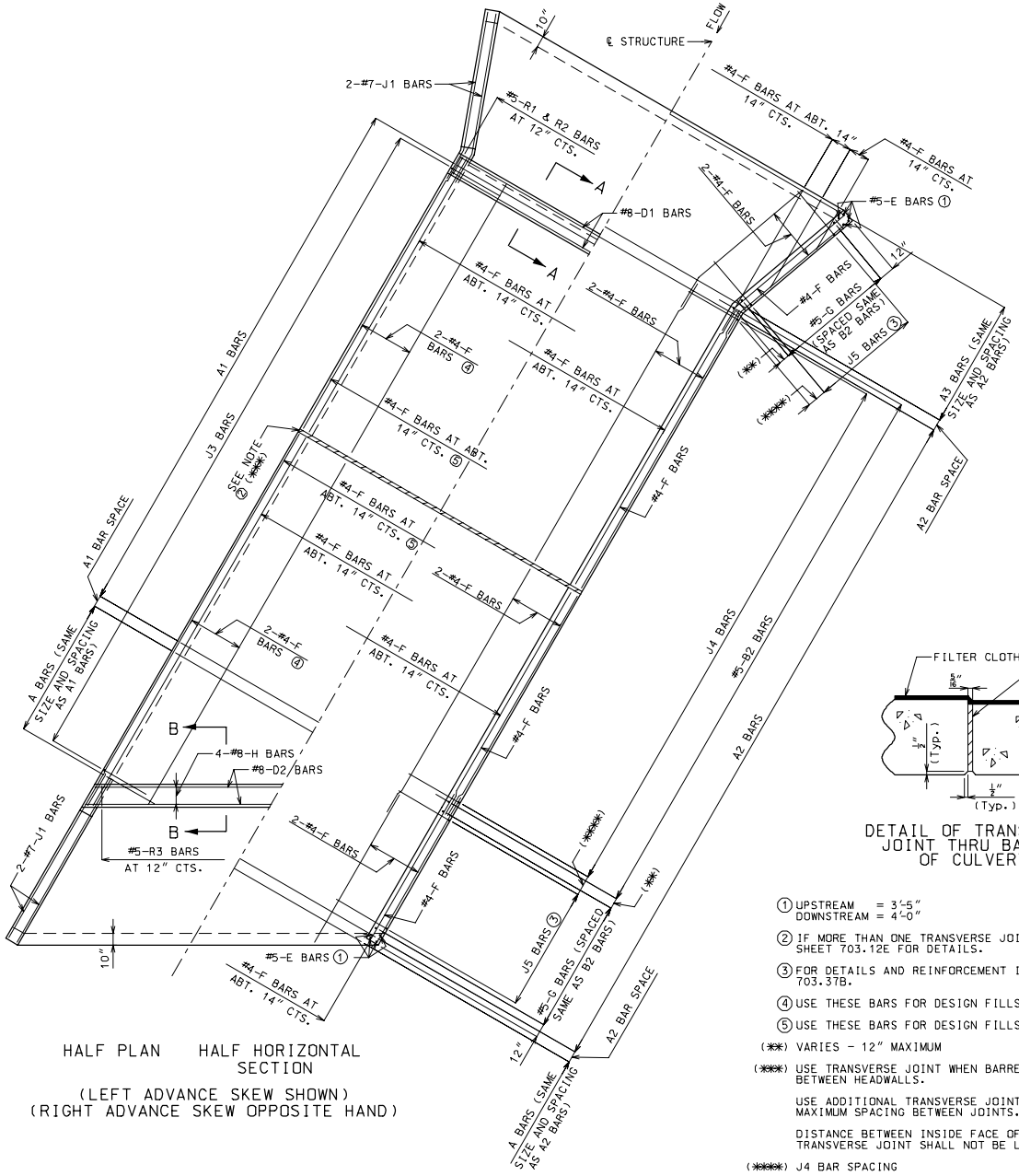
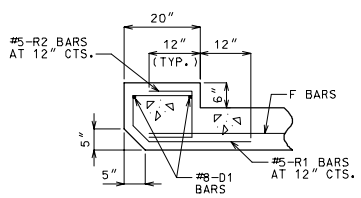
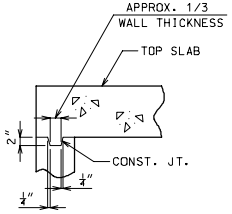


