

Standard Specifications for Road and Bridge Construction

Adopted January 1, 2012



Illinois Department of Transportation

pressure developed in the annular space shall not exceed the liner pipe manufacturer's recommended value.

Upon completion of the pumping operation, the remaining 6 in. (150 mm) at the upstream and downstream ends shall be filled with a nonshrink grout. Only enough water to make a stiff but workable nonshrink grout shall be used.

543.04 Method of Measurement. This work will be measured for payment in place in feet (meters).

Excavation in rock will be measured for payment according to Article 502.12.

543.05 Basis of Payment. This work will be paid for at the contract unit price per foot (meter) for INSERTION CULVERT LINER of the inside diameter specified.

Excavation in rock will be paid for according to Article 502.13.

SEWERS

SECTION 550. STORM SEWERS

550.01 Description. This work shall consist of constructing storm sewers.

550.02 Materials. Materials shall be according to the following.

Item	Article Section
(a) Clay Sewer Pipe	1040.02
(b) Extra Strength Clay Pipe	1040.02
(c) Concrete Sewer, Storm Drain, and Culvert Pipe	1042
(d) Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe	1042
(e) Reinforced Concrete Elliptical Culvert, Storm Drain, and Sewer Pipe (Note 1)	1042
(f) Reinforced Concrete Arch Culvert, Storm Drain, and Sewer Pipe (Note 1)	1042
(g) Polyvinyl Chloride (PVC) Pipe	1040.03
(h) Corrugated Polyvinyl Chloride (PVC) Pipe with a Smooth Interior	1040.03
(i) Polyvinyl Chloride (PVC) Profile Wall Pipe-794	1040.03
(j) Rubber Gaskets and Preformed Flexible Joint Sealants for Concrete Pipe	1056
(k) Mastic Joint Sealer for Pipe	1055
(l) External Sealing Band	1057
(m) Fine Aggregate (Note 2)	1003.04
(n) Coarse Aggregate (Note 3)	1004.05
(o) Reinforcement Bars and Welded Wire Fabric	1006.10
(p) Handling Hole Plugs	1042.16
(q) Polyvinyl Chloride (PVC) Profile Wall Pipe-304	1040.03
(r) Polyethylene (PE) Pipe with a Smooth Interior	1040.04
(s) Corrugated Polyethylene (PE) Pipe with a Smooth Interior	1040.04
(t) Polyethylene (PE) Profile Wall Pipe	1040.04

Note 1. The class of elliptical and arch pipe used for various storm sewer sizes and heights of fill shall conform to the requirements for circular pipe.

Note 2. The fine aggregate shall be moist.

Note 3. The coarse aggregate shall be wet.

550.03 Kinds of Material Permitted. When a Class of storm sewer 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: Clay Sewer Pipe Extra Strength Clay Pipe Concrete Sewer, Storm Drain, and Culvert Pipe 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
B	Rigid Pipes: Clay Sewer Pipe Extra Strength Clay Pipe Concrete Sewer, Storm Drain, and Culvert Pipe 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: 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) Pipe with a Smooth Interior Corrugated Polyethylene (PE) Pipe with a Smooth Interior Polyethylene (PE) Profile Wall Pipe

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

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.

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

The kind of material and thickness or thickness class required for the various types of storm sewers shall be according to the following tables.

STORM SEWERS
KIND OF MATERIAL PERMITTED AND STRENGTH REQUIRED
FOR A GIVEN PIPE DIAMETER AND FILL HEIGHT OVER THE TOP OF THE PIPE

