sheet to be used in conjunction with Sheet TRRCB G3-20.
2. Fill, dimensions "S" and "H" are in feet.
3. Dimensions "A", "B", "C", "D", and "Sp." listed in the bar list are in inches.
4. Dimensions "L", "H", "V" are in feet and inches.

LATEST REVISION DATE

APPROVED BY BRIDGE ENGINEER

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Standard Design
Triple Reinforced Concrete Box Culverts
July, 2020

Culvert Barrel Details
10' x 9' Barrel Sections

TRRCB 10-9-20
Sheet 2 of 2

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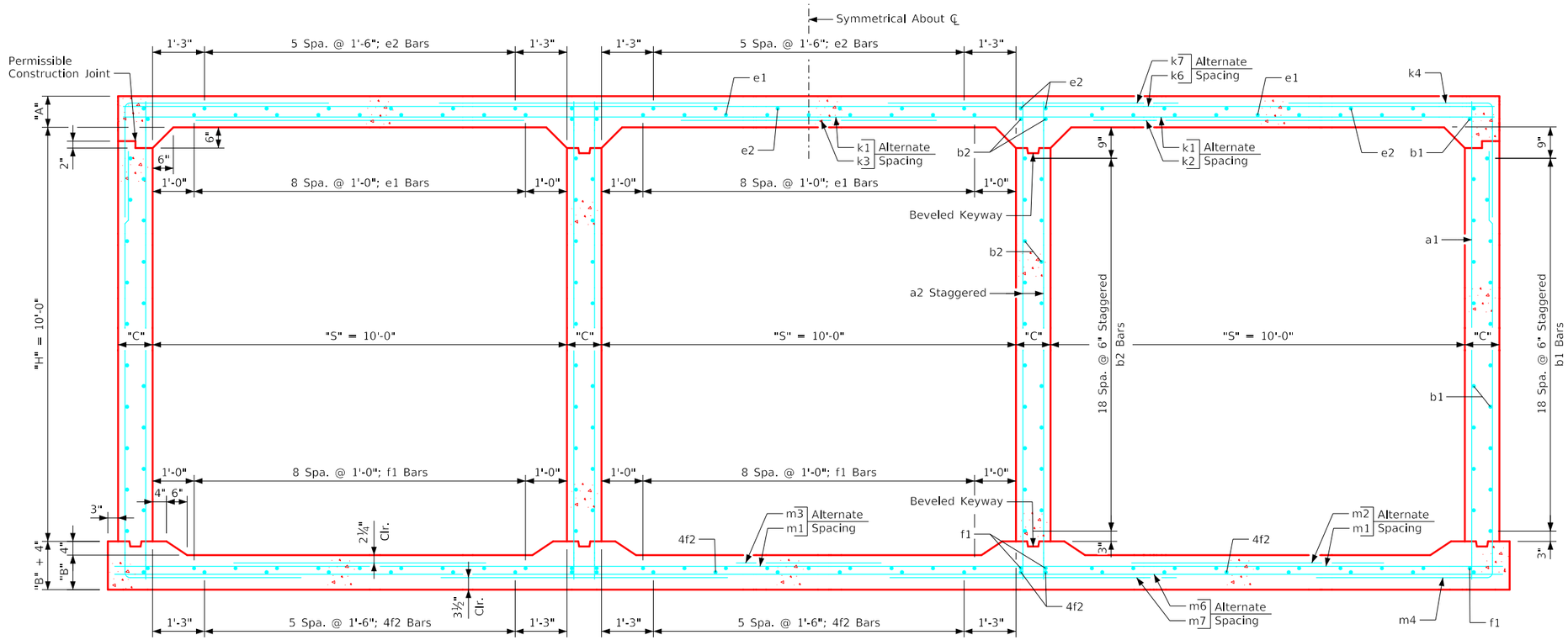

Triple 10' x 10' Barrel Section

Notes:

1. Dimensions listed on this sheet to be used in conjunction with Sheet TRRCB G3-20.
2. Fill, dimensions "S" and "H" are in feet.
3. Dimensions "A", "B", "C", "D", and "Sp." listed in the bar list are in inches.
4. Dimensions "L", "H", "V" are in feet and inches.

LATEST REVISION DATE

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Standard Design

Triple Reinforced Concrete Box Culverts

July, 2020

Culvert Barrel Details

10' x 10' Barrel Sections

TRRCB 10-10-20

Sheet 1 of 2

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Variable Dimensions and Quantities for Triple 10' x 10' Barrel Sections

Dimensions													
Fill	S	H	A	B	C	D	E	R	T	U	W	X	Z
0	10	10	13	11	10	6	9	0'-0	0'-0	6'-3	2'-5	4'-2	4'-0
1	10	10	12.5	11	10	6	9	0'-10	0'-3	6'-3	2'-5	3'-8	3'-8
2	10	10	9	10	10	9	9	2'-1	1'-10	6'-4	2'-2	4'-2	3'-8
3-6	10	10	8	10	10	9	9	2'-0	1'-7	4'-3	2'-2	3'-7	3'-8
7-8	10	10	8	10	10	9	9	2'-10	2'-2	3'-6	3'-0	4'-2	3'-6
9-10	10	10	9	11	10	9	9	3'-2	2'-2	3'-5	2'-9	4'-2	3'-5
11-12	10	10	9.5	12	10	9	9	3'-0	1'-10	3'-6	2'-5	4'-2	3'-5
13-15	10	10	11.5	14	10	9	9	3'-3	1'-10	3'-4	2'-2	3'-6	3'-6
16-17	10	10	12.5	14.5	10.5	9	9	3'-2	1'-6	3'-4	2'-1	4'-2	3'-4
18-19	10	10	13.5	15.5	11	6	9	4'-3	2'-0	3'-5	1'-10	3'-5	3'-5
20-21	10	10	14	16.5	12	6	9	4'-3	1'-10	3'-5	1'-9	3'-4	3'-6
22-23	10	10	15.5	17.5	12.5	6	9	3'-3	1'-5	3'-8	1'-5	3'-4	3'-7
24-25	10	10	16.5	18.5	12.5	9	9	3'-2	1'-3	3'-8	1'-3	3'-3	3'-8

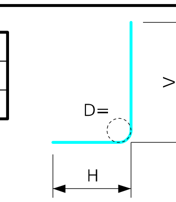
	Bar List																							
	a1			a2			b1			b2			e1			e2			f1			f2		
Fill	Size	Sp.	L	Size	Sp.	L	Size	Sp.	No.	Size	Sp.	No.	Size	Sp.	No.	Size	Sp.	No.	Size	Sp.	No.	Size	Sp.	No.
0	4	6	11'-11	7	9	11'-11	4	6	40	4	6	42	4	12	27	4	18	24	4	12	33	4	18	24
1	4	6	11'-10	7	9	11'-10	4	6	40	4	6	42	4	12	27	4	18	24	4	12	33	4	18	24
2	4	12	11'-6	7	9	11'-6	4	6	40	4	6	42	5	12	27	4	18	24	4	12	33	4	18	24
3-6	4	12	11'-5	7	9	11'-5	4	6	40	4	6	42	4	12	27	4	18	24	4	12	33	4	18	24
7-8	4	12	11'-5	7	9	11'-5	4	6	40	4	6	42	4	12	27	4	18	24	4	12	33	4	18	24
9-10	4	9	11'-7	7	9	11'-7	4	6	40	4	6	42	4	12	27	4	18	24	4	12	33	4	18	24
11-12	4	9	11'-8	7	9	11'-8	4	6	40	4	6	42	4	12	27	4	18	24	4	12	33	4	18	24
13-15	5	12	12'-0	7	9	12'-0	4	6	40	4	6	42	4	12	27	4	18	24	4	12	33	4	18	24
16-17	4	9	12'-2	7	9	12'-2	4	6	40	4	6	42	4	12	27	4	18	24	4	12	33	4	18	24
18-19	4	6	12'-4	7	9	12'-4	4	6	40	4	6	42	4	12	27	4	18	24	4	12	33	4	18	24
20-21	4	6	12'-5	7	9	12'-5	4	6	40	4	6	42	4	12	27	4	18	24	4	12	33	4	18	24
22-23	4	6	12'-8	7	9	12'-8	4	6	40	4	6	42	4	12	27	4	18	24	4	12	33	4	18	24
24-25	5	9	12'-10	7	9	12'-10	4	6	40	4	6	42	4	12	27	4	18	24	4	12	33	4	18	24

	Bar List																	
	k1			k2			k3			k4					k6			k7		
Fill	Size	Sp.	L	Size	Sp.	L	Size	Sp.	L	Size	Sp.	L	H	V	Size	Sp.	L	Size	Sp.	L
0	6	18	33'-0	5	18	11'-1	4	18	10'-10	6	12	10'-4	6'-5	3'-11	4	12	33'-0	4	12	12'-6
1	6	18	33'-0	5	18	10'-10	4	18	9'-2	6	12	10'-4	6'-5	3'-11	4	12	33'-0	4	12	12'-6
2	5	9	33'-0	4	9	8'-1	4	9	6'-8	5	6	9'-5	6'-3	3'-2	5	18	33'-0	7	18	13'-2
3-6	5	12	33'-0	5	12	8'-5	5	12	6'-10	5	6	7'-9	4'-8	3'-1	5	12	33'-0	5	12	8'-11
7-8	5	12	33'-0	5	12	7'-6	4	12	5'-2	5	6	6'-10	3'-9	3'-1	5	12	33'-0	6	12	7'-1
9-10	5	12	33'-0	5	12	7'-10	4	12	4'-6	6	9	7'-6	3'-9	3'-9	5	12	33'-0	6	12	7'-0
11-12	5	12	33'-0	5	12	8'-4	4	12	4'-10	6	9	7'-4	3'-8	3'-8	4	12	33'-0	7	12	7'-2
13-15	5	12	33'-0	5	12	8'-6	4	12	4'-4	6	9	7'-8	3'-10	3'-10	5	12	33'-0	6	12	6'-11
16-17	5	12	33'-2	5	12	9'-4	4	12	4'-6	5	6	7'-4	3'-8	3'-8	5	12	33'-2	6	12	7'-0
18-19	5	9	33'-4	4	9	8'-5	4	9	2'-5	6	9	7'-10	3'-11	3'-11	5	12	33'-4	6	12	7'-2
20-21	5	9	33'-8	4	9	8'-10	4	9	2'-6	6	9	8'-0	4'-0	4'-0	4	12	33'-8	7	12	7'-2
22-23	5	9	33'-10	4	9	9'-7	4	9	4'-6	6	9	8'-2	4'-1	4'-1	5	18	33'-10	8	18	7'-7
24-25	5	9	33'-10	4	9	10'-0	4	9	4'-8	6	9	8'-4	4'-2	4'-2	5	18	33'-10	8	18	7'-8

	Bar List																								Quantities				
	k9			m1			m2			m3			m4					m6			m7			m9			Concrete (CY/FT)				Steel
Fill	Size	Sp.	L	Size	Sp.	L	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	4	4.5	33'-0	5	12	33'-6	4	12	7'-2	4	12	2'-6	6	12	19'-10	9'-6	10'-4	5	18	33'-6	7	18	8'-0	7	4.5	33'-6	1.424	1.234	1.180	3.838	516.63
1	4	4.5	33'-0	5	12	33'-6	4	12	7'-2	4	12	3'-6	6	12	19'-4	9'-0	10'-4	4	9	33'-6	4	9	7'-4	4	4.5	33'-6	1.373	1.234	1.180	3.787	506.66
2	7	4.5	33'-0	5	12	33'-6	5	12	7'-7	4	12	2'-6	5	6	15'-1	4'-10	10'-3	4	12	33'-6	6	12	7'-5	6	4.5	33'-6	1.013	1.130	1.180	3.323	551.74
3-6	5	4.5	33'-0	5	12	33'-6	5	12	7'-7	4	12	3'-8	5	6	14'-6	4'-3	10'-3	4	9	33'-6	5	9	7'-6	7	4.5	33'-6	0.910	1.130	1.180	3.220	524.29
7-8	6	4.5	33'-0	5	9	33'-6	4	9	5'-10	4	9	2'-6	5	6	13'-11	3'-8	10'-3	4	12	33'-6	7	12	7'-1	7	4.5	33'-6	0.910	1.130	1.180	3.220	523.00
9-10	6	4.5	33'-0	5	9	33'-6	4	9	6'-6	4	9	2'-6	6	9	14'-1	3'-9	10'-4	4	12	33'-6	7	12	7'-0	7	4.5	33'-6	1.013	1.234	1.180	3.427	532.55
11-12	7	4.5	33'-0	5	9	33'-6	4	9	7'-3	4	9	2'-6	6	9	14'-1	3'-8	10'-5	4	12	33'-6	7	12	7'-0	7	4.5	33'-6	1.064	1.339	1.180	3.583	532.63
13-15	6	4.5	33'-0	5	9	33'-6	4	9	8'-1	4	9	3'-10	6	9	14'-4	3'-9	10'-7	5	18	33'-6	8	18	7'-4	8	4.5	33'-6	1.270	1.547	1.180	3.997	547.34
16-17	6	4.5	33'-2	5	9	33'-8	4	9	8'-4	4	9	2'-6	5	6	14'-5	3'-9	10'-8	5	12	33'-8	6	12	7'-0	6	4.5	33'-8	1.382	1.606	1.242	4.230	548.32
18-19	6	4.5	33'-4	5	9	33'-10	4	9	8'-9	4	9	4'-1	6	9	14'-6	3'-9	10'-9	5	12	33'-10	6	12	7'-2	6	4.5	33'-10	1.495	1.721	1.301	4.517	571.74
20-21	7	4.5	33'-8	6	12	34'-2	5	12	8'-11	4	12	4'-4	6	9	14'-8	3'-10	10'-10	5	12	34'-2	6	12	7'-4	6	4.5	34'-2	1.567	1.848	1.419	4.834	581.66
22-23	8	4.5	33'-10	6	12	34'-4	5	12	9'-9	4	12	4'-4	6	9	14'-10	3'-11	10'-11	5	12	34'-4	6	12	7'-6	6	4.5	34'-4	1.736	1.965	1.478	5.179	592.24
24-25	8	4.5	33'-10	6	12	34'-4	5	12	10'-1	4	12	4'-6	6	9	14'-11	3'-11	11'-0	5	12	34'-4	6	12	7'-9	6	4.5	34'-4	1.841	2.072	1.478	5.391	598.89

Bent Bar Detail

Bars	D
5	3¾"
6	4½"



k4 & m4

Note:
All dimensions are out to out.
D = pin diameter.

Notes:

1. Dimensions listed on this sheet to be used in conjunction with Sheet TRRCB G3-20.
2. Fill, dimensions "S" and "H" are in feet.
3. Dimensions "A", "B", "C", "D", and "Sp." listed in the bar list are in inches.
4. Dimensions "L", "H", "V" are in feet and inches.

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Standard Design

Triple Reinforced Concrete Box Culverts

July, 2020

Culvert Barrel Details

10' x 10' Barrel Sections

TRRCB 10-10-20

Sheet 2 of 2

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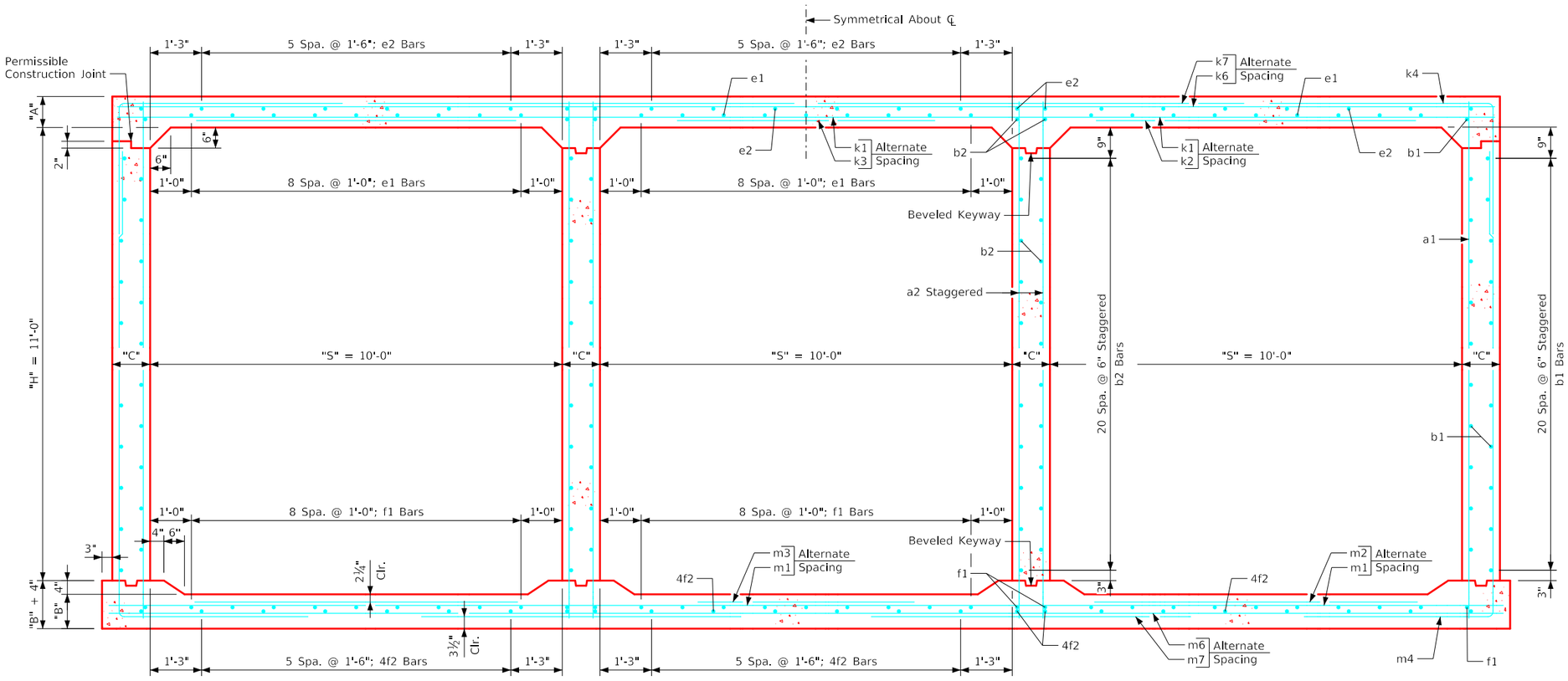

Triple 10' x 11' Barrel Section

Notes:

1. Dimensions listed on this sheet to be used in conjunction with Sheet TRRCB G3-20.
2. Fill, dimensions "S" and "H" are in feet.
3. Dimensions "A", "B", "C", "D", and "Sp." listed in the bar list are in inches.
4. Dimensions "L", "H", "V" are in feet and inches.

LATEST REVISION DATE

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Standard Design

Triple Reinforced Concrete Box Culverts

July, 2020

Culvert Barrel Details

10' x 11' Barrel Sections

TRRCB 10-11-20

Sheet 1 of 2

Variable Dimensions and Quantities for Triple 10' x 11' Barrel Sections

Dimensions

Fill	S	H	A	B	C	D	E	R	T	U	W	X	Z
0	10	11	13	11	11	9	9	0'-0	0'-0	6'-3	2'-5	3'-8	4'-0
1	10	11	12.5	11	11	9	9	0'-10	0'-3	6'-3	2'-5	3'-8	3'-8
2	10	11	9	10	11	9	9	1'-3	0'-11	6'-10	2'-2	4'-3	3'-8
3-6	10	11	8	10	11	9	9	2'-0	1'-8	4'-2	2'-2	3'-4	3'-9
7-8	10	11	8	10	11	9	9	2'-10	2'-3	3'-6	3'-1	4'-3	3'-6
9-10	10	11	8.5	11	11	9	9	2'-9	2'-2	3'-5	2'-9	4'-3	3'-6
11-12	10	11	9.5	12	11	9	9	3'-0	2'-1	3'-5	2'-6	4'-3	3'-4
13-15	10	11	11.5	14	11	6	9	3'-0	1'-11	3'-4	2'-3	4'-3	3'-6
16-17	10	11	12	14.5	11.5	9	9	4'-3	2'-3	3'-5	2'-1	4'-3	3'-5
18-19	10	11	13	15.5	12.5	6	9	4'-3	2'-1	3'-5	1'-11	3'-11	3'-6
20-21	10	11	14	16.5	13	9	6	4'-4	1'-10	3'-6	1'-9	3'-11	3'-7
22-23	10	11	15	17.5	13.5	9	6	4'-3	1'-8	3'-6	1'-6	3'-4	3'-8
24-25	10	11	16	18.5	14	9	9	3'-8	1'-5	3'-7	1'-4	3'-3	3'-9

Bar List

	a1			a2			b1			b2			e1			e2			f1			f2		
Fill	Size	Sp.	L	Size	Sp.	L	Size	Sp.	No.	Size	Sp.	No.	Size	Sp.	No.	Size	Sp.	No.	Size	Sp.	No.	Size	Sp.	No.
0	4	12	12'-11	7	9	12'-11	4	6	44	4	6	46	4	12	27	4	18	24	4	12	33	4	18	24
1	4	12	12'-10	7	9	12'-10	4	6	44	4	6	46	4	12	27	4	18	24	4	12	33	4	18	24
2	4	9	12'-6	7	9	12'-6	4	6	44	4	6	46	4	12	27	4	18	24	4	12	33	4	18	24
3-6	4	9	12'-5	7	9	12'-5	4	6	44	4	6	46	4	12	27	4	18	24	4	12	33	4	18	24
7-8	4	12	12'-5	7	9	12'-5	4	6	44	4	6	46	4	12	27	4	18	24	4	12	33	4	18	24
9-10	5	12	12'-6	7	9	12'-6	4	6	44	4	6	46	4	12	27	4	18	24	4	12	33	4	18	24
11-12	5	12	12'-8	7	9	12'-8	4	6	44	4	6	46	4	12	27	4	18	24	4	12	33	4	18	24
13-15	4	6	13'-0	7	9	13'-0	4	6	44	4	6	46	4	12	27	4	18	24	4	12	33	4	18	24
16-17	6	12	13'-1	7	9	13'-1	4	6	44	4	6	46	4	12	27	4	18	24	4	12	33	4	18	24
18-19	4	6	13'-3	7	9	13'-3	4	6	44	4	6	46	4	12	27	4	18	24	4	12	33	4	18	24
20-21	6	9	13'-5	6	6	13'-5	4	6	44	4	6	46	4	12	27	4	18	24	4	12	33	4	18	24
22-23	6	9	13'-7	6	6	13'-7	4	6	44	4	6	46	4	12	27	4	18	24	4	12	33	4	18	24
24-25	6	9	13'-9	8	9	13'-9	4	6	44	4	6	46	4	12	27	4	18	24	4	12	33	4	18	24

	k1			k2			k3			k4					k6			k7		
Fill	Size	Sp.	L	Size	Sp.	L	Size	Sp.	L	Size	Sp.	L	H	V	Size	Sp.	L	Size	Sp.	L
0	6	18	33'-4	5	18	11'-2	4	18	10'-11	6	9	10'-6	6'-7	3'-11	4	12	33'-4	4	12	12'-6
1	6	18	33'-4	5	18	10'-11	4	18	9'-3	6	9	10'-6	6'-7	3'-11	4	12	33'-4	4	12	12'-6
2	5	12	33'-4	5	12	10'-1	5	12	8'-5	6	9	10'-4	6'-9	3'-7	5	18	33'-4	7	18	13'-8
3-6	5	12	33'-4	5	12	8'-4	5	12	6'-11	6	9	8'-7	5'-1	3'-6	5	12	33'-4	5	12	8'-8
7-8	5	12	33'-4	5	12	7'-5	4	12	5'-3	5	6	7'-1	4'-0	3'-1	5	12	33'-4	6	12	7'-1
9-10	5	12	33'-4	5	12	7'-7	4	12	5'-5	5	6	7'-1	3'-11	3'-2	5	12	33'-4	6	12	6'-11
11-12	5	12	33'-4	5	12	7'-10	4	12	4'-11	5	6	7'-2	3'-11	3'-3	5	12	33'-4	6	12	6'-11
13-15	5	12	33'-4	5	12	8'-6	4	12	4'-11	6	9	8'-2	4'-1	4'-1	5	12	33'-4	6	12	6'-11
16-17	5	9	33'-6	4	9	7'-8	4	9	2'-6	6	9	8'-0	4'-0	4'-0	4	12	33'-6	7	12	7'-1
18-19	5	9	33'-10	4	9	8'-1	4	9	2'-6	5	6	7'-7	4'-1	3'-6	5	12	33'-10	6	12	7'-1
20-21	5	9	34'-0	4	9	8'-10	4	9	2'-5	6	9	8'-2	4'-1	4'-1	5	12	34'-0	6	12	7'-3
22-23	5	9	34'-2	4	9	9'-3	4	9	2'-8	5	6	7'-10	4'-2	3'-8	5	12	34'-2	6	12	7'-4
24-25	5	9	34'-4	4	9	9'-9	4	9	3'-10	5	6	8'-0	4'-3	3'-9	5	12	34'-4	6	12	7'-6

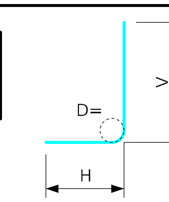
Bar List

	k9			m1			m2			m3			m4				
Fill	Size	Sp.	L	Size	Sp.	L	Size	Sp.	L	Size	Sp.	L	Size	Sp.	L	H	V
0	4	4.5	33'-4	5	12	33'-10	4	12	7'-3	4	12	3'-7	6	9	20'-11	9'-7	11'-4
1	4	4.5	33'-4	5	12	33'-10	4	12	7'-3	4	12	3'-7	6	9	17'-10	6'-6	11'-4
2	7	4.5	33'-4	5	12	33'-10	5	12	7'-8	4	12	2'-5	6	9	16'-5	5'-2	11'-3
3-6	5	4.5	33'-4	5	12	33'-10	5	12	7'-7	4	12	4'-3	6	9	15'-11	4'-8	11'-3
7-8	6	4.5	33'-4	5	9	33'-10	4	9	5'-10	4	9	2'-5	6	6	15'-4	4'-1	11'-3
9-10	6	4.5	33'-4	5	9	33'-10	4	9	6'-6	4	9	2'-5	5	6	15'-3	3'-11	11'-4
11-12	6	4.5	33'-4	5	9	33'-10	4	9	7'-2	4	9	2'-5	5	6	15'-5	4'-0	11'-5
13-15	6	4.5	33'-4	5	9	33'-10	4	9	8'-0	4	9	2'-5	6	9	15'-9	4'-2	11'-7
16-17	7	4.5	33'-6	5	9	34'-0	4	9	8'-4	4	9	2'-6	6	9	15'-9	4'-1	11'-8
18-19	6	4.5	33'-10	5	9	34'-4	4	9	8'-8	4	9	3'-2	5	6	15'-11	4'-2	11'-9
20-21	6	4.5	34'-0	6	12	34'-6	5	12	8'-11	4	12	3'-3	6	9	16'-0	4'-2	11'-10
22-23	6	4.5	34'-2	6	12	34'-8	5	12	9'-5	4	12	4'-6	5	6	16'-2	4'-3	11'-11
24-25	6	4.5	34'-4	6	12	34'-10	5	12	10'-1	4	12	4'-8	5	6	16'-4	4'-4	12'-0

	m6			m7			m9			Quantities: Concrete (CY/FT)				Steel
Fill	Size	Sp.	L	Size	Sp.	L	Size	Sp.	L	Slab	Floor	Walls	Total	(LB/FT)
0	5	18	33'-10	7	18	7'-11	7	4.5	33'-10	1.443	1.247	1.437	4.127	549.13
1	4	9	33'-10	4	9	7'-4	4	4.5	33'-10	1.391	1.247	1.437	4.075	527.55
2	4	12	33'-10	6	12	7'-5	6	4.5	33'-10	1.028	1.141	1.437	3.606	568.45
3-6	4	9	33'-10	5	9	7'-6	7	4.5	33'-10	0.924	1.141	1.437	3.502	551.50
7-8	4	12	33'-10	7	12	7'-1	7	4.5	33'-10	0.924	1.141	1.437	3.502	572.05
9-10	4	12	33'-10	7	12	7'-1	7	4.5	33'-10	0.976	1.247	1.437	3.660	554.42
11-12	5	12	33'-10	6	12	6'-9	6	4.5	33'-10	1.080	1.352	1.437	3.869	560.26
13-15	5	18	33'-10	8	18	7'-3	8	4.5	33'-10	1.287	1.563	1.437	4.287	575.42
16-17	5	12	34'-0	6	12	7'-1	6	4.5	34'-0	1.348	1.625	1.502	4.475	588.61
18-19	5	12	34'-4	6	12	7'-3	6	4.5	34'-4	1.472	1.751	1.632	4.855	591.50
20-21	5	12	34'-6	6	12	7'-5	6	4.5	34'-6	1.587	1.869	1.697	5.153	631.08
22-23	5	12	34'-8	6	12	7'-7	6	4.5	34'-8	1.704	1.987	1.763	5.454	637.34
24-25	5	12	34'-10	6	12	7'-10	6	4.5	34'-10	1.821	2.107	1.828	5.756	661.66

Bent Bar Detail

Bars	D
5	3¾"
6	4½"



k4 & m4

Note:
All dimensions are out to out.
D = pin diameter.

Notes:

1. Dimensions listed on this sheet to be used in conjunction with Sheet TRRCB G3-20.
2. Fill, dimensions "S" and "H" are in feet.
3. Dimensions "A", "B", "C", "D", and "Sp." listed in the bar list are in inches.
4. Dimensions "L", "H", "V" are in feet and inches.

LATEST REVISION DATE

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Standard Design
Triple Reinforced Concrete Box Culverts
July, 2020

Culvert Barrel Details
10' x 11' Barrel Sections

TRRCB 10-11-20
Sheet 2 of 2

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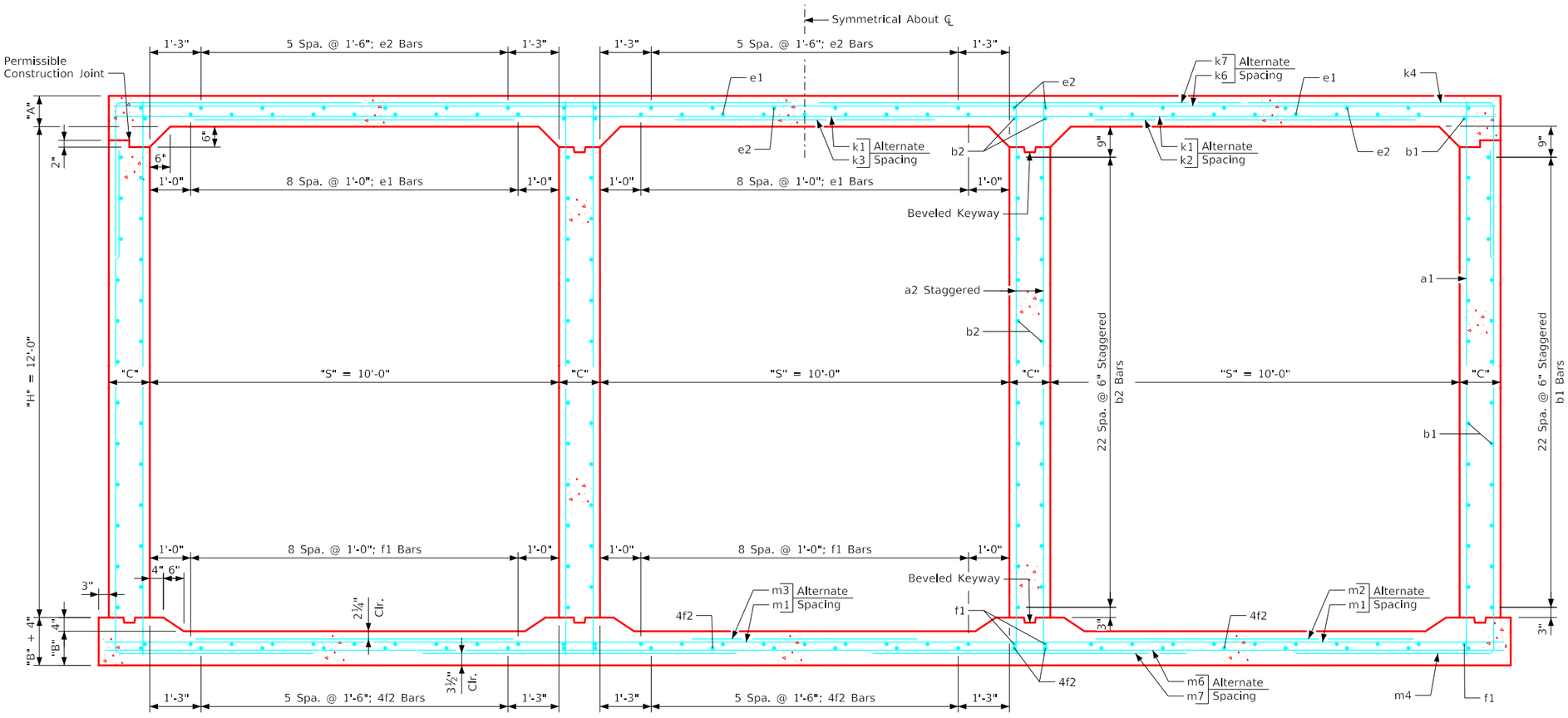

Triple 10' x 12' Barrel Section

Notes:

1. Dimensions listed on this sheet to be used in conjunction with Sheet TRRCB G3-20.
2. Fill, dimensions "S" and "H" are in feet.
3. Dimensions "A", "B", "C", "D", and "Sp." listed in the bar list are in inches.
4. Dimensions "L", "H", "V" are in feet and inches.

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Standard Design

Triple Reinforced Concrete Box Culverts

July, 2020

Culvert Barrel Details

10' x 12' Barrel Sections

TRRCB 10-12-20

Sheet 1 of 2

Variable Dimensions and Quantities for Triple 10' x 12' Barrel Sections

Dimensions

Fill	S	H	A	B	C	D	E	R	T	U	W	X	Z
0	10	12	13	11.5	12	9	9	0'-0	0'-0	6'-4	2'-6	3'-9	3'-10
1	10	12	12.5	11	12	9	9	0'-10	0'-4	6'-4	2'-5	3'-9	3'-11
2	10	12	9	10	12	9	9	1'-0	1'-0	6'-11	2'-3	4'-3	3'-8
3-6	10	12	8	10	12	6	9	2'-0	1'-8	4'-1	2'-3	3'-3	3'-9
7-8	10	12	8	10.5	12	9	9	2'-10	2'-3	3'-5	2'-2	3'-1	3'-8
9-10	10	12	8.5	11	12	9	9	2'-9	2'-2	3'-5	2'-10	4'-3	3'-6
11-12	10	12	9.5	12	12	6	9	2'-8	2'-2	3'-5	2'-6	4'-3	3'-4
13-15	10	12	11.5	14	12.5	6	9	2'-6	1'-8	3'-5	2'-3	4'-3	3'-7
16-17	10	12	12	14.5	13	9	6	2'-7	1'-10	3'-5	2'-1	4'-4	3'-6
18-19	10	12	13	15.5	13.5	9	6	2'-6	1'-6	3'-5	1'-11	4'-0	3'-7
20-21	10	12	14	16.5	14	9	9	4'-1	1'-11	3'-6	1'-8	4'-0	3'-8
22-23	10	12	15	17.5	14.5	6	9	3'-11	1'-8	3'-7	1'-7	4'-0	3'-8
24-25	10	12	16.5	18.5	15	6	9	3'-3	1'-4	3'-9	1'-4	4'-0	3'-9

Bar List

	a1			a2			b1			b2			e1			e2			f1			f2		
Fill	Size	Sp.	L	Size	Sp.	L	Size	Sp.	No.	Size	Sp.	No.	Size	Sp.	No.	Size	Sp.	No.	Size	Sp.	No.	Size	Sp.	No.
0	4	9	13'-11	7	9	13'-11	4	6	48	4	6	50	4	12	27	4	18	24	4	12	33	4	18	24
1	4	9	13'-10	7	9	13'-10	4	6	48	4	6	50	4	12	27	4	18	24	4	12	33	4	18	24
2	5	12	13'-6	7	9	13'-6	4	6	48	4	6	50	4	12	27	4	18	24	4	12	33	4	18	24
3-6	4	6	13'-5	7	9	13'-5	4	6	48	4	6	50	4	12	27	4	18	24	4	12	33	4	18	24
7-8	5	12	13'-5	7	9	13'-5	4	6	48	4	6	50	4	12	27	4	18	24	4	12	33	4	18	24
9-10	5	12	13'-6	7	9	13'-6	4	6	48	4	6	50	4	12	27	4	18	24	4	12	33	4	18	24
11-12	4	6	13'-8	7	9	13'-8	4	6	48	4	6	50	4	12	27	4	18	24	4	12	33	4	18	24
13-15	4	6	14'-0	7	9	14'-0	4	6	48	4	6	50	4	12	27	4	18	24	4	12	33	4	18	24
16-17	6	12	14'-1	6	6	14'-1	4	6	48	4	6	50	4	12	27	4	18	24	4	12	33	4	18	24
18-19	6	9	14'-3	6	6	14'-3	4	6	48	4	6	50	4	12	27	4	18	24	4	12	33	4	18	24
20-21	6	9	14'-5	8	9	14'-5	4	6	48	4	6	50	4	12	27	4	18	24	4	12	33	4	18	24
22-23	4	6	14'-7	8	9	14'-7	4	6	48	4	6	50	4	12	27	4	18	24	4	12	33	4	18	24
24-25	4	6	14'-10	8	9	14'-10	4	6	48	4	6	50	4	12	27	4	18	24	4	12	33	4	18	24

	k1			k2			k3			k4					k6			k7		
Fill	Size	Sp.	L	Size	Sp.	L	Size	Sp.	L	Size	Sp.	L	H	V	Size	Sp.	L	Size	Sp.	L
0	6	18	33'-8	5	18	11'-4	4	18	11'-0	6	9	10'-6	6'-7	3'-11	4	12	33'-8	4	12	12'-8
1	6	18	33'-8	5	18	11'-0	4	18	9'-4	6	9	10'-6	6'-7	3'-11	4	12	33'-8	4	12	12'-8
2	5	12	33'-8	5	12	10'-0	5	12	9'-0	7	9	11'-2	7'-2	4'-0	5	18	33'-8	7	18	13'-10
3-6	5	12	33'-8	5	12	8'-4	5	12	7'-0	5	6	8'-4	5'-3	3'-1	5	12	33'-8	5	12	8'-5
7-8	5	12	33'-8	5	12	7'-4	4	12	5'-4	7	9	8'-4	4'-6	3'-10	4	9	33'-8	5	9	6'-10
9-10	5	12	33'-8	5	12	7'-8	4	12	5'-6	7	9	8'-4	4'-5	3'-11	5	12	33'-8	6	12	6'-11
11-12	5	12	33'-8	5	12	7'-9	4	12	5'-8	7	9	8'-10	4'-5	4'-5	5	12	33'-8	6	12	6'-11
13-15	6	18	33'-10	6	18	8'-9	4	18	6'-0	5	6	7'-10	4'-5	3'-5	5	12	33'-10	6	12	6'-11
16-17	5	12	34'-0	5	12	8'-9	4	12	5'-11	6	6	8'-2	4'-4	3'-10	5	12	34'-0	6	12	6'-11
18-19	5	12	34'-2	5	12	9'-3	4	12	6'-2	5	6	7'-11	4'-5	3'-6	5	12	34'-2	6	12	7'-0
20-21	5	9	34'-4	4	9	8'-6	4	9	3'-0	5	6	8'-1	4'-6	3'-7	5	18	34'-4	8	18	7'-3
22-23	5	9	34'-6	4	9	9'-0	4	9	3'-4	8	12	9'-8	4'-10	4'-10	5	18	34'-6	8	18	7'-5
24-25	5	9	34'-8	4	9	9'-9	4	9	4'-9	8	12	9'-10	4'-11	4'-11	5	18	34'-8	8	18	7'-8

Bar List

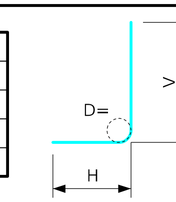
	k9			m1			m2			m3			m4					m6			m7			m9		
Fill	Size	Sp.	L	Size	Sp.	L	Size	Sp.	L	Size	Sp.	L	Size	Sp.	L	H	V	Size	Sp.	L	Size	Sp.	L	Size	Sp.	L
0	4	4.5	33'-8	5	12	34'-2	4	12	7'-3	4	12	3'-6	6	9	21'-6	9'-1	12'-5	4	9	34'-2	4	9	7'-7	4	4.5	34'-2
1	4	4.5	33'-8	5	12	34'-2	4	12	7'-3	4	12	3'-6	6	9	18'-10	6'-6	12'-4	5	18	34'-2	7	18	7'-9	7	4.5	34'-2
2	7	4.5	33'-8	5	12	34'-2	5	12	7'-7	4	12	2'-6	6	9	17'-6	5'-3	12'-3	4	12	34'-2	6	12	7'-4	6	4.5	34'-2
3-6	5	4.5	33'-8	5	12	34'-2	5	12	7'-4	4	12	4'-6	5	6	17'-0	4'-9	12'-3	4	9	34'-2	5	9	7'-6	7	4.5	34'-2
7-8	5	4.5	33'-8	5	12	34'-2	5	12	7'-9	4	12	4'-10	7	9	16'-10	4'-6	12'-4	5	18	34'-2	8	18	7'-4	8	4.5	34'-2
9-10	6	4.5	33'-8	5	9	34'-2	4	9	6'-5	4	9	2'-6	7	9	16'-9	4'-5	12'-4	4	12	34'-2	7	12	7'-0	7	4.5	34'-2
11-12	6	4.5	33'-8	5	9	34'-2	4	9	7'-2	4	9	2'-6	7	9	16'-10	4'-5	12'-5	5	12	34'-2	6	12	6'-9	6	4.5	34'-2
13-15	6	4.5	33'-10	5	9	34'-4	4	9	7'-9	4	9	2'-6	5	6	17'-1	4'-6	12'-7	5	18	34'-4	8	18	7'-4	8	4.5	34'-4
16-17	6	4.5	34'-0	5	9	34'-6	4	9	8'-1	4	9	2'-5	5	6	17'-1	4'-5	12'-8	5	12	34'-6	6	12	7'-1	6	4.5	34'-6
18-19	6	4.5	34'-2	5	9	34'-8	4	9	8'-9	4	9	3'-2	5	6	17'-3	4'-6	12'-9	5	12	34'-8	6	12	7'-4	6	4.5	34'-8
20-21	8	4.5	34'-4	5	9	34'-10	4	9	9'-3	4	9	3'-2	5	6	17'-5	4'-7	12'-10	5	12	34'-10	6	12	7'-6	6	4.5	34'-10
22-23	8	4.5	34'-6	6	12	35'-0	5	12	9'-5	4	12	3'-2	8	12	17'-7	4'-8	12'-11	5	12	35'-0	6	12	7'-7	6	4.5	35'-0
24-25	8	4.5	34'-8	6	12	35'-2	5	12	9'-11	4	12	3'-3	8	12	17'-8	4'-8	13'-0	5	12	35'-2	6	12	7'-9	6	4.5	35'-2

Quantities

	Concrete (CY/FT)				Steel (LB/FT)
Fill	Slab	Floor	Walls	Total	
0	1.462	1.315	1.715	4.492	564.63
1	1.410	1.262	1.715	4.387	557.95
2	1.043	1.156	1.715	3.914	612.42
3-6	0.938	1.156	1.715	3.809	581.05
7-8	0.938	1.209	1.715	3.862	603.26
9-10	0.990	1.262	1.715	3.967	617.39
11-12	1.095	1.368	1.715	4.178	633.45
13-15	1.314	1.591	1.787	4.692	596.34
16-17	1.375	1.654	1.858	4.887	631.68
18-19	1.491	1.771	1.929	5.191	635.92
20-21	1.607	1.890	2.000	5.497	661.26
22-23	1.725	2.009	2.072	5.806	703.45
24-25	1.898	2.130	2.143	6.171	713.03

Bent Bar Detail

Bars	D
5	3¾"
6	4½"
7	5¼"
8	6"



k4 & m4

Note:
All dimensions are out to out.
D = pin diameter.

Notes:

1. Dimensions listed on this sheet to be used in conjunction with Sheet TRRCB G3-20.
2. Fill, dimensions "S" and "H" are in feet.
3. Dimensions "A", "B", "C", "D", and "Sp." listed in the bar list are in inches.
4. Dimensions "L", "H", "V" are in feet and inches.

LATEST REVISION DATE

APPROVED BY BRIDGE ENGINEER

IOWADOT

Standard Design
Triple Reinforced Concrete Box Culverts
July, 2020

Culvert Barrel Details
10' x 12' Barrel Sections

TRRCB 10-12-20
Sheet 2 of 2

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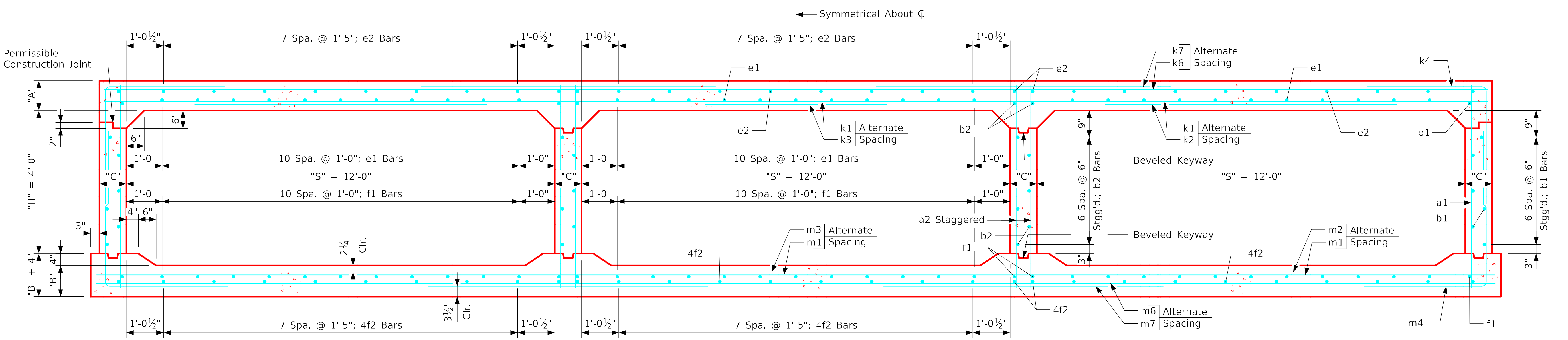


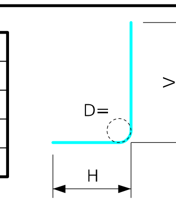
Triple 12' x 4' Barrel Section

Notes:

1. Dimensions listed on this sheet to be used in conjunction with Sheet TRRCB G3-20.
2. Fill, dimensions "S" and "H" are in feet.
3. Dimensions "A", "B", "C", "D", and "Sp." listed in the bar list are in inches.
4. Dimensions "L", "H", "V" are in feet and inches.

Bent Bar Detail

Bars	D
4	3"
5	3¾"
6	4½"
7	5¼"



k4 & m4

Note:
All dimensions are out to out.
D = pin diameter.

Variable Dimensions and Quantities for Triple 12' x 4' Barrel Sections

Dimensions

Fill	S	H	A	B	C	D	E	R	T	U	W	X	Z
0	12	4	14	11	9	9	9	0'-0	0'-0	7'-0	2'-10	4'-4	4'-3
1	12	4	13	10.5	9	9	9	0'-5	0'-3	6'-7	2'-10	4'-5	4'-3
2	12	4	10	10	9	9	9	2'-2	1'-9	5'-8	2'-8	5'-2	4'-3
3-6	12	4	9	10	9	9	6	2'-7	1'-7	4'-7	3'-7	5'-2	4'-0
7-8	12	4	9.5	11	9	9	9	3'-10	3'-0	4'-1	3'-3	5'-2	3'-11
9-10	12	4	11	12.5	9	9	9	5'-2	2'-10	3'-10	2'-10	5'-2	3'-10
11-12	12	4	12	13.5	9	9	9	5'-2	2'-8	3'-10	2'-9	5'-2	3'-10
13-15	12	4	13.5	15.5	9	6	9	4'-1	2'-6	3'-10	2'-5	4'-2	3'-10
16-17	12	4	14.5	16.5	9	9	9	4'-0	2'-3	3'-10	2'-0	4'-1	3'-10
18-19	12	4	15.5	17.5	9	9	9	3'-11	1'-9	3'-11	1'-10	4'-9	3'-11
20-21	12	4	16.5	18.5	9	9	9	4'-7	1'-4	3'-11	1'-5	4'-9	4'-0
22-23	12	4	18	20	9	9	9	4'-3	1'-1	4'-0	1'-2	4'-9	4'-1
24-25	12	4	19.5	21	9.5	9	6	4'-1	0'-11	4'-2	1'-1	4'-7	4'-2

Bar List

	a1			a2			b1			b2			e1			e2			f1			f2		
Fill	Size	Sp.	L	Size	Sp.	L	Size	Sp.	No.	Size	Sp.	No.	Size	Sp.	No.	Size	Sp.	No.	Size	Sp.	No.	Size	Sp.	No.
0	4	12	6'-0	6	9	6'-0	4	6	16	4	6	18	4	12	33	4	17	30	4	12	39	4	17	30
1	4	12	5'-10	6	9	5'-10	4	6	16	4	6	18	4	12	33	4	17	30	4	12	39	4	17	30
2	5	12	5'-7	7	9	5'-7	4	6	16	4	6	18	4	12	33	4	17	30	4	12	39	4	17	30
3-6	5	12	5'-6	5	6	5'-6	4	6	16	4	6	18	4	12	33	4	17	30	4	12	39	4	17	30
7-8	4	9	5'-7	6	9	5'-7	4	6	16	4	6	18	4	12	33	4	17	30	4	12	39	4	17	30
9-10	4	12	5'-10	6	9	5'-10	4	6	16	4	6	18	4	12	33	4	17	30	4	12	39	4	17	30
11-12	4	12	6'-0	6	9	6'-0	4	6	16	4	6	18	4	12	33	4	17	30	4	12	39	4	17	30
13-15	4	6	6'-4	6	9	6'-4	4	6	16	4	6	18	4	12	33	4	17	30	4	12	39	4	17	30
16-17	5	12	6'-6	6	9	6'-6	4	6	16	4	6	18	4	12	33	4	17	30	4	12	39	4	17	30
18-19	4	9	6'-8	6	9	6'-8	4	6	16	4	6	18	4	12	33	4	17	30	4	12	39	4	17	30
20-21	4	9	6'-10	6	9	6'-10	4	6	16	4	6	18	4	12	33	4	17	30	4	12	39	4	17	30
22-23	4	12	7'-1	6	9	7'-1	4	6	16	4	6	18	4	12	33	4	17	30	4	12	39	4	17	30
24-25	4	12	7'-3	5	6	7'-3	4	6	16	4	6	18	4	12	33	4	17	30	4	12	39	4	17	30

	k1			k2			k3			k4					k6			k7		
Fill	Size	Sp.	L	Size	Sp.	L	Size	Sp.	L	Size	Sp.	L	H	V	Size	Sp.	L	Size	Sp.	L
0	6	18	38'-8	6	18	12'-11	4	18	12'-9	6	12	6'-11	2'-11	4'-0	5	18	38'-8	6	18	14'-7
1	6	18	38'-8	6	18	12'-8	4	18	11'-11	5	6	7'-0	3'-6	3'-6	5	18	38'-8	6	18	14'-2
2	5	9	38'-8	4	9	10'-2	4	9	8'-5	6	9	7'-4	3'-8	3'-8	5	18	38'-8	8	18	13'-8
3-6	4	9	38'-8	5	9	10'-9	4	9	7'-7	6	9	7'-2	3'-7	3'-7	5	9	38'-8	5	9	9'-8
7-8	5	9	38'-8	4	9	7'-11	4	9	5'-1	6	9	6'-8	3'-0	3'-8	5	12	38'-8	7	12	8'-4
9-10	5	9	38'-8	4	9	8'-5	4	9	2'-5	5	6	5'-10	2'-6	3'-4	4	9	38'-8	6	9	7'-11
11-12	5	9	38'-8	4	9	9'-1	4	9	2'-5	5	6	5'-9	2'-4	3'-5	5	12	38'-8	7	12	8'-1
13-15	6	12	38'-8	5	12	9'-9	4	12	4'-7	4	6	5'-6	2'-4	3'-2	5	12	38'-8	7	12	8'-2
16-17	6	12	38'-8	5	12	10'-4	4	12	4'-9	4	6	5'-7	2'-4	3'-3	5	9	38'-8	6	9	8'-3
18-19	7	18	38'-8	7	18	11'-2	4	18	4'-11	4	6	5'-9	2'-5	3'-4	5	9	38'-8	6	9	8'-5
20-21	5	9	38'-8	5	9	11'-7	4	9	3'-7	4	6	5'-10	2'-5	3'-5	5	9	38'-8	6	9	8'-6
22-23	5	9	38'-8	5	9	11'-10	4	9	4'-3	4	6	6'-1	2'-6	3'-7	5	9	38'-8	6	9	8'-9
24-25	5	9	38'-10	5	9	12'-1	4	9	4'-8	5	9	6'-8	2'-7	4'-1	5	9	38'-10	6	9	9'-1

Bar List

	k9			m1			m2			m3			m4					m6			m7			m9		
Fill	Size	Sp.	L	Size	Sp.	L	Size	Sp.	L	Size	Sp.	L	Size	Sp.	L	H	V	Size	Sp.	L	Size	Sp.	L	Size	Sp.	L
0	6	4.5	38'-8	4	9	39'-2	4	9	8'-6	4	9	4'-1	7	12	8'-8	4'-4	4'-4	4	9	39'-2	5	9	8'-6	5	4.5	39'-2
1	6	4.5	38'-8	4	9	39'-2	4	9	8'-1	4	9	3'-11	5	6	8'-0	3'-8	4'-4	4	9	39'-2	5	9	8'-6	5	4.5	39'-2
2	8	4.5	38'-8	5	12	39'-2	5	12	8'-4	4	12	2'-5	6	9	7'-8	3'-5	4'-3	4	12	39'-2	7	12	8'-7	7	4.5	39'-2
3-6	5	4.5	38'-8	5	9	39'-2	4	9	6'-8	4	9	2'-5	6	9	7'-7	3'-4	4'-3	5	9	39'-2	6	9	8'-1	6	4.5	39'-2
7-8	7	4.5	38'-8	5	9	39'-2	4	9	7'-6	4	9	2'-5	6	9	7'-4	3'-0	4'-4	5	12	39'-2	7	12	8'-0	7	4.5	39'-2
9-10	6	4.5	38'-8	5	9	39'-2	4	9	8'-5	4	9	2'-5	5	6	7'-2	2'-8	4'-6	5	12	39'-2	7	12	8'-0	7	4.5	39'-2
11-12	7	4.5	38'-8	6	12	39'-2	5	12	8'-9	4	12	2'-5	5	6	7'-0	2'-5	4'-7	5	12	39'-2	7	12	8'-0	7	4.5	39'-2
13-15	7	4.5	38'-8	6	12	39'-2	5	12	10'-0	4	12	4'-5	4	6	7'-2	2'-5	4'-9	5	12	39'-2	7	12	8'-2	7	4.5	39'-2
16-17	6	4.5	38'-8	5	9	39'-2	5	9	10'-10	4	9	4'-7	4	6	7'-3	2'-5	4'-10	5	12	39'-2	7	12	8'-3	7	4.5	39'-2
18-19	6	4.5	38'-8	5	9	39'-2	5	9	11'-2	4	9	3'-3	4	6	7'-4	2'-5	4'-11	5	9	39'-2	6	9	8'-6	6	4.5	39'-2
20-21	6	4.5	38'-8	6	12	39'-2	6	12	11'-7	4	12	3'-3	4	6	7'-5	2'-5	5'-0	5	9	39'-2	6	9	8'-8	6	4.5	39'-2
22-23	6	4.5	38'-8	6	12	39'-2	6	12	11'-10	4	12	3'-3	4	6	7'-7	2'-6	5'-1	5	9	39'-2	6	9	8'-11	6	4.5	39'-2
24-25	6	4.5	38'-10	6	12	39'-4	6	12	12'-0	4	12	3'-8	5	9	7'-9	2'-7	5'-2	5	9	39'-4	6	9	9'-1	6	4.5	39'-4

Quantities

	Concrete (CY/FT)				Steel (LB/FT)
Fill	Slab	Floor	Walls	Total	
0	1.766	1.422	0.396	3.584	452.18
1	1.646	1.362	0.396	3.404	451.58
2	1.285	1.301	0.396	2.982	508.58
3-6	1.165	1.301	0.396	2.862	518.68
7-8	1.225	1.422	0.396	3.043	505.63
9-10	1.405	1.605	0.396	3.406	490.71
11-12	1.526	1.727	0.396	3.649	510.16
13-15	1.706	1.971	0.396	4.073	516.53
16-17	1.827	2.093	0.396	4.316	529.82
18-19	1.947	2.215	0.396	4.558	545.71
20-21	2.067	2.337	0.396	4.800	556.03
22-23	2.248	2.520	0.396	5.164	559.42
24-25	2.441	2.654	0.418	5.513	570.97

LATEST REVISION DATE
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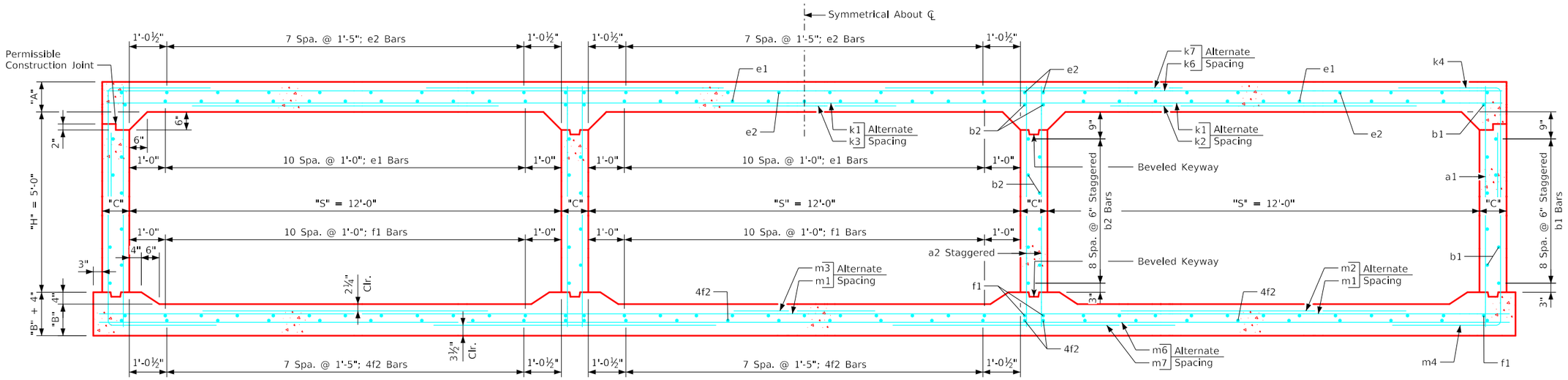
IOWA DOT

Standard Design
Triple Reinforced Concrete Box Culverts
July, 2020

Culvert Barrel Details
12' x 4' Barrel Sections

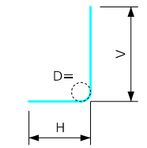
TRRCB 12-4-20



Triple 12' x 5' Barrel Section

Bent Bar Detail

Bars	D
4	3"
5	3¾"
6	4½"
7	5¼"



k4 & m4

Note:
All dimensions are out to out.
D = pin diameter.

Notes:

1. Dimensions listed on this sheet to be used in conjunction with Sheet TRRCB G3-20.
2. Fill, dimensions "S" and "H" are in feet.
3. Dimensions "A", "B", "C", "D", and "Sp." listed in the bar list are in inches.
4. Dimensions "L", "H", "V" are in feet and inches.

