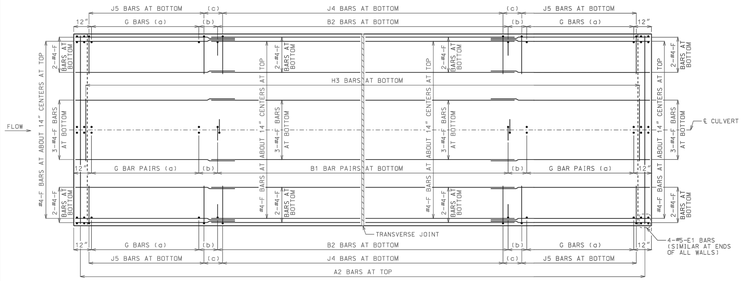
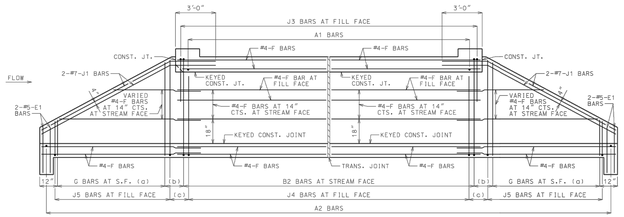


PLAN OF BOTTOM SLAB



ELEVATION OF EXTERIOR WALL
J1 BARS MAY BE BENT IN FIELD OR SHOP.

LAYING OUT TRANVERSE JOINTS
UNLESS SHOWN ON BRIDGE PLANS

USE A TRANSVERSE JOINT WHEN BARREL LENGTH IS OVER 80 FEET. USE ADDITIONAL JOINTS TO LIMIT CUT SECTION LENGTH AND END SECTION BARREL LENGTH MEASURED ALONG CENTERLINE OF CULVERT TO 50 FEET.

MINIMUM END SECTION LENGTH SHALL BE 3 FEET MEASURED ALONG THE SHORTEST WALL FROM THE INSIDE FACE OF HEADWALL TO THE TRANSVERSE JOINT.

TO AVOID LOCATING TRANSVERSE JOINTS UNDER A TRAVELED WAY WITH DESIGN FILLS 2 FEET OR LESS THE FOLLOWING SHALL APPLY:

BARREL LENGTH UP TO 90 FEET WITHOUT A TRANSVERSE JOINT

CUT SECTION LENGTHS UP TO 60 FEET

WHEN BARREL AND CUT SECTION LENGTH RESTRICTIONS REQUIRE TRANSVERSE JOINTS TO BE LOCATED UNDER A TRAVELED WAY WITH DESIGN FILLS 2 FEET OR LESS, THE JOINTS SHALL BE LOCATED TO MINIMIZE THE LENGTH OF JOINT UNDER THE TRAVELED WAY.

TRAVELED WAY IS THE ROADWAY WIDTH MINUS SHOULDER WIDTHS.

FOR CUT SECTION DETAILS, SEE 703.46.

GENERAL NOTES:
FOR SECTIONS THRU BARREL, WINGS AND HEADWALLS, SEE SHEET 3 OF 3. FOR BAR SIZES, SPACING AND DIMENSIONS OF ALL REINFORCEMENT EXCEPT J5 BARS, SEE 703.47. FOR J5 BARS, SEE 703.37.

CONSTRUCTION JOINT KEY NOT SHOWN FOR CLARITY IN PLAN AND ELEVATION. SEE SHEET 3 OF 3 FOR DETAILS.

DRAWING NOT TO SCALE. FOLLOW DIMENSIONS.

MINIMUM CLEARANCE TO REINFORCING STEEL SHALL BE 1½".

LAP LONGITUDINAL BARS A MINIMUM OF 23" AT SPLICES.

BEVELED HEADWALL SHALL BE LOCATED AT UPSTREAM END.