Nom. Dia. in.	Type 1 Fill Height: 3' and less with 1' minimum cover										Type 2 Fill Height: Greater than 3', not exceeding 10'									
	RCCP Class	CSP Class	ESCP	PVC	CPVC	PVCPW -794	PVCPW -304	PE	CPE	PEPW	RCCP Class	CSP Class	ESCP	PVC	CPVC	PVCPW -794	PVCPW -304	PE	CPE	PEPW
10	NA	3	X	X	NA	NA	NA	X	NA	NA	NA	1	*X	X	**	NA	NA	X	NA	NA
12	IV	NA	NA	X	X	X	X	X	X	NA	III	1	*X	X	X	X	NA	X	X	NA
15	IV	NA	NA	X	X	X	X	X	X	NA	III	2	X	X	X	X	X	X	NA	
18	IV	NA	NA	X	X	X	X	X	X	X	III	2	X	X	X	X	X	X	X	
21	IV	NA	NA	X	X	X	X	NA	NA	X	III	2	X	X	X	X	X	NA	NA	
24	IV	NA	NA	X	X	X	X	X	X	X	III	2	X	X	X	X	X	X	X	
27	IV	NA	NA	X	X	X	X	X	X	X	III	NA	X	X	X	X	X	X	X	
30	III	NA	X	X	X	X	X	X	X	X	III	NA	X	X	X	X	X	X	X	
33	III	NA	X	X	NA	X	X	X	X	X	III	NA	X	X	NA	X	X	X	X	
36	III	NA	X	X	X	X	X	X	X	X	III	NA	X	X	X	X	X	X	X	
42	II	NA	NA	NA	NA	X	X	X	X	X	III	NA	NA	NA	NA	X	X	X	X	
48	II	NA	NA	NA	NA	X	X	X	X	X	III	NA	NA	NA	NA	X	X	X	X	
54	II	NA	NA	NA	NA	NA	NA	NA	NA	NA	III	NA	NA	NA	NA	NA	NA	NA	NA	
60	I	NA	NA	NA	NA	NA	NA	NA	NA	NA	II	NA	NA	NA	NA	NA	NA	NA	NA	
66	I	NA	NA	NA	NA	NA	NA	NA	NA	NA	II	NA	NA	NA	NA	NA	NA	NA	NA	
72	I	NA	NA	NA	NA	NA	NA	NA	NA	NA	II	NA	NA	NA	NA	NA	NA	NA	NA	
78	I	NA	NA	NA	NA	NA	NA	NA	NA	NA	II	NA	NA	NA	NA	NA	NA	NA	NA	
84	I	NA	NA	NA	NA	NA	NA	NA	NA	NA	II	NA	NA	NA	NA	NA	NA	NA	NA	
90	I	NA	NA	NA	NA	NA	NA	NA	NA	NA	II	NA	NA	NA	NA	NA	NA	NA	NA	
96	I	NA	NA	NA	NA	NA	NA	NA	NA	NA	II	NA	NA	NA	NA	NA	NA	NA	NA	
102	I	NA	NA	NA	NA	NA	NA	NA	NA	NA	II	NA	NA	NA	NA	NA	NA	NA	NA	
108	I	NA	NA	NA	NA	NA	NA	NA	NA	NA	II	NA	NA	NA	NA	NA	NA	NA	NA	

RCCP Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe
CSP Concrete Sewer, Storm Drain, and Culvert 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 also use standard strength Clay Sewer Pipe
** May be used if Bureau of Materials and Physical Research approves and with manufacturer's certification.

ESCP Extra Strength Clay Pipe
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

Storm Sewers

Art. 550.03

STORM SEWERS (metric) KIND OF MATERIAL PERMITTED AND STRENGTH REQUIRED FOR A GIVEN PIPE DIAMETER AND FILL HEIGHT OVER THE TOP OF THE PIPE																				
Nom. Dia. mm	Type 1 Fill Height: 1 m and less with 0.3 m minimum cover										Type 2 Fill Height: Greater than 1 m, not exceeding 3 m									
	RCCP Class	CSP Class	ESCP	PVC	CPVC	PVCPW -794	PVCPW -304	PE	CPE	PEPW	RCCP Class	CSP Class	ESCP	PVC	CPVC	PVCPW -794	PVCPW -304	PE	CPE	PEPW
250	NA	3	X	X	NA	NA	X	NA	NA	NA	NA	1	*X	X	**	NA	NA	X	NA	NA
300	IV	NA	NA	X	X	X	X	X	X	NA	III	1	*X	X	X	X	X	X	X	NA
375	IV	NA	NA	X	X	X	X	X	X	NA	III	2	X	X	X	X	X	X	NA	
450	IV	NA	NA	X	X	X	X	X	X	X	III	2	X	X	X	X	X	X	X	
525	IV	NA	NA	X	X	X	X	NA	NA	X	III	2	X	X	X	X	X	NA	NA	
600	IV	NA	NA	X	X	X	X	X	X	X	III	2	X	X	X	X	X	X	X	
675	IV	NA	NA	X	X	X	X	X	X	X	III	NA	X	X	X	X	X	X	X	
750	III	NA	X	X	X	X	X	X	X	X	III	NA	X	X	X	X	X	X	X	
825	III	NA	X	X	NA	X	X	X	X	X	III	NA	X	X	NA	X	X	X	X	
900	III	NA	X	X	X	X	X	X	X	X	III	NA	X	X	X	X	X	X	X	
1050	II	NA	NA	NA	NA	X	X	X	X	X	III	NA	NA	NA	NA	X	X	X	X	
1200	II	NA	NA	NA	NA	X	X	X	X	X	III	NA	NA	NA	NA	X	X	X	X	
1350	II	NA	NA	NA	NA	NA	NA	NA	NA	NA	III	NA	NA	NA	NA	NA	NA	NA	NA	
1500	I	NA	NA	NA	NA	NA	NA	NA	NA	NA	II	NA	NA	NA	NA	NA	NA	NA	NA	
1650	I	NA	NA	NA	NA	NA	NA	NA	NA	NA	II	NA	NA	NA	NA	NA	NA	NA	NA	
1800	I	NA	NA	NA	NA	NA	NA	NA	NA	NA	II	NA	NA	NA	NA	NA	NA	NA	NA	
1950	I	NA	NA	NA	NA	NA	NA	NA	NA	NA	II	NA	NA	NA	NA	NA	NA	NA	NA	
2100	I	NA	NA	NA	NA	NA	NA	NA	NA	NA	II	NA	NA	NA	NA	NA	NA	NA	NA	
2250	I	NA	NA	NA	NA	NA	NA	NA	NA	NA	II	NA	NA	NA	NA	NA	NA	NA	NA	
2400	I	NA	NA	NA	NA	NA	NA	NA	NA	NA	II	NA	NA	NA	NA	NA	NA	NA	NA	
2550	I	NA	NA	NA	NA	NA	NA	NA	NA	NA	II	NA	NA	NA	NA	NA	NA	NA	NA	
2700	I	NA	NA	NA	NA	NA	NA	NA	NA	NA	II	NA	NA	NA	NA	NA	NA	NA	NA	

