**SECTION 333000 – SANITARY SEWER SYSTEM**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification sections, apply to this section.

1.2 SUMMARY

A. This section includes the furnishing and installation of a sanitary sewer system.

B. Related sections include the following:

1. Division 31 Section “Earthwork.”
2. [ Division 33 Section “Directional Drilling.” ]
3. [ Division 33 Section “Boring and Jacking.” ]
4. [ Division 33 Section “Wastewater Utility Pumping Stations.” ]
5. [ ]

**SPECIFIER: Delete inapplicable items in REFERENCES.**

1.3 REFERENCES

A. Except as herein specified or as indicated on the Drawings, the work of this section shall comply with the following:

1. ASTM Standard Specifications:

a. A48 - Gray Iron Castings.

b. A167 - Stainless and Heat Resisting Chromium - Nickel Steel Plate, Sheet, and Strip.

c. A536 - Ductile Iron Castings.

d. A746 - Ductile Iron Gravity Sewer Pipe.

e. C14 - Concrete Sewer, Storm Drain, and Culvert Pipe.

f. C55 - Concrete Building Brick.

g. C62 - Building Brick (Solid Masonry Units Made from Clay or Shale).

h. C76 - Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe.

i. C139 - Concrete Masonry Units for Construction of Catch Basins and Manholes.

j. C270 - Mortar for Unit Masonry.

k. C425 - Compression Joints for Vitrified Clay Pipe and Fittings.

l. C443 - Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets.

m. C478 - Precast Concrete Manhole Sections.

n. C700 - Vitrified Clay Pipe, Extra Strength, Standard Strength, and Perforated.

o. C923 - Resilient Connectors Between Reinforced Concrete Manhole Structures and Pipes.

p. D449 - Asphalt Used in Dampproofing and Waterproofing.

q. D1527 - Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe, Schedules 40 and 80.

r. D1784 -Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds.

s. D1785 - Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120.

t. D2239 - Polyethylene (PE) Plastic Pipe (SIDR-PR) Based on Controlled Inside Diameter.

u. D2241 - Poly(Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR-Series).

v. D2282 - Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe (SDR-PR).

w. D2680 - Acrylonitrile-Butadiene-Styrene (ABS) and Poly(Vinyl Chloride) (PVC) Composite Sewer Pipe.

x. D2751 - Acrylonitrile-Butadiene-Styrene (ABS) Sewer Pipe and Fittings.

y. D3034 - Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings.

z. D3035 - Polyethylene (PE) Plastic Pipe (SDR-PR) based on Controlled Outside Diameter.

aa. D3212 - Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals.

bb. D3262 - Reinforced Plastic Mortar Sewer Pipe.

cc. D3840 - Reinforced Plastic Mortar Pipe Fittings for Non-Pressure Applications.

dd. D3965 - Rigid Acrylonitrile-Butadiene-Styrene (ABS) Compounds for Pipe and Fittings.

ee. D4396 - Rigid Poly(Vinyl Chloride) (PVC) and Related Plastic Compounds for Nonpressure Piping Products.

ff. F679 - Poly(Vinyl Chloride) (PVC) Large-Diameter Plastic Gravity Sewer Pipe and Fittings.

gg. F794 - Poly(Vinyl Chloride) (PVC) Profile Gravity Sewer Pipe and Fittings Based on Controlled Inside Diameter.

hh. F949 - Poly(Vinyl Chloride) (PVC) Corrugated Sewer Pipe with a Smooth Interior and Fittings.

2. ASTM Standards:

a. C12 - Practice for Installing Vitrified Clay Pipe Lines.

b. C301 - Method for Testing Vitrified Clay Pipe.

c. C497 - Method of Testing Concrete Pipe, Sections, or Tile.

d. C822 - Definitions of Terms Relating to Concrete Pipe and Related Products.

e. C828 - Practice for Low Pressure Air Test of Vitrified Clay Pipe Lines.

f. C924 - Practice for Testing Concrete Sewer Lines by Low-Pressure Air Test Method.

g. C969 - Practice for Infiltration and Exfiltration Acceptance Testing of Installed Precast Concrete Pipe Sewer Lines.

h. C1103 - Practice for Joint Acceptance Testing of Installed Precast Pipe Sewer Lines.

i. D2321 - Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity - Flow Applications.

j. D3839 - Practice for Underground Installation of Flexible Reinforced Thermosetting Resin Pipe and Reinforced Plastic Mortar Pipe.

k. F402 - Practice for Safe Handling of Solvent Cements and Primers Used for Joining Thermoplastic Pipe and Fittings.

l. F1417 - Test method for installation acceptance of plastic gravity sewer lines using low-pressure air.