(a) SAME SIZE AND SPACING AS ADJACENT B BARS

(b) VARIES. 12" MAXIMUM

(c) J4 BAR SPACING

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
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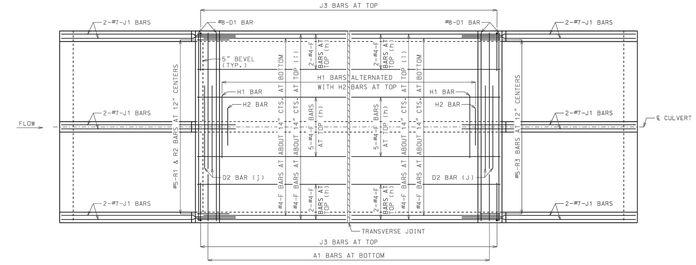
STATE OF MISSOURI — DENNIS W. HEDMANN — NUMBER PE-27141 — PROFESSIONAL ENGINEER
THIS SHEET WAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY

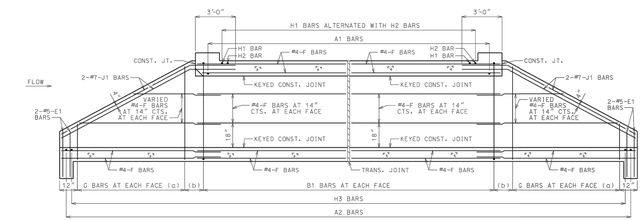
CONCRETE DOUBLE BOX CULVERT
SKEW: SQUARED
WINGS: STRAIGHT

REINFORCEMENT

DATE EFFECTIVE:	10/01/2011	703.40H	SHEET NO.
DATE PREPARED:	5/13/2015		1 OF 3



PLAN OF TOP SLAB
B BARS IN WALLS ARE NOT SHOWN FOR CLARITY. FOR PLACEMENT, SEE SHEET 1 OF 3.



SECTION NEAR INTERIOR WALL
J1 BARS MAY BE BENT IN FIELD OR SHOP.

GENERAL NOTES:
FOR SECTIONS THRU BARREL, WINGS AND HEADWALLS, SEE SHEET 3 OF 3. FOR BAR SIZES, SPACING AND DIMENSIONS OF ALL REINFORCEMENT EXCEPT J5 BARS, SEE 703.47. FOR J5 BARS, SEE 703.37.

CONSTRUCTION JOINT KEY NOT SHOWN FOR CLARITY IN PLAN AND SECTION. SEE SHEET 3 OF 3 FOR DETAILS.

DRAWING NOT TO SCALE. FOLLOW DIMENSIONS.

MINIMUM CLEARANCE TO REINFORCING STEEL SHALL BE 1½".

LAP LONGITUDINAL BARS A MINIMUM OF 23" AT SPLICES.

BEVELED HEADWALL SHALL BE LOCATED AT UPSTREAM END.

(a) SAME SIZE AND SPACING AS ADJACENT B BARS

(b) VARIES. 12" MAXIMUM

(c) NOT SPECIFIED ON THIS SHEET

(d) NOT SPECIFIED ON THIS SHEET

(e) NOT SPECIFIED ON THIS SHEET

(f) NOT SPECIFIED ON THIS SHEET

(g) NOT SPECIFIED ON THIS SHEET

(h) FOR DESIGN FILLS OVER 2'-0"

(i) FOR DESIGN FILLS 2'-0" OR LESS

(j) NOT REQUIRED FOR CLEAR SPANS ≤ 10'-0"
#8 FOR CLEAR SPAN > 10'-0"
#9 FOR CLEAR SPAN > 13'-0"

IF REQUIRED, THE MINIMUM LENGTH EACH SIDE OF ℄ WALL SHALL BE THE GREATER OF 48 BAR DIAMETERS OR ½ CLEAR SPAN. THE CLEAR SPAN IS PARALLEL TO LONG DIRECTION OF HEADWALL.