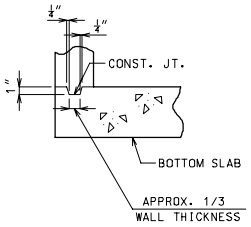
HALF PLAN HALF HORIZONTAL SECTION

(LEFT ADVANCE SKEW SHOWN)
(RIGHT ADVANCE SKEW OPPOSITE HAND)

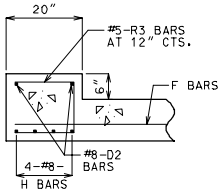


SECTION A-A

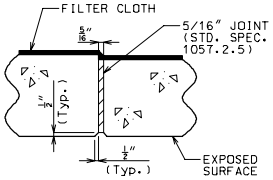




DETAIL OF KEYED CONST. JT.



SECTION B-B



DETAIL OF TRANSVERSE JOINT THRU BARREL OF CULVERT

① UPSTREAM = 3'-5"
DOWNSTREAM = 4'-0"

② IF MORE THAN ONE TRANSVERSE JOINT IS REQUIRED, SEE STANDARD SHEET 703.12E FOR DETAILS.

③ FOR DETAILS AND REINFORCEMENT IN WINGS, SEE STANDARD SHEET 703.37B.

④ USE THESE BARS FOR DESIGN FILLS OF MORE THAN 2'-0".

⑤ USE THESE BARS FOR DESIGN FILLS OF 2'-0" OR LESS.

(✱✱) VARIES - 12" MAXIMUM

(✱✱✱) USE TRANSVERSE JOINT WHEN BARREL IS OVER 80 FEET LONG BETWEEN HEADWALLS.

USE ADDITIONAL TRANSVERSE JOINTS TO PROVIDE 50 FEET MAXIMUM SPACING BETWEEN JOINTS.

DISTANCE BETWEEN INSIDE FACE OF HEADWALL AND TRANSVERSE JOINT SHALL NOT BE LESS THAN 3'-0".

(✱✱✱✱) J4 BAR SPACING

GENERAL NOTES:

ALL DIMENSIONS SHOWN ARE IN INCH UNLESS OTHERWISE NOTED.

FOR DIMENSIONS AND SIZE AND SPACING OF REINFORCING STEEL. SEE STANDARD SHEET 703.15C.

LAP ALL LONGITUDINAL BARS A MINIMUM OF 23" AT SPLICES.

MINIMUM CLEARANCE TO REINFORCING STEEL SHALL BE 1-1/2" UNLESS OTHERWISE SHOWN.

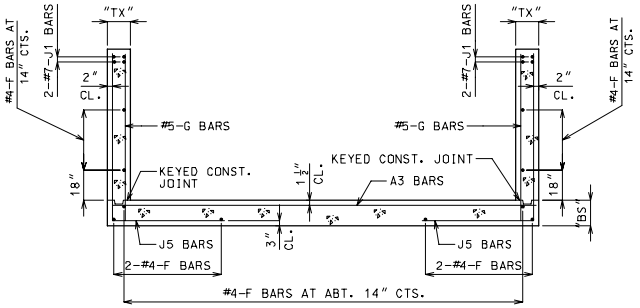
JOINT FILLER SHALL BE SECURELY STITCHED TO ONE FACE OF THE CONCRETE WITH NO. 10 GAGE COPPER WIRE OR NO. 12 GAGE SOFT DRAWN GALVANIZED STEEL WIRE.

BEVELED HEADWALL TO BE LOCATED AT UPSTREAM END.

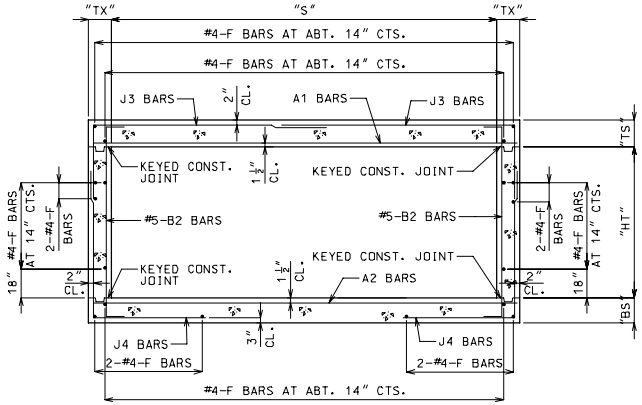
A FILTER CLOTH 3 FEET IN WIDTH AND DOUBLE THICKNESS SHALL BE APPLIED TO ALL TRANSVERSE JOINTS IN THE TOP SLAB AND SIDEWALLS. THE MATERIAL SHALL BE CENTERED ON THE JOINT AND THE EDGES SEALED WITH A MASTIC OR WITH TWO SIDED TAPE. THE FILTER CLOTH SHALL BE A GEOTEXTILE MEETING THE APPROVAL OF THE ENGINEER AND HAVING A GRAB TENSILE STRENGTH OF 180 LBS. (ASTM D-4632) AND AN APPARENT OPENING SIZE OF 50 TO 100 (ASTM D-4751). NO DIRECT PAYMENT WILL BE MADE FOR FURNISHING AND INSTALLING FILTER CLOTH.