Variable Dimensions and Quantities for Triple 12' x 5' Barrel Sections

Fill	Dimensions S	H	A	B	C	D	E	R	T	U	W	X	Z
0	12	5	14	11.5	9	9	9	0'-0	0'-0	7'-3	3'-2	5'-2	4'-4
1	12	5	13	11	9	9	9	0'-9	0'-3	6'-10	2'-10	4'-4	4'-3
2	12	5	10	10	9	9	9	1'-9	1'-7	5'-9	3'-8	5'-2	4'-3
3-6	12	5	9	10	9	9	6	3'-8	2'-7	4'-7	3'-5	5'-2	4'-0
7-8	12	5	10	11	9	9	9	3'-0	2'-2	3'-11	3'-2	5'-2	3'-10
9-10	12	5	11	12.5	9	9	9	5'-2	2'-10	3'-10	2'-10	5'-2	3'-10
11-12	12	5	12	13.5	9	9	9	5'-2	2'-7	3'-10	2'-8	5'-2	3'-10
13-15	12	5	13.5	15.5	9	6	9	4'-1	2'-5	3'-10	2'-3	4'-2	3'-10
16-17	12	5	14.5	16.5	9	9	9	4'-0	1'-10	3'-10	2'-0	4'-1	3'-10
18-19	12	5	15.5	17.5	9	9	9	3'-11	1'-9	3'-11	1'-10	4'-9	3'-11
20-21	12	5	17	18.5	9	9	9	4'-0	1'-2	4'-0	1'-5	4'-9	4'-0
22-23	12	5	18	20	9	9	9	4'-2	1'-1	4'-0	1'-2	4'-9	4'-1
24-25	12	5	19.5	21.5	9	9	9	4'-1	0'-11	4'-1	1'-0	4'-9	4'-2

Fill	Bar List a1 Size	a1 Sp.	a1 L	a2 Size	a2 Sp.	a2 L	b1 Size	b1 Sp.	b1 No.	b2 Size	b2 Sp.	b2 No.	e1 Size	e1 Sp.	e1 No.	e2 Size	e2 Sp.	e2 No.	f1 Size	f1 Sp.	f1 No.	f2 Size	f2 Sp.	f2 No.	k1 Size	k1 Sp.	k1 L	k2 Size	k2 Sp.	k2 L	k3 Size	k3 Sp.	k3 L	k4 Size	k4 Sp.	k4 L	k4 H	k4 V	k6 Size	k6 Sp.	k6 L	k7 Size	k7 Sp.	k7 L
0	4	12	7'-0	6	9	7'-0	4	6	20	4	6	22	4	12	33	4	17	30	4	12	39	4	17	30	6	18	38'-8	6	18	12'-11	4	18	12'-9	6	12	7'-2	3'-2	4'-0	5	18	38'-8	6	18	14'-10
1	4	12	6'-11	6	9	6'-11	4	6	20	4	6	22	4	12	33	4	17	30	4	12	39	4	17	30	6	18	38'-8	6	18	12'-8	4	18	11'-3	6	12	7'-2	3'-3	3'-11	5	18	38'-8	6	18	14'-5
2	4	9	6'-7	7	9	6'-7	4	6	20	4	6	22	4	12	33	4	17	30	4	12	39	4	17	30	7	18	38'-8	6	18	11'-0	5	18	9'-3	6	9	7'-4	3'-8	3'-8	5	18	38'-8	8	18	13'-9
3-6	4	9	6'-6	5	6	6'-6	4	6	20	4	6	22	4	12	33	4	17	30	4	12	39	4	17	30	5	9	38'-8	4	9	8'-10	4	9	5'-5	6	9	7'-2	3'-7	3'-7	5	9	38'-8	5	9	9'-10
7-8	4	9	6'-8	6	9	6'-8	4	6	20	4	6	22	4	12	33	4	17	30	4	12	39	4	17	30	5	12	38'-8	5	12	9'-8	4	12	6'-9	6	9	6'-6	2'-10	3'-8	5	9	38'-8	5	9	8'-2
9-10	4	12	6'-10	6	9	6'-10	4	6	20	4	6	22	4	12	33	4	17	30	4	12	39	4	17	30	5	9	38'-8	4	9	8'-7	4	9	2'-5	5	6	5'-10	2'-6	3'-4	4	9	38'-8	6	9	8'-0
11-12	4	12	7'-0	6	9	7'-0	4	6	20	4	6	22	4	12	33	4	17	30	4	12	39	4	17	30	5	9	38'-8	4	9	9'-2	4	9	2'-5	5	6	5'-10	2'-5	3'-5	5	12	38'-8	7	12	8'-1
13-15	4	6	7'-4	6	9	7'-4	4	6	20	4	6	22	4	12	33	4	17	30	4	12	39	4	17	30	6	12	38'-8	5	12	10'-0	4	12	4'-7	4	6	5'-7	2'-5	3'-2	5	12	38'-8	7	12	8'-2
16-17	4	12	7'-6	6	9	7'-6	4	6	20	4	6	22	4	12	33	4	17	30	4	12	39	4	17	30	7	18	38'-8	7	18	11'-1	4	18	4'-9	4	6	5'-8	2'-5	3'-3	5	9	38'-8	6	9	8'-3
18-19	4	9	7'-8	6	9	7'-8	4	6	20	4	6	22	4	12	33	4	17	30	4	12	39	4	17	30	7	18	38'-8	7	18	11'-2	4	18	4'-11	4	6	5'-9	2'-5	3'-4	5	9	38'-8	6	9	8'-5
20-21	4	12	7'-10	6	9	7'-10	4	6	20	4	6	22	4	12	33	4	17	30	4	12	39	4	17	30	7	18	38'-8	7	18	11'-9	4	18	4'-9	4	6	5'-11	2'-6	3'-5	5	9	38'-8	6	9	8'-8
22-23	4	12	8'-1	6	9	8'-1	4	6	20	4	6	22	4	12	33	4	17	30	4	12	39	4	17	30	5	9	38'-8	5	9	11'-10	4	9	4'-5	4	6	6'-2	2'-7	3'-7	5	9	38'-8	6	9	8'-9
24-25	4	12	8'-4	6	9	8'-4	4	6	20	4	6	22	4	12	33	4	17	30	5	12	39	4	17	30	5	9	38'-8	5	9	12'-0	4	9	4'-7	4	6	6'-4	2'-8	3'-8	5	9	38'-8	6	9	9'-0

Fill	Bar List k9 Size	k9 Sp.	k9 L	m1 Size	m1 Sp.	m1 L	m2 Size	m2 Sp.	m2 L	m3 Size	m3 Sp.	m3 L	m4 Size	m4 Sp.	m4 L	m4 H	m4 V	m6 Size	m6 Sp.	m6 L	m7 Size	m7 Sp.	m7 L	m9 Size	m9 Sp.	m9 L	Quantities Concrete (CY/FT) Slab	Floor	Walls	Total	Steel (LB/FT)
0	6	4.5	38'-8	5	12	39'-2	4	12	8'-1	4	12	2'-5	7	12	9'-10	4'-5	5'-5	4	12	39'-2	6	12	8'-8	6	4.5	39'-2	1.766	1.483	0.507	3.756	466.74
1	6	4.5	38'-8	4	9	39'-2	4	9	8'-5	4	9	4'-1	7	12	9'-5	4'-1	5'-4	4	12	39'-2	6	12	8'-6	6	4.5	39'-2	1.646	1.422	0.507	3.575	460.39
2	8	4.5	38'-8	5	9	39'-2	4	9	6'-7	4	9	2'-5	6	9	8'-9	3'-6	5'-3	4	12	39'-2	7	12	8'-7	7	4.5	39'-2	1.285	1.301	0.507	3.093	538.84
3-6	5	4.5	38'-8	6	12	39'-2	5	12	7'-0	4	12	2'-5	6	9	8'-7	3'-4	5'-3	5	9	39'-2	6	9	8'-2	6	4.5	39'-2	1.165	1.301	0.507	2.973	546.55
7-8	5	4.5	38'-8	6	12	39'-2	5	12	7'-8	4	12	2'-5	6	9	8'-4	3'-0	5'-4	5	9	39'-2	6	9	7'-10	6	4.5	39'-2	1.285	1.422	0.507	3.214	529.61
9-10	6	4.5	38'-8	6	12	39'-2	5	12	8'-7	4	12	2'-5	5	6	8'-1	2'-7	5'-6	5	12	39'-2	7	12	8'-0	7	4.5	39'-2	1.405	1.605	0.507	3.517	514.61
11-12	7	4.5	38'-8	6	12	39'-2	5	12	9'-0	4	12	2'-5	5	6	8'-1	2'-6	5'-7	5	12	39'-2	7	12	8'-0	7	4.5	39'-2	1.526	1.727	0.507	3.760	526.42
13-15	7	4.5	38'-8	5	9	39'-2	5	9	10'-4	4	9	4'-5	4	6	8'-2	2'-5	5'-9	5	12	39'-2	7	12	8'-2	7	4.5	39'-2	1.706	1.971	0.507	4.184	533.87
16-17	6	4.5	38'-8	5	9	39'-2	5	9	10'-11	4	9	4'-7	4	6	8'-4	2'-6	5'-10	5	12	39'-2	7	12	8'-3	7	4.5	39'-2	1.827	2.093	0.507	4.427	549.47
18-19	6	4.5	38'-8	5	9	39'-2	5	9	11'-2	4	9	3'-3	4	6	8'-5	2'-6	5'-11	5	9	39'-2	6	9	8'-6	6	4.5	39'-2	1.947	2.215	0.507	4.669	559.79
20-21	6	4.5	38'-8	6	12	39'-2	6	12	11'-7	4	12	3'-3	4	6	8'-6	2'-6	6'-0	5	9	39'-2	6	9	8'-8	6	4.5	39'-2	2.127	2.337	0.507	4.971	573.79
22-23	6	4.5	38'-8	6	12	39'-2	6	12	11'-10	4	12	3'-3	4	6	8'-8	2'-7	6'-1	5	9	39'-2	6	9	8'-11	6	4.5	39'-2	2.248	2.520	0.507	5.275	573.42
24-25	6	4.5	38'-8	6	12	39'-2	6	12	12'-0	4	12	3'-3	4	6	8'-11	2'-8	6'-3	5	9	39'-2	6	9	9'-2	6	4.5	39'-2	2.428	2.703	0.507	5.638	593.37

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IOWA DOT

Standard Design

Triple Reinforced Concrete Box Culverts

July, 2020

Culvert Barrel Details

12' x 5' Barrel Sections

TRRCB 12-5-20

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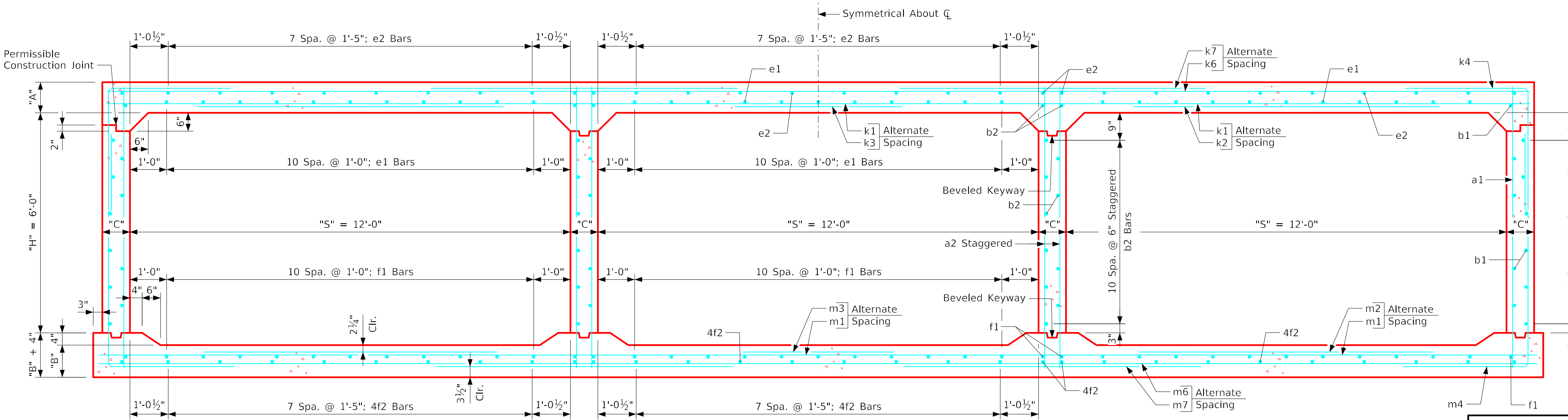


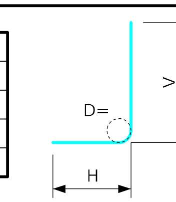
Triple 12' x 6' Barrel Section

Notes:

1. Dimensions listed on this sheet to be used in conjunction with Sheet TRRCB G3-20.
2. Fill, dimensions "S" and "H" are in feet.
3. Dimensions "A", "B", "C", "D", and "Sp." listed in the bar list are in inches.
4. Dimensions "L", "H", "V" are in feet and inches.

Bent Bar Detail

Bars	D
4	3"
5	3¾"
6	4½"
7	5¼"



k4 & m4

Note:
All dimensions are out to out.
D = pin diameter.

Variable Dimensions and Quantities for Triple 12' x 6' Barrel Sections

Dimensions

Fill	S	H	A	B	C	D	E	R	T	U	W	X	Z
0	12	6	14	11.5	9	9	9	0'-0	0'-0	7'-7	2'-9	4'-4	4'-3
1	12	6	13	11	9	9	9	0'-8	0'-2	7'-1	2'-8	4'-5	4'-3
2	12	6	10	10	9	9	9	2'-2	1'-11	5'-11	3'-7	5'-2	4'-1
3-6	12	6	9	10	9	9	9	3'-11	2'-6	4'-8	3'-4	5'-2	4'-0
7-8	12	6	10	11	9	9	9	5'-2	2'-11	3'-11	3'-1	5'-2	3'-9
9-10	12	6	11	12.5	9	9	9	5'-2	2'-9	3'-10	2'-9	5'-2	3'-10
11-12	12	6	12	14	9	9	9	5'-2	2'-9	3'-10	2'-8	4'-3	3'-9
13-15	12	6	13.5	15.5	9	6	9	4'-1	2'-5	3'-10	2'-3	4'-2	3'-10
16-17	12	6	14.5	16.5	9	9	9	4'-0	1'-10	3'-10	2'-0	4'-1	3'-10
18-19	12	6	15.5	17.5	9	9	9	3'-11	1'-9	3'-11	1'-10	4'-9	3'-11
20-21	12	6	16.5	19	9	9	9	3'-10	1'-4	3'-11	1'-3	4'-7	4'-0
22-23	12	6	18	20	9	9	9	4'-0	1'-1	4'-0	1'-2	4'-8	4'-1
24-25	12	6	19.5	21.5	9	9	9	4'-4	1'-0	4'-1	1'-0	4'-9	4'-2

Bar List

	a1			a2			b1			b2			e1			e2			f1			f2		
Fill	Size	Sp.	L	Size	Sp.	L	Size	Sp.	No.	Size	Sp.	No.	Size	Sp.	No.	Size	Sp.	No.	Size	Sp.	No.	Size	Sp.	No.
0	4	12	8'-0	6	9	8'-0	4	6	24	4	6	26	4	12	33	4	17	30	4	12	39	4	17	30
1	4	12	7'-11	6	9	7'-11	4	6	24	4	6	26	4	12	33	4	17	30	4	12	39	4	17	30
2	4	9	7'-7	7	9	7'-7	4	6	24	4	6	26	4	12	33	4	17	30	4	12	39	4	17	30
3-6	4	9	7'-6	6	9	7'-6	4	6	24	4	6	26	4	12	33	4	17	30	4	12	39	4	17	30
7-8	4	9	7'-8	6	9	7'-8	4	6	24	4	6	26	4	12	33	4	17	30	4	12	39	4	17	30
9-10	4	12	7'-10	6	9	7'-10	4	6	24	4	6	26	4	12	33	4	17	30	4	12	39	4	17	30
11-12	4	12	8'-1	6	9	8'-1	4	6	24	4	6	26	4	12	33	4	17	30	4	12	39	4	17	30
13-15	4	6	8'-4	6	9	8'-4	4	6	24	4	6	26	4	12	33	4	17	30	4	12	39	4	17	30
16-17	5	12	8'-6	6	9	8'-6	4	6	24	4	6	26	4	12	33	4	17	30	4	12	39	4	17	30
18-19	5	12	8'-8	6	9	8'-8	4	6	24	4	6	26	4	12	33	4	17	30	4	12	39	4	17	30
20-21	4	9	8'-10	6	9	8'-10	4	6	24	4	6	26	4	12	33	4	17	30	4	12	39	4	17	30
22-23	4	9	9'-1	6	9	9'-1	4	6	24	4	6	26	4	12	33	4	17	30	4	12	39	4	17	30
24-25	4	9	9'-4	6	9	9'-4	4	6	24	4	6	26	4	12	33	4	17	30	5	12	39	4	17	30

	k1			k2			k3			k4					k6			k7		
Fill	Size	Sp.	L	Size	Sp.	L	Size	Sp.	L	Size	Sp.	L	H	V	Size	Sp.	L	Size	Sp.	L
0	6	18	38'-8	6	18	12'-11	4	18	12'-9	4	6	7'-2	3'-7	3'-7	5	18	38'-8	6	18	15'-2
1	6	18	38'-8	6	18	12'-9	4	18	11'-5	6	12	7'-10	3'-11	3'-11	5	18	38'-8	6	18	14'-8
2	6	12	38'-8	5	12	10'-0	4	12	8'-5	6	9	7'-4	3'-8	3'-8	5	18	38'-8	8	18	13'-11
3-6	5	9	38'-8	4	9	8'-8	4	9	4'-11	6	9	7'-2	3'-7	3'-7	5	9	38'-8	5	9	10'-1
7-8	5	9	38'-8	4	9	8'-3	4	9	2'-5	6	9	6'-7	2'-11	3'-8	5	9	38'-8	5	9	8'-3
9-10	5	9	38'-8	4	9	8'-9	4	9	2'-5	5	6	5'-11	2'-7	3'-4	4	9	38'-8	6	9	8'-0
11-12	6	12	38'-8	5	12	8'-11	4	12	2'-5	5	6	6'-0	2'-7	3'-5	5	12	38'-8	7	12	8'-1
13-15	6	12	38'-8	5	12	10'-0	4	12	4'-7	4	6	5'-8	2'-6	3'-2	5	12	38'-8	7	12	8'-2
16-17	7	18	38'-8	7	18	11'-1	4	18	4'-9	4	6	5'-9	2'-6	3'-3	5	9	38'-8	6	9	8'-3
18-19	7	18	38'-8	7	18	11'-2	4	18	4'-11	4	6	5'-11	2'-7	3'-4	5	9	38'-8	6	9	8'-5
20-21	5	9	38'-8	5	9	11'-7	4	9	5'-1	4	6	6'-0	2'-7	3'-5	5	9	38'-8	6	9	8'-6
22-23	5	9	38'-8	5	9	11'-10	4	9	4'-9	4	6	6'-3	2'-8	3'-7	5	9	38'-8	6	9	8'-9
24-25	6	12	38'-8	6	12	11'-11	4	12	4'-1	4	6	6'-5	2'-9	3'-8	5	9	38'-8	6	9	8'-11

Bar List

	k9			m1			m2			m3			m4				
Fill	Size	Sp.	L	Size	Sp.	L	Size	Sp.	L	Size	Sp.	L	Size	Sp.	L	H	V
0	6	4.5	38'-8	4	9	39'-2	4	9	8'-10	4	9	4'-1	5	6	11'-1	4'-8	6'-5
1	6	4.5	38'-8	5	12	39'-2	5	12	8'-8	4	12	3'-11	7	12	10'-10	4'-6	6'-4
2	8	4.5	38'-8	5	9	39'-2	4	9	6'-9	4	9	2'-5	6	9	9'-9	3'-6	6'-3
3-6	5	4.5	38'-8	6	12	39'-2	5	12	7'-2	4	12	2'-5	6	9	9'-8	3'-5	6'-3
7-8	5	4.5	38'-8	6	12	39'-2	5	12	7'-11	4	12	2'-5	6	9	9'-5	3'-1	6'-4
9-10	6	4.5	38'-8	6	12	39'-2	5	12	8'-9	4	12	2'-5	5	6	9'-3	2'-9	6'-6
11-12	7	4.5	38'-8	6	12	39'-2	5	12	9'-2	4	12	4'-3	5	6	9'-2	2'-7	6'-7
13-15	7	4.5	38'-8	5	9	39'-2	5	9	10'-5	4	9	4'-5	4	6	9'-4	2'-7	6'-9
16-17	6	4.5	38'-8	5	9	39'-2	5	9	11'-0	4	9	4'-7	4	6	9'-5	2'-7	6'-10
18-19	6	4.5	38'-8	5	9	39'-2	5	9	11'-2	4	9	3'-3	4	6	9'-6	2'-7	6'-11
20-21	6	4.5	38'-8	5	9	39'-2	5	9	11'-9	4	9	3'-7	4	6	9'-8	2'-8	7'-0
22-23	6	4.5	38'-8	6	12	39'-2	6	12	11'-10	4	12	3'-5	4	6	9'-10	2'-9	7'-1
24-25	6	4.5	38'-8	6	12	39'-2	6	12	12'-0	4	12	3'-3	4	6	10'-1	2'-10	7'-3

	m6			m7			m9			Quantities: Concrete (CY/FT)				Steel (LB/FT)
Fill	Size	Sp.	L	Size	Sp.	L	Size	Sp.	L	Slab	Floor	Walls	Total	
0	4	12	39'-2	6	12	8'-7	6	4.5	39'-2	1.766	1.483	0.618	3.867	476.47
1	4	9	39'-2	5	9	8'-7	5	4.5	39'-2	1.646	1.422	0.618	3.686	494.53
2	5	9	39'-2	5	9	8'-4	5	4.5	39'-2	1.285	1.301	0.618	3.204	568.68
3-6	5	9	39'-2	6	9	8'-2	6	4.5	39'-2	1.165	1.301	0.618	3.084	561.58
7-8	5	9	39'-2	6	9	7'-9	6	4.5	39'-2	1.285	1.422	0.618	3.325	551.26
9-10	5	12	39'-2	7	12	8'-0	7	4.5	39'-2	1.405	1.605	0.618	3.628	531.18
11-12	4	9	39'-2	6	9	7'-11	6	4.5	39'-2	1.526	1.788	0.618	3.932	543.21
13-15	5	12	39'-2	7	12	8'-2	7	4.5	39'-2	1.706	1.971	0.618	4.295	549.47
16-17	5	12	39'-2	7	12	8'-3	7	4.5	39'-2	1.827	2.093	0.618	4.538	564.34
18-19	5	9	39'-2	6	9	8'-6	6	4.5	39'-2	1.947	2.215	0.618	4.780	577.29
20-21	5	12	39'-2	7	12	8'-8	7	4.5	39'-2	2.067	2.398	0.618	5.083	568.47
22-23	5	9	39'-2	6	9	8'-11	6	4.5	39'-2	2.248	2.520	0.618	5.386	591.74
24-25	5	9	39'-2	6	9	9'-1	6	4.5	39'-2	2.428	2.703	0.618	5.749	618.16

LATEST REVISION DATE

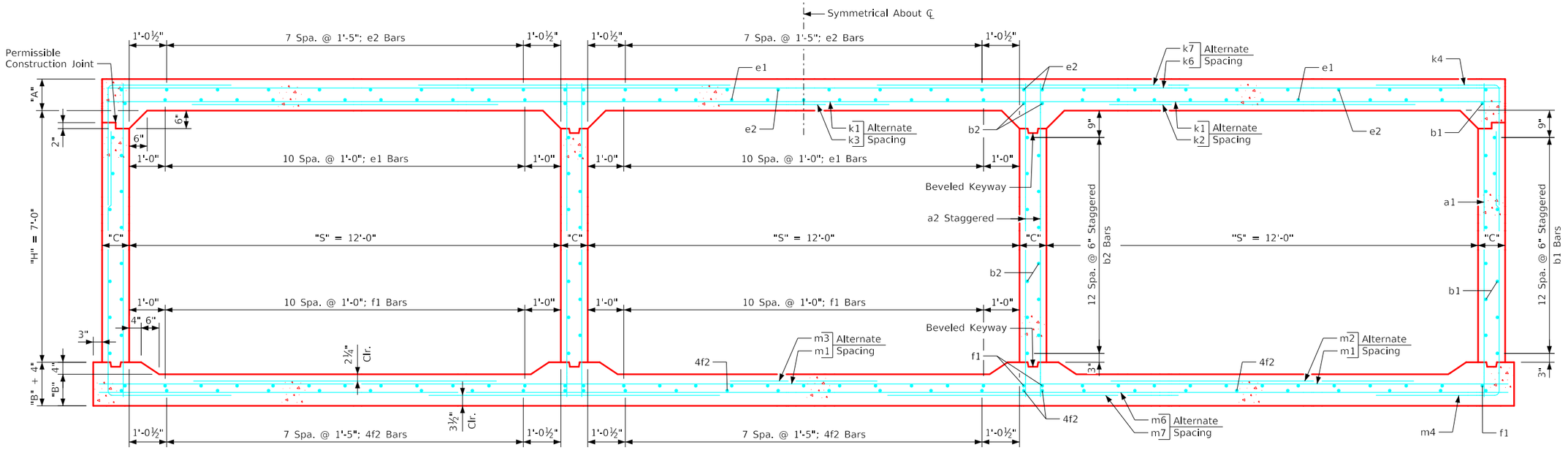
APPROVED BY BRIDGE ENGINEER

IOWA DOT

Standard Design
Triple Reinforced Concrete Box Culverts
July, 2020

Culvert Barrel Details
12' x 6' Barrel Sections

TRRCB 12-6-20



Triple 12' x 7' Barrel Section

Notes:

1. Dimensions listed on this sheet to be used in conjunction with Sheet TRRCB G3-20.
2. Fill, dimensions "S" and "H" are in feet.
3. Dimensions "A", "B", "C", "D", and "Sp." listed in the bar list are in inches.
4. Dimensions "L", "H", "V" are in feet and inches.

LATEST REVISION DATE

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IOWADOT

Standard Design

Triple Reinforced Concrete Box Culverts

July, 2020

Culvert Barrel Details

12' x 7' Barrel Sections

TRRCB 12-7-20

Sheet 1 of 2

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Variable Dimensions and Quantities for Triple 12' x 7' Barrel Sections

Dimensions

Fill	S	H	A	B	C	D	E	R	T	U	W	X	Z
0	12	7	14	11.5	9	9	9	0'-0	0'-0	7'-7	2'-7	5'-2	4'-3
1	12	7	13	11	9	9	9	0'-8	0'-1	7'-7	2'-8	4'-5	4'-3
2	12	7	10	10	9	9	9	2'-5	1'-10	6'-1	3'-6	5'-2	4'-1
3-6	12	7	9	10.5	9	9	9	3'-10	2'-6	4'-9	3'-6	5'-2	4'-1
7-8	12	7	10	11.5	9	9	9	5'-2	2'-11	3'-11	3'-2	5'-2	3'-11
9-10	12	7	11	13	9	9	9	5'-2	2'-9	3'-10	2'-10	5'-2	3'-8
11-12	12	7	12	14	9	9	9	5'-2	2'-9	3'-10	2'-8	4'-3	3'-9
14-15	12	7	13.5	15.5	9	6	9	5'-2	2'-5	3'-10	2'-3	4'-2	3'-9
16-17	12	7	14.5	16.5	9	6	9	4'-0	1'-10	3'-10	2'-0	4'-1	3'-10
18-19	12	7	15.5	18	9	6	9	3'-11	1'-9	3'-11	1'-8	4'-9	3'-11
20-21	12	7	17	19	9	6	9	3'-9	1'-2	4'-0	1'-8	4'-9	4'-0
22-23	12	7	18	20	9	6	9	3'-9	1'-1	4'-0	1'-2	4'-8	4'-1
24-25	12	7	19.5	21.5	9	9	9	3'-8	0'-11	4'-1	1'-0	4'-6	4'-2

Bar List

Fill	a1			a2			b1			b2			e1			e2			f1			f2		
	Size	Sp.	L	Size	Sp.	L	Size	Sp.	No.	Size	Sp.	No.	Size	Sp.	No.	Size	Sp.	No.	Size	Sp.	No.	Size	Sp.	No.
0	4	12	9'-0	6	9	9'-0	4	6	28	4	6	30	4	12	33	4	17	30	4	12	39	4	17	30
1	4	12	8'-11	6	9	8'-11	4	6	28	4	6	30	4	12	33	4	17	30	4	12	39	4	17	30
2	4	9	8'-7	7	9	8'-7	4	6	28	4	6	30	4	12	33	4	17	30	4	12	39	4	17	30
3-6	4	12	8'-6	6	9	8'-6	4	6	28	4	6	30	4	12	33	4	17	30	4	12	39	4	17	30
7-8	4	12	8'-8	6	9	8'-8	4	6	28	4	6	30	4	12	33	4	17	30	4	12	39	4	17	30
9-10	4	12	8'-11	6	9	8'-11	4	6	28	4	6	30	4	12	33	4	17	30	4	12	39	4	17	30
11-12	4	12	9'-1	6	9	9'-1	4	6	28	4	6	30	4	12	33	4	17	30	4	12	39	4	17	30
14-15	4	6	9'-4	6	9	9'-4	4	6	28	4	6	30	4	12	33	4	17	30	4	12	39	4	17	30
16-17	4	6	9'-6	6	9	9'-6	4	6	28	4	6	30	4	12	33	4	17	30	4	12	39	4	17	30
18-19	4	6	9'-8	6	9	9'-8	4	6	28	4	6	30	4	12	33	4	17	30	4	12	39	4	17	30
20-21	4	6	9'-11	6	9	9'-11	4	6	28	4	6	30	4	12	33	4	17	30	4	12	39	4	17	30
22-23	4	6	10'-1	6	9	10'-1	4	6	28	4	6	30	4	12	33	4	17	30	4	12	39	4	17	30
24-25	5	12	10'-4	6	9	10'-4	4	6	28	4	6	30	4	12	33	4	17	30	5	12	39	4	17	30

Fill	k1			k2			k3			k4					k6			k7		
	Size	Sp.	L	Size	Sp.	L	Size	Sp.	L	Size	Sp.	L	H	V	Size	Sp.	L	Size	Sp.	L
0	6	18	38'-8	6	18	12'-11	4	18	12'-9	5	9	7'-10	4'-3	3'-7	5	18	38'-8	6	18	15'-2
1	6	18	38'-8	6	18	12'-10	5	18	11'-5	6	12	8'-8	4'-4	4'-4	5	18	38'-8	6	18	15'-2
2	6	12	38'-8	5	12	10'-2	4	12	7'-11	6	9	7'-4	3'-8	3'-8	5	18	38'-8	8	18	14'-1
3-6	5	9	38'-8	4	9	8'-10	4	9	5'-1	5	6	7'-0	3'-6	3'-6	5	9	38'-8	5	9	10'-3
7-8	5	9	38'-8	4	9	8'-4	4	9	2'-5	5	6	6'-6	3'-3	3'-3	5	9	38'-8	5	9	8'-3
9-10	5	9	38'-8	4	9	8'-10	4	9	2'-5	5	6	6'-2	2'-10	3'-4	4	9	38'-8	6	9	8'-1
11-12	6	12	38'-8	5	12	9'-0	4	12	2'-5	5	6	6'-2	2'-9	3'-5	5	12	38'-8	7	12	8'-2
14-15	6	12	38'-8	5	12	10'-1	4	12	2'-5	6	12	6'-7	2'-8	3'-11	5	12	38'-8	7	12	8'-2
16-17	7	18	38'-8	7	18	11'-1	4	18	4'-9	6	12	6'-8	2'-8	4'-0	5	9	38'-8	6	9	8'-3
18-19	7	18	38'-8	7	18	11'-2	4	18	4'-11	4	6	6'-1	2'-9	3'-4	5	9	38'-8	6	9	8'-5
20-21	7	18	38'-8	7	18	11'-9	4	18	5'-3	4	6	6'-4	2'-10	3'-6	5	9	38'-8	6	9	8'-8
22-23	5	9	38'-8	5	9	11'-10	4	9	5'-3	4	6	6'-5	2'-10	3'-7	5	9	38'-8	6	9	8'-9
24-25	5	9	38'-8	5	9	12'-0	4	9	5'-5	4	6	6'-7	2'-11	3'-8	5	9	38'-8	6	9	8'-11

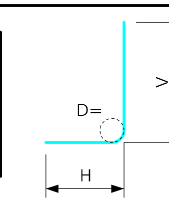
Bar List

Fill	k9			m1			m2			m3			m4				
	Size	Sp.	L	Size	Sp.	L	Size	Sp.	L	Size	Sp.	L	Size	Sp.	L	H	V
0	6	4.5	38'-8	6	18	39'-2	6	18	9'-2	4	18	2'-5	6	9	12'-8	5'-3	7'-5
1	6	4.5	38'-8	5	12	39'-2	5	12	8'-9	4	12	3'-11	7	12	12'-3	4'-11	7'-4
2	8	4.5	38'-8	6	12	39'-2	5	12	7'-0	4	12	2'-5	6	9	11'-0	3'-9	7'-3
3-6	5	4.5	38'-8	6	12	39'-2	5	12	7'-1	4	12	2'-5	5	6	10'-10	3'-6	7'-4
7-8	5	4.5	38'-8	6	12	39'-2	5	12	7'-11	4	12	2'-5	5	6	10'-6	3'-1	7'-5
9-10	6	4.5	38'-8	6	12	39'-2	5	12	8'-10	4	12	2'-5	5	6	10'-4	2'-10	7'-6
11-12	7	4.5	38'-8	6	12	39'-2	5	12	9'-3	4	12	4'-3	5	6	10'-4	2'-9	7'-7
13-15	7	4.5	38'-8	5	9	39'-2	5	9	10'-6	4	9	4'-5	6	12	10'-6	2'-9	7'-9
16-17	6	4.5	38'-8	5	9	39'-2	5	9	11'-0	4	9	4'-7	6	12	10'-7	2'-9	7'-10
18-19	6	4.5	38'-8	5	9	39'-2	5	9	11'-4	4	9	3'-3	4	6	10'-9	2'-10	7'-11
20-21	6	4.5	38'-8	6	12	39'-2	6	12	11'-4	4	12	3'-3	4	6	10'-10	2'-10	8'-0
22-23	6	4.5	38'-8	6	12	39'-2	6	12	11'-10	4	12	3'-5	4	6	11'-0	2'-11	8'-1
24-25	6	4.5	38'-8	6	12	39'-2	6	12	12'-0	4	12	3'-9	4	6	11'-3	3'-0	8'-3

Fill	m6			m7			m9			Quantities: Concrete (CY/FT)				Steel
	Size	Sp.	L	Size	Sp.	L	Size	Sp.	L	Slab	Floor	Walls	Total	(LB/FT)
0	4	9	39'-2	5	9	8'-7	5	4.5	39'-2	1.766	1.483	0.729	3.978	509.84
1	4	9	39'-2	5	9	8'-6	5	4.5	39'-2	1.646	1.422	0.729	3.797	517.95
2	4	9	39'-2	6	9	8'-4	6	4.5	39'-2	1.285	1.301	0.729	3.315	588.16
3-6	5	12	39'-2	7	12	8'-5	7	4.5	39'-2	1.165	1.362	0.729	3.256	565.55
7-8	5	12	39'-2	7	12	8'-1	7	4.5	39'-2	1.285	1.483	0.729	3.497	554.97
9-10	4	9	39'-2	6	9	7'-9	6	4.5	39'-2	1.405	1.666	0.729	3.800	538.79
11-12	4	9	39'-2	6	9	7'-11	6	4.5	39'-2	1.526	1.788	0.729	4.043	560.26
13-15	5	12	39'-2	7	12	8'-1	7	4.5	39'-2	1.706	1.971	0.729	4.406	574.95
16-17	5	12	39'-2	7	12	8'-3	7	4.5	39'-2	1.827	2.093	0.729	4.649	595.68
18-19	5	12	39'-2	7	12	8'-6	7	4.5	39'-2	1.947	2.276	0.729	4.952	588.18
20-21	5	12	39'-2	7	12	8'-8	7	4.5	39'-2	2.127	2.398	0.729	5.254	602.16
22-23	5	9	39'-2	6	9	8'-11	6	4.5	39'-2	2.248	2.520	0.729	5.497	615.76
24-25	5	9	39'-2	6	9	9'-1	6	4.5	39'-2	2.428	2.703	0.729	5.860	630.11

Bent Bar Detail

Bars	D
4	3"
5	3¾"
6	4½"
7	5¼"



k4 & m4

Note:
All dimensions are out to out.
D = pin diameter.

Notes:

1. Dimensions listed on this sheet to be used in conjunction with Sheet TRRCB G3-20.
2. Fill, dimensions "S" and "H" are in feet.
3. Dimensions "A", "B", "C", "D", and "Sp." listed in the bar list are in inches.
4. Dimensions "L", "H", "V" are in feet and inches.

LATEST REVISION DATE

APPROVED BY BRIDGE ENGINEER

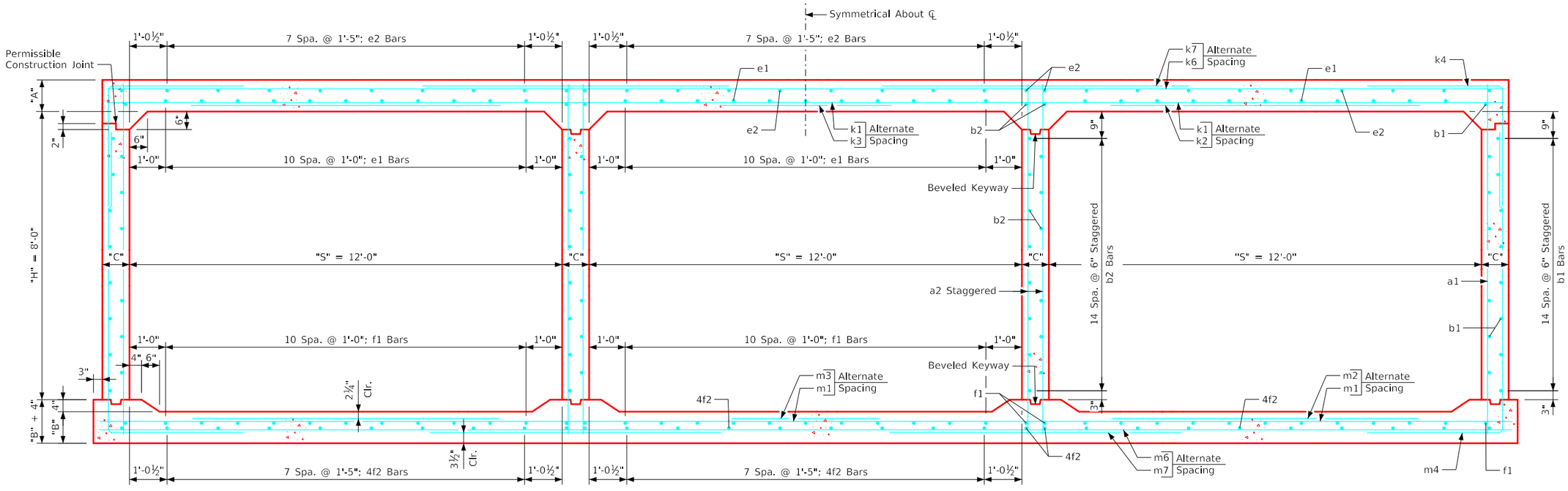
IOWA DOT

Standard Design
Triple Reinforced Concrete Box Culverts
July, 2020

Culvert Barrel Details
12' x 7' Barrel Sections

TRRCB 12-7-20
Sheet 2 of 2

ENGLISHLRFDSIGNEDTRIPLECULVERTS.DGN - TRRCB 12-7s2-20 - THIS SHEET ISSUED 07-2020.



Triple 12' x 8' Barrel Section

Notes:

1. Dimensions listed on this sheet to be used in conjunction with Sheet TRRCB G3-20.
2. Fill, dimensions "S" and "H" are in feet.
3. Dimensions "A", "B", "C", "D", and "Sp." listed in the bar list are in inches.
4. Dimensions "L", "H", "V" are in feet and inches.

LATEST REVISION DATE

APPROVED BY BRIDGE ENGINEER

IOWADOT

Standard Design

Triple Reinforced Concrete Box Culverts

July, 2020

Culvert Barrel Details

12' x 8' Barrel Sections

TRRCB 12-8-20

Sheet 1 of 2

ENGLISHLRFDSIGNEDTRIPLECULVERTS.DGN - TRRCB 12-8s1-20 - THIS SHEET ISSUED 07-2020.

Variable Dimensions and Quantities for Triple 12' x 8' Barrel Sections

Dimensions													
Fill	S	H	A	B	C	D	E	R	T	U	W	X	Z
0	12	8	14	11.5	9	9	9	0'-2	0'-0	7'-7	2'-7	4'-5	4'-4
1	12	8	13	11	9	9	9	0'-10	0'-4	7'-7	2'-8	4'-5	4'-3
2	12	8	10	10	9	9	9	2'-4	1'-10	6'-3	3'-5	5'-2	4'-1
3-6	12	8	9	10.5	9	9	9	3'-8	2'-4	4'-10	3'-5	5'-2	4'-1
7-8	12	8	10	11.5	9	9	9	5'-2	2'-10	3'-11	3'-1	5'-2	3'-11
9-10	12	8	11	13	9	9	9	5'-2	2'-9	3'-10	2'-9	5'-2	3'-8
11-12	12	8	12	14	9	9	9	5'-2	2'-8	3'-10	2'-8	5'-2	3'-9
13-15	12	8	13.5	15.5	9	9	9	4'-1	2'-5	3'-10	2'-2	4'-2	3'-9
16-17	12	8	14.5	17	9	9	9	4'-0	1'-10	3'-10	1'-11	4'-0	3'-10
18-19	12	8	16	18	9	9	9	3'-10	1'-8	3'-11	1'-8	4'-9	3'-11
20-21	12	8	17	19	9.5	9	6	3'-8	1'-2	4'-0	1'-8	4'-10	4'-0
23-25	12	8	18	20	10	6	9	3'-8	1'-1	4'-1	1'-2	4'-4	4'-1
24-25	12	8	19	21.5	10	6	9	3'-8	1'-1	4'-1	1'-0	4'-2	4'-3

	Bar List																							
	a1			a2			b1			b2			e1			e2			f1			f2		
Fill	Size	Sp.	L	Size	Sp.	L	Size	Sp.	No.	Size	Sp.	No.	Size	Sp.	No.	Size	Sp.	No.	Size	Sp.	No.	Size	Sp.	No.
0	4	12	10'-0	6	9	10'-0	4	6	32	4	6	34	4	12	33	4	17	30	4	12	39	4	17	30
1	4	12	9'-11	6	9	9'-11	4	6	32	4	6	34	4	12	33	4	17	30	4	12	39	4	17	30
2	4	9	9'-7	6	9	9'-7	4	6	32	4	6	34	4	12	33	4	17	30	4	12	39	4	17	30
3-6	4	12	9'-6	6	9	9'-6	4	6	32	4	6	34	4	12	33	4	17	30	4	12	39	4	17	30
7-8	4	12	9'-8	6	9	9'-8	4	6	32	4	6	34	4	12	33	4	17	30	4	12	39	4	17	30
9-10	4	12	9'-11	6	9	9'-11	4	6	32	4	6	34	4	12	33	4	17	30	4	12	39	4	17	30
11-12	4	12	10'-1	6	9	10'-1	4	6	32	4	6	34	4	12	33	4	17	30	4	12	39	4	17	30
13-15	4	12	10'-4	6	9	10'-4	4	6	32	4	6	34	4	12	33	4	17	30	4	12	39	4	17	30
16-17	4	12	10'-6	6	9	10'-6	4	6	32	4	6	34	4	12	33	4	17	30	4	12	39	4	17	30
18-19	4	12	10'-9	6	9	10'-9	4	6	32	4	6	34	4	12	33	4	17	30	4	12	39	4	17	30
20-21	4	12	10'-11	5	6	10'-11	4	6	32	4	6	34	4	12	33	4	17	30	4	12	39	4	17	30
23-25	4	6	11'-1	7	9	11'-1	4	6	32	4	6	34	4	12	33	4	17	30	4	12	39	4	17	30
24-25	4	6	11'-3	7	9	11'-3	4	6	32	4	6	34	4	12	33	4	17	30	5	12	39	4	17	30

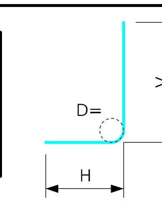
	Bar List																				
	k1			k2			k3			k4					k6			k7		
Fill	Size	Sp.	L	Size	Sp.	L	Size	Sp.	L	Size	Sp.	L	H	V	Size	Sp.	L	Size	Sp.	L
0	6	18	38'-8	6	18	12'-11	4	18	12'-5	4	6	10'-2	7'-0	3'-2	5	18	38'-8	6	18	15'-2
1	5	12	38'-8	5	12	12'-7	4	12	11'-1	6	12	9'-5	5'-6	3'-11	5	18	38'-8	6	18	15'-2
2	6	12	38'-8	5	12	10'-4	4	12	8'-1	6	9	7'-10	4'-2	3'-8	5	18	38'-8	8	18	14'-3
3-6	4	6	38'-8	4	6	9'-1	4	9	5'-5	5	6	6'-11	3'-9	3'-2	5	9	38'-8	5	9	10'-5
7-8	5	9	38'-8	4	9	8'-6	4	9	2'-5	5	6	6'-6	3'-3	3'-3	5	9	38'-8	5	9	8'-3
9-10	5	9	38'-8	4	9	8'-10	4	9	2'-5	5	6	6'-8	3'-4	3'-4	4	9	38'-8	6	9	8'-1
11-12	6	12	38'-8	5	12	9'-1	4	12	2'-5	5	6	6'-10	3'-5	3'-5	5	12	38'-8	7	12	8'-2
13-15	6	12	38'-8	5	12	9'-9	4	12	4'-7	5	6	6'-6	3'-0	3'-6	5	12	38'-8	7	12	8'-3
16-17	7	18	38'-8	7	18	11'-1	4	18	4'-9	5	6	6'-8	3'-0	3'-8	5	9	38'-8	6	9	8'-3
18-19	7	18	38'-8	7	18	11'-3	4	18	5'-1	5	6	6'-9	3'-0	3'-9	5	12	38'-8	7	12	8'-6
20-21	7	18	38'-10	7	18	11'-10	4	18	5'-6	6	9	7'-4	3'-1	4'-3	5	12	38'-10	7	12	8'-8
23-25	5	9	39'-0	5	9	12'-0	4	9	5'-6	6	12	7'-6	3'-2	4'-4	5	9	39'-0	6	9	8'-10
24-25	6	12	39'-0	6	12	12'-0	4	12	5'-6	6	12	7'-8	3'-3	4'-5	5	9	39'-0	6	9	8'-10

	Bar List														
	k9			m1			m2			m3			m4		
Fill	Size	Sp.	L	Size	Sp.	L	Size	Sp.	L	Size	Sp.	L	Size	Sp.	L
0	6	4.5	38'-8	5	12	39'-2	5	12	8'-11	4	12	3'-11	5	6	14'-2
1	6	4.5	38'-8	5	12	39'-2	5	12	8'-9	4	12	3'-11	7	12	13'-10
2	8	4.5	38'-8	6	12	39'-2	5	12	7'-2	4	12	2'-5	6	9	12'-4
3-6	5	4.5	38'-8	6	12	39'-2	5	12	7'-7	4	12	2'-5	5	6	12'-1
7-8	5	4.5	38'-8	6	12	39'-2	5	12	8'-1	4	12	2'-5	5	6	11'-8
9-10	6	4.5	38'-8	6	12	39'-2	5	12	9'-0	4	12	2'-5	5	6	11'-7
11-12	7	4.5	38'-8	6	12	39'-2	5	12	9'-4	4	12	2'-5	5	6	11'-7
13-15	7	4.5	38'-8	5	9	39'-2	5	9	10'-4	4	9	4'-5	5	6	11'-10
16-17	6	4.5	38'-8	5	9	39'-2	5	9	11'-1	4	9	4'-9	5	6	11'-11
18-19	7	4.5	38'-8	5	9	39'-2	5	9	11'-4	4	9	3'-3	5	6	12'-0
20-21	7	4.5	38'-10	6	12	39'-4	6	12	11'-5	4	12	3'-2	6	9	12'-2
22-23	6	4.5	39'-0	6	12	39'-6	6	12	11'-11	4	12	4'-2	6	12	12'-4
24-25	6	4.5	39'-0	6	12	39'-6	6	12	12'-1	4	12	4'-6	6	12	12'-7

	Bar List											Quantities				
	m4		m6			m7			m9			Concrete (CY/FT)				Steel
Fill	H	V	Size	Sp.	L	Size	Sp.	L	Size	Sp.	L	Slab	Floor	Walls	Total	(LB/FT)
0	5'-9	8'-5	4	9	39'-2	5	9	8'-9	5	4.5	39'-2	1.766	1.483	0.840	4.089	533.21
1	5'-6	8'-4	4	9	39'-2	5	9	8'-7	5	4.5	39'-2	1.646	1.422	0.840	3.908	537.50
2	4'-1	8'-3	4	9	39'-2	6	9	8'-4	6	4.5	39'-2	1.285	1.301	0.840	3.426	595.74
3-6	3'-9	8'-4	5	12	39'-2	7	12	8'-5	7	4.5	39'-2	1.165	1.362	0.840	3.367	589.37
7-8	3'-3	8'-5	5	12	39'-2	7	12	8'-1	7	4.5	39'-2	1.285	1.483	0.840	3.608	571.16
9-10	3'-1	8'-6	4	9	39'-2	6	9	7'-9	6	4.5	39'-2	1.405	1.666	0.840	3.911	557.18
11-12	3'-0	8'-7	5	12	39'-2	7	12	8'-0	7	4.5	39'-2	1.526	1.788	0.840	4.154	587.37
13-15	3'-1	8'-9	5	12	39'-2	7	12	8'-1	7	4.5	39'-2	1.706	1.971	0.840	4.517	596.18
16-17	3'-1	8'-10	5	12	39'-2	7	12	8'-4	7	4.5	39'-2	1.827	2.154	0.840	4.821	617.34
18-19	3'-1	8'-11	5	12	39'-2	7	12	8'-6	7	4.5	39'-2	2.007	2.276	0.840	5.123	611.08
20-21	3'-2	9'-0	5	12	39'-4	7	12	8'-8	7	4.5	39'-4	2.139	2.410	0.887	5.436	628.34
22-23	3'-3	9'-1	5	9	39'-6	6	9	8'-10	6	4.5	39'-6	2.272	2.544	0.934	5.750	664.37
24-25	3'-4	9'-3	5	9	39'-6	6	9	9'-2	6	4.5	39'-6	2.393	2.729	0.934	6.056	691.34

Bent Bar Detail

Bars	D
4	3"
5	3¾"
6	4½"
7	5¼"



k4 & m4

Note:
All dimensions are out to out.
D = pin diameter.

Notes:

1. Dimensions listed on this sheet to be used in conjunction with Sheet TRRCB G3-20.
2. Fill, dimensions "S" and "H" are in feet.
3. Dimensions "A", "B", "C", "D", and "Sp." listed in the bar list are in inches.
4. Dimensions "L", "H", "V" are in feet and inches.

LATEST REVISION DATE

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IOWA DOT

Standard Design
Triple Reinforced Concrete Box Culverts
July, 2020

Culvert Barrel Details
12' x 8' Barrel Sections

TRRCB 12-8-20
Sheet 2 of 2

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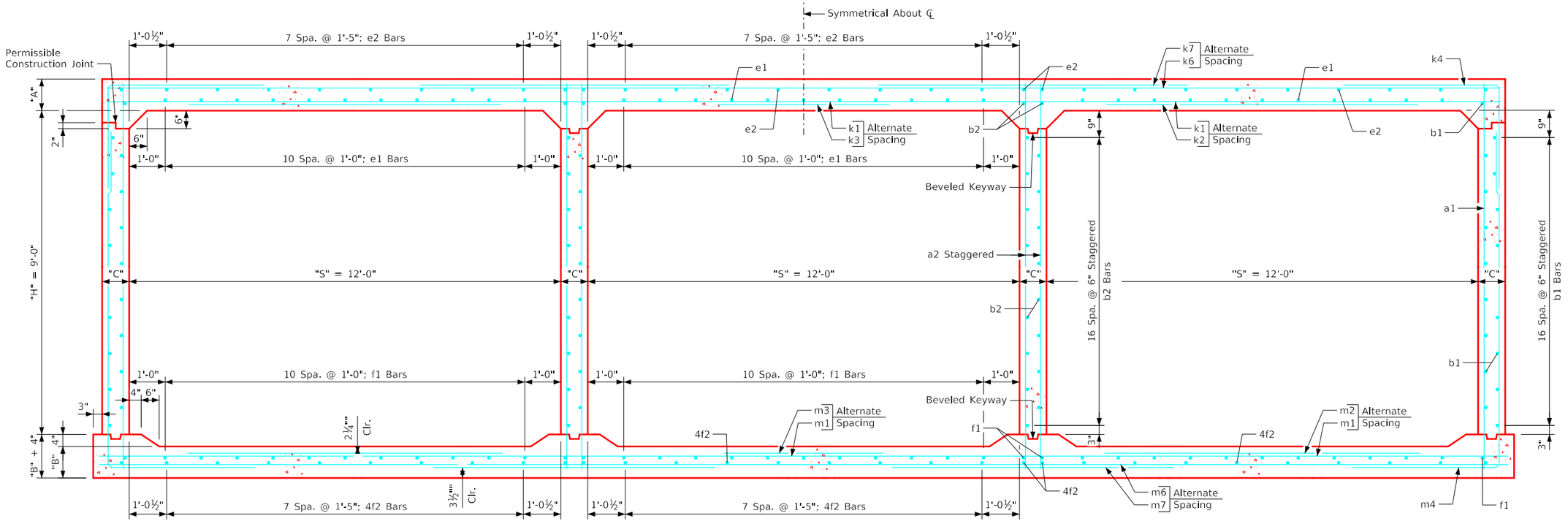

Triple 12' x 9' Barrel Section

Notes:

1. Dimensions listed on this sheet to be used in conjunction with Sheet TRRCB G3-20.
2. Fill, dimensions "S" and "H" are in feet.
3. Dimensions "A", "B", "C", "D", and "Sp." listed in the bar list are in inches.
4. Dimensions "L", "H", "V" are in feet and inches.

LATEST REVISION DATE

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Standard Design

Triple Reinforced Concrete Box Culverts

July, 2020

Culvert Barrel Details

12' x 9' Barrel Sections

TRRCB 12-9-20

Sheet 1 of 2

ENGLISHLRFDSIGNEDTRIPLECULVERTS.DGN - TRRCB 12-9s1-20 - THIS SHEET ISSUED 07-2020.

Variable Dimensions and Quantities for Triple 12' x 9' Barrel Sections

Dimensions

Fill	S	H	A	B	C	D	E	R	T	U	W	X	Z
0	12	9	14	11.5	9	9	9	0'-4	0'-0	7'-7	2'-7	4'-5	4'-4
1	12	9	13.5	11.5	9	9	9	0'-10	0'-4	7'-7	2'-7	4'-5	4'-3
2	12	9	10	10	9	9	9	1'-9	1'-1	6'-7	3'-5	5'-2	4'-3
3-6	12	9	9	10.5	9	9	9	3'-10	2'-4	5'-0	3'-1	5'-2	4'-1
7-8	12	9	10	11.5	9	9	9	5'-2	2'-10	3'-11	3'-1	5'-2	3'-11
9-10	12	9	11	13	9	9	9	5'-2	2'-10	3'-10	2'-9	5'-2	3'-8
11-12	12	9	12	14	9	9	9	5'-2	2'-8	3'-10	2'-6	5'-2	3'-9
13-15	12	9	13.5	16	9	9	9	4'-1	2'-5	3'-10	2'-2	4'-1	3'-10
16-17	12	9	14.5	17	9.5	9	6	5'-2	1'-10	3'-10	1'-11	4'-0	3'-11
18-19	12	9	15.5	18	10	9	9	4'-0	1'-9	3'-11	1'-9	3'-11	4'-0
20-21	12	9	16.5	19	10.5	9	9	3'-11	1'-4	4'-0	1'-8	3'-11	4'-1
22-23	12	9	18.5	20	11	9	9	3'-6	1'-0	4'-1	1'-3	3'-9	4'-2
24-25	12	9	19	21.5	11.5	9	9	3'-7	1'-1	4'-2	1'-0	3'-8	4'-3

Bar List

	a1			a2			b1			b2			e1			e2		
Fill	Size	Sp.	L	Size	Sp.	L	Size	Sp.	No.	Size	Sp.	No.	Size	Sp.	No.	Size	Sp.	No.
0	4	12	11'-0	6	9	11'-0	4	6	36	4	6	38	4	12	33	4	17	30
1	4	12	11'-0	6	9	11'-0	4	6	36	4	6	38	4	12	33	4	17	30
2	4	9	10'-7	6	9	10'-7	4	6	36	4	6	38	4	12	33	4	17	30
3-6	4	9	10'-6	6	9	10'-6	4	6	36	4	6	38	4	12	33	4	17	30
7-8	4	9	10'-8	6	9	10'-8	4	6	36	4	6	38	4	12	33	4	17	30
9-10	4	9	10'-11	6	9	10'-11	4	6	36	4	6	38	4	12	33	4	17	30
11-12	4	9	11'-1	6	9	11'-1	4	6	36	4	6	38	4	12	33	4	17	30
13-15	4	9	11'-4	6	9	11'-4	4	6	36	4	6	38	4	12	33	4	17	30
16-17	4	12	11'-6	5	6	11'-6	4	6	36	4	6	38	4	12	33	4	17	30
18-19	4	9	11'-8	7	9	11'-8	4	6	36	4	6	38	4	12	33	4	17	30
20-21	4	9	11'-10	7	9	11'-10	4	6	36	4	6	38	4	12	33	4	17	30
22-23	5	12	12'-1	7	9	12'-1	4	6	36	4	6	38	4	12	33	4	17	30
24-25	4	9	12'-3	7	9	12'-3	4	6	36	4	6	38	4	12	33	4	17	30

	f1			f2			k1			k2			k3		
Fill	Size	Sp.	No.	Size	Sp.	No.	Size	Sp.	L	Size	Sp.	L	Size	Sp.	L
0	4	12	39	4	17	30	5	12	38'-8	5	12	12'-11	4	12	12'-1
1	4	12	39	4	17	30	6	18	38'-8	6	18	12'-7	5	18	11'-1
2	4	12	39	4	17	30	7	18	38'-8	7	18	11'-10	5	18	9'-3
3-6	4	12	39	4	17	30	6	12	38'-8	5	12	9'-2	4	12	5'-1
7-8	4	12	39	4	17	30	5	9	38'-8	4	9	8'-7	4	9	2'-5
9-10	4	12	39	4	17	30	6	12	38'-8	5	12	8'-9	4	12	2'-5
11-12	4	12	39	4	17	30	6	12	38'-8	5	12	9'-2	4	12	2'-5
13-15	4	12	39	4	17	30	6	12	38'-8	5	12	9'-9	4	12	4'-7
16-17	4	12	39	4	17	30	7	18	38'-10	7	18	11'-2	4	18	2'-6
18-19	4	12	39	4	17	30	7	18	39'-0	7	18	11'-4	4	18	4'-10
20-21	4	12	39	4	17	30	5	9	39'-2	5	9	11'-9	4	9	5'-0
22-23	4	12	39	4	17	30	7	18	39'-4	7	18	12'-2	4	18	5'-11
24-25	5	12	39	4	17	30	6	12	39'-6	6	12	12'-2	4	12	5'-10

	k4					k6			k7		
Fill	Size	Sp.	L	H	V	Size	Sp.	L	Size	Sp.	L
0	6	12	11'-9	7'-9	4'-0	5	18	38'-8	6	18	15'-2
1	6	12	11'-8	7'-9	3'-11	5	18	38'-8	6	18	15'-2
2	6	9	8'-6	4'-10	3'-8	5	18	38'-8	8	18	14'-7
3-6	6	9	7'-10	4'-3	3'-7	5	9	38'-8	5	9	10'-8
7-8	6	9	7'-4	3'-8	3'-8	5	9	38'-8	5	9	8'-4
9-10	6	9	7'-6	3'-9	3'-9	4	9	38'-8	6	9	8'-1
11-12	6	9	7'-1	3'-3	3'-10	5	12	38'-8	7	12	8'-2
13-15	6	9	7'-3	3'-3	4'-0	5	12	38'-8	7	12	8'-3
16-17	5	6	7'-4	3'-8	3'-8	5	12	38'-10	7	12	8'-3
18-19	6	9	7'-6	3'-4	4'-2	5	9	39'-0	6	9	8'-5
20-21	5	6	7'-8	3'-10	3'-10	5	9	39'-2	6	9	8'-7
22-23	6	9	8'-0	3'-7	4'-5	5	12	39'-4	7	12	8'-10
24-25	5	6	8'-0	4'-0	4'-0	5	9	39'-6	6	9	8'-11

Bar List

	k9			m1			m2			m3		
Fill	Size	Sp.	L	Size	Sp.	L	Size	Sp.	L	Size	Sp.	L
0	6	4.5	38'-8	5	12	39'-2	5	12	9'-4	4	12	3'-11
1	6	4.5	38'-8	5	12	39'-2	5	12	8'-11	4	12	3'-11
2	8	4.5	38'-8	6	12	39'-2	5	12	7'-4	4	12	2'-5
3-6	5	4.5	38'-8	6	12	39'-2	5	12	8'-0	4	12	2'-5
7-8	5	4.5	38'-8	6	12	39'-2	5	12	8'-2	4	12	2'-5
9-10	6	4.5	38'-8	6	12	39'-2	5	12	9'-1	4	12	2'-5
11-12	7	4.5	38'-8	5	9	39'-2	5	9	9'-8	4	9	2'-5
13-15	7	4.5	38'-8	5	9	39'-2	5	9	10'-8	4	9	4'-7
16-17	7	4.5	38'-10	5	9	39'-4	5	9	11'-2	4	9	4'-10
18-19	6	4.5	39'-0	5	9	39'-6	5	9	11'-4	4	9	5'-0
20-21	6	4.5	39'-2	6	12	39'-8	6	12	11'-6	4	12	5'-0
22-23	7	4.5	39'-4	6	12	39'-10	6	12	12'-0	4	12	5'-5
24-25	6	4.5	39'-6	6	12	40'-0	6	12	12'-4	4	12	5'-8

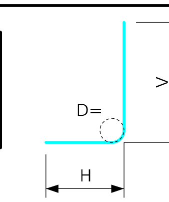
	m4					m6			m7			m9		
Fill	Size	Sp.	L	H	V	Size	Sp.	L	Size	Sp.	L	Size	Sp.	L
0	7	12	15'-11	6'-6	9'-5	4	9	39'-2	5	9	8'-9	5	4.5	39'-2
1	7	12	15'-7	6'-2	9'-5	4	12	39'-2	6	12	8'-8	6	4.5	39'-2
2	6	9	13'-9	4'-6	9'-3	5	12	39'-2	7	12	8'-7	7	4.5	39'-2
3-6	6	9	13'-5	4'-1	9'-4	5	12	39'-2	7	12	8'-5	7	4.5	39'-2
7-8	6	9	12'-11	3'-6	9'-5	5	12	39'-2	7	12	8'-1	7	4.5	39'-2
9-10	6	9	12'-10	3'-4	9'-6	4	9	39'-2	6	9	7'-9	6	4.5	39'-2
11-12	6	9	12'-11	3'-4	9'-7	5	12	39'-2	7	12	8'-0	7	4.5	39'-2
13-15	6	9	13'-2	3'-5	9'-9	4	9	39'-2	6	9	8'-3	6	4.5	39'-2
16-17	5	6	13'-3	3'-5	9'-10	5	12	39'-4	7	12	8'-5	7	4.5	39'-4
18-19	6	9	13'-4	3'-5	9'-11	5	12	39'-6	7	12	8'-7	7	4.5	39'-6
20-21	5	6	13'-6	3'-6	10'-0	5	12	39'-8	7	12	8'-9	7	4.5	39'-8
22-23	6	9	13'-8	3'-7	10'-1	5	9	39'-10	6	9	8'-11	6	4.5	39'-10
24-25	5	6	14'-0	3'-9	10'-3	5	12	40'-0	7	12	9'-2	7	4.5	40'-0

Quantities

	Concrete (CY/FT)				Steel
Fill	Slab	Floor	Walls	Total	(LB/FT)
0	1.766	1.483	0.952	4.201	568.29
1	1.706	1.483	0.952	4.141	559.74
2	1.285	1.301	0.952	3.538	635.71
3-6	1.165	1.362	0.952	3.479	616.50
7-8	1.285	1.483	0.952	3.720	594.92
9-10	1.405	1.666	0.952	4.023	589.00
11-12	1.526	1.788	0.952	4.266	609.87
13-15	1.706	2.032	0.952	4.690	612.45
16-17	1.837	2.165	1.004	5.006	629.11
18-19	1.969	2.299	1.057	5.325	664.68
20-21	2.101	2.430	1.113	5.644	678.47
22-23	2.357	2.566	1.166	6.089	693.11
24-25	2.431	2.765	1.218	6.414	716.84

Bent Bar Detail

Bars	D
5	3¾"
6	4½"
7	5¼"



k4 & m4

Note:
All dimensions are out to out.
D = pin diameter.