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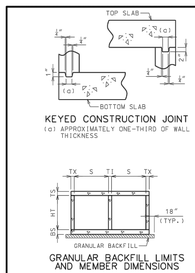
THIS SHEET WAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY

CONCRETE DOUBLE BOX CULVERT
SKEW: SQUARED
WINGS: STRAIGHT

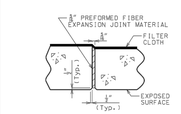
REINFORCEMENT

DATE EFFECTIVE:	10/01/2011	703.40H	SHEET NO.
DATE PREPARED:	5/13/2015		2 OF 3



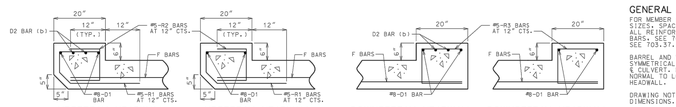
KEYED CONSTRUCTION JOINT
(c) APPROXIMATELY ONE-THIRD OF WALL THICKNESS

GRANULAR BACKFILL LIMITS AND MEMBER DIMENSIONS



TRANSVERSE JOINT THRU BARREL
PREFORMED FIBER EXPANSION JOINT MATERIAL IN ACCORDANCE WITH SEC 1057 SHALL BE SECURELY STITCHED TO ONE FACE OF THE CONCRETE WITH 10 GAUGE COPPER WIRE OR 12 GAUGE SOFT DRAWN GALVANIZED STEEL WIRE.

FILTER CLOTH 3 FEET IN WIDTH AND DOUBLE THICKNESS SHALL BE CENTERED ON TRANSVERSE JOINTS IN TOP SLAB AND SIDEWALLS WITH EDGES SEALED WITH MASTIC OR TWO SIDED TAPE. FILTER CLOTH SHALL BE A SUBSURFACE DRAINAGE GEOTEXTILE IN ACCORDANCE WITH SEC 1011. COST OF FURNISHING AND INSTALLING FILTER CLOTH WILL BE CONSIDERED COMPLETELY COVERED BY THE CONTRACT UNIT PRICE FOR OTHER ITEMS.



UPSTREAM HEADWALL REINFORCEMENT
NEAR INTERIOR WALL

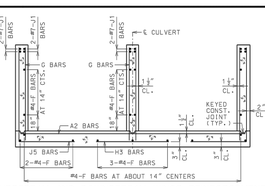
UPSTREAM HEADWALL REINFORCEMENT
NEAR MIDSPAN

DOWNSTREAM HEADWALL REINFORCEMENT
NEAR INTERIOR WALL

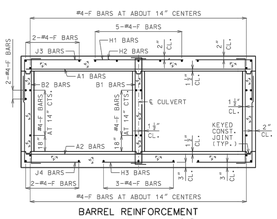
DOWNSTREAM HEADWALL REINFORCEMENT
NEAR MIDSPAN

(b) #8 FOR CLEAR SPAN > 10'-0"
#9 FOR CLEAR SPAN > 13'-0"
NOT REQUIRED FOR CLEAR SPANS ≤ 10'-0"

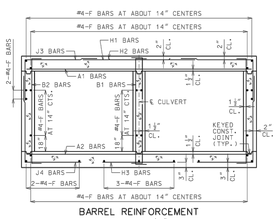
IF D2 BARS ARE REQUIRED, THE MINIMUM LENGTH EACH SIDE OF ℄ WALL SHALL BE THE GREATER OF 48 BAR DIAMETERS OR ½ CLEAR SPAN. THE CLEAR SPAN IS PARALLEL TO LONG DIRECTION OF HEADWALL.



UPSTREAM AND DOWNSTREAM WINGS REINFORCEMENT



BARREL REINFORCEMENT
FOR DESIGN FILLS OVER 2'-0"



BARREL REINFORCEMENT
FOR DESIGN FILLS 2'-0" OR LESS

GENERAL NOTES:
FOR MEMBER THICKNESS AND FOR BAR SIZES, SPACING AND DIMENSIONS OF ALL REINFORCEMENT EXCEPT J5 BARS, SEE 703.47. FOR J5 BARS, SEE 703.37.

