

SECTION 035
SPECIFICATIONS - PIPE INSTALLATION

1.0 General

All aspects of pipe installation, including, but not limited to, joint construction, bedding, pipe material, concrete thrust block design and construction, backfilling, trench construction, maximum loading imposed on pipe in the trench, and field testing, shall conform to the Manufacturer's Specification for the particular type of pipe specified. It shall be the responsibility of the Contractor to notify the Manufacturer at the start of the work and to request the Manufacturer to have a field representative on the job to instruct the Contractor, the Contractor's personnel, Engineers and Inspectors of the latest construction and installation methods.

2.0 Requirements for Specific Pipe Materials

The following are detailed installation requirements for pipe materials specified in Section 027.

2.1 Clay Pipe

Clay pipe for sanitary sewers may be laid in depths from four (4) feet to sixteen (16) feet deep. Clay sewer pipe shall not be laid in depths greater than sixteen (16) feet.

2.1.1 Joints for Clay Pipe

During installation the joint material on both the bell and coupling end and the spigot end shall be wiped clean and thoroughly coated in the trench with the pipe manufacturer's recommended lubricant. The spigot end shall be inserted in the bell or coupling and pressure applied until the pipe ends will butt together and the joints will remain in continuous compression around the full circumference of the pipe. The joint when engaged shall be flexible enough to allow reasonable deflection in any direction and still maintain uniform compression.

2.1.2 Superimposed Loads on Clay Pipe

In cases where excessive trench widths, or superimposed live loads cause stresses in the pipe in excess of its crushing strength requirements, then an alternative pipe material and/or a concrete cradle or encasement shall be used as determined by the Engineer.

2.2 Pre-stressed Concrete Cylinder Pipe

For the joints for pre-stressed concrete cylinder pipe, the ring shall fit over the spigot end of the pipe and securely lock into place. If rubber gaskets are not to be used in a short period of time, they are to be stored in a cool dark place away from the sun, electric motors, oil and grease. Before the gasket is placed in the spigot groove, it should be thoroughly lubricated with approved lubricants. The groove on the spigot must be thoroughly cleaned. Under no condition should the soap on the gasket be allowed to dry out. The exterior joint opening shall be protected with a polyurethane foam loop impregnated with Portland Cement.

2.3 Poly-Vinyl Chloride (PVC) Pipe

In cases where excessive trench widths, or superimposed live loads cause stresses in the pipe in excess of its crushing strength requirements, then an alternative pipe material and/or a concrete cradle or

encasement shall be used as determined by the Engineer.

2.3.1 PVC Pipe for Gravity Sanitary Sewers

PVC pipe with a standard dimension ratio (SDR) of twenty-six (26) may be laid in depths from four (4) feet to twenty (20) feet with specified bedding and ditch widths. PVC sewer pipe shall not be laid in depths greater than twenty (20) feet.

2.3.2 PVC Pipe for Force Main Sewers

All fittings for PVC force main shall be ductile iron pipe.

The assembly of PVC pressure pipe shall be accomplished as follows:

- a) Clean the bell and spigot to remove any foreign matter;
- b) Confirm the factory-installed gasket is in the groove and seated firmly and evenly;
- c) Apply manufacturer's lubricant to the beveled edge of the spigot end;
- d) Push lubricated spigot end with turning motion into bell until stop mark on spigot is even with the pipe bell. The gasket is properly seated if the pipe can be turned in the bell after the joint is made.

Cutting of PVC pipe shall be accomplished by using a fine-toothed saw and miter box tubing cutter approved for PVC pipe. All burrs shall be removed from inside the cut end with a file or knife before joint is assembled.

The force main shall be laid on four (4) inches of approved bedding materials with a minimum of one (1) foot of approved bedding above the pipe, the joints, however, shall be left exposed until the line has been pressure tested. The portion of the line being pressure tested shall be complete with all necessary thrust blocks and temporary end blocking in place.

