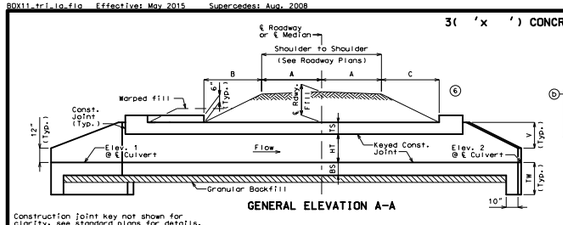
BOX11_tri_ig.fig Effective: May 2015 Supercedes: Aug. 2008

3('x ') CONCRETE BOX CULVERT

SEC/SUR ✱ TWP ✱ RGE ✱

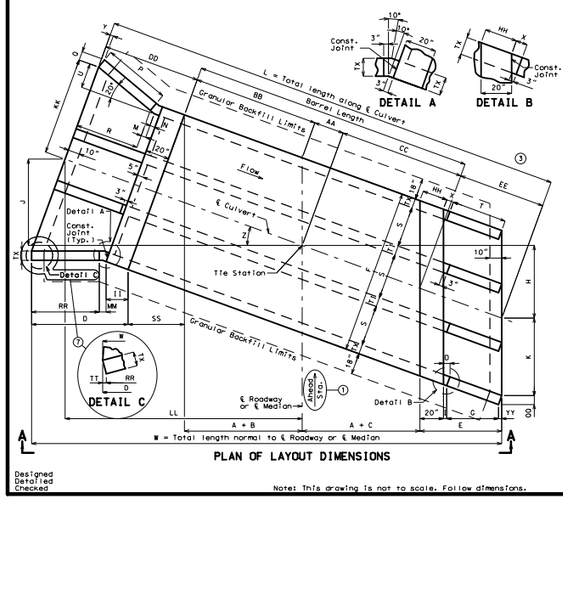


GENERAL ELEVATION A-A

Construction joint key not shown for clarity; see standard plans for details.

If any part of the barrel is exposed, the roadway fill shall be warped to provide 12 inches minimum cover. (Roadway Item)

If unsuitable material is encountered, excavation of unsuitable material and furnishing and placing of granular backfill shall be in accordance with Sec 206.



PLAN OF LAYOUT DIMENSIONS

LOCATION SKETCH

Designed
Detailed
Checked

Note: This drawing is not to scale. Follow dimensions.

Sheet No. 1 of

Layout Dimensions

Var.	Equation	Dim.	Var.	Equation	Dim.	Var.	Equation	Dim.
S	- - -	x	K	(35/2 + T1)(sec Z)	x	BB	(A + B)(sec Z)	x
HT	- - -	x	L	AA + BB + CC + DD + EE	x	CC	(A + C)(sec Z)	x
TS	- - -	x	M	N(cos 20°)	x	DD	R + M + N + 20"	x
BS	- - -	x	N	3" + TX(tan 10°)	x	EE	E(sec Z)	x
TX	- - -	x	O	I + YY	x	HH	20"(sec Z)	x
T1	- - -	x	P	2V[sec(Z + 20°)]	x	II	20"(cos Z)	x
A	- - -	x	Q	TX(cos 20°)	x	KK	35/2 + T1 + U	x
B	- - -	x	R	P(cos 20°)	x	LL	(AA + BB + DD)(cos Z)	x
C	- - -	x	T	G(sec Z)	x	MM	3"[cos Z + cos(Z - 20°)]	x
D	II + MM + RR (+ TT) (7)	x	U	(R + M)(tan 20°)	x	QQ	TX(cos Z)	x
E	G + O + 20"	x	V	HT + TS - 12"	x	RR	P[cos(Z - 20°)]	x
F	3S + 2TX + 2T1 (b)	x	W	2A + B + C + D + E + SS	x	SS	F(sin Z)	x
G	2V	x	X	3" + TX(tan Z)	x	TT	TX[sin(20° - Z)] (7)	x
H	(A + C + E)(tan Z)	x	Y	TX(sin 20°)	x	YY	TX(sin Z)	x
I	3"(cos Z)	x	Z	Skew Angle	x	TW	Max{3'-4" or (BS + 12")}	x
J	(AA + BB + DD)(sin Z)	x	AA	F(tan Z)/2	x			

Hydrologic Data

Drainage Area = ___ mi^2
Design Flood Frequency = ___ years
Design Flood Discharge = ___ cfs
Design Flood (D.F.) Elevation = _____ ft

Base Flood (100-year)

Base Flood Elevation = _____
Base Flood Discharge = ___ cfs
Estimated Backwater = ___ ft
Outlet Velocity = __ ft/s

Roadway Overtopping

Overtopping Flood Discharge = ___ cfs
Overtopping Flood Frequency = ___ years
_____ Flood Elevation = _____

Elevations

Upstream (Elev. 1) =
Downstream (Elev. 2) =
Pr. Gr. at Tie Sta. =

Fill Heights

(6) ℄ Rdwy at ℄ Culvert = ft
Design (All units) = ft

Dimensions are based on end units. Fill heights are measured from the top of top slab to the top of earth fill or roadway. (a)

Estimated Quantities

			Final
Class 4 Excavation	cu. yard	x	
Removal of Bridges	lump sum	1	
Class B-1 Concrete (Culverts-Bridge)	cu. yard	x	
Reinforcing Steel (Culverts-Bridge)	pound	x	

(2)

General Notes:

Design Specifications:
2010 AASHTO LRFD Bridge Design Specifications and 2010 Interim Revisions

Design Loading:
Vehicular = HL-93 minus lane load. Earth = 120 lb/cf
Equivalent Fluid Pressure = 30 lb/cf (min.), 60 lb/cf (max.)

