

## SECTION 601 - SANITARY SEWER PIPELINES

### 1. GENERAL

Sewer pipelines, conforming to these specifications and of the respective size shown on the Drawings for the particular location, shall be constructed to proper line and grade; resulting in an unobstructed conduit having a smooth and uniform invert.

### 2. TRENCH PREPARATION

Bottom of trench shall be manually graded and shaped to provide uniform support for the pipe throughout each entire length, with recesses excavated to receive bells or couplings. Final grading and shaping shall be done only when the trench bottom is dry and pipe lying is ready to proceed.

### 3. CLAY SEWER PIPE AND FITTINGS

Extra strength, clay sewer pipe, complying with ASTM Designation C-700-71T, shall be used. Each shipment shall be accompanied by a certificate from the manufacturer or an independent laboratory certifying that the material has been tested under ASTM Designation C-700-71T and conforms to the above requirements. Material will be subject to physical inspection and culling at the job site for the purpose of rejecting defective and damaged pipe.

### 4. POLYVINYL CHLORIDE PIPE & FITTINGS

Polyvinyl Chloride pipe shall be the integral wall, bell and spigot joint type which meets or exceeds all of the requirements set forth in ASTM D-3034 (latest revision) and shall be rated for SDR-26. All PVC pipe shall be installed in accordance with these specifications and manufacturer's recommendations. PVC pipe shall be installed with an improved bedding and backfill in accordance with these specifications and the standard detail. Each shipment of pipe shall be accompanied by a certificate from the manufacturer or an independent laboratory certifying that the material has been tested under ASTM D-3034.

PVC pipe fittings shall have a cell classification equal to or exceeding 12454-B, 12454-C or 13343-C as defined in ASTM specification D-1784. Saddles will not be permitted.

### 5. JOINTING MATERIALS

Joints in clay sewer lines shall be made with factory-fabricated jointing connections on clay sewer pipe conforming to ASTM Designation C425-72 where materials used have resilient properties and when the same resilient material is used in the joint, both on the spigot end and in the bell of the pipe; except that the material of one of the controlled complementary jointing ends, either in the bell or on the spigot, may vary in hardness from the other. These preformed ends, by controlled complementary design, will form a positive mating pattern of closure.

Joints in clay sewer lines may also be made with factory fabricated jointing connections on clay sewer pipe conforming to ASTM Designation C594-72, Type B. The above stated certification from the manufacturer will be required.

Factory-fabricated jointing connections shall be installed at the factory before shipment;

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precision molded and fused on the spigot and in the bell of the pipe or on both ends of plain end pipe. The connection material shall have long life, make watertight joint, be root-resistant, be flexible, and easy to install. Installation shall be made by the use of a lubricant sealer just prior to making the joint; the sealer shall provide a means of bonding the surfaces of the connections. Proper handling of the pipe to prevent damage shall be in accordance with the manufacturer's requirements.

Polyvinyl Chloride (PVC) pipe shall have flexible gasket compression type joints conforming to ASTM D-3212. The gasket shall comply with ASTM F-477.

Couplings used for joining plain end sections of sewer pipe shall be 316 stainless steel shielded couplings with 316 stainless steel adjustable clamps. Couplings shall be Mission ARC or approved equal.

### 6. INSTALLATION OF CLAY SEWER PIPELINES

Pipe shall not be laid when trench or weather conditions are unsuitable for such work, water shall be kept out of the trench. When work is not in progress, all pipe or fittings shall be closed securely to prevent entrance of foreign material.

A. Laying pipe. Pipe laying shall proceed upgrade with spigots pointing in the direction of flow. The trench bottom shall be shaped to support the pipe barrel, with recesses at bells or couplings, and the entire run of pipe shall be straight and true to grade, in accordance with Class C bedding (ASCE-MREP-No. 37). Pipe shall be inspected for defects prior to being placed and interior of bell or couplings and exterior of spigot cleaned carefully.

B. Joints. Annular space of bells or couplings shall be entirely filled and practically watertight; defects and excessive leakage shall be repaired immediately. Infiltration and/or seepage shall not exceed 250 gallons per day per inch nominal pipe diameter per mile of pipe. Any pipe disturbed after completion of joints shall be taken up, the joints cleaned, and the pipe relayed properly.

When the pipe is moved into jointing position, rest the spigot end on a small board to keep it off the ground. Wipe foreign matter from the connection in the bell or coupling and on the spigot(s). Be sure to remove any stones, sand, or small objects that may be embedded in the connection. Apply lubricant sealer with a small brush to the mating surfaces of the connection. Complete the joint immediately after application of the lubricant sealer. A proper bond absolutely depends on time. If there is any delay, simply reapply lubricant sealer just prior to jointing. Push the spigot firmly into the bell or coupling, making sure the pipe is properly seated.

### 7. INSTALLATION OF POLYVINYL CHLORIDE SEWER PIPELINES

Pipe shall not be laid when trench or weather conditions are unsuitable for such work. Water shall be removed from the trench. When work is not in progress, all pipe or fittings shall be closed securely to prevent entrance of foreign material.