Notes:

1. Dimensions listed on this sheet to be used in conjunction with Sheet TRRCB G3-20.
2. Fill, dimensions "S" and "H" are in feet.
3. Dimensions "A", "B", "C", "D", and "Sp." listed in the bar list are in inches.
4. Dimensions "L", "H", "V" are in feet and inches.

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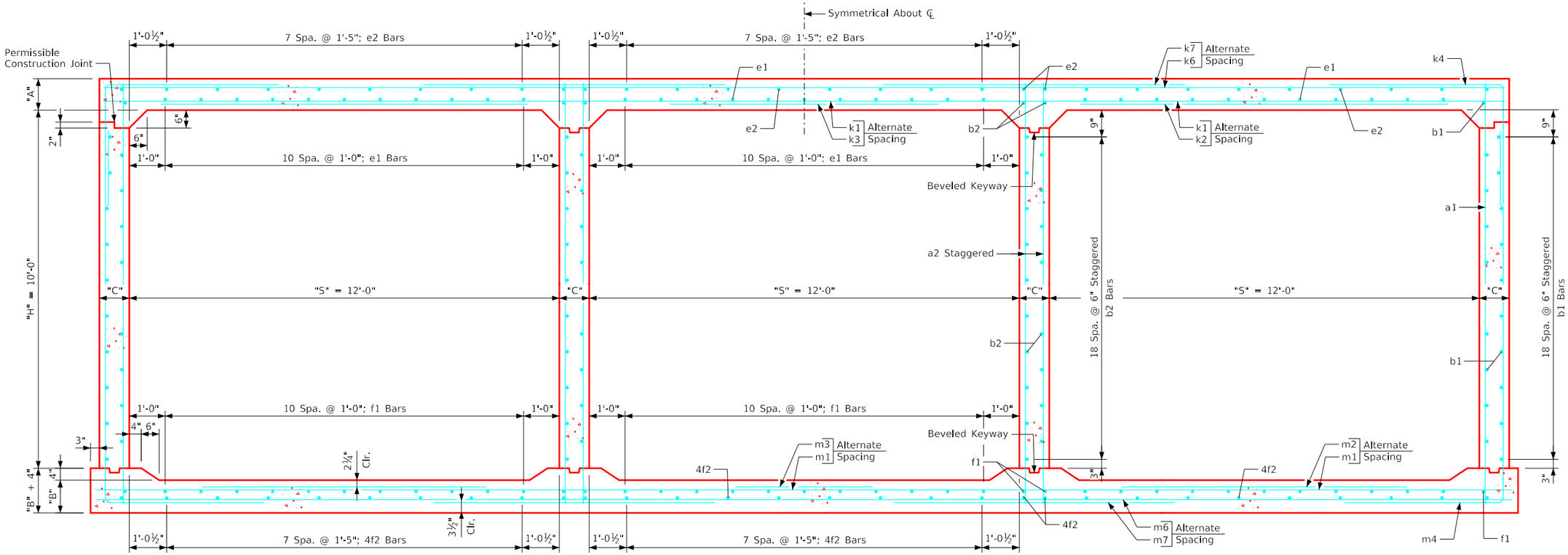
Standard Design
Triple Reinforced Concrete Box Culverts
July, 2020

Culvert Barrel Details
12' x 9' Barrel Sections

TRRCB 12-9-20
Sheet 2 of 2



Triple 12' x 10' Barrel Section

Notes:

1. Dimensions listed on this sheet to be used in conjunction with Sheet TRRCB G3-20.
2. Fill, dimensions "S" and "H" are in feet.
3. Dimensions "A", "B", "C", "D", and "Sp." listed in the bar list are in inches.
4. Dimensions "L", "H", "V" are in feet and inches.

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Standard Design

Triple Reinforced Concrete Box Culverts

July, 2020

Culvert Barrel Details

12' x 10' Barrel Sections

TRRCB 12-10-20

Sheet 1 of 2

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Variable Dimensions and Quantities for Triple 12' x 10' Barrel Sections

Dimensions

Fill	S	H	A	B	C	D	E	R	T	U	W	X	Z
0	12	10	14	11.5	10	9	9	0'-1	0'-0	7'-8	2'-7	4'-6	4'-4
1	12	10	13	11.5	10	9	9	0'-10	0'-4	7'-8	2'-7	4'-6	4'-3
2	12	10	10	10	10	9	9	2'-4	1'-10	6'-7	3'-5	5'-2	4'-3
3-6	12	10	9	10.5	10	9	9	3'-8	2'-5	4'-11	3'-1	5'-2	4'-2
7-8	12	10	10	11.5	10	9	9	5'-2	2'-11	4'-0	3'-1	5'-2	3'-11
9-10	12	10	11	13	10	9	9	5'-2	2'-9	3'-10	2'-9	5'-2	3'-9
11-12	12	10	12	14	10	6	9	5'-2	2'-9	3'-11	2'-8	5'-2	3'-10
13-15	12	10	13.5	16	10	6	9	5'-2	2'-5	3'-11	2'-2	4'-2	3'-11
16-17	12	10	14.5	17	10.5	6	9	4'-9	1'-11	3'-11	1'-11	4'-1	3'-11
18-19	12	10	15.5	18	11	9	9	4'-0	1'-9	4'-0	1'-9	4'-0	4'-0
20-21	12	10	16.5	19	11.5	9	9	3'-9	1'-8	4'-0	1'-7	3'-9	4'-1
22-23	12	10	17.5	20	12.5	6	9	3'-8	1'-3	4'-1	1'-3	3'-9	4'-3
24-25	12	10	19.5	21.5	13	9	6	3'-4	1'-0	4'-3	1'-1	3'-6	4'-4

Bar List

Fill	a1			a2			b1			b2			e1			e2			f1			f2		
	Size	Sp.	L	Size	Sp.	L	Size	Sp.	No.	Size	Sp.	No.	Size	Sp.	No.	Size	Sp.	No.	Size	Sp.	No.	Size	Sp.	No.
0	4	9	12'-0	7	9	12'-0	4	6	40	4	6	42	4	12	33	4	17	30	4	12	39	4	17	30
1	4	12	11'-11	7	9	11'-11	4	6	40	4	6	42	4	12	33	4	17	30	4	12	39	4	17	30
2	4	9	11'-7	7	9	11'-7	4	6	40	4	6	42	4	12	33	4	17	30	4	12	39	4	17	30
3-6	5	12	11'-6	7	9	11'-6	4	6	40	4	6	42	4	12	33	4	17	30	4	12	39	4	17	30
7-8	5	12	11'-8	7	9	11'-8	4	6	40	4	6	42	4	12	33	4	17	30	4	12	39	4	17	30
9-10	5	12	11'-11	7	9	11'-11	4	6	40	4	6	42	4	12	33	4	17	30	4	12	39	4	17	30
11-12	4	6	12'-1	7	9	12'-1	4	6	40	4	6	42	4	12	33	4	17	30	4	12	39	4	17	30
13-15	4	6	12'-4	7	9	12'-4	4	6	40	4	6	42	4	12	33	4	17	30	4	12	39	4	17	30
16-17	4	6	12'-6	7	9	12'-6	4	6	40	4	6	42	4	12	33	4	17	30	4	12	39	4	17	30
18-19	5	9	12'-8	7	9	12'-8	4	6	40	4	6	42	4	12	33	4	17	30	4	12	39	4	17	30
20-21	6	12	12'-10	7	9	12'-10	4	6	40	4	6	42	4	12	33	4	17	30	4	12	39	4	17	30
22-23	4	6	13'-0	7	9	13'-0	4	6	40	4	6	42	4	12	33	4	17	30	4	12	39	4	17	30
24-25	6	12	13'-4	6	6	13'-4	4	6	40	4	6	42	4	12	33	4	17	30	5	12	39	4	17	30

Fill	k1			k2			k3			k4					k6			k7		
	Size	Sp.	L	Size	Sp.	L	Size	Sp.	L	Size	Sp.	L	H	V	Size	Sp.	L	Size	Sp.	L
0	6	18	39'-0	6	18	13'-1	5	18	12'-8	6	9	11'-10	7'-10	4'-0	5	18	39'-0	6	18	15'-4
1	6	18	39'-0	6	18	12'-9	5	18	11'-2	5	6	10'-11	7'-5	3'-6	5	18	39'-0	6	18	15'-4
2	6	12	39'-0	5	12	10'-4	4	12	8'-2	5	6	8'-9	5'-6	3'-3	5	18	39'-0	8	18	14'-7
3-6	4	6	39'-0	4	6	9'-1	4	6	5'-6	6	9	8'-3	4'-8	3'-7	5	9	39'-0	5	9	10'-5
7-8	5	9	39'-0	4	9	8'-5	4	9	2'-6	6	9	7'-8	3'-10	3'-10	5	9	39'-0	5	9	8'-4
9-10	5	9	39'-0	4	9	8'-10	4	9	2'-6	6	9	7'-6	3'-9	3'-9	4	9	39'-0	6	9	8'-1
11-12	6	12	39'-0	5	12	9'-0	4	12	2'-6	6	9	7'-8	3'-10	3'-10	5	12	39'-0	7	12	8'-3
13-15	6	12	39'-0	5	12	9'-8	4	12	2'-6	6	9	8'-0	4'-0	4'-0	5	12	39'-0	7	12	8'-3
16-17	7	18	39'-2	7	18	11'-0	4	18	3'-4	6	9	8'-2	4'-1	4'-1	5	12	39'-2	7	12	8'-4
18-19	7	18	39'-4	7	18	11'-4	4	18	4'-11	6	9	8'-4	4'-2	4'-2	5	12	39'-4	7	12	8'-6
20-21	7	18	39'-6	7	18	11'-7	4	18	5'-6	6	9	8'-0	3'-9	4'-3	5	9	39'-6	6	9	8'-7
22-23	5	9	39'-10	5	9	12'-1	4	9	5'-8	5	6	7'-10	3'-11	3'-11	5	9	39'-10	6	9	8'-8
24-25	5	9	40'-0	5	9	12'-5	4	9	6'-5	6	9	8'-10	4'-5	4'-5	5	12	40'-0	7	12	9'-1

Bar List

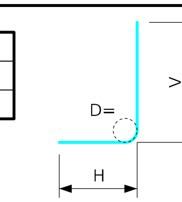
Fill	k9			m1			m2			m3			m4					m6			m7			m9		
	Size	Sp.	L	Size	Sp.	L	Size	Sp.	L	Size	Sp.	L	Size	Sp.	L	H	V	Size	Sp.	L	Size	Sp.	L	Size	Sp.	L
0	6	4.5	39'-0	5	12	39'-6	5	12	9'-0	4	12	3'-10	6	9	16'-9	6'-4	10'-5	4	9	39'-6	5	9	8'-8	5	4.5	39'-6
1	6	4.5	39'-0	5	12	39'-6	5	12	9'-0	4	12	3'-10	5	6	16'-7	6'-2	10'-5	4	12	39'-6	6	12	8'-7	6	4.5	39'-6
2	8	4.5	39'-0	6	12	39'-6	5	12	7'-3	4	12	2'-6	5	6	14'-11	4'-8	10'-3	5	12	39'-6	7	12	8'-7	7	4.5	39'-6
3-6	5	4.5	39'-0	6	12	39'-6	5	12	8'-0	4	12	2'-6	6	9	14'-9	4'-5	10'-4	5	12	39'-6	7	12	8'-6	7	4.5	39'-6
7-8	5	4.5	39'-0	6	12	39'-6	5	12	8'-1	4	12	2'-6	6	9	14'-3	3'-10	10'-5	5	12	39'-6	7	12	8'-1	7	4.5	39'-6
9-10	6	4.5	39'-0	6	12	39'-6	5	12	9'-0	4	12	2'-6	6	9	14'-2	3'-8	10'-6	4	9	39'-6	6	9	7'-10	6	4.5	39'-6
11-12	7	4.5	39'-0	6	12	39'-6	5	12	9'-4	4	12	2'-6	6	9	14'-3	3'-8	10'-7	5	12	39'-6	7	12	8'-0	7	4.5	39'-6
13-15	7	4.5	39'-0	5	9	39'-6	5	9	10'-8	4	9	4'-6	6	9	14'-6	3'-9	10'-9	4	9	39'-6	6	9	8'-4	6	4.5	39'-6
16-17	7	4.5	39'-2	5	9	39'-8	5	9	11'-1	4	9	4'-8	6	9	14'-7	3'-9	10'-10	5	12	39'-8	7	12	8'-5	7	4.5	39'-8
18-19	7	4.5	39'-4	5	9	39'-10	5	9	11'-6	4	9	4'-11	6	9	14'-9	3'-10	10'-11	5	12	39'-10	7	12	8'-7	7	4.5	39'-10
20-21	6	4.5	39'-6	5	9	40'-0	5	9	11'-9	4	9	5'-6	6	9	14'-11	3'-11	11'-0	5	12	40'-0	7	12	8'-9	7	4.5	40'-0
22-23	6	4.5	39'-10	6	12	40'-4	6	12	12'-2	4	12	5'-6	5	6	15'-1	4'-0	11'-1	5	9	40'-4	6	9	9'-0	6	4.5	40'-4
24-25	7	4.5	40'-0	6	12	40'-6	6	12	12'-5	4	12	6'-1	6	9	15'-4	4'-1	11'-3	5	12	40'-6	7	12	9'-3	7	4.5	40'-6

Quantities

Fill	Concrete (CY/FT)				Steel (LB/FT)
	Slab	Floor	Walls	Total	
0	1.786	1.499	1.180	4.465	614.55
1	1.665	1.499	1.180	4.344	598.89
2	1.301	1.315	1.180	3.796	663.47
3-6	1.179	1.376	1.180	3.735	655.63
7-8	1.301	1.499	1.180	3.980	635.71
9-10	1.422	1.684	1.180	4.286	620.89
11-12	1.544	1.807	1.180	4.531	658.24
13-15	1.726	2.053	1.180	4.959	661.68
16-17	1.857	2.183	1.242	5.282	682.61
18-19	1.990	2.318	1.301	5.609	692.08
20-21	2.124	2.454	1.360	5.938	710.39
22-23	2.271	2.603	1.478	6.352	730.18
24-25	2.531	2.804	1.537	6.872	749.84

Bent Bar Detail

Bars	D
5	3¾"
6	4½"



k4 & m4

Note:
All dimensions are out to out.
D = pin diameter.

Notes:

1. Dimensions listed on this sheet to be used in conjunction with Sheet TRRCB G3-20.
2. Fill, dimensions "S" and "H" are in feet.
3. Dimensions "A", "B", "C", "D", and "Sp." listed in the bar list are in inches.
4. Dimensions "L", "H", "V" are in feet and inches.

LATEST REVISION DATE

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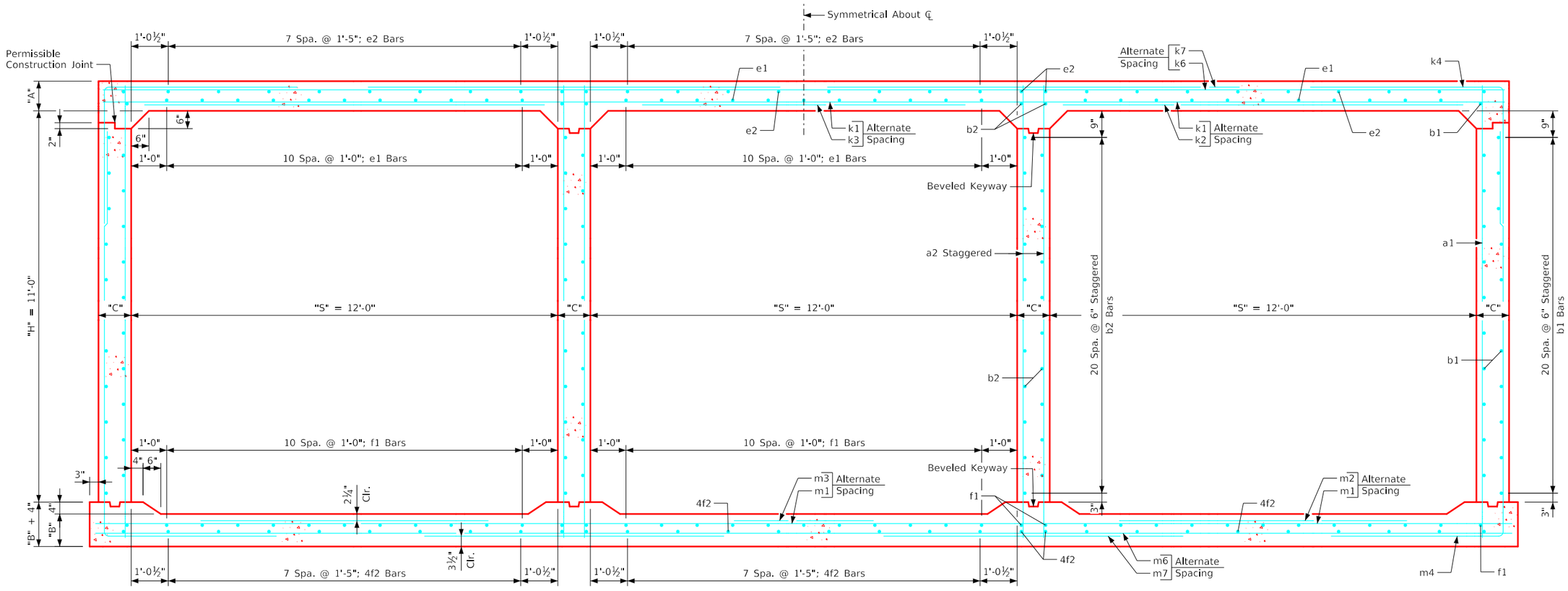
Standard Design
Triple Reinforced Concrete Box Culverts
July, 2020

Culvert Barrel Details
12' x 10' Barrel Sections

TRRCB 12-10-20
Sheet 2 of 2



Triple 12' x 11' Barrel Section

Notes:

1. Dimensions listed on this sheet to be used in conjunction with Sheet TRRCB G3-20.
2. Fill, dimensions "S" and "H" are in feet.
3. Dimensions "A", "B", "C", "D", and "Sp." listed in the bar list are in inches.
4. Dimensions "L", "H", "V" are in feet and inches.

LATEST REVISION DATE

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Standard Design

Triple Reinforced Concrete Box Culverts

July, 2020

Culvert Barrel Details

12' x 11' Barrel Sections

TRRCB 12-11-20

Sheet 1 of 2

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Variable Dimensions and Quantities for Triple 12' x 11' Barrel Sections

Dimensions

Fill	S	H	A	B	C	D	E	R	T	U	W	X	Z
0	12	11	14	11.5	11	9	9	0'-0	0'-0	7'-8	2'-7	4'-6	4'-3
1	12	11	13	11.5	11	9	9	0'-10	0'-5	7'-8	2'-8	4'-6	4'-3
2	12	11	10	10	11	9	9	2'-4	1'-11	6'-7	3'-5	5'-3	4'-3
3-6	12	11	9	10.5	11	9	9	3'-8	2'-6	4'-11	3'-1	5'-3	4'-2
7-8	12	11	9.5	11.5	11	9	9	4'-1	2'-11	4'-0	3'-1	5'-3	4'-0
9-10	12	11	11	13	11	6	9	5'-3	2'-10	3'-11	2'-10	5'-3	3'-10
11-12	12	11	12	14	11	6	9	5'-3	2'-8	3'-10	2'-8	5'-3	3'-10
13-15	12	11	13.5	15.5	11	9	9	5'-3	2'-6	3'-11	2'-3	4'-10	3'-11
16-17	12	11	14.5	16.5	12	9	9	5'-3	2'-3	3'-11	2'-1	4'-10	4'-0
18-19	12	11	15.5	17.5	12.5	9	9	4'-1	1'-10	4'-0	1'-10	4'-4	4'-1
20-21	12	11	17	18.5	13	9	6	3'-8	1'-7	4'-1	1'-10	4'-6	4'-2
22-23	12	11	17.5	20	13.5	9	6	3'-8	1'-3	4'-2	1'-3	3'-9	4'-3
24-25	12	11	19	21.5	14	9	9	3'-5	1'-1	4'-3	1'-1	3'-6	4'-5

Bar List

	a1			a2			b1			b2		
Fill	Size	Sp.	L	Size	Sp.	L	Size	Sp.	No.	Size	Sp.	No.
0	4	9	13'-0	7	9	13'-0	4	6	44	4	6	46
1	4	9	12'-11	7	9	12'-11	4	6	44	4	6	46
2	4	12	12'-7	7	9	12'-7	4	6	44	4	6	46
3-6	4	12	12'-6	7	9	12'-6	4	6	44	4	6	46
7-8	5	12	12'-8	7	9	12'-8	4	6	44	4	6	46
9-10	4	6	12'-11	7	9	12'-11	4	6	44	4	6	46
11-12	4	6	13'-1	7	9	13'-1	4	6	44	4	6	46
13-15	6	12	13'-4	7	9	13'-4	4	6	44	4	6	46
16-17	6	9	13'-6	7	9	13'-6	4	6	44	4	6	46
18-19	6	9	13'-8	7	9	13'-8	4	6	44	4	6	46
20-21	4	9	13'-10	6	6	13'-10	4	6	44	4	6	46
22-23	4	9	14'-0	6	6	14'-0	4	6	44	4	6	46
24-25	6	9	14'-3	8	9	14'-3	4	6	44	4	6	46

	e1			e2			f1			f2		
Fill	Size	Sp.	No.	Size	Sp.	No.	Size	Sp.	No.	Size	Sp.	No.
0	4	12	33	4	17	30	4	12	39	4	17	30
1	4	12	33	4	17	30	4	12	39	4	17	30
2	4	12	33	4	17	30	4	12	39	4	17	30
3-6	4	12	33	4	17	30	4	12	39	4	17	30
7-8	4	12	33	4	17	30	4	12	39	4	17	30
9-10	4	12	33	4	17	30	4	12	39	4	17	30
11-12	4	12	33	4	17	30	4	12	39	4	17	30
13-15	4	12	33	4	17	30	4	12	39	4	17	30
16-17	4	12	33	4	17	30	4	12	39	4	17	30
18-19	4	12	33	4	17	30	4	12	39	4	17	30
20-21	4	12	33	4	17	30	4	12	39	4	17	30
22-23	4	12	33	4	17	30	4	12	39	4	17	30
24-25	4	12	33	4	17	30	5	12	39	4	17	30

	k1			k2			k3			k4					k6			k7		
Fill	Size	Sp.	L	Size	Sp.	L	Size	Sp.	L	Size	Sp.	L	H	V	Size	Sp.	L	Size	Sp.	L
0	6	18	39'-4	6	18	13'-2	5	18	12'-11	6	9	11'-11	7'-11	4'-0	5	18	39'-4	6	18	15'-4
1	6	18	39'-4	6	18	12'-9	5	18	11'-3	6	9	11'-10	7'-11	3'-11	5	18	39'-4	6	18	15'-4
2	6	12	39'-4	5	12	10'-2	4	12	8'-3	7	9	10'-3	6'-2	4'-1	5	18	39'-4	8	18	14'-8
3-6	5	9	39'-4	4	9	8'-10	4	9	5'-7	7	9	9'-1	5'-2	3'-11	4	12	39'-4	7	12	10'-5
7-8	5	9	39'-4	4	9	8'-3	4	9	4'-9	5	6	7'-5	4'-3	3'-2	4	9	39'-4	6	9	8'-3
9-10	5	9	39'-4	4	9	8'-8	4	9	2'-5	6	9	8'-2	4'-1	4'-1	5	9	39'-4	5	9	8'-1
11-12	5	9	39'-4	4	9	9'-1	4	9	2'-5	5	6	7'-5	4'-0	3'-5	4	9	39'-4	6	9	8'-0
13-15	6	12	39'-4	5	12	9'-7	4	12	2'-5	5	6	7'-7	4'-1	3'-6	5	12	39'-4	7	12	8'-3
16-17	6	12	39'-8	5	12	10'-4	4	12	2'-6	6	9	8'-2	4'-1	4'-1	5	12	39'-8	7	12	8'-3
18-19	7	18	39'-10	7	18	11'-2	4	18	4'-10	5	6	8'-2	4'-1	4'-1	5	12	39'-10	7	12	8'-5
20-21	7	18	40'-0	7	18	11'-8	4	18	5'-9	8	12	9'-2	4'-2	5'-0	5	12	40'-0	7	12	8'-8
22-23	5	9	40'-2	5	9	12'-3	4	9	5'-10	7	9	9'-4	4'-8	4'-8	5	9	40'-2	6	9	8'-9
24-25	5	9	40'-4	5	9	12'-6	4	9	6'-4	5	6	8'-8	4'-4	4'-4	5	12	40'-4	7	12	9'-0

Bar List

	k9			m1			m2			m3		
Fill	Size	Sp.	L	Size	Sp.	L	Size	Sp.	L	Size	Sp.	L
0	6	4.5	39'-4	5	12	39'-10	5	12	9'-0	4	12	3'-11
1	6	4.5	39'-4	5	12	39'-10	5	12	8'-11	4	12	3'-11
2	8	4.5	39'-4	6	12	39'-10	5	12	7'-2	4	12	2'-5
3-6	7	4.5	39'-4	6	12	39'-10	5	12	7'-11	4	12	2'-5
7-8	6	4.5	39'-4	6	12	39'-10	5	12	8'-1	4	12	2'-5
9-10	5	4.5	39'-4	6	12	39'-10	5	12	8'-10	4	12	2'-5
11-12	6	4.5	39'-4	6	12	39'-10	5	12	9'-3	4	12	2'-5
13-15	7	4.5	39'-4	5	9	39'-10	5	9	10'-2	4	9	3'-3
16-17	7	4.5	39'-8	5	9	40'-2	5	9	10'-10	4	9	3'-4
18-19	7	4.5	39'-10	5	9	40'-4	5	9	11'-3	4	9	4'-4
20-21	7	4.5	40'-0	6	12	40'-6	6	12	11'-4	4	12	4'-1
22-23	6	4.5	40'-2	6	12	40'-8	6	12	12'-4	4	12	5'-8
24-25	7	4.5	40'-4	6	12	40'-10	6	12	12'-6	4	12	6'-2

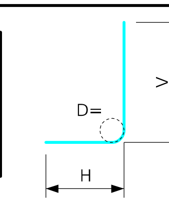
	m4					m6			m7			m9		
Fill	Size	Sp.	L	H	V	Size	Sp.	L	Size	Sp.	L	Size	Sp.	L
0	6	9	17'-9	6'-4	11'-5	4	9	39'-10	5	9	8'-7	5	4.5	39'-10
1	6	9	17'-9	6'-4	11'-5	4	9	39'-10	5	9	8'-7	5	4.5	39'-10
2	7	9	16'-3	5'-0	11'-3	5	12	39'-10	7	12	8'-7	7	4.5	39'-10
3-6	7	9	16'-2	4'-10	11'-4	5	12	39'-10	7	12	8'-5	7	4.5	39'-10
7-8	5	6	15'-7	4'-2	11'-5	5	12	39'-10	7	12	8'-1	7	4.5	39'-10
9-10	6	9	15'-7	4'-1	11'-6	4	9	39'-10	6	9	7'-10	6	4.5	39'-10
11-12	5	6	15'-8	4'-1	11'-7	5	12	39'-10	7	12	8'-0	7	4.5	39'-10
13-15	5	6	15'-11	4'-2	11'-9	5	12	39'-10	7	12	8'-3	7	4.5	39'-10
16-17	6	9	15'-11	4'-1	11'-10	5	12	40'-2	7	12	8'-4	7	4.5	40'-2
18-19	5	6	16'-1	4'-2	11'-11	5	9	40'-4	6	9	8'-7	6	4.5	40'-4
20-21	8	12	16'-2	4'-2	12'-0	5	9	40'-6	6	9	8'-9	6	4.5	40'-6
22-23	7	9	16'-5	4'-4	12'-1	5	9	40'-8	6	9	9'-0	6	4.5	40'-8
24-25	5	6	16'-8	4'-5	12'-3	5	12	40'-10	7	12	9'-4	7	4.5	40'-10

Quantities

	Concrete (CY/FT)				Steel (LB/FT)
Fill	Slab	Floor	Walls	Total	
0	1.807	1.512	1.437	4.756	633.11
1	1.684	1.512	1.437	4.633	630.13
2	1.317	1.326	1.437	4.080	723.42
3-6	1.194	1.388	1.437	4.019	691.24
7-8	1.256	1.512	1.437	4.205	649.71
9-10	1.439	1.698	1.437	4.574	658.11
11-12	1.562	1.822	1.437	4.821	660.63
13-15	1.745	2.008	1.437	5.190	693.61
16-17	1.888	2.153	1.567	5.608	714.89
18-19	2.023	2.289	1.632	5.944	739.34
20-21	2.220	2.426	1.697	6.343	773.16
22-23	2.294	2.628	1.763	6.685	792.05
24-25	2.494	2.831	1.828	7.153	801.71

Bent Bar Detail

Bars	D
5	3¾"
6	4½"
7	5¼"
8	6"



k4 & m4

Note:
All dimensions are out to out.
D = pin diameter.

Notes:

1. Dimensions listed on this sheet to be used in conjunction with Sheet TRRCB G3-20.
2. Fill, dimensions "S" and "H" are in feet.
3. Dimensions "A", "B", "C", "D", and "Sp." listed in the bar list are in inches.
4. Dimensions "L", "H", "V" are in feet and inches.

LATEST REVISION DATE

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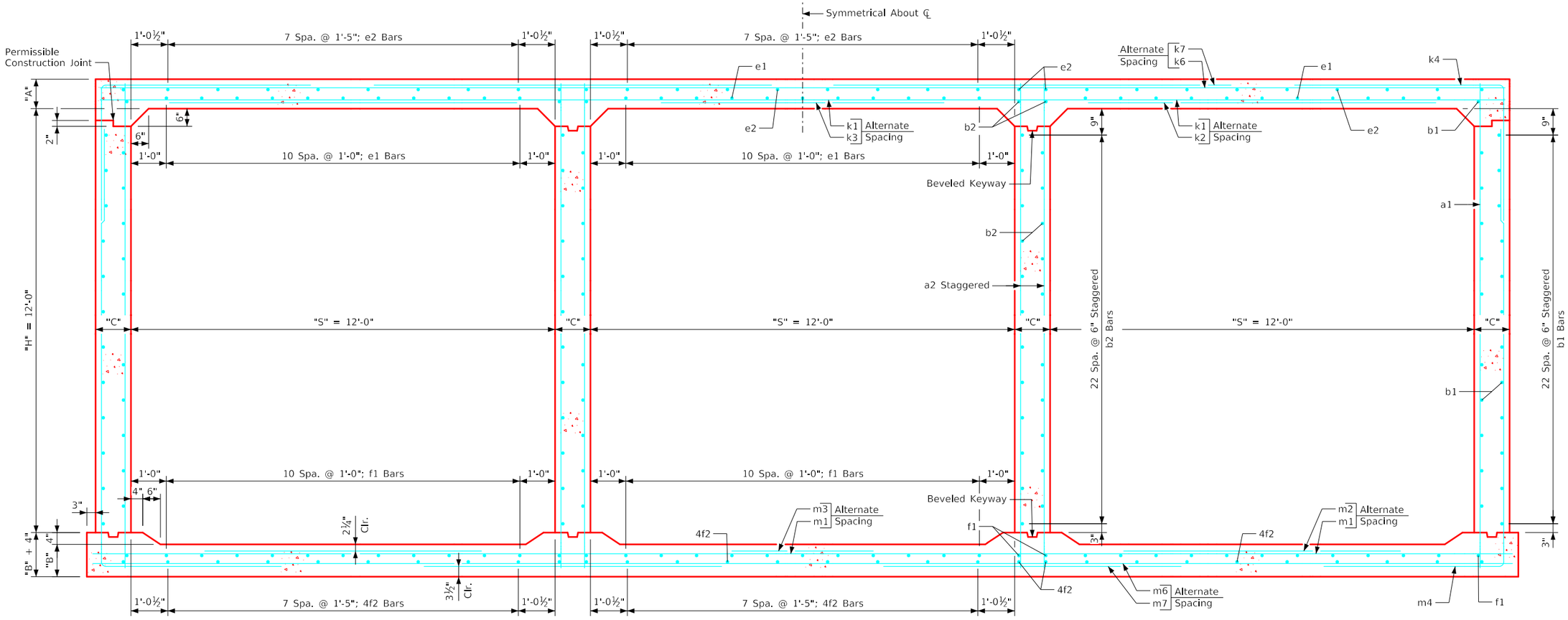
Standard Design
Triple Reinforced Concrete Box Culverts
July, 2020

Culvert Barrel Details
12' x 11' Barrel Sections

TRRCB 12-11-20
Sheet 2 of 2



Triple 12' x 12' Barrel Section

Notes:

1. Dimensions listed on this sheet to be used in conjunction with Sheet TRRCB G3-20.
2. Fill, dimensions "S" and "H" are in feet.
3. Dimensions "A", "B", "C", "D", and "Sp." listed in the bar list are in inches.
4. Dimensions "L", "H", "V" are in feet and inches.

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Standard Design

Triple Reinforced Concrete Box Culverts

July, 2020

Culvert Barrel Details

12' x 12' Barrel Sections

TRRCB 12-12-20

Sheet 1 of 2

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Variable Dimensions and Quantities for Triple 12' x 12' Barrel Sections

Dimensions													
Fill	S	H	A	B	C	D	E	R	T	U	W	X	Z
0	12	12	14	12	12	9	9	0'-0	0'-0	7'-9	2'-7	4'-6	4'-4
1	12	12	13	11.5	12	9	9	0'-10	0'-6	7'-9	2'-8	5'-3	4'-3
2	12	12	10	10	12	9	9	2'-5	2'-0	6'-6	3'-5	5'-3	4'-3
3-6	12	12	9	10.5	12	9	9	3'-8	2'-7	4'-10	3'-1	4'-10	4'-2
7-8	12	12	9.5	11.5	12	9	9	4'-1	3'-0	4'-0	3'-2	5'-0	4'-0
9-10	12	12	11	13	12	6	9	4'-11	2'-11	3'-11	2'-10	5'-3	3'-10
11-12	12	12	12	14	12	9	9	5'-0	2'-8	3'-11	2'-8	5'-3	3'-11
13-15	12	12	13.5	15.5	12.5	9	9	5'-3	2'-6	4'-0	2'-3	4'-7	4'-0
16-17	12	12	14.5	16.5	13	9	6	5'-1	2'-4	4'-0	2'-1	4'-4	4'-0
18-19	12	12	15	17.5	13.5	9	6	3'-6	1'-10	4'-0	1'-11	3'-10	4'-1
20-21	12	12	16	19	14	9	9	3'-5	1'-9	4'-1	1'-8	3'-10	4'-3
22-23	12	12	18	20.5	14.5	6	9	3'-5	1'-2	4'-3	1'-2	3'-6	4'-4
24-25	12	12	19	21.5	15	6	9	2'-11	1'-0	4'-3	1'-1	3'-6	4'-5

	Bar List																							
	a1			a2			b1			b2			e1			e2			f1			f2		
Fill	Size	Sp.	L	Size	Sp.	L	Size	Sp.	No.	Size	Sp.	No.	Size	Sp.	No.	Size	Sp.	No.	Size	Sp.	No.	Size	Sp.	No.
0	4	12	14'-1	7	9	14'-1	4	6	48	4	6	50	4	12	33	4	17	30	4	12	39	4	17	30
1	5	12	13'-11	7	9	13'-11	4	6	48	4	6	50	4	12	33	4	17	30	4	12	39	4	17	30
2	4	12	13'-7	7	9	13'-7	4	6	48	4	6	50	4	12	33	4	17	30	4	12	39	4	17	30
3-6	4	9	13'-6	7	9	13'-6	4	6	48	4	6	50	4	12	33	4	17	30	4	12	39	4	17	30
7-8	4	9	13'-8	7	9	13'-8	4	6	48	4	6	50	4	12	33	4	17	30	4	12	39	4	17	30
9-10	4	6	13'-11	7	9	13'-11	4	6	48	4	6	50	4	12	33	4	17	30	4	12	39	4	17	30
11-12	6	9	14'-1	7	9	14'-1	4	6	48	4	6	50	4	12	33	4	17	30	4	12	39	4	17	30
13-15	6	9	14'-4	7	9	14'-4	4	6	48	4	6	50	4	12	33	4	17	30	4	12	39	4	17	30
16-17	5	12	14'-6	6	6	14'-6	4	6	48	4	6	50	4	12	33	4	17	30	4	12	39	4	17	30
18-19	5	12	14'-7	6	6	14'-7	4	6	48	4	6	50	4	12	33	4	17	30	4	12	39	4	17	30
20-21	5	12	14'-10	8	9	14'-10	4	6	48	4	6	50	4	12	33	4	17	30	4	12	39	4	17	30
22-23	4	6	15'-1	8	9	15'-1	4	6	48	4	6	50	4	12	33	4	17	30	4	12	39	4	17	30
24-25	4	6	15'-3	8	9	15'-3	4	6	48	4	6	50	4	12	33	4	17	30	5	12	39	4	17	30

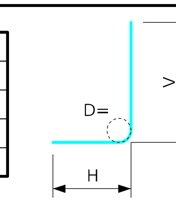
	Bar List																		
	k1			k2			k3			k4					k6			k7		
Fill	Size	Sp.	L	Size	Sp.	L	Size	Sp.	L	Size	Sp.	L	H	V	Size	Sp.	L	Size	Sp.	L
0	6	18	39'-8	6	18	13'-4	5	18	13'-0	6	9	12'-0	8'-0	4'-0	5	18	39'-8	6	18	15'-6
1	6	18	39'-8	6	18	12'-10	5	18	11'-4	6	9	11'-11	8'-0	3'-11	5	18	39'-8	6	18	15'-6
2	6	12	39'-8	5	12	10'-1	4	12	8'-2	7	9	10'-9	6'-8	4'-1	5	18	39'-8	8	18	14'-7
3-6	5	9	39'-8	4	9	8'-9	4	9	5'-8	7	9	9'-6	5'-7	3'-11	4	12	39'-8	7	12	10'-2
7-8	5	9	39'-8	4	9	7'-10	4	9	4'-10	7	9	8'-8	4'-8	4'-0	4	9	39'-8	6	9	8'-2
9-10	5	9	39'-8	4	9	8'-6	4	9	3'-2	5	6	7'-10	4'-6	3'-4	5	9	39'-8	5	9	8'-1
11-12	5	9	39'-8	4	9	9'-1	4	9	3'-0	5	6	7'-10	4'-5	3'-5	4	9	39'-8	6	9	8'-1
13-15	6	12	39'-10	5	12	9'-5	4	12	2'-6	5	6	8'-0	4'-6	3'-6	5	12	39'-10	7	12	8'-3
16-17	6	12	40'-0	5	12	10'-2	4	12	2'-11	8	12	9'-6	4'-9	4'-9	5	12	40'-0	7	12	8'-4
18-19	7	18	40'-2	7	18	11'-2	4	18	6'-2	7	9	8'-10	4'-5	4'-5	5	9	40'-2	6	9	8'-4
20-21	7	18	40'-4	7	18	11'-4	4	18	6'-4	6	6	9'-0	4'-6	4'-6	5	9	40'-4	6	9	8'-6
22-23	7	18	40'-6	7	18	12'-3	4	18	6'-4	8	12	10'-2	5'-1	5'-1	5	12	40'-6	7	12	8'-11
24-25	7	18	40'-8	7	18	12'-8	4	18	7'-5	8	12	10'-4	5'-2	5'-2	5	12	40'-8	7	12	9'-0

	Bar List																								
	k9			m1			m2			m3			m4					m6			m7			m9		
Fill	Size	Sp.	L	Size	Sp.	L	Size	Sp.	L	Size	Sp.	L	Size	Sp.	L	H	V	Size	Sp.	L	Size	Sp.	L	Size	Sp.	L
0	6	4.5	39'-8	5	12	40'-2	5	12	9'-2	4	12	4'-0	7	9	19'-9	7'-4	12'-5	4	9	40'-2	5	9	8'-8	5	4.5	40'-2
1	6	4.5	39'-8	5	12	40'-2	5	12	9'-0	4	12	2'-6	6	9	18'-9	6'-4	12'-5	4	9	40'-2	5	9	8'-6	5	4.5	40'-2
2	8	4.5	39'-8	6	12	40'-2	5	12	7'-3	4	12	2'-6	7	9	17'-4	5'-1	12'-3	5	12	40'-2	7	12	8'-6	7	4.5	40'-2
3-6	7	4.5	39'-8	6	12	40'-2	5	12	7'-7	4	12	3'-4	7	9	17'-4	5'-0	12'-4	5	12	40'-2	7	12	8'-5	7	4.5	40'-2
7-8	6	4.5	39'-8	6	12	40'-2	5	12	8'-0	4	12	3'-0	7	9	17'-0	4'-7	12'-5	5	12	40'-2	7	12	8'-1	7	4.5	40'-2
9-10	5	4.5	39'-8	6	12	40'-2	5	12	8'-10	4	12	2'-6	5	6	17'-0	4'-6	12'-6	4	9	40'-2	6	9	7'-10	6	4.5	40'-2
11-12	6	4.5	39'-8	6	12	40'-2	5	12	9'-2	4	12	2'-6	5	6	17'-1	4'-6	12'-7	5	12	40'-2	7	12	8'-1	7	4.5	40'-2
13-15	7	4.5	39'-10	5	9	40'-4	5	9	10'-1	4	9	3'-10	5	6	17'-4	4'-7	12'-9	5	12	40'-4	7	12	8'-3	7	4.5	40'-4
16-17	7	4.5	40'-0	5	9	40'-6	5	9	10'-10	4	9	4'-5	8	12	17'-4	4'-6	12'-10	5	12	40'-6	7	12	8'-4	7	4.5	40'-6
18-19	6	4.5	40'-2	5	9	40'-8	5	9	11'-2	4	9	5'-6	7	9	17'-6	4'-7	12'-11	5	9	40'-8	6	9	8'-6	6	4.5	40'-8
20-21	6	4.5	40'-4	5	9	40'-10	5	9	11'-8	4	9	5'-6	6	6	17'-8	4'-8	13'-0	5	12	40'-10	7	12	8'-10	7	4.5	40'-10
22-23	7	4.5	40'-6	5	9	41'-0	5	9	12'-6	4	9	6'-2	8	12	17'-11	4'-9	13'-2	5	12	41'-0	7	12	9'-1	7	4.5	41'-0
24-25	7	4.5	40'-8	6	12	41'-2	6	12	12'-8	4	12	6'-3	8	12	18'-1	4'-10	13'-3	5	12	41'-2	7	12	9'-3	7	4.5	41'-2

	Quantities				
	Concrete (CY/FT)				Steel
Fill	Slab	Floor	Walls	Total	(LB/FT)
0	1.827	1.591	1.715	5.133	681.66
1	1.703	1.528	1.715	4.946	653.05
2	1.333	1.341	1.715	4.389	745.84
3-6	1.209	1.403	1.715	4.327	718.74
7-8	1.271	1.528	1.715	4.514	708.08
9-10	1.456	1.716	1.715	4.887	679.32
11-12	1.580	1.841	1.715	5.136	703.84
13-15	1.775	2.038	1.787	5.600	731.61
16-17	1.909	2.174	1.858	5.941	766.61
18-19	1.982	2.311	1.929	6.222	793.95
20-21	2.118	2.513	2.000	6.631	819.66
22-23	2.381	2.716	2.072	7.169	827.82
24-25	2.519	2.857	2.143	7.519	857.92

Bent Bar Detail

Bars	D
5	3¾"
6	4½"
7	5¼"
8	6"



k4 & m4

Note:
All dimensions are out to out.
D = pin diameter.

Notes:

1. Dimensions listed on this sheet to be used in conjunction with Sheet TRRCB G3-20.
2. Fill, dimensions "S" and "H" are in feet.
3. Dimensions "A", "B", "C", "D", and "Sp." listed in the bar list are in inches.
4. Dimensions "L", "H", "V" are in feet and inches.

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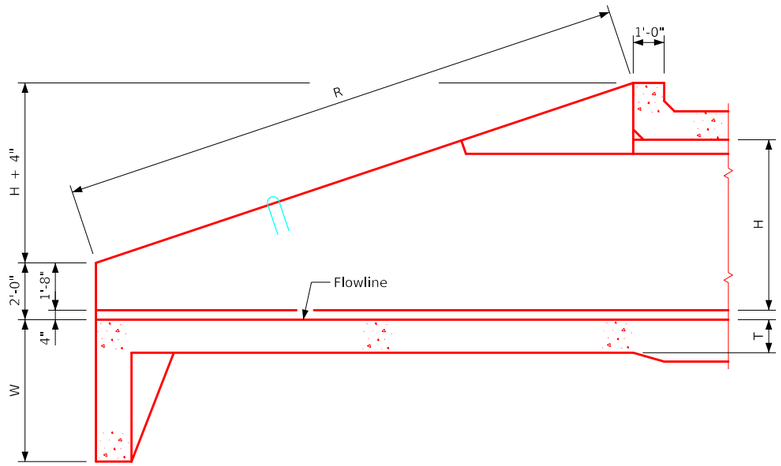
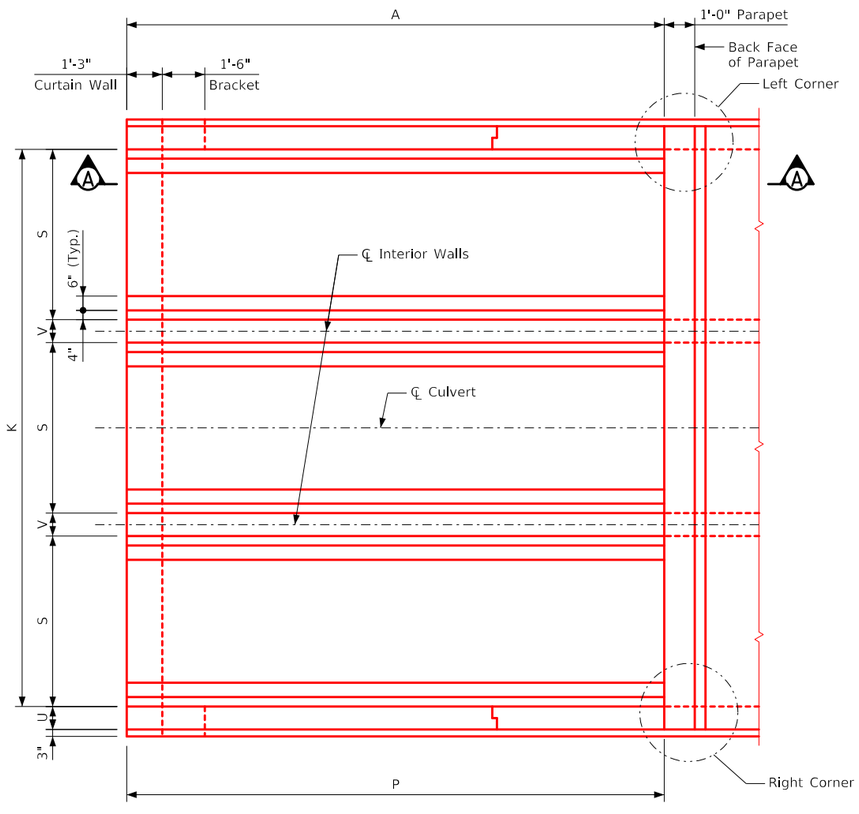
Standard Design
Triple Reinforced Concrete Box Culverts
July, 2020

Culvert Barrel Details
12' x 12' Barrel Sections

TRRCB 12-12-20
Sheet 2 of 2



Elevation Section A-A



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'	10' x 8'	10' x 7'	10' x 6'	10' x 5'	10' x 4'	S x H
Headwall Dimensions	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	A
	H	12'-0	11'-0	10'-0	9'-0	8'-0	7'-0	6'-0	5'-0	4'-0	12'-0	11'-0	10'-0	9'-0	8'-0	7'-0	6'-0	5'-0	4'-0	H
	K	38'-0	38'-0	37'-8	37'-8	37'-8	37'-6	37'-6	37'-6	37'-6	32'-0	32'-0	31'-8	31'-8	31'-8	31'-6	31'-6	31'-6	31'-6	K
	P	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	P
	R	39'-0	35'-10⅛	32'-8⅛	29'-6⅛	26'-4¼	23'-2¼	20'-0⅜	16'-10⅜	13'-8½	39'-0	35'-10⅛	32'-8⅛	29'-6⅛	26'-4¼	23'-2¼	20'-0⅜	16'-10⅜	13'-8½	R
	R1	38'-7¼	35'-5¼	32'-3⅜	29'-1½	25'-11½	22'-9⅝	19'-7¾	16'-5⅞	13'-4⅛	38'-7¼	35'-5¼	32'-3⅜	29'-1½	25'-11½	22'-9⅝	19'-7¾	16'-5⅞	13'-4⅛	R1
	S	12'-0	12'-0	12'-0	12'-0	12'-0	12'-0	12'-0	12'-0	12'-0	10'-0	10'-0	10'-0	10'-0	10'-0	10'-0	10'-0	10'-0	10'-0	S
	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	1'-1	1'-1	1'-1	1'-1	1'-1	T
	U	1'-0	1'-0	10	10	10	9	9	9	9	1'-0	1'-0	10	10	10	9	9	9	9	U
	V	1'-0	1'-0	10	10	10	9	9	9	9	1'-0	1'-0	10	10	10	9	9	9	9	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	4'-0	3'-9	3'-6	3'-6	3'-6	W
Bar Spacing	B	1'-0	1'-0	1'-0	1'-0	1'-0	1'-0	1'-0	9	1'-0	1'-0	1'-0	1'-0	1'-0	1'-0	1'-0	1'-0	1'-0	1'-0	B
	C	1'-0	1'-0	1'-0	1'-0	9	9	9	1'-0	1'-0	1'-0	1'-0	1'-0	1'-0	9	9	9	1'-0	1'-0	C
	D	6	6	1'-0	1'-0	1'-0	1'-0	1'-0	9	1'-0	6	6	1'-0	1'-0	1'-0	1'-0	1'-0	1'-0	1'-0	D
	E	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	E

Notes:

1. See Sheet TRRCB G2-20 for General Notes, Specifications, and Design Stresses.
2. See Sheets TRPWH 0-2-20 thru 0-5-20 for location of certain dimensions tabulated.
3. Dimensions are in feet and inches unless otherwise noted.

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Standard Design

Triple Reinforced Concrete Box Culverts

July, 2020

Dimension Table
0° Skew

TRPWH
0-1-20

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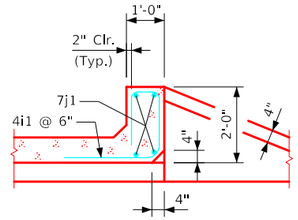
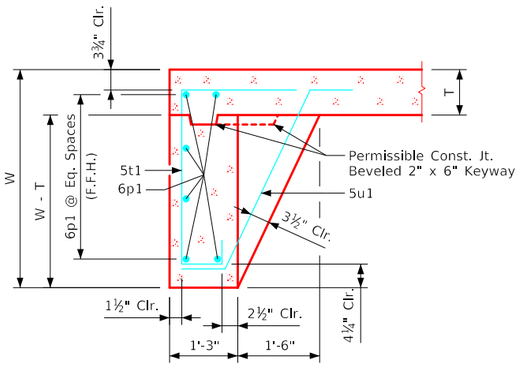
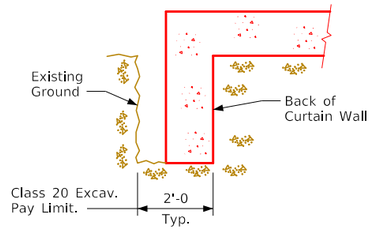


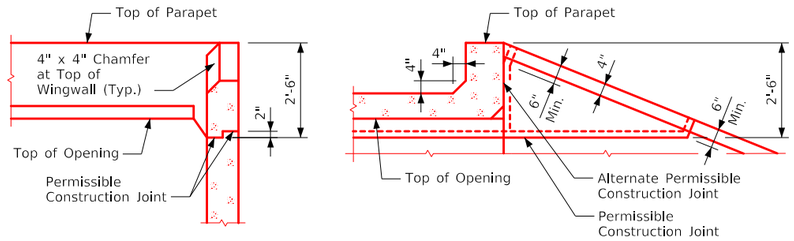
Section thru Parapet



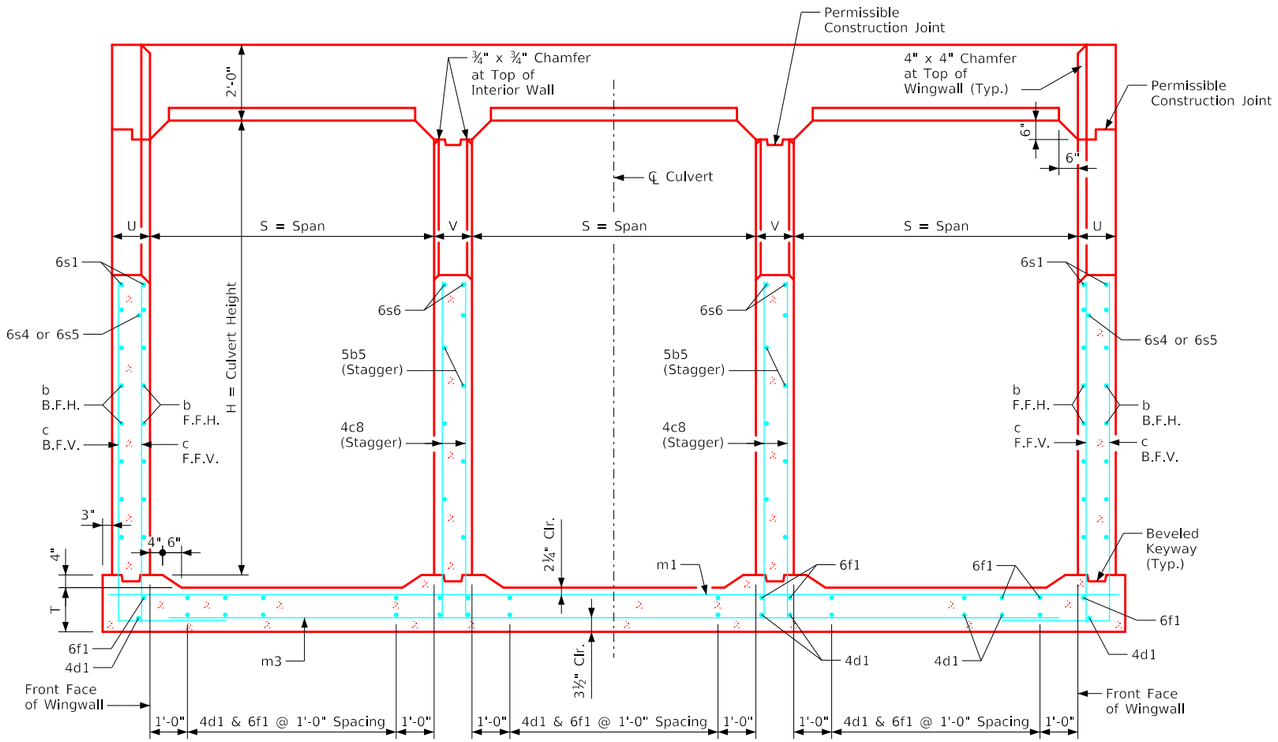
Section thru Curtain Wall



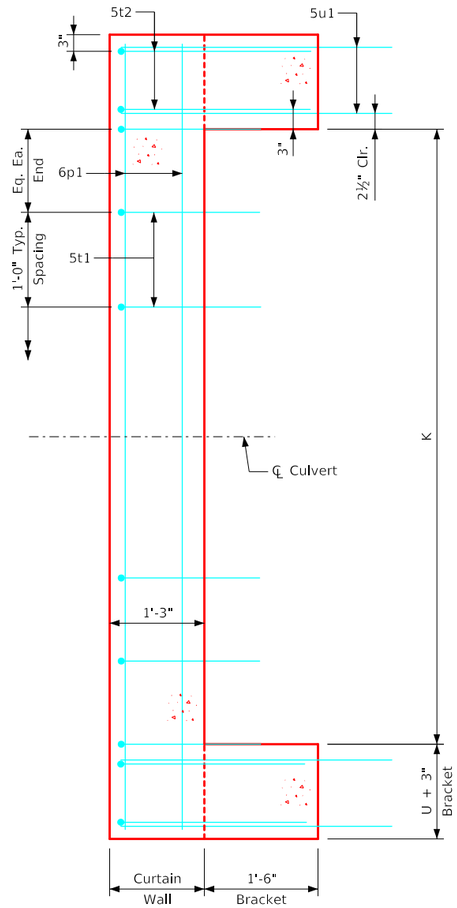
Curtain Wall
Class 20 Excavation



Top of Wingwall Details



Typical Cross Section - thru Headwall



Curtain Wall Detail - Plan View
(Apron is not shown)

Notes:

1. See Sheet TRRCB G2-20 for General Notes, Specifications, and Design Stresses.
2. For dimension table see Sheet TRPWH 0-1-20.

August 2022
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Standard Design

Triple Reinforced Concrete Box Culverts

July, 2020

Cross Section Details
0° Skew

TRPWH
0-2-20

Revised 08-2022: Changed chamfer at top of Interior Walls to 3/4" x 3/4" (was 4" x 4").
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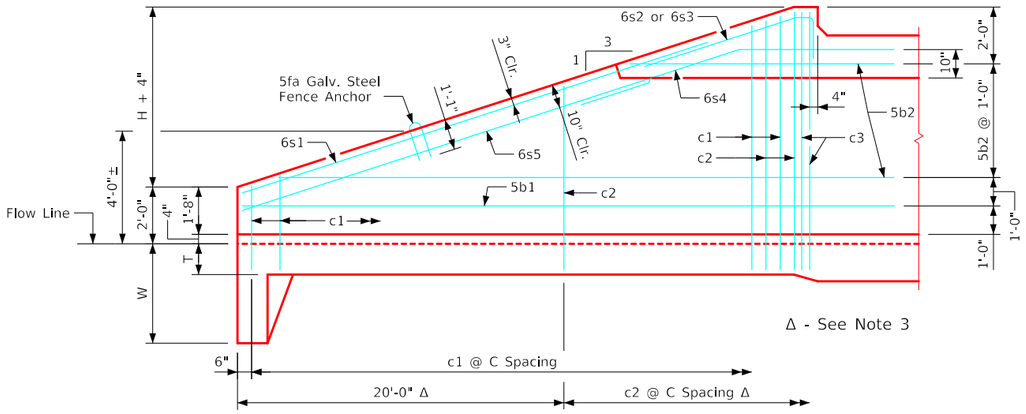
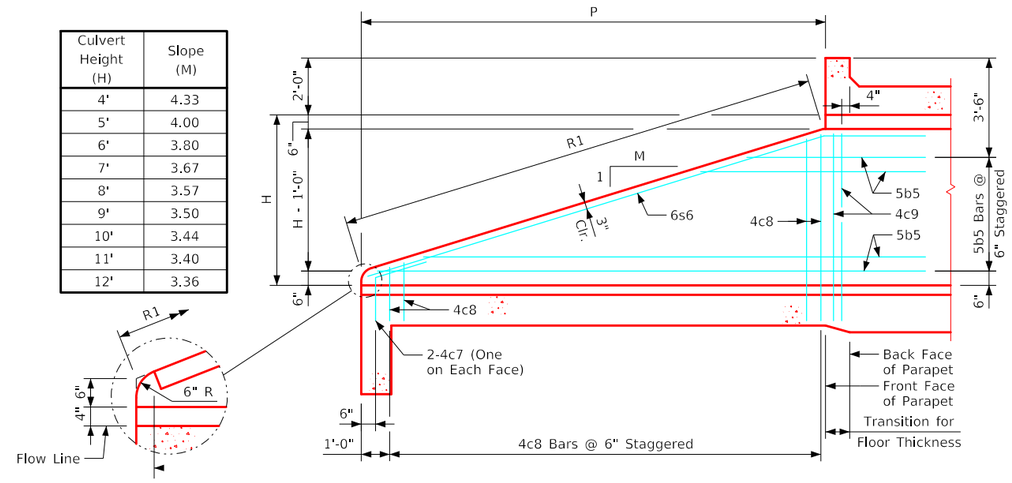
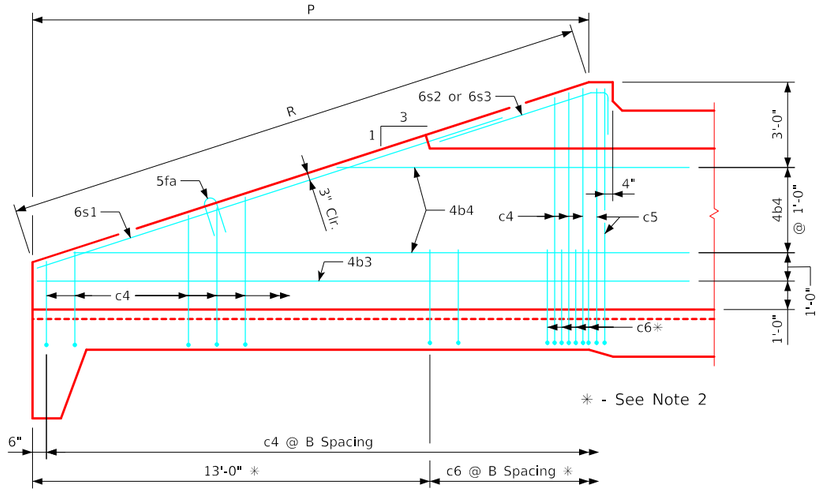


Typical View - Front Face Wingwall Reinforcing

Culvert Height (H)	Slope (M)
4'	4.33
5'	4.00
6'	3.80
7'	3.67
8'	3.57
9'	3.50
10'	3.44
11'	3.40
12'	3.36



Typical View - Interior Wall



Typical View - Back Face Wingwall Reinforcing

Notes:

1. Bar spacings and positions shown are similar for all sizes of headwalls in this standard.
2. Not applicable for 4' thru 5' height headwalls.
3. Not applicable for 4' thru 8' height headwalls.
4. For headwall dimensions and bar spacing see Sheet TRPWH 0-1-20.
5. Apron m3 bars are to be centered on ℄ culvert.
6. B.F.V. (c5) and F.F.V. (c3) and interior wall both F.V. (c9) bars are approximately 4" from the back of parapet for all headwalls.