Design Unit Stresses:
Class B-1 Concrete (Box Culvert) f'c = 4,000 psi
Reinforcing Steel (Grade 60) fy = 60,000 psi

Miscellaneous:
MoDOT Construction personnel will indicate the type of box culvert constructed:
☐ Precast Concrete Box used
☐ Cast-In-Place Concrete Box used

When alternate precast concrete box sections are used, the minimum distance from inside face of headwalls to precast sections measured along the shortest wall shall be 3 feet. Reinforcement and dimensions for wings and headwalls shall be in accordance with Missouri Standard Plans.

Channel bottom shall be graded within the right of way for transition of channel bed to culvert openings. Channel banks shall be tapered to match culvert openings. (Roadway Item)

Traffic Handling:
Structure to be closed during construction. Traffic to be maintained on during construction. See roadway plans for traffic control.

B.M.

CULVERT-BRIDGE: ROUTE ✱ OVER ✱

ROUTE ✱ FROM ✱ TO ✱
ABOUT ✱ MILES ✱ OF ✱
TIE STA. ---------

STD. 703.37
STD. 703.83
STD. 703.86
STD. 703.87
STD. 706.35

"THIS MEDIA SHOULD NOT BE CONSIDERED A CERTIFIED DOCUMENT."

DATE PREPARED: 6/2/2015
ROUTE ✱ STATE MO
DISTRICT BR SHEET NO. ✱
COUNTY ✱
JOB NO. ✱
CONTRACT NO.
PROJECT NO.
BRIDGE NO. BOX 11

DESCRIPTION | DATE | APPROVALS

MISSOURI HIGHWAY AND TRANSPORTATION COMMISSION

105 WEST CAPITOL, JEFFERSON CITY, MO 65101
1-888-ASK-MODOT (1-888-275-6636)

BOX11_tri_ig_fig.dgn 11:22:40 AM 6/2/2015

Standard Drawing Guidance

(Do not show on plans. Turn off the Bridge Construction level to hide)

Some details have been grouped together to allow easy substitution with alternate details. To edit grouped details, select them and press <Ctrl> U.

(1) Ahead station is shown for streams flowing left to right. Arrow must be flipped for streams that flow right to left.

(2) Modify Estimated Quantities as "Required. Don't leave blank rows but leave space between Estimated Quantities and General Notes for at least one pay item to be added during construction. See Alternate Details for culvert extensions, or if five items are required.

(3) Add any required transverse joints proportionally spaced along the barrel. Label units and add actual lengths of units along the barrel.

(4) Insert STD 703.60 when pipe inlets are required. Add pipe inlets to Plan of Layout Dimensions at appropriate locations and to Elevation A-A if visible from elevation. Add inlet data using notes where space allows, or use tables.

(5) For nonstandard culverts with only one design fill height, add supplemental reinforcement table.

(6) No need to revise General Elevation A-A for dual roadways. In Fill Heights table add a lane designation after ℄ Rdwy and insert another row for the other lane.

(7) For skews 20 degrees or more, remove Detail C, remove TT from equation for D and place "N/A" in the Dim. column of Dimension TT. Will first need to separate Detail C from Plan by selecting and pressing <Ctrl> U.

*** VARIABLE DESIGN FILL HEIGHTS ***

(a) Select and delete the details grouped with the Fill Heights table. Select and move the alternate grouped details to drawing.

(b) Place "See Member Thickness table" in the Equation column and place "Varies" in the Dim. column. If Dimension F varies, place "Varies" in the Dim. column.

(c) Remove blank rows. End units may have different design fill heights but both units need to have the same member thicknesses.

(d) This portion of table required when design fill height exceeds limits of the standard plans or when culvert cell height or span is not standard. If only a portion of the units are nonstandard, fill out entire table using the values from the standard table where applicable. Omit if not required.

If any part of the barrel is exposed, the roadway fill shall be warped to provide 12 inches minimum cover. (Roadway Item)

Construction joint key not shown for clarity; see standard plans for details.

If unsuitable material is encountered, excavation of unsuitable material and furnishing and placing of granular backfill shall be in accordance with Sec 206.

