

# **Standard Specifications for Road and Bridge Construction**

Adopted January 1, 2012



**Illinois Department of Transportation**

**SECTION 542. PIPE CULVERTS**

**542.01 Description.** This work shall consist of furnishing and installing pipe culverts.

**542.02 Materials.** Materials shall be according to the following.

Item	Article/Section
(a) Corrugated Steel Pipe .....	1006.01
(b) Corrugated Steel Pipe Arch .....	1006.01
(c) Bituminous Coated Corrugated Steel Pipe .....	1006.01
(d) Bituminous Coated Corrugated Steel Pipe Arch .....	1006.01
(e) Zinc and Aramid Fiber Composite Coated Corrugated Steel Pipe .....	1006.01
(f) Aluminized Steel Type 2 Corrugated Pipe .....	1006.01
(g) Aluminized Steel Type 2 Corrugated Pipe Arch .....	1006.01
(h) Precoated Galvanized Corrugated Steel Pipe .....	1006.01
(i) Precoated Galvanized Corrugated Steel Pipe Arch .....	1006.01
(j) Corrugated Aluminum Alloy Pipe .....	1006.03
(k) Corrugated Aluminum Alloy Pipe Arch .....	1006.03
(l) Extra Strength Clay Pipe .....	1040.02
(m) Concrete Sewer, Storm Drain, and Culvert Pipe .....	1042
(n) Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe .....	1042
(o) Reinforced Concrete Elliptical Culvert, Storm Drain, and Sewer Pipe .....	1042
(p) Reinforced Concrete Arch Culvert, Storm Drain, and Sewer Pipe .....	1042
(q) Polyvinyl Chloride (PVC) Pipe .....	1040.03
(r) Corrugated Polyvinyl Chloride (PVC) Pipe with a Smooth Interior .....	1040.03
(s) Polyvinyl Chloride (PVC) Profile Wall Pipe-794 .....	1040.03
(t) Polyvinyl Chloride (PVC) Profile Wall Pipe-304 .....	1040.03
(u) Corrugated Polyethylene (PE) Pipe with a Smooth Interior .....	1040.04
(v) Polyethylene (PE) Profile Wall Pipe .....	1040.04
(w) Polyethylene (PE) Pipe with a Smooth Interior .....	1040.04
(x) Rubber Gaskets and Preformed Flexible Joint Sealants for Concrete Pipe .....	1056
(y) Mastic Joint Sealer for Pipe .....	1055
(z) External Sealing Band .....	1057
(aa) Fine Aggregate (Note 1) .....	1003.04
(bb) Coarse Aggregate (Note 2) .....	1004.05
(cc) Packaged Rapid Hardening Mortar or Concrete .....	1018
(dd) Nonshrink Grout .....	1024.02
(ee) Reinforcement Bars and Welded Wire Fabric .....	1006.10
(ff) Handling Hole Plugs .....	1042.16

Note 1. The fine aggregate shall be moist.

Note 2. The coarse aggregate shall be wet.

**542.03 Material Permitted.** When a Class of pipe is specified, the material shall be selected from the following table. When a particular material is specified, no other kind of material will be permitted.

Class	Materials
A	Rigid Pipes: Extra Strength Clay Pipe Concrete Sewer Storm Drain and Culvert Pipe, Class 3 Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe Reinforced Concrete Elliptical Culvert, Storm Drain, and Sewer Pipe Reinforced Concrete Arch Culvert, Storm Drain, and Sewer Pipe
C	Rigid Pipes: Extra Strength Clay Pipe Concrete Sewer Storm Drain and Culvert Pipe, Class 3 Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe Reinforced Concrete Elliptical Culvert, Storm Drain, and Sewer Pipe Reinforced Concrete Arch Culvert, Storm Drain, and Sewer Pipe Flexible Pipes: Aluminized Steel Type 2 Corrugated Pipe Aluminized Steel Type 2 Corrugated Pipe Arch Precoated Galvanized Corrugated Steel Pipe Precoated Galvanized Corrugated Steel Pipe Arch Corrugated Aluminum Alloy Pipe Corrugated Aluminum Alloy Pipe Arch Polyvinyl Chloride (PVC) Pipe Corrugated Polyvinyl Chloride (PVC) Pipe with a Smooth Interior Polyvinyl Chloride (PVC) Profile Wall Pipe-794 Polyvinyl Chloride (PVC) Profile Wall Pipe-304 Polyethylene (PE) Profile Wall Pipe Polyethylene (PE) Pipe with a Smooth Interior
D	Rigid Pipes: Extra Strength Clay Pipe Concrete Sewer Storm Drain and Culvert Pipe, Class 3 Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe Reinforced Concrete Elliptical Culvert, Storm Drain, and Sewer Pipe Reinforced Concrete Arch Culvert, Storm Drain, and Sewer Pipe Flexible Pipes: Corrugated Steel Pipe Corrugated Steel Pipe Arch Bituminous Coated Corrugated Steel Pipe Bituminous Coated Corrugated Steel Pipe Arch Zinc and Aramid Fiber Composite Coated Corrugated Steel Pipe Aluminized Steel Type 2 Corrugated Pipe Aluminized Steel Type 2 Corrugated Pipe Arch Precoated Galvanized Corrugated Steel Pipe Precoated Galvanized Corrugated Steel Pipe Arch Corrugated Aluminum Alloy Pipe Corrugated Aluminum Alloy Pipe Arch Polyvinyl Chloride (PVC) Pipe Corrugated Polyvinyl Chloride (PVC) Pipe with a Smooth Interior Polyvinyl Chloride (PVC) Profile Wall Pipe-794 Polyvinyl Chloride (PVC) Profile Wall Pipe-304 Corrugated Polyethylene (PE) Pipe with a Smooth Interior Polyethylene (PE) Profile Wall Pipe Polyethylene (PE) Pipe with a Smooth Interior