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Standard Design

Triple Reinforced Concrete Box Culverts

July, 2020

Wingwall Elevations
0° Skew

TRPWH
0-3-20

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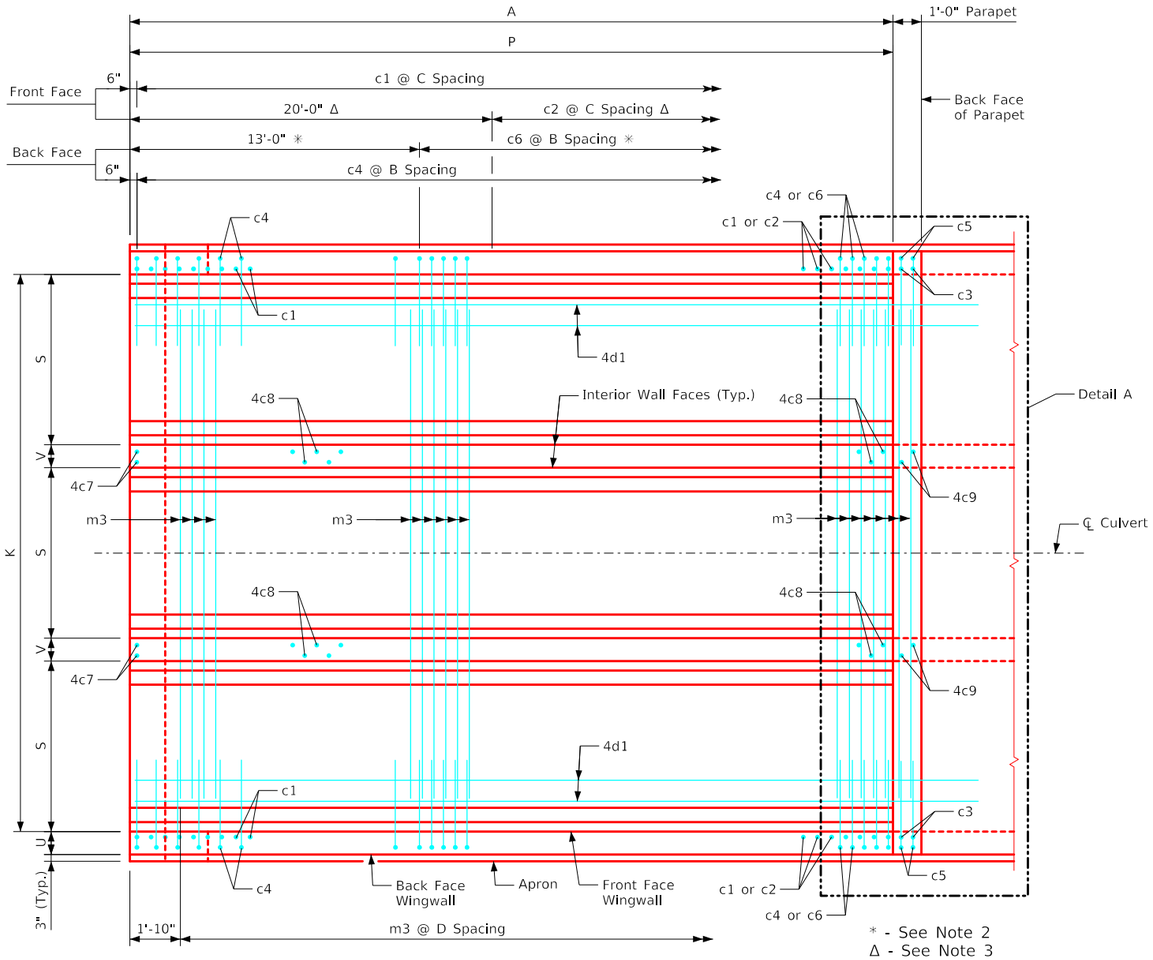
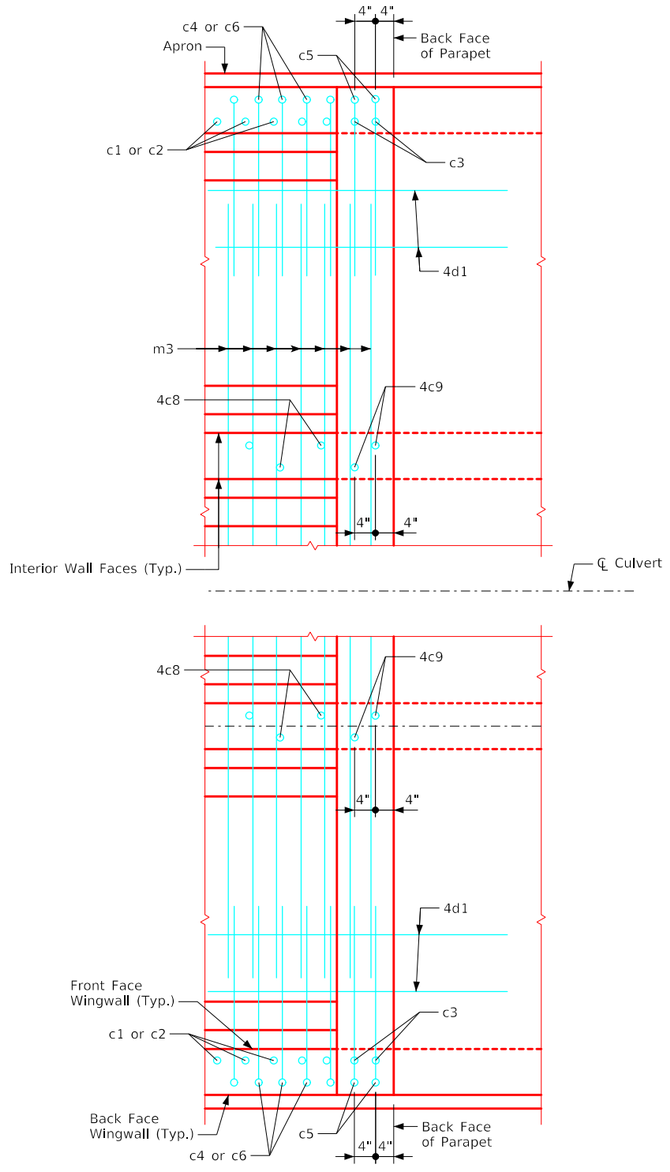


Plan View - Bottom Apron Reinforcing

(Curtain Wall Reinforcing not shown, See Sheet TRPWH 0-2-20)



Detail A

Notes:

1. Bar spacings and positions shown are similar for all sizes of headwalls in this standard.
2. Not applicable for 4' & 5' height headwalls.
3. Not applicable for 4' thru 8' height headwalls.
4. For headwall dimensions and bar spacing see Sheet TRPWH 0-1-20.
5. Apron m3 bars are to be centered on ℄ culvert.
6. B.F.V. (c5), F.F.V. (c3) and interior wall both F.V. (c9) bars are approximately 4" from the back of parapet for all headwalls.

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Standard Design

Triple Reinforced Concrete Box Culverts

July, 2020

Bottom Apron Reinforcing 0° Skew	TRPWH 0-4-20

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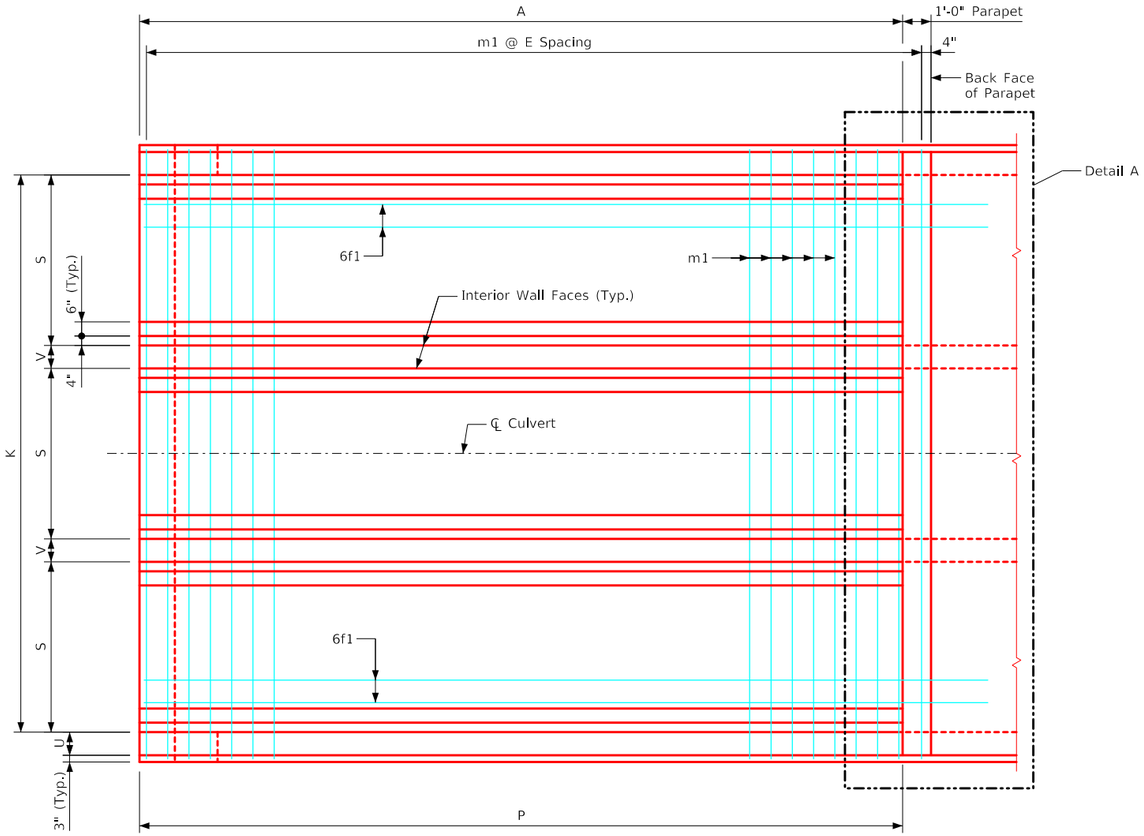
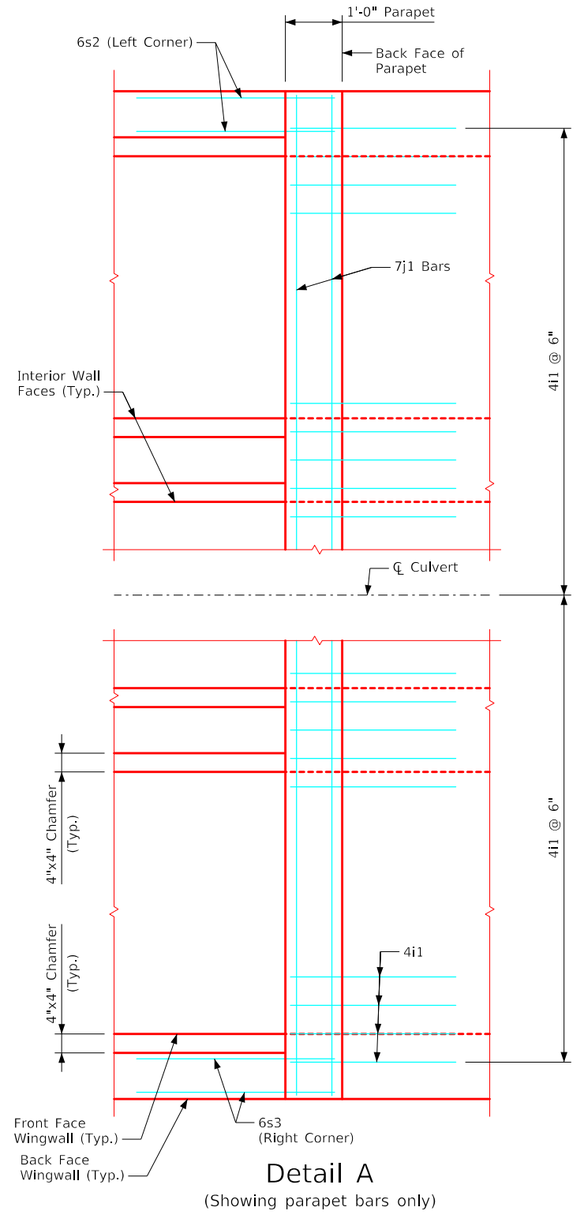


Plan View - Top Apron Reinforcing

(Wall Reinforcing not shown for clarity)



Detail A

(Showing parapet bars only)

Notes:

1. Bar spacings and positions shown are similar for all sizes of headwalls in this standard.
2. For headwall dimensions and bar spacing see Sheet TRPWH 0-1-20.
3. Top transverse apron bars are referenced approximately 4" from the back of the parapet for all headwalls.

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Standard Design

Triple Reinforced Concrete Box Culverts

July, 2020

Parapet Reinforcing & Top Apron Reinforcing 0° Skew

TRPWH 0-5-20

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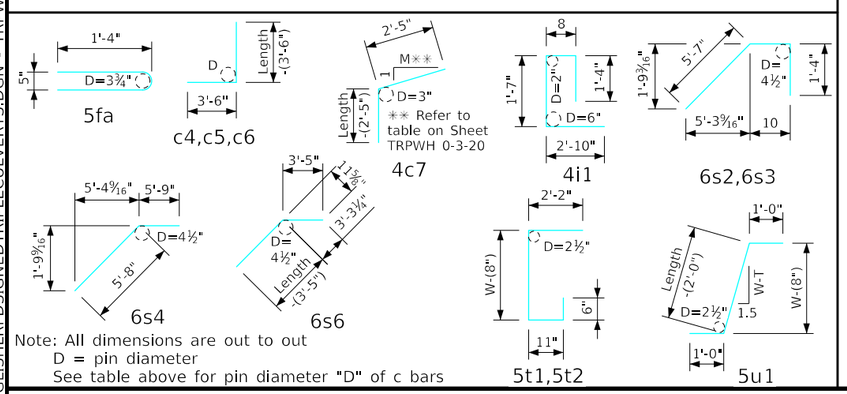
Bill of Reinforcing for One Headwall 0° Skew Span x Culvert Height

Location	Shape	12' x 12'				12' x 11'				12' x 10'				12' x 9'				12' x 8'				12' x 7'			
		Bar	No.	Length	Wt.	Bar	No.	Length	Wt.	Bar	No.	Length	Wt.	Bar	No.	Length	Wt.	Bar	No.	Length	Wt.	Bar	No.	Length	Wt.
Fence Anchor (Galv.)		5fa	2	2'-10	6	5fa	2	2'-10	6	5fa	2	2'-10	6	5fa	2	2'-10	6	5fa	2	2'-10	6	5fa	2	2'-10	6
Wingwall, F.F.H.		5b1	2	40'-3	89	5b1	2	37'-3	78	5b1	2	34'-3	71	5b1	2	31'-3	65	5b1	2	28'-3	59	5b1	2	25'-3	53
Wingwall, F.F.H.		5b2	22 Var.	2 Each 8'-10 to 38'-10	547	5b2	20 Var.	2 Each 8'-10 to 35'-10	466	5b2	18 Var.	2 Each 8'-10 to 32'-10	391	5b2	16 Var.	2 Each 8'-10 to 29'-10	323	5b2	14 Var.	2 Each 8'-10 to 26'-10	260	5b2	12 Var.	2 Each 8'-10 to 23'-10	204
Wingwall, B.F.H.		4b3	2	40'-3	57	4b3	2	37'-3	50	4b3	2	34'-3	46	4b3	2	31'-3	42	4b3	2	28'-3	38	4b3	2	25'-3	34
Wingwall, B.F.H.		4b4	20 Var.	2 Each 11'-10 to 38'-10	338	4b4	18 Var.	2 Each 11'-10 to 35'-10	287	4b4	16 Var.	2 Each 11'-10 to 32'-10	239	4b4	14 Var.	2 Each 11'-10 to 29'-10	195	4b4	12 Var.	2 Each 11'-10 to 26'-10	155	4b4	10 Var.	2 Each 11'-10 to 23'-10	119
Interior Wall, Both F.H.		5b5	42 Var.	2 Each 6'-3 to 39'-10	1009	5b5	38 Var.	2 Each 6'-3 to 36'-10	854	5b5	34 Var.	2 Each 6'-4 to 33'-10	712	5b5	30 Var.	2 Each 6'-4 to 30'-10	581	5b5	26 Var.	2 Each 6'-5 to 27'-10	464	5b5	22 Var.	2 Each 6'-6 to 24'-10	359
Wingwall, F.F.V.		5c1	74 Var.	2 Each 2'-8 to 14'-8	669	5c1	68 Var.	2 Each 2'-8 to 13'-8	579	4c1	62 Var.	2 Each 2'-8 to 12'-8	318	4c1	56 Var.	2 Each 2'-8 to 11'-8	268	4c1	66 Var.	2 Each 2'-8 to 10'-8	294	4c1	58 Var.	2 Each 2'-8 to 9'-8	239
Wingwall, F.F.V.		5c2	36 Var.	2 Each 9'-2 to 14'-10	451	5c2	30 Var.	2 Each 9'-2 to 13'-10	360	4c2	24 Var.	2 Each 9'-2 to 12'-10	176	4c2	18 Var.	2 Each 9'-2 to 11'-10	126	c2	--	--	--	c2	--	--	--
Wingwall, F.F.V. (L)		5c3	2	15'-1	31	5c3	2	14'-1	29	4c3	2	13'-1	17	4c3	2	12'-1	16	4c3	2	11'-1	15	4c3	2	10'-1	13
Wingwall, F.F.V. (R)		5c3	2	15'-1	31	5c3	2	14'-1	29	4c3	2	13'-1	17	4c3	2	12'-1	16	4c3	2	11'-1	15	4c3	2	10'-1	13
Wingwall, B.F.V.		6c4	74 Var.	2 Each 6'-4 to 18'-4	1371	5c4	68 Var.	2 Each 6'-4 to 17'-4	839	5c4	62 Var.	2 Each 6'-4 to 16'-4	733	5c4	56 Var.	2 Each 6'-4 to 15'-4	633	5c4	50 Var.	2 Each 6'-4 to 14'-4	539	5c4	44 Var.	2 Each 6'-4 to 13'-4	451
Wingwall, B.F.V. (L)		6c5	2	18'-7	56	5c5	2	17'-7	37	5c5	2	16'-7	35	5c5	2	15'-7	33	5c5	2	14'-7	30	5c5	2	13'-7	28
Wingwall, B.F.V. (R)		6c5	2	18'-7	56	5c5	2	17'-7	37	5c5	2	16'-7	35	5c5	2	15'-7	33	5c5	2	14'-7	30	5c5	2	13'-7	28
Wingwall, B.F.V.		6c6	50	8'-6	638	5c6	44	8'-6	390	5c6	38	8'-6	337	5c6	32	8'-6	284	5c6	26	8'-6	231	5c6	20	8'-6	177
Interior Wall, Both F.V		4c7	4	3'-10	10	4c7	4	3'-10	10	4c7	4	3'-10	10	4c7	4	3'-10	10	4c7	4	3'-10	10	4c7	4	3'-10	10
Interior Wall, Both F.V		4c8	146 Var.	2 Each 1'-7 to 12'-4	679	4c8	134 Var.	2 Each 1'-7 to 11'-4	578	4c8	122 Var.	2 Each 1'-7 to 10'-4	486	4c8	110 Var.	2 Each 1'-7 to 9'-4	401	4c8	98 Var.	2 Each 1'-7 to 8'-4	325	4c8	86 Var.	2 Each 1'-7 to 7'-4	256
Interior Wall, Both F.V		4c9	4	12'-7	34	4c9	4	11'-7	31	4c9	4	10'-7	28	4c9	4	9'-7	26	4c9	4	8'-7	23	4c9	4	7'-7	20
Apron, Longit., Bott.		4d1	39	40'-3	1112	4d1	39	37'-3	970	4d1	39	34'-3	892	4d1	39	31'-3	814	4d1	39	28'-3	736	4d1	39	25'-3	658
Apron, Longit., Top		6f1	39	40'-3	2499	6f1	39	37'-3	2182	6f1	39	34'-3	2006	6f1	39	31'-3	1831	6f1	39	28'-3	1655	6f1	39	25'-3	1479
Parapet, Vertical		4i1	77	6'-5	330	4i1	77	6'-5	330	4i1	75	6'-5	321	4i1	75	6'-5	321	4i1	75	6'-5	321	4i1	75	6'-5	321
Parapet, Horizontal		7j1	4	39'-8	324	7j1	4	39'-8	324	7j1	4	39'-0	319	7j1	4	39'-0	319	7j1	4	39'-0	319	7j1	4	38'-8	316
Apron, Trans., Top		5m1	51	40'-2	2265	5m1	47	40'-2	2087	5m1	43	39'-6	1772	5m1	39	39'-6	1607	5m1	35	39'-6	1442	5m1	31	39'-2	1266
Apron, Trans., Top		m2	--	--	--	m2	--	--	--	m2	--	--	--	m2	--	--	--	m2	--	--	--	m2	--	--	--
Apron, Trans., Bott.		5m3	73	36'-7	2785	5m3	67	36'-7	2556	6m3	31	36'-9	1711	5m3	28	35'-11	1049	5m3	25	35'-11	937	5m3	22	35'-7	816
Curtain, Horiz.		6p1	6	40'-2	384	6p1	6	40'-2	384	6p1	6	39'-6	356	6p1	6	39'-6	356	6p1	6	39'-6	356	6p1	5	39'-2	294
Wing Slope, Both F.		6s1	4	35'-8	214	6s1	4	32'-7	196	6s1	4	29'-5	177	6s1	4	26'-3	158	6s1	4	23'-1	139	6s1	4	19'-11	120
Wing Slope, Both F. (L)		6s2	2	7'-9	23	6s2	2	7'-9	23	6s2	2	7'-9	23	6s2	2	7'-9	23	6s2	2	7'-9	23	6s2	2	7'-9	23
Wing Slope, Both F. (R)		6s3	2	7'-9	23	6s3	2	7'-9	23	6s3	2	7'-9	23	6s3	2	7'-9	23	6s3	2	7'-9	23	6s3	2	7'-9	23
Wing Slope, F.F.		6s4	2	11'-5	34	6s4	2	11'-5	34	6s4	2	11'-5	34	6s4	2	11'-5	34	6s4	2	11'-5	34	6s4	2	11'-5	34
Wing Slope, F.F.		6s5	2	33'-2	100	6s5	2	30'-0	90	6s5	2	26'-10	81	6s5	2	23'-8	71	6s5	2	20'-6	62	6s5	2	17'-4	52
Interior Wall, Both F.		6s6	4	41'-10	266	6s6	4	38'-8	232	6s6	4	35'-6	213	6s6	4	32'-4	194	6s6	4	29'-2	175	6s6	4	26'-0	156
Curtain, Vert.		5t1	39	7'-11	322	5t1	39	7'-8	312	5t1	38	7'-5	294	5t1	38	7'-2	284	5t1	38	6'-11	274	5t1	38	6'-8	264
Curtain, Vert. Ends		5t2	4	7'-11	33	5t2	4	7'-8	32	5t2	4	7'-5	31	5t2	4	7'-2	30	5t2	4	6'-11	29	5t2	4	6'-8	28
Bracket, Vert.		5u1	4	6'-7	27	5u1	4	6'-5	27	5u1	4	6'-2	26	5u1	4	5'-11	25	5u1	4	5'-9	24	5u1	4	5'-6	23
Estimated Quantities One Headwall	Reinf. Steel			16,813 LB				14,462 LB				11,936 LB				10,197 LB				9043 LB				7883 LB	
	Concrete Parapet Δ	3.7		119.9 CY		3.7		108.2 CY		3.6		90.8 CY		3.6		80.9 CY		3.6		71.3 CY		3.5		60.3 CY	
	Concrete Wingwalls	38.5				32.8				22.9				18.9				15.2				10.7			
	Concrete Apron ✳	77.7				71.7				64.3				58.4				52.5				46.1			

c Bar Pin Diameter	
Bar Size	D
5	3¾"
6	4½"

Bent Bar Details



Note: All dimensions are out to out
D = pin diameter
See table above for pin diameter "D" of c bars

Note: Weight of bars over 40'-0" long include an allowance of 2'-5" for lap.

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.

(L) - Indicates bar located at left corner.
(R) - Indicates bar located at right corner.
Refer to Sheet TRPWH 0-1-20 for left and right corner locations.

Headwall Notes:

1. This headwall is based on a 3:1 slope normal to centerline of roadway.
2. The sides of the apron are to be formed to ensure correct line and grade.
3. All apron 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.
4. 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.
5. Concrete quantities are estimated from back of parapet.
6. Horizontal tails of bars "b" & "s" estimated to extend 2'-5" beyond back of parapet (into end of barrel). Longitudinal bars "4d1" and "6f1" estimated to project into end section of barrel a minimum of 2'-5" beyond back of parapet. The "length" column reflects total number of feet necessary to meet these requirements.
7. Dimensions are in feet and inches unless otherwise noted.

LATEST REVISION DATE

APPROVED BY BRIDGE ENGINEER

IOWA DOT

Standard Design - Triple Reinforced Concrete Box Culverts

Parallel Wing Headwalls

July, 2020

Quantity Tabulation
12'-0" Span
0° Skew

TRPWH
0-6-20
Sheet 1 of 2

ENGLISHLRFDSIGNEDTRIPLECULVERTS.DGN - TRPWH 0-6-20 S1 - THIS SHEET ISSUED 07-2020.

Bill of Reinforcing for One Headwall 0° Skew Span x Culvert Height

Location	Shape	12' x 6' Bar	12' x 6' No.	12' x 6' Length	12' x 6' Wt.	12' x 5' Bar	12' x 5' No.	12' x 5' Length	12' x 5' Wt.	12' x 4' Bar	12' x 4' No.	12' x 4' Length	12' x 4' Wt.
Fence Anchor (Galv.)		5fa	2	2'-10	6	5fa	2	2'-10	6	5fa	2	2'-10	6
Wingwall, F.F.H.		5b1	2	22'-3	46	5b1	2	19'-3	40	5b1	2	16'-3	34
Wingwall, F.F.H.		5b2	10 Var.	2 Each 8'-10 to 20'-10	155	5b2	8 Var.	2 Each 8'-10 to 17'-10	111	5b2	6 Var.	2 Each 8'-10 to 14'-10	74
Wingwall, B.F.H.		4b3	2	22'-3	30	4b3	2	19'-3	26	4b3	2	16'-3	22
Wingwall, B.F.H.		4b4	8 Var.	2 Each 11'-10 to 20'-10	87	4b4	6 Var.	2 Each 11'-10 to 17'-10	59	4b4	4 Var.	2 Each 11'-10 to 14'-10	36
Interior Wall, Both F.H.		5b5	18 Var.	2 Each 6'-7 to 21'-10	267	5b5	14 Var.	2 Each 6'-9 to 18'-9	186	5b5	10 Var.	2 Each 7'-1 to 15'-9	119
Wingwall, F.F.V.		4c1	50 Var.	2 Each 2'-8 to 8'-8	189	4c1	32 Var.	2 Each 2'-8 to 7'-8	110	4c1	26 Var.	2 Each 2'-8 to 6'-8	81
Wingwall, F.F.V.		c2	--	--	--	c2	--	--	--	c2	--	--	--
Wingwall, F.F.V. (L)		4c3	2	9'-1	12	4c3	2	8'-1	11	4c3	2	7'-1	9
Wingwall, F.F.V. (R)		4c3	2	9'-1	12	4c3	2	8'-1	11	4c3	2	7'-1	9
Wingwall, B.F.V.		5c4	38 Var.	2 Each 6'-4 to 12'-4	370	5c4	42 Var.	2 Each 6'-4 to 11'-4	387	5c4	26 Var.	2 Each 6'-4 to 10'-4	226
Wingwall, B.F.V. (L)		5c5	2	12'-7	26	5c5	2	11'-7	24	5c5	2	10'-7	22
Wingwall, B.F.V. (R)		5c5	2	12'-7	26	5c5	2	11'-7	24	5c5	2	10'-7	22
Wingwall, B.F.V.		5c6	14	8'-6	124	c6	--	--	--	c6	--	--	--
Interior Wall, Both F.V		4c7	4	3'-10	10	4c7	4	3'-10	10	4c7	4	3'-10	10
Interior Wall, Both F.V		4c8	74 Var.	2 Each 1'-7 to 6'-4	196	4c8	62 Var.	2 Each 1'-7 to 5'-4	143	4c8	50 Var.	2 Each 1'-6 to 4'-4	97
Interior Wall, Both F.V		4c9	4	6'-7	18	4c9	4	5'-7	15	4c9	4	4'-7	12
Apron, Longit., Bott.		4d1	39	22'-3	580	4d1	39	19'-3	502	4d1	39	16'-3	423
Apron, Longit., Top		6f1	39	22'-3	1303	6f1	39	19'-3	1128	6f1	39	16'-3	952
Parapet, Vertical		4i1	75	6'-5	321	4i1	75	6'-5	321	4i1	75	6'-5	321
Parapet, Horizontal		7j1	4	38'-8	316	7j1	4	38'-8	316	7j1	4	38'-8	316
Apron, Trans., Top		5m1	27	39'-2	1103	5m1	23	39'-2	940	5m1	19	39'-2	776
Apron, Trans., Top		m2	--	--	--	m2	--	--	--	m2	--	--	--
Apron, Trans., Bott.		4m3	19	34'-10	442	4m3	21	34'-10	489	4m3	13	34'-10	302
Curtain, Horiz.		6p1	5	39'-2	294	6p1	5	39'-2	294	6p1	5	39'-2	294
Wing Slope, Both F.		6s1	4	16'-9	101	6s1	4	13'-7	82	6s1	4	10'-5	63
Wing Slope, Both F. (L)		6s2	2	7'-9	23	6s2	2	7'-9	23	6s2	2	7'-9	23
Wing Slope, Both F. (R)		6s3	2	7'-9	23	6s3	2	7'-9	23	6s3	2	7'-9	23
Wing Slope, F.F.		6s4	2	11'-5	34	6s4	2	11'-5	34	6s4	2	11'-5	34
Wing Slope, F.F.		6s5	2	14'-2	43	6s5	2	11'-0	33	6s5	2	7'-10	24
Interior Wall, Both F.		6s6	4	22'-10	137	6s6	4	19'-8	118	6s6	4	16'-7	100
Curtain, Vert.		5t1	38	6'-5	254	5t1	38	6'-5	254	5t1	38	6'-5	254
Curtain, Vert. Ends		5t2	4	6'-5	27	5t2	4	6'-5	27	5t2	4	6'-5	27
Bracket, Vert.		5u1	4	5'-4	22	5u1	4	5'-4	22	5u1	4	5'-4	22
Estimated Quantities One Headwall	Reinf. Steel			6597 LB				5769 LB				4733 LB	
	Concrete Parapet Δ		3.5	51.9 CY			3.5	44.3 CY			3.5	36.9 CY	
	Concrete Wingwalls		8.1				5.9				3.9		
	Concrete Apron ✳		40.3				34.9				29.5		

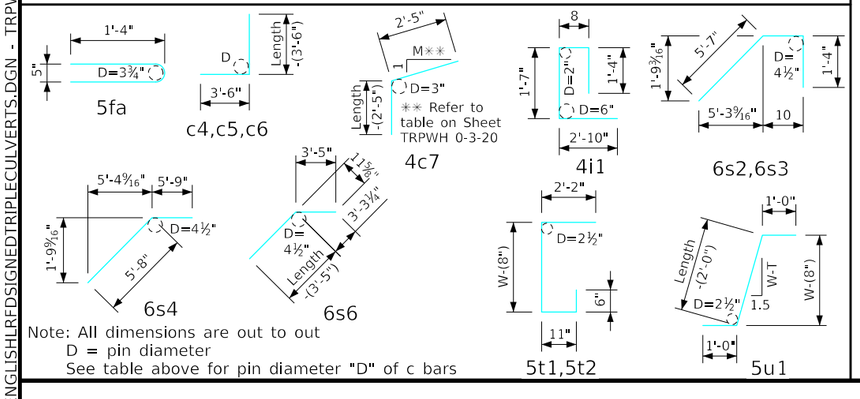
Note: Weight of bars over 40'-0" long include an allowance of 2'-5" for lap.

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.

(L) - Indicates bar located at left corner.
(R) - Indicates bar located at right corner.
Refer to Sheet TRPWH 0-1-20 for left and right corner locations.

c Bar Pin Diameter	
Bar Size	D
5	3¾"
6	4½"

Bent Bar Details



Note: All dimensions are out to out
D = pin diameter
See table above for pin diameter "D" of c bars

Headwall Notes:

1. This headwall is based on a 3:1 slope normal to centerline of roadway.
2. The sides of the apron are to be formed to ensure correct line and grade.
3. All apron 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.
4. 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.
5. Concrete quantities are estimated from back of parapet.
6. Horizontal tails of bars "b" & "s" estimated to extend 2'-5" beyond back of parapet (into end of barrel). Longitudinal bars "4d1" and "6f1" estimated to project into end section of barrel a minimum of 2'-5" beyond back of parapet. The "length" column reflects total number of feet necessary to meet these requirements.
7. Dimensions are in feet and inches unless otherwise noted.

LATEST REVISION DATE

APPROVED BY BRIDGE ENGINEER

IOWADOT

Standard Design - Triple Reinforced Concrete Box Culverts

Parallel Wing Headwalls

July, 2020

Quantity Tabulation
12'-0" Span
0° Skew

TRPWH
0-6-20
Sheet 2 of 2

ENGLISHLRFDSIGNEDTRIPLECULVERTS.DGN - TRPWH 0-6-20 S2 - THIS SHEET ISSUED 07-2020.

Bill of Reinforcing for One Headwall 0° Skew Span x Culvert Height

Location	Shape	10' x 12'				10' x 11'				10' x 10'				10' x 9'				10' x 8'				10' x 7'			
		Bar	No.	Length	Wt.	Bar	No.	Length	Wt.	Bar	No.	Length	Wt.	Bar	No.	Length	Wt.	Bar	No.	Length	Wt.	Bar	No.	Length	Wt.
Fence Anchor (Galv.)		5fa	2	2'-10	6	5fa	2	2'-10	6	5fa	2	2'-10	6	5fa	2	2'-10	6	5fa	2	2'-10	6	5fa	2	2'-10	6
Wingwall, F.F.H.		5b1	2	40'-3	89	5b1	2	37'-3	78	5b1	2	34'-3	71	5b1	2	31'-3	65	5b1	2	28'-3	59	5b1	2	25'-3	53
Wingwall, F.F.H.		5b2	22 Var.	2 Each 8'-10 to 38'-10	547	5b2	20 Var.	2 Each 8'-10 to 35'-10	466	5b2	18 Var.	2 Each 8'-10 to 32'-10	391	5b2	16 Var.	2 Each 8'-10 to 29'-10	323	5b2	14 Var.	2 Each 8'-10 to 26'-10	260	5b2	12 Var.	2 Each 8'-10 to 23'-10	204
Wingwall, B.F.H.		4b3	2	40'-3	57	4b3	2	37'-3	50	4b3	2	34'-3	46	4b3	2	31'-3	42	4b3	2	28'-3	38	4b3	2	25'-3	34
Wingwall, B.F.H.		4b4	20 Var.	2 Each 11'-10 to 38'-10	338	4b4	18 Var.	2 Each 11'-10 to 35'-10	287	4b4	16 Var.	2 Each 11'-10 to 32'-10	239	4b4	14 Var.	2 Each 11'-10 to 29'-10	195	4b4	12 Var.	2 Each 11'-10 to 26'-10	155	4b4	10 Var.	2 Each 11'-10 to 23'-10	119
Interior Wall, Both F.H.		5b5	42 Var.	2 Each 6'-3 to 39'-10	1009	5b5	38 Var.	2 Each 6'-3 to 36'-10	854	5b5	34 Var.	2 Each 6'-4 to 33'-10	712	5b5	30 Var.	2 Each 6'-4 to 30'-10	581	5b5	26 Var.	2 Each 6'-5 to 27'-10	464	5b5	22 Var.	2 Each 6'-6 to 24'-10	359
Wingwall, F.F.V.		5c1	74 Var.	2 Each 2'-7 to 14'-7	662	5c1	68 Var.	2 Each 2'-7 to 13'-7	573	4c1	62 Var.	2 Each 2'-7 to 12'-7	314	4c1	56 Var.	2 Each 2'-7 to 11'-7	265	4c1	66 Var.	2 Each 2'-7 to 10'-7	290	4c1	58 Var.	2 Each 2'-7 to 9'-7	236
Wingwall, F.F.V.		5c2	36 Var.	2 Each 9'-1 to 14'-9	447	5c2	30 Var.	2 Each 9'-1 to 13'-9	357	4c2	24 Var.	2 Each 9'-1 to 12'-9	175	4c2	18 Var.	2 Each 9'-1 to 11'-9	125	c2	--	--	--	c2	--	--	--
Wingwall, F.F.V. (L)		5c3	2	15'-0	31	5c3	2	14'-0	29	4c3	2	13'-0	17	4c3	2	12'-0	16	4c3	2	11'-0	15	4c3	2	10'-0	13
Wingwall, F.F.V. (R)		5c3	2	15'-0	31	5c3	2	14'-0	29	4c3	2	13'-0	17	4c3	2	12'-0	16	4c3	2	11'-0	15	4c3	2	10'-0	13
Wingwall, B.F.V.		6c4	74 Var.	2 Each 6'-3 to 18'-3	1362	5c4	68 Var.	2 Each 6'-3 to 17'-3	833	5c4	62 Var.	2 Each 6'-3 to 16'-3	727	5c4	56 Var.	2 Each 6'-3 to 15'-3	628	5c4	50 Var.	2 Each 6'-3 to 14'-3	535	5c4	44 Var.	2 Each 6'-3 to 13'-3	447
Wingwall, B.F.V. (L)		6c5	2	18'-6	56	5c5	2	17'-6	37	5c5	2	16'-6	34	5c5	2	15'-6	32	5c5	2	14'-6	30	5c5	2	13'-6	28
Wingwall, B.F.V. (R)		6c5	2	18'-6	56	5c5	2	17'-6	37	5c5	2	16'-6	34	5c5	2	15'-6	32	5c5	2	14'-6	30	5c5	2	13'-6	28
Wingwall, B.F.V.		6c6	50	8'-6	638	5c6	44	8'-6	390	5c6	38	8'-6	337	5c6	32	8'-6	284	5c6	26	8'-6	231	5c6	20	8'-6	177
Interior Wall, Both F.V		4c7	4	3'-9	10	4c7	4	3'-9	10	4c7	4	3'-9	10	4c7	4	3'-9	10	4c7	4	3'-9	10	4c7	4	3'-9	10
Interior Wall, Both F.V		4c8	146 Var.	2 Each 1'-6 to 12'-3	671	4c8	134 Var.	2 Each 1'-6 to 11'-3	571	4c8	122 Var.	2 Each 1'-6 to 10'-3	479	4c8	110 Var.	2 Each 1'-6 to 9'-3	395	4c8	98 Var.	2 Each 1'-6 to 8'-3	319	4c8	86 Var.	2 Each 1'-6 to 7'-3	251
Interior Wall, Both F.V		4c9	4	12'-6	33	4c9	4	11'-6	31	4c9	4	10'-6	28	4c9	4	9'-6	25	4c9	4	8'-6	23	4c9	4	7'-6	20
Apron, Longit., Bott.		4d1	33	40'-3	941	4d1	33	37'-3	821	4d1	33	34'-3	755	4d1	33	31'-3	689	4d1	33	28'-3	623	4d1	33	25'-3	557
Apron, Longit., Top		6f1	33	40'-3	2115	6f1	33	37'-3	1846	6f1	33	34'-3	1698	6f1	33	31'-3	1549	6f1	33	28'-3	1400	6f1	33	25'-3	1252
Parapet, Vertical		4i1	65	6'-5	279	4i1	65	6'-5	279	4i1	63	6'-5	270	4i1	63	6'-5	270	4i1	63	6'-5	270	4i1	63	6'-5	270
Parapet, Horizontal		7j1	4	33'-8	275	7j1	4	33'-8	275	7j1	4	33'-0	270	7j1	4	33'-0	270	7j1	4	33'-0	270	7j1	4	32'-8	267
Apron, Trans., Top		5m1	51	34'-2	1817	5m1	47	34'-2	1675	5m1	43	33'-6	1502	5m1	39	33'-6	1363	5m1	35	33'-6	1223	5m1	31	33'-2	1072
Apron, Trans., Top		m2	--	--	--	m2	--	--	--	m2	--	--	--	m2	--	--	--	m2	--	--	--	m2	--	--	--
Apron, Trans., Bott.		5m3	73	30'-7	2329	5m3	67	30'-7	2137	6m3	31	30'-9	1432	5m3	28	29'-11	874	5m3	25	29'-11	780	5m3	22	29'-7	679
Curtain, Horiz.		6p1	6	34'-2	308	6p1	6	34'-2	308	6p1	6	33'-6	302	6p1	6	33'-6	302	6p1	6	33'-6	302	6p1	5	33'-2	249
Wing Slope, Both F.		6s1	4	35'-8	214	6s1	4	32'-7	196	6s1	4	29'-5	177	6s1	4	26'-3	158	6s1	4	23'-1	139	6s1	4	19'-11	120
Wing Slope, Both F. (L)		6s2	2	7'-9	23	6s2	2	7'-9	23	6s2	2	7'-9	23	6s2	2	7'-9	23	6s2	2	7'-9	23	6s2	2	7'-9	23
Wing Slope, Both F. (R)		6s3	2	7'-9	23	6s3	2	7'-9	23	6s3	2	7'-9	23	6s3	2	7'-9	23	6s3	2	7'-9	23	6s3	2	7'-9	23
Wing Slope, F.F.		6s4	2	11'-5	34	6s4	2	11'-5	34	6s4	2	11'-5	34	6s4	2	11'-5	34	6s4	2	11'-5	34	6s4	2	11'-5	34
Wing Slope, F.F.		6s5	2	33'-2	100	6s5	2	30'-0	90	6s5	2	26'-10	81	6s5	2	23'-8	71	6s5	2	20'-6	62	6s5	2	17'-4	52
Interior Wall, Both F.		6s6	4	41'-10	266	6s6	4	38'-8	232	6s6	4	35'-6	213	6s6	4	32'-4	194	6s6	4	29'-2	175	6s6	4	26'-0	156
Curtain, Vert.		5t1	33	7'-11	272	5t1	33	7'-8	264	5t1	32	7'-5	248	5t1	32	7'-2	239	5t1	32	6'-11	231	5t1	32	6'-8	223
Curtain, Vert. Ends		5t2	4	7'-11	33	5t2	4	7'-8	32	5t2	4	7'-5	31	5t2	4	7'-2	30	5t2	4	6'-11	29	5t2	4	6'-8	28
Bracket, Vert.		5u1	4	6'-7	27	5u1	4	6'-4	26	5u1	4	6'-2	26	5u1	4	5'-11	25	5u1	4	5'-8	24	5u1	4	5'-6	23
Estimated Quantities One Headwall	Reinf. Steel			15,099 LB				12,899 LB				10,722 LB				9154 LB				8088 LB				7026 LB	
	Concrete Parapet Δ	3.3		104.7 CY		3.3		94.1 CY		3.1		77.9 CY		3.1		69.1 CY		3.1		60.7 CY		3.0		50.9 CY	
	Concrete Wingwalls	38.5				32.8				22.9				18.9				15.2				10.7			
	Concrete Apron ✳	62.9				58.0				51.9				47.1				42.4				37.2			

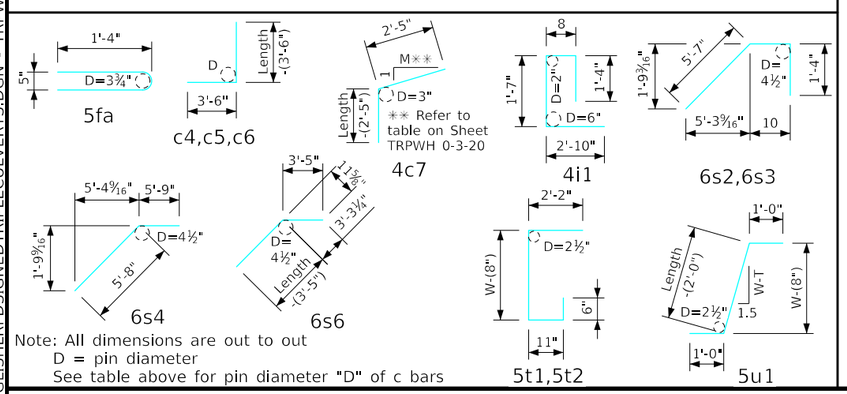
c Bar Pin Diameter	
Bar Size	D
5	3¾"
6	4½"

Note: Weight of bars over 40'-0" long include an allowance of 2'-5" for lap.

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.

(L) - Indicates bar located at left corner.
(R) - Indicates bar located at right corner.
Refer to Sheet TRPWH 0-1-20 for left and right corner locations.

Bent Bar Details



Note: All dimensions are out to out
D = pin diameter
See table above for pin diameter "D" of c bars

Headwall Notes:

1. This headwall is based on a 3:1 slope normal to centerline of roadway.
2. The sides of the apron are to be formed to ensure correct line and grade.
3. All apron 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.
4. 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.
5. Concrete quantities are estimated from back of parapet.
6. Horizontal tails of bars "b" & "s" estimated to extend 2'-5" beyond back of parapet (into end of barrel). Longitudinal bars "4d1" and "6f1" estimated to project into end section of barrel a minimum of 2'-5" beyond back of parapet. The "length" column reflects total number of feet necessary to meet these requirements.
7. Dimensions are in feet and inches unless otherwise noted.

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IOWA DOT

Standard Design - Triple Reinforced Concrete Box Culverts

Parallel Wing Headwalls

July, 2020

Quantity Tabulation
10'-0" Span
0° Skew

TRPWH
0-7-20
Sheet 1 of 2

ENGLISHLRFDSIGNEDTRIPLECULVERTS.DGN - TRPWH 0-7-20 S1 - THIS SHEET ISSUED 07-2020.

Bill of Reinforcing for One Headwall 0° Skew Span x Culvert Height

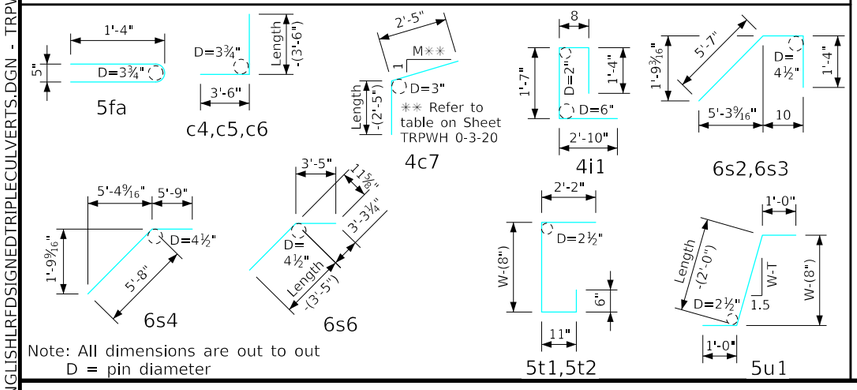
Location	Shape	10' x 6' Bar	10' x 6' No.	10' x 6' Length	10' x 6' Wt.	10' x 5' Bar	10' x 5' No.	10' x 5' Length	10' x 5' Wt.	10' x 4' Bar	10' x 4' No.	10' x 4' Length	10' x 4' Wt.
Fence Anchor (Galv.)		5fa	2	2'-10	6	5fa	2	2'-10	6	5fa	2	2'-10	6
Wingwall, F.F.H.		5b1	2	22'-3	46	5b1	2	19'-3	40	5b1	2	16'-3	34
Wingwall, F.F.H.		5b2	10 Var.	2 Each 8'-10 to 20'-10	155	5b2	8 Var.	2 Each 8'-10 to 17'-10	111	5b2	6 Var.	2 Each 8'-10 to 14'-10	74
Wingwall, B.F.H.		4b3	2	22'-3	30	4b3	2	19'-3	26	4b3	2	16'-3	22
Wingwall, B.F.H.		4b4	8 Var.	2 Each 11'-10 to 20'-10	87	4b4	6 Var.	2 Each 11'-10 to 17'-10	59	4b4	4 Var.	2 Each 11'-10 to 14'-10	36
Interior Wall, Both F.H.		5b5	18 Var.	2 Each 6'-7 to 21'-10	267	5b5	14 Var.	2 Each 6'-9 to 18'-9	186	5b5	10 Var.	2 Each 7'-1 to 15'-9	119
Wingwall, F.F.V.		4c1	50 Var.	2 Each 2'-7 to 8'-7	186	4c1	32 Var.	2 Each 2'-7 to 7'-7	109	4c1	26 Var.	2 Each 2'-7 to 6'-7	80
Wingwall, F.F.V.		c2	--	--	--	c2	--	--	--	c2	--	--	--
Wingwall, F.F.V. (L)		4c3	2	9'-0	12	4c3	2	8'-0	11	4c3	2	7'-0	9
Wingwall, F.F.V. (R)		4c3	2	9'-0	12	4c3	2	8'-0	11	4c3	2	7'-0	9
Wingwall, B.F.V.		5c4	38 Var.	2 Each 6'-3 to 12'-3	367	5c4	32 Var.	2 Each 6'-3 to 11'-3	292	5c4	26 Var.	2 Each 6'-3 to 10'-3	224
Wingwall, B.F.V. (L)		5c5	2	12'-6	26	5c5	2	11'-6	24	5c5	2	10'-6	22
Wingwall, B.F.V. (R)		5c5	2	12'-6	26	5c5	2	11'-6	24	5c5	2	10'-6	22
Wingwall, B.F.V.		5c6	14	8'-6	124	c6	--	--	--	c6	--	--	--
Interior Wall, Both F.V		4c7	4	3'-9	10	4c7	4	3'-9	10	4c7	4	3'-9	10
Interior Wall, Both F.V		4c8	74 Var.	2 Each 1'-6 to 6'-3	192	4c8	62 Var.	2 Each 1'-6 to 5'-3	140	4c8	50 Var.	2 Each 1'-5 to 4'-3	95
Interior Wall, Both F.V		4c9	4	6'-6	17	4c9	4	5'-6	15	4c9	4	4'-6	12
Apron, Longit., Bott.		4d1	33	22'-3	490	4d1	33	19'-3	424	4d1	33	16'-3	358
Apron, Longit., Top		6f1	33	22'-3	1103	6f1	33	19'-3	954	6f1	33	16'-3	805
Parapet, Vertical		4i1	63	6'-5	270	4i1	63	6'-5	270	4i1	63	6'-5	270
Parapet, Horizontal		7j1	4	32'-8	267	7j1	4	32'-8	267	7j1	4	32'-8	267
Apron, Trans., Top		5m1	27	33'-2	934	5m1	23	33'-2	796	5m1	19	33'-2	657
Apron, Trans., Top		m2	--	--	--	m2	--	--	--	m2	--	--	--
Apron, Trans., Bott.		4m3	19	28'-10	366	4m3	16	28'-10	308	4m3	13	28'-10	250
Curtain, Horiz.		6p1	5	33'-2	249	6p1	5	33'-2	249	6p1	5	33'-2	249
Wing Slope, Both F.		6s1	4	16'-9	101	6s1	4	13'-7	82	6s1	4	10'-5	63
Wing Slope, Both F. (L)		6s2	2	7'-9	23	6s2	2	7'-9	23	6s2	2	7'-9	23
Wing Slope, Both F. (R)		6s3	2	7'-9	23	6s3	2	7'-9	23	6s3	2	7'-9	23
Wing Slope, F.F.		6s4	2	11'-5	34	6s4	2	11'-5	34	6s4	2	11'-5	34
Wing Slope, F.F.		6s5	2	14'-2	43	6s5	2	11'-0	33	6s5	2	7'-10	24
Interior Wall, Both F.		6s6	4	22'-10	137	6s6	4	19'-8	118	6s6	4	16'-7	100
Curtain, Vert.		5t1	32	6'-5	214	5t1	32	6'-5	214	5t1	32	6'-5	214
Curtain, Vert. Ends		5t2	4	6'-5	27	5t2	4	6'-5	27	5t2	4	6'-5	27
Bracket, Vert.		5u1	4	5'-4	22	5u1	4	5'-4	22	5u1	4	5'-4	22
Estimated Quantities One Headwall	Reinf. Steel			5866 LB				4908 LB				4160 LB	
	Concrete: Parapet Δ	3.0		43.6 CY		3.0		37.1 CY		3.0		30.8 CY	
	Concrete: Wingwalls	8.1				5.9				3.9			
	Concrete: Apron ✳	32.5				28.2				23.9			

Note: Weight of bars over 40'-0" long include an allowance of 2'-5" for lap.

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.

(L) - Indicates bar located at left corner.
(R) - Indicates bar located at right corner.
Refer to Sheet TRPWH 0-1-20 for left and right corner locations.

Bent Bar Details



Note: All dimensions are out to out
D = pin diameter

Headwall Notes:

1. This headwall is based on a 3:1 slope normal to centerline of roadway.
2. The sides of the apron are to be formed to ensure correct line and grade.
3. All apron 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.
4. 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.
5. Concrete quantities are estimated from back of parapet.
6. Horizontal tails of bars "b" & "s" estimated to extend 2'-5" beyond back of parapet (into end of barrel). Longitudinal bars "4d1" and "6f1" estimated to project into end section of barrel a minimum of 2'-5" beyond back of parapet. The "length" column reflects total number of feet necessary to meet these requirements.
7. Dimensions are in feet and inches unless otherwise noted.

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Standard Design - Triple Reinforced Concrete Box Culverts

Parallel Wing Headwalls

July, 2020

Quantity Tabulation 10'-0" Span 0° Skew

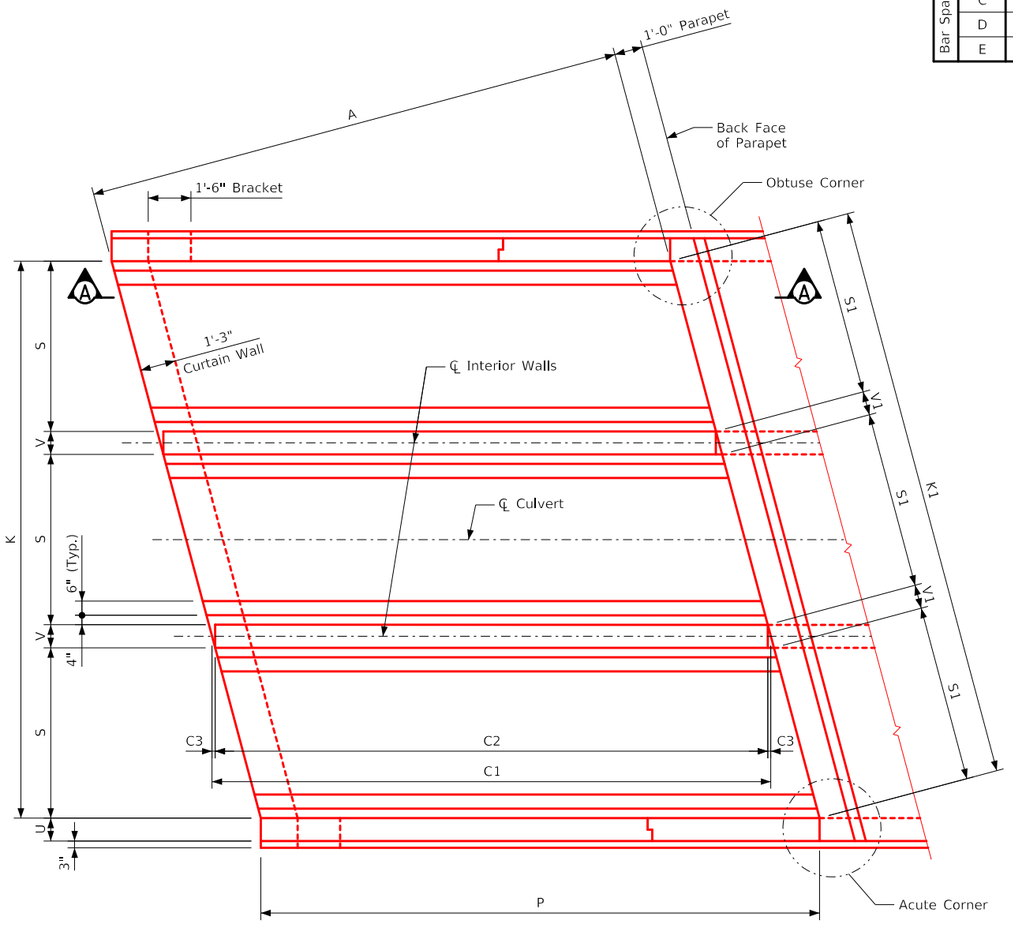
TRPWH 0-7-20

Sheet 2 of 2

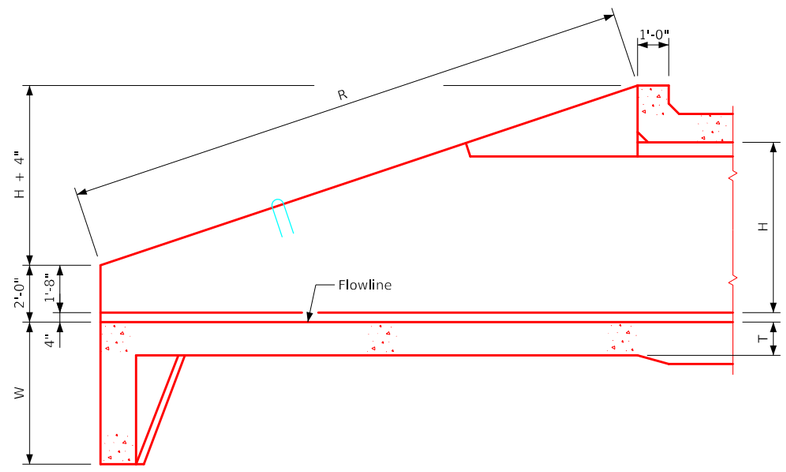
ENGLISHLRFDSIGNEDTRIPLECULVERTS.DGN - TRPWH 0-7-20 S2 - THIS SHEET ISSUED 07-2020.

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'	S x H
Headwall Dimensions	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	A
	C1	38'-3⅜	35'-2⅜	32'-1⅛	28'-11⅞	25'-10⅝	22'-9⅜	19'-8	16'-6¾	13'-5½	38'-3⅜	35'-2⅜	32'-1⅛	28'-11⅞	25'-10⅝	22'-9⅜	19'-8	16'-6¾	13'-5½	C1
	C2	38'-0⅜	34'-11⅛	31'-10⅜	28'-9⅛	25'-7⅞	22'-6⅞	19'-5½	16'-4¼	13'-3	38'-0⅜	34'-11⅛	31'-10⅜	28'-9⅛	25'-7⅞	22'-6⅞	19'-5½	16'-4¼	13'-3	C2
	C3	1⅝	1⅝	1⅜	1⅜	1⅜	1¼	1¼	1¼	1¼	1⅝	1⅝	1⅜	1⅜	1⅜	1¼	1¼	1¼	1¼	C3
	H	12'-0	11'-0	10'-0	9'-0	8'-0	7'-0	6'-0	5'-0	4'-0	12'-0	11'-0	10'-0	9'-0	8'-0	7'-0	6'-0	5'-0	4'-0	H
	K	38'-0	38'-0	37'-8	37'-8	37'-8	37'-6	37'-6	37'-6	37'-6	32'-0	32'-0	31'-8	31'-8	31'-8	31'-6	31'-6	31'-6	31'-6	K
	K1	39'-4⅛	39'-4⅛	39'-0⅛	39'-0⅛	39'-0⅛	38'-10⅛	38'-10⅛	38'-10⅛	38'-10⅛	33'-1½	33'-1½	32'-9½	32'-9½	32'-9½	32'-7½	32'-7½	32'-7½	32'-7½	K1
	P	38'-3⅜	35'-2⅜	32'-1⅛	28'-11⅞	25'-10⅝	22'-9⅜	19'-8	16'-6¾	13'-5½	38'-3⅜	35'-2⅜	32'-1⅛	28'-11⅞	25'-10⅝	22'-9⅜	19'-8	16'-6¾	13'-5½	P
	R	40'-2⅞	36'-11¾	33'-8⅝	30'-5½	27'-2¼	23'-11⅛	20'-8	17'-4⅞	14'-1⅝	40'-2⅞	36'-11¾	33'-8⅝	30'-5½	27'-2¼	23'-11⅛	20'-8	17'-4⅞	14'-1⅝	R
	R1	39'-7⅛	36'-4	33'-1⅜	29'-10¼	26'-7⅛	23'-4¼	20'-1⅛	16'-10⅛	13'-7⅛	39'-7⅛	36'-4	33'-1⅜	29'-10¼	26'-7⅛	23'-4¼	20'-1⅛	16'-10⅛	13'-7⅛	R1
	S	12'-0	12'-0	12'-0	12'-0	12'-0	12'-0	12'-0	12'-0	12'-0	10'-0	10'-0	10'-0	10'-0	10'-0	10'-0	10'-0	10'-0	10'-0	S
	S1	12'-5⅛	12'-5⅛	12'-5⅛	12'-5⅛	12'-5⅛	12'-5⅛	12'-5⅛	12'-5⅛	12'-5⅛	10'-4¼	10'-4¼	10'-4¼	10'-4¼	10'-4¼	10'-4¼	10'-4¼	10'-4¼	10'-4¼	S1
	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	1'-1	1'-1	1'-1	1'-1	1'-1	T
	U	1'-0	1'-0	10	10	10	9	9	9	9	1'-0	1'-0	10	10	10	9	9	9	9	U
	V	1'-0	1'-0	10	10	10	9	9	9	9	1'-0	1'-0	10	10	10	9	9	9	9	V
	V1	1'-0⅜	1'-0⅜	10⅜	10⅜	10⅜	9⅜	9⅜	9⅜	9⅜	1'-0⅜	1'-0⅜	10⅜	10⅜	10⅜	9⅜	9⅜	9⅜	9⅜	V1
	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	4'-0	3'-9	3'-6	3'-6	3'-6	W
Bar Spacing	B	1'-0	1'-0	1'-0	1'-0	1'-0	1'-0	1'-0	9	9	1'-0	1'-0	1'-0	1'-0	1'-0	1'-0	1'-0	1'-0	1'-0	B
	C	1'-0	1'-0	1'-0	1'-0	9	9	9	1'-0	1'-0	1'-0	1'-0	1'-0	1'-0	9	9	9	1'-0	1'-0	C
	D	6	6	1'-0	1'-0	1'-0	1'-0	1'-0	9	1'-0	6	6	1'-0	9	1'-0	1'-0	1'-0	1'-0	1'-0	D
	E	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	E



Plan View



Elevation Section A-A

Notes:

1. See Sheet TRRCB G2-20 for General Notes, Specifications, and Design Stresses.
2. See Sheets TRPWH 15-2-20 thru 15-5-20 for location of certain dimensions tabulated.
3. Dimensions are in feet and inches unless otherwise noted.

