SECTION 607 STORM SEWERS

607.1 Description

(1) This section describes excavating required trenches or tunnels, and laying or constructing pipe storm sewers inside, then backfilling the trenches and cleaning out as necessary.

607.2 Materials

(1) Use materials conforming to the requirements for the class of material named and specified below.

Composite pipe, couplings, fittings and joint materials ..... AASHTO M 264
Annular rubber and plastic gaskets for flexible, watertight joints ..... AASHTO M 198
External rubber gaskets, mastic, and protective film..... ASTM C 877
Mortar 519.2.3

607.2.1 Non-reinforced Concrete Pipe

(1) Use non-reinforced concrete pipe conforming to AASHTO M 86, for the class of pipe specified, except use a concrete mixture that contains at least 564 pounds (335 kg) of cementitious material per cubic yard (m^3) of concrete.

607.2.2 Mastic Joint Sealer

(1) Use a department-approved cold-applied bituminous mastic joint sealer with a consistency enables application to joints with a trowel if air temperatures range from 20 F to 100 F (-7C to 38 C).

607.3 Construction

607.3.1 Excavation

607.3.1.1 General

(1) Unless specified otherwise in the contract, or the engineer allows, perform sewer construction in open trenches and in a manner that protects pipelines or sewers from unusual stresses.

(2) Perform trenching as specified in 29 CFR part 1926, OSHA subpart P for excavations and trenches. Make trenches wide enough to provide free working space on each side of the sewer, preferably this space shall not exceed 1/2 the nominal diameter of the pipe or size of the sewer, and never be less than 6 inches (150 mm). The required working space shall depend upon the size of the sewer and the character of the material encountered in the excavation; however, always provide sufficient space between the sewer and the sides of the trench to allow for preparing the foundation, laying the sewer, and placing and compacting the backfill as specified.

(3) Dig the side slopes of all portions of the trench, that have an elevation less than one foot (300 mm) above the top of the pipe, as nearly vertical as possible.

(4) If utilities and other restraints make sloping or benching of the excavation impractical, employ a shoring system conforming to OSHA Subpart P.

(5) Excavate the trenches in reasonably close conformity with the plans and as the engineer laid out in the field. Begin trench excavation at the proposed sewer outlet and proceed toward the upper end.

(6) Keep the trenches dewatered until the joint material sufficiently hardens.

(7) If the contract specifies or the engineer allows, the contractor may construct sewers by tunneling or jacking instead of open trenching. Adhere to the construction details the plans show, the contract specifies or the engineer establishes.

(8) Understand that the inlet and discharge elevations for storm sewers the plans show, are subject to revisions in order to fit field conditions, and the engineer may adjust the profile grades from those the plans show.

607.3.1.2 Rock Excavation for Storm Sewer

(1) Classify rock excavation for storm sewer as specified for rock excavation in 205.2.3, except classify the necessary removal of all rock boulders with a volume of 1/2 cubic yard (0.4 m^3) or more, as rock excavation.

607.3.2 Constructing Foundation

(1) Construct the foundation in the trench to prevent subsequent settlement and rupture of the sewer pipe.

(2) The contractor may lay sewer pipe, except in rock, or wet conditions, on a shaped, firm earth subgrade, or on a backfilled granular foundation or bed.

(3) If laying the pipe foundation on firm earth, shape the trench bottom to give full and continuous support to the pipe for at least the lower 1/10th of the outside vertical diameter of the pipe.

(4) If placing the pipe foundation on backfilled granular material, excavate the trench to at least 6 inches (150 mm) below the elevation established for the bottom of the pipe. Backfill this depth with granular backfill as modified in 209.2 for bedding under culvert pipes, or with an engineer-approved graded aggregate, that passes a one-inch (25 mm) sieve. Compact the material before laying the pipe on the backfilled granular material.

(5) After laying the pipe on the compacted granular foundation, place additional granular material conforming to the above requirements under and around the pipe in layers not greater than 6 inches (150 mm). Compact this material by ramming, tamping, or vibrating to provide full and continuous support to the pipe for at least the lower 1/6th of the outside vertical diameter of the pipe.

(6) If existing granular foundation material conforms to the above requirements for granular backfill for a depth of at least 6 inches (150 mm) below the bottom of the pipe, and the engineer determines this, then omit excavating, shaping, and backfilling below the bottom of the pipe.