Thrust blocks shall be used with PVC plastic pressure pipe where the pipe:

- a) Changes directions (i.e. ells, tees, etc.);
- b) Changes sizes;
- c) Terminates;
- d) Is expected to develop thrust at valves.

2.4 Restrained Joint (RJ) PVC Pipe

The installation of such pipe shall be as directed by the manufacturer.

2.5 Ductile Iron (DI) Pipe

After cutting or coring of DI pipe, all exposed iron surfaces shall be sealed with a bituminous painted coating, or other coating approved by the Engineer.

Connections between DI pipe and other pipe materials shall be made with a Band Seal Adapter or equal. A gasket shall be provided to fit over the plain end of the DI pipe so the adapter can be tightened around both pipes to make a water tight and structural seal.

2.5.1 Joints for DI Pipe

Mechanical joint installation shall require the inside of the bell and plain end of the pipe to be thoroughly cleaned. The surfaces of the pipe and the gasket shall then be brushed with soapy water. Install the gland first with the gasket following over the plain end and then seat the plain end into the bell. Next press the gasket firmly and evenly into the bell moving the gland into position for bolting. Inset all bolts and tighten finger tight while keeping the plain end of the pipe centrally located within the bell. Tighten bolts alternately until all bolts have been uniformly tightened.

Push-on joint installation shall require that the bell be cleaned and the groove lubricated with Super Bell-Tight Lubricant or equal. Super Bell-Tight gaskets, or equal, must be clean when used and installed so that the recesses face into the pipe and away from the installer. The gasket must be seated properly and along with the beveled end of the pipe shall be thoroughly lubricated. Field cut pipe must be smooth and beveled before installing gasket. During cold weather gaskets shall be kept warm for ease of installation. The joint shall be made in a reasonably straight alignment to prevent the gasket from being torn or disturbed. Joints shall be water tight when completed.

All joints inside casings shall use "Gripper" type gaskets.

2.6 High Density Polyethylene Pipe (HDPE)

All HDPE pipe will be joined by an approved butt fusion or electrofusion technique according to the manufacturer. After fusion and installation, any HDPE material found to decrease the planned material diameter of the pipe, whether at the joints or at other location within the installed pipe, shall be removed by use of a McElroy Internal Bead Remover, or an equal approved before the opening of project bids. Removal of internal beads shall be performed before the Engineer will give final acceptance of the work performed.

3.0 Staking

Refer to Lines and Grades in Section 021 of these Specifications for staking requirements. Staking requirements shall apply to both gravity sanitary sewers and force main sewers

4.0 Excavation

The Contractor shall make to the width and depth necessary for proper construction, all excavations in earth and rock required for constructing the sewers and other structures included in his Contract and according to the Plans and Specifications. Excavation shall include the following: the clearing of the site of the work; the excavating, loosening, classifying, loading, removing, transporting and disposing of all materials, wet or dry, necessary to be removed for purposes of construction; trenching and all trench shoring including sheeting and bracing; all draining and pumping of water; disposal of all excavated materials; and all incidental work. The bottom of the trench shall be smooth and cleared of stones or protruding hard objects. All materials such as trees, brush, debris, etc. removed in site clearing shall be disposed of by the Contractor.

4.1 Trench Width

Trench widths shall be sufficiently wide to permit tamping around the pipe.

Trench widths measured at the top elevation of the pipe shall not exceed the limits for pipe sizes as

shown in the table below:

<u>Pipe Inside Diameter</u>	<u>Trench Width at Top of Pipe</u>
Eight (8) inches to Twelve (12) inches, inclusive inches;	Pipe O.D. plus Twenty (20)
Fifteen (15) inches to Thirty-Six (36) inches, inclusive	Pipe O.D. plus Sixteen (16) inches;
Greater than Thirty-Six (36) inches, inclusive	Pipe O.D. plus Twenty-Four (24) inches.