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IOWADOT

Standard Design - Triple Reinforced Concrete Box Culverts

Parallel Wing Headwalls

July, 2020

Dimension Table
15° Skew

TRPWH
15-1-20

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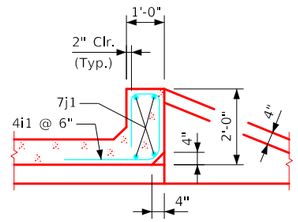
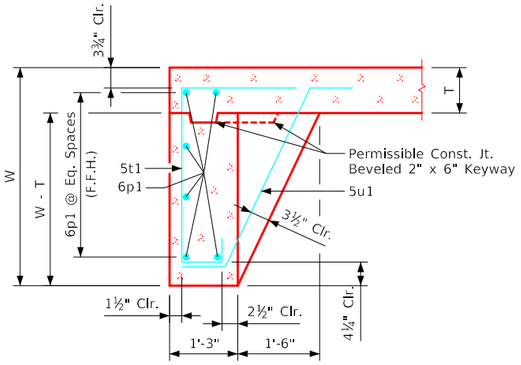
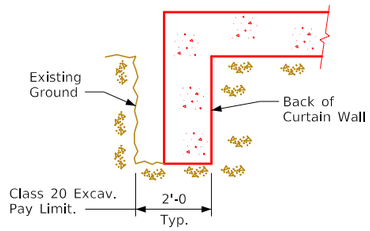


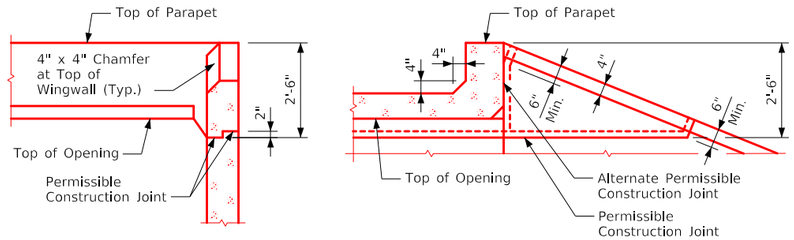
Section thru Parapet



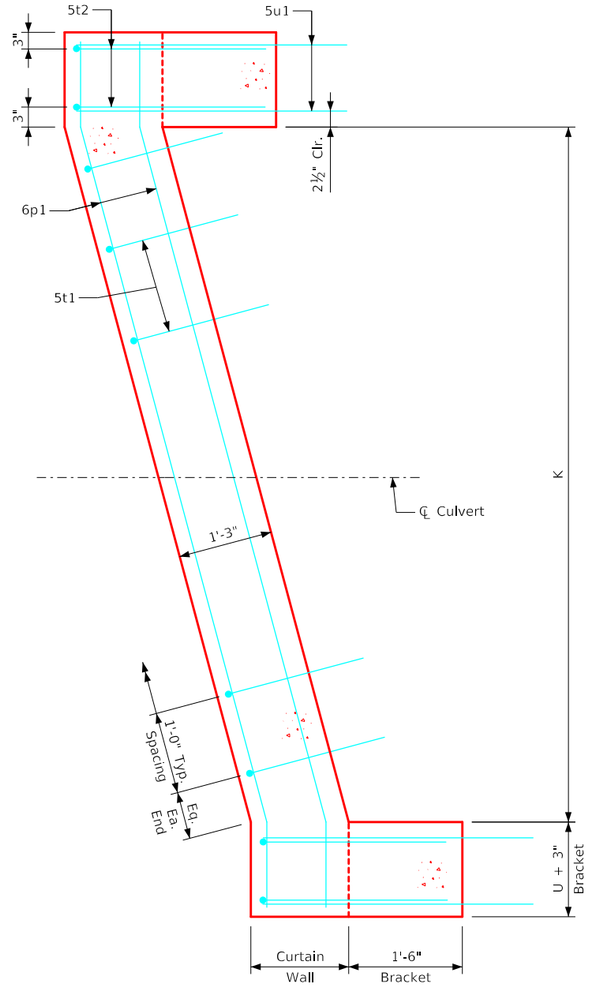
Section thru Curtain Wall



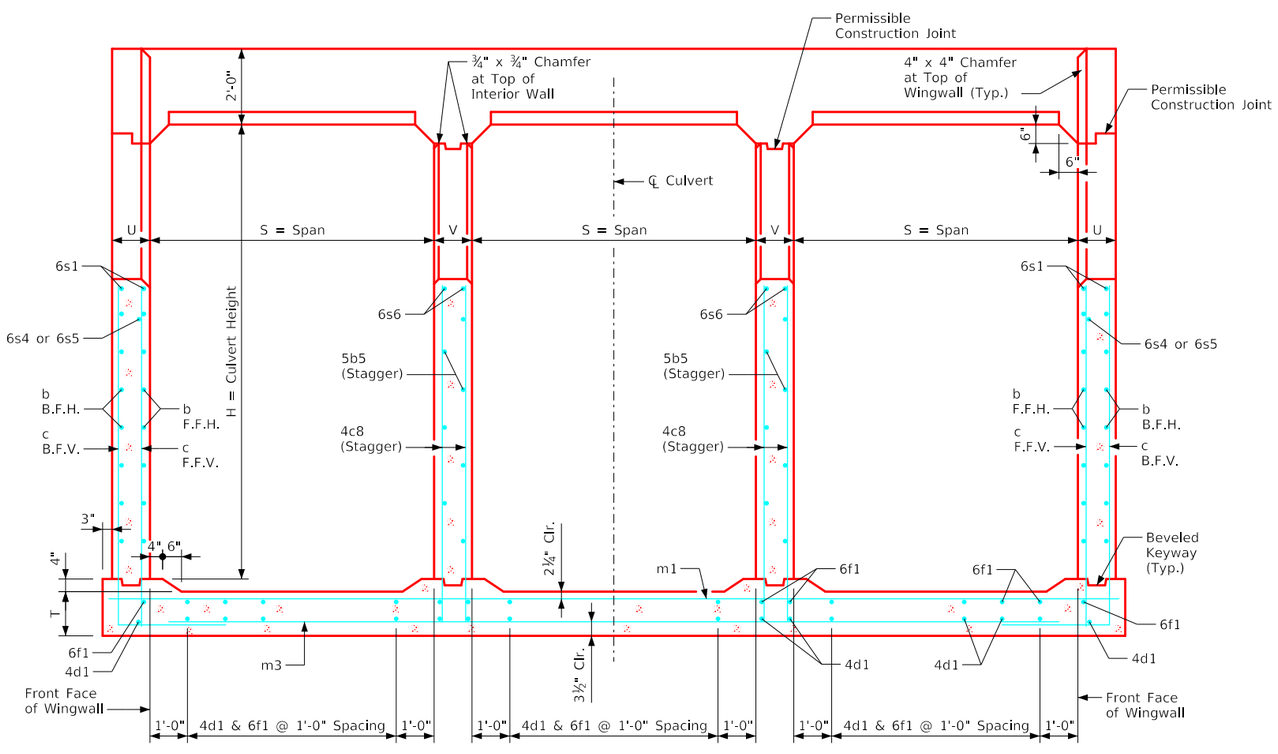
Curtain Wall
Class 20 Excavation



Top of Wingwall Details



Curtain Wall Detail - Plan View
(Apron is not shown)



Typical Cross Section - thru Headwall

Notes:

1. See Sheet TRRCB G2-20 for General Notes, Specifications, and Design Stresses.
2. For dimension table see Sheet TRPWH 15-1-20.

August 2022
LATEST REVISION DATE

APPROVED BY BRIDGE ENGINEER

IOWADOT

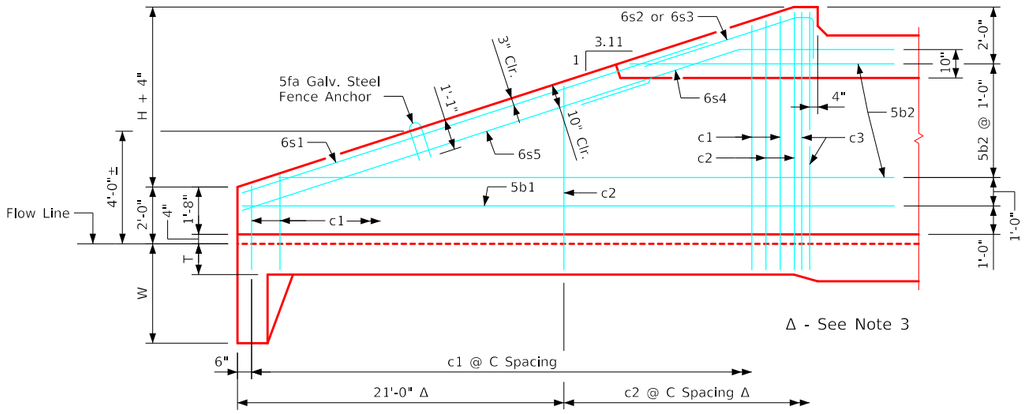
Standard Design - Triple Reinforced Concrete Box Culverts

Parallel Wing Headwalls

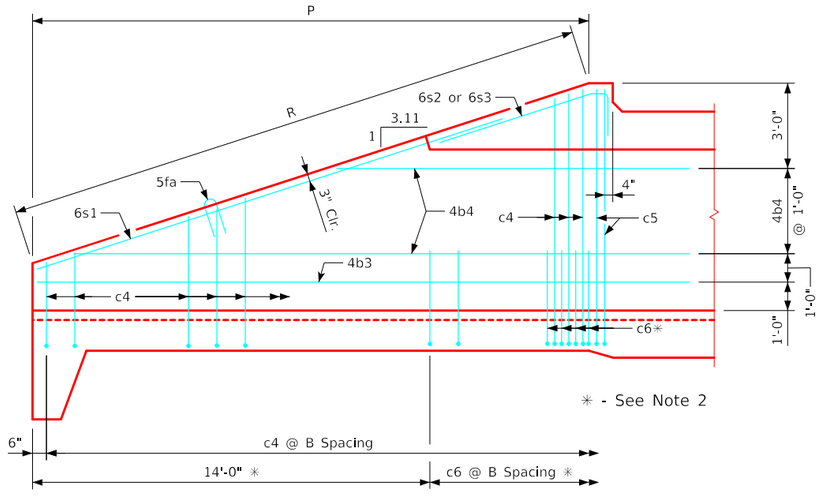
July, 2020

Cross Section Details 15° Skew	TRPWH 15-2-20

Revised 08-2022: Changed chamfer at top of Interior Walls to 3/4" x 3/4" (was 4" x 4").
ENGLISHLRFDSIGNEDTRIPLECULVERTS.DGN - TRPWH 15-2-20 - THIS SHEET ISSUED 07-2020.

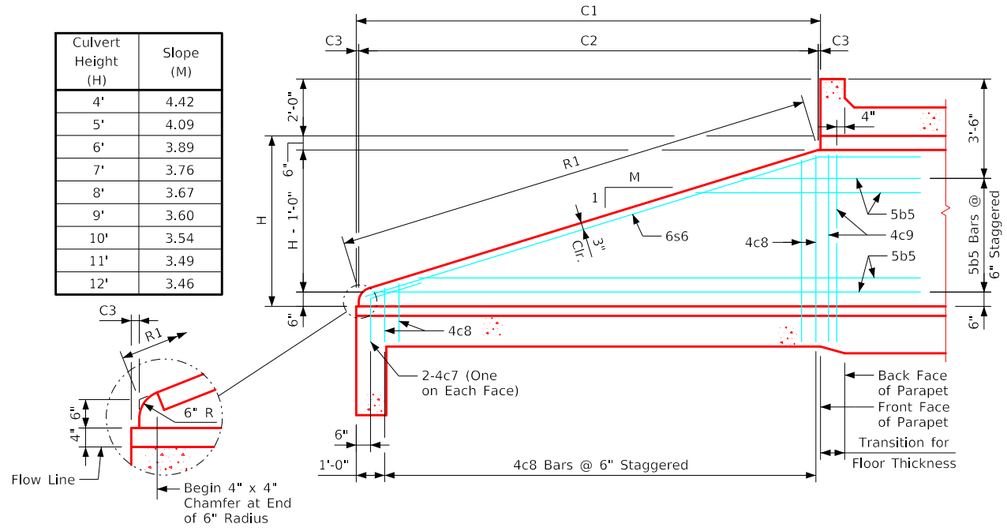


Typical View - Front Face Wingwall Reinforcing



Typical View - Back Face Wingwall Reinforcing

Culvert Height (H)	Slope (M)
4'	4.42
5'	4.09
6'	3.89
7'	3.76
8'	3.67
9'	3.60
10'	3.54
11'	3.49
12'	3.46



Typical View - Interior Wall

Notes:

1. Bar spacings and positions shown are similar for all sizes of headwalls in this standard.
2. Not applicable for 4' thru 5' height headwalls.
3. Not applicable for 4' thru 8' height headwalls.
4. For headwall dimensions and bar spacing see Sheet TRPWH 15-1-20.
5. Apron m3 bars are to be centered on ℄ culvert.
6. B.F.V. (c5) and F.F.V. (c3) and interior wall both F.V. (c9) bars are approximately 4" from the back of parapet for all headwalls.

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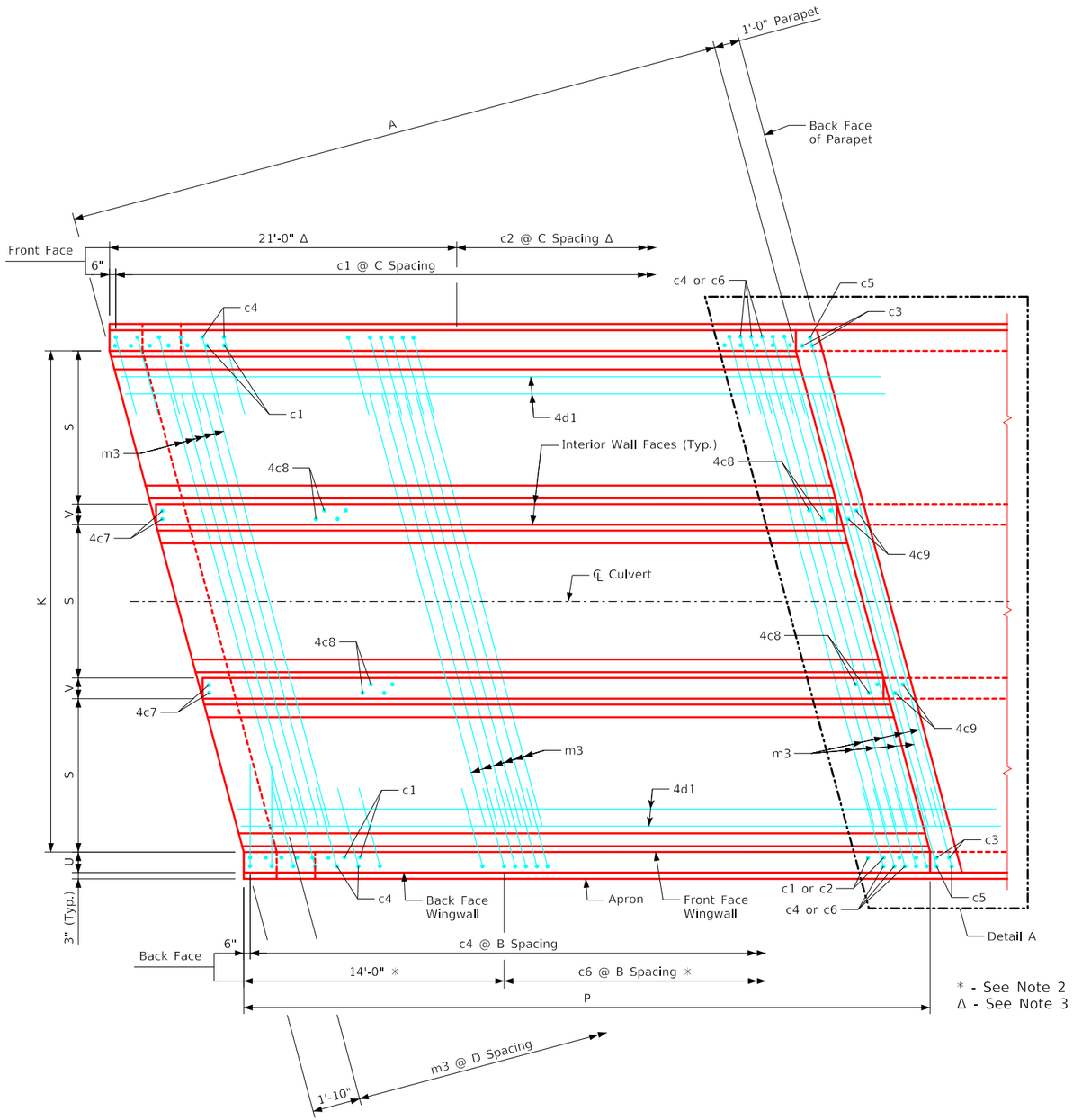
Standard Design - Triple Reinforced Concrete Box Culverts

Parallel Wing Headwalls

July, 2020

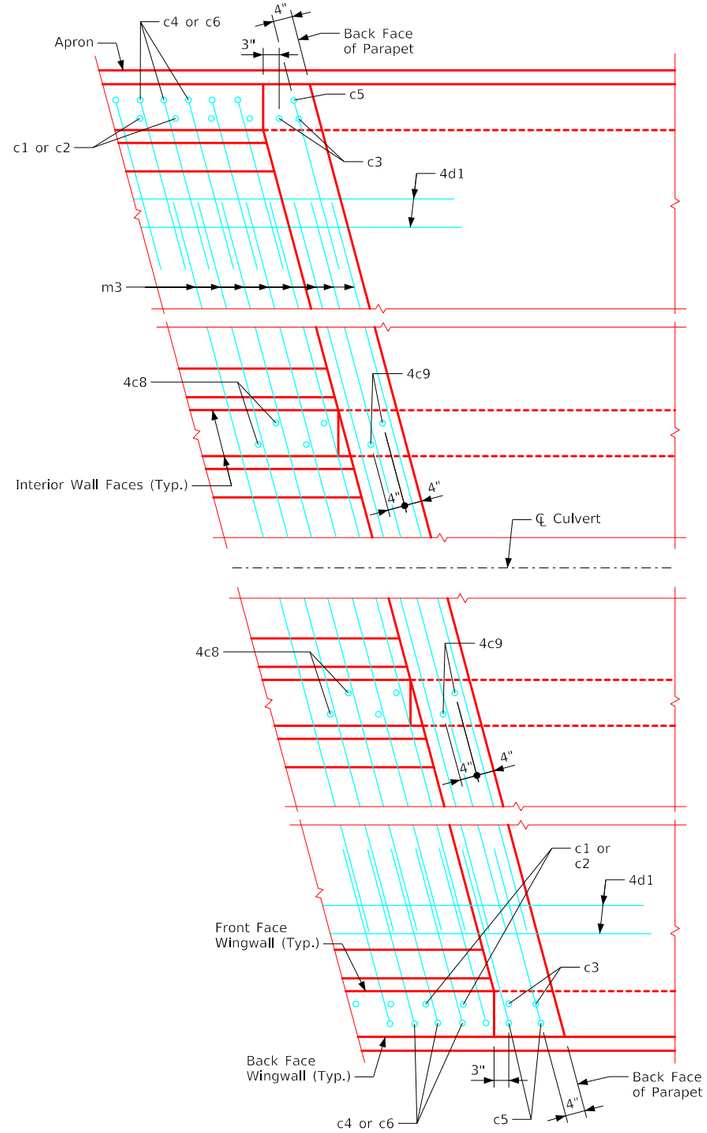
Wingwall Elevations
15° Skew

TRPWH
15-3-20



Plan View - Bottom Apron Reinforcing

(Curtain Wall Reinforcing not shown, See Sheet TRPWH 15-2-20)



Detail A

Notes:

1. Bar spacings and positions shown are similar for all sizes of headwalls in this standard.
2. Not applicable for 4' & 5' height headwalls.
3. Not applicable for 4' thru 8' height headwalls.
4. For headwall dimensions and bar spacing see Sheet TRPWH 15-1-20.
5. Apron m3 bars are to be centered on ℄ culvert.
6. B.F.V. (c5), F.F.V. (c3) and interior wall both F.V. (c9) bars are approximately 4" from the back of parapet for all headwalls.

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Standard Design - Triple Reinforced Concrete Box Culverts

Parallel Wing Headwalls

July, 2020

Bottom Apron Reinforcing 15° Skew	TRPWH 15-4-20

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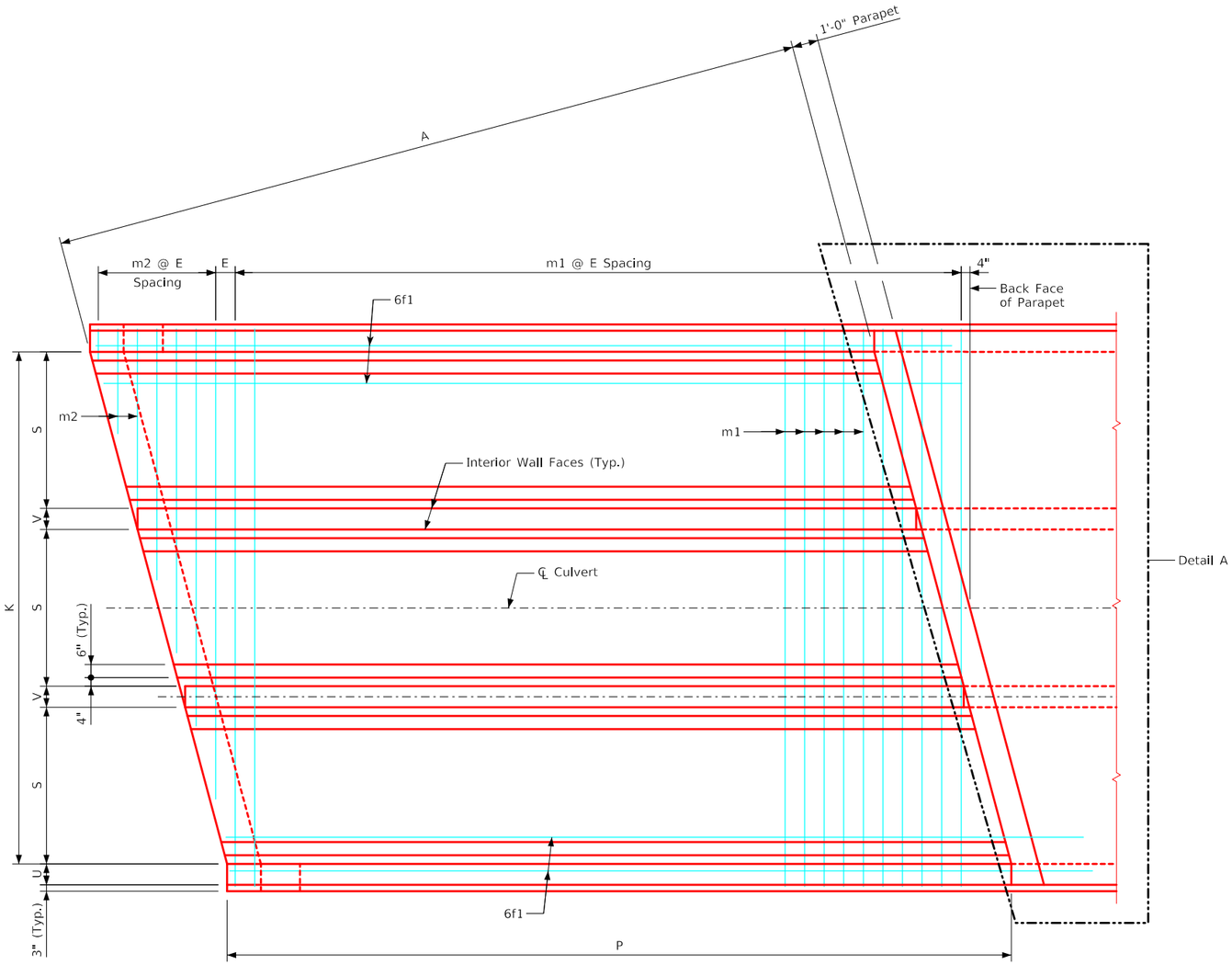
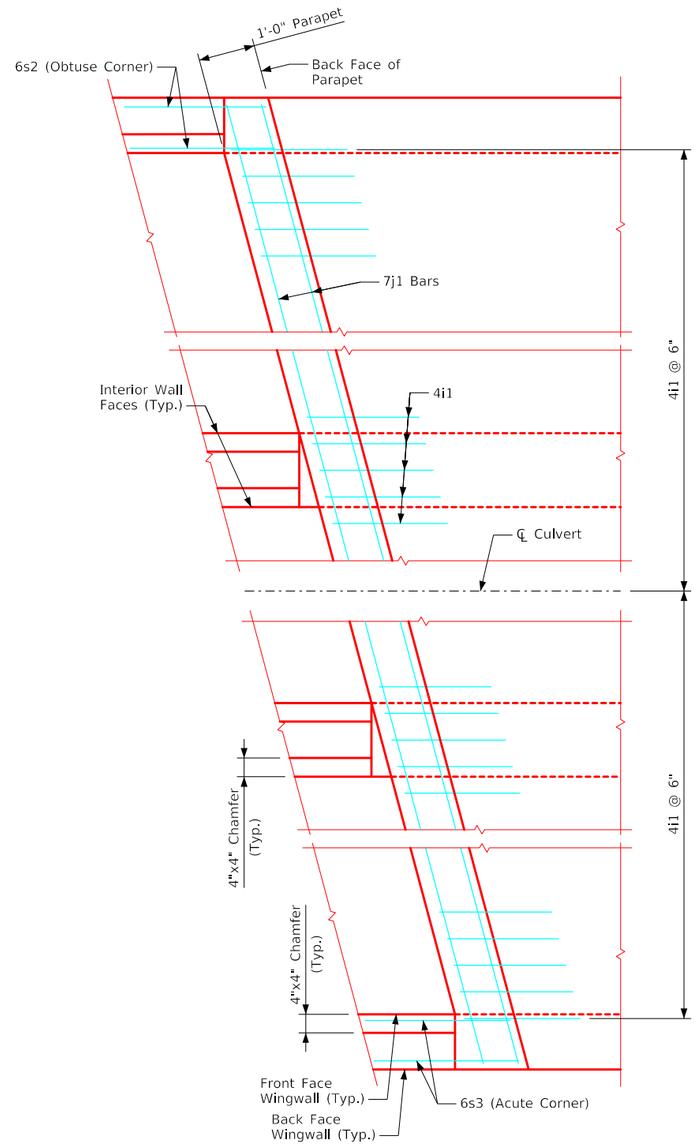


Plan View - Top Apron Reinforcing

(Wall Reinforcing not shown for clarity)



Detail A

(Showing parapet bars only)

Notes:

1. Bar spacings and positions shown are similar for all sizes of headwalls in this standard.
2. For headwall dimensions and bar spacing see Sheet TRPWH 15-1-20.
3. Top transverse apron bars are referenced approximately 4" from the back of the parapet for all headwalls.

LATEST REVISION DATE

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Standard Design - Triple Reinforced Concrete Box Culverts

Parallel Wing Headwalls

July, 2020

Parapet Reinforcing & Top Apron Reinforcing 15° Skew

TRPWH 15-5-20

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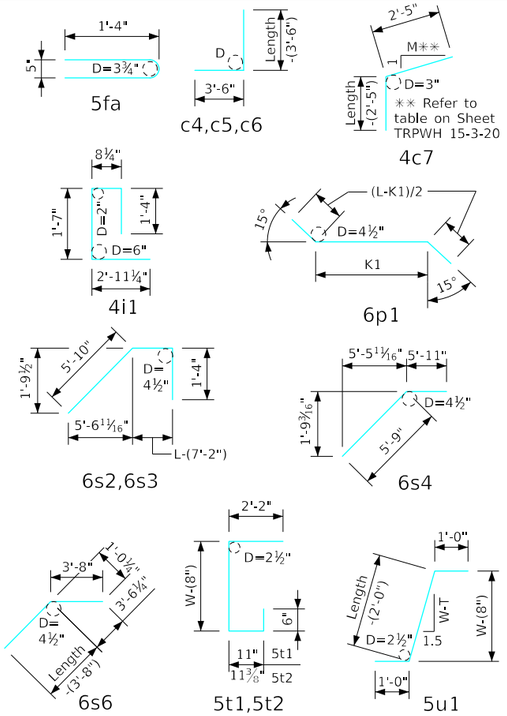
Bent Bar Details



Note: All dimensions are out to out
D = pin diameter
See table below for pin diameter "D" of c bars

c Bar Pin Diameter	
Bar Size	D
5	3¾"
6	4½"

Bill of Reinforcing for One Headwall 15° Skew Span x Culvert Height

Location	Shape	12' x 12'				12' x 11'				12' x 10'				12' x 9'				12' x 8'				12' x 7'			
		Bar	No.	Length	Wt.	Bar	No.	Length	Wt.	Bar	No.	Length	Wt.	Bar	No.	Length	Wt.	Bar	No.	Length	Wt.	Bar	No.	Length	Wt.
Fence Anchor (Galv.)		5fa	2	2'-10	6	5fa	2	2'-10	6	5fa	2	2'-10	6	5fa	2	2'-10	6	5fa	2	2'-10	6	5fa	2	2'-10	6
Wingwall, F.F.H.		5b1	2	41'-7	92	5b1	2	38'-6	80	5b1	2	35'-5	74	5b1	2	32'-4	67	5b1	2	29'-2	61	5b1	2	26'-1	54
Wingwall, F.F.H.		5b2	22 Var.	2 Each 9'-2 to 40'-2	571	5b2	20 Var.	2 Each 9'-2 to 37'-1	482	5b2	18 Var.	2 Each 9'-2 to 34'-0	405	5b2	16 Var.	2 Each 9'-2 to 30'-11	334	5b2	14 Var.	2 Each 9'-2 to 27'-9	270	5b2	12 Var.	2 Each 9'-2 to 24'-8	212
Wingwall, B.F.H.		4b3	2	41'-9	59	4b3	2	38'-8	52	4b3	2	35'-6	47	4b3	2	32'-5	43	4b3	2	29'-3	39	4b3	2	26'-2	35
Wingwall, B.F.H.		4b4	20 Var.	2 Each 12'-5 to 40'-4	356	4b4	18 Var.	2 Each 12'-5 to 37'-3	299	4b4	16 Var.	2 Each 12'-4 to 34'-1	248	4b4	14 Var.	2 Each 12'-4 to 31'-0	203	4b4	12 Var.	2 Each 12'-4 to 27'-11	161	4b4	10 Var.	2 Each 12'-4 to 24'-9	124
Interior Wall, Both F.H.		5b5	42 Var.	2 Each 6'-7 to 41'-2	1051	5b5	38 Var.	2 Each 6'-8 to 38'-1	887	5b5	34 Var.	2 Each 6'-8 to 35'-0	739	5b5	30 Var.	2 Each 6'-8 to 31'-10	602	5b5	26 Var.	2 Each 6'-9 to 28'-9	481	5b5	22 Var.	2 Each 6'-10 to 25'-7	372
Wingwall, F.F.V.		5c1	76 Var.	2 Each 2'-8 to 14'-7	684	5c1	70 Var.	2 Each 2'-8 to 13'-7	593	4c1	64 Var.	2 Each 2'-8 to 12'-8	328	4c1	58 Var.	2 Each 2'-8 to 11'-8	278	4c1	68 Var.	2 Each 2'-8 to 10'-8	303	4c1	60 Var.	2 Each 2'-8 to 9'-8	247
Wingwall, F.F.V.		5c2	36 Var.	2 Each 9'-3 to 14'-9	451	5c2	30 Var.	2 Each 9'-3 to 13'-9	360	4c2	24 Var.	2 Each 9'-3 to 12'-10	177	4c2	16 Var.	2 Each 9'-3 to 11'-6	111	c2	--	--	--	c2	--	--	--
Wingwall, F.F.V. (O)		5c3	2	15'-1	31	5c3	2	14'-1	29	4c3	2	13'-1	17	4c3	2	12'-1	16	4c3	2	11'-1	15	4c3	2	10'-1	13
Wingwall, F.F.V. (A)		5c3	2	15'-1	31	5c3	2	14'-1	29	4c3	2	13'-1	17	4c3	2	12'-1	16	4c3	2	11'-1	15	4c3	2	10'-1	13
Wingwall, B.F.V.		6c4	76 Var.	2 Each 6'-4 to 18'-3	1403	5c4	70 Var.	2 Each 6'-4 to 17'-4	864	5c4	64 Var.	2 Each 6'-4 to 16'-4	757	5c4	58 Var.	2 Each 6'-4 to 15'-5	658	5c4	52 Var.	2 Each 6'-4 to 14'-5	563	5c4	46 Var.	2 Each 6'-4 to 13'-5	474
Wingwall, B.F.V. (O)		6c5	1	18'-7	28	5c5	1	17'-7	18	5c5	1	16'-7	17	5c5	1	15'-7	16	5c5	1	14'-7	15	5c5	1	13'-7	14
Wingwall, B.F.V. (A)		6c5	2	18'-7	56	5c5	2	17'-7	37	5c5	2	16'-7	35	5c5	2	15'-7	33	5c5	2	14'-7	30	5c5	2	13'-7	28
Wingwall, B.F.V.		6c6	50	8'-6	638	5c6	44	8'-6	390	5c6	38	8'-6	337	5c6	30	8'-6	266	5c6	24	8'-6	213	5c6	18	8'-6	160
Interior Wall, Both F.V		4c7	4	3'-10	10	4c7	4	3'-10	10	4c7	4	3'-10	10	4c7	4	3'-10	10	4c7	4	3'-10	10	4c7	4	3'-10	10
Interior Wall, Both F.V		4c8	150 Var.	2 Each 1'-7 to 12'-3	693	4c8	136 Var.	2 Each 1'-7 to 11'-2	579	4c8	124 Var.	2 Each 1'-7 to 10'-2	487	4c8	112 Var.	2 Each 1'-7 to 9'-3	405	4c8	100 Var.	2 Each 1'-7 to 8'-3	328	4c8	88 Var.	2 Each 1'-7 to 7'-3	260
Interior Wall, Both F.V		4c9	4	12'-7	34	4c9	4	11'-7	31	4c9	4	10'-7	28	4c9	4	9'-7	26	4c9	4	8'-7	23	4c9	4	7'-7	20
Apron, Longit., Bott.		4d1	39	41'-7	1146	4d1	39	38'-5	1001	4d1	39	35'-4	921	4d1	39	32'-3	840	4d1	39	29'-2	760	4d1	39	26'-0	677
Apron, Longit., Top		6f1	39	41'-7	2577	6f1	39	38'-5	2250	6f1	39	35'-4	2070	6f1	39	32'-3	1889	6f1	39	29'-2	1709	6f1	39	26'-0	1523
Parapet, Vertical		4i1	77	6'-7	339	4i1	77	6'-7	339	4i1	75	6'-7	330	4i1	75	6'-7	330	4i1	75	6'-7	330	4i1	75	6'-7	330
Parapet, Horiz.		7j1	4	41'-0	355	7j1	4	41'-0	355	7j1	4	40'-4	350	7j1	4	40'-4	350	7j1	4	40'-4	350	7j1	4	40'-0	327
Apron, Trans., Top		5m1	45	40'-2	1999	5m1	41	40'-2	1821	5m1	37	39'-6	1524	5m1	33	39'-6	1360	5m1	29	39'-6	1195	5m1	25	39'-2	1021
Apron, Trans., Top		5m2	14 Var.	2'-7 to 39'-0	304	5m2	14 Var.	2'-3 to 38'-7	298	5m2	13 Var.	4'-4 to 37'-11	286	5m2	13 Var.	3'-11 to 37'-6	281	5m2	13 Var.	3'-6 to 37'-1	275	5m2	13 Var.	3'-0 to 36'-7	268
Apron, Trans., Bott.		5m3	73	38'-1	2900	5m3	67	38'-1	2661	6m3	31	38'-1	1773	5m3	28	37'-4	1090	5m3	25	37'-4	973	5m3	22	37'-0	849
Curtain, Horiz.		6p1	6	41'-6	396	6p1	6	41'-6	396	6p1	6	40'-10	390	6p1	6	40'-10	390	6p1	6	40'-10	390	6p1	5	40'-6	322
Wing Slope, Both F.		6s1	4	36'-8	220	6s1	4	33'-5	201	6s1	4	30'-2	181	6s1	4	26'-11	162	6s1	4	23'-8	142	6s1	4	20'-5	123
Wing Slope, Both F. (O)		6s2	2	7'-9	23	6s2	2	7'-9	23	6s2	2	7'-10	24	6s2	2	7'-10	24	6s2	2	7'-10	24	6s2	2	7'-10	24
Wing Slope, Both F. (A)		6s3	2	8'-0	24	6s3	2	8'-0	24	6s3	2	8'-0	24	6s3	2	8'-0	24	6s3	2	8'-0	24	6s3	2	8'-0	24
Wing Slope, F.F.		6s4	2	11'-8	35	6s4	2	11'-8	35	6s4	2	11'-8	35	6s4	2	11'-8	35	6s4	2	11'-8	35	6s4	2	11'-8	35
Wing Slope, F.F.		6s5	2	34'-2	103	6s5	2	30'-11	93	6s5	2	27'-8	83	6s5	2	24'-5	73	6s5	2	21'-2	64	6s5	2	17'-11	54
Interior Wall, Both F.		6s6	4	43'-1	273	6s6	4	39'-9	239	6s6	4	36'-7	220	6s6	4	33'-4	200	6s6	4	30'-1	181	6s6	4	26'-10	161
Curtain, Vert.		5t1	40	7'-11	330	5t1	40	7'-8	320	5t1	40	7'-5	309	5t1	40	7'-2	299	5t1	40	6'-11	289	5t1	39	6'-8	271
Curtain, Vert. Ends		5t2	4	7'-11	33	5t2	4	7'-8	32	5t2	4	7'-5	31	5t2	4	7'-2	30	5t2	4	6'-11	29	5t2	4	6'-8	28
Bracket, Vert.		5u1	4	6'-7	27	5u1	4	6'-5	27	5u1	4	6'-2	26	5u1	4	5'-11	25	5u1	4	5'-9	24	5u1	4	5'-6	23
Estimated Quantities One Headwall	Reinf. Steel			17,278 LB				14,861 LB				12,306 LB				10,492 LB				9327 LB				8102 LB	
	Concrete Parapet Δ	3.9		124.1 CY		3.9		112.0 CY		3.7		94.0 CY		3.7		83.7 CY		3.7		73.8 CY		3.6		62.4 CY	
	Concrete Wingwalls	39.8				33.9				23.7				19.5				15.8				11.1			
	Concrete Apron ✳	80.4				74.2				66.6				60.5				54.3				47.7			

Note: Weight of bars over 40'-0" long include an allowance of 2'-5" for lap.

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.

(A) - Indicates bar located at acute corner.
(O) - Indicates bar located at obtuse corner.
Refer to Sheet TRPWH 15-1-20 for acute and obtuse corner locations.

Headwall Notes:

1. This headwall is based on a 3:1 slope normal to centerline of roadway.
2. The sides of the apron are to be formed to ensure correct line and grade.
3. All apron 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.
4. 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.
5. Concrete quantities are estimated from back of parapet.
6. Horizontal tails of bars "b" & "s" estimated to extend 2'-5" beyond back of parapet (into end of barrel). Longitudinal bars "4d1" and "6f1" estimated to project into end section of barrel a minimum of 2'-5" beyond back of parapet. The "length" column reflects total number of feet necessary to meet these requirements.
7. Dimensions are in feet and inches unless otherwise noted.

LATEST REVISION DATE

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Standard Design - Triple Reinforced Concrete Box Culverts

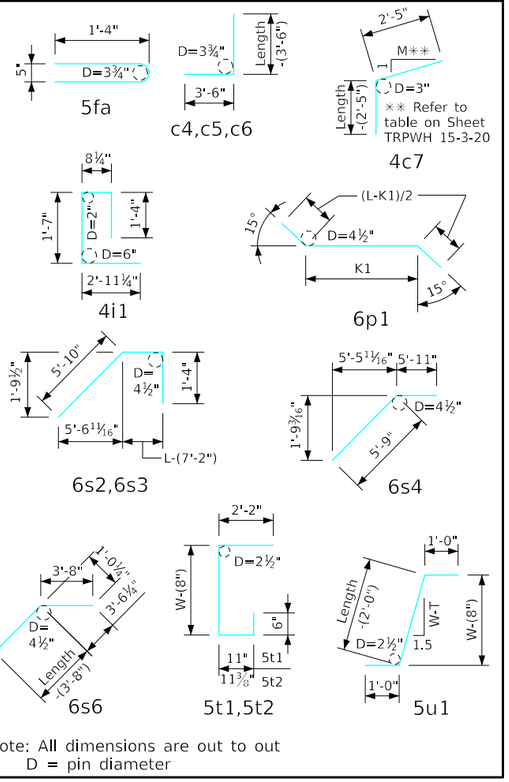
Parallel Wing Headwalls

July, 2020

Quantity Tabulation
12'-0" Span
15° Skew

TRPWH
15-6-20
Sheet 1 of 2

Bent Bar Details



Note: All dimensions are out to out
D = pin diameter

Bill of Reinforcing for One Headwall 15° Skew Span x Culvert Height

Location	Shape	12' x 6' Bar	12' x 6' No.	12' x 6' Length	12' x 6' Wt.	12' x 5' Bar	12' x 5' No.	12' x 5' Length	12' x 5' Wt.	12' x 4' Bar	12' x 4' No.	12' x 4' Length	12' x 4' Wt.
Fence Anchor (Galv.)		5fa	2	2'-10	6	5fa	2	2'-10	6	5fa	2	2'-10	6
Wingwall, F.F.H.		5b1	2	23'-0	48	5b1	2	19'-10	41	5b1	2	16'-9	35
Wingwall, F.F.H.		5b2	10 Var.	2 Each 9'-2 to 21'-7	160	5b2	8 Var.	2 Each 9'-2 to 18'-5	115	5b2	6 Var.	2 Each 9'-2 to 15'-4	77
Wingwall, B.F.H.		4b3	2	23'-1	31	4b3	2	19'-11	27	4b3	2	16'-10	22
Wingwall, B.F.H.		4b4	8 Var.	2 Each 12'-4 to 21'-8	91	4b4	6 Var.	2 Each 12'-4 to 18'-6	62	4b4	4 Var.	2 Each 12'-4 to 15'-5	37
Interior Wall, Both F.H.		5b5	18 Var.	2 Each 6'-11 to 22'-6	276	5b5	14 Var.	2 Each 7'-1 to 19'-4	193	5b5	10 Var.	2 Each 7'-4 to 16'-2	123
Wingwall, F.F.V.		4c1	52 Var.	2 Each 2'-8 to 8'-9	198	4c1	34 Var.	2 Each 2'-8 to 7'-10	119	4c1	26 Var.	2 Each 2'-8 to 6'-6	80
Wingwall, F.F.V.		c2	--	--	--	c2	--	--	--	c2	--	--	--
Wingwall, F.F.V. (O)		4c3	2	9'-1	12	4c3	2	8'-1	11	4c3	2	7'-1	9
Wingwall, F.F.V. (A)		4c3	2	9'-1	12	4c3	2	8'-1	11	4c3	2	7'-1	9
Wingwall, B.F.V.		5c4	40 Var.	2 Each 6'-4 to 12'-6	393	5c4	44 Var.	2 Each 6'-4 to 11'-5	407	5c4	36 Var.	2 Each 6'-4 to 10'-6	316
Wingwall, B.F.V. (O)		5c5	1	12'-7	13	5c5	1	11'-7	12	5c5	1	10'-7	11
Wingwall, B.F.V. (A)		5c5	2	12'-7	26	5c5	2	11'-7	24	5c5	2	10'-7	22
Wingwall, B.F.V.		5c6	12	8'-6	106	c6	--	--	--	c6	--	--	--
Interior Wall, Both F.V		4c7	4	3'-10	10	4c7	4	3'-10	10	4c7	4	3'-10	10
Interior Wall, Both F.V		4c8	74 Var.	2 Each 1'-7 to 6'-2	192	4c8	62 Var.	2 Each 1'-7 to 5'-3	142	4c8	50 Var.	2 Each 1'-6 to 4'-3	96
Interior Wall, Both F.V		4c9	4	6'-7	18	4c9	4	5'-7	15	4c9	4	4'-7	12
Apron, Longit., Bott.		4d1	39	22'-11	597	4d1	39	19'-10	517	4d1	39	16'-8	434
Apron, Longit., Top		6f1	39	22'-11	1342	6f1	39	19'-10	1162	6f1	39	16'-8	976
Parapet, Vertical		4i1	75	6'-7	330	4i1	75	6'-7	330	4i1	75	6'-7	330
Parapet, Horiz.		7j1	4	40'-0	327	7j1	4	40'-0	327	7j1	4	40'-0	327
Apron, Trans., Top		5m1	21	39'-2	858	5m1	16	39'-2	654	5m1	12	39'-2	490
Apron, Trans., Top		5m2	13 Var.	2'-7 to 36'-2	263	5m2	14 Var.	2'-2 to 38'-7	298	5m2	13 Var.	4'-7 to 38'-2	290
Apron, Trans., Bott.		4m3	19	36'-3	460	4m3	21	36'-3	509	4m3	13	36'-3	315
Curtain, Horiz.		6p1	5	40'-6	322	6p1	5	40'-6	322	6p1	5	40'-6	322
Wing Slope, Both F.		6s1	4	17'-1	103	6s1	4	13'-10	83	6s1	4	10'-7	64
Wing Slope, Both F. (O)		6s2	2	7'-10	24	6s2	2	7'-10	24	6s2	2	7'-10	24
Wing Slope, Both F. (A)		6s3	2	8'-0	24	6s3	2	8'-0	24	6s3	2	8'-0	24
Wing Slope, F.F.		6s4	2	11'-8	35	6s4	2	11'-8	35	6s4	2	11'-8	35
Wing Slope, F.F.		6s5	2	14'-8	44	6s5	2	11'-4	34	6s5	2	8'-1	24
Interior Wall, Both F.		6s6	4	23'-7	142	6s6	4	20'-4	122	6s6	4	17'-1	103
Curtain, Vert.		5t1	39	6'-5	261	5t1	39	6'-5	261	5t1	39	6'-5	261
Curtain, Vert. Ends		5t2	4	6'-5	27	5t2	4	6'-5	27	5t2	4	6'-5	27
Bracket, Vert.		5u1	4	5'-4	22	5u1	4	5'-4	22	5u1	4	5'-4	22

Estimated Quantities One Headwall			12' x 6'		12' x 5'		12' x 4'	
Reinf. Steel			6773 LB		5946 LB		4933 LB	
Concrete	Parapet Δ	3.6	53.7 CY		3.6	45.8 CY	3.6	38.2 CY
	Wingwalls	8.4			6.1		4.1	
	Apron ✳	41.7			36.1		30.5	

Note: Weight of bars over 40'-0" long include an allowance of 2'-5" for lap.

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.

(A) - Indicates bar located at acute corner.
(O) - Indicates bar located at obtuse corner.
Refer to Sheet TRPWH 15-1-20 for acute and obtuse corner locations.

Headwall Notes:

1. This headwall is based on a 3:1 slope normal to centerline of roadway.
2. The sides of the apron are to be formed to ensure correct line and grade.
3. All apron 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.
4. 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.
5. Concrete quantities are estimated from back of parapet.
6. Horizontal tails of bars "b" & "s" estimated to extend 2'-5" beyond back of parapet (into end of barrel). Longitudinal bars "4d1" and "6f1" estimated to project into end section of barrel a minimum of 2'-5" beyond back of parapet. The "length" column reflects total number of feet necessary to meet these requirements.
7. Dimensions are in feet and inches unless otherwise noted.

LATEST REVISION DATE

APPROVED BY BRIDGE ENGINEER

IOWADOT

Standard Design - Triple Reinforced Concrete Box Culverts

Parallel Wing Headwalls

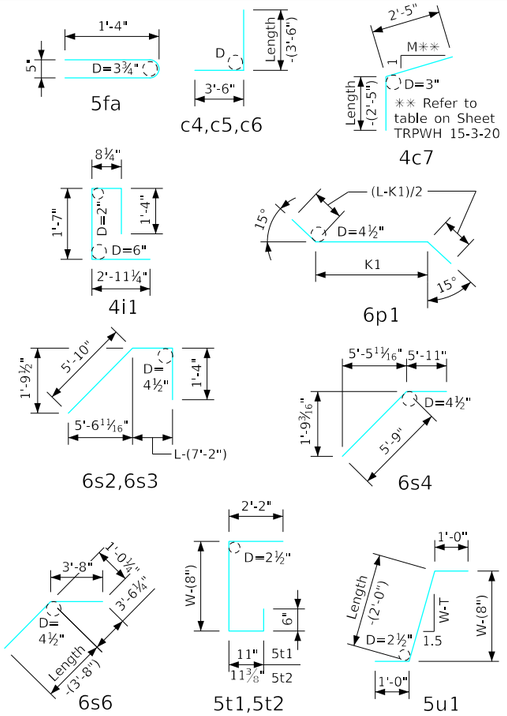
July, 2020

Quantity Tabulation
12'-0" Span
15° Skew

TRPWH
15-6-20
Sheet 2 of 2

ENGLISHLRFDSIGNEDTRIPLECULVERTS.DGN - TRPWH 15-6-20 S2 - THIS SHEET ISSUED 07-2020.

Bent Bar Details



Note: All dimensions are out to out
D = pin diameter
See table below for pin diameter "D" of c bars

c Bar Pin Diameter	
Bar Size	D
5	3¾"
6	4½"

Bill of Reinforcing for One Headwall 15° Skew Span x Culvert Height

Location	Shape	10' x 12'				10' x 11'				10' x 10'				10' x 9'				10' x 8'				10' x 7'			
		Bar	No.	Length	Wt.	Bar	No.	Length	Wt.	Bar	No.	Length	Wt.	Bar	No.	Length	Wt.	Bar	No.	Length	Wt.	Bar	No.	Length	Wt.
Fence Anchor (Galv.)		5fa	2	2'-10	6	5fa	2	2'-10	6	5fa	2	2'-10	6	5fa	2	2'-10	6	5fa	2	2'-10	6	5fa	2	2'-10	6
Wingwall, F.F.H.		5b1	2	41'-7	92	5b1	2	38'-6	80	5b1	2	35'-5	74	5b1	2	32'-4	67	5b1	2	29'-2	61	5b1	2	26'-1	54
Wingwall, F.F.H.		5b2	22 Var.	2 Each 9'-2 to 40'-2	571	5b2	20 Var.	2 Each 9'-2 to 37'-1	482	5b2	18 Var.	2 Each 9'-2 to 34'-0	405	5b2	16 Var.	2 Each 9'-2 to 30'-11	334	5b2	14 Var.	2 Each 9'-2 to 27'-9	270	5b2	12 Var.	2 Each 9'-2 to 24'-8	212
Wingwall, B.F.H.		4b3	2	41'-9	59	4b3	2	38'-8	52	4b3	2	35'-6	47	4b3	2	32'-5	43	4b3	2	29'-3	39	4b3	2	26'-2	35
Wingwall, B.F.H.		4b4	20 Var.	2 Each 12'-5 to 40'-4	356	4b4	18 Var.	2 Each 12'-5 to 37'-3	299	4b4	16 Var.	2 Each 12'-4 to 34'-1	248	4b4	14 Var.	2 Each 12'-4 to 31'-0	203	4b4	12 Var.	2 Each 12'-4 to 27'-11	161	4b4	10 Var.	2 Each 12'-4 to 24'-9	124
Interior Wall, Both F.H.		5b5	42 Var.	2 Each 6'-7 to 41'-2	1051	5b5	38 Var.	2 Each 6'-8 to 38'-1	887	5b5	34 Var.	2 Each 6'-8 to 35'-0	739	5b5	30 Var.	2 Each 6'-8 to 31'-10	602	5b5	26 Var.	2 Each 6'-9 to 28'-9	481	5b5	22 Var.	2 Each 6'-10 to 25'-7	372
Wingwall, F.F.V.		5c1	76 Var.	2 Each 2'-7 to 14'-6	677	5c1	70 Var.	2 Each 2'-7 to 13'-6	587	4c1	64 Var.	2 Each 2'-7 to 12'-7	324	4c1	58 Var.	2 Each 2'-7 to 11'-7	274	4c1	68 Var.	2 Each 2'-7 to 10'-7	299	4c1	60 Var.	2 Each 2'-7 to 9'-7	244
Wingwall, F.F.V.		5c2	36 Var.	2 Each 9'-2 to 14'-8	447	5c2	30 Var.	2 Each 9'-2 to 13'-8	357	4c2	24 Var.	2 Each 9'-2 to 12'-9	176	4c2	16 Var.	2 Each 9'-2 to 11'-5	110	c2	--	--	--	c2	--	--	--
Wingwall, F.F.V. (O)		5c3	2	15'-0	31	5c3	2	14'-0	29	4c3	2	13'-0	17	4c3	2	12'-0	16	4c3	2	11'-0	15	4c3	2	10'-0	13
Wingwall, F.F.V. (A)		5c3	2	15'-0	31	5c3	2	14'-0	29	4c3	2	13'-0	17	4c3	2	12'-0	16	4c3	2	11'-0	15	4c3	2	10'-0	13
Wingwall, B.F.V.		6c4	76 Var.	2 Each 6'-3 to 18'-2	1394	5c4	70 Var.	2 Each 6'-3 to 17'-3	858	5c4	64 Var.	2 Each 6'-3 to 16'-3	751	5c4	58 Var.	2 Each 6'-3 to 15'-4	653	5c4	52 Var.	2 Each 6'-3 to 14'-4	558	5c4	46 Var.	2 Each 6'-3 to 13'-4	470
Wingwall, B.F.V. (O)		6c5	1	18'-6	28	5c5	1	17'-6	18	5c5	1	16'-6	17	5c5	1	15'-6	16	5c5	1	14'-6	15	5c5	1	13'-6	14
Wingwall, B.F.V. (A)		6c5	2	18'-6	56	5c5	2	17'-6	37	5c5	2	16'-6	34	5c5	2	15'-6	32	5c5	2	14'-6	30	5c5	2	13'-6	28
Wingwall, B.F.V.		6c6	50	8'-6	638	5c6	44	8'-6	390	5c6	38	8'-6	337	5c6	30	8'-6	266	5c6	24	8'-6	213	5c6	18	8'-6	160
Interior Wall, Both F.V		4c7	4	3'-9	10	4c7	4	3'-9	10	4c7	4	3'-9	10	4c7	4	3'-9	10	4c7	4	3'-9	10	4c7	4	3'-9	10
Interior Wall, Both F.V		4c8	150 Var.	2 Each 1'-6 to 12'-2	685	4c8	136 Var.	2 Each 1'-6 to 11'-1	572	4c8	124 Var.	2 Each 1'-6 to 10'-1	480	4c8	112 Var.	2 Each 1'-6 to 9'-2	399	4c8	100 Var.	2 Each 1'-6 to 8'-2	323	4c8	88 Var.	2 Each 1'-6 to 7'-2	255
Interior Wall, Both F.V		4c9	4	12'-6	33	4c9	4	11'-6	31	4c9	4	10'-6	28	4c9	4	9'-6	25	4c9	4	8'-6	23	4c9	4	7'-6	20
Apron, Longit., Bott.		4d1	33	41'-7	970	4d1	33	38'-5	847	4d1	33	35'-4	779	4d1	33	32'-3	711	4d1	33	29'-2	643	4d1	33	26'-0	573
Apron, Longit., Top		6f1	33	41'-7	2181	6f1	33	38'-5	1904	6f1	33	35'-4	1751	6f1	33	32'-3	1599	6f1	33	29'-2	1446	6f1	33	26'-0	1289
Parapet, Vertical		4i1	65	6'-7	286	4i1	65	6'-7	286	4i1	63	6'-7	277	4i1	63	6'-7	277	4i1	63	6'-7	277	4i1	63	6'-7	277
Parapet, Horiz.		7j1	4	34'-10	285	7j1	4	34'-10	285	7j1	4	34'-2	279	7j1	4	34'-2	279	7j1	4	34'-2	279	7j1	4	33'-9	276
Apron, Trans., Top		5m1	46	34'-2	1639	5m1	42	34'-2	1497	5m1	38	33'-6	1328	5m1	34	33'-6	1188	5m1	30	33'-6	1048	5m1	26	33'-2	899
Apron, Trans., Top		5m2	12 Var.	2'-5 to 33'-2	223	5m2	11 Var.	4'-10 to 32'-10	216	5m2	11 Var.	4'-1 to 32'-1	207	5m2	11 Var.	3'-9 to 31'-8	203	5m2	11 Var.	3'-4 to 31'-4	199	5m2	11 Var.	2'-9 to 30'-9	192
Apron, Trans., Bott.		6m3	73	32'-8	3582	5m3	67	31'-10	2225	6m3	31	31'-11	1486	5m3	37	31'-2	1203	5m3	25	31'-2	813	5m3	22	30'-10	708
Curtain, Horiz.		6p1	6	35'-3	318	6p1	6	35'-3	318	6p1	6	34'-7	312	6p1	6	34'-7	312	6p1	6	34'-7	312	6p1	5	34'-3	257
Wing Slope, Both F.		6s1	4	36'-8	220	6s1	4	33'-5	201	6s1	4	30'-2	181	6s1	4	26'-11	162	6s1	4	23'-8	142	6s1	4	20'-5	123
Wing Slope, Both F. (O)		6s2	2	7'-9	23	6s2	2	7'-9	23	6s2	2	7'-10	24	6s2	2	7'-10	24	6s2	2	7'-10	24	6s2	2	7'-10	24
Wing Slope, Both F. (A)		6s3	2	8'-0	24	6s3	2	8'-0	24	6s3	2	8'-0	24	6s3	2	8'-0	24	6s3	2	8'-0	24	6s3	2	8'-0	24
Wing Slope, F.F.		6s4	2	11'-8	35	6s4	2	11'-8	35	6s4	2	11'-8	35	6s4	2	11'-8	35	6s4	2	11'-8	35	6s4	2	11'-8	35
Wing Slope, F.F.		6s5	2	34'-2	103	6s5	2	30'-11	93	6s5	2	27'-8	83	6s5	2	24'-5	73	6s5	2	21'-2	64	6s5	2	17'-11	54
Interior Wall, Both F.		6s6	4	43'-1	273	6s6	4	39'-9	239	6s6	4	36'-7	220	6s6	4	33'-4	200	6s6	4	30'-1	181	6s6	4	26'-10	161
Curtain, Vert.		5t1	34	7'-11	281	5t1	34	7'-8	272	5t1	33	7'-5	255	5t1	33	7'-2	247	5t1	33	6'-11	238	5t1	33	6'-8	229
Curtain, Vert. Ends		5t2	4	7'-11	33	5t2	4	7'-8	32	5t2	4	7'-5	31	5t2	4	7'-2	30	5t2	4	6'-11	29	5t2	4	6'-8	28
Bracket, Vert.		5u1	4	6'-7	27	5u1	4	6'-4	26	5u1	4	6'-2	26	5u1	4	5'-11	25	5u1	4	5'-8	24	5u1	4	5'-6	23
Estimated Quantities One Headwall	Reinf. Steel			16,668 LB				13,247 LB				11,008 LB				9664 LB				8297 LB				7202 LB	
	Concrete Parapet Δ		3.4	108.3 CY			3.4	97.4 CY			3.2	80.6 CY			3.2	71.5 CY			3.2	62.9 CY			3.1	52.7 CY	
	Concrete Wingwalls		39.8				33.9				23.7				19.5				15.8				11.1		
	Concrete Apron ✳		65.1				60.1				53.7				48.8				43.9				38.5		

Note: Weight of bars over 40'-0" long include an allowance of 2'-5" for lap.

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.

(A) - Indicates bar located at acute corner.
(O) - Indicates bar located at obtuse corner.
Refer to Sheet TRPWH 15-1-20 for acute and obtuse corner locations.

Headwall Notes:

1. This headwall is based on a 3:1 slope normal to centerline of roadway.
2. The sides of the apron are to be formed to ensure correct line and grade.
3. All apron 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.
4. 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.
5. Concrete quantities are estimated from back of parapet.
6. Horizontal tails of bars "b" & "s" estimated to extend 2'-5" beyond back of parapet (into end of barrel). Longitudinal bars "4d1" and "6f1" estimated to project into end section of barrel a minimum of 2'-5" beyond back of parapet. The "length" column reflects total number of feet necessary to meet these requirements.
7. Dimensions are in feet and inches unless otherwise noted.