(7) The contractor may use material from trench excavation conforming to section 209 as foundation or bedding material.

(8) If rock, hardpan, or fragmented material is encountered, then excavate the trench to a depth of at least 6 inches (150 mm) below the bottom of the pipe and backfill with material conforming to the above requirements to produce a granular cushion. Place additional granular material under and around the pipe as specified above.

(9) If the sewer trench is soft, muddy, or wet and will not dry out, excavate it to at least 6 inches (150 mm) below the elevation established for the bottom of the pipe. Backfill this depth with grade 1 granular backfill as modified in 209.2 for bedding under culvert pipes, or with size No. 1 coarse aggregate for concrete as specified in 501.2.5.4 and compact thoroughly. Place this material under and around the pipe for at least the lower 1/6 of the outside vertical diameter of the pipe. Compact this material in layers not exceeding 6 inches (150 mm) as specified above.

(10) Excavate recesses to receive bells if necessary.

(11) If the contractor cannot obtain the proper bearing for the, excavate the unsuitable material and backfill with material conforming to the above requirements for bedding material.

(12) If the contract details types of bedding, or required trench widths other than described above, conform to the contract details.

607.3.3 Laying Pipe Sewers

(1) Begin laying pipes in finished trenches at the lowest point and proceed towards the upper end, also lay the pipe so the spigot or tongue ends point in the direction of flow.

(2) Clean sockets carefully before lowering pipes into trenches. Lower and place the pipes to avoid unnecessary handling in the trench or damage to the pipe. Provide a firm bearing beneath the entire length of each section and make it substantially true to the line and grade required.

(3) Lay all pipes with ends abutting. Take care when shoving the pipes together so the joints are properly adjusted and not overly large. Fit and match the pipes so that if set firmly in line and grade they form a sewer with a smooth and uniform invert.

(4) After installing the pipe, seal all lift holes with suitable concrete or other engineer-approved plugs.

(5) If it is difficult to obtain the size pipe the plans or the contract specifies, the contractor may, with the engineer’s approval, furnish and install a larger size.

607.3.4 Joints

(1) Make joints for concrete pipe with portland cement mortar, annular rubber or plastic gaskets, external rubber gaskets, or engineer-approved mastic joint sealer, as specified below, or by a combination of these types, unless the plans or contract special provisions specify the type to use.

(2) If using portland cement or trowelable mastic joint sealer, fill the joint with cement mortar or mastic sealer and wipe the inside of the joint and finish smooth.

(3) If using annular rubber or plastic gaskets, fit the gasket snugly into the annular space between the surfaces of the connecting parts of the pipe sections to form a flexible, watertight joint.

(4) If using preformed mastic joint sealer, remove all sharp edges and protrusions from pipe joint surfaces and clean dust, dirt, and other foreign matter from them. The contractor may use of a primer. If using a primer, use the type recommended by the preformed seal manufacturer. After the primer dries, remove the wrapper from one side of the seal only and press the seal to the primed surface. When ready to assemble, remove the remaining wrapper and fit the pipe sections in place. Shove the pipe sections together at the required alignment. Make seals of sufficient size so that after the pipe sections are in their final position a squeeze-out of the seal is evident around the joints exterior circumference. Remove and make flush with the interior pipe wall, any extrusion of the seal inside the pipe.

(5) Place external rubber as the manufacturer specifies and the engineer approves.

(6) Seal joints for composite pipe with standard couplings and solvent cement or with rubber or plastic gaskets. Follow the manufacturer's directions.

607.3.5 Backfilling

(1) Backfill all trenches and excavations immediately after completing sewer construction. Use granular backfill conforming to section 209 for backfill material, except that all material shall pass a 3 inch (75 mm) sieve if placed around the pipe and to 6 inches (150 mm) above the pipe if using concrete sewer pipe, or a 1 1/2 inch (37.5 mm) sieve if using composite sewer pipe.

(2) The contractor may use material from trench excavation conforming to section 209 for granular backfill. Use in embankments if suitable, or dispose of surplus material or material unsuited for backfill as specified 205.3.12.

(3) Deposit the backfill material in the trench or excavation in a manner that causes no damage to the pipe. Deposit the material in uniformly thick layers, as specified for public highway culverts in 520.3.4.1. Tamp or ram each layer thoroughly with proper tools that do not injure or disturb the sewer.