ALTERNATE AND SUPPLEMENTAL DETAILS

Corresponds to the border of the standard drawing for ease in moving alternate details (Snap to corner)

Pipes With Same Diameter

XX" Pipe Inlet Data

Station	Offset	F.L. Elev.
xx+xx.xx	xx.xx' XX	xxx.xx
xx+xx.xx	xx.xx' XX	xxx.xx
xx+xx.xx	xx.xx' XX	xxx.xx

Pipes With Different Diameters

Pipe Inlet Data

Station	Offset	Dia.	F.L. Elev.
xx+xx.xx	xx.xx' XX	xx"	xxx.xx
xx+xx.xx	xx.xx' XX	xx"	xxx.xx
xx+xx.xx	xx.xx' XX	xx"	xxx.xx

Inlets Sized for Elevation A-A (Pipe Diameter/Culvert Ht)

0.1	0.2	0.3	0.4	0.5
0.6	0.7	0.8	0.9	

Ext Use 0.5 detail for 36" pipe into a 6' tall culvert.

Supplemental Pipe Inlet Details (4)

Supplemental Reinforcement Table (Nonstandard culverts with only one design fill height) (5)

Top Slab Reinforcement																Bottom Slab Reinforcement												Wall Reinforcement					
A1 Bars		J3 Bars			H1 Bars					H2 Bars						A2 Bars		J4 Bars				H3 Bars						B1 Bars		B2 Bars			
Sz.	Spa.	Sz.	Spa.	C1	K2	Sz.	Spa.	C5	Q8	Sz.	Spa.	C6	Q9			Sz.	Spa.	Sz.	Spa.	C4	K3	Sz.	Spa.	C7	Q10			Sz.	Spa.	Sz.	Spa.	G1	
x	x	x	x	x	x	x	x	x	x	x	x	x	x			x	x	x	x	x	x	x	x	x	x			x	x	x	x	x	

Substitute table for tables shown on Standard Plan 703.87

Alternate Details for Multiple Design Fill Heights (a)

Fill Heights

℄ Rdwy at ℄ Culvert = ft
Design (Units 1 &) = ft
Design (Units &) = ft
Design (Units &) = ft

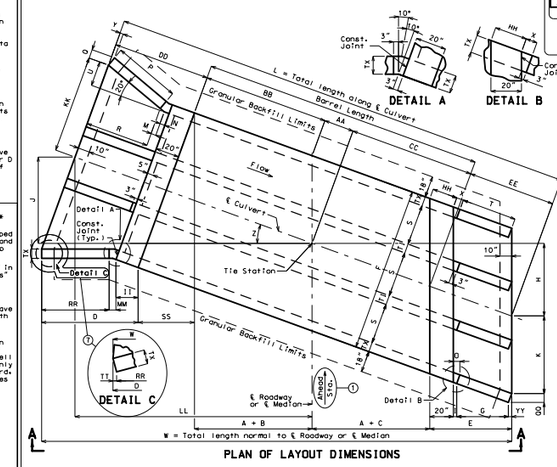
Dimensions are based on end units, except AA is based on Unit __. Fill heights are measured from the top of top slab to the top of earth fill or roadway.

Estimated Quantities

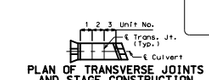
			Final
Class 4 Excavation	cu. yard	x	
Temporary Shoring	lump sum	1	
Partial Removal of Culvert-Bridge Concrete	lump sum	1	
Class B-1 Concrete (Culverts-Bridge)	cu. yard	x	
Reinforcing Steel (Culverts-Bridge)	pound	x	

(2)

Alternate Estimated Quantities for Culvert Extensions or when Five Items are Required



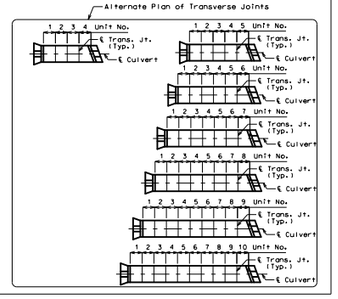
PLAN OF LAYOUT DIMENSIONS



PLAN OF TRANSVERSE JOINTS AND STAGE CONSTRUCTION

Remove if not applicable.

Alternate Plan of Transverse Joints



LOCATION SKETCH

Unit No.	Unit Length	Member Thickness						Top Slab Reinforcement														Bottom Slab Reinforcement												Wall Reinforcement					
								A1 Bars		J3 Bars			H1 Bars					H2 Bars				A2 Bars		J4 Bars				H3 Bars						B1 Bars		B2 Bars			
		TS	BS	TX	T1	F		Sz.	Spa.	Sz.	Spa.	C1	K2	Sz.	Spa.	C5	Q8	Sz.	Spa.	C6	Q9	Sz.	Spa.	Sz.	Spa.	C4	K3	Sz.	Spa.	Sz.	Spa.	C7	Q10	Sz.	Spa.	Sz.	Spa.	G1	
x	x	x	x	x	x	-	-	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
x	x	x	x	x	x	-	-	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
x	x	x	x	x	x	-	-	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	

Substitute table for tables shown on Standard Plan 703.87