BARREL AND WINGS SECTIONS ARE SYMMETRICAL ABOUT AND NORMAL TO ℄ CULVERT. HEADWALL SECTIONS ARE NORMAL TO LONG DIRECTION OF HEADWALL.

DRAWING NOT TO SCALE. FOLLOW DIMENSIONS.

MINIMUM CLEARANCE TO REINFORCING STEEL SHALL BE 1½".

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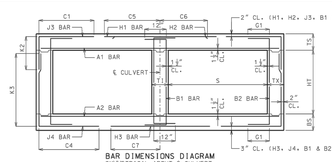
CONCRETE DOUBLE BOX CULVERT
SKEW: SQUARED
WINGS: STRAIGHT

SECTIONS

DATE EFFECTIVE:	10/01/2011	703.40H	SHEET NO.
DATE PREPARED:	5/13/2015		3 OF 3

DESIGN FILL	MEMBER THICKNESS				A1 BARS		J3 BARS				H1 BARS		H2 BARS		A2 BARS		J4 BARS				H3 BARS		B1 BARS		B2 BARS	
							K2										K3									
	TS	BS	TX	TI	SIZE	SPA.	SIZE	SPA.	C1	HT=8'	HT=9'	HT=10'	SIZE	SPA.	C5	SIZE	SPA.	C6	SIZE	SPA.	SIZE	SPA.	C4	HT=8'	HT=9'	HT=10'	SIZE	SPA.	C7	SIZE	SPA.	SIZE	SPA.	G1
1 FT	13	10	8	8	5	6.5	4	7	48.9	29.0	29.0	29.0	5	15	38.0	5	15	28.0	5	8	4	5	48.3	66	78	90	6	6	47.5	5	12	5	12	12
2 FT	13	10	8	8	5	6.5	4	7	48.9	29.0	29.0	29.0	5	15	38.0	5	15	28.0	5	8	4	5	48.3	66	78	90	6	6	47.5	5	12	5	12	12
4 FT	9	10	8	8	5	7.5	5	7.5	49.1	29.0	29.0	29.0	5	12	62.0	5	12	50.0	5	8	4	7	58.9	66	78	90	6	6.5	49.5	5	8.5	5	12	12
6 FT	9	10	8	8	5	6	5	6	49.0	29.0	29.0	29.0	5	12	55.5	5	12	52.0	5	8	4	6.5	56.1	66	78	90	6	6	48.5	5	12	5	12	12
8 FT	10	11	8	8	5	8	5	7.5	36.0	26.0	26.0	26.0	6	16	51.0	6	16	31.5	5	7	4	6.5	34.1	67	79	91	6	6	48.0	5	12	5	12	O
10 FT	12	12	8	8	5	7	5	7	49.0	29.0	29.0	29.0	5	15	49.0	5	15	31.0	5	6.5	4	6	32.6	68	80	92	6	6	49.0	5	12	5	12	O
12 FT	12	13	8	8	5	7	5	6.5	32.8	28.0	28.0	28.0	6	15	48.5	6	15	31.0	5	6.5	4	6	31.5	69	81	93	6	6.5	48.0	5	12	5	12	O
14 FT	13	14	8	8	5	6.5	5	6.5	31.6	29.0	29.0	33.0	6	15	48.5	6	15	31.0	5	6	5	5	30.8	70	82	94	6	6	47.5	5	12	5	12	O
16 FT	14	15	8	8	5	7	5	6.5	30.6	30.0	30.0	34.0	6	14	48.0	6	14	31.0	5	6	5	6.5	30.1	71	83	95	6	6	47.5	5	12	5	12	O
18 FT	15	16	8	8	5	6	5	6	35.1	31.0	31.0	35.0	6	14	55.5	6	14	36.5	5	6	5	6	29.9	72	84	96	6	6	47.5	5	12	5	12	O