(4) If puddling or water flooding is required or approved for consolidating the backfill, do not perform the first flooding until after backfilling the trench or excavation to at least 2 feet (600 mm) above the top of the pipe or sewer, and after compacting the backfill by tamping. Perform the second flooding after the previous trench filling and after compacting in uniform layers. Avoid an excess of water to prevent undue pressure on the pipe or sewer.

(5) If using sheeting or shoring in excavation, the backfill must conform to the requirements above, carefully draw, and remove the sheeting and braces in a manner that will not disturb the completed work. Carefully refill all openings left from the pulled sheeting with engineer-approved backfill material and compact properly.

(6) Do not walk or work on the completed pipe sewer, except as necessary to tamp or backfill, until backfilling the trench to at least 2 feet (600 mm) above the top of the pipe.

(7) Fill the trench simultaneously on both sides of the sewer without causing injurious side pressures.

607.3.6 Clean Out

(1) Clean all new or re-laid sewers of accumulations of silt, debris, and other foreign matter, and before acceptance, test all installations with water or other engineer-approved methods. These tests must indicate unimpeded flow.

(2) Clean all existing sewers of silt, debris, and other foreign matter that accumulated due to the contractor's operations.

607.4 Measurement

607.4.1 Pipe Sewers

(1) The department will measure the Storm Sewer Pipe bid items by the linear foot acceptably completed. This measurement equals the distance along the centerline of the pipe, from the pipe end at a free outlet to the center of the end catch basin, manhole, inlet, junction or other drainage structure; or from center to center of catch basins, end manholes, inlets, other drainage structures or junctions. The department will make no deduction from these measured lengths for intermediate catch basins, manholes, inlets, other drainage structures, junctions, or fittings.

607.4.2 Rock Excavation for Storm Sewer

(1) The department will measure Storm Sewer Rock Excavation by the cubic yard acceptably completed. The department will measure this work in its original position and compute the volume, excluding boulders, by the method of average end areas.

(2) The department will measure boulders of 1/2 cubic yard (0.4 m^3) or more as specified for boulders and surface stone greater than one cubic yard in 205.5.1.

(3) The department will measure this work vertically from the top of the rock to the bottom of the rock, or to an elevation 6 inches (150 mm) below the bottom of the pipe, whichever is higher, and horizontally for the required width of the trench as specified for trenching in 607.3.1.1. The department will not measure excavation below or beyond the specified limits.

607.5 Payment

(1) The department will pay for measured quantities at the contract unit price under the following bid items:

ITEM NUMBER	DESCRIPTION	UNIT
607.0100 - 0399	Storm Sewer Pipe Non-Reinforced Concrete (class) (inch)	LF
607.0400 - 0499	Storm Sewer Pipe Composite (inch)	LF
607.5000	Storm Sewer Rock Excavation	CY

607.5.1 Pipe Sewers

(1) Payment for the Storm Sewer Pipe bid items is full compensation for providing all materials, including all special Y's, mitered sections, elbows and connections required; for all excavating, except rock excavation; for sheeting and shoring; for forming foundation; for laying pipe; for sealing joints and making connections to new or existing fixtures; for providing granular backfill material, including bedding material; for backfilling; for removing sheeting and shoring; and for cleaning out and restoring the site of the work.

(2) Apply contract unit prices, without adjustment, to the quantities of storm sewers constructed at elevations not greater than one foot (300 mm) above or below what the plans show. If the engineer orders the construction of pipe storm sewers or portions of pipe storm sewers at elevations greater than one foot (300 mm) above or below those the plans show, then the department will pay for this work as specified for extra work in 109.4.

(3) Work performed one foot (300 mm) or less below the pipe bottom to form a satisfactory foundation as specified in 607.3.2 is incidental to the work. The department will pay for work required at depths greater than one foot (300 mm) below the pipe bottom as specified for extra work in 109.4.

607.5.2 Rock Excavation for Storm Sewer

(1) Payment for Storm Sewer Rock Excavation is full compensation for all rock excavation and disposal. If the contract does not contain the Storm Sewer Rock Excavation bid item, the department will pay for the required excavation as specified for extra work in 109.4.