Whenever the trench widths measured at the top of the pipe shall exceed the above specified width, the Contractor shall at his own expense remove any disturbed earth and shall refill all the excavated trench from wall to wall with approved granular bedding, concrete cradle or concrete encasement or a combination thereof as directed by the Engineer.

5.0 Bedding

All sewer trenches shall be excavated to a depth of not less than four (4) inches lower than the lowest elevation of the sewer pipe. A minimum of four (4) inches of approved granular bedding shall be placed in the bottom of the trench, with an additional amount of approved granular bedding tamped and cradled around and over the pipe to a level of one (1) foot above the top of the pipe. Pipe shall be supported over its entire length. One (1) foot of approved bedding material above the top of the pipe shall apply to all types of pipe material, with the exception of ductile iron, where the bedding shall be to the top of the pipe when installed at depths less than sixteen (16) feet.

If the ground conditions are not suitable for bedding as outlined, the Contractor must excavate and dispose of the unsuitable material and add approved granular bedding material to support the pipe, as determined by the Engineer. The bedding shall be built up in six (6) inch to twelve (12) inch layers of approved granular backfill to the bottom of the sewer pipe with an additional amount of approved granular backfill allowed for tamping and cradle beneath, around and over the pipe to a level of one (1) foot above the top of the pipe. The above work shall be made part of the contract amount.

5.1 Approved Bedding Material

Granular pipe cradle and envelope shall be constructed with granular materials from approved local deposits graded to Illinois Department of Transportation Standard Specifications for Road and Bridge Construction, latest edition, the Section for Coarse Aggregate Standards. Acceptable graduations for the granular pipe cradle and envelope are CA-7 and CA-11. The material shall be a crushed gravel or a crushed stone as per IDOT's Coarse Aggregate Standards with a minimum of 75% fractured material, from approved sources as determined by the Engineer.

PVC pipe with excavation depths of sixteen (16) feet to twenty (20) feet shall use CA-7 or CA-11 white rock crushed stone. DIP with excavation depths greater than twenty (20) feet shall also use CA-7 or CA-11 white rock crushed stone for bedding material.

5.2 Concrete Cradle

Structural concrete shall be used for all concrete cradle. Vitrified clay pipe will be laid in concrete cradle when the invert of the sewer is greater than sixteen (16) feet in depth or if the proper trench width is not maintained as specified in paragraph 4.1 above. No extra payment will be allowed for the

concrete cradle when the proper trench width was not maintained by the Contractor.

5.3 Concrete Encasement

Where sewers are laid at shallow depth or where shown on the plans and where ordered by the Engineer, the pipe shall be encased in concrete in accordance with the drawing for concrete encasement in Section 095 of these specifications.

6.0 Placement of Fill or Embankment

Where a sewer is shown or ordered by the Engineer to be placed in a fill section, the Contractor shall remove any and all weeds, tree roots, large rocks, or frozen material that will decay, or other material unsuitable for compaction of the fill area. The existing ground area of the fill section shall be plowed or disked before the fill is started to aid in bonding the fill section and the existing ground together.

The fill material shall be free of large rocks, frozen ground, material that will decay, or any other substance that might cause future settlement of the fill area. As far as it is practical, each layer of fill material shall extend the entire length and width of the fill area. Each layer shall be disked to break up oversize lumps and to mix different layers of the fill to provide a more uniform moisture content. The fill material shall be placed in layers not to exceed eight (8) inches in depth. Each layer shall be rolled with either a pneumatic roller weighing twenty-five (25) tons or an equivalent sheeps-foot roller. Other types of equipment must be approved by the Engineer. Should the fill material contain insufficient moisture to provide satisfactory compaction, the Contractor shall, at his own expense, apply water as directed. The fill material shall be placed and compacted to meet the following requirements: the moisture content of the fill material when placed shall be within two (2) percent of the optimum moisture content as determined ASTM D-1557 (Modified Proctor Test); compaction shall meet the requirements of ninety-five (95) of the ASTM D-1557.

