



UNIVERSAL CULVERT DESIGN

PID : 118153 **Date :** 11/08/2023 **Project :** COL-644-8.00

Location : Hanoverton, Ohio (SR-644)

Description : Proposed Conditions - COL-644 Culvert Analysis (40.716469 N, -80.909357 W)

Designer : JDB

HEADWATER CONTROL CODES: INLET - Inlet Control.
 OUTLET - Outlet Control.
 OUTLET* - Outlet Control with backwater curve used to compute headwater. See Figure III - 7E in HDS 5 for type flow.
 OUTLET** - Outlet Control - See Figure III - 7D in HDS 5 for type flow.
 N/A - Flow is supercritical with low headwater and low tailwater. Control Section is at the inlet.

Inlet Invert Elevation (ft.) : 1110.82 **Outlet Invert Elevation (ft.) :** 1108.00 **Tailwater Elevation (ft.) :** 1109.60 **Overflow Elevation (ft.) :** 1132.89
Allowable Headwater Elevation (ft.) : 1131.83 or Diameter + 2 ft. (whichever is less)
Pipe Length (ft.) : 124.00 **Culvert Slope (ft./ft.) :** 0.0227 **Design Manning 'n' :** 0.0120
Design Discharge (cfs) : 27.65 @ 10 yrs. **Flood Discharge (cfs) :** 38.72 @ 100 yrs.

	FLOW	PIPE	CULVERT SIZE	HWI	HWO	FLOW	VELOCITY	DN	DC	MANNING	HEADWATER	OVER	DESIGN	BURIAL
	(cfs.)	#		(ft.)	(ft.)	TYPE	(fps.)	(ft.)	(ft.)	N	CONTROL	FLOW	CODE	DEPTH
												(cfs.)		(ft.)
CULVERT TYPE : CIRCULAR SMOOTH			Entrance Type : Half Headwall							Entrance Loss (Ke) : 0.20				
	27.65	1	24 in.	1114.6	1112.9	2 - E	12.90	1.29	1.82	0.0120	INLET	0.00	D	0.00
	27.65	1	21 in.	1116.0	1115.3	2 - E	11.50	1.75	1.70	0.0120	INLET	0.00	D - 1	0.00
	27.65	1	18 in.	1119.7	1121.4	2 - G	15.65	1.50	1.49	0.0120	OUTLET	0.00	D - 2	0.00
	27.65	1	27 in.	1113.8	1111.7	2 - E	13.01	1.19	1.83	0.0120	INLET	0.00	D + 1	0.00
	38.72	1	24 in.	1116.8	1115.8	2 - E	13.34	1.74	1.95	0.0120	INLET	0.00	F	0.00
	38.72	1	21 in.	1120.1	1120.8	2 - F	16.12	1.75	1.74	0.0120	OUTLET**	0.00	F - 1	0.00
	36.22	1	18 in.	1141.2	1132.8	2 - H	20.50	1.50	1.50	0.0120	INLET	2.50	F - 2	0.00
	38.72	1	27 in.	1115.3	1113.5	2 - E	14.02	1.47	2.07	0.0120	INLET	0.00	F + 1	0.00
CULVERT TYPE : CIRCULAR CORRUGATED			Entrance Type : Half Headwall							Entrance Loss (Ke) : 0.90				
Corrugated Metal Pipe (2 2/3 x 1/2 in. corrugations)														
	27.65	1	27 in.	1114.6	1114.9	2 - F	7.98	2.25	1.83	0.0245	OUTLET**	0.00	D	0.00



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FLOW (cfs.)	PIPE #	CULVERT SIZE	HWI (ft.)	HWO (ft.)	FLOW TYPE	VELOCITY (fps.)	DN (ft.)	DC (ft.)	MANNING N	HEADWATER CONTROL	OVER FLOW (cfs.)	DESIGN CODE	BURIAL DEPTH (ft.)
27.65	1	24 in.	1115.9	1118.8	2 - F	9.21	2.00	1.82	0.0247	OUTLET**	0.00	D - 1	0.00
27.65	1	21 in.	1118.1	1127.2	2 - F	11.59	1.75	1.70	0.0248	OUTLET**	0.00	D - 2	0.00
27.65	1	30 in.	1113.9	1113.0	2 - E	7.52	1.75	1.79	0.0244	INLET	0.00	D + 1	0.00
38.72	1	27 in.	1116.9	1119.8	2 - F	10.11	2.25	2.07	0.0245	OUTLET**	0.00	F	0.00
38.72	1	24 in.	1119.2	1127.4	2 - F	12.42	2.00	1.95	0.0247	OUTLET**	0.00	F - 1	0.00
31.72	1	21 in.	1126.9	1144.1	2 - F	13.23	1.75	1.72	0.0248	OUTLET**	7.00	F - 2	0.00
38.72	1	30 in.	1115.5	1116.0	2 - F	8.80	2.50	2.10	0.0244	OUTLET**	0.00	F + 1	0.00
Corrugated Metal Pipe (3 x 1 in. corrugations)													
27.65	1	36 in.	1113.3	N/A	1 - C	6.86	1.66	1.70	0.0281	INLET	0.00	D	0.00
27.65	1	42 in.	1113.2	N/A	1 - C	6.92	1.52	1.62	0.0278	INLET	0.00	D + 1	0.00
38.72	1	36 in.	1114.1	1114.5	2 - F	7.63	2.09	2.03	0.0281	OUTLET*	0.00	F	0.00
38.72	1	42 in.	1113.7	N/A	1 - C	7.54	1.84	1.93	0.0278	INLET	0.00	F + 1	0.00
Corrugated Metal Pipe (6 x 2 in. corrugations)													
27.65	1	60 in.	1112.8	N/A	1 - C	5.94	1.43	1.46	0.0332	INLET	0.00	D	0.00
27.65	1	66 in.	1112.7	N/A	1 - C	5.90	1.38	1.42	0.0330	INLET	0.00	D + 1	0.00
38.72	1	60 in.	1113.3	N/A	1 - C	6.52	1.71	1.74	0.0332	INLET	0.00	F	0.00
38.72	1	66 in.	1113.1	N/A	1 - C	6.50	1.64	1.69	0.0330	INLET	0.00	F + 1	0.00
Corrugated Metal Pipe (6 x 2 in. corrugations, Field Paved Invert)													
27.65	1	60 in.	1112.8	N/A	1 - C	7.06	1.27	1.46	0.0260	INLET	0.00	D	0.00
27.65	1	66 in.	1112.7	N/A	1 - C	7.00	1.23	1.42	0.0260	INLET	0.00	D + 1	0.00
38.72	1	60 in.	1113.3	N/A	1 - C	7.77	1.51	1.74	0.0260	INLET	0.00	F	0.00
38.72	1	66 in.	1113.1	N/A	1 - C	7.71	1.45	1.69	0.0260	INLET	0.00	F + 1	0.00