

TECHNICAL NOTES

Principal Spillway Cantilevered Outlet and Pipe Support

A pipe support or pier shall be used to support the cantilevered outlet of the barrel when present or future conditions at the outlet end of pipe may not be adequate to provide firm support. The pipe support should be placed at the intersection of the downstream slope of the embankment and the flow line of the outlet channel projected upstream. The cantilever length shall extend beyond the pipe support and shall be a minimum of 3.0 feet above the flow line of the outlet channel.

See the table below for the requirements of the maximum unsupported or cantilevered lengths of corrugated metal pipes.

For solid wall plastic, corrugated plastic or concrete pipe the maximum allowable unsupported or cantilever length shall be computed from a cantilever beam analysis for the given pipe material, section modulus and cantilever distance. If the cantilever distance exceeds the allowable, the pipe shall be supported with a constructed beam or cradle. Plastic pipes may be sleeved with a corrugated metal pipe with the allowable unsupported or cantilevered lengths as shown in the tables below.

A pipe support may not be required if the downstream channel is stable or a scour hole is not likely to develop due to low peak discharges. When a pipe support is not used, the pipe shall extend not less than 3 feet beyond the point where the downstream slopes of the embankment intersect the flow line of channel, projected upstream. The outlet end of barrel shall be placed a minimum of 2.0 feet above the flow line of the channel. If aggrading or siltation in the channel is possible, then the outlet end of pipe should be raised.

For gated drawdown or trickle tube outlets the pipe shall extend not less than 3 feet beyond the point where the downstream slopes of the embankment intersect the flow line of channel (or natural ground), projected upstream. No minimum height requirement above the channel or ground surface is required, but adequate protection from erosion or operational concerns do to ice or sedimentation shall be addressed.

Corrugation $2\frac{2}{3} \times \frac{1}{2}$ inches

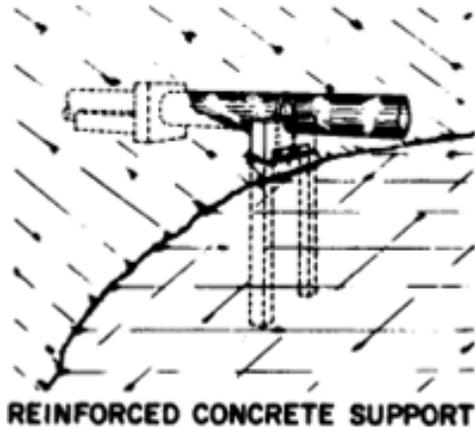
Corrugated Steel Pipe Gauge					
Diameter of Pipe (inches)	16 gauge	14 gauge	12 gauge	10 gauge	8 gauge
	Length of Cantilever (feet)				
24	6.5	7.5	10		
26	6	7.5	10	12.5	
48	5.5	7	9.5	12.5	15
60		7	9.5	12	14.5
72			9.0	12	14.5
84				11.5	14
96					13.5

Corrugation 5 X 1 inches or 3 X1 inches

Corrugated Steel Pipe Gauge					
Diameter of Pipe (inches)	16 gauge	14 gauge	12 gauge	10 gauge	8 gauge
	Length of Cantilever (feet)				
36	4.5	5.5			
48	4.5	5.5	7.5		
60	4	5	7	9	11
72	4	5	7	9	11
84	4	5	7	9	11
96		5	7	9	11
108			7	9	10.5

Design Rational for the above CMP tables. . Allowable span lengths for simply supported corrugated steel pipes were taken from The Handbook of Steel Drainage and Highway Construction Products. Allowable cantilever lengths were computed by equating the maximum moment for a simple span with uniform load $\left(\frac{wl^2}{8}\right)$ length to the cantilever maximum moment $\left(\frac{wl^2}{2}\right)$.

Typical Pipe Supports



References

NATIONAL ENGINEERING HANDBOOK, SECTION 16
DRAINAGE OF AGRICULTURAL LAND
CHAPTER 5. OPEN DITCHES FOR DRAINAGE - DESIGN, CONSTRUCTION AND MAINTENANCE

ENGINEERING FIELD HANDBOOK, CHAPTER 6, STRUCTURES

HANDBOOK OF STEEL DRAINAGE AND HIGHWAY CONSTRUCTION PRODUCTS, TABLE 3-4,
Allowable Span in Feet for CSP Flowing Full.