When metric sizes are specified on the plans, the next larger available manufactured English pipe may be substituted at no additional cost to the Department.

For PE pipe culverts, where no end treatment is specified, a standard corrugated PE coupling shall be provided for each exposed end of the pipe. The coupling shall be installed flush with the end(s) of the pipe.

The Contractor may, at no additional cost to the Department, substitute a stronger pipe of the same kind of material specified.

When a pipe diameter is specified, only a circular pipe will be permitted. When a round size equivalent is specified, only elliptical or arch pipe will be permitted.

The kind of material and thickness or thickness class required for the various types of pipe culverts shall be according to Tables IA - IC, IIA, IIB, and IIIA – IIIC and the following.

- (a) Steel or aluminum alloy arch and concrete elliptical or arch pipes will be designated pipe culverts, special for fill heights exceeding 15 ft (4.5 m).
- (b) Extra strength clay pipe will only be permitted for pipe culverts Types 2 and 3, up to and including 36 in. (900 mm), for all pipe classes.
- (c) Concrete sewer, storm drain, and culvert pipe Class 3 will only be permitted for pipe culverts Type 2, up to and including 36 in. (900 mm); and pipe culverts Type 3, up to and including 24 in. (600 mm), for all pipe classes.

TABLE IIIA: PLASTIC PIPE PERMITTED FOR A GIVEN PIPE DIAMETER AND FILL HEIGHT OVER THE TOP OF THE PIPE														
Nominal Diameter in.	Type 1 Fill Height: 3' and less, with 1' min. cover							Type 2 Fill Height: Greater than 3', not exceeding 10'						
	PVC	CPVC	PVCPW -794	PVCPW -304	PE	CPE	PEPW	PVC	CPVC	PVCPW -794	PVCPW -304	PE	CPE	PEPW
10	X	NA	NA	NA	X	NA	NA	X	*	NA	NA	X	NA	NA
12	X	X	X	X	X	X	NA	X	X	X	X	X	X	NA
15	X	X	X	X	X	X	NA	X	X	X	X	X	X	NA
18	X	X	X	X	X	X	X	X	X	X	X	X	X	X
21	X	X	X	X	NA	NA	X	X	X	X	X	NA	NA	X
24	X	X	X	X	X	X	X	X	X	X	X	X	X	X
30	X	X	X	X	X	X	X	X	X	X	X	X	X	X
36	X	X	X	X	X	X	X	X	X	X	X	X	X	X
42	NA	NA	X	X	X	X	X	NA	NA	X	X	X	X	X
48	NA	NA	X	X	X	X	X	NA	NA	X	X	X	X	X

TABLE IIIB: PLASTIC PIPE PERMITTED FOR A GIVEN PIPE DIAMETER AND FILL HEIGHT OVER THE TOP OF THE PIPE												
Nominal Diameter in.	Type 3 Fill Height: Greater than 10', not exceeding 15'						Type 4 Fill Height: Greater than 15', not exceeding 20'					
	PVC	CPVC	PVCPW -794	PVCPW -304	PE	PEPW	PVC	CPVC	PVCPW -794	PVCPW -304		
10	X	*	NA	NA	X	NA	X	*	NA	NA		
12	X	X	X	X	X	NA	X	X	X	X		
15	X	X	X	X	X	NA	X	X	X	X		
18	X	X	X	X	X	X	X	X	X	X		
21	X	X	X	X	NA	X	X	X	X	X		
24	X	X	X	X	X	X	X	X	X	X		
30	X	X	X	X	X	X	X	X	X	X		
36	X	X	X	X	X	X	X	X	X	X		
42	NA	NA	X	X	X	X	NA	NA	X	X		
48	NA	NA	X	X	X	X	NA	NA	X	X		