LATEST REVISION DATE

APPROVED BY BRIDGE ENGINEER

IOWADOT

Standard Design - Triple Reinforced Concrete Box Culverts

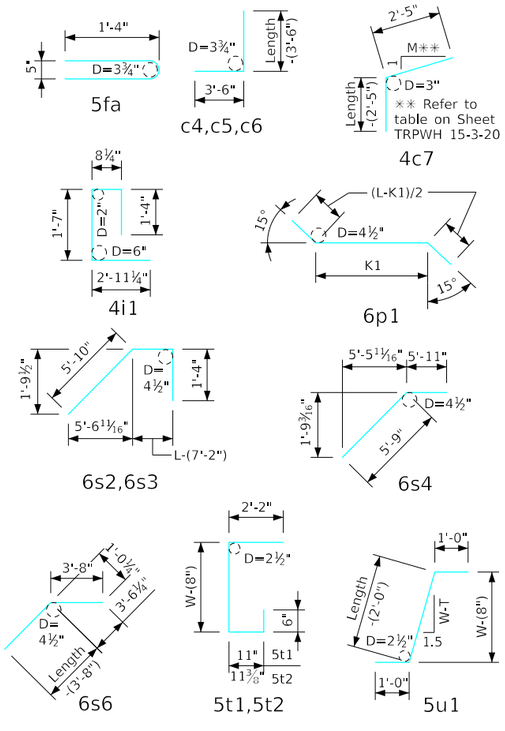
Parallel Wing Headwalls

July, 2020

Quantity Tabulation
10'-0" Span
15° Skew

TRPWH
15-7-20
Sheet 1 of 2

Bent Bar Details



Note: All dimensions are out to out
D = pin diameter

Bill of Reinforcing for One Headwall 15° Skew Span x Culvert Height

Location	Shape	10' x 6' Bar	10' x 6' No.	10' x 6' Length	10' x 6' Wt.	10' x 5' Bar	10' x 5' No.	10' x 5' Length	10' x 5' Wt.	10' x 4' Bar	10' x 4' No.	10' x 4' Length	10' x 4' Wt.
Fence Anchor (Galv.)		5fa	2	2'-10	6	5fa	2	2'-10	6	5fa	2	2'-10	6
Wingwall, F.F.H.		5b1	2	23'-0	48	5b1	2	19'-10	41	5b1	2	16'-9	35
Wingwall, F.F.H.		5b2	10 Var.	2 Each 9'-2 to 21'-7	160	5b2	8 Var.	2 Each 9'-2 to 18'-5	115	5b2	6 Var.	2 Each 9'-2 to 15'-4	77
Wingwall, B.F.H.		4b3	2	23'-1	31	4b3	2	19'-11	27	4b3	2	16'-10	22
Wingwall, B.F.H.		4b4	8 Var.	2 Each 12'-4 to 21'-8	91	4b4	6 Var.	2 Each 12'-4 to 18'-6	62	4b4	4 Var.	2 Each 12'-4 to 15'-5	37
Interior Wall, Both F.H.		5b5	18 Var.	2 Each 6'-11 to 22'-6	276	5b5	14 Var.	2 Each 7'-1 to 19'-4	193	5b5	10 Var.	2 Each 7'-4 to 16'-2	123
Wingwall, F.F.V.		4c1	52 Var.	2 Each 2'-7 to 8'-8	195	4c1	34 Var.	2 Each 2'-7 to 7'-9	117	4c1	26 Var.	2 Each 2'-7 to 6'-5	78
Wingwall, F.F.V.		c2	--	--	--	c2	--	--	--	c2	--	--	--
Wingwall, F.F.V. (O)		4c3	2	9'-0	12	4c3	2	8'-0	11	4c3	2	7'-0	9
Wingwall, F.F.V. (A)		4c3	2	9'-0	12	4c3	2	8'-0	11	4c3	2	7'-0	9
Wingwall, B.F.V.		5c4	40 Var.	2 Each 6'-3 to 12'-5	389	5c4	34 Var.	2 Each 6'-3 to 11'-5	313	5c4	26 Var.	2 Each 6'-3 to 10'-2	223
Wingwall, B.F.V. (O)		5c5	1	12'-6	13	5c5	1	11'-6	12	5c5	1	10'-6	11
Wingwall, B.F.V. (A)		5c5	2	12'-6	26	5c5	2	11'-6	24	5c5	2	10'-6	22
Wingwall, B.F.V.		5c6	12	8'-6	106	c6	--	--	--	c6	--	--	--
Interior Wall, Both F.V		4c7	4	3'-9	10	4c7	4	3'-9	10	4c7	4	3'-9	10
Interior Wall, Both F.V		4c8	74 Var.	2 Each 1'-6 to 6'-1	187	4c8	62 Var.	2 Each 1'-6 to 5'-2	138	4c8	50 Var.	2 Each 1'-5 to 4'-2	93
Interior Wall, Both F.V		4c9	4	6'-6	17	4c9	4	5'-6	15	4c9	4	4'-6	12
Apron, Longit., Bott.		4d1	33	22'-11	505	4d1	33	19'-10	437	4d1	33	16'-8	367
Apron, Longit., Top		6f1	33	22'-11	1136	6f1	33	19'-10	983	6f1	33	16'-8	826
Parapet, Vertical		4i1	63	6'-7	277	4i1	63	6'-7	277	4i1	63	6'-7	277
Parapet, Horiz.		7j1	4	33'-9	276	7j1	4	33'-9	276	7j1	4	33'-9	276
Apron, Trans., Top		5m1	22	33'-2	761	5m1	18	33'-2	623	5m1	13	33'-2	450
Apron, Trans., Top		5m2	11 Var.	2'-4 to 30'-4	187	5m2	10 Var.	4'-9 to 29'-11	181	5m2	11 Var.	4'-4 to 32'-4	210
Apron, Trans., Bott.		4m3	19	30'-1	382	4m3	16	30'-1	322	4m3	13	30'-1	261
Curtain, Horiz.		6p1	5	34'-3	257	6p1	5	34'-3	257	6p1	5	34'-3	257
Wing Slope, Both F.		6s1	4	17'-1	103	6s1	4	13'-10	83	6s1	4	10'-7	64
Wing Slope, Both F. (O)		6s2	2	7'-10	24	6s2	2	7'-10	24	6s2	2	7'-10	24
Wing Slope, Both F. (A)		6s3	2	8'-0	24	6s3	2	8'-0	24	6s3	2	8'-0	24
Wing Slope, F.F.		6s4	2	11'-8	35	6s4	2	11'-8	35	6s4	2	11'-8	35
Wing Slope, F.F.		6s5	2	14'-8	44	6s5	2	11'-4	34	6s5	2	8'-1	24
Interior Wall, Both F.		6s6	4	23'-7	142	6s6	4	20'-4	122	6s6	4	17'-1	103
Curtain, Vert.		5t1	33	6'-5	221	5t1	33	6'-5	221	5t1	33	6'-5	221
Curtain, Vert. Ends		5t2	4	6'-5	27	5t2	4	6'-5	27	5t2	4	6'-5	27
Bracket, Vert.		5u1	4	5'-4	22	5u1	4	5'-4	22	5u1	4	5'-4	22

Estimated Quantities One Headwall			10' x 6'		10' x 5'		10' x 4'	
	Reinf. Steel		6002 LB		5043 LB		4235 LB	
	Concrete	Parapet Δ	3.1	45.1 CY	3.1	38.4 CY	3.1	31.9 CY
		Wingwalls	8.4		6.1		4.1	
		Apron ✳	33.6		29.2		24.7	

Note: Weight of bars over 40'-0" long include an allowance of 2'-5" for lap.

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.

(A) - Indicates bar located at acute corner.
(O) - Indicates bar located at obtuse corner.
Refer to Sheet TRPWH 15-1-20 for acute and obtuse corner locations.

Headwall Notes:

1. This headwall is based on a 3:1 slope normal to centerline of roadway.
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7. Dimensions are in feet and inches unless otherwise noted.

LATEST REVISION DATE

APPROVED BY BRIDGE ENGINEER

IOWADOT

Standard Design - Triple Reinforced Concrete Box Culverts

Parallel Wing Headwalls

July, 2020

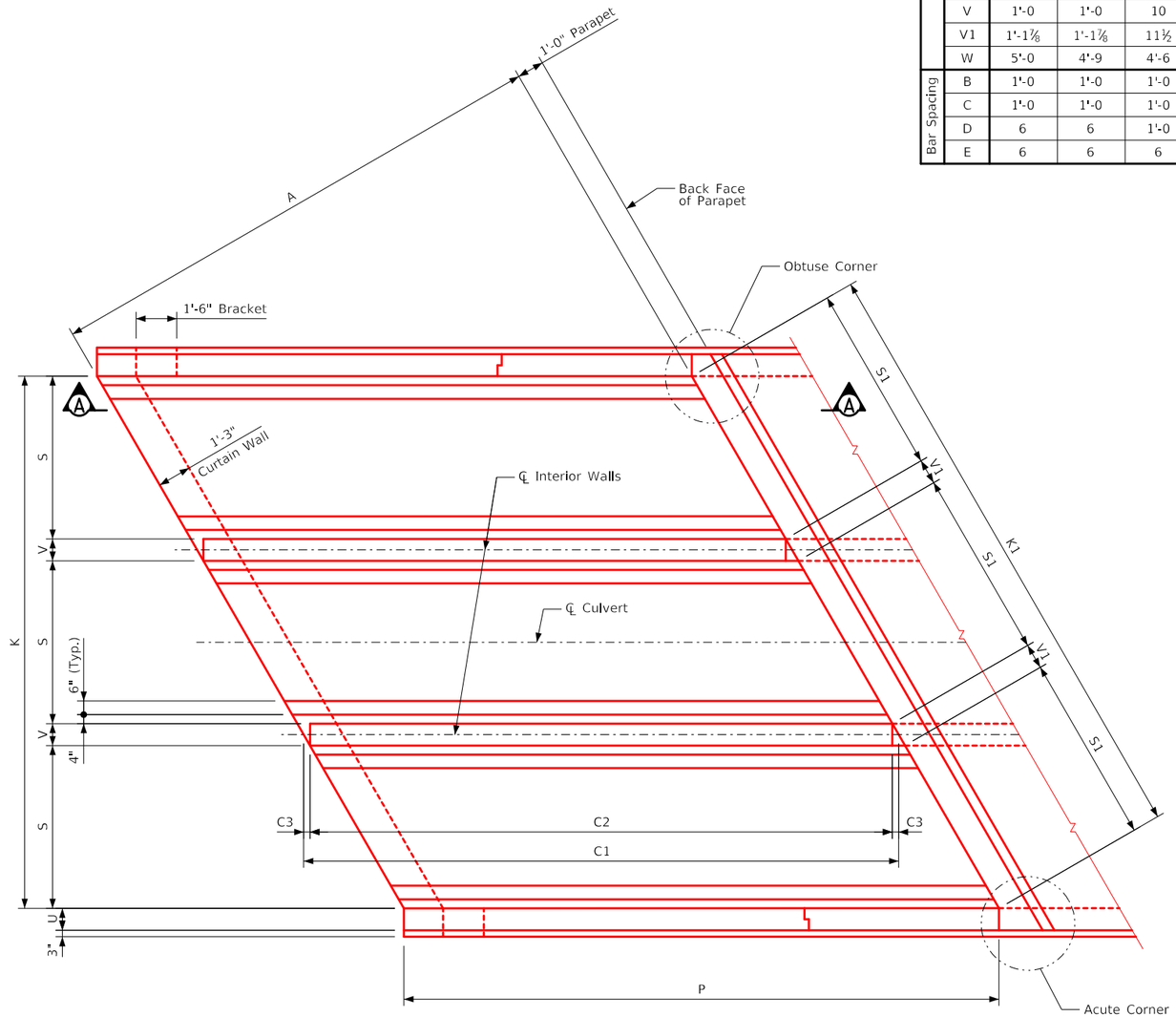
Quantity Tabulation
10'-0" Span
15° Skew

TRPWH
15-7-20
Sheet 2 of 2

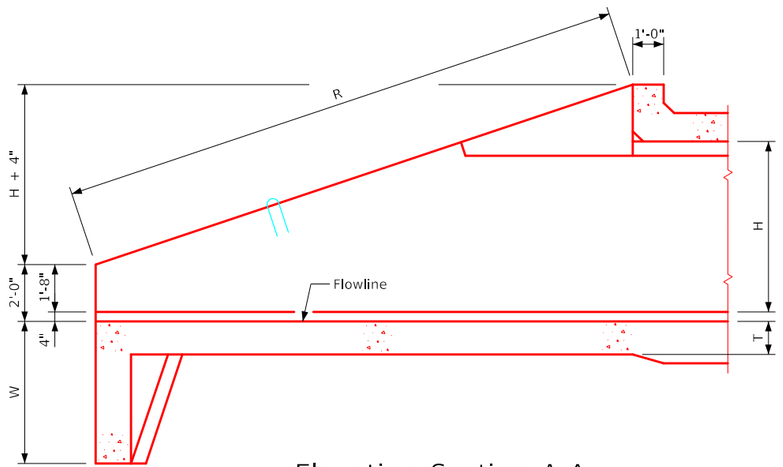
ENGLISHLRFDSIGNEDTRIPLECULVERTS.DGN - TRPWH 15-7-20 S2 - THIS SHEET ISSUED 07-2020.

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'	S x H
Headwall Dimensions	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	A
	C1	42'-8⅜	39'-3⅜	35'-9½	32'-4	28'-10⅜	25'-4⅞	21'-11¼	18'-5¾	15'-0⅛	42'-8⅜	39'-3⅜	35'-9½	32'-4	28'-10⅜	25'-4⅞	21'-11¼	18'-5¾	15'-0⅛	C1
	C2	42'-1⅝	38'-8⅛	35'-3¾	31'-10¼	28'-4⅝	24'-11⅝	21'-6	18'-0½	14'-6⅞	42'-1⅝	38'-8⅛	35'-3¾	31'-10¼	28'-4⅝	24'-11⅝	21'-6	18'-0½	14'-6⅞	C2
	C3	3½	3½	2⅞	2⅞	2⅞	2⅝	2⅝	2⅝	2⅝	3½	3½	2⅞	2⅞	2⅞	2⅝	2⅝	2⅝	2⅝	C3
	H	12'-0	11'-0	10'-0	9'-0	8'-0	7'-0	6'-0	5'-0	4'-0	12'-0	11'-0	10'-0	9'-0	8'-0	7'-0	6'-0	5'-0	4'-0	H
	K	38'-0	38'-0	37'-8	37'-8	37'-8	37'-6	37'-6	37'-6	37'-6	32'-0	32'-0	31'-8	31'-8	31'-8	31'-6	31'-6	31'-6	31'-6	K
	K1	43'-10½	43'-10½	43'-5¾	43'-5¾	43'-5¾	43'-3½	43'-3½	43'-3½	43'-3½	36'-11⅝	36'-11⅝	36'-6⅞	36'-6⅞	36'-6⅞	36'-4⅝	36'-4⅝	36'-4⅝	36'-4⅝	K1
	P	42'-8⅝	39'-3⅛	35'-9½	32'-4	28'-10⅜	25'-4⅞	21'-11¼	18'-5¾	15'-0⅛	42'-8⅝	39'-3⅛	35'-9½	32'-4	28'-10⅜	25'-4⅞	21'-11¼	18'-5¾	15'-0⅛	P
	R	44'-5⅝	40'-10⅜	37'-3⅛	33'-7⅞	30'-0½	26'-5¼	22'-10	19'-2¾	15'-7½	44'-5⅝	40'-10⅜	37'-3⅛	33'-7⅞	30'-0½	26'-5¼	22'-10	19'-2¾	15'-7½	R
	R1	43'-6¾	39'-11½	36'-5⅜	32'-10⅛	29'-2⅞	25'-8⅛	22'-1	18'-5¾	14'-10⅝	43'-6¾	39'-11½	36'-5⅜	32'-10⅛	29'-2⅞	25'-8⅛	22'-1	18'-5¾	14'-10⅝	R1
	S	12'-0	12'-0	12'-0	12'-0	12'-0	12'-0	12'-0	12'-0	12'-0	10'-0	10'-0	10'-0	10'-0	10'-0	10'-0	10'-0	10'-0	10'-0	S
	S1	13'-10¼	13'-10¼	13'-10¼	13'-10¼	13'-10¼	13'-10¼	13'-10¼	13'-10¼	13'-10¼	11'-6⅝	11'-6⅝	11'-6⅝	11'-6⅝	11'-6⅝	11'-6⅝	11'-6⅝	11'-6⅝	11'-6⅝	S1
	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	1'-1	1'-1	1'-1	1'-1	1'-1	T
	U	1'-0	1'-0	10	10	10	9	9	9	9	1'-0	1'-0	10	10	10	9	9	9	9	U
	V	1'-0	1'-0	10	10	10	9	9	9	9	1'-0	1'-0	10	10	10	9	9	9	9	V
	V1	1'-1⅛	1'-1⅞	11½	11½	11½	10⅜	10⅜	10⅜	10⅜	1'-1⅞	1'-1⅞	11½	11½	11½	10⅜	10⅜	10⅜	10⅜	V1
	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	4'-0	3'-9	3'-6	3'-6	3'-6	W
Bar Spacing	B	1'-0	1'-0	1'-0	1'-0	1'-0	1'-0	1'-0	9	9	1'-0	1'-0	1'-0	1'-0	1'-0	1'-0	1'-0	9	1'-0	B
	C	1'-0	1'-0	1'-0	1'-0	9	9	9	1'-0	1'-0	1'-0	1'-0	1'-0	1'-0	9	9	9	1'-0	1'-0	C
	D	6	6	1'-0	1'-0	1'-0	1'-0	1'-0	9	1'-0	6	6	6	6	1'-0	1'-0	1'-0	1'-0	1'-0	D
	E	6	6	6	6	6	6	6	6	6	9	9	9	9	9	9	9	9	9	E



Plan View



Elevation Section A-A

Notes:

1. See Sheet TRRCB G2-20 for General Notes, Specifications, and Design Stresses.
2. See Sheets TRPWH 30-2-20 thru 30-5-20 for location of certain dimensions tabulated.
3. Dimensions are in feet and inches unless otherwise noted.

LATEST REVISION DATE

APPROVED BY BRIDGE ENGINEER

IOWA DOT

Standard Design - Triple Reinforced Concrete Box Culverts

Parallel Wing Headwalls

July, 2020

Dimension Table
30° Skew

TRPWH
30-1-20

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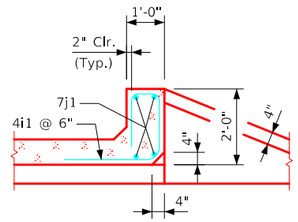
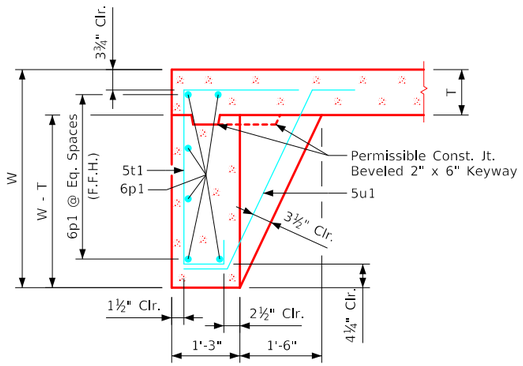
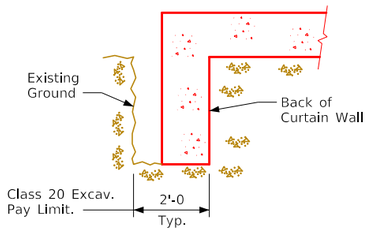


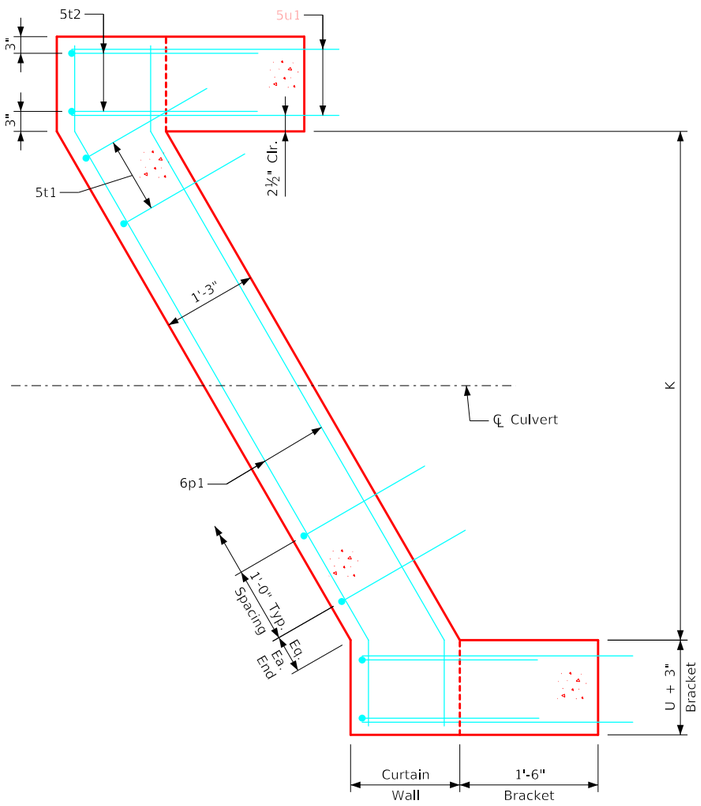
Section thru Parapet



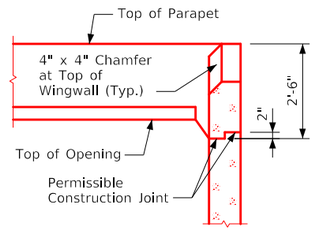
Section thru Curtain Wall

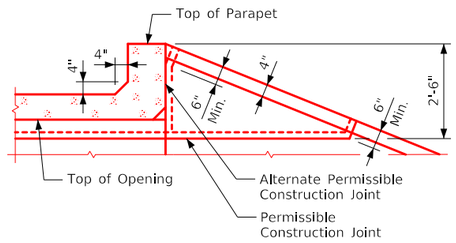


Curtain Wall
Class 20 Excavation

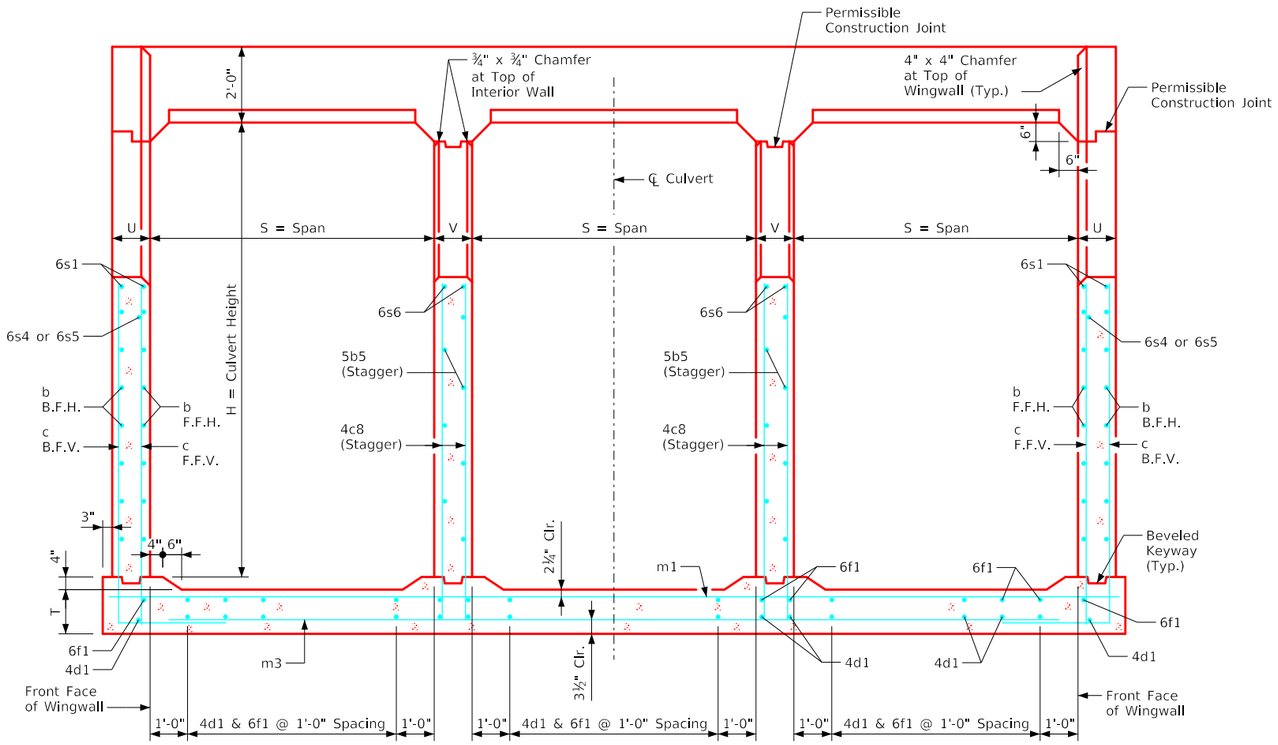


Curtain Wall Detail - Plan View
(Apron is not shown)





Top of Wingwall Details



Typical Cross Section - thru Headwall

Notes:

1. See Sheet TRRCB G2-20 for General Notes, Specifications, and Design Stresses.
2. For dimension table see Sheet TRPWH 30-1-20.

August 2022
LATEST REVISION DATE

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Standard Design - Triple Reinforced Concrete Box Culverts

Parallel Wing Headwalls

July, 2020

Cross Section Details
30° Skew

TRPWH
30-2-20

Revised 08-2022: Changed chamfer at top of Interior Walls to 3/4" x 3/4" (was 4" x 4").
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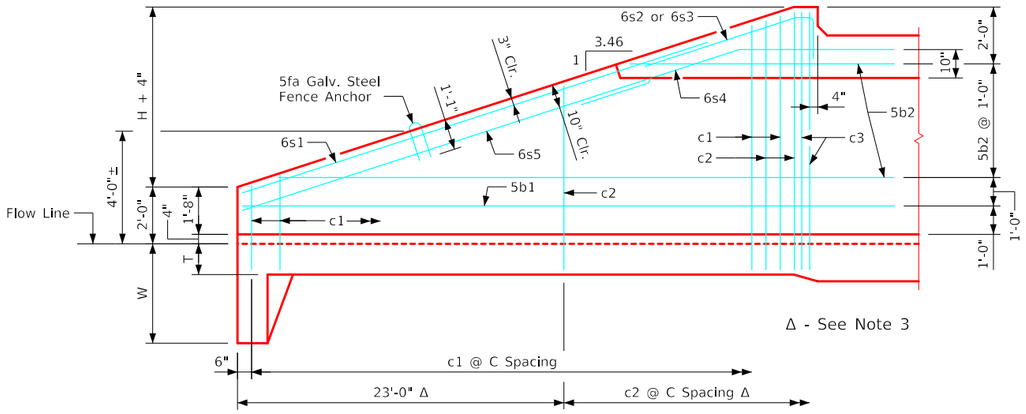
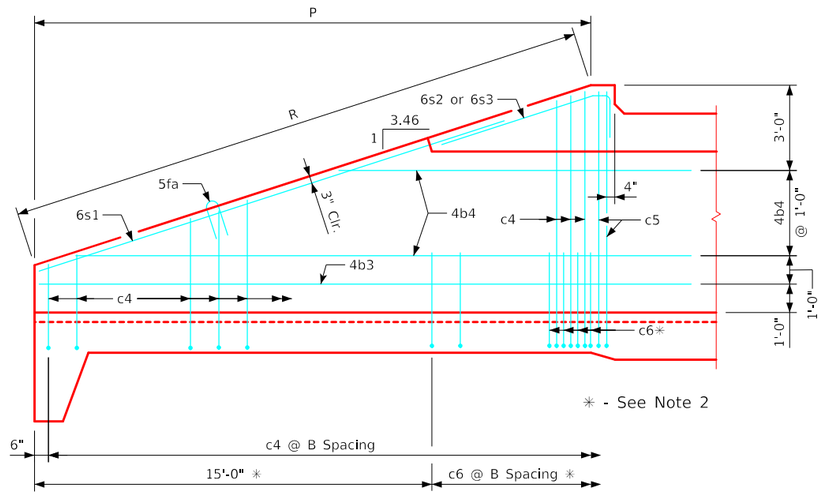
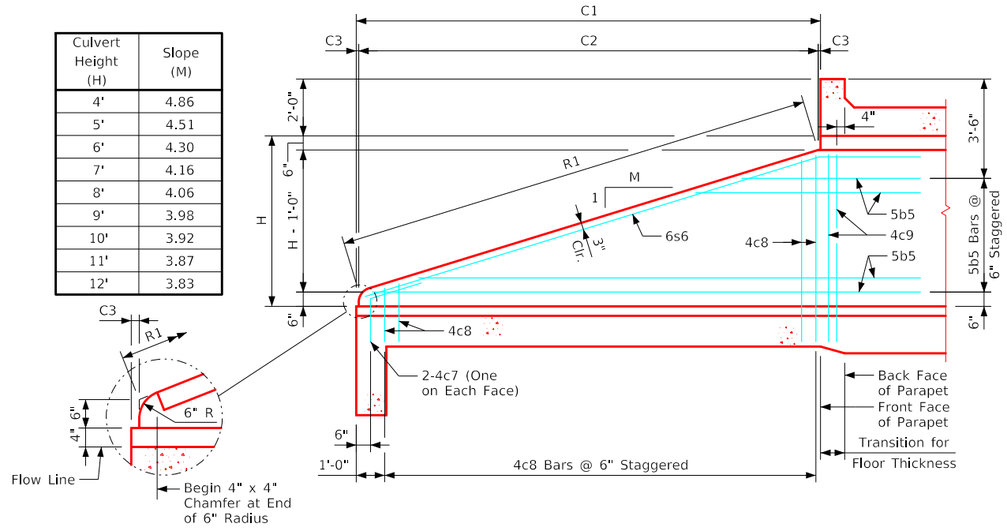


Typical View - Front Face Wingwall Reinforcing



Typical View - Back Face Wingwall Reinforcing

Culvert Height (H)	Slope (M)
4'	4.86
5'	4.51
6'	4.30
7'	4.16
8'	4.06
9'	3.98
10'	3.92
11'	3.87
12'	3.83



Typical View - Interior Wall

Notes:

1. Bar spacings and positions shown are similar for all sizes of headwalls in this standard.
2. Not applicable for 4' thru 5' height headwalls.
3. Not applicable for 4' thru 8' height headwalls.
4. For headwall dimensions and bar spacing see Sheet TRPWH 30-1-20.
5. Apron m3 bars are to be centered on ℄ culvert.
6. B.F.V. (c5) and F.F.V. (c3) and interior wall both F.V. (c9) bars are approximately 4" from the back of parapet for all headwalls.

LATEST REVISION DATE

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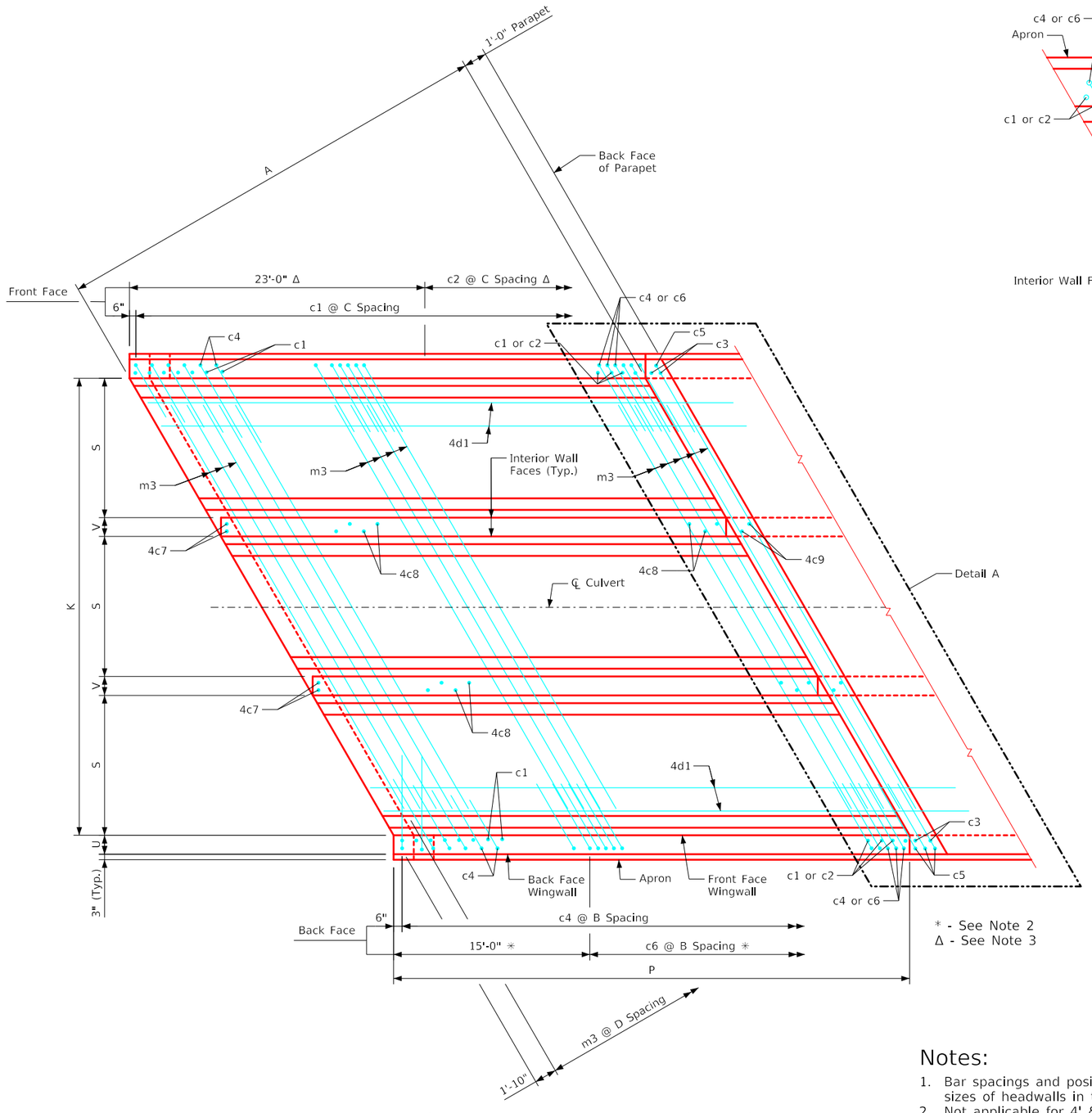
Standard Design - Triple Reinforced Concrete Box Culverts

Parallel Wing Headwalls

July, 2020

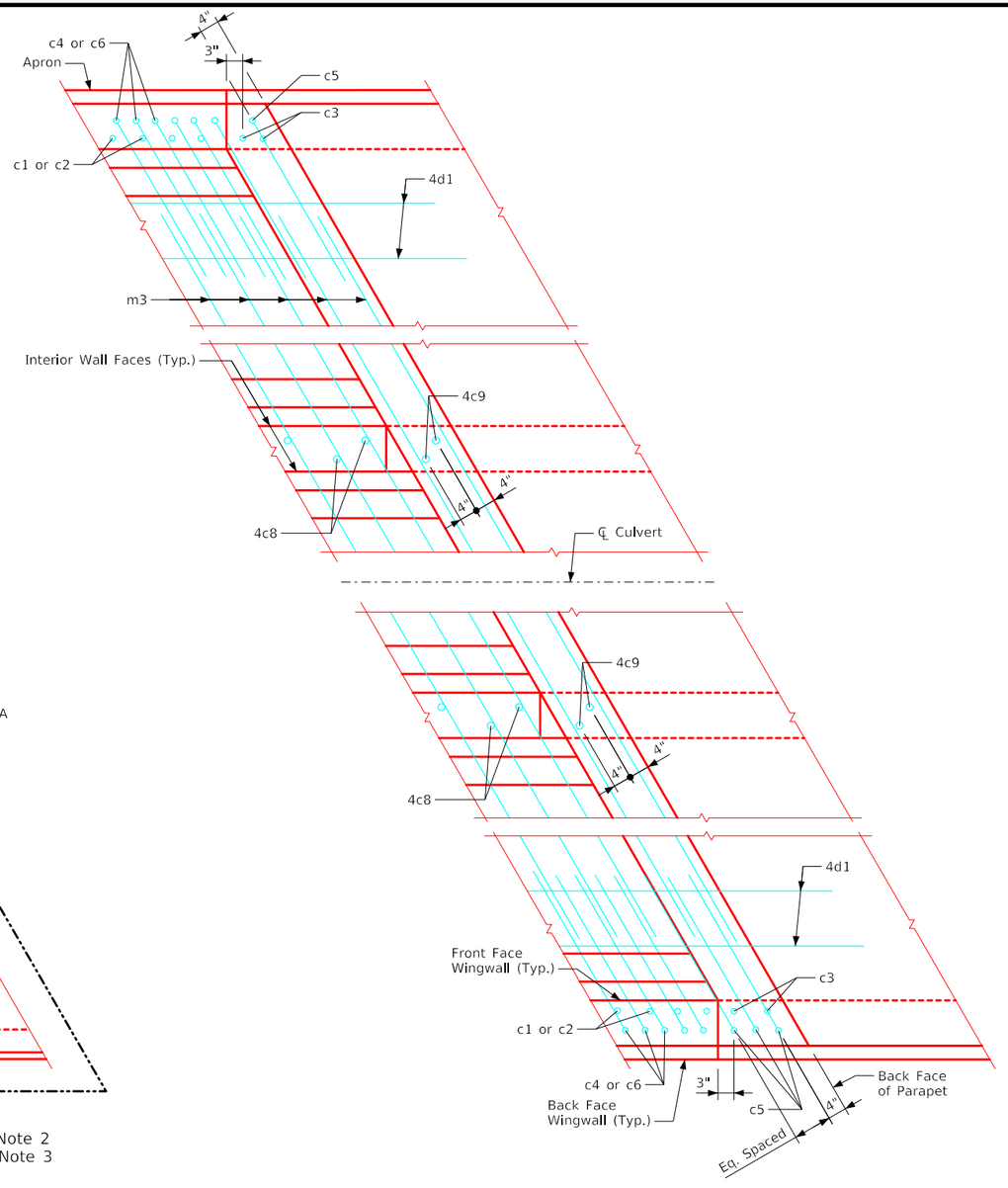
Wingwall Elevations
30° Skew

TRPWH
30-3-20



Plan View - Bottom Apron Reinforcing

(Curtain Wall Reinforcing not shown, See Sheet TRPWH 30-2-20)



DETAIL A

Notes:

1. Bar spacings and positions shown are similar for all sizes of headwalls in this standard.
2. Not applicable for 4' & 5' height headwalls.
3. Not applicable for 4' thru 8' height headwalls.
4. For headwall dimensions and bar spacing see Sheet TRPWH 30-1-20.
5. Apron m3 bars are to be centered on ℄ culvert.
6. B.F.V. (c5), F.F.V. (c3) and interior wall both F.V. (c9) bars are approximately 4" from the back of parapet for all headwalls.

LATEST REVISION DATE

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Standard Design - Triple Reinforced Concrete Box Culverts

Parallel Wing Headwalls

July, 2020

Bottom Apron Reinforcing 30° Skew	TRPWH 30-4-20

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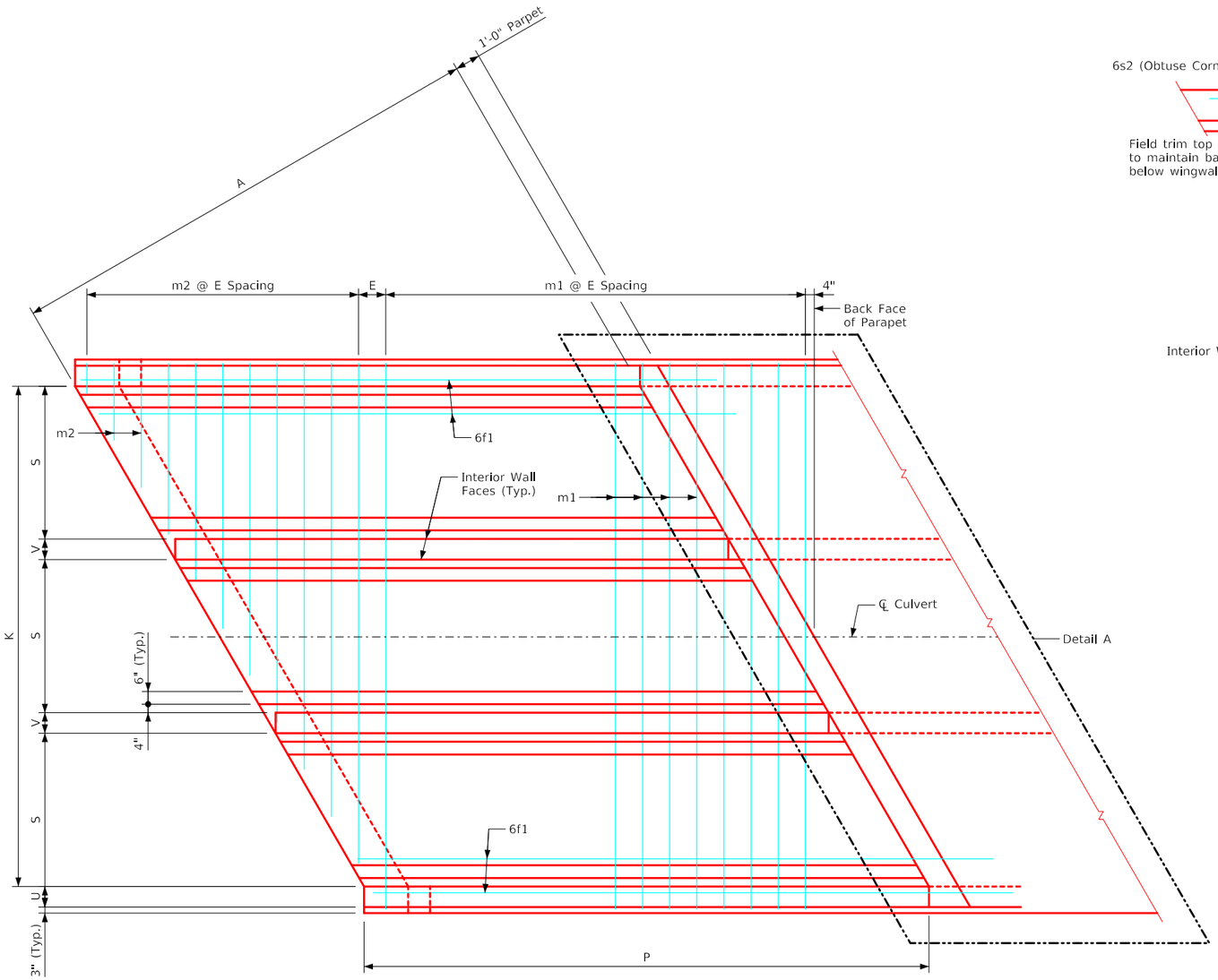
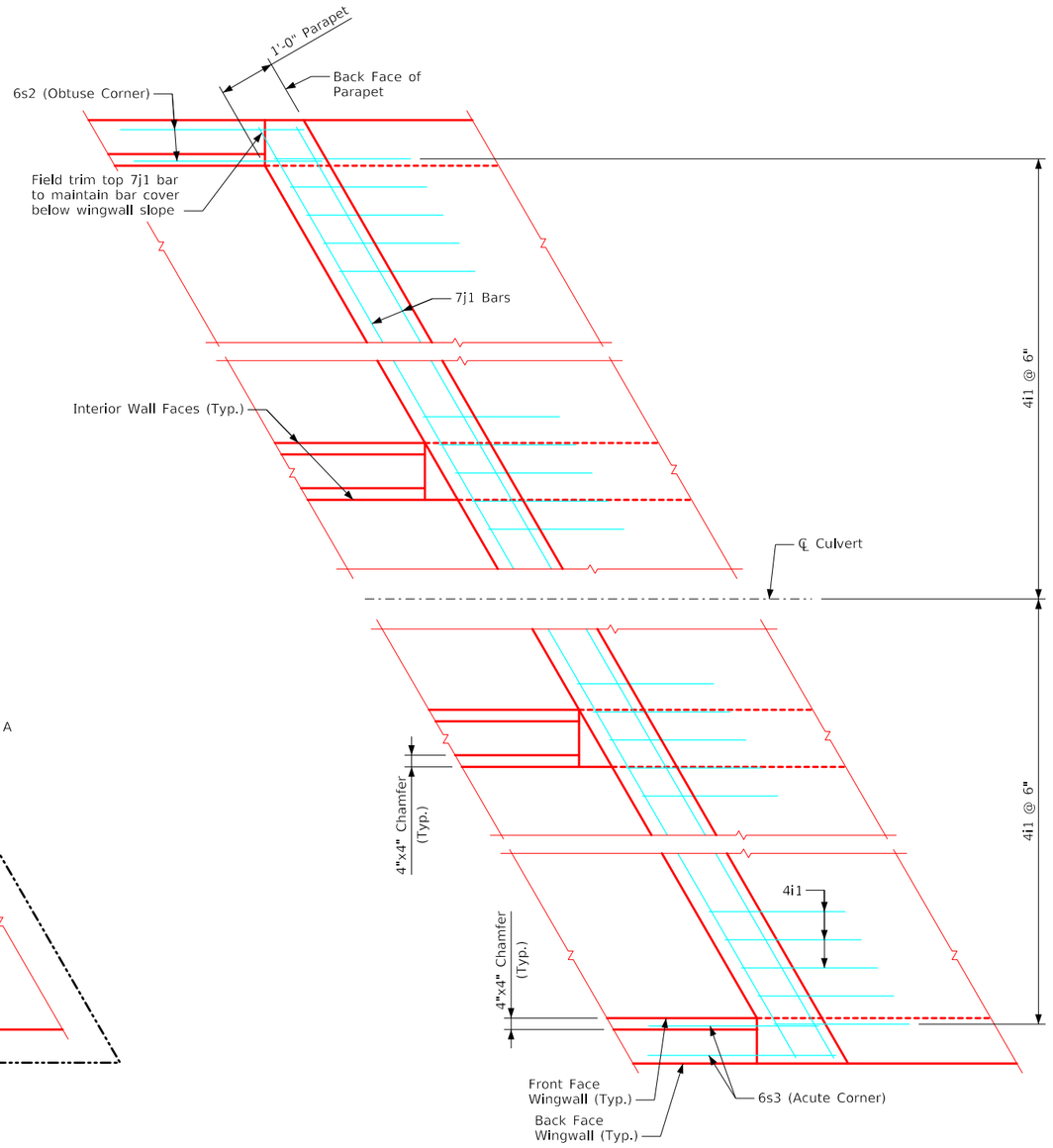


Plan View - Top Apron Reinforcing

(Wall Reinforcing not shown for clarity)



Detail A

(Showing parapet bars only)

Notes:

1. Bar spacings and positions shown are similar for all sizes of headwalls in this standard.
2. For headwall dimensions and bar spacing see Sheet TRPWH 30-1-20.
3. Top transverse apron bars are referenced approximately 4" from the back of the parapet for all headwalls.

LATEST REVISION DATE

APPROVED BY BRIDGE ENGINEER

IOWADOT

Standard Design - Triple Reinforced Concrete Box Culverts

Parallel Wing Headwalls

July, 2020

Parapet Reinforcing & Top Apron Reinforcing 30° Skew

TRPWH 30-5-20

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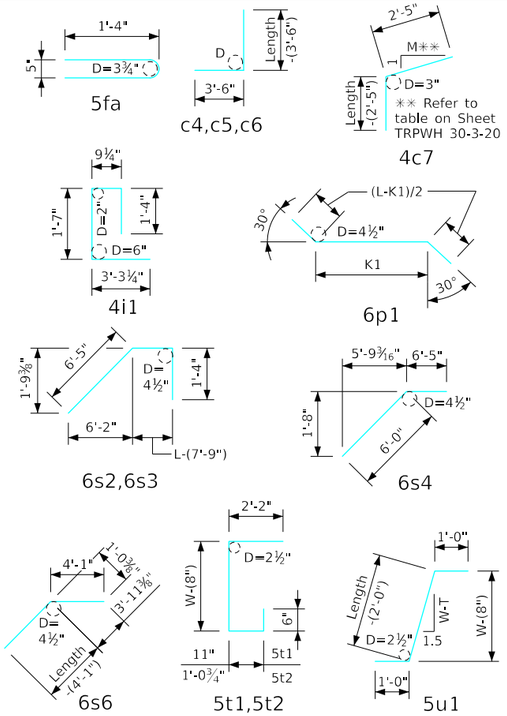
Bent Bar Details



Note: All dimensions are out to out
D = pin diameter
See table below for pin diameter "D" of c bars

c Bar Pin Diameter	
Bar Size	D
5	3¾"
6	4½"

Bill of Reinforcing for One Headwall 30° Skew Span x Culvert Height

Location	Shape	12' x 12'				12' x 11'				12' x 10'				12' x 9'				12' x 8'				12' x 7'			
		Bar	No.	Length	Wt.	Bar	No.	Length	Wt.	Bar	No.	Length	Wt.	Bar	No.	Length	Wt.	Bar	No.	Length	Wt.	Bar	No.	Length	Wt.
Fence Anchor (Galv.)		5fa	2	2'-10	6	5fa	2	2'-10	6	5fa	2	2'-10	6	5fa	2	2'-10	6	5fa	2	2'-10	6	5fa	2	2'-10	6
Wingwall, F.F.H.		5b1	2	46'-2	101	5b1	2	42'-9	94	5b1	2	39'-3	82	5b1	2	35'-10	75	5b1	2	32'-4	67	5b1	2	28'-11	60
Wingwall, F.F.H.		5b2	22 Var.	2 Each 10'-0 to 44'-7	636	5b2	20 Var.	2 Each 10'-0 to 41'-2	539	5b2	18 Var.	2 Each 10'-0 to 37'-8	447	5b2	16 Var.	2 Each 10'-0 to 34'-3	369	5b2	14 Var.	2 Each 10'-0 to 30'-9	298	5b2	12 Var.	2 Each 10'-0 to 27'-4	234
Wingwall, B.F.H.		4b3	2	46'-6	65	4b3	2	43'-1	61	4b3	2	39'-6	53	4b3	2	36'-1	48	4b3	2	32'-7	44	4b3	2	29'-1	39
Wingwall, B.F.H.		4b4	20 Var.	2 Each 13'-9 to 44'-11	398	4b4	18 Var.	2 Each 13'-9 to 41'-6	335	4b4	16 Var.	2 Each 13'-8 to 37'-11	276	4b4	14 Var.	2 Each 13'-8 to 34'-5	225	4b4	12 Var.	2 Each 13'-8 to 31'-0	179	4b4	10 Var.	2 Each 13'-7 to 27'-6	137
Interior Wall, Both F.H.		5b5	42 Var.	2 Each 7'-4 to 45'-8	1176	5b5	38 Var.	2 Each 7'-5 to 42'-2	993	5b5	34 Var.	2 Each 7'-4 to 38'-9	817	5b5	30 Var.	2 Each 7'-5 to 35'-3	668	5b5	26 Var.	2 Each 7'-5 to 31'-9	531	5b5	22 Var.	2 Each 7'-6 to 28'-4	411
Wingwall, F.F.V.		5c1	86 Var.	2 Each 2'-8 to 14'-9	781	5c1	78 Var.	2 Each 2'-8 to 13'-8	664	4c1	72 Var.	2 Each 2'-8 to 12'-9	371	4c1	64 Var.	2 Each 2'-8 to 11'-7	305	4c1	76 Var.	2 Each 2'-8 to 10'-8	338	4c1	68 Var.	2 Each 2'-8 to 9'-10	284
Wingwall, F.F.V.		5c2	40 Var.	2 Each 9'-2 to 14'-8	497	5c2	34 Var.	2 Each 9'-2 to 13'-9	406	4c2	26 Var.	2 Each 9'-2 to 12'-7	189	4c2	20 Var.	2 Each 9'-2 to 11'-9	140	c2	--	--	--	c2	--	--	--
Wingwall, F.F.V. (O)		5c3	2	15'-1	31	5c3	2	14'-1	29	4c3	2	13'-1	17	4c3	2	12'-1	16	4c3	2	11'-1	15	4c3	2	10'-1	13
Wingwall, F.F.V. (A)		5c3	2	15'-1	31	5c3	2	14'-1	29	4c3	2	13'-1	17	4c3	2	12'-1	16	4c3	2	11'-1	15	4c3	2	10'-1	13
Wingwall, B.F.V.		6c4	86 Var.	2 Each 6'-4 to 18'-6	1604	5c4	78 Var.	2 Each 6'-4 to 17'-4	963	5c4	72 Var.	2 Each 6'-4 to 16'-5	854	5c4	64 Var.	2 Each 6'-4 to 15'-4	723	5c4	58 Var.	2 Each 6'-4 to 14'-5	628	5c4	50 Var.	2 Each 6'-4 to 13'-3	511
Wingwall, B.F.V. (O)		6c5	1	18'-7	28	5c5	1	17'-7	18	5c5	1	16'-7	17	5c5	1	15'-7	16	5c5	1	14'-7	15	5c5	1	13'-7	14
Wingwall, B.F.V. (A)		6c5	3	18'-7	84	5c5	3	17'-7	55	5c5	3	16'-7	52	5c5	3	15'-7	49	5c5	3	14'-7	46	5c5	3	13'-7	43
Wingwall, B.F.V.		6c6	56	8'-6	715	5c6	50	8'-6	443	5c6	42	8'-6	372	5c6	36	8'-6	319	5c6	28	8'-6	248	5c6	22	8'-6	195
Interior Wall, Both F.V		4c7	4	3'-10	10	4c7	4	3'-10	10	4c7	4	3'-10	10	4c7	4	3'-10	10	4c7	4	3'-10	10	4c7	4	3'-10	10
Interior Wall, Both F.V		4c8	166 Var.	2 Each 1'-7 to 12'-3	767	4c8	152 Var.	2 Each 1'-7 to 11'-3	652	4c8	138 Var.	2 Each 1'-7 to 10'-3	545	4c8	124 Var.	2 Each 1'-7 to 9'-3	449	4c8	110 Var.	2 Each 1'-7 to 8'-2	358	4c8	96 Var.	2 Each 1'-6 to 7'-2	278
Interior Wall, Both F.V		4c9	4	12'-7	34	4c9	4	11'-7	31	4c9	4	10'-7	28	4c9	4	9'-7	26	4c9	4	8'-7	23	4c9	4	7'-7	20
Apron, Longit., Bott.		4d1	39	46'-1	1264	4d1	39	42'-7	1172	4d1	39	39'-2	1020	4d1	39	35'-8	929	4d1	39	32'-3	840	4d1	39	28'-9	749
Apron, Longit., Top		6f1	39	46'-1	2841	6f1	39	42'-7	2636	6f1	39	39'-2	2294	6f1	39	35'-8	2089	6f1	39	32'-3	1889	6f1	39	28'-9	1684
Parapet, Vertical		4i1	77	7'-0	360	4i1	77	7'-0	360	4i1	75	7'-0	351	4i1	75	7'-0	351	4i1	75	7'-0	351	4i1	75	7'-0	351
Parapet, Horiz.		7j1	4	45'-9	394	7j1	4	45'-9	394	7j1	4	45'-0	388	7j1	4	45'-0	388	7j1	4	45'-0	388	7j1	4	44'-7	384
Apron, Trans., Top		5m1	65	40'-2	2887	5m1	58	40'-2	2576	5m1	51	39'-6	2101	5m1	45	39'-6	1854	5m1	38	39'-6	1566	5m1	31	39'-2	1266
Apron, Trans., Top		5m2	43 Var.	2'-5 to 38'-10	925	5m2	43 Var.	2'-6 to 38'-11	929	5m2	43 Var.	2'-3 to 38'-7	916	5m2	42 Var.	2'-4 to 37'-10	880	5m2	42 Var.	2'-5 to 37'-11	883	5m2	42 Var.	2'-3 to 37'-9	876
Apron, Trans., Bott.		5m3	73	42'-10	3445	5m3	67	42'-10	3162	6m3	31	42'-9	2103	6m3	28	42'-9	1900	5m3	25	42'-0	1158	5m3	22	41'-8	1012
Curtain, Horiz.		6p1	6	46'-0	436	6p1	6	46'-0	436	6p1	6	45'-3	430	6p1	6	45'-3	430	6p1	6	45'-3	430	6p1	5	44'-11	355
Wing Slope, Both F.		6s1	4	40'-4	257	6s1	4	36'-9	221	6s1	4	33'-2	199	6s1	4	29'-6	177	6s1	4	25'-11	156	6s1	4	22'-4	134
Wing Slope, Both F. (O)		6s2	2	8'-3	25	6s2	2	8'-3	25	6s2	2	8'-4	25	6s2	2	8'-4	25	6s2	2	8'-4	25	6s2	2	8'-4	25
Wing Slope, Both F. (A)		6s3	2	8'-9	26	6s3	2	8'-9	26	6s3	2	8'-9	26	6s3	2	8'-9	26	6s3	2	8'-9	26	6s3	2	8'-9	26
Wing Slope, F.F.		6s4	2	12'-5	37	6s4	2	12'-5	37	6s4	2	12'-5	37	6s4	2	12'-5	37	6s4	2	12'-5	37	6s4	2	12'-5	37
Wing Slope, F.F.		6s5	2	37'-11	114	6s5	2	34'-3	103	6s5	2	30'-8	92	6s5	2	27'-1	81	6s5	2	23'-5	70	6s5	2	19'-10	60
Interior Wall, Both F.		6s6	4	47'-5	299	6s6	4	43'-10	278	6s6	4	40'-4	257	6s6	4	36'-9	221	6s6	4	33'-1	199	6s6	4	29'-7	178
Curtain, Vert.		5t1	44	7'-11	363	5t1	44	7'-8	352	5t1	44	7'-5	340	5t1	44	7'-2	329	5t1	44	6'-11	317	5t1	44	6'-8	306
Curtain, Vert. Ends		5t2	4	8'-1	34	5t2	4	7'-10	33	5t2	4	7'-7	32	5t2	4	7'-4	31	5t2	4	7'-1	30	5t2	4	6'-10	29
Bracket, Vert.		5u1	4	6'-7	27	5u1	4	6'-5	27	5u1	4	6'-2	26	5u1	4	5'-11	25	5u1	4	5'-9	24	5u1	4	5'-6	23
Estimated Quantities One Headwall	Reinf. Steel			20,698 LB				18,095 LB				14,790 LB				13,233 LB				11,210 LB				9763 LB	
	Concrete	Parapet Δ	4.3	138.4 CY		4.3		124.9 CY		4.1		104.7 CY		4.1		93.3 CY		4.1		82.3 CY		4.0		69.6 CY	
		Wingwalls	44.4			37.9				26.4				21.8				17.6				12.4			
		Apron ✳	89.7			82.7				74.2				67.4				60.6				53.2			

Note: Weight of bars over 40'-0" long include an allowance of 2'-5" for lap.

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.

(A) - Indicates bar located at acute corner.
(O) - Indicates bar located at obtuse corner.
Refer to Sheet TRPWH 30-1-20 for acute and obtuse corner locations.

Headwall Notes:

1. This headwall is based on a 3:1 slope normal to centerline of roadway.
2. The sides of the apron are to be formed to ensure correct line and grade.
3. All apron 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.
4. 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.
5. Concrete quantities are estimated from back of parapet.
6. Horizontal tails of bars "b" & "s" estimated to extend 2'-5" beyond back of parapet (into end of barrel). Longitudinal bars "4d1" and "6f1" estimated to project into end section of barrel a minimum of 2'-5" beyond back of parapet. The "length" column reflects total number of feet necessary to meet these requirements.
7. Dimensions are in feet and inches unless otherwise noted.

LATEST REVISION DATE

APPROVED BY BRIDGE ENGINEER

IOWADOT

Standard Design - Triple Reinforced Concrete Box Culverts

Parallel Wing Headwalls

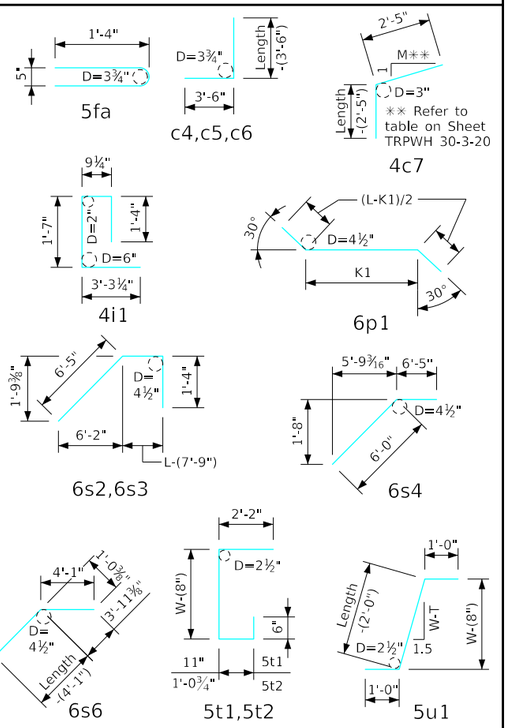
July, 2020

Quantity Tabulation
12'-0" Span
30° Skew

TRPWH
30-6-20
Sheet 1 of 2

ENGLISHLRFDSIGNEDTRIPLECULVERTS.DGN - TRPWH 30-6-20 S1 - THIS SHEET ISSUED 07-2020.

