DIVISION 5

MANHOLES

Section 5.01 GENERAL:

This division covers the requirements for manhole materials and installation. Manholes shall be installed at the locations and at the depth shown on the drawings. Manholes shall be furnished complete with cast-iron rings and covers.

Section 5.02 CONCRETE BASE:

Unless otherwise noted manhole bases shall be precast and shall have pipe inverts and a resilient connection between pipe and manhole for each pipe connecting to the manhole.

Where sewer lines pass through or enter manholes, the invert channels shall be smooth and semi-circular in cross section, conforming to the details shown on the Drawings. Changes of direction of flow within the manholes shall be made with a smooth curve with as long a radius as possible. The floor of the manhole outside the flow channels shall be smooth and slope toward the channel at not less than one-half inch (1/2“) per foot.

Concrete pipe connections to manholes shall be achieved by use of manhole coupling adapters, rubber gaskets, positive seal gasket system, or grouting a bell or spigot pipe at the appropriate locations. Rubber gaskets or boots shall be made of rubber compound meeting ASTM C-923 Specifications for resilient connections between pipe and manhole. They shall meet all other applicable ASTM specifications, including ASTM F-477.

Positive seal gasket systems boot shall have a wall thickness of three-eighths inch (3/8”). The boot shall either be “cast-in-place” in the precast base or attached to the precast base by means of an internal expanding band. When the boot is attached to the precast base, a watertight seal between the boot and the precast base must be accomplished. An external band (take-up clamp) shall be supplied and used to clamp and seal the boot to the pipe. The band shall be made of 300 series nonmagnetic corrosion-resistant steel. After the band has been placed, it shall be completely coated with a bituminous material approved by the Public Works Representative/Engineer.

PVC pipe connections to manholes shall be achieved by use of manhole coupling adapters, rubber gaskets, or positive seal gasket system. PVC may not be grouted directly to concrete.

The maximum size pipe that can be used in a 48-inch manhole is twenty-four (24”) inch PVC or twenty-one (21”) inch concrete. For pipes larger than these require a 60-inch manhole or concrete box.

Concrete for manhole bases shall comply with the requirements of Division 8, Concrete, of these Specifications.

When cast-in-place manholes are authorized, they must be watertight and conform in dimension and design to the standard drawings. Cast-in-place manholes will only be considered on concrete sewer lines. A gasket placed over the outside of the pipe or other means of providing a watertight seal is required.

Section 5.03 WALL AND CONE SECTIONS:

All manholes shall be precast, sectional, reinforced concrete pipe of forty-eight-inch (48") or sixty-inch (60”) diameter as specified. Both cylindrical and taper sections shall conform to all requirements of ASTM Designation C-478-88 (or latest revision) for Precast Reinforced Concrete Manhole Sections with the following exceptions:

1. The throat section of the manhole shall be adjustable, by use of manhole sections, up to forty-eight inches (48") in height.

2. The taper section shall be a maximum of thirty-six inches (36") in height for 48-inch manholes and thirty-nine inches (39") for 60-inch manholes, shall be of eccentric conical design, and shall taper uniformly to thirty inches (30") inside diameter.

3. The pipe used in the base section shall be furnished in section lengths of one, two, three, and four-feet (1, 2, 3, and 4 feet) as required.

All joint surfaces of precast sections and the face of the manhole base shall be thoroughly cleaned and wet prior to setting precast sections. All joints, including grade rings, shall be set in mortar or butyl rubber gasket. The mortar shall consist of one (1) part cement and one and one-half (1-1/2) parts sand with sufficient water added to bring the mixture to workable consistency or the joints shall be sealed with a butyl rubber gasket that is permanently flexible and non-shrinking. All joints shall be water tight and free from appreciable irregularities in the interior wall surface.

Sub-section A. Manholes Shall Be Furnished With Steps:

The steps are to be made of co-polymer polypropylene. The co-polymer polypropylene used shall conform to ASTM D-4101-82 PP200B33450Z02. The steel used in manufacturing of this product shall be a deformed ½" reinforcing rod. This material shall be grade 60 and conform to the requirements of ASTM A-615.