FOR MORE DETAILS AND SECTION THROUGH BOX. SEE 703.14E SHEET 2 OF 3.

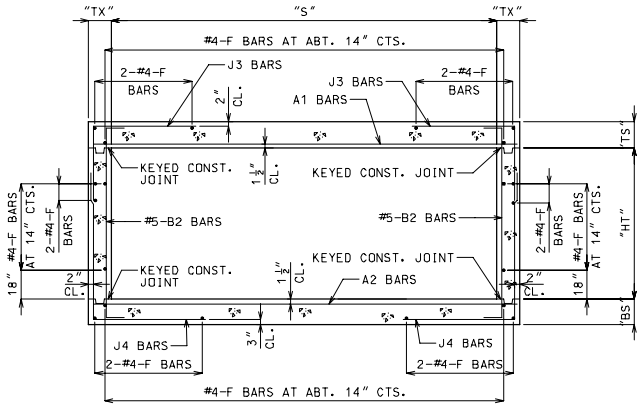
MISSOURI HIGHWAY AND TRANSPORTATION COMMISSION			
	CONCRETE SINGLE BOX STRUCTURE FLARED WINGS (SKEWED)		
DATE: _____	EFFECTIVE: 01-01-2003	703.14E	1/3



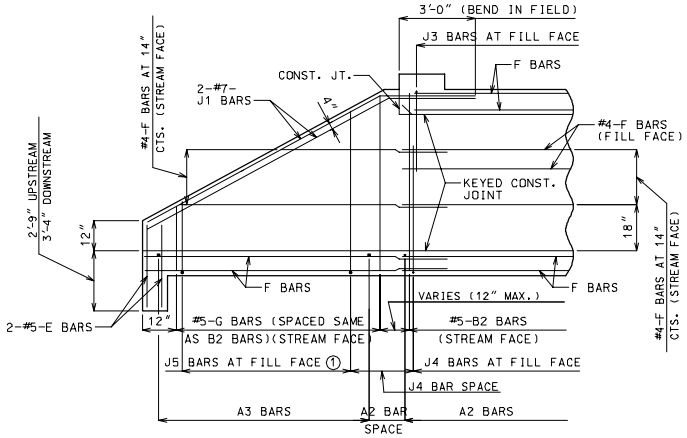
SECTION THRU WINGS (UPSTREAM SHOWN)



SECTION THRU BOX (DESIGN FILLS 2'-0" OR LESS)



SECTION THRU BOX (DESIGN FILLS OVER 2'-0")



ELEVATION OF WING
(UPSTREAM SHOWN)

NOTE: CONSTRUCTION JOINT KEY OMITTED FOR CLARITY.

GENERAL NOTES:

ALL DIMENSIONS SHOWN ARE IN INCH UNLESS OTHERWISE NOTED.

J1 BARS MAY BE BENT IN FIELD OR SHOP.

MINIMUM CLEARANCE TO REINFORCING STEEL SHALL BE 1-1/2" UNLESS OTHERWISE SHOWN.

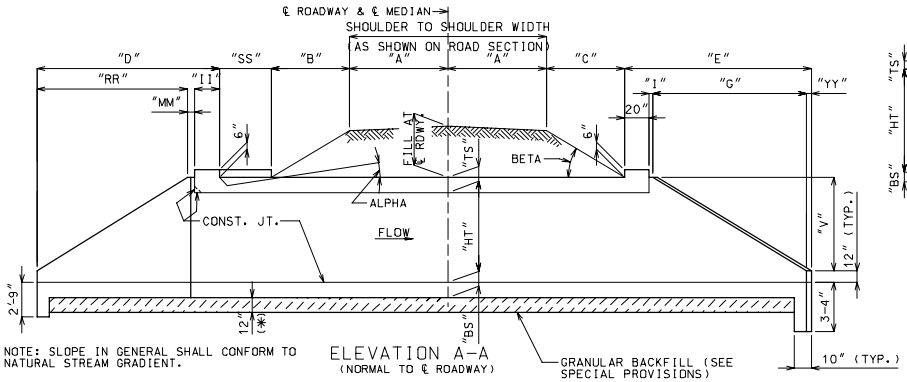
FOR DIMENSIONS AND SIZE AND SPACING OF REINFORCING STEEL, SEE STANDARD SHEET 703.15C.