Bent Bar Details



Note: All dimensions are out to out
D = pin diameter

Bill of Reinforcing for One Headwall 30° Skew Span x Culvert Height

Location	Shape	12' x 6' Bar	12' x 6' No.	12' x 6' Length	12' x 6' Wt.	12' x 5' Bar	12' x 5' No.	12' x 5' Length	12' x 5' Wt.	12' x 4' Bar	12' x 4' No.	12' x 4' Length	12' x 4' Wt.
Fence Anchor (Galv.)		5fa	2	2'-10	6	5fa	2	2'-10	6	5fa	2	2'-10	6
Wingwall, F.F.H.		5b1	2	25'-5	53	5b1	2	22'-0	46	5b1	2	18'-6	39
Wingwall, F.F.H.		5b2	10 Var.	2 Each 10'-0 to 23'-10	176	5b2	8 Var.	2 Each 10'-0 to 20'-5	127	5b2	6 Var.	2 Each 10'-0 to 16'-11	84
Wingwall, B.F.H.		4b3	2	25'-7	34	4b3	2	22'-2	30	4b3	2	18'-8	25
Wingwall, B.F.H.		4b4	8 Var.	2 Each 13'-7 to 24'-0	100	4b4	6 Var.	2 Each 13'-7 to 20'-7	68	4b4	4 Var.	2 Each 13'-7 to 17'-1	41
Interior Wall, Both F.H.		5b5	18 Var.	2 Each 7'-7 to 24'-10	304	5b5	14 Var.	2 Each 7'-9 to 21'-4	212	5b5	10 Var.	2 Each 8'-1 to 17'-10	135
Wingwall, F.F.V.		4c1	58 Var.	2 Each 2'-8 to 8'-9	221	4c1	36 Var.	2 Each 2'-8 to 7'-7	123	4c1	30 Var.	2 Each 2'-8 to 6'-8	94
Wingwall, F.F.V.		c2	--	--	--	c2	--	--	--	c2	--	--	--
Wingwall, F.F.V. (O)		4c3	2	9'-1	12	4c3	2	8'-1	11	4c3	2	7'-1	9
Wingwall, F.F.V. (A)		4c3	2	9'-1	12	4c3	2	8'-1	11	4c3	2	7'-1	9
Wingwall, B.F.V.		5c4	44 Var.	2 Each 6'-4 to 12'-5	430	5c4	48 Var.	2 Each 6'-4 to 11'-4	442	5c4	40 Var.	2 Each 6'-4 to 10'-6	351
Wingwall, B.F.V. (O)		5c5	1	12'-7	13	5c5	1	11'-7	12	5c5	1	10'-7	11
Wingwall, B.F.V. (A)		5c5	3	12'-7	39	5c5	3	11'-7	36	5c5	3	10'-7	33
Wingwall, B.F.V.		5c6	14	8'-6	124	c6	--	--	--	c6	--	--	--
Interior Wall, Both F.V		4c7	4	3'-10	10	4c7	4	3'-10	10	4c7	4	3'-10	10
Interior Wall, Both F.V		4c8	84 Var.	2 Each 1'-6 to 6'-4	220	4c8	70 Var.	2 Each 1'-6 to 5'-4	160	4c8	56 Var.	2 Each 1'-6 to 4'-3	108
Interior Wall, Both F.V		4c9	4	6'-7	18	4c9	4	5'-7	15	4c9	4	4'-7	12
Apron, Longit., Bott.		4d1	39	25'-4	660	4d1	39	21'-10	569	4d1	39	18'-4	478
Apron, Longit., Top		6f1	39	25'-4	1484	6f1	39	21'-10	1279	6f1	39	18'-4	1074
Parapet, Vertical		4i1	75	7'-0	351	4i1	75	7'-0	351	4i1	75	7'-0	351
Parapet, Horiz.		7j1	4	44'-7	384	7j1	4	44'-7	384	7j1	4	44'-7	384
Apron, Trans., Top		5m1	24	39'-2	980	5m1	17	39'-2	694	5m1	10	39'-2	409
Apron, Trans., Top		5m2	42 Var.	2'-4 to 37'-10	880	5m2	42 Var.	2'-5 to 37'-11	883	5m2	42 Var.	2'-6 to 38'-0	887
Apron, Trans., Bott.		4m3	19	40'-10	549	4m3	21	40'-10	607	4m3	13	40'-10	376
Curtain, Horiz.		6p1	5	44'-11	355	6p1	5	44'-11	355	6p1	5	44'-11	355
Wing Slope, Both F.		6s1	4	18'-8	112	6s1	4	15'-1	91	6s1	4	11'-6	69
Wing Slope, Both F. (O)		6s2	2	8'-4	25	6s2	2	8'-4	25	6s2	2	8'-4	25
Wing Slope, Both F. (A)		6s3	2	8'-9	26	6s3	2	8'-9	26	6s3	2	8'-9	26
Wing Slope, F.F.		6s4	2	12'-5	37	6s4	2	12'-5	37	6s4	2	12'-5	37
Wing Slope, F.F.		6s5	2	16'-3	49	6s5	2	12'-8	38	6s5	2	9'-0	27
Interior Wall, Both F.		6s6	4	25'-11	156	6s6	4	22'-4	134	6s6	4	18'-9	113
Curtain, Vert.		5t1	44	6'-5	294	5t1	44	6'-5	294	5t1	44	6'-5	294
Curtain, Vert. Ends		5t2	4	6'-7	27	5t2	4	6'-7	27	5t2	4	6'-7	27
Bracket, Vert.		5u1	4	5'-4	22	5u1	4	5'-4	22	5u1	4	5'-4	22
Estimated Quantities One Headwall	Reinf. Steel		8163 LB				7125 LB				5921 LB		
	Concrete Parapet Δ		4.0	59.9 CY			4.0	51.1 CY			4.0	42.6 CY	
	Concrete Wingwalls		9.4				6.8				4.6		
	Concrete Apron ✳		46.5				40.3				34.0		

Note: Weight of bars over 40'-0" long include an allowance of 2'-5" for lap.

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.

(A) - Indicates bar located at acute corner.
(O) - Indicates bar located at obtuse corner.
Refer to Sheet TRPWH 30-1-20 for acute and obtuse corner locations.

Headwall Notes:

1. This headwall is based on a 3:1 slope normal to centerline of roadway.
2. The sides of the apron are to be formed to ensure correct line and grade.
3. All apron 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.
4. 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.
5. Concrete quantities are estimated from back of parapet.
6. Horizontal tails of bars "b" & "s" estimated to extend 2'-5" beyond back of parapet (into end of barrel). Longitudinal bars "4d1" and "6f1" estimated to project into end section of barrel a minimum of 2'-5" beyond back of parapet. The "length" column reflects total number of feet necessary to meet these requirements.
7. Dimensions are in feet and inches unless otherwise noted.

LATEST REVISION DATE

APPROVED BY BRIDGE ENGINEER

IOWADOT

Standard Design - Triple Reinforced Concrete Box Culverts

Parallel Wing Headwalls

July, 2020

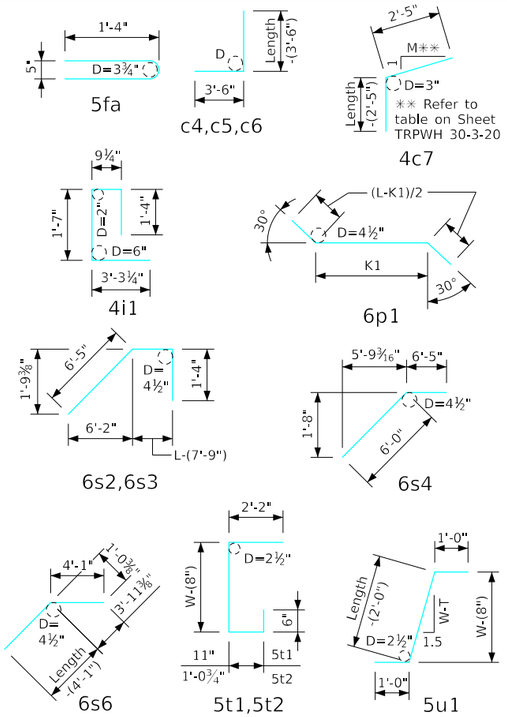
Quantity Tabulation
12'-0" Span
30° Skew

TRPWH
30-6-20
Sheet 2 of 2

ENGLISHLRFDSIGNEDTRIPLECULVERTS.DGN - TRPWH 30-5-20 S2 - THIS SHEET ISSUED 07-2020.

7/29/2022 10:58:35 AM bkloss pw:\\NTPwint1.dot.int.lan:PWMain\Documents\Highway\Bridge\Standards Development V8i\Culverts\EnglishLRFDSignedTripleCulverts.dgn TRPWH 30-6-20 S2 11x17_pdf.pltcfg

Bent Bar Details



Note: All dimensions are out to out
D = pin diameter
See table below for pin diameter "D" of c bars

c Bar Pin Diameter	
Bar Size	D
5	3¾"
6	4½"

Bill of Reinforcing for One Headwall 30° Skew Span x Culvert Height

Location	Shape	10' x 12'				10' x 11'				10' x 10'				10' x 9'				10' x 8'				10' x 7'			
		Bar	No.	Length	Wt.	Bar	No.	Length	Wt.	Bar	No.	Length	Wt.	Bar	No.	Length	Wt.	Bar	No.	Length	Wt.	Bar	No.	Length	Wt.
Fence Anchor (Galv.)		5fa	2	2'-10	6	5fa	2	2'-10	6	5fa	2	2'-10	6	5fa	2	2'-10	6	5fa	2	2'-10	6	5fa	2	2'-10	6
Wingwall, F.F.H.		5b1	2	46'-2	101	5b1	2	42'-9	94	5b1	2	39'-3	82	5b1	2	35'-10	75	5b1	2	32'-4	67	5b1	2	28'-11	60
Wingwall, F.F.H.		5b2	22 Var.	2 Each 10'-0 to 44'-7	636	5b2	20 Var.	2 Each 10'-0 to 41'-2	539	5b2	18 Var.	2 Each 10'-0 to 37'-8	447	5b2	16 Var.	2 Each 10'-0 to 34'-3	369	5b2	14 Var.	2 Each 10'-0 to 30'-9	298	5b2	12 Var.	2 Each 10'-0 to 27'-4	234
Wingwall, B.F.H.		4b3	2	46'-6	65	4b3	2	43'-1	61	4b3	2	39'-6	53	4b3	2	36'-1	48	4b3	2	32'-7	44	4b3	2	29'-1	39
Wingwall, B.F.H.		4b4	20 Var.	2 Each 13'-9 to 44'-11	398	4b4	18 Var.	2 Each 13'-9 to 41'-6	335	4b4	16 Var.	2 Each 13'-8 to 37'-11	276	4b4	14 Var.	2 Each 13'-8 to 34'-5	225	4b4	12 Var.	2 Each 13'-8 to 31'-0	179	4b4	10 Var.	2 Each 13'-7 to 27'-6	137
Interior Wall, Both F.H.		5b5	42 Var.	2 Each 7'-4 to 45'-8	1176	5b5	38 Var.	2 Each 7'-5 to 42'-2	993	5b5	34 Var.	2 Each 7'-4 to 38'-9	817	5b5	30 Var.	2 Each 7'-5 to 35'-3	668	5b5	26 Var.	2 Each 7'-5 to 31'-9	531	5b5	22 Var.	2 Each 7'-6 to 28'-4	411
Wingwall, F.F.V.		5c1	86 Var.	2 Each 2'-7 to 14'-8	774	5c1	78 Var.	2 Each 2'-7 to 13'-7	658	4c1	72 Var.	2 Each 2'-7 to 12'-8	367	4c1	64 Var.	2 Each 2'-7 to 11'-6	301	4c1	76 Var.	2 Each 2'-7 to 10'-7	334	4c1	68 Var.	2 Each 2'-7 to 9'-9	280
Wingwall, F.F.V.		5c2	40 Var.	2 Each 9'-1 to 14'-7	494	5c2	34 Var.	2 Each 9'-1 to 13'-8	403	4c2	26 Var.	2 Each 9'-1 to 12'-6	187	4c2	20 Var.	2 Each 9'-1 to 11'-8	139	c2	--	--	--	c2	--	--	--
Wingwall, F.F.V. (O)		5c3	2	15'-0	31	5c3	2	14'-0	29	4c3	2	13'-0	17	4c3	2	12'-0	16	4c3	2	11'-0	15	4c3	2	10'-0	13
Wingwall, F.F.V. (A)		5c3	2	15'-0	31	5c3	2	14'-0	29	4c3	2	13'-0	17	4c3	2	12'-0	16	4c3	2	11'-0	15	4c3	2	10'-0	13
Wingwall, B.F.V.		6c4	86 Var.	2 Each 6'-3 to 18'-5	1593	5c4	78 Var.	2 Each 6'-3 to 17'-3	956	5c4	72 Var.	2 Each 6'-3 to 16'-4	848	5c4	64 Var.	2 Each 6'-3 to 15'-3	718	5c4	58 Var.	2 Each 6'-3 to 14'-4	623	5c4	50 Var.	2 Each 6'-3 to 13'-2	506
Wingwall, B.F.V. (O)		6c5	1	18'-6	28	5c5	1	17'-6	18	5c5	1	16'-6	17	5c5	1	15'-6	16	5c5	1	14'-6	15	5c5	1	13'-6	14
Wingwall, B.F.V. (A)		6c5	3	18'-6	83	5c5	3	17'-6	55	5c5	3	16'-6	52	5c5	3	15'-6	48	5c5	3	14'-6	45	5c5	3	13'-6	42
Wingwall, B.F.V.		6c6	56	8'-6	715	5c6	50	8'-6	443	5c6	42	8'-6	372	5c6	36	8'-6	319	5c6	28	8'-6	248	5c6	22	8'-6	195
Interior Wall, Both F.V		4c7	4	3'-9	10	4c7	4	3'-9	10	4c7	4	3'-9	10	4c7	4	3'-9	10	4c7	4	3'-9	10	4c7	4	3'-9	10
Interior Wall, Both F.V		4c8	166 Var.	2 Each 1'-6 to 12'-2	758	4c8	152 Var.	2 Each 1'-6 to 11'-2	643	4c8	138 Var.	2 Each 1'-6 to 10'-2	538	4c8	124 Var.	2 Each 1'-6 to 9'-2	442	4c8	110 Var.	2 Each 1'-6 to 8'-1	352	4c8	96 Var.	2 Each 1'-5 to 7'-1	273
Interior Wall, Both F.V		4c9	4	12'-6	33	4c9	4	11'-6	31	4c9	4	10'-6	28	4c9	4	9'-6	25	4c9	4	8'-6	23	4c9	4	7'-6	20
Apron, Longit., Bott.		4d1	33	46'-1	1069	4d1	33	42'-7	992	4d1	33	39'-2	863	4d1	33	35'-8	786	4d1	33	32'-3	711	4d1	33	28'-9	634
Apron, Longit., Top		6f1	33	46'-1	2404	6f1	33	42'-7	2230	6f1	33	39'-2	1941	6f1	33	35'-8	1768	6f1	33	32'-3	1599	6f1	33	28'-9	1425
Parapet, Vertical		4i1	65	7'-0	304	4i1	65	7'-0	304	4i1	63	7'-0	295	4i1	63	7'-0	295	4i1	63	7'-0	295	4i1	63	7'-0	295
Parapet, Horiz.		7j1	4	38'-10	318	7j1	4	38'-10	318	7j1	4	38'-1	311	7j1	4	38'-1	311	7j1	4	38'-1	311	7j1	4	37'-8	308
Apron, Trans., Top		5m1	46	34'-2	1639	5m1	41	34'-2	1461	5m1	37	33'-6	1293	5m1	32	33'-6	1118	5m1	28	33'-6	978	5m1	23	33'-2	796
Apron, Trans., Top		5m2	24 Var.	2'-6 to 32'-4	436	5m2	24 Var.	3'-0 to 32'-10	448	5m2	23 Var.	3'-2 to 31'-9	419	5m2	24 Var.	2'-4 to 32'-3	433	5m2	23 Var.	2'-10 to 31'-5	411	5m2	23 Var.	3'-2 to 31'-9	419
Apron, Trans., Bott.		6m3	73	36'-7	4011	6m3	67	36'-7	3682	6m3	61	35'-11	3291	6m3	55	35'-11	2967	5m3	25	35'-1	915	5m3	22	34'-8	795
Curtain, Horiz.		6p1	6	39'-1	352	6p1	6	39'-1	352	6p1	6	38'-4	345	6p1	6	38'-4	345	6p1	6	38'-4	345	6p1	5	38'-0	285
Wing Slope, Both F.		6s1	4	40'-4	257	6s1	4	36'-9	221	6s1	4	33'-2	199	6s1	4	29'-6	177	6s1	4	25'-11	156	6s1	4	22'-4	134
Wing Slope, Both F. (O)		6s2	2	8'-3	25	6s2	2	8'-3	25	6s2	2	8'-4	25	6s2	2	8'-4	25	6s2	2	8'-4	25	6s2	2	8'-4	25
Wing Slope, Both F. (A)		6s3	2	8'-9	26	6s3	2	8'-9	26	6s3	2	8'-9	26	6s3	2	8'-9	26	6s3	2	8'-9	26	6s3	2	8'-9	26
Wing Slope, F.F.		6s4	2	12'-5	37	6s4	2	12'-5	37	6s4	2	12'-5	37	6s4	2	12'-5	37	6s4	2	12'-5	37	6s4	2	12'-5	37
Wing Slope, F.F.		6s5	2	37'-11	114	6s5	2	34'-3	103	6s5	2	30'-8	92	6s5	2	27'-1	81	6s5	2	23'-5	70	6s5	2	19'-10	60
Interior Wall, Both F.		6s6	4	47'-5	299	6s6	4	43'-10	278	6s6	4	40'-4	257	6s6	4	36'-9	221	6s6	4	33'-1	199	6s6	4	29'-7	178
Curtain, Vert.		5t1	37	7'-11	306	5t1	37	7'-8	296	5t1	37	7'-5	286	5t1	37	7'-2	277	5t1	37	6'-11	267	5t1	37	6'-8	257
Curtain, Vert. Ends		5t2	4	8'-1	34	5t2	4	7'-10	33	5t2	4	7'-7	32	5t2	4	7'-4	31	5t2	4	7'-1	30	5t2	4	6'-10	29
Bracket, Vert.		5u1	4	6'-7	27	5u1	4	6'-4	26	5u1	4	6'-2	26	5u1	4	5'-11	25	5u1	4	5'-8	24	5u1	4	5'-6	23
Estimated Quantities One Headwall	Reinf. Steel			18,590 LB				16,135 LB				13,872 LB				12,364 LB				9204 LB				7979 LB	
	Concrete	Parapet Δ	3.8	120.8 CY		3.8	108.7 CY			3.6	89.9 CY			3.6	79.8 CY			3.6	70.1 CY			3.5	58.8 CY		
		Wingwalls	44.4			37.9				26.4				21.8				17.6				12.4			
		Apron ✳	72.6			67.0				59.9				54.4				48.9				42.9			

Note: Weight of bars over 40'-0" long include an allowance of 2'-5" for lap.

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.

(A) - Indicates bar located at acute corner.
(O) - Indicates bar located at obtuse corner.
Refer to Sheet TRPWH 30-1-20 for acute and obtuse corner locations.

Headwall Notes:

1. This headwall is based on a 3:1 slope normal to centerline of roadway.
2. The sides of the apron are to be formed to ensure correct line and grade.
3. All apron 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.
4. 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.
5. Concrete quantities are estimated from back of parapet.
6. Horizontal tails of bars "b" & "s" estimated to extend 2'-5" beyond back of parapet (into end of barrel). Longitudinal bars "4d1" and "6f1" estimated to project into end section of barrel a minimum of 2'-5" beyond back of parapet. The "length" column reflects total number of feet necessary to meet these requirements.
7. Dimensions are in feet and inches unless otherwise noted.

LATEST REVISION DATE

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IOWADOT

Standard Design - Triple Reinforced Concrete Box Culverts

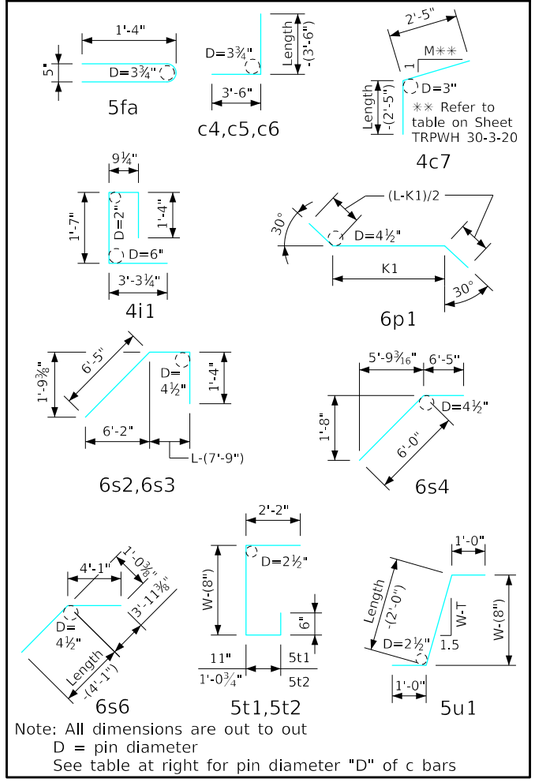
Parallel Wing Headwalls

July, 2020

Quantity Tabulation
10'-0" Span
30° Skew

TRPWH
30-7-20
Sheet 1 of 2

Bent Bar Details



Note: All dimensions are out to out
D = pin diameter
See table at right for pin diameter "D" of c bars

Bill of Reinforcing for One Headwall 30° Skew Span x Culvert Height

Location	Shape	10' x 6' Bar	10' x 6' No.	10' x 6' Length	10' x 6' Wt.	10' x 5' Bar	10' x 5' No.	10' x 5' Length	10' x 5' Wt.	10' x 4' Bar	10' x 4' No.	10' x 4' Length	10' x 4' Wt.
Fence Anchor (Galv.)		5fa	2	2'-10	6	5fa	2	2'-10	6	5fa	2	2'-10	6
Wingwall, F.F.H.		5b1	2	25'-5	53	5b1	2	22'-0	46	5b1	2	18'-6	39
Wingwall, F.F.H.		5b2	10 Var.	2 Each 10'-0 to 23'-10	176	5b2	8 Var.	2 Each 10'-0 to 20'-5	127	5b2	6 Var.	2 Each 10'-0 to 16'-11	84
Wingwall, B.F.H.		4b3	2	25'-7	34	4b3	2	22'-2	30	4b3	2	18'-8	25
Wingwall, B.F.H.		4b4	8 Var.	2 Each 13'-7 to 24'-0	100	4b4	6 Var.	2 Each 13'-7 to 20'-7	68	4b4	4 Var.	2 Each 13'-7 to 17'-1	41
Interior Wall, Both F.H.		5b5	18 Var.	2 Each 7'-7 to 24'-10	304	5b5	14 Var.	2 Each 7'-9 to 21'-4	212	5b5	10 Var.	2 Each 8'-1 to 17'-10	135
Wingwall, F.F.V.		4c1	58 Var.	2 Each 2'-7 to 8'-8	218	4c1	36 Var.	2 Each 2'-7 to 7'-6	121	4c1	30 Var.	2 Each 2'-7 to 6'-7	92
Wingwall, F.F.V.		c2	--	--	--	c2	--	--	--	c2	--	--	--
Wingwall, F.F.V. (O)		4c3	2	9'-0	12	4c3	2	8'-0	11	4c3	2	7'-0	9
Wingwall, F.F.V. (A)		4c3	2	9'-0	12	4c3	2	8'-0	11	4c3	2	7'-0	9
Wingwall, B.F.V.		5c4	44 Var.	2 Each 6'-3 to 12'-4	426	5c4	48 Var.	2 Each 6'-3 to 11'-3	438	5c4	30 Var.	2 Each 6'-3 to 10'-4	259
Wingwall, B.F.V. (O)		5c5	1	12'-6	13	5c5	1	11'-6	12	5c5	1	10'-6	11
Wingwall, B.F.V. (A)		5c5	3	12'-6	39	5c5	3	11'-6	36	5c5	3	10'-6	33
Wingwall, B.F.V.		5c6	14	8'-6	124	c6	--	--	--	c6	--	--	--
Interior Wall, Both F.V		4c7	4	3'-9	10	4c7	4	3'-9	10	4c7	4	3'-9	10
Interior Wall, Both F.V		4c8	84 Var.	2 Each 1'-5 to 6'-3	215	4c8	70 Var.	2 Each 1'-5 to 5'-3	156	4c8	56 Var.	2 Each 1'-5 to 4'-2	104
Interior Wall, Both F.V		4c9	4	6'-6	17	4c9	4	5'-6	15	4c9	4	4'-6	12
Apron, Longit., Bott.		4d1	33	25'-4	558	4d1	33	21'-10	481	4d1	33	18'-4	404
Apron, Longit., Top		6f1	33	25'-4	1256	6f1	33	21'-10	1082	6f1	33	18'-4	909
Parapet, Vertical		4i1	63	7'-0	295	4i1	63	7'-0	295	4i1	63	7'-0	295
Parapet, Horiz.		7j1	4	37'-8	308	7j1	4	37'-8	308	7j1	4	37'-8	308
Apron, Trans., Top		5m1	18	33'-2	623	5m1	14	33'-2	484	5m1	9	33'-2	311
Apron, Trans., Top		5m2	24 Var.	2'-4 to 32'-3	433	5m2	23 Var.	2'-10 to 31'-5	411	5m2	24 Var.	2'-1 to 31'-11	426
Apron, Trans., Bott.		4m3	19	33'-11	430	4m3	16	33'-11	363	4m3	13	33'-11	295
Curtain, Horiz.		6p1	5	38'-0	285	6p1	5	38'-0	285	6p1	5	38'-0	285
Wing Slope, Both F.		6s1	4	18'-8	112	6s1	4	15'-1	91	6s1	4	11'-6	69
Wing Slope, Both F. (O)		6s2	2	8'-4	25	6s2	2	8'-4	25	6s2	2	8'-4	25
Wing Slope, Both F. (A)		6s3	2	8'-9	26	6s3	2	8'-9	26	6s3	2	8'-9	26
Wing Slope, F.F.		6s4	2	12'-5	37	6s4	2	12'-5	37	6s4	2	12'-5	37
Wing Slope, F.F.		6s5	2	16'-3	49	6s5	2	12'-8	38	6s5	2	9'-0	27
Interior Wall, Both F.		6s6	4	25'-11	156	6s6	4	22'-4	134	6s6	4	18'-9	113
Curtain, Vert.		5t1	37	6'-5	248	5t1	37	6'-5	248	5t1	37	6'-5	248
Curtain, Vert. Ends		5t2	4	6'-7	27	5t2	4	6'-7	27	5t2	4	6'-7	27
Bracket, Vert.		5u1	4	5'-4	22	5u1	4	5'-4	22	5u1	4	5'-4	22

Estimated Quantities One Headwall			10' x 6'	10' x 5'	10' x 4'
Reinf. Steel			6649 LB	5656 LB	4696 LB
Concrete	Parapet Δ		3.5	3.5	3.5
	Wingwalls		9.4	6.8	4.6
	Apron ✳		37.5	32.5	27.6
Concrete			50.4 CY	42.8 CY	35.7 CY

Note: Weight of bars over 40'-0" long include an allowance of 2'-5" for lap.

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.

(A) - Indicates bar located at acute corner.
(O) - Indicates bar located at obtuse corner.
Refer to Sheet TRPWH 30-1-20 for acute and obtuse corner locations.

Headwall Notes:

1. This headwall is based on a 3:1 slope normal to centerline of roadway.
2. The sides of the apron are to be formed to ensure correct line and grade.
3. All apron 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.
4. 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.
5. Concrete quantities are estimated from back of parapet.
6. Horizontal tails of bars "b" & "s" estimated to extend 2'-5" beyond back of parapet (into end of barrel). Longitudinal bars "4d1" and "6f1" estimated to project into end section of barrel a minimum of 2'-5" beyond back of parapet. The "length" column reflects total number of feet necessary to meet these requirements.
7. Dimensions are in feet and inches unless otherwise noted.

LATEST REVISION DATE

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IOWADOT

Standard Design - Triple Reinforced Concrete Box Culverts

Parallel Wing Headwalls

July, 2020

Quantity Tabulation
10'-0" Span
30° Skew

TRPWH
30-7-20
Sheet 2 of 2

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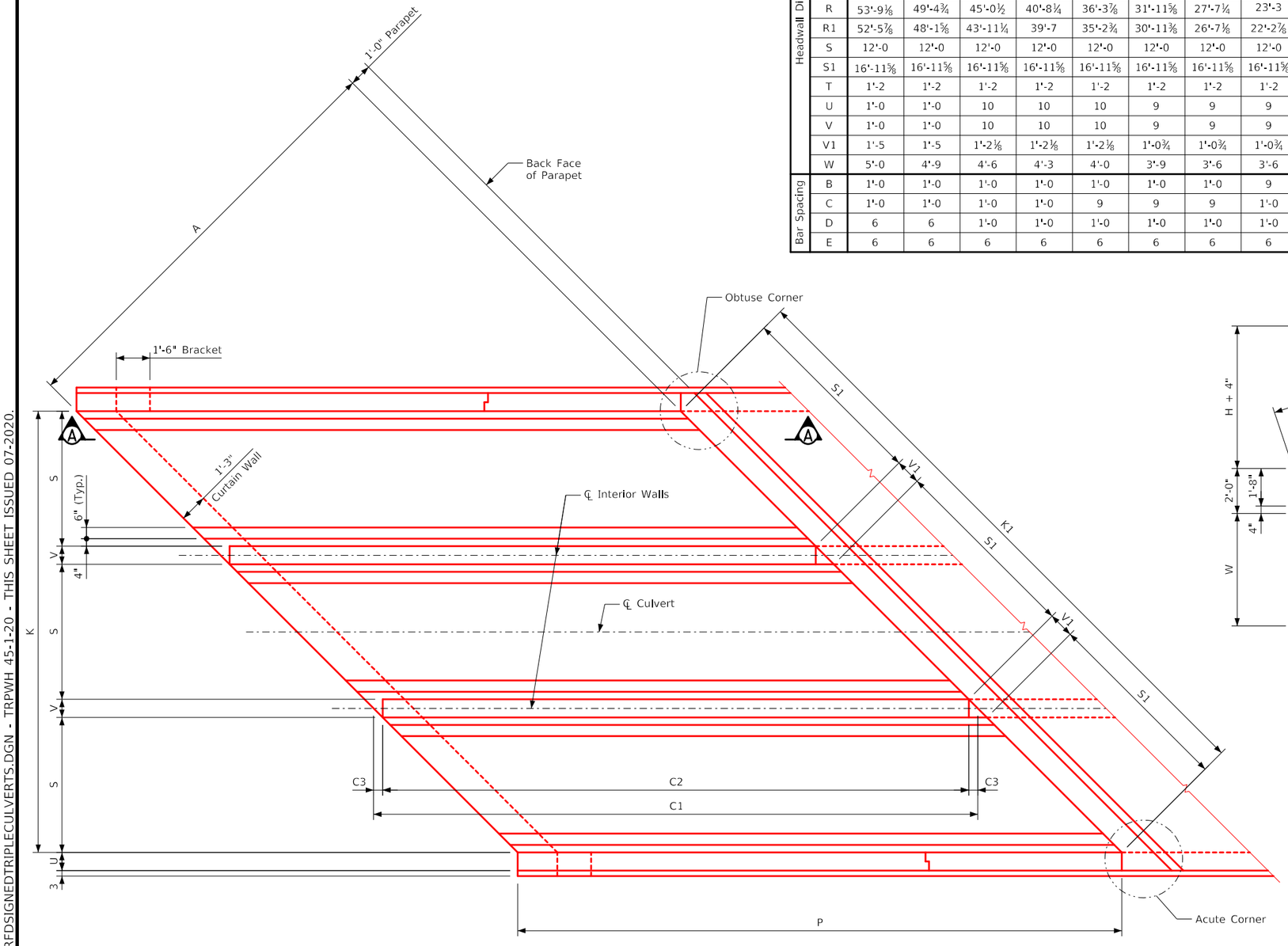
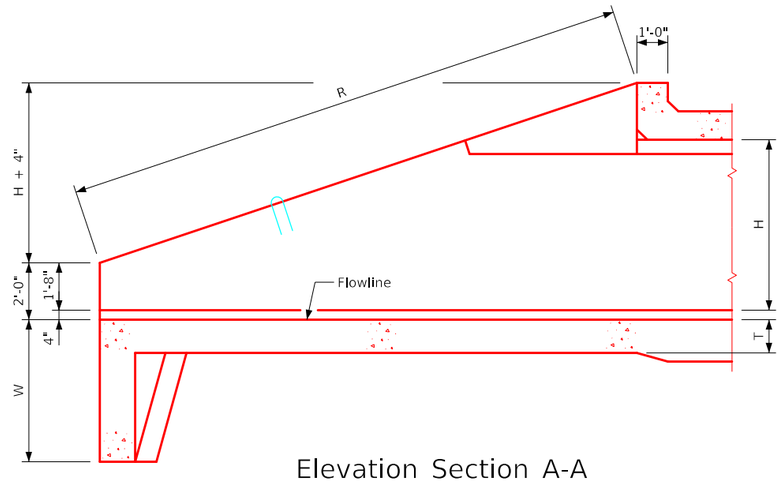
Dimension Table

	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'	S x H
Headwall Dimensions	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	A
	C1	52'-3⅜	48'-1	43'-10⅛	39'-7⅛	35'-4¼	31'-1⅜	26'-10½	22'-7½	18'-4⅝	52'-3⅜	48'-1	43'-10⅛	39'-7⅛	35'-4¼	31'-1⅜	26'-10½	22'-7½	18'-4⅝	C1
	C2	51'-3⅜	47'-1	43'-0⅛	38'-9⅛	34'-6¼	30'-4⅜	26'-1½	21'-10½	17'-7⅝	51'-3⅜	47'-1	43'-0⅛	38'-9⅛	34'-6¼	30'-4⅜	26'-1½	21'-10½	17'-7⅝	C2
	C3	6	6	5	5	5	4½	4½	4½	4½	6	6	5	5	5	4½	4½	4½	4½	C3
	H	12'-0	11'-0	10'-0	9'-0	8'-0	7'-0	6'-0	5'-0	4'-0	12'-0	11'-0	10'-0	9'-0	8'-0	7'-0	6'-0	5'-0	4'-0	H
	K	38'-0	38'-0	37'-8	37'-8	37'-8	37'-6	37'-6	37'-6	37'-6	32'-0	32'-0	31'-8	31'-8	31'-8	31'-6	31'-6	31'-6	31'-6	K
	K1	53'-8⅝	53'-8⅞	53'-3⅛	53'-3⅛	53'-3⅛	53'-0⅜	53'-0⅜	53'-0⅜	53'-0⅜	45'-3¼	45'-3¼	44'-9½	44'-9½	44'-9½	44'-6¾	44'-6¾	44'-6¾	44'-6¾	K1
	P	52'-3⅜	48'-1	43'-10⅛	39'-7⅛	35'-4¼	31'-1⅜	26'-10½	22'-7½	18'-4⅝	52'-3⅜	48'-1	43'-10⅛	39'-7⅛	35'-4¼	31'-1⅜	26'-10½	22'-7½	18'-4⅝	P
	R	53'-9⅛	49'-4¾	45'-0½	40'-8¼	36'-3⅜	31'-11⅝	27'-7¼	23'-3	18'-10⅝	53'-9⅛	49'-4¾	45'-0½	40'-8¼	36'-3⅜	31'-11⅝	27'-7¼	23'-3	18'-10⅝	R
	R1	52'-5⅞	48'-1⅝	43'-11¼	39'-7	35'-2¾	30'-11⅜	26'-7⅛	22'-2⅞	17'-10⅜	52'-5⅞	48'-1⅝	43'-11¼	39'-7	35'-2¾	30'-11⅜	26'-7⅛	22'-2⅞	17'-10⅜	R1
	S	12'-0	12'-0	12'-0	12'-0	12'-0	12'-0	12'-0	12'-0	12'-0	10'-0	10'-0	10'-0	10'-0	10'-0	10'-0	10'-0	10'-0	10'-0	S
	S1	16'-11⅝	16'-11⅝	16'-11⅝	16'-11⅝	16'-11⅝	16'-11⅝	16'-11⅝	16'-11⅝	16'-11⅝	14'-1¾	14'-1¾	14'-1¾	14'-1¾	14'-1¾	14'-1¾	14'-1¾	14'-1¾	14'-1¾	S1
	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	1'-1	1'-1	1'-1	1'-1	1'-1	T
	U	1'-0	1'-0	10	10	10	9	9	9	9	1'-0	1'-0	10	10	10	9	9	9	9	U
	V	1'-0	1'-0	10	10	10	9	9	9	9	1'-0	1'-0	10	10	10	9	9	9	9	V
	V1	1'-5	1'-5	1'-2⅛	1'-2⅛	1'-2⅛	1'-0¾	1'-0¾	1'-0¾	1'-0¾	1'-5	1'-5	1'-2⅛	1'-2⅛	1'-2⅛	1'-0¾	1'-0¾	1'-0¾	1'-0¾	V1
	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	4'-0	3'-9	3'-6	3'-6	3'-6	W
Bar Spacing	B	1'-0	1'-0	1'-0	1'-0	1'-0	1'-0	1'-0	9	9	1'-0	1'-0	1'-0	1'-0	1'-0	1'-0	1'-0	9	9	B
	C	1'-0	1'-0	1'-0	1'-0	9	9	9	1'-0	1'-0	1'-0	1'-0	1'-0	1'-0	1'-0	9	9	9	1'-0	C
	D	6	6	1'-0	1'-0	1'-0	1'-0	1'-0	1'-0	1'-0	6	6	6	1'-0	1'-0	1'-0	1'-0	1'-0	1'-0	D
	E	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	E



Plan View



Elevation Section A-A

Notes:

1. See Sheet TRRCB G2-20 for General Notes, Specifications, and Design Stresses.
2. See Sheets TRPWH 45-2-20 thru 45-5-20 for location of certain dimensions tabulated.
3. Dimensions are in feet and inches unless otherwise noted.

LATEST REVISION DATE

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Standard Design - Triple Reinforced Concrete Box Culverts

Parallel Wing Headwalls

July, 2020

Dimension Table
45° Skew

TRPWH
45-1-20

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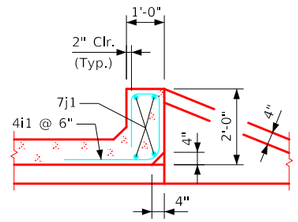
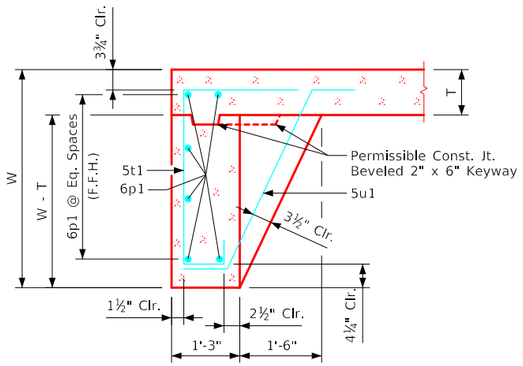
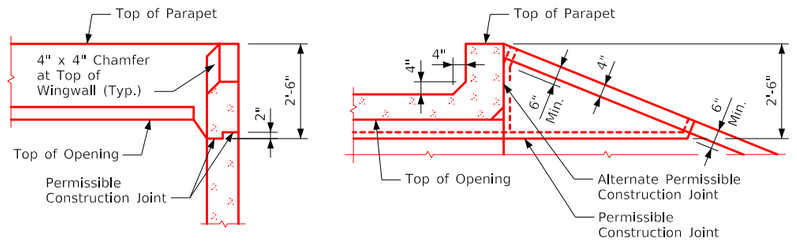


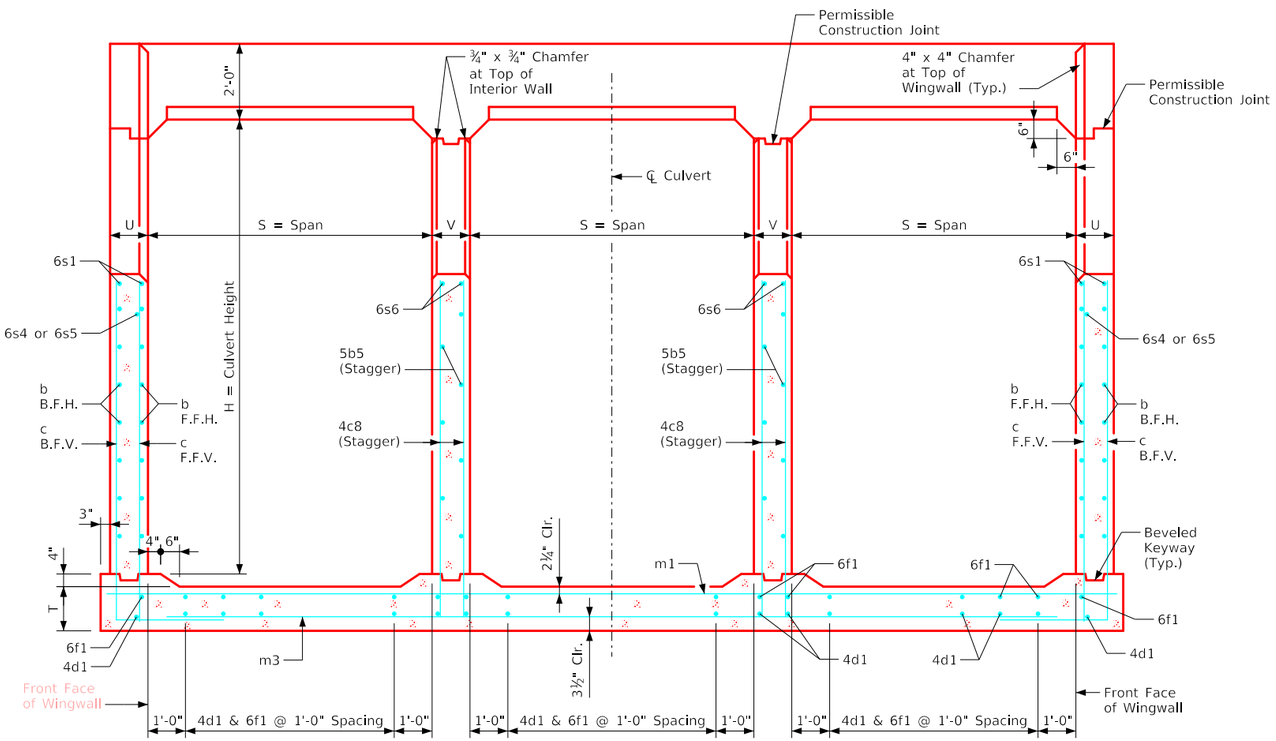
Section thru Parapet



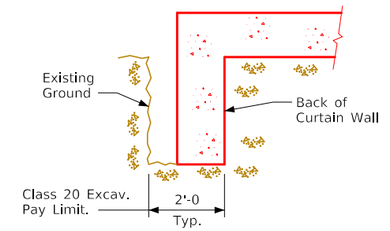
Section thru Curtain Wall



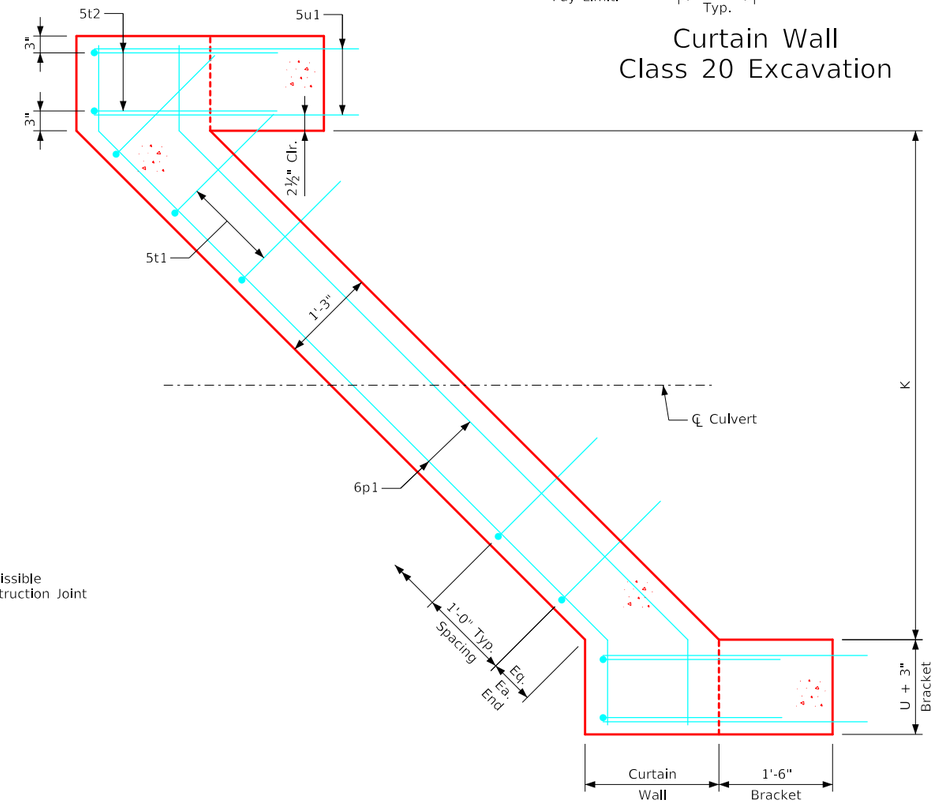
Top of Wingwall Details



Typical Cross Section - thru Headwall



Curtain Wall
Class 20 Excavation



Curtain Wall Detail - Plan View
(Apron is not shown)

Notes:

1. See Sheet TRRCB G2-20 for General Notes, Specifications, and Design Stresses.
2. For dimension table see Sheet TRPWH 45-1-20.

August 2022
LATEST REVISION DATE

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Standard Design - Triple Reinforced Concrete Box Culverts

Parallel Wing Headwalls

July, 2020

Cross Section Details
45° Skew

TRPWH
45-2-20

Revised 08-2022: Changed chamfer at top of Interior Walls to 3/4" x 3/4" (was 4" x 4").
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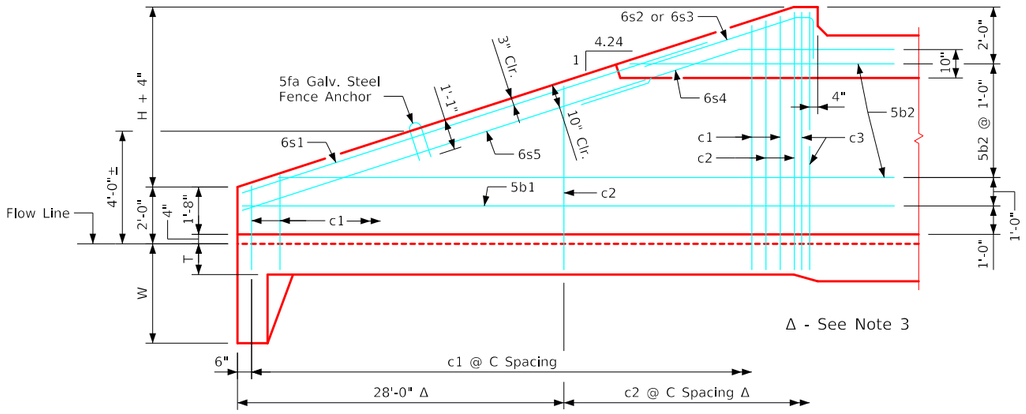
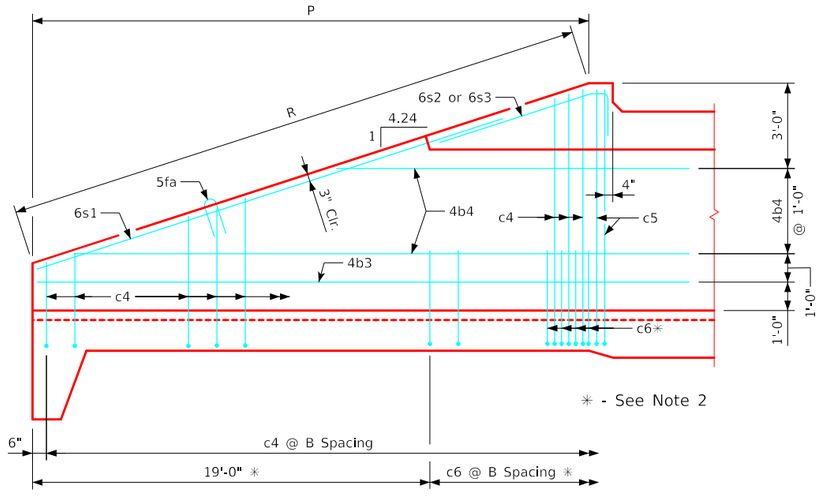
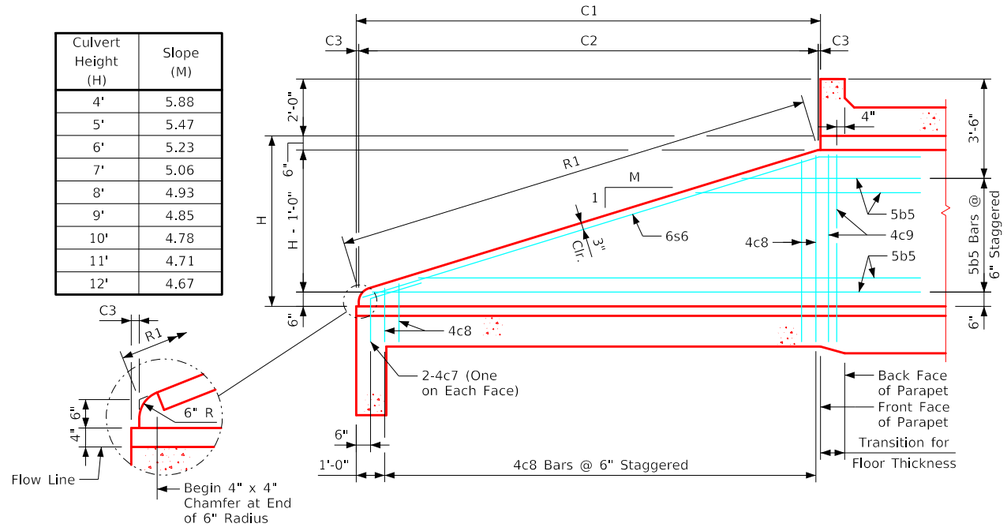


Typical View - Front Face Wingwall Reinforcing



Typical View - Back Face Wingwall Reinforcing

Culvert Height (H)	Slope (M)
4'	5.88
5'	5.47
6'	5.23
7'	5.06
8'	4.93
9'	4.85
10'	4.78
11'	4.71
12'	4.67



Typical View - Interior Wall

Notes:

1. Bar spacings and positions shown are similar for all sizes of headwalls in this standard.
2. Not applicable for 4' thru 5' height headwalls.
3. Not applicable for 4' thru 8' height headwalls.
4. For headwall dimensions and bar spacing see Sheet TRPWH 45-1-20.
5. Apron m3 bars are to be centered on ℄ culvert.
6. B.F.V. (c5) and F.F.V. (c3) and interior wall both F.V. (c9) bars are approximately 4" from the back of parapet for all headwalls.

LATEST REVISION DATE

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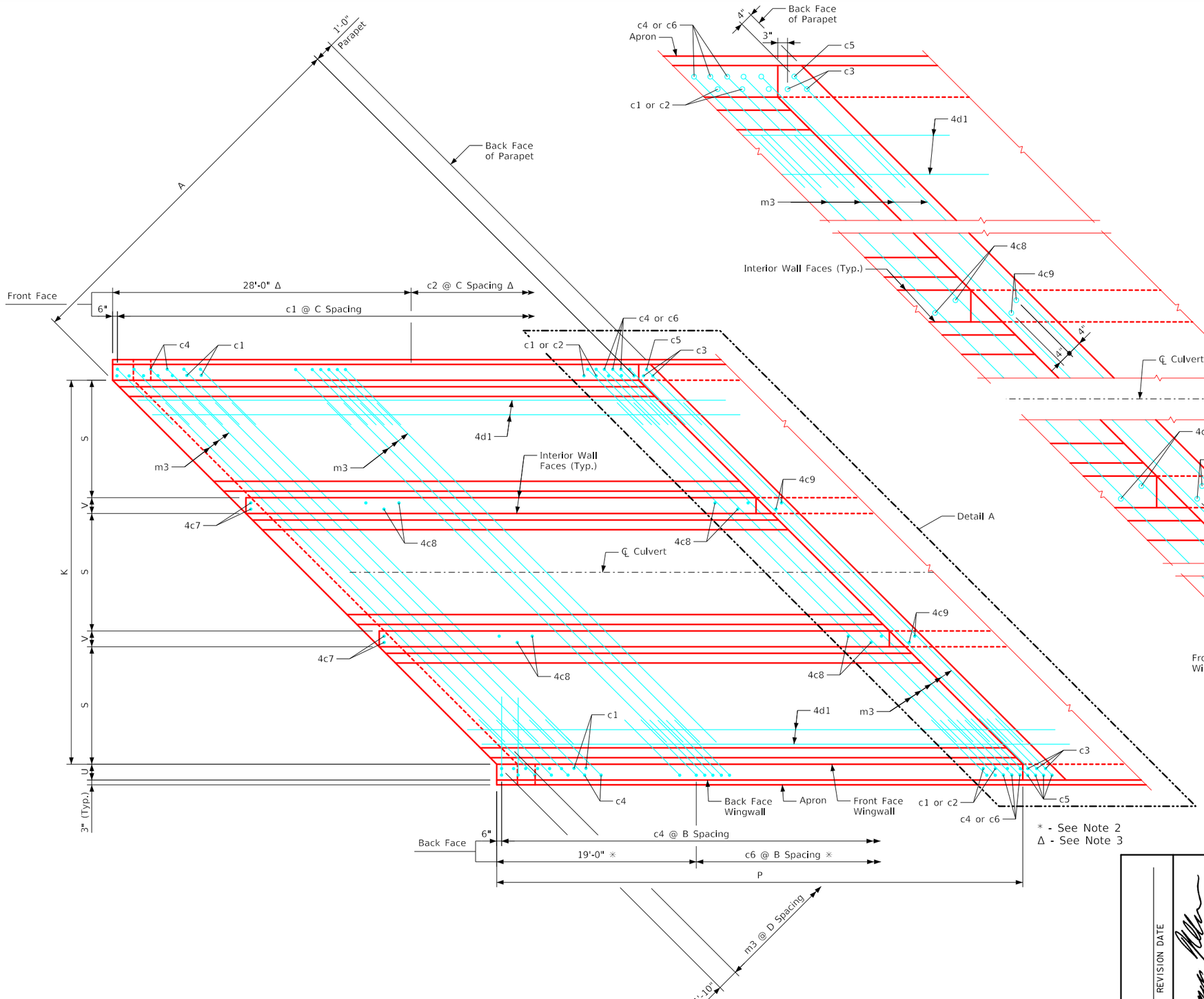
Standard Design - Triple Reinforced Concrete Box Culverts

Parallel Wing Headwalls

July, 2020

Wingwall Elevations
45° Skew

TRPWH
45-3-20



Plan View - Bottom Apron Reinforcing

(Curtain Wall Reinforcing not shown, See Sheet TRPWH 45-2-20)

Detail A

Notes:

1. Bar spacings and positions shown are similar for all sizes of headwalls in this standard.
2. Not applicable for 4' & 5' height headwalls.
3. Not applicable for 4' thru 8' height headwalls.
4. For headwall dimensions and bar spacing see Sheet TRPWH 45-1-20.
5. Apron m3 bars are to be centered on ℄ culvert.
6. B.F.V. (c5), F.F.V. (c3) and interior wall both F.V. (c9) bars are approximately 4" from the back of parapet for all headwalls.

* - See Note 2
Δ - See Note 3

IOWA DOT

Standard Design - Triple Reinforced Concrete Box Culverts

Parallel Wing Headwalls

July, 2020

Bottom Apron Reinforcing 45° Skew	TRPWH 45-4-20

LATEST REVISION DATE

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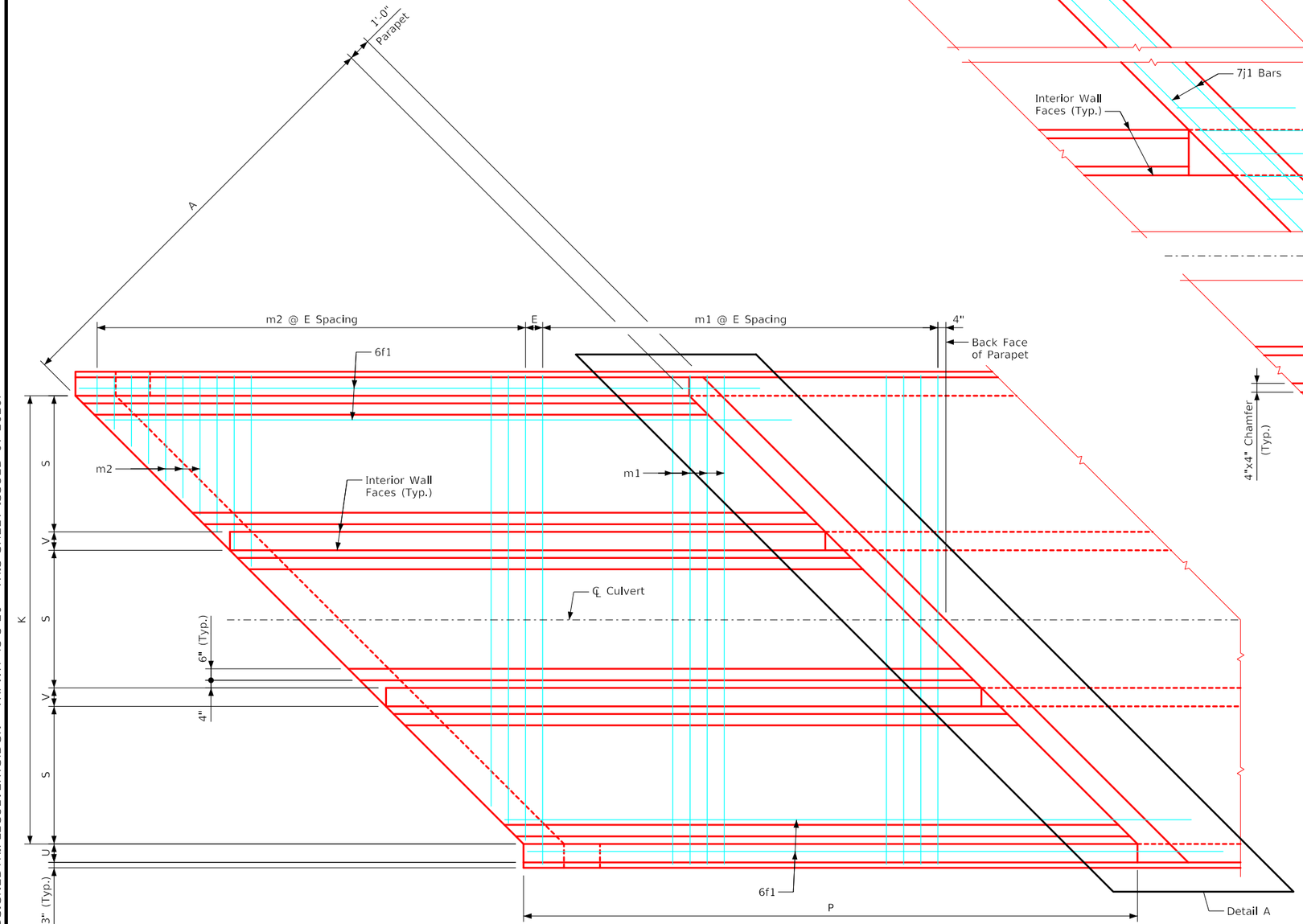
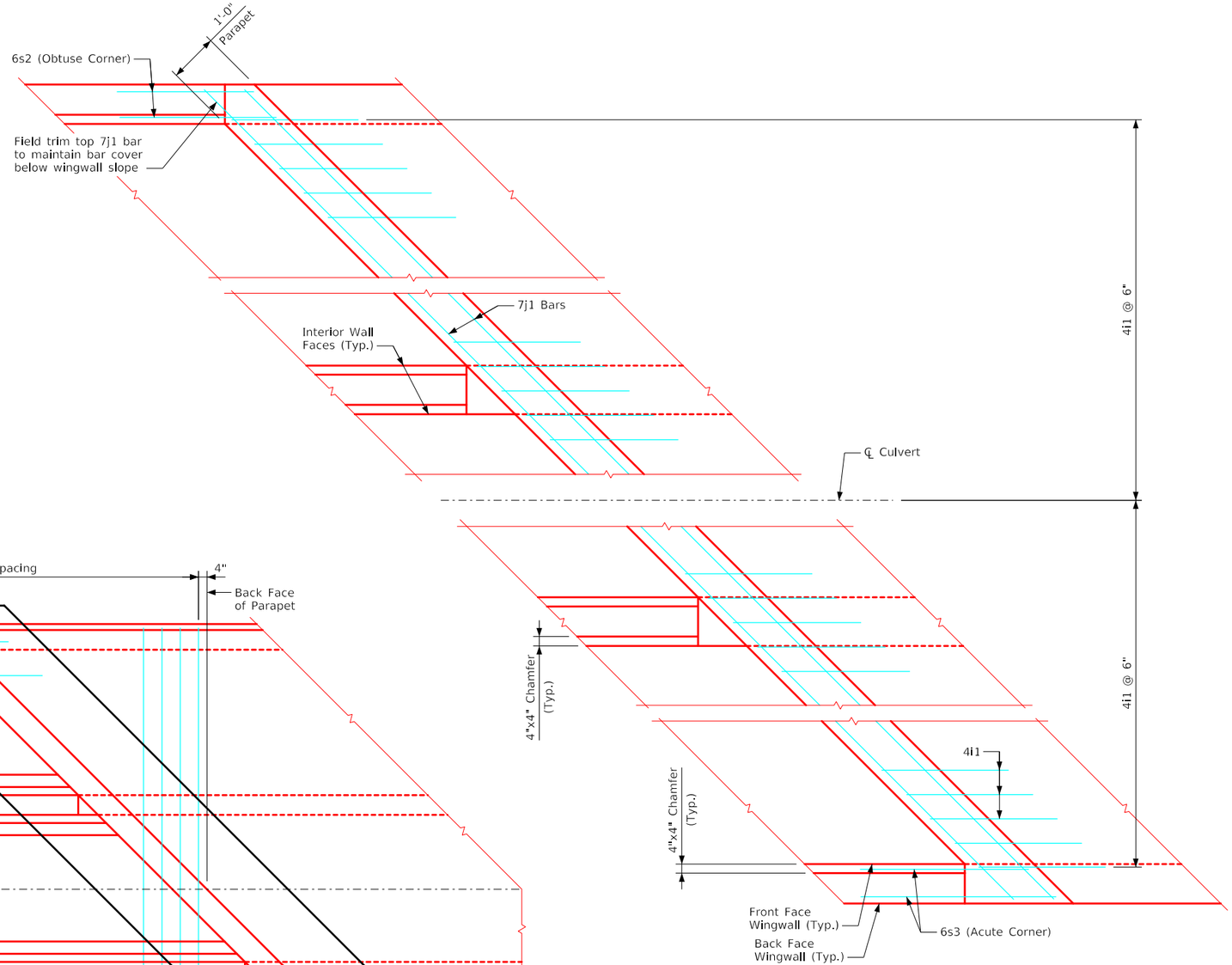
Notes:

1. Bar spacings and positions shown are similar for all sizes of headwalls in this standard.
2. For headwall dimensions and bar spacing see Sheet TRPWH 45-1-20.
3. Top transverse apron bars are referenced approximately 4" from the back of the parapet for all headwalls.



Plan View - Top Apron Reinforcing

(Wall Reinforcing not shown for clarity)



Detail A

(Showing parapet bars only)

LATEST REVISION DATE

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IOWA DOT

Standard Design - Triple Reinforced Concrete Box Culverts

Parallel Wing Headwalls

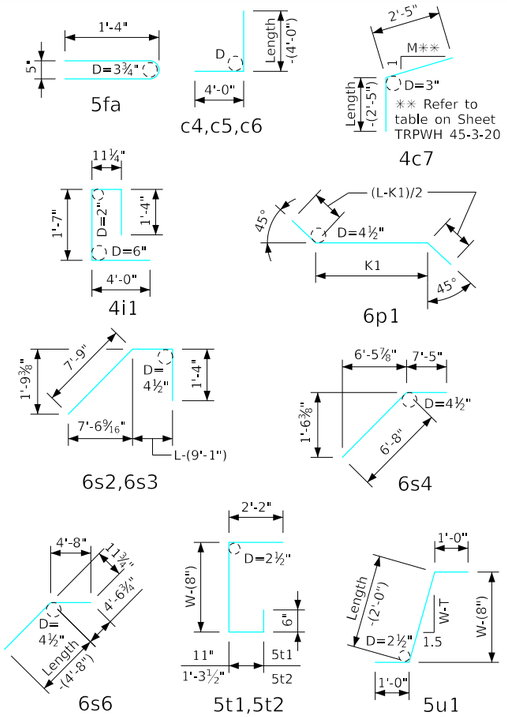
July, 2020

Parapet Reinforcing & Top Apron Reinforcing 45° Skew

TRPWH 45-5-20

ENGLISHLRFDSIGNEDTRIPLECULVERTS.DGN - TRPWH 45-5-20 - THIS SHEET ISSUED 07-2020.