A. Laying Pipe. Pipe laying shall proceed upgrade with spigots pointing in the direction of

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flow. The trench shall consist of a minimum of four (4) inches of compacted select pipe bedding material below the pipe, select backfill material to a minimum of 12 inches above the crown of the pipe and standard backfill material from 12 inches above the pipe to the top of the trench in accordance with Section 101, entitled "Trench and Backfill."

The select bedding material, when the trench is dry and stable and dewatering is not required, shall be a sand-gravel mix conforming to Kansas Department of Transportation (KDOT) Standard Specifications for BD-1 under drain aggregate. Select backfill material shall also conform to KDOT BD-1 under drain aggregate. Bedding and backfill material shall be compacted to a minimum of ninety (90) percent of standard Proctor density using hand or mechanical tamping. If the trenches are wet or unstable or dewatering is required, the appropriate bedding material shall be determined by the Engineer.

The trench sub grade shall be prepared to provide a uniform and continuous pipe support between pipe bells or joints. Place and compact select bedding material by shovel slicing, or vibrating, and prepare select bedding material so that the pipe will be true to line and grade after installation. After each pipe has been brought to grade, aligned and placed in final position, deposit and compact by shovel slicing sufficient select bedding material under the pipe haunches and on each side of the pipe to hold the pipe in proper position during subsequent pipe jointing, bedding and backfilling operations. Place select bedding material uniformly and simultaneously on each side of the pipe to prevent lateral displacement.

B. Joints. Annular space of bells or couplings shall be entirely filled and practically watertight; defect and excessive leakage shall be repaired immediately. Infiltration and/or seepage shall not exceed 250 gallons per day per inch nominal pipe diameter per mile of pipe. Any pipe disturbed after completion of joints shall be taken up, the joints cleaned, and the pipe relaid properly.

When the pipe is moved into jointing position, rest the spigot end on a small board to keep it off the ground. Wipe foreign matter from the connection in the bell or coupling and on the spigot(s). Be sure to remove any stones, sand, or small objects that may be embedded in the connection.

Apply lubricant sealer with a small brush to the mating surfaces of the connection. Complete the joint immediately after application of the lubricant sealer. A proper bond absolutely depends on time. If there is any delay, simply reapply lubricant sealer just prior to jointing. Push the spigot firmly into the bell or coupling, making sure the pipe is properly seated.

### 8. SERVICE CONNECTIONS

All tees or risers shall be plugged with discs of like material sealed into place with mortar, asphalt or manufacturer's approved materials.

After the tees are laid, and before the trench is backfilled, a 2x4 piece of wood needs to be inserted in the trench at the end of the service line and should stick above the final grade by no less than 3 feet. Each additional 2x4 piece of wood needs to be secured in an upright position, and nailed to the stake driven into the trench toward which the tee points. Care should be taken to avoid

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disturbing these markers during backfilling.

An accurate record of the location of each tee shall be kept by the Contractor. This record shall be given to the City at the completion of the contract.

### 9. RISER PIPE

Where trench depths are excessive and tees are installed, the Contractor shall use clay or PVC riser pipe. The riser pipe shall be connected to the service tee with 1/8 bend so that the riser pipe can be installed in a vertical position along the side of the trench at which the tee points. The tee and 1/8 bend shall be encased in concrete to assure a stable connection. Riser pipe shall be installed so that the top of the pipe shall terminate approximately 12 feet below the ground level. Cutting pipe will not be required to attain this 12-foot depth. The cost of the installation of the 1/8 bend shall be included in the riser pipe item.

### 10. SERVICE LINES

Service lines shall be installed at locations described by the Engineer. Service lines shall be 4" clay or PVC pipe laid true to line and grade, and shall include laying of the pipe, fittings, plugs, marking of the end of service line. Trenching and backfilling shall conform to Section 101, entitled "Trench and Backfill." Four inch service lines shall be laid at 1/4 inch per foot rise from the tee on the lateral and to the length as described by the Engineer.

### 11. CONNECTION TO EXISTING MANHOLE

At locations that require a connection to an existing manhole, and the manhole has not been stubbed out at the required depth and size the Contractor shall break a hole in the manhole at the proper location so the clay or PVC pipe can be installed and grouted into place.

### 12. TESTING

Sewers shall be laid with straight alignment between manholes. Alignment tests such as "lamping" will be conducted by the Engineer. At the direction of the Engineer, the Contractor shall at no cost to the City conduct dimension tests of PVC pipe and fittings in accordance with ASTM D2122. Any pipe section or fitting not meeting the ASTM standards shall be rejected and replaced.

The Contractor shall conduct low pressure air tests of all pipelines that are eight (8) inches in diameter or larger in accordance with ASTM C-828 for clay pipelines and ASTM F-1417 for PVC pipelines. All costs involved in performing these low pressure air tests shall be borne by the Contractor. Should any test conducted on the clay or PVC sewer pipe disclose an air loss exceeding the limits as specified in ASTM C-828 or ASTM F-1417 respectively, the Contractor shall at his own expense locate, remove, and replace the defective pipeline.

