SECTION 3100--SANITARY SEWER MANHOLES

3101 SCOPE. This section covers standard, drop, and special sewer manholes. Manholes shall be constructed of reinforced concrete complete with covers, fittings, and other appurtenances in accordance with the Standard Details, unless otherwise approved by the City Engineer.

Only manholes which are required to have outside pipe and fittings for dropping sewage into the lower line will be designated as drop manholes. Inside drop manholes where the incoming line discharges directly into the manhole and which do not require special fittings will be considered standard manholes.

3102 MATERIALS. The Contractor shall be required to use the materials shown on the City of Gardner Approved Materials List unless otherwise specified or approved by the City Engineer. The Approved Materials List is available on the City of Gardner public website at www.gardnerkansas.gov. The acceptable materials for manhole construction are outlined in Table 3102-1.

***Table 3102-1** - Sanitary Sewer Manhole Construction Materials*

Item	Acceptable Material
Pre-Cast Concrete Manhole	Circular reinforced precast concrete shall conform to ASTM C478
Concrete	Per Section 2000, KDOT 4.0 AE (4,000 psi minimum)
Minimum Wall Thickness	Per Section 3103
Openings	Manhole/pipe connectors shall be cast into the manhole wall
Manhole/Pipe Connectors	Flexible gaskets shall conform to ASTM C923
External Joint Sealant	Adhesive tape shall conform to ASTM C877 Type III self-shrinking butyl rubber
Protective Manhole Liner	Epoxy or polyurethane coating shall conform to ASTM D638, D658, D790, D792, D2240, D4060 and D7234

3103 STANDARD MANHOLES. All manholes shall be constructed in accordance with the Standard Details and requirements found herein. Manholes shall be precast unless otherwise specified or approved by the City Engineer. Precast bases shall be poured monolithically with the walls of the bottom manhole section. Concrete used for poured-in-place based for doghouse manholes shall conform to the Technical Specifications. Manholes may be constructed with either eccentric or concentric cones unless otherwise approved by the City Engineer.

Precast concrete manholes shall have a wall thickness not less than one-twelfth (1/12) of inside diameter plus one (1) inch or five (5) inches, whichever is greater. Precast concrete sections shall be inspected when delivered and all cracked or otherwise visibly defective units rejected. Excessive air pockets or cracks on either the interior or exterior surface of the precast sections shall be cause for rejection. A pipe to manhole connector using an ASTM C923 resilient device that provides a flexible watertight seal for pipes, including services, entering and exiting pre-cast concrete manholes shall be cast-in place at the time of manufacture by the pre-cast concrete manhole manufacturer.

3104 CONSTRUCTION. Manhole inverts shall be constructed of KDOT Grade 3.0 AE concrete conforming to the Technical Specifications.

In no case shall the invert section through a manhole be greater than that of the outgoing pipe. The shape of the invert shall conform to the lower half of the pipe it connects. Side branches shall be connected with as large of a radius of curvature as practicable. All inverts shall be troweled to a smooth clean surface.

Circular precast sections shall be provided with a mastic gasket or preformed flexible joint to seal joints between sections. The space between connecting pipes and the wall of precast sections shall be closed by a water-tight manhole pipe connector. Mortar shall not be placed in the open space on the outside of the manhole where the resilient connector penetrates the manhole wall. When the concrete invert fill is installed on the inside of the manhole, fill shall not be placed in the space on the top half of the pipe where the resilient connector penetrates the manhole wall.

All manholes under construction shall be covered in an appropriate manner to prevent entry of any storm water runoff, trench water, sand, earth, or any other foreign substances at any time during construction or while the manhole is unattended.

3105 CASTINGS. All manhole frames and covers installed within the 100-year floodplain shall be anchored to the manhole through the frame assembly, and all adjustment grade rings with not less than four 3/4-inch diameter anchor bolts shall have a minimum of four (4) inches of embedment into the concrete manhole.

3106 CONNECTIONS TO EXISTING MANHOLES AND SEWERS.

Connections to Existing Manholes: A pipe to manhole connector using an ASTM C923 resilient device that provides a flexible watertight seal for pipes entering and exiting manholes shall be installed by the Contractor from outside the manhole. All openings to accommodate these connectors shall be core drilled with approved equipment. No service line taps to existing manholes shall be allowed unless approved by City Engineer.

Connections to Existing Sewer Lines: Manholes installed over existing sewer lines require placement of a new precast manhole and replacement of the existing sewer pipe to the first joint in all directions.

3107 MANHOLE STEPS. All manholes shall be formed and cast without steps. Steps cannot be cut-off and patched.

3108 GRADE RINGS. Manholes shall be fitted with a grade ring(s) to support the manhole frame and cover to the specified final elevation, as needed. A maximum of three (3) rings will be accepted. These grade rings shall have a maximum of nine (9) inches of vertical adjustment. When field adjustments exceed nine (9) inches, precast concrete manhole sections shall be used to provide finished grade elevation. Contractor shall use angle grade rings to match finished pavement grade for manholes located in paved areas. Installation of grade rings shall be per manufacturer's recommendations.

Grade rings shall be as shown on the Approved Materials List. Concrete grade rings shall not be

allowed for sanitary sewer manholes.

3109 **ACCEPTANCE TESTING.** Vacuum tests shall be conducted on all newly constructed manholes, existing manholes that have been repaired or restored or manholes constructed over existing sewers. Vacuum tests shall meet the requirements of ASTM C1244 except as modified herein.

Manholes shall be completely backfilled, up to and including the casting, before the vacuum testing begins. All lift holes shall be plugged with a non-shrinking mortar, as approved by the City Engineer. The Contractor shall plug all pipes connected to the manhole using pneumatic plugs. The pneumatic plugs should be placed into the pipe after the inside surface has been cleaned. Air shall be introduced into the plugs to 25 psig. Bracing can be used to ensure that the plugs are not pulled into the manhole during vacuum testing. After the manhole has been properly prepared, the vacuum tester shall be installed. The test head shall be placed on top of the casting or fit inside the casting in a manner which incorporates the casting and all adjustment and adaptor rings into the vacuum test. The vacuum pump shall be connected to the outlet port with the valve open. The outlet valve shall be closed after a vacuum draw of 10 inches of Mercury (Hg) has been obtained. The test shall pass if the vacuum maintains a minimum of 9 inches of Hg. in a time greater than one minute. If the manhole fails, the Contractor shall locate the leak and make proper repairs and then re-test. A visual inspection will be performed for each manhole by the City Engineer after the manhole has met the requirements of the vacuum test and is considered in its final state. The inspection shall determine the completeness of the manhole. Any defects identified shall be repaired to the City Engineer’s satisfaction.