20 FT	15	17	8	8	5	6	5	6	35.1	31.0	31.0	35.0	6	14	55.5	6	14	36.5	5	6	5	6	29.9	73	85	97	6	6	47.5	5	12	5	12	O
22 FT	16	18	8	8	5	8	5	7	33.4	32.0	36.0	36.0	6	13	52.5	6	13	34.5	5	6	5	6.5	28.0	74	86	98	6	6.5	47.5	5	12	5	12	O
24 FT	17	19	8	8	5	7	5	6.5	33.1	32.0	36.0	36.0	6	13	52.5	6	13	35.5	5	6	5	6.5	28.0	75	87	99	6	6.5	47.5	5	12	5	12	O
26 FT	18	20	8	8	5	7	5	6.5	33.1	38.0	38.0	38.0	6	13	52.0	6	13	36.5	5	6	5	6	28.1	76	88	100	6	6	47.5	5	12	5	10.5	O
28 FT	19	21	8	8	5	7	5	6.5	33.1	39.0	39.0	39.0	6	13	52.0	6	13	36.0	5	6	5	6	31.5	77	89	101	6	6	50.5	5	12	5	9.5	O
30 FT	20	22	8	8	5	7	5	7.5	37.1	44.0	44.0	44.0	6	12	51.5	6	12	35.5	5	7.5	5	7	31.4	78	90	102	7	7.5	50.5	5	12	5	9.5	O
32 FT	21	23	8	8	5	6.5	5	7	37.1	45.0	45.0	45.0	6	12	51.0	6	12	34.5	5	7.5	5	6.5	31.5	79	91	103	7	7	50.5	5	12	5	9.5	O
34 FT	22	23	8	8	5	6	5	6.5	37.1	46.0	46.0	46.0	6	12	58.5	6	12	38.5	5	7.5	5	6	32.6	79	91	103	7	7	50.5	5	12	5	9	O
36 FT	22	24	8	8	5	6	5	6.5	37.1	46.0	46.0	46.0	7	15	55.5	7	15	39.5	5	7	5	6	31.6	80	92	104	7	7	50.0	5	12	5	9	O
38 FT	23	25	8	8	5	6	5	6	37.1	47.0	47.0	47.0	7	15	55.0	7	15	38.5	5	7	5	6	31.9	81	93	105	7	6.5	50.0	5	12	5	8.5	O
40 FT	24	26	9	8	6	6	6	7	38.0	48.0	48.0	48.0	7	14	54.0	7	14	37.5	5	7	6	6.5	32.5	82	94	106	7	6.5	50.0	5	12	5	8.5	O
42 FT	25	27	9	8	6	6	6	6.5	38.0	49.0	49.0	49.0	7	14	53.5	7	14	37.5	5	6.5	5	6	32.6	83	95	107	7	6	50.0	5	12	5	8.5	O
44 FT	25	28	9	8	7	7.5	6	6.5	38.1	49.0	49.0	49.0	7	14	55.0	7	14	37.5	6	6.5	6	6	32.8	84	96	108	7	6	50.0	5	12	5	8.5	O
46 FT	26	28	9	8	7	7.5	6	6.5	38.1	50.0	50.0	50.0	7	13	52.5	7	13	36.5	6	6.5	6	6	32.9	84	96	108	7	6	50.0	5	12	5	8	O
48 FT	27	29	9	8	7	7	6	7	39.0	51.0	51.0	51.0	7	13	52.5	7	13	36.0	6	6.5	6	6	33.5	85	97	109	7	6	50.0	5	12	5	7.5	O
50 FT	27	30	10	8	7	7	6	7	39.0	51.0	51.0	51.0	7	13	51.5	7	13	36.0	6	6.5	6	6.5	33.5	86	98	110	7	6	50.0	5	12	5	8	O

