

Technical Bulletin

Pipes – An Overview

Pipes – A pipe, or culvert, is an enclosed conduit that is used to carry water under a road so that it can continue on its natural course. Crosspipes are culverts used to carry only road drainage under the roadway. Stream pipes refer to larger culverts that convey stream water under the road.



Photo 1

A plastic crosspipe is used to convey ditch flow under the roadway



Photo 2

A stream passes through an old metal culvert.

PURPOSE – Typically pipes are used for two functions on unpaved roads: (1) As a crosspipe to convey ditch flow away from the road, and (2) as a stream pipe, which allow streams to cross underneath the road.

BENEFITS OF PIPES

- **Crosspipes:** Properly managing ditch drainage through the use of pipes will help to preserve the roadbed, ditches, and banks. Erosion and sediment deposition into nearby streams will be decreased.
- **Stream Pipes:** When properly installed, stream-crossing pipes help enable fish passage and help preserve the stream ecosystem. There are many different materials and sizes, which allows the consideration of various site characteristics when choosing the pipe.

WHERE TO USE

- **Crosspipes** – Crosspipes should be used to convey road drainage across the roadway as often as possible to prevent excessive flow and erosion in long ditch runs. Adding more crosspipes will mean less water in the road ditch and less water flowing out of each individual pipe. Crosspipes should be outletted away from streams whenever possible to keep sediment-laden road runoff away from the watercourse.
- **Stream Pipes** – Stream pipes are used at minor stream crossings where a bridge is not necessary or economically feasible.

GENERAL PIPE CONSIDERATIONS

- Pipes need to be carefully installed in order to ensure that they will properly function. Installation considerations include: inlet elevation, outlet elevation, grade, adequate compacted cover, and inlet/outlet protection.
- Routine maintenance is required to ensure that the pipes are not plugged and that the area above and below the pipe is free of debris.

CROSSPIPE CONSIDERATIONS

- Place crosspipe outlets at natural ground elevation, on firm, non-erosive soil or in rocky or brushy areas.
- Discharge crosspipes where there is high infiltration capability or into vegetated filter strips or sediment traps before the discharge reaches surface waterways.
- Use additional crosspipes to prevent water from building erosive force in the road ditch. Steeper roads require more frequent crosspipes to prevent erosion.

STREAM-CROSSING CONSIDERATIONS

- Pipes need to be sized properly depending on their location and watershed in order to be capable of handling large flow volumes without plugging. Check with you local Conservation District about permit requirements.
- Do not force streams to turn into and out of a pipe that goes straight across the road. Instead, use longer pipes placed at an angle in line with the natural flow of the stream.
- Limit construction activity to periods of low flow in streams.
- Minimize natural channel changes and the amount of excavation or fill in the channel.
- Consider purchasing a larger pipe and embedding the bottom of the pipe in the stream channel.
- Consider alternative techniques such as the use of multiple pipes, or the use of a bottomless arch pipe which retains the natural streambed and requires less cover.

More information on standards for pipes can be found at the American Society for Testing Materials (ASTM) or in local ordinances

	Diameter	Plastic	Corrugated Metal	Concrete	Ductile Iron*
Estimated Life Expectancy	-	30 years	30 years (Steel), 75+ years (Aluminum)	75-100 years	30 years
Required Cover Thickness	15"	12"	12"	12"	30" (2.5')
	48"	12"	12"	12"	30" (2.5')
Cost/foot (approximate)	15"	\$6.25	\$8.41	\$12.50	\$39
	48"	\$50.00	\$26.22	\$82.52	\$297
Weight (lbs per foot)	15"	4.6	10.78	127	50*
	48"	31.25	33.64	867	260
Corrosion Resistance (acid mine drainage, etc)	-	Resistant to Corrosion	Steel-subject to corrosion, Aluminum-resistant to corrosion	Resistant to Corrosion	Resistant to Corrosion
Full Flow Capacity (cfs)	15"	10	5	8	12*
	48"	230	106	177	221

* Ductile iron figures are for 16" and 48" pipe.

Table 1 – Summary of typical pipe characteristics for different pipe materials. Data in this table were gathered from several sources, and it is a rough estimate of values intended as a guide. Consult local manufacturers for product recommendations.

References:

- Low Volume Roads Engineering: Best Management Practices Field Guide. Gordon Keller and James Sherar. July 2003. http://pdf.dec.org/pdf_docs/PNADB595.pdf
- Dipra, <http://www.dipra.org/faq/design.cfm#FAQ9>
- Lane, <http://www.lane-enterprises.com/>
- Hanson Pipe Products, <http://www.hansonpipeandproducts.com/>
- American Concrete Pipe Association <http://www.concrete-pipe.org/>
- Rinker, <http://www.rinker.com/>

- Concrete Info: Rinker, Hanson, American Concrete Pipe Association, Lane
- Plastic Pipe Info: ADS Pipes and Lane Pipes
- Corrugated Metal and Aluminum pipe information: Lane
- Steel pipe information: Process Associates of America
- Ductile Iron pipe info: Ductile Iron Pipe Research Association (Dipra)