All fill and compaction shall be completed to an elevation of not less than three (3) feet above the top of the pipe before installing the sewer. After the sewer has been installed and back filled, the Contractor shall dress the fill or embankment as specified on the plans.

7.0 Laying Pipe - General

All pipe shall be carefully inspected before being laid, and no cracked, broken or defective pipe shall be used in the work. Reasonable care in storing the pipe shall be used, with the spigot end being protected from contact with the ground. In stacking, alternate horizontal layers shall be reversed and staggered so that the bell of the upper layer rests on the barrel of the pipe and not the spigot joint. Each pipe shall be laid in conformity with the line and levels given by the Engineers and in the presence of the inspector. The line of each pipe as it is placed shall be located accurately with a laser. Generally, all pipe shall be laid with the bell end upstream. The bottom of the trench shall be so shaped that uniform bearing is obtained throughout the length of each pipe section. Before the pipes are put together the interior of the sewer already in place, including the bell thereof, shall be thoroughly cleared of all dirt and superfluous matters of every description. On small sewers where cleaning after laying may be difficult, a swag or drag shall be kept in the line and pulled forward past each joint after its completion. A watertight clay disc stopper or other approved stopper shall be set in place in the last pipe laid and not be removed except to lay another pipe which in turn must be stoppered. No pipes shall be laid where the water has not first been removed from the ditch.

Upon completion any lines that have rock, silt, mud, or other material inside the pipe shall be cleaned, at the Contractor's expense, to the satisfaction of the Engineer.

7.1 Laying Pipe with a Laser

There are a number of lasers used in construction; hence, the method used to set up the laser prior to laying the sewer shall be approved. However, an above-ground spinning laser is unacceptable as the only laser used to check the grade of the sewer. Beginning at the first manhole, the laser will be leveled and set on line and grade. As the sewer construction reaches the next manhole, the laser will be moved to that new manhole, leveled, and line and grade reset for the next reach of sewer with the percent of grade given on the plans.

The laser will be checked for level, line and grade each morning and noon or at such other times as the construction is resumed after any delay in the work or at such times as in the opinion of the Engineer the line and grade is in question as to its accuracy and conformance with the plans.

The sewer pipe leaving each manhole will be checked at the following intervals; at the end of the first pipe laid, twenty-five (25) foot point and at every hundred foot point thereafter by an external method independent of the laser. The method used for this check shall be determined by the Engineer.

The Contractor shall have a District approved ventilation system on site. The system shall be ready and available for use by the construction crew. The system shall be of adequate size to ventilate the manhole and pipes in order to remove condensation.

7.2 Laying Pipe with Other Methods

The methods described of aligning the center and of placing the invert of the pipe at proper elevation, shall be used unless some other method is approved by the Engineer in writing.

8.0 Force Mains

Slopes for force mains shall be uniform in order to assure full efficiency of the sewer. Any portion of the force main having pockets, humps, or a broken uneven backslope shall be removed and replaced at the Contractors expense. Minimum cover over the top of all force mains shall be not less than four (4) feet.

There shall be furnished (where necessary) at the point(s) shown in the line a properly designed combination air release and air inlet valve suitable for operating under a specified working pressure. The valve shall be designed to exhaust large quantities of air when the line is being filled; to exhaust small air accumulations when the line is in service; and to allow large quantities of air to re-enter the pipe in case of loss of pressure in the line. The valve shall be installed as per manufacturer's instructions. A District approved valve shall be installed at the base of the air release valve. The valve shall be a ball valve, a gate valve, or a plug valve.

A No. 10, solid insulated copper wire, tracer wire shall be buried with all force mains, regardless of pipe material. Bring tracer wire to the surface within a six (6)-inch PVC riser approximately every five hundred (500) feet. Risers shall have a cast iron cap. Do not place risers in driveways, drainage ways, or property lines.