The Contractor shall conduct deflection testing of all PVC or flexible sewer pipelines that are eight (8) inches in diameter or larger, by hand pulling a mandrel through the entire length of the pipeline after installation and final backfilling. Pipeline shall pass a mandrel with an outside diameter of 95 percent of the undeflected interior diameter and a length of not less than twice the inside diameter of the pipeline. Contractor shall be required to furnish all equipment and labor necessary to complete the deflection testing. Pipelines that have deflected more than 5 percent of its

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undeflected interior diameter must be reconstructed or replaced by the Contractor without additional cost to the City. The reconstructed or replaced pipeline shall be tested for deflection.

All sanitary sewer pipeline, eight (8) inches in diameter and larger, shall be inspected with a television camera by the City prior to acceptance. Any pipeline found to possess defects such as cracked pipe, offset joints, or other similar defects that could cause maintenance problems for the City must be removed and replaced by the Contractor without additional cost to the City.

The Contractor shall conduct a hydrostatic test on all manholes by using one of the following two (2) methods:

Method 1: Full depth infiltration (max.25 feet) with a water loss of less than 1.14 gal./ft.depth/day. Special instructions may be added for absorption time or for less than 24 hour test time, but the infiltration must still be less than 1.14 gal. /ft. of depth/day. If infiltration occurs, before or after the infiltration test, it shall also be less than 1.14 gal. /ft. of depth/day.

Method 2: The vacuum test, as specified by the Kansas Department of Health and Environment, using vacuum testing equipment as produced by NPC Systems, Inc. or equal. A vacuum of 10 inches of mercury shall be drawn and the vacuum pump shut off. With the valves closed, the time shall be measured for the vacuum to drop to 9 inches. The manhole shall pass if the time is greater than 60 seconds for 48" diameter, 75 seconds for 60", and 40 seconds for 72" diameter manholes.

If the manhole fails the initial test, necessary repairs shall be made with a non shrink grout while the vacuum is still being drawn. Retesting shall proceed until a satisfactory test is obtained.

### 13. MINIMUM COVER

A minimum earth cover of 30 inches shall be provided for sewer pipe. Where this depth of cover is not available, protection shall be provided by earth fill, encasement in concrete, or installation of cast iron sewer pipelines.

### 14. SEPARATION OF WATER MAINS AND POLLUTION SOURCES

It is of utmost importance that potable water lines be protected from any source of pollution. The following shall pertain to instances where individual or industrial septic tanks and tile absorption fields, waste stabilization ponds, waste water lines discharging into roadside ditches, feedlots, or other sources of pollution are encountered.

A. A minimum distance of 25 feet shall be maintained between all potable water lines and all septic tanks, waste stabilization ponds or open sewage discharge locations.

B. Under no circumstances shall a water line extend through a septic tank tile absorption field, or feedlot. All water lines shall be located a minimum of 25 feet from the farthest known extent of any sewage absorption.

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C. A minimum horizontal distance of 10 feet shall be maintained between parallel water and sewer lines. The laying of potable water lines and sanitary sewers shall be in separate trenches with undisturbed earth between them. In cases where it is not practical to maintain a 10 foot separation, KDHE will consider proposals providing equivalent protection by other methods on a case-by-case basis, if supported by data from the design engineer. Equivalent protection may require sanitary sewer construction with one of the following additional protective features: concrete encasement, vacuum sewers, or joint fewer pipes such as polyethylene or cured-in-place.

D. When a water pipe and a sanitary sewer cross and the sewer is 2 feet or more (clear space) below the water pipe, no special requirements or limitations are provided herein. At all other crossings, the sanitary sewer is to be constructed of one of the following materials (or approved equal) and pressure tested to assure water tightness pursuant to Chapter VI of the KDHE Minimum Standards of Design of Water Pollution Control Facilities:

PVC pipe conforming to ASTM D3034 with minimum wall thickness of SDR26, ASTM F679, or ASTM F794, with casketed push-on joints in conformance with ASTM D3212.

Joints in the sewer pipe shall be located as far as practical from the intersected water main.

When a sanitary sewer line is above a waterline, the sanitary sewer shall be encased in concrete with a minimum of 6-inch thickness for a 10-foot distance on each side of the crossing.

E. Where a water main is laid across or through an area where there is an existing sanitary sewer, which is not constructed of one of the above specified materials and is 2 feet or less below the water pipe, the existing sewer shall be encased in concrete with a minimum of 6 inch thickness for a 10 foot distance on each side of the crossing or the crossed section of sewer requirements. KDHE will consider proposals providing equivalent protection by other means on a case-by-case basis, if supported by data from the design engineer.

F. Under no condition will it be considered that encasement of the water main through an area of real or potential pollution would provide the protection needed to the water supply.