DESIGN FILL	MEMBER THICKNESS				A1 BARS		J3 BARS				H1 BARS		H2 BARS		A2 BARS		J4 BARS				H3 BARS		B1 BARS		B2 BARS	
							K2										K3									
	TS	BS	TX	TI	SIZE	SPA.	SIZE	SPA.	C1	HT=8'	HT=9'	HT=10'	SIZE	SPA.	C5	SIZE	SPA.	C6	SIZE	SPA.	SIZE	SPA.	C4	HT=8'	HT=9'	HT=10'	SIZE	SPA.	C7	SIZE	SPA.	SIZE	SPA.	G1
1 FT	13	10	8	8	5	6.5	5	8.5	50.9	29.0	33.0	33.0	5	14	100.0	5	14	29.5	5	8.5	4	7.5	71.6	103	115	129	6	6	47.5	5	12	5	12	12
2 FT	13	10	8	8	5	6.5	5	8.5	50.9	29.0	33.0	33.0	5	14	100.0	5	14	29.5	5	8.5	4	7.5	64.1	103	115	129	6	6	47.5	5	12	5	12	12
4 FT	9	10	9	8	5	7.5	5	6	49.0	29.0	29.0	29.0	5	12	73.0	5	12	50.0	5	7.5	5	6	55.4	102	114	126	6	6.5	49.5	5	10	5	12	12
6 FT	9	10	9	8	5	6	5	6	51.4	29.0	29.0	29.0	6	12	54.0	6	12	52.0	5	7	5	6	53.4	102	114	126	6	6	48.5	5	12	5	12	12
8 FT	10	11	9	8	5	8	5	6	48.0	26.0	30.0	30.0	5	12	48.0	5	12	28.5	5	7	6	7.5	50.9	103	115	127	6	6	48.0	5	12	5	11.5	O
10 FT	11	12	9	8	5	7	5	6	48.0	31.0	31.0	31.0	6	16	49.5	6	16	30.5	5	6.5	5	6	46.0	104	116	128	6	6	48.0	5	12	5	10.5	O
12 FT	12	13	9	8	5	7	5	6	44.5	32.0	32.0	32.0	6	15	48.5	6	15	31.0	5	6.5	5	6	45.0	105	117	129	6	6	47.5	5	12	5	9.5	O
14 FT	13	14	9	8	5	6.5	5	6	43.3	33.0	33.0	33.0	6	15	48.0	6	15	30.5	5	6	5	6	43.9	106	118	130	6	6	47.5	5	12	5	8.5	O
16 FT	14	15	9	8	5	6	5	6	42.1	34.0	34.0	34.0	6	15	47.5	6	15	30.5	5	6	5	6	43.0	107	119	131	6	6	47.5	5	12	5	8.5	O
18 FT	15	16	10	8	6	8.5	5	6.5	47.1	35.0	35.0	35.0	6	15	53.0	6	15	34.5	5	8	5	7	42.8	108	120	132	6	6	47.5	5	12	5	8.5	O
20 FT	15	17	10	8	6	8	5	6	50.6	35.0	35.0	35.0	6	14	52.5	6	14	34.5	5	8	5	7	40.0	109	121	133	6	6	47.5	5	12	5	8	O
22 FT	16	18	10	8	6	8	5	6	44.5	36.0	36.0	36.0	6	14	52.0	6	14	34.0	6	8	5	7	40.0	110	122	134	6	6.5	47.5	5	12	5	8	O
24 FT	17	19	10	8	6	8	5	6	48.4	37.0	37.0	37.0	6	14	51.0	6	14	34.0	6	8	5	6.5	40.0	111	123	135	6	6	47.5	5	12	5	7.5	O
26 FT	18	20	11	8	6	7.5	5	6	45.0	38.0	38.0	38.0	6	13	51.0	6	13	35.5	6	7.5	5	7	40.5	112	124	136	6	6	47.5	5	12	5	7.5	O