Bent Bar Details



Note: All dimensions are out to out
D = pin diameter
See table below for pin diameter "D" of c bars

c Bar Pin Diameter	
Bar Size	D
5	3¾"
6	4½"

Bill of Reinforcing for One Headwall 45° Skew Span x Culvert Height

Location	Shape	12' x 12'				12' x 11'				12' x 10'				12' x 9'				12' x 8'				12' x 7'			
		Bar	No.	Length	Wt.	Bar	No.	Length	Wt.	Bar	No.	Length	Wt.	Bar	No.	Length	Wt.	Bar	No.	Length	Wt.	Bar	No.	Length	Wt.
Fence Anchor (Galv.)		5fa	2	2'-10	6	5fa	2	2'-10	6	5fa	2	2'-10	6	5fa	2	2'-10	6	5fa	2	2'-10	6	5fa	2	2'-10	6
Wingwall, F.F.H.		5b1	2	56'-2	122	5b1	2	51'-11	113	5b1	2	47'-8	104	5b1	2	43'-5	96	5b1	2	39'-2	82	5b1	2	34'-11	73
Wingwall, F.F.H.		5b2	22 Var.	2 Each 11'-9 to 54'-2	776	5b2	20 Var.	2 Each 11'-9 to 49'-11	658	5b2	18 Var.	2 Each 11'-9 to 45'-9	550	5b2	16 Var.	2 Each 11'-9 to 41'-6	449	5b2	14 Var.	2 Each 11'-9 to 37'-3	358	5b2	12 Var.	2 Each 11'-9 to 33'-0	280
Wingwall, B.F.H.		4b3	2	56'-9	79	4b3	2	52'-6	73	4b3	2	48'-1	67	4b3	2	43'-10	62	4b3	2	39'-7	53	4b3	2	35'-3	47
Wingwall, B.F.H.		4b4	20 Var.	2 Each 16'-7 to 54'-9	489	4b4	18 Var.	2 Each 16'-7 to 50'-6	413	4b4	16 Var.	2 Each 16'-5 to 46'-1	340	4b4	14 Var.	2 Each 16'-5 to 41'-10	276	4b4	12 Var.	2 Each 16'-5 to 37'-7	216	4b4	10 Var.	2 Each 16'-4 to 33'-3	166
Interior Wall, Both F.H.		5b5	42 Var.	2 Each 8'-9 to 55'-5	1441	5b5	38 Var.	2 Each 8'-9 to 51'-2	1213	5b5	34 Var.	2 Each 8'-8 to 46'-11	1001	5b5	30 Var.	2 Each 8'-9 to 42'-8	815	5b5	26 Var.	2 Each 8'-10 to 38'-5	641	5b5	22 Var.	2 Each 8'-10 to 34'-2	493
Wingwall, F.F.V.		5c1	104 Var.	2 Each 2'-8 to 14'-8	940	5c1	96 Var.	2 Each 2'-8 to 13'-9	822	4c1	88 Var.	2 Each 2'-8 to 12'-9	453	4c1	80 Var.	2 Each 2'-8 to 11'-10	387	4c1	94 Var.	2 Each 2'-8 to 10'-9	421	4c1	82 Var.	2 Each 2'-8 to 9'-9	340
Wingwall, F.F.V.		5c2	50 Var.	2 Each 9'-1 to 14'-9	621	5c2	42 Var.	2 Each 9'-1 to 13'-10	502	4c2	32 Var.	2 Each 9'-1 to 12'-8	232	4c2	24 Var.	2 Each 9'-1 to 11'-9	167	c2	--	--	--	c2	--	--	--
Wingwall, F.F.V. (O)		5c3	2	15'-1	31	5c3	2	14'-1	29	4c3	2	13'-1	17	4c3	2	12'-1	16	4c3	2	11'-1	15	4c3	2	10'-1	13
Wingwall, F.F.V. (A)		5c3	3	15'-1	47	5c3	3	14'-1	44	4c3	3	13'-1	26	4c3	3	12'-1	24	4c3	3	11'-1	22	4c3	3	10'-1	20
Wingwall, B.F.V.		6c4	104 Var.	2 Each 6'-10 to 18'-10	2005	5c4	96 Var.	2 Each 6'-10 to 17'-11	1239	5c4	88 Var.	2 Each 6'-10 to 16'-11	1090	5c4	80 Var.	2 Each 6'-10 to 16'-0	953	5c4	70 Var.	2 Each 6'-10 to 14'-10	791	5c4	62 Var.	2 Each 6'-10 to 13'-11	671
Wingwall, B.F.V. (O)		6c5	1	19'-1	29	5c5	1	18'-1	19	5c5	1	17'-1	18	5c5	1	16'-1	17	5c5	1	15'-1	16	5c5	1	14'-1	15
Wingwall, B.F.V. (A)		6c5	4	19'-1	115	5c5	4	18'-1	75	5c5	4	17'-1	71	5c5	4	16'-1	67	5c5	4	15'-1	63	5c5	4	14'-1	59
Wingwall, B.F.V.		6c6	68	9'-0	919	6c6	60	9'-0	811	6c6	50	9'-0	676	6c6	42	9'-0	568	5c6	34	9'-0	319	5c6	26	9'-0	244
Interior Wall, Both F.V		4c7	4	3'-10	10	4c7	4	3'-10	10	4c7	4	3'-10	10	4c7	4	3'-10	10	4c7	4	3'-10	10	4c7	4	3'-10	10
Interior Wall, Both F.V		4c8	202 Var.	2 Each 1'-6 to 12'-3	928	4c8	186 Var.	2 Each 1'-6 to 11'-3	792	4c8	170 Var.	2 Each 1'-6 to 10'-4	672	4c8	152 Var.	2 Each 1'-6 to 9'-3	546	4c8	136 Var.	2 Each 1'-6 to 8'-4	447	4c8	118 Var.	2 Each 1'-6 to 7'-3	345
Interior Wall, Both F.V		4c9	4	12'-7	34	4c9	4	11'-7	31	4c9	4	10'-7	28	4c9	4	9'-7	26	4c9	4	8'-7	23	4c9	4	7'-7	20
Apron, Longit., Bott.		4d1	39	55'-11	1520	4d1	39	51'-8	1409	4d1	39	47'-6	1300	4d1	39	43'-3	1190	4d1	39	39'-0	1016	4d1	39	34'-9	905
Apron, Longit., Top		6f1	39	55'-11	3417	6f1	39	51'-8	3168	6f1	39	47'-6	2924	6f1	39	43'-3	2675	6f1	39	39'-0	2285	6f1	39	34'-9	2036
Parapet, Vertical		4i1	77	7'-10	403	4i1	77	7'-10	403	4i1	75	7'-10	392	4i1	75	7'-10	392	4i1	75	7'-10	392	4i1	75	7'-10	392
Parapet, Horiz.		7j1	4	56'-1	478	7j1	4	56'-1	478	7j1	4	55'-1	470	7j1	4	55'-1	470	7j1	4	55'-1	470	7j1	4	54'-8	467
Apron, Trans., Top		6m1	69	40'-2	4413	6m1	60	40'-2	3838	6m1	52	39'-6	3085	5m1	44	39'-6	1813	5m1	35	39'-6	1442	5m1	27	39'-2	1103
Apron, Trans., Top		6m2	74 Var.	2'-3 to 38'-9	2279	6m2	74 Var.	2'-6 to 39'-0	2306	6m2	73 Var.	2'-5 to 38'-5	2239	5m2	73 Var.	2'-2 to 38'-2	1535	5m2	73 Var.	2'-5 to 38'-5	1555	5m2	73 Var.	2'-0 to 38'-0	1523
Apron, Trans., Bott.		6m3	73	52'-11	6067	5m3	67	52'-1	3809	6m3	31	51'-11	2530	6m3	28	51'-11	2285	6m3	25	51'-11	2040	5m3	22	50'-8	1218
Curtain, Horiz.		6p1	6	55'-10	525	6p1	6	55'-10	525	6p1	6	55'-1	518	6p1	6	55'-1	518	6p1	6	55'-1	518	6p1	5	54'-8	429
Wing Slope, Both F.		6s1	4	48'-4	305	6s1	4	43'-11	278	6s1	4	39'-7	238	6s1	4	35'-3	212	6s1	4	30'-10	185	6s1	4	26'-6	159
Wing Slope, Both F. (O)		6s2	2	9'-5	28	6s2	2	9'-5	28	6s2	2	9'-7	29	6s2	2	9'-7	29	6s2	2	9'-7	29	6s2	2	9'-8	29
Wing Slope, Both F. (A)		6s3	2	10'-5	31	6s3	2	10'-5	31	6s3	2	10'-5	31	6s3	2	10'-5	31	6s3	2	10'-5	31	6s3	2	10'-5	31
Wing Slope, F.F.		6s4	2	14'-1	42	6s4	2	14'-1	42	6s4	2	14'-1	42	6s4	2	14'-1	42	6s4	2	14'-1	42	6s4	2	14'-1	42
Wing Slope, F.F.		6s5	2	45'-10	145	6s5	2	41'-6	132	6s5	2	37'-2	112	6s5	2	32'-9	98	6s5	2	28'-5	85	6s5	2	24'-1	72
Interior Wall, Both F.		6s6	4	56'-11	356	6s6	4	52'-7	330	6s6	4	48'-5	305	6s6	4	44'-0	279	6s6	4	39'-8	238	6s6	4	35'-5	213
Curtain, Vert.		5t1	54	7'-11	446	5t1	54	7'-8	432	5t1	54	7'-5	418	5t1	54	7'-2	404	5t1	54	6'-11	390	5t1	54	6'-8	375
Curtain, Vert. Ends		5t2	4	8'-4	35	5t2	4	8'-1	34	5t2	4	7'-10	33	5t2	4	7'-7	32	5t2	4	7'-4	31	5t2	4	7'-1	30
Bracket, Vert.		5u1	4	6'-7	27	5u1	4	6'-5	27	5u1	4	6'-2	26	5u1	4	5'-11	25	5u1	4	5'-9	24	5u1	4	5'-6	23
Estimated Quantities One Headwall	Reinf. Steel			29,109 LB				24,120 LB				20,053 LB				16,515 LB				14,256 LB				11,849 LB	
	Concrete	Parapet Δ	5.3	169.5 CY		5.3		153.0 CY		5.0		128.3 CY		5.0		114.2 CY		5.0		100.7 CY		4.9		85.3 CY	
		Wingwalls	54.4			46.4				32.4				26.7				21.5				15.2			
		Apron ✳	109.8			101.3				90.9				82.5				74.2				65.2			

Note: Weight of bars over 40'-0" long include an allowance of 2'-5" for lap.

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.

(A) - Indicates bar located at acute corner.
(O) - Indicates bar located at obtuse corner.
Refer to Sheet TRPWH 45-1-20 for acute and obtuse corner locations.

Headwall Notes:

1. This headwall is based on a 3:1 slope normal to centerline of roadway.
2. The sides of the apron are to be formed to ensure correct line and grade.
3. All apron 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.
4. 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.
5. Concrete quantities are estimated from back of parapet.
6. Horizontal tails of bars "b" & "s" estimated to extend 2'-5" beyond back of parapet (into end of barrel). Longitudinal bars "4d1" and "6f1" estimated to project into end section of barrel a minimum of 2'-5" beyond back of parapet. The "length" column reflects total number of feet necessary to meet these requirements.
7. Dimensions are in feet and inches unless otherwise noted.

LATEST REVISION DATE

APPROVED BY BRIDGE ENGINEER

IOWADOT

Standard Design - Triple Reinforced Concrete Box Culverts

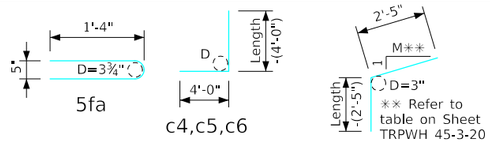
Parallel Wing Headwalls

July, 2020

Quantity Tabulation
12'-0" Span
45° Skew

TRPWH
45-6-20
Sheet 1 of 2

Bent Bar Details



Note: All dimensions are out to out
D = pin diameter
See table below for pin diameter "D" of c bars

c Bar Pin Diameter	
Bar Size	D
5	3¾"
6	4½"

Note: Weight of bars over 40'-0" long include an allowance of 2'-5" for lap.

Bill of Reinforcing for One Headwall 45° Skew Span x Culvert Height

Location	Shape	12' x 6' Bar	12' x 6' No.	12' x 6' Length	12' x 6' Wt.	12' x 5' Bar	12' x 5' No.	12' x 5' Length	12' x 5' Wt.	12' x 4' Bar	12' x 4' No.	12' x 4' Length	12' x 4' Wt.
Fence Anchor (Galv.)		5fa	2	2'-10	6	5fa	2	2'-10	6	5fa	2	2'-10	6
Wingwall, F.F.H.		5b1	2	30'-9	64	5b1	2	26'-6	55	5b1	2	22'-3	46
Wingwall, F.F.H.		5b2	10 Var.	2 Each 11'-9 to 28'-9	211	5b2	8 Var.	2 Each 11'-9 to 24'-6	151	5b2	6 Var.	2 Each 11'-9 to 20'-3	100
Wingwall, B.F.H.		4b3	2	31'-0	41	4b3	2	26'-9	36	4b3	2	22'-6	30
Wingwall, B.F.H.		4b4	8 Var.	2 Each 16'-4 to 29'-1	121	4b4	6 Var.	2 Each 16'-4 to 24'-10	82	4b4	4 Var.	2 Each 16'-4 to 20'-7	49
Interior Wall, Both F.H.		5b5	18 Var.	2 Each 9'-0 to 29'-10	365	5b5	14 Var.	2 Each 9'-2 to 25'-7	254	5b5	10 Var.	2 Each 9'-6 to 21'-3	160
Wingwall, F.F.V.		4c1	72 Var.	2 Each 2'-8 to 8'-10	277	4c1	46 Var.	2 Each 2'-8 to 7'-10	161	4c1	36 Var.	2 Each 2'-8 to 6'-8	112
Wingwall, F.F.V.		c2	--	--	--	c2	--	--	--	c2	--	--	--
Wingwall, F.F.V. (O)		4c3	2	9'-1	12	4c3	2	8'-1	11	4c3	2	7'-1	9
Wingwall, F.F.V. (A)		4c3	3	9'-1	18	4c3	3	8'-1	16	4c3	3	7'-1	14
Wingwall, B.F.V.		5c4	54 Var.	2 Each 6'-10 to 12'-11	556	6c4	60 Var.	2 Each 6'-10 to 11'-11	845	6c4	48 Var.	2 Each 6'-10 to 10'-11	640
Wingwall, B.F.V. (O)		5c5	1	13'-1	14	6c5	1	12'-1	18	6c5	1	11'-1	17
Wingwall, B.F.V. (A)		5c5	4	13'-1	55	6c5	4	12'-1	73	6c5	4	11'-1	67
Wingwall, B.F.V.		5c6	16	9'-0	150	c6	--	--	--	c6	--	--	--
Interior Wall, Both F.V		4c7	4	3'-10	10	4c7	4	3'-10	10	4c7	4	3'-10	10
Interior Wall, Both F.V		4c8	102 Var.	2 Each 1'-6 to 6'-3	264	4c8	84 Var.	2 Each 1'-6 to 5'-3	189	4c8	68 Var.	2 Each 1'-6 to 4'-3	131
Interior Wall, Both F.V		4c9	4	6'-7	18	4c9	4	5'-7	15	4c9	4	4'-7	12
Apron, Longit., Bott.		4d1	39	30'-6	795	4d1	39	26'-3	684	4d1	39	22'-0	573
Apron, Longit., Top		6f1	39	30'-6	1787	6f1	39	26'-3	1538	6f1	39	22'-0	1289
Parapet, Vertical		4i1	75	7'-10	392	4i1	75	7'-10	392	4i1	75	7'-10	392
Parapet, Horiz.		7j1	4	54'-8	467	7j1	4	54'-8	467	7j1	4	54'-8	467
Apron, Trans., Top		5m1	18	39'-2	735	5m1	10	39'-2	409	5m1	1	39'-2	41
Apron, Trans., Top		5m2	73 Var.	2'-3 to 38'-3	1542	5m2	73 Var.	2'-0 to 38'-0	1523	5m2	73 Var.	2'-3 to 38'-3	1542
Apron, Trans., Bott.		5m3	19	50'-8	1052	5m3	16	50'-8	886	5m3	13	50'-8	720
Curtain, Horiz.		6p1	5	54'-8	429	6p1	5	54'-8	429	6p1	5	54'-8	429
Wing Slope, Both F.		6s1	4	22'-2	133	6s1	4	17'-9	107	6s1	4	13'-5	81
Wing Slope, Both F. (O)		6s2	2	9'-8	29	6s2	2	9'-8	29	6s2	2	9'-8	29
Wing Slope, Both F. (A)		6s3	2	10'-5	31	6s3	2	10'-5	31	6s3	2	10'-5	31
Wing Slope, F.F.		6s4	2	14'-1	42	6s4	2	14'-1	42	6s4	2	14'-1	42
Wing Slope, F.F.		6s5	2	19'-8	59	6s5	2	15'-4	46	6s5	2	11'-0	33
Interior Wall, Both F.		6s6	4	31'-1	187	6s6	4	26'-8	160	6s6	4	22'-4	134
Curtain, Vert.		5t1	54	6'-5	361	5t1	54	6'-5	361	5t1	54	6'-5	361
Curtain, Vert. Ends		5t2	4	6'-10	29	5t2	4	6'-10	29	5t2	4	6'-10	29
Bracket, Vert.		5u1	4	5'-4	22	5u1	4	5'-4	22	5u1	4	5'-4	22
Estimated Quantities One Headwall	Reinf. Steel		10,274 LB				9077 LB				7618 LB		
	Concrete	Parapet Δ	4.9	73.3 CY		4.9		62.5 CY		4.9		52.2 CY	
		Wingwalls	11.5			8.3				5.6			
		Apron ✳	56.9			49.3				41.7			

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.

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7. Dimensions are in feet and inches unless otherwise noted.

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APPROVED BY BRIDGE ENGINEER

IOWADOT

Standard Design - Triple Reinforced Concrete Box Culverts

Parallel Wing Headwalls

July, 2020

Quantity Tabulation
12'-0" Span
45° Skew

TRPWH
45-6-20
Sheet 2 of 2

ENGLISHLRFDSIGNEDTRIPLECULVERTS.DGN - TRPWH 45-6-20 S2 - THIS SHEET ISSUED 07-2020.

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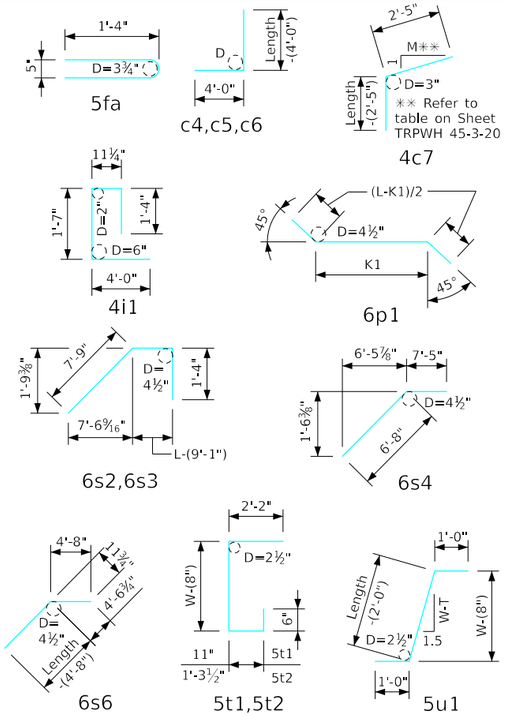
Bent Bar Details



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Bill of Reinforcing for One Headwall 45° Skew Span x Culvert Height

Location	Shape	10' x 12'				10' x 11'				10' x 10'				10' x 9'				10' x 8'				10' x 7'			
		Bar	No.	Length	Wt.	Bar	No.	Length	Wt.	Bar	No.	Length	Wt.	Bar	No.	Length	Wt.	Bar	No.	Length	Wt.	Bar	No.	Length	Wt.
Fence Anchor (Galv.)		5fa	2	2'-10	6	5fa	2	2'-10	6	5fa	2	2'-10	6	5fa	2	2'-10	6	5fa	2	2'-10	6	5fa	2	2'-10	6
Wingwall, F.F.H.		5b1	2	56'-2	122	5b1	2	51'-11	113	5b1	2	47'-8	104	5b1	2	43'-5	96	5b1	2	39'-2	82	5b1	2	34'-11	73
Wingwall, F.F.H.		5b2	22 Var.	2 Each 11'-9 to 54'-2	776	5b2	20 Var.	2 Each 11'-9 to 49'-11	658	5b2	18 Var.	2 Each 11'-9 to 45'-9	550	5b2	16 Var.	2 Each 11'-9 to 41'-6	449	5b2	14 Var.	2 Each 11'-9 to 37'-3	358	5b2	12 Var.	2 Each 11'-9 to 33'-0	280
Wingwall, B.F.H.		4b3	2	56'-9	79	4b3	2	52'-6	73	4b3	2	48'-1	67	4b3	2	43'-10	62	4b3	2	39'-7	53	4b3	2	35'-3	47
Wingwall, B.F.H.		4b4	20 Var.	2 Each 16'-7 to 54'-9	489	4b4	18 Var.	2 Each 16'-7 to 50'-6	413	4b4	16 Var.	2 Each 16'-5 to 46'-1	340	4b4	14 Var.	2 Each 16'-5 to 41'-10	276	4b4	12 Var.	2 Each 16'-5 to 37'-7	216	4b4	10 Var.	2 Each 16'-4 to 33'-3	166
Interior Wall, Both F.H.		5b5	42 Var.	2 Each 8'-9 to 55'-5	1441	5b5	38 Var.	2 Each 8'-9 to 51'-2	1213	5b5	34 Var.	2 Each 8'-8 to 46'-11	1001	5b5	30 Var.	2 Each 8'-9 to 42'-8	815	5b5	26 Var.	2 Each 8'-10 to 38'-5	641	5b5	22 Var.	2 Each 8'-10 to 34'-2	493
Wingwall, F.F.V.		5c1	104 Var.	2 Each 2'-7 to 14'-7	931	5c1	96 Var.	2 Each 2'-7 to 13'-8	814	4c1	88 Var.	2 Each 2'-7 to 12'-8	448	4c1	80 Var.	2 Each 2'-7 to 11'-9	383	4c1	94 Var.	2 Each 2'-7 to 10'-8	416	4c1	82 Var.	2 Each 2'-7 to 9'-8	336
Wingwall, F.F.V.		5c2	50 Var.	2 Each 9'-0 to 14'-8	617	5c2	42 Var.	2 Each 9'-0 to 13'-9	498	4c2	32 Var.	2 Each 9'-0 to 12'-7	231	4c2	24 Var.	2 Each 9'-0 to 11'-8	166	c2	--	--	--	c2	--	--	--
Wingwall, F.F.V. (O)		5c3	2	15'-0	31	5c3	2	14'-0	29	4c3	2	13'-0	17	4c3	2	12'-0	16	4c3	2	11'-0	15	4c3	2	10'-0	13
Wingwall, F.F.V. (A)		5c3	3	15'-0	47	5c3	3	14'-0	44	4c3	3	13'-0	26	4c3	3	12'-0	24	4c3	3	11'-0	22	4c3	3	10'-0	20
Wingwall, B.F.V.		6c4	104 Var.	2 Each 6'-9 to 18'-9	1992	5c4	96 Var.	2 Each 6'-9 to 17'-10	1231	5c4	88 Var.	2 Each 6'-9 to 16'-10	1082	5c4	80 Var.	2 Each 6'-9 to 15'-11	946	5c4	70 Var.	2 Each 6'-9 to 14'-9	785	5c4	62 Var.	2 Each 6'-9 to 13'-10	666
Wingwall, B.F.V. (O)		6c5	1	19'-0	29	5c5	1	18'-0	19	5c5	1	17'-0	18	5c5	1	16'-0	17	5c5	1	15'-0	16	5c5	1	14'-0	15
Wingwall, B.F.V. (A)		6c5	4	19'-0	114	5c5	4	18'-0	75	5c5	4	17'-0	71	5c5	4	16'-0	67	5c5	4	15'-0	63	5c5	4	14'-0	58
Wingwall, B.F.V.		6c6	68	9'-0	919	6c6	60	9'-0	811	6c6	50	9'-0	676	6c6	42	9'-0	568	5c6	34	9'-0	319	5c6	26	9'-0	244
Interior Wall, Both F.V		4c7	4	3'-9	10	4c7	4	3'-9	10	4c7	4	3'-9	10	4c7	4	3'-9	10	4c7	4	3'-9	10	4c7	4	3'-9	10
Interior Wall, Both F.V		4c8	202 Var.	2 Each 1'-5 to 12'-2	916	4c8	186 Var.	2 Each 1'-5 to 11'-2	782	4c8	170 Var.	2 Each 1'-5 to 10'-3	662	4c8	152 Var.	2 Each 1'-5 to 9'-2	537	4c8	136 Var.	2 Each 1'-5 to 8'-3	439	4c8	118 Var.	2 Each 1'-5 to 7'-2	338
Interior Wall, Both F.V		4c9	4	12'-6	33	4c9	4	11'-6	31	4c9	4	10'-6	28	4c9	4	9'-6	25	4c9	4	8'-6	23	4c9	4	7'-6	20
Apron, Longit., Bott.		4d1	33	55'-11	1286	4d1	33	51'-8	1192	4d1	33	47'-6	1100	4d1	33	43'-3	1007	4d1	33	39'-0	860	4d1	33	34'-9	766
Apron, Longit., Top		6f1	33	55'-11	2891	6f1	33	51'-8	2681	6f1	33	47'-6	2474	6f1	33	43'-3	2264	6f1	33	39'-0	1933	6f1	33	34'-9	1722
Parapet, Vertical		4i1	65	7'-10	340	4i1	65	7'-10	340	4i1	63	7'-10	330	4i1	63	7'-10	330	4i1	63	7'-10	330	4i1	63	7'-10	330
Parapet, Horiz.		7j1	4	47'-7	409	7j1	4	47'-7	409	7j1	4	46'-8	401	7j1	4	46'-8	401	7j1	4	46'-8	401	7j1	4	46'-2	397
Apron, Trans., Top		6m1	75	34'-2	3849	6m1	66	34'-2	3387	6m1	58	33'-6	2918	5m1	50	33'-6	1747	5m1	41	33'-6	1433	5m1	33	33'-2	1142
Apron, Trans., Top		6m2	62 Var.	2'-3 to 32'-9	1630	6m2	62 Var.	2'-6 to 33'-0	1653	6m2	61 Var.	2'-5 to 32'-5	1596	5m2	61 Var.	2'-2 to 32'-2	1092	5m2	61 Var.	2'-5 to 32'-5	1108	5m2	61 Var.	2'-0 to 32'-0	1082
Apron, Trans., Bott.		6m3	73	44'-5	5135	5m3	67	43'-7	3215	5m3	61	42'-8	2868	6m3	28	43'-5	1928	6m3	25	43'-5	1721	5m3	22	42'-2	1023
Curtain, Horiz.		6p1	6	47'-5	449	6p1	6	47'-5	449	6p1	6	46'-7	442	6p1	6	46'-7	442	6p1	6	46'-7	442	6p1	5	46'-2	365
Wing Slope, Both F.		6s1	4	48'-4	305	6s1	4	43'-11	278	6s1	4	39'-7	238	6s1	4	35'-3	212	6s1	4	30'-10	185	6s1	4	26'-6	159
Wing Slope, Both F. (O)		6s2	2	9'-5	28	6s2	2	9'-5	28	6s2	2	9'-7	29	6s2	2	9'-7	29	6s2	2	9'-7	29	6s2	2	9'-8	29
Wing Slope, Both F. (A)		6s3	2	10'-5	31	6s3	2	10'-5	31	6s3	2	10'-5	31	6s3	2	10'-5	31	6s3	2	10'-5	31	6s3	2	10'-5	31
Wing Slope, F.F.		6s4	2	14'-1	42	6s4	2	14'-1	42	6s4	2	14'-1	42	6s4	2	14'-1	42	6s4	2	14'-1	42	6s4	2	14'-1	42
Wing Slope, F.F.		6s5	2	45'-10	145	6s5	2	41'-6	132	6s5	2	37'-2	112	6s5	2	32'-9	98	6s5	2	28'-5	85	6s5	2	24'-1	72
Interior Wall, Both F.		6s6	4	56'-11	356	6s6	4	52'-7	330	6s6	4	48'-5	305	6s6	4	44'-0	279	6s6	4	39'-8	238	6s6	4	35'-5	213
Curtain, Vert.		5t1	46	7'-11	380	5t1	46	7'-8	368	5t1	45	7'-5	348	5t1	45	7'-2	336	5t1	45	6'-11	325	5t1	45	6'-8	313
Curtain, Vert. Ends		5t2	4	8'-4	35	5t2	4	8'-1	34	5t2	4	7'-10	33	5t2	4	7'-7	32	5t2	4	7'-4	31	5t2	4	7'-1	30
Bracket, Vert.		5u1	4	6'-7	27	5u1	4	6'-4	26	5u1	4	6'-2	26	5u1	4	5'-11	25	5u1	4	5'-8	24	5u1	4	5'-6	23
Estimated Quantities One Headwall	Reinf. Steel			25,890 LB				21,415 LB				18,630 LB				14,758 LB				12,682 LB				10,524 LB	
	Concrete Parapet Δ		4.7	147.9 CY			4.7	133.0 CY			4.4	110.1 CY			4.4	97.7 CY			4.4	85.8 CY			4.3	72.0 CY	
	Concrete Wingwalls		54.4				46.4				32.4				26.7				21.5				15.2		
	Concrete Apron ✳		88.8				81.9				73.3				66.6				59.9				52.5		

Note: Weight of bars over 40'-0" long include an allowance of 2'-5" for lap.

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.

(A) - Indicates bar located at acute corner.
(O) - Indicates bar located at obtuse corner.
Refer to Sheet TRPWH 45-1-20 for acute and obtuse corner locations.

Headwall Notes:

1. This headwall is based on a 3:1 slope normal to centerline of roadway.
2. The sides of the apron are to be formed to ensure correct line and grade.
3. All apron 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.
4. 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.
5. Concrete quantities are estimated from back of parapet.
6. Horizontal tails of bars "b" & "s" estimated to extend 2'-5" beyond back of parapet (into end of barrel). Longitudinal bars "4d1" and "6f1" estimated to project into end section of barrel a minimum of 2'-5" beyond back of parapet. The "length" column reflects total number of feet necessary to meet these requirements.
7. Dimensions are in feet and inches unless otherwise noted.

LATEST REVISION DATE

APPROVED BY BRIDGE ENGINEER

IOWADOT

Standard Design - Triple Reinforced Concrete Box Culverts

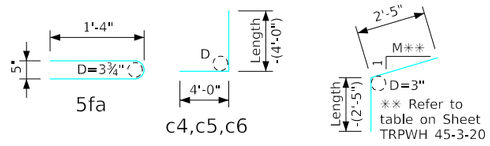
Parallel Wing Headwalls

July, 2020

Quantity Tabulation
10'-0" Span
45° Skew

TRPWH
45-7-20
Sheet 1 of 2

Bent Bar Details



Note: All dimensions are out to out
D = pin diameter
See table below for pin diameter "D" of c bars

c Bar Pin Diameter	
Bar Size	D
5	3¾"
6	4½"

Note: Weight of bars over 40'-0" long include an allowance of 2'-5" for lap.

Bill of Reinforcing for One Headwall 45° Skew Span x Culvert Height

Location	Shape	10' x 6' Bar	10' x 6' No.	10' x 6' Length	10' x 6' Wt.	10' x 5' Bar	10' x 5' No.	10' x 5' Length	10' x 5' Wt.	10' x 4' Bar	10' x 4' No.	10' x 4' Length	10' x 4' Wt.
Fence Anchor (Galv.)		5fa	2	2'-10	6	5fa	2	2'-10	6	5fa	2	2'-10	6
Wingwall, F.F.H.		5b1	2	30'-9	64	5b1	2	26'-6	55	5b1	2	22'-3	46
Wingwall, F.F.H.		5b2	10 Var.	2 Each 11'-9 to 28'-9	211	5b2	8 Var.	2 Each 11'-9 to 24'-6	151	5b2	6 Var.	2 Each 11'-9 to 20'-3	100
Wingwall, B.F.H.		4b3	2	31'-0	41	4b3	2	26'-9	36	4b3	2	22'-6	30
Wingwall, B.F.H.		4b4	8 Var.	2 Each 16'-4 to 29'-1	121	4b4	6 Var.	2 Each 16'-4 to 24'-10	82	4b4	4 Var.	2 Each 16'-4 to 20'-7	49
Interior Wall, Both F.H.		5b5	18 Var.	2 Each 9'-0 to 29'-10	365	5b5	14 Var.	2 Each 9'-2 to 25'-7	254	5b5	10 Var.	2 Each 9'-6 to 21'-3	160
Wingwall, F.F.V.		4c1	72 Var.	2 Each 2'-7 to 8'-9	273	4c1	46 Var.	2 Each 2'-7 to 7'-9	159	4c1	36 Var.	2 Each 2'-7 to 6'-7	110
Wingwall, F.F.V.		c2	--	--	--	c2	--	--	--	c2	--	--	--
Wingwall, F.F.V. (O)		4c3	2	9'-0	12	4c3	2	8'-0	11	4c3	2	7'-0	9
Wingwall, F.F.V. (A)		4c3	3	9'-0	18	4c3	3	8'-0	16	4c3	3	7'-0	14
Wingwall, B.F.V.		5c4	54 Var.	2 Each 6'-9 to 12'-10	551	6c4	60 Var.	2 Each 6'-9 to 11'-10	837	6c4	48 Var.	2 Each 6'-9 to 10'-10	634
Wingwall, B.F.V. (O)		5c5	1	13'-0	14	6c5	1	12'-0	18	6c5	1	11'-0	17
Wingwall, B.F.V. (A)		5c5	4	13'-0	54	6c5	4	12'-0	72	6c5	4	11'-0	66
Wingwall, B.F.V.		5c6	16	9'-0	150	c6	--	--	--	c6	--	--	--
Interior Wall, Both F.V		4c7	4	3'-9	10	4c7	4	3'-9	10	4c7	4	3'-9	10
Interior Wall, Both F.V		4c8	102 Var.	2 Each 1'-5 to 6'-2	258	4c8	84 Var.	2 Each 1'-5 to 5'-2	185	4c8	68 Var.	2 Each 1'-5 to 4'-2	127
Interior Wall, Both F.V		4c9	4	6'-6	17	4c9	4	5'-6	15	4c9	4	4'-6	12
Apron, Longit., Bott.		4d1	33	30'-6	672	4d1	33	26'-3	579	4d1	33	22'-0	485
Apron, Longit., Top		6f1	33	30'-6	1512	6f1	33	26'-3	1301	6f1	33	22'-0	1090
Parapet, Vertical		4i1	63	7'-10	330	4i1	63	7'-10	330	4i1	63	7'-10	330
Parapet, Horiz.		7j1	4	46'-2	397	7j1	4	46'-2	397	7j1	4	46'-2	397
Apron, Trans., Top		5m1	24	33'-2	830	5m1	16	33'-2	553	5m1	7	33'-2	242
Apron, Trans., Top		5m2	61 Var.	2'-3 to 32'-3	1097	5m2	61 Var.	2'-0 to 32'-0	1082	5m2	61 Var.	2'-3 to 32'-3	1097
Apron, Trans., Bott.		5m3	19	42'-2	884	5m3	16	42'-2	744	5m3	13	42'-2	605
Curtain, Horiz.		6p1	5	46'-2	365	6p1	5	46'-2	365	6p1	5	46'-2	365
Wing Slope, Both F.		6s1	4	22'-2	133	6s1	4	17'-9	107	6s1	4	13'-5	81
Wing Slope, Both F. (O)		6s2	2	9'-8	29	6s2	2	9'-8	29	6s2	2	9'-8	29
Wing Slope, Both F. (A)		6s3	2	10'-5	31	6s3	2	10'-5	31	6s3	2	10'-5	31
Wing Slope, F.F.		6s4	2	14'-1	42	6s4	2	14'-1	42	6s4	2	14'-1	42
Wing Slope, F.F.		6s5	2	19'-8	59	6s5	2	15'-4	46	6s5	2	11'-0	33
Interior Wall, Both F.		6s6	4	31'-1	187	6s6	4	26'-8	160	6s6	4	22'-4	134
Curtain, Vert.		5t1	45	6'-5	301	5t1	45	6'-5	301	5t1	45	6'-5	301
Curtain, Vert. Ends		5t2	4	6'-10	29	5t2	4	6'-10	29	5t2	4	6'-10	29
Bracket, Vert.		5u1	4	5'-4	22	5u1	4	5'-4	22	5u1	4	5'-4	22
Estimated Quantities One Headwall	Reinf. Steel		9085 LB				8025 LB				6703 LB		
	Concrete	Parapet Δ	4.3	61.7 CY		4.3	52.4 CY			4.3	43.7 CY		
		Wingwalls	11.5			8.3				5.6			
		Apron ✳	45.9			39.8				33.8			

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.

(A) - Indicates bar located at acute corner.
(O) - Indicates bar located at obtuse corner.
Refer to Sheet TRPWH 45-1-20 for acute and obtuse corner locations.

Headwall Notes:

1. This headwall is based on a 3:1 slope normal to centerline of roadway.
2. The sides of the apron are to be formed to ensure correct line and grade.
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7. Dimensions are in feet and inches unless otherwise noted.

LATEST REVISION DATE

APPROVED BY BRIDGE ENGINEER

IOWADOT

Standard Design - Triple Reinforced Concrete Box Culverts

Parallel Wing Headwalls

July, 2020

Quantity Tabulation
10'-0" Span
45° Skew

TRPWH
45-7-20
Sheet 2 of 2

ENGLISHLRFDSIGNEDTRIPLECULVERTS.DGN - TRPWH 45-7-20 S2 - THIS SHEET ISSUED 07-2020.

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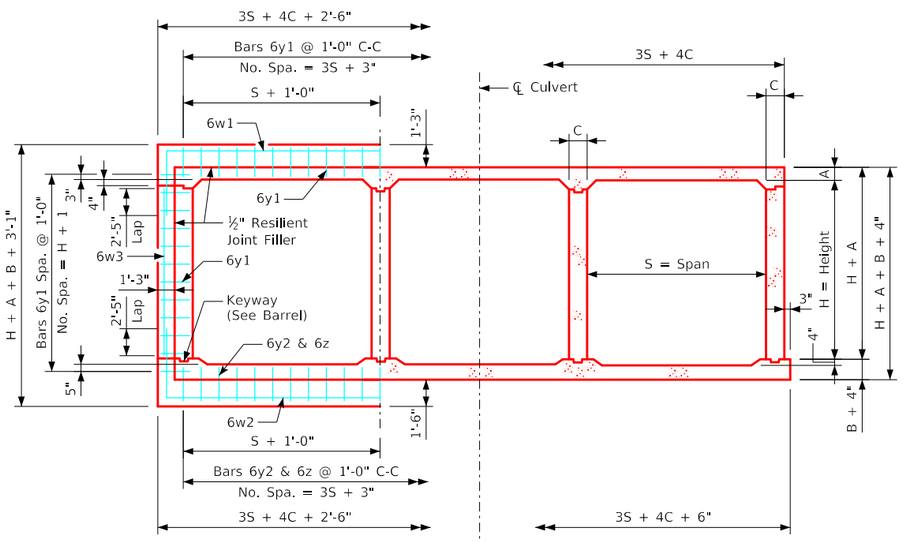
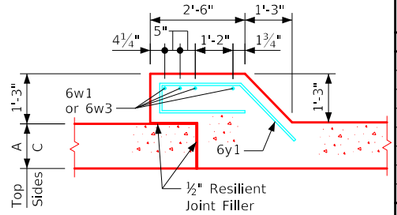
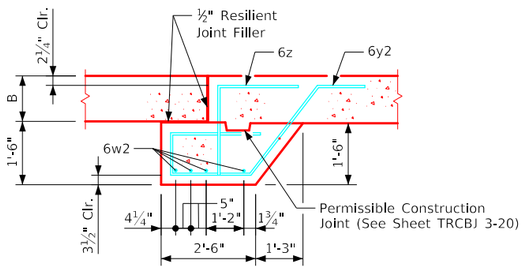


Joint Detail
Section thru Barrel



Top & Sides - Bars 6y1



Bottom - Bars 6y2 & 6z

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'		
Bar	Location	Shape	No.	Length	Weight	No.	Length	Weight	No.	Length	Weight	No.	Length	Weight	No.	Length	Weight
6w1	Slab & Walls		4	45'-0	270	4	45'-0	270	4	45'-0	270	4	45'-0	270	4	45'-0	270
6w2	Floor & Walls		4	47'-6	285	4	49'-6	297	4	45'-4	272	4	45'-4	272	4	45'-4	272
6w3	Walls		--	--	--	--	--	--	8	5'-6	66	8	6'-6	78	8	7'-6	90
6y1	Top & Sides		46	8'-0	553	48	8'-0	577	50	8'-0	601	52	8'-0	625	54	8'-0	649
6y2	Bottom		34	9'-6	485	34	9'-6	485	34	9'-6	485	34	9'-6	485	34	9'-7	489
6z	Bottom & Floor		34	3'-11	200	34	3'-11	200	34	3'-11	200	34	3'-11	200	34	3'-11	200
Total Weight (LB)					1793			1829			1894			1930			1970
Total Concrete (CY)				13.0			13.3			13.6			13.9			14.2	

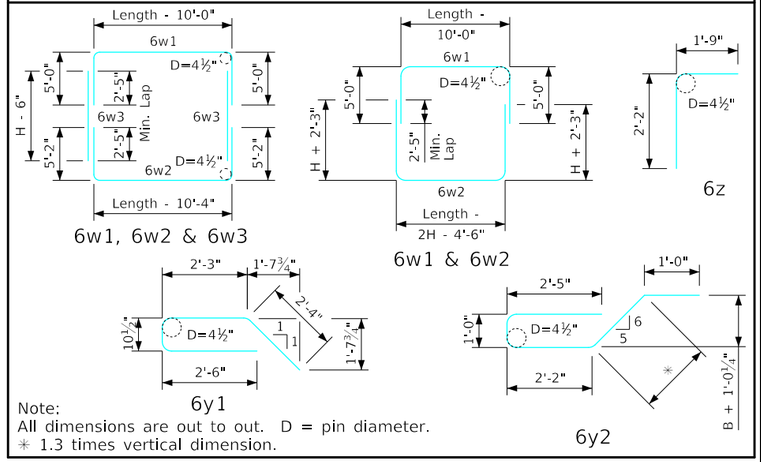
Estimate of Quantities - One Joint - 10' Span

Bill of Reinforcing Steel			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
6w1	Slab & Walls		4	45'-2	271	4	45'-6	273	4	45'-10	275	4	46'-4	278
6w2	Floor & Walls		4	45'-6	273	4	45'-10	275	4	46'-2	277	4	46'-8	280
6w3	Walls		8	8'-6	102	8	9'-6	114	8	10'-6	126	8	11'-6	138
6y1	Top & Sides		56	8'-0	673	58	8'-0	697	60	8'-0	721	62	8'-0	745
6y2	Bottom		34	9'-7	489	34	9'-6	485	34	9'-6	485	34	9'-6	485
6z	Bottom & Floor		34	3'-11	200	34	3'-11	200	34	3'-11	200	34	3'-11	200
Total Weight (LB)					2008			2044			2084			2126
Total Concrete (CY)				14.5			14.9			15.2			15.7	

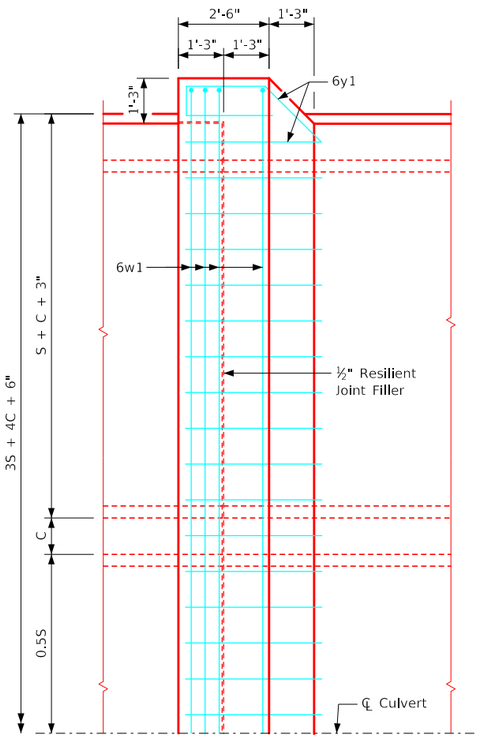
Concrete Placement

Barrel Size	Barrel Dimension			Bell Joint Quantities (CY)		
	A	B	C	Footing	Walls	Slab
10' x 4'	12.5	14.5	9	6.511	1.047	5.441
10' x 5'	12.5	14.5	9	6.511	1.332	5.441
10' x 6'	12.5	14.5	9	6.511	1.618	5.441
10' x 7'	12.5	14.5	9	6.511	1.903	5.441
10' x 8'	12.5	15	9	6.522	2.189	5.441
10' x 9'	12.5	15	9.5	6.551	2.474	5.464
10' x 10'	12.5	14.5	10.5	6.596	2.760	5.512
10' x 11'	12	14.5	11.5	6.654	3.045	5.548
10' x 12'	12	14.5	13	6.739	3.331	5.619

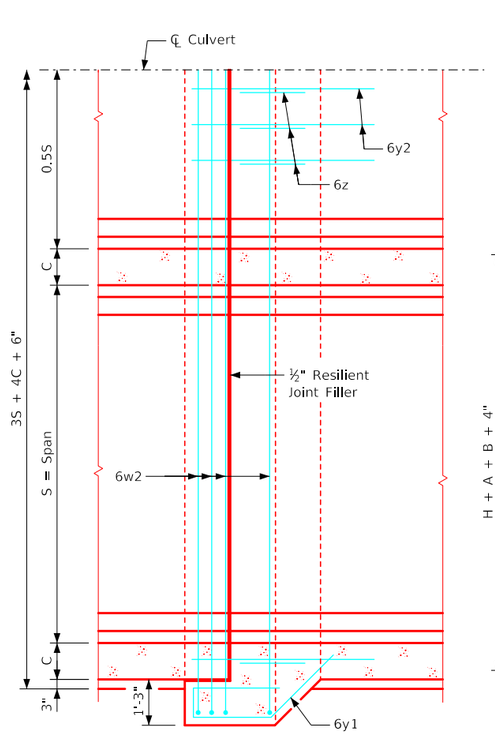
Bent Bar Details



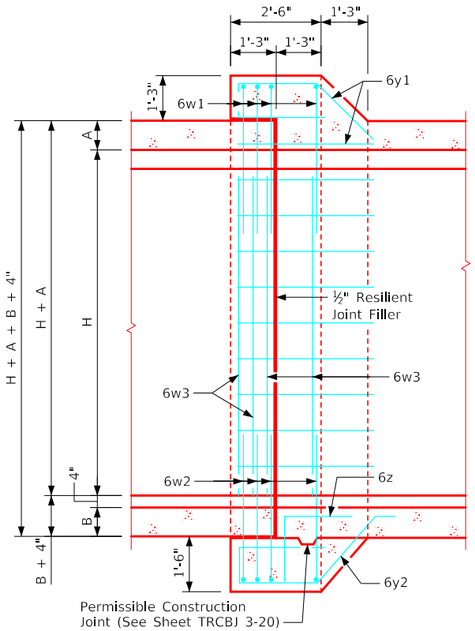
Note:
All dimensions are out to out. D = pin diameter.
✳ 1.3 times vertical dimension.



Plan View - Slab



Plan View - Floor



Longitudinal Section

Notes:

1. 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 TRRCB culvert barrel detail sheets.
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4. Material and construction to be in accordance with the current Standard Specifications of I.D.O.T.
5. See Sheet TRRCB G2-20 for General Notes, Specifications, and Design Stresses.
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7. Barrel floor bars m1 & m9 are to be shortened 6" in length at bell joints.
8. Dimensions "A", "B" and "C" are in inches. "Length" dimensions in bar lists are in feet and inches.

LATEST REVISION DATE

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IOWA DOT

Standard Design

Triple Reinforced Concrete Box Culverts

July, 2020

Culvert Bell Joints

10' Span

TRCBJ 1-20

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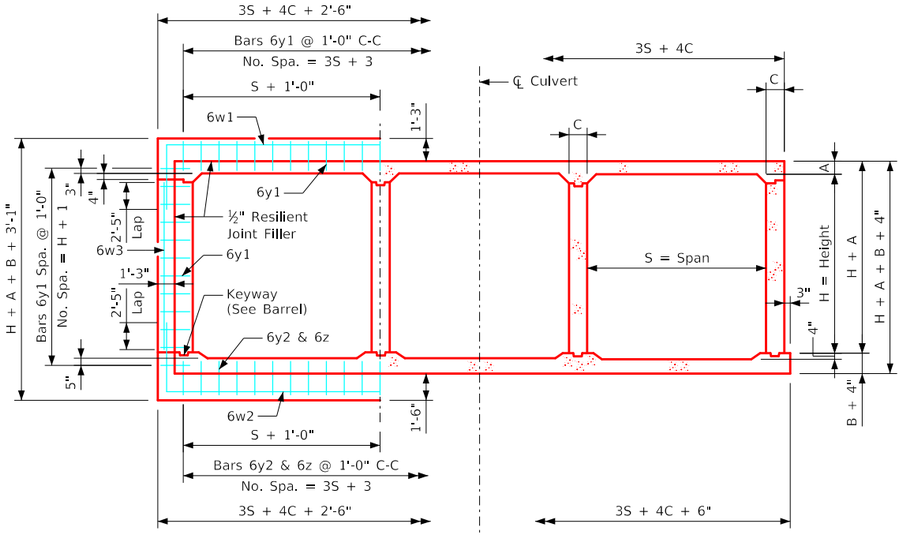
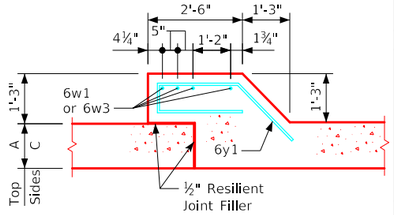
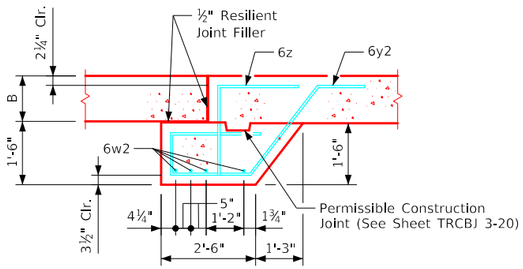


Joint Detail
Section thru Barrel



Top & Sides - Bars 6y1



Bottom - Bars 6y2 & 6z

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'		
Bar	Location	Shape	No.	Length	Weight	No.	Length	Weight	No.	Length	Weight	No.	Length	Weight	No.	Length	Weight
6w1	Slab & Walls		4	51'-4	308	4	51'-4	308	4	51'-4	308	4	51'-4	308	4	51'-4	308
6w2	Floor & Walls		4	53'-10	323	4	55'-10	335	4	51'-8	310	4	51'-8	310	4	51'-8	310
6w3	Walls		--	--	--	--	--	--	8	5'-6	66	8	6'-6	78	8	7'-6	90
6y1	Top & Sides		52	8'-0	625	54	8'-0	649	56	8'-0	673	58	8'-0	697	60	8'-0	721
6y2	Bottom		40	9'-9	586	40	9'-9	586	40	9'-9	586	40	9'-9	586	40	9'-10	591
6z	Bottom & Floor		40	4'-1	245	40	4'-1	245	40	4'-1	245	40	4'-1	245	40	4'-1	245
Total Weight (LB)					2087			2123			2188			2224			2265
Total Concrete (CY)				15.0			15.3			15.6			15.8			16.1	

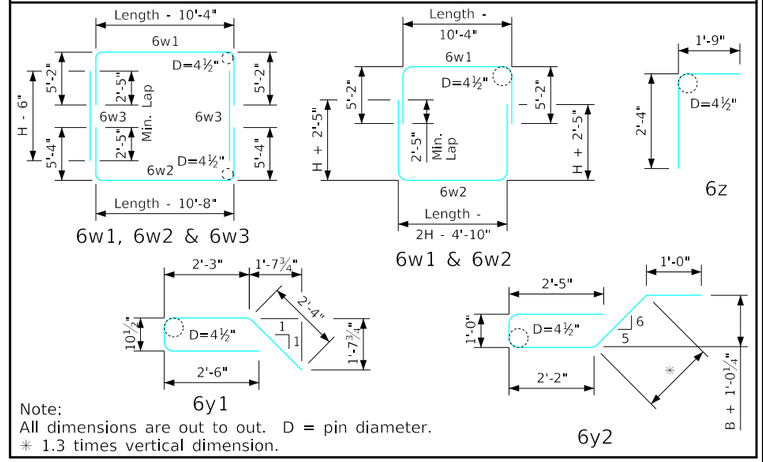
Estimate of Quantities - One Joint - 12' Span

Bill of Reinforcing Steel			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
6w1	Slab & Walls		4	51'-6	309	4	51'-10	311	4	52'-4	314	4	52'-8	316
6w2	Floor & Walls		4	51'-10	311	4	52'-2	313	4	52'-8	316	4	53'-0	318
6w3	Walls		8	8'-6	102	8	9'-6	114	8	10'-6	126	8	11'-6	138
6y1	Top & Sides		62	8'-0	745	64	8'-0	769	66	8'-0	793	68	8'-0	817
6y2	Bottom		40	9'-10	591	40	9'-10	591	40	9'-9	586	40	9'-9	586
6z	Bottom & Floor		40	4'-1	245	40	4'-1	245	40	4'-1	245	40	4'-1	245
Total Weight (LB)					2303			2343			2380			2420
Total Concrete (CY)				16.5			16.9			17.3			17.7	

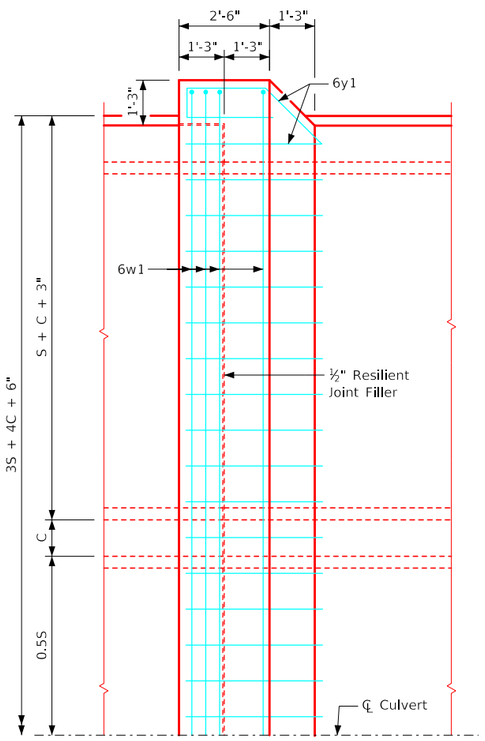
Concrete Placement

Barrel Size	Barrel Dimension			Bell Joint Quantities (CY)		
	A	B	C	Footing	Walls	Slab
12' x 4'	14.5	16.5	9	7.588	1.047	6.345
12' x 5'	14.5	16.5	9	7.588	1.332	6.345
12' x 6'	14.5	16.5	9	7.588	1.618	6.345
12' x 7'	14.5	16.5	9	7.588	1.903	6.345
12' x 8'	14.5	17	9	7.600	2.189	6.345
12' x 9'	14.5	17	9.5	7.629	2.474	6.369
12' x 10'	14.5	17	10.5	7.686	2.760	6.416
12' x 11'	14.5	16.5	12	7.760	3.045	6.487
12' x 12'	14.5	16.5	13	7.817	3.331	6.535

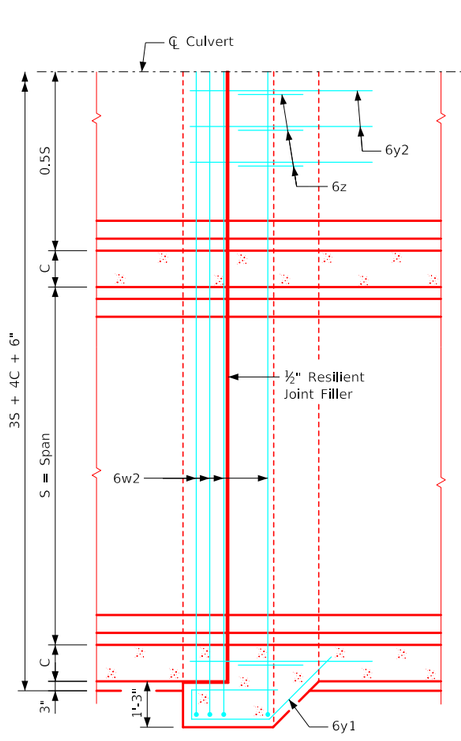
Bent Bar Details



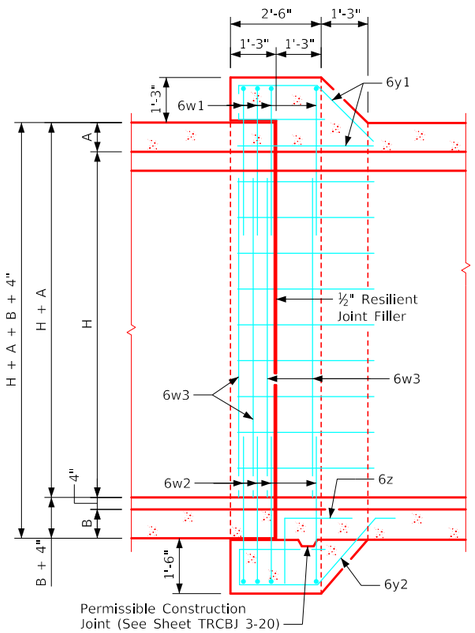
Note:
All dimensions are out to out. D = pin diameter.
✳ 1.3 times vertical dimension.



Plan View - Slab



Plan View - Floor



Longitudinal Section

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LATEST REVISION DATE

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IOWA DOT

Standard Design

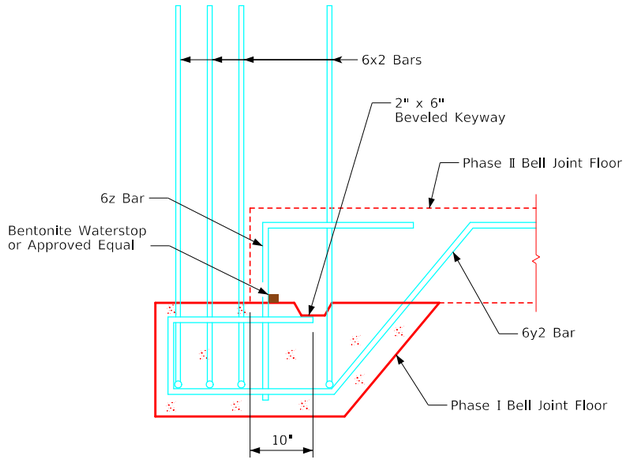
Triple Reinforced Concrete Box Culverts

July, 2020

Culvert Bell Joints

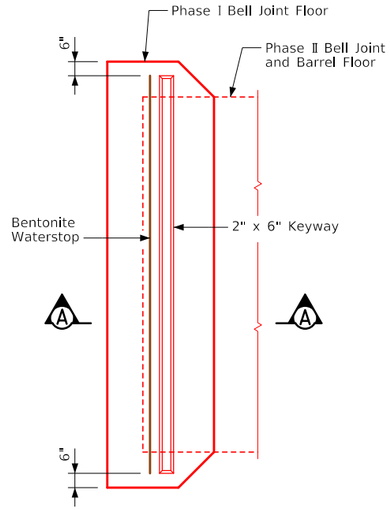
12' Span

TRCBJ 2-20



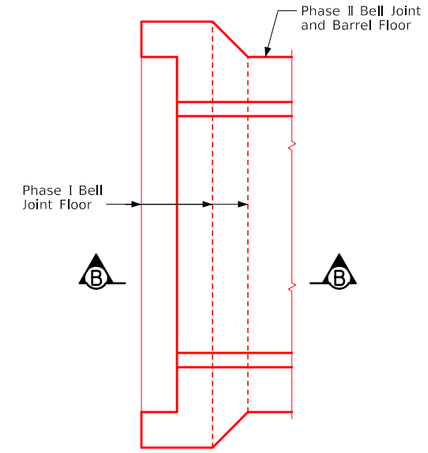
Section A-A

Bell Joint at Floor



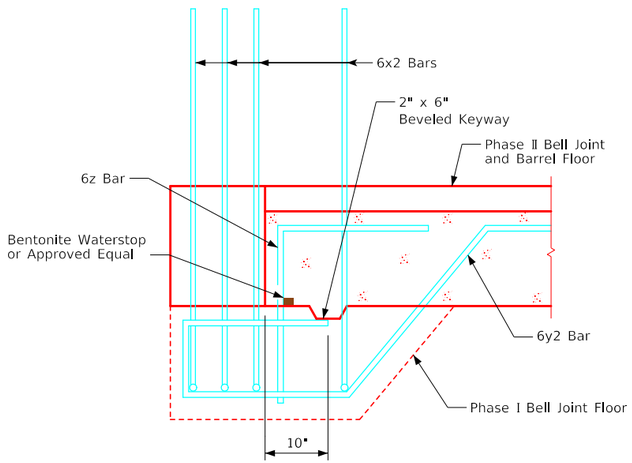
Plan View - Phase I

(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

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.
6. Cost of waterstop considered incidental to the project.

LATEST REVISION DATE

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IOWADOT

Standard Design

Triple Reinforced Concrete Box Culverts

July, 2020

Culvert Bell Joints

All Spans

TRCBJ 3-20

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