Section 5.04 DROP MANHOLES:

When the difference in elevation of an incoming sewer is 12-inches or greater a drop manhole shall be used. The drop manhole shall be constructed as shown in the Standard Drawings. The piping from the wye to the manhole on both legs shall be ductile iron or PVC pipe with appropriate fittings. If the sewer main that the drop manhole is a part of is concrete, then a transition coupling (Fernco) shall be used to connect the main with the drop pipe assembly.

The drop pipe assembly shall be encased in flowable fill. The flowable fill shall be placed to the minimum thickness as shown on the Standard Drawings.

Sub-section A. Cement:

Use Portland Cement, Type II per Division 8, Portland Cement Concrete.

Sub-section B. Fly Ash:

Supply fly ash that complies with ASTM C-618 Class F except that the loss on ignition must be 3 percent or less.

Sub-section C. Fine Aggregate:

Use natural sand. The sand shall meet the following gradation when tested in accordance with AASHTO T-27.

Fine Aggregate

Sieve Size	Percent Passing
No. ¾	100
No. 100	0-10

Sub-section D. Mix Design:

The mix design shall meet the following requirements:

- Mix design compressive strength (28 day) – between 50 to 150 psi.
- Portland Cement – at least 50 pounds per cubic yard.
- Fly Ash – at least 300 pounds per cubic yard.
- Slump – 6 to 10 inches maximum.

Section 5.05 MANHOLE RINGS AND COVERS:

All iron casting shall conform to the requirements of ASTM Designation A-48 (Class 35) for grey iron castings, free from blowholes and shrinkage defects. Castings shall be free from fins and burrs and shall be shot-blasted to remove sand and other foreign matter.

Rings and covers shall be equal to the twenty-four inch (24") Standard circular, with machined bearing surfaces, gravity, solid, non-rocking type. The minimum weight of the cover shall be one hundred sixty (160) pounds. The minimum weight of the ring shall be two hundred eighty (280 lbs.). Flat rings and covers shall be allowed only when specifically authorized. **Each cover shall contain one (1) pick hole but shall not contain air vent holes**. Vented covers may be specified for certain areas. Use vented covers only when authorized. The tops of the cover and ring shall be flush and there shall be 1/8-inch clearance between the cover and the ring. In addition to the foundry name and year of manufacture, the cover shall be marked "SEWER," "STORM DRAIN," "DRAIN," or "IRRIGATION" as appropriate.

Sub-section A. Setting of Manhole Frames and Covers:

Manhole rings shall be set in place in with the shaft in a bed of cement sand mortar, which mix shall be one part cement to two parts sand or Kent Seal. Covers shall be set to the finished grade and contour of the existing street. Rings and covers shall be protected during backfilling and compaction of the soil and during the placing or replacing of road surfaces. Any rings or covers loosened from the manhole sections shall be reset in cement mortar and any rings or covers damaged or broken shall be replaced by the Developer/Contractor at its expense. Manholes placed in asphalt surfacing shall be set in a concrete collar. The collar shall be at least eight inches (8") thick and extend at least twelve inches (12") from the cast iron ring. The concrete collar shall be constructed such that at the interface with the asphalt, the collar shall be one-half inch (1/2") lower than the pavement. The cast iron ring shall be constructed such that it is three-fourths inch (3/4") lower than the pavement. Brick shall not be used to raise the manhole. Cones shall not be broken out to lower the ring to meet the road grade. Sections shall be removed and grade rings or adapter rings (riser) used.

Section 5.06 CONNECTIONS TO EXISTING SEWER:

Manholes used to connect the sewer to the existing sewer shall be plumb and centered on the existing pipe at the elevation designated and the base placed as specified. Care shall be taken not to disturb the alignment of the existing sewer.

The cutting of the existing sewer pipe shall be done in the presence of the Public Works Representative/Engineer. The cut shall be full area of the new pipe and shall be finished so as to leave no projections that will restrict the flow or catch solids.

Every precaution shall be taken to prevent any material from entering the sewer main. Any such materials entering the sewer shall be removed.

Section 5.07 INCOMING SEWER LINES:

In no case shall an incoming sanitary sewer be allowed to drop more that 12-inches to the base. Sewer lines where the grade is higher than 12-inches above the existing base; a drop manhole connection shall be used. In all cases the base shall have a channel for the incoming sewage.