- RCCP Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe
- CSP Concrete Sewer, Storm Drain, and Culvert 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 also use standard strength Clay Sewer Pipe
- ** May be used if Bureau of Materials and Physical Research approves and with manufacturer's certification.
- ESCP Extra Strength Clay Pipe
- 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

CONSTRUCTION REQUIREMENTS

550.04 Excavation and Foundation. Trenches shall be excavated to an elevation 4 in. (100 mm) below the bottom of the pipe and to the following widths.

Trench Depth/Protection	Required Trench Width On Each Side of the Pipe
5 ft (1.5 m) and less, without protection	9 in. (225 mm)
5 ft (1.5 m) and less, with protection	18 in. (450 mm)
Greater than 5 ft (1.5 m)	18 in. (450 mm)

The trench shall be excavated so that vertical faces are maintained at least to the elevation of the top of pipe. For trench depths greater than 5 ft (1.5 m), trench protection shall be utilized according to the applicable standards for work place safety. The Contractor shall provide to the Engineer, in writing, his/her procedures for fulfilling the safety requirements for trench protection.

If a water main is encountered during storm sewer construction, the requirements of the IEPA shall govern the horizontal and vertical separation of the water main from the storm sewer.

Well compacted aggregate, at least 4 in. (100 mm) in depth below the pipe, shall be placed for the entire width of the trench and length of the pipe; except when the storm sewer outlets from an embankment or natural ground, the last 3 ft (1 m) of the pipe shall be bedded in impervious material. The aggregate and impervious material shall be compacted by mechanical means to the satisfaction of the Engineer.

When pipe having bells or hubs is used, cross trenches not more than 2 in. (50 mm) wider than the bell or hub shall be excavated to provide uniform bearing along the length of the pipe.

If the excavation has been made deeper than necessary, the foundation shall be brought to the proper grade by the addition of well compacted bedding material.

Where a firm foundation is not encountered at the grade established due to soft, spongy, or otherwise unsuitable soil, unless other special construction methods are called for in the contract, all such unsuitable soil under the pipe and for the width of the trench shall be removed and replaced with well-compacted bedding material.

Where rock, in either ledge or boulder formation, is encountered, it shall be removed to an elevation at least 8 in. (200 mm) below the bottom of the pipe and replaced with a cushion of well compacted bedding material.

All excavated material not needed on the work shall be disposed of according to Article 202.03.

550.05 Plugging Existing Sewers and Drains. Abandoned sewers and drains, as designated by the Engineer, shall be plugged with Class SI concrete, or brick and suitable mortar, to the satisfaction of the Engineer.

This work will not be paid for separately, but shall be considered as included in the contract unit price bid for the storm sewer items or in the absence of such items for earth excavation.