1 FOR DETAILS OF REINFORCEMENT IN WINGS, SEE STANDARD SHEET 703.37B.

MISSOURI HIGHWAY AND TRANSPORTATION COMMISSION

CONCRETE
SINGLE BOX STRUCTURE
FLARED WINGS
(SKEWED)

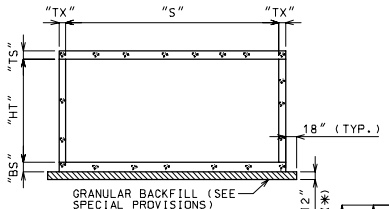
DATE: _____ | EFFECTIVE: 01-01-2003 | 703.14E | 2/3



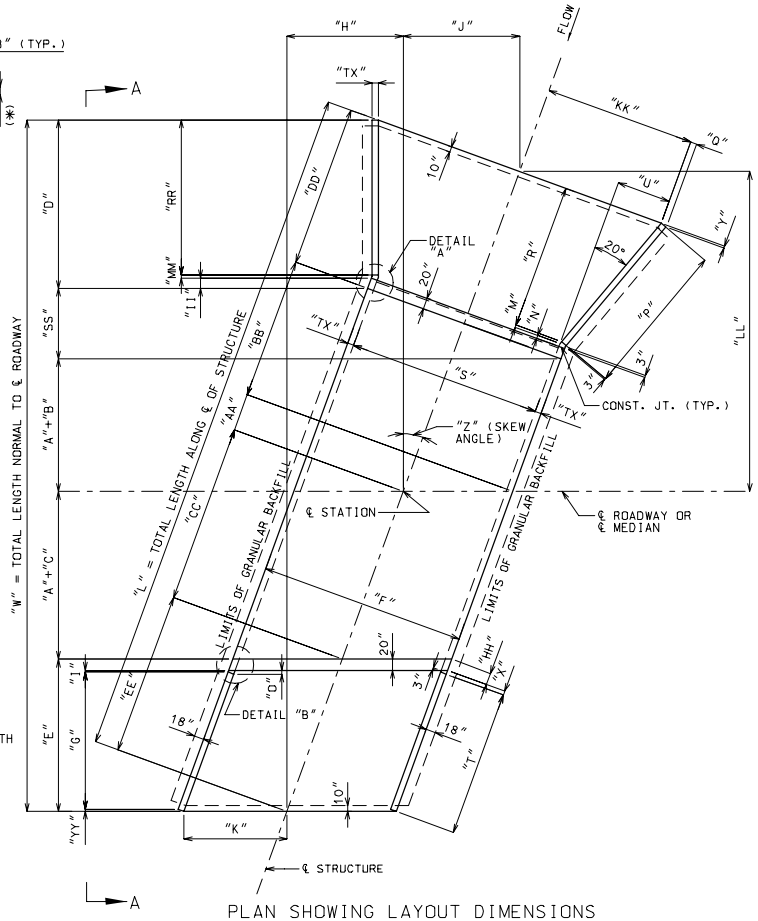
NOTE: SLOPE IN GENERAL SHALL CONFORM TO NATURAL STREAM GRADIENT.

(✱) DEPTH OF GRANULAR BACKFILL MAY VARY. 12" USED FOR ESTIMATING QUANTITIES.

ELEVATION A–A
(NORMAL TO ℄ ROADWAY)



SECTION THRU BOX
(NORMAL TO ℄ STRUCTURE)



PLAN SHOWING LAYOUT DIMENSIONS
(DOWNSTREAM AT LEFT SHOWN–FOR DOWNSTREAM AT RIGHT, ROTATE 180° ABOUT ℄ STRUCTURE)

