AREA OF STEEL REQUIRED FOR "J5" BARS IN WINGS (sq. in./ft.)
BARREL HEIGHT VS. WALL THICKNESS

✳ BACKFILL SLOPE = 2:1

WALL THICKNESS	BARREL HEIGHT (ft.)												
"TX" (in.)	4	5	6	7	8	9	10	11	12	13	14	15	16
8	0.1683	0.1683	0.1699	0.2502	0.2677								
9	0.1683	0.1683	0.1683	0.2111	0.2680	0.3071	0.4101	0.5366					
10		0.1683	0.1683	0.1821	0.2573	0.2867	0.3510	0.4573	0.5856	0.7393			
11			0.1683	0.1683	0.2260	0.3061	0.3073	0.3992	0.5095	0.6405	0.7954	0.9780	
12				0.1683	0.2016	0.2748	0.3259	0.3546	0.4515	0.5661	0.7007	0.8580	1.0413
13					0.1820	0.2479	0.3285	0.3461	0.4058	0.5078	0.6271	0.7658	0.9262
14						0.2259	0.2990	0.3665	0.3687	0.4608	0.5681	0.6924	0.8355
15							0.2745	0.3550	0.3871	0.4219	0.5195	0.6323	0.7617
16									0.4078	0.4078	0.4788	0.5821	0.7004
17									0.3863	0.4286	0.4442	0.5396	0.6486
18										0.4495	0.4495	0.5029	0.6041
19											0.4705	0.4711	0.5654
20												0.4915	0.5316

AREA OF STEEL REQUIRED FOR "J5"BARS IN WINGS (sq. in./ft.)
BARREL HEIGHT VS. WALL THICKNESS

✳ BACKFILL SLOPE = 3:1

WALL THICKNESS	BARREL HEIGHT (ft.)												
"TX" (in.)	4	5	6	7	8	9	10	11	12	13	14	15	16
8	0.1683	0.1683	0.1683	0.1683	0.2280								
9	0.1683	0.1683	0.1683	0.1683	0.1917	0.2617	0.2680	0.3393					
10		0.1683	0.1683	0.1683	0.1683	0.2255	0.2867	0.2911	0.3708	0.4651			
11			0.1683	0.1683	0.1683	0.1982	0.2626	0.3061	0.3244	0.4059	0.5012	0.6119	
12				0.1683	0.1683	0.1769	0.2342	0.3030	0.3259	0.3605	0.4443	0.5412	0.6527
13					0.1683	0.1683	0.2113	0.2732	0.3461	0.3461	0.3993	0.4857	0.5846
14						0.1683	0.1926	0.2489	0.3155	0.3665	0.3665	0.4408	0.5299
15							0.1769	0.2285	0.2895	0.3608	0.3871	0.4037	0.4848
16									0.2676	0.3333	0.4078	0.4078	0.4470
17									0.2488	0.3098	0.3803	0.4286	0.4286
18										0.2893	0.3551	0.4303	0.4495
19											0.3330	0.4035	0.4705
20												0.3799	0.4551

NOTE:

IF AREA OF STEEL IN THE WALL OF THE CULVERT (J4 Bars) IS GREATER THAN THAT INDICATED IN THE TABLE, USE THE SAME SIZE AND SPACING FOR THE "J5" BARS IN THE WINGS. HOWEVER, IF THE AREA OF STEEL PROVIDEDBY MATCHING SIZE AND SPACING OF THE "J4" BARS IS INSUFFICIENT, INCREASE THE SIZE OF THE "J5" BARS (#8 Max.) AND/OR DECREASE THE SPACING OF THE "J5" BARS (6" Min.). USE SMALLEST BAR SIZE POSSIBLE BASED ON MINIMUM SPACING.

MINIMUM STEEL TO BE USED IN THE WINGS FOR "J5" BARS IS #4 BARS AT 14" CENTERS (As = 0.1683 sq. in./ft.)

✳ SEE STANDARD PLAN 703.37B, SHEET 2 OF 2 FOR BACKFILL SLOPE TO BE USED BASED ON SKEW.

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-ASK-MODOT (1-888-275-6636)

STATE OF MISSOURI
DENNIS W. HECKMAN
NUMBER PE-27141
PROFESSIONAL ENGINEER

THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY.

CONCRETE BOX CULVERT

EXTERIOR WING REINFORCEMENT (HS20 & HS20 MOD. LOADING)

DATE EFFECTIVE: 10-01-2009
DATE PREPARED: 10/28/2009

703.37B

SHEET NO. 1 OF 2

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.