28 FT	19	21	11	8	6	7.5	5	6	49.0	38.0	38.0	38.0	6	13	49.0	6	13	35.5	6	7.5	5	6.5	41.0	113	125	137	6	7	50.5	5	12	5	7	O
30 FT	19	22	12	8	6	6.5	6	8	49.8	39.0	39.0	39.0	6	13	50.0	6	13	35.5	6	7.5	5	6.5	40.9	114	126	138	7	7.5	50.5	5	12	5	7.5	O
32 FT	20	23	12	8	6	6.5	6	8	49.6	40.0	40.0	40.0	6	12	49.5	6	12	34.5	6	7.5	5	6.5	41.0	115	127	139	7	7	50.5	5	12	5	7	O
34 FT	21	24	12	8	6	7.5	6	7.5	49.6	41.0	41.0	41.0	6	12	49.0	6	12	33.5	6	7.5	5	6.5	41.1	116	128	140	7	7	50.5	5	12	5	6.5	O
36 FT	22	25	12	8	6	6.5	6	6.5	49.6	42.0	42.0	42.0	7	15	53.0	7	15	38.0	6	7	5	6.5	41.3	117	129	141	7	6.5	50.5	5	12	5	7	O
38 FT	23	26	12	8	6	6	6	6.5	50.4	43.0	43.0	43.0	7	15	52.5	7	15	37.0	6	6.5	5	6	41.6	118	130	142	7	6.5	50.5	5	12	5	6.5	O
40 FT	23	26	13	8	6	6	7	7	50.3	43.0	43.0	43.0	7	15	52.0	7	15	37.5	6	6.5	5	6	41.6	118	130	142	7	6.5	50.5	5	12	5	6.5	O
42 FT	24	27	13	8	6	6	7	7	51.0	44.0	44.0	44.0	7	14	51.5	7	14	37.0	6	6.5	5	6	42.1	119	131	143	7	6	50.5	5	12	5	6	O
44 FT	24	28	14	8	7	7	6	7	51.1	44.0	44.0	44.0	7	14	51.5	7	14	37.0	6	6.5	5	6	42.1	120	132	144	7	6	50.5	5	12	5	6	O
46 FT	25	28	14	8	7	7.5	6	6.5	51.1	45.0	49.0	49.0	7	14	50.5	7	14	36.0	6	6.5	5	6.5	42.6	121	133	145	7	6	50.5	5	12	5	6	O
48 FT	26	30	14	8	7	7.5	6	6.5	51.1	46.0	50.0	50.0	7	15	50.5	7	15	36.0	6	6.5	6	6	45.4	122	134	146	7	6	50.5	5	12	5	6	O
50 FT	26	30	15	8	7	7	6	6.5	51.9	50.0	50.0	50.0	7	14	50.5	7	14	36.0	6	6	6	6	45.8	122	134	146	8	7.5	56.5	5	12	5	8	O



BAR DIMENSIONS DIAGRAM
SYMMETRICAL ABOUT ℄ CULVERT.

GENERAL NOTES:
IF DESIGN FILL IS BETWEEN TABULATED DESIGN FILLS, USE THE NEXT GREATER TABULATED DESIGN FILL, EXCEPT FOR DESIGN FILLS BETWEEN 2 FEET AND 4 FEET. FOR DESIGN FILLS BETWEEN 2 FEET AND 4 FEET USE THE GREATER MEMBER THICKNESS, AREA OF REINFORCEMENT AND BAR DIMENSIONS FROM THE 2 FEET AND 4 FEET TABULATED DESIGN FILLS. AREA OF REINFORCEMENT EQUALS BAR AREA PER FOOT SPACING.

SPECIAL DESIGNS ARE REQUIRED WHEN THE DESIGN FILL IS LESS THAN 1 FOOT OR GREATER THAN 50 FEET.

DIMENSIONS ARE