GENERAL DATA TABLE

VARIABLE	DIMENSION (in.)	VARIABLE	DIMENSION (in.)
ALPHA	SEE EQUATIONS	"U"	(R + M)(TAN 20°)
BETA	SEE EQUATIONS	"V"	HT + TS – 12"
"B"	SEE EQUATIONS	"W"	2A + B + C + D + E + SS
"C"	SEE EQUATIONS	"X"	3" + TX(TAN Z)
"D"	II + MM + RR	"Y"	TX(SIN 20°)
"E"	G + O + 20"	"Z"	SKEW ANGLE
"F"	S + 2TX	"AA"	(F/2)(TAN Z)
"G"	2V	"BB"	(A + B)(SEC Z)
"H"	(A + C + E)(TAN Z)	"CC"	(A + C)(SEC Z)
"I"	3"(COS Z)	"DD"	R + M + N + 20"
"J"	(AA + BB + DD)(SIN Z)	"EE"	E(SEC Z)
"K"	(S/2)(SEC Z)	"HH"	20"(SEC Z)
"L"	AA + BB + CC + DD + EE	"II"	20"(COS Z)
"M"	N(COS 20°)	"KK"	(S/2) + U
"N"	3" + TX(TAN 10°)	"LL"	(AA + BB + DD)(COS Z)
"O"	I + YY	"MM"	3"[COS Z + COS(Z – 20°)]
"P"	2V[SEC(Z + 20°)]	"RR"	P [COS (Z – 20°)]
"Q"	TX(COS 20°)	"SS"	F(SIN Z)
"R"	P(COS 20°)	"YY"	TX(SIN Z)
"T"	G(SEC Z)		

GENERAL NOTES:

DESIGN SPECIFICATIONS:
AASHTO – 1996
LOAD FACTOR DESIGN

DESIGN UNIT STRESSES:
CLASS B-1 CONCRETE f'c = 4,000 psi
REINFORCING STEEL (GRADE 60),
fy = 60,000 psi

DESIGN LOADING:
EARTH 120 #/ft.³
EQUIVALENT FLUID PRESSURE
30 #/ft.³ (MIN.) – 60 #/ft.³ (MAX.)

ALL DIMENSIONS SHOWN ARE IN INCHES (in.) UNLESS OTHERWISE NOTED.

THIS DRAWING IS NOT TO SCALE. FOLLOW DIMENSIONS.

FOR DIMENSIONS NOT SHOWN, SEE STANDARD SHEETS 703.14E, SHEETS 1 & 2 OF 3 OR 703.15C.

NOTE:
WHEN ALTERNATE PRECAST BOX SECTIONS ARE USED, THE MINIMUM BARREL LENGTH MEASURED ALONG THE SHORTEST WALL FROM THE FIRST JOINT TO THE OUTSIDE OF THE HEADWALL SHALL BE 3'-2". REINFORCEMENT AND DIMENSIONS FOR THE WINGS AND HEADWALLS SHALL BE IN ACCORDANCE WITH MISSOURI STANDARD PLANS DRAWINGS.

EQUATIONS FOR COMPUTING LENGTH OF BARRELS

LET ALPHA = ANGLE OF SLOPE OF BARREL WITH HORIZONTAL ALONG ℄ OF CULVERT.

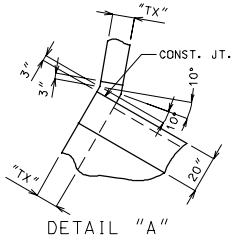
LET BETA = ANGLE OF SLOPE OF FILL NORMAL TO ℄ ROADWAY.

$$\text{"B" OR "C"} = \frac{(\text{FILL AT ℄ ROADWAY}) \pm (\text{CROSS-SLOPE}) \times \text{"A"} \pm \text{A TAN(ALPHA)}}{\text{TAN(BETA)} \pm \text{TAN(ALPHA)}}$$

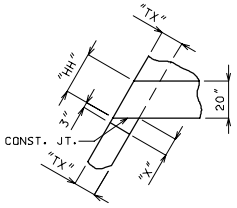
"B" OR "C" = HORIZONTAL DISTANCE FROM EDGE OF SHOULDER TO HEADWALL NORMAL TO ℄ OF ROADWAY.

DEFINITIONS

CROSS-SLOPE: SLOPE OF EACH PART OF THE ROADWAY INCLUDING ROADWAY CROWN, SHOULDER SLOPE, AND/OR SUPERELEVATION. SEE DESIGN ROADWAY CROSS SECTION FOR LANE AND SHOULDER WIDTHS AND SLOPES.



DETAIL "A"



DETAIL "B"

MISSOURI HIGHWAY AND TRANSPORTATION COMMISSION

CONCRETE
SINGLE BOX STRUCTURE
FLARED WINGS
(SKEWED)

DATE: _____ | EFFECTIVE: 01-01-2003 | 703.14E | 3/3