9.0 Water Removal

The Contractor shall at all times during construction provide and maintain ample means and devices with which to promptly remove and properly disposal of all water entering the excavations, or other parts of the work and shall keep said excavations dry until the structures to be built therein are completed. No water or

unauthorized sewage shall be drained into the work built or under construction.

The entire system of sewers shall be dry and the removal and handling of water required to maintain dry trenches or other excavations for the construction of sewers or other structures in the dry trench, shall be at the expense of the Contractor, including the cost of underdrains where needed.

10.0 Rock Excavation

It shall be the responsibility of the Contractor to investigate the occurrence and depth of any rock strata requiring other than normal machine excavation. No additional payment for this item will be allowed.

Where rock is encountered the Contractor shall excavate the sewer trench to a depth of six (6) inches below the bottom of the pipe and to a width of sixteen (16) inches plus the outside diameter of the pipe. All loose material shall be removed from the trench. A minimum of six (6) inches of approved bedding shall be tamped in place under the pipe with an additional six (6) inches of bedding tamped and cradled around the pipe. Additional bedding material shall also be added to a height of twelve (12) inches over the top of the pipe.

Rock shall be that material occurring in a natural state which requires blasting, barring, or wedging for removal from its original bed and having a compressive strength in excess of three hundred (300) pounds per square inch. It specifically includes all ledge rock, bedrock or boulders larger than one (1) cubic yard in volume.

11.0 Explosives

Approved explosives may be used where such blasting will not injure existing utilities, structures or improvements as determined by the Engineer, however, such approval does not relieve the Contractor from the responsibility and liability for damages as a result of the use of explosives. Local news media shall be notified twenty-four (24) hours before blasting is scheduled to start. The Engineer may provide the Contractor with some contact names and telephone numbers that shall be placed on the Contractor's listing of media contacts before the commencement of blasting.

The explosive charges used shall not make the excavation unduly large or irregular nor shall it shatter the rock upon which masonry structures are to be placed. Each charge shall be covered with heavy timber, steel mats, or other approved cover and shall be placed no closer than fifty (50) feet from the completed sewer pipe or structure. No blasting or storage of explosives will be permitted closer than three hundred (300) feet from high frequency or welding equipment.

Before use or storage of explosives is permitted, the Contractor must secure at his own expense such permits or bonds as may be required from the governing agency having jurisdiction and shall comply with all ordinances and regulations of such authority.

12.0 Joining Pipes of Dissimilar Materials

Connections between pipes of dissimilar materials, or of unequal outside diameters, shall be made using Fernco-brand flexible-type couplings. The Fernco-brand flexible type coupling shall be fit over the plain ends of both pipes (any bell sections shall be removed) and then tightened to make a water tight seal.

13.0 Connection to Existing Sewer

When a Contractor is directed to connect an outlet sewer to an existing sewer, he shall immediately provide

a temporary bulkhead at the closest manhole. Connections to existing sewers shall be performed using methods detailed in these Specifications. All connections to existing manholes that do not have an existing hole or stub shall be cored and a rubber boot then installed. Other methods shall be approved by the Engineer.

14.0 Erosion Control

Where an area is disturbed due to excavation, erosion and sediment control measures shall be taken to prevent soil erosion and sediment runoff from the site. Erosion and sediment control measures shall be placed at locations shown on the plans. All erosion and sediment control measures shall be placed on the downstream side of disturbed areas such that no sediment escapes from the site. These control measures shall be constructed and fully functional prior to initiating clearing, grading, stripping, excavating, or fill activities on the site and shall remain in place until the ground is stabilized with permanent ground cover. The Engineer shall judge when the ground has been stabilized and where erosion prevention and sediment control devices shall be necessary. All control measures shall be properly maintained by the Contractor to ensure effective operation. When stockpiling earthen materials, control measures shall be placed downstream to prevent erosion and sediment runoff of the stockpiled material.

The Contractor shall comply with all requirements of erosion control permits from the City of Peoria, Peoria County, and/or the Illinois Environmental Protection Agency.

END OF SECTION