550.06 Laying Sewer Pipe. The trench shall be kept free from water while the sewer is being placed and until the joint has been sealed. The laying of pipes shall be started at the outlet end with the spigot ends pointing in the direction of flow, and shall proceed toward the inlet end with pipes abutting and true to line and grade. The flow line at the outlet end of the pipe shall be at least 6 in. (150 mm) above the flow line of the open ditch.

When an end treatment, pipe tee, or elbow is required, it will be specified on the plans. End treatments shall be according to Article 542.07. Pipe tees and elbows shall be according to Article 542.08.

The ends of pipes shall be carefully cleaned before the pipes are lowered into the trenches, and the pipes shall be lowered so as to avoid unnecessary handling in the trench.

As each length of pipe is laid, the mouth of the pipe shall be properly protected to prevent the entrance of earth or the bedding material. The pipes shall be fitted and matched so that when laid in the work they will form a sewer with a smooth, uniform invert. If reinforced concrete pipe is used, the word "Top" or "Bottom" may be stenciled on the inside of the pipe sections. All concrete pipe so marked shall be placed as indicated by these marks. Each section of pipe shall be pushed or pulled to the section in place to ensure tight joints. Pipe having a diameter greater than 42 in. (1050 mm) shall be set or "brought home" with a winch, come-a-long, or other positive means.

All joints in concrete sewer pipe shall be sealed with rubber gaskets, preformed flexible joint sealants, mastic joint sealer, or external sealing bands. When mastic joint sealer is used, it shall be applied according to the manufacturer's recommendations and the material shall completely fill the joint after the pipes have been brought together. After each joint is sealed, it shall be wiped clean on the inside. Handling holes in concrete pipe shall be filled with a precast concrete plug and sealed with mastic or mortar; or filled with a polyethylene plug. The plug shall not project beyond the inside surface after installation.

PVC and PE pipes shall be joined according to the manufacturer's specifications.

550.07 Backfilling. As soon as the condition of the pipe will permit, the entire width of the trench shall be backfilled with aggregate to a height of at least the center of the pipe; except when the storm sewer outlets from an embankment or natural ground, the last 3 ft (1 m) of the pipe shall be backfilled with impervious material. The backfill material shall be placed longitudinally along the pipe. The elevation of the backfill material on each side of the pipe shall be the same. The space under the pipe shall be completely filled. The backfill material shall be placed in 8 in. (200 mm) lifts, loose measurement, and compacted by mechanical means to the satisfaction of the Engineer.

When using flexible pipe, as listed in the first table of Article 550.03, the aggregate shall be continued to a height of at least 1 ft (300 mm) above the top of the pipe and compacted to a minimum of 95 percent of standard lab density by mechanical means.

The installed pipe and its embedment shall not be disturbed when using movable trench boxes and shields, sheet pile, or other trench protection.

The remainder of the trench shall be backfilled to the natural line or finished surface as rapidly as the condition of the sewer will permit. The backfill material shall consist of suitable excavated material from the trench or trench backfill as herein specified. All backfill material shall be deposited in such a manner as not to damage the sewer. The filling of the trench shall be carried on simultaneously on both sides of the pipe.

The backfill material for trenches made in the subgrade of the proposed improvement, and trenches where the inner edge of the trench is within 2 ft (600 mm) of the proposed edge of pavement, curb, gutter, curb and gutter, stabilized shoulder or sidewalk, shall be trench backfill

All backfill material shall be deposited and compacted as specified in Method 1, 2, or 3 below. The method used shall be the choice of the Contractor. If the method used does not produce results satisfactory to the Engineer, the Contractor will be required to alter or change the method being used.

When trench backfill is used with Method 1, the lifts shall not exceed 8 in. (200 mm) in depth, loose measurement, and each lift shall be compacted to 85 percent of standard lab density by mechanical means. When trench backfill is used with Method 2 or 3, gradations CA 6 and CA 10 will not be allowed.

- (a) Method 1. The material shall be deposited in uniform lifts not exceeding 12 in. (300 mm) in depth, loose measurement, and each lift shall be compacted by mechanical means to the satisfaction of the Engineer.
- (b) Method 2. The material shall be deposited in uniform lifts not exceeding 12 in. (300 mm) thick, loose measurement, and each lift shall be either inundated or deposited in water.
- (c) Method 3. The trench shall be backfilled with loose material, and settlement secured by introducing water through holes jetted into the backfill to a point approximately 2 ft (600 mm) above the top of the pipe. The holes shall be spaced as directed by the Engineer but shall be no farther than 6 ft (2 m) apart.