PVC Polyvinyl Chloride (PVC) Pipe

CPVC Corrugated Polyvinyl Chloride (PVC) Pipe with a Smooth Interior

PVCPW-794 Polyvinyl Chloride (PVC) Profile Wall Pipe-794

PVCPW-304 Polyvinyl Chloride (PVC) Profile Wall Pipe-304

X This material may be used for the given pipe diameter and fill height.

NA This material is Not Acceptable for the given pipe diameter and fill height.

\* May be used if Bureau of Materials and Physical Research approves and with manufacturer's certification.

PE Polyethylene (PE) Pipe with a Smooth Interior

CPE Corrugated Polyethylene (PE) Pipe with a Smooth Interior

PEPW Polyethylene (PE) Profile Wall Pipe

TABLE IIIA: PLASTIC PIPE PERMITTED  
FOR A GIVEN PIPE DIAMETER AND FILL HEIGHT OVER THE TOP OF THE PIPE  
(Metric)

Nominal Diameter mm	Type 1 Fill Height: 1 m and less with 0.3 m min. cover							Type 2 Fill Height: Greater than 1 m, not exceeding 3 m						
	PVC	CPVC	PVCPW -794	PVCPW -304	PE	CPE	PEPW	PVC	CPVC	PVCPW -794	PVCPW -304	PE	CPE	PEPW
250	X	NA	NA	NA	X	NA	NA	X	*	NA	NA	X	NA	NA
300	X	X	X	X	X	X	NA	X	X	X	X	X	X	NA
375	X	X	X	X	X	X	NA	X	X	X	X	X	X	NA
450	X	X	X	X	X	X	X	X	X	X	X	X	X	X
525	X	X	X	X	NA	NA	X	X	X	X	X	NA	NA	X
600	X	X	X	X	X	X	X	X	X	X	X	X	X	X
750	X	X	X	X	X	X	X	X	X	X	X	X	X	X
900	X	X	X	X	X	X	X	X	X	X	X	X	X	X
1000	NA	NA	X	X	X	X	X	NA	NA	X	X	X	X	X
1200	NA	NA	X	X	X	X	X	NA	NA	X	X	X	X	X

TABLE IIIB: PLASTIC PIPE PERMITTED  
FOR A GIVEN PIPE DIAMETER AND FILL HEIGHT OVER THE TOP OF THE PIPE  
(Metric)

Nominal Diameter mm	Type 3 Fill Height: Greater than 3 m, not exceeding 4.5 m						Type 4 Fill Height: Greater than 4.5 m, not exceeding 6 m					
	PVC	CPVC	PVCPW -794	PVCPW -304	PE	PEPW	PVC	CPVC	PVCPW -794	PVCPW -304		
250	X	*	NA	NA	X	NA	X	*	NA	NA		
300	X	X	X	X	X	NA	X	X	X	X		
375	X	X	X	X	X	NA	X	X	X	X		
450	X	X	X	X	X	X	X	X	X	X		
525	X	X	X	X	NA	X	X	X	X	X		
600	X	X	X	X	X	X	X	X	X	X		
750	X	X	X	X	X	X	X	X	X	X		
900	X	X	X	X	X	X	X	X	X	X		
1000	NA	NA	X	X	X	X	NA	NA	X	X		
1200	NA	NA	X	X	X	X	NA	NA	X	X		

CPVC Corrugated Polyvinyl Chloride (PVC) Pipe with a Smooth Interior

PVCPW-794 Polyvinyl Chloride (PVC) Profile Wall Pipe-794

PVCPW-304 Polyvinyl Chloride (PVC) Profile Wall Pipe-304

X This material may be used for the given pipe diameter and fill height.

NA This material is Not Acceptable for the given pipe diameter and fill height.

\*

May be used if Bureau of Materials and Physical Research approves and with manufacturer's certification.

PVC Polyvinyl Chloride (PVC) Pipe

PE Polyethylene (PE) Pipe with a Smooth Interior

CPE Corrugated Polyethylene (PE) Pipe with a Smooth Interior

PEPW Polyethylene (PE) Profile Wall Pipe