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

* BACKFILL SLOPE = 1:2

WALL THICKNESS "TX" (mm)	BARREL HEIGHT (m)												
	1.2	1.5	1.8	2.1	2.4	2.7	3.0	3.3	3.6	3.9	4.2	4.5	4.8
200	369	369	369	369	524								
225	369	369	369	369	440	602	804	1050					
250		369	369	369	380	519	690	898	1149	1449			
275			369	369	369	456	605	786	1003	1259	1562	1918	
300				369	369	407	540	700	890	1116	1380	1688	2046
325					369	369	487	630	801	1002	1237	1510	1824
350						369	444	574	729	911	1122	1367	1648
375							408	527	669	835	1027	1250	1505
400									618	771	948	1152	1385
425									574	716	880	1068	1284
450										668	821	997	1197
475											770	934	1121
500												879	1054

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

* BACKFILL SLOPE = 1:3

WALL THICKNESS "TX" (mm)	BARREL HEIGHT (m)												
	1.2	1.5	1.8	2.1	2.4	2.7	3.0	3.3	3.6	3.9	4.2	4.5	4.8
200	369	369	369	369	369								
225	369	369	369	369	369	385	512	665					
250		369	369	369	369	369	441	573	729	913			
275			369	369	369	369	388	503	639	799	986	1203	
300				369	369	369	369	449	569	711	876	1067	1285
325					369	369	369	405	514	641	789	959	1153
350						369	369	369	468	583	717	871	1047
375							369	397	430	536	658	799	959
400									439	495	608	737	885
425									481	481	565	685	822
450										523	528	640	767
475											566	600	719
500												608	677

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 PROVIDED BY MATCHING SIZE AND SPACING OF THE "J4" BARS IS INSUFFICIENT, INCREASE THE SIZE OF THE "J5" BARS (#25 Max.) AND/OR DECREASE THE SPACING OF THE "J5" BARS (150 mm Min.). USE SMALLEST BAR SIZE POSSIBLE BASED ON MINIMUM SPACING.

MINIMUM STEEL TO BE USED IN THE WINGS FOR "J5" BARS IS #13 BARS AT 350 mm CENTERS (As=369 SQ. mm)

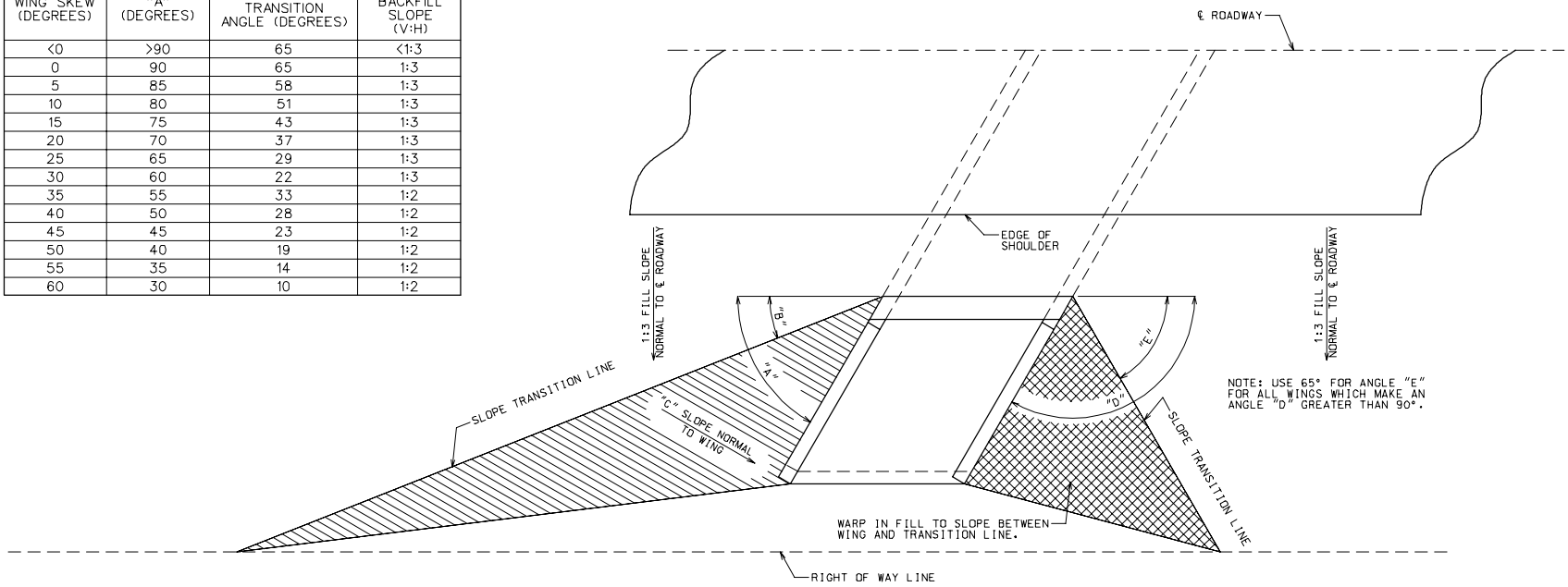
*** SEE STANDARD PLAN M703.37B, SHEET 2 OF 2 FOR BACKFILL SLOPE TO BE USED BASED ON SKEW.**

MISSOURI HIGHWAY AND TRANSPORTATION COMMISSION

CONCRETE BOX CULVERT
EXTERIOR WING REINFORCEMENT
(MS18 & MS18 MOD LOADING)

DATE: EFFECTIVE: 04-01-2001 **M703.37B** 1/2

WING BACKFILL TABLE			
WING SKEW (DEGREES)	"A" (DEGREES)	"B" TRANSITION ANGLE (DEGREES)	"C" BACKFILL SLOPE (V:H)
<0	>90	65	<1:3
0	90	65	1:3
5	85	58	1:3
10	80	51	1:3
15	75	43	1:3
20	70	37	1:3
25	65	29	1:3
30	60	22	1:3
35	55	33	1:2
40	50	28	1:2
45	45	23	1:2
50	40	19	1:2
55	35	14	1:2
60	30	10	1:2



NOTE: USE 65° FOR ANGLE "E" FOR ALL WINGS WHICH MAKE AN ANGLE "D" GREATER THAN 90°.

PLAN OF WINGS AND SLOPE TRANSITION LINES

NOTE: BACKFILL TRANSITION ANGLE AND BACKFILL SLOPE SHALL APPLY TO ALL BOX CULVERTS REGARDLESS OF TYPE - SINGLE, DOUBLE, OR TRIPLE.

MISSOURI HIGHWAY AND TRANSPORTATION COMMISSION

CONCRETE BOX CULVERTS
EXTERIOR WING BACKFILL SLOPE TRANSITION

DATE: _____ | EFFECTIVE: 04-01-2001 | M703.37B | 2/2