The water shall be injected at a pressure just sufficient to sink the holes at a moderate rate of speed. The pressure shall be such that the water will not cut cavities in the backfill material nor overflow the surface. If water does overflow the surface, it shall be drained into the jetted holes by means of shallow trenches.

Water shall be injected as long as it will be absorbed by the backfill material and until samples taken from test holes in the trench show a satisfactory

moisture content. The Contractor shall bore the test holes not more than 50 ft (15 m) apart and at such other locations in the trench designated by the Engineer. As soon as the water soaking has been completed, all holes shall be filled with soil and compacted by ramming with a tool approved by the Engineer.

Backfill material which has been water soaked shall be allowed to settle and dry for at least ten days before any surface course or pavement is constructed on it. At the end of the settling and drying period, the crusted top of the backfill material shall be scarified and, if necessary, sufficient backfill material added, as specified in Method 1, to complete the backfilling operations.

In lieu of suitable excavated material or trench backfill, the Contractor may, at no additional cost to the Department, backfill the entire trench with controlled low-strength material according to Section 593.

When sheeting and bracing have been used, sufficient bracing shall be left across the trench as the backfilling progresses to hold the sides firmly in place without caving or settlement. This bracing shall be removed as soon as practicable. Any depressions which may develop within the area involved in the construction operation due to settlement of the backfilling material shall be filled in a manner meeting the approval of the Engineer.

When the Contractor constructs the trench with sloped or benched sides, backfilling for the full width of the excavation shall be as herein before specified, except no additional compensation will be allowed for trench backfill material required outside the vertical limits of the specified trench width.

Whenever excavation is made for installing sewer pipe across earth shoulders or private property, the topsoil disturbed by excavation operations shall be replaced as nearly as possible in its original position, and the whole area involved in the construction operations shall be left in a neat and presentable condition.

550.08 Deflection Testing for Storm Sewers. All PVC and PE storm sewers shall be tested for deflection not less than 30 days after the pipe is installed and the backfill compacted. The testing shall be performed in the presence of the Engineer.

For PVC and PE storm sewers with diameters 24 in. (600 mm) or smaller, a mandrel drag shall be used for deflection testing. For PVC and PE storm sewers with diameters over 24 in. (600 mm), deflection measurements other than by a mandrel drag shall be used.

Where the mandrel is used, the mandrel shall be furnished by the Contractor and pulled by hand through the pipeline with a suitable rope or cable connected to each end. Winching or other means of forcing the deflection gauge through the pipeline will not be allowed.

The mandrel shall be of a shape similar to that of a true circle enabling the gauge to pass through a satisfactory pipeline with little or no resistance. The mandrel shall be of a design to prevent it from tipping from side to side and to prevent debris build-up from occurring between the channels of the adjacent fins or legs during operation. Each end of the core of the mandrel shall have fasteners to which the pulling cables

can be attached. The mandrel shall have nine, various sized fins or legs of appropriate dimension for various diameter pipes. Each fin or leg shall have a permanent marking that states its designated pipe size and percent of deflection allowable.

The outside diameter of the mandrel shall be 95 percent of the base inside diameter. For all PVC pipe and PE Profile Wall pipe, the base inside diameter shall be defined using ASTM D 3034 methodology. For all other PE pipe, the base inside diameter shall be defined as the average inside diameter based on the minimum and maximum tolerances specified in the corresponding ASTM or AASHTO material specifications.

If the pipe is found to have a deflection greater than that specified, that pipe section shall be removed, replaced, and retested.

550.09 Method of Measurement. Storm sewers will be measured for payment in place in feet (meters). When the storm sewer enters a manhole, inlet, or catch basin, the measurement will end at the inside wall of the manhole, inlet or catch basin. Allowance will be made for the length of pipe necessary to permit the pipe to meet the sides of the manhole. No payment for storm sewer will be made through an inlet or manhole where the inlet or manhole is paid for as a separate item. However, when the storm sewer is continuous and the inlet is constructed on top of the storm sewer, the measurement will be from end to end of storm sewer with a deduction made for the tee section which is paid for separately.

Trench backfill will be measured for payment according to Article 208.03.

Excavation in rock will be measured for payment according to Article 502.12.

550.10 Basis of Payment. This work will be paid for at the contract unit price per foot (meter) for STORM SEWERS, of the class, type, and diameter specified, and of the kind of material when specified.

Trench backfill will be paid for according to Article 208.04.

Excavation in rock will be paid for according to Article 502.13.

Removal and replacement of unsuitable material below plan bedding grade will be paid for according to Article 109.04.

End treatments, pipe tees, and elbows will be paid for according to Article 542.11.