3. ANSI/AWWA:

a. A21.4 - Cement Mortar Lining for Ductile Iron Pipe and Fittings for Water.
b. C111/A21.11 - Rubber Gasket Joints for Ductile Iron Pressure Pipe and Fittings.

4. NASSCO - National Association of Sewer Service Companies: Recommended Specification for Sewer Collection System Rehabilitation.

5. MDOT:

a. 2012 Standard Specifications for Construction.
b. Standard Plans.

1.4 SUBMITTALS

A. Product Data:

1. Pipe materials.
2. Manholes.
3. Mandrel.

B. Certificates: Submit manufacturers' sworn statements that the pipe materials furnished comply with this Specification.

1.5 QUALITY ASSURANCE

A. Fabrication and Installation Personnel Qualifications:

1. Trained and experienced in the fabrication and installation of the materials and equipment.

2. Knowledgeable of the design and the reviewed Shop Drawings.

B. [ Testing as specified in Article 3.4 of this Specification. ]

PART 2 - PRODUCTS

2.1 PIPE MATERIALS

A. Sanitary Sewer Pipe:

1. General: 15-Inch Diameter and Smaller:

a. One type for entire work.
b. Except service leads or where a specific type is indicated on the Drawings.

2. Types:

a. Vitrified Clay:

1) ASTM C700, [ extra strength. ] [ standard strength. ]
2) Joints: ASTM C425, flexible compression joint.
3) Fittings: ASTM C700.
4) Gaskets: [ SBR ] [ EPDM ] rubber.

b. Reinforced Concrete:

1) ASTM C76. Class [ III ] [ IV ] [ V ].

2) Joints:

a) O-ring, ASTM C443.
b) Bell and spigot.
c) Gaskets: [ SBR ] [ EPDM ] rubber.

**SPECIFIER: Using large diameter concrete pipe in situations with low flows and high strength sewage can lead to hydrogen sulfide corrosion of the pipe interior above the water line. The use of an interior coating may be necessary to ensure long-term pipe integrity. Larger diameter plastic pipes, i.e., Vilonor HDPE may need to be considered.**

3) Epoxy Coatings for Pipe Interiors:

a) [ ]

**SPECIFIER: Consult Water Design Manual before specifying Non-SBR Gaskets.**

3. Gaskets:

a. ANSI/AWWA C111/A21.11.
b. [ Styrene Butadiene (SBR). ]
c. [ Ethylene Propylene (EDPM). ]
d. [ Acrylonitrile Butadiene (NBR). ]
e. [ Fluorocarbon (FPM) ].

**Gasket temperature capability/common use for reference:**

| | | |
|---|---|---|
| **SBR** | **150 Degrees F** | **Fresh Water, Sanitary Sewer (standard gasket)** |
| **EPDM** | **250 Degrees F** | **Fresh Water, Hot Water, Sanitary Sewer** |
| **NBR** | **150 Degrees F** | **Hydrocarbons, Fats, Oils, Grease, Chemicals** |
| **FPM** | **300 Degrees F** | **Hydrocarbons, Acids, Petroleum** |

f. PVC (Solid Wall) - Pipe Diameter of 15 Inches or Less:

1) Pipe and Fittings: ASTM D3034 SDR [ 35 ] [ ]:

a) PVC Compound Cell Classification: ASTM D1784, 12454-B or 12454-C.

2) Joints: ASTM D3212, elastomeric gasket, push-on.
3) Gaskets: ASTM F477.

g. PVC (Solid Wall) - Pipe Diameter of 18 Inches or Greater:

1) Pipe and Fittings: ASTM F679:

a) PVC Compound Cell Classification: ASTM D1784, 12454-B or 12454-C.

2) Joints: ASTM D3212, elastomeric gasket, push-on.
3) Gaskets: ASTM F477.

h. PVC Composite (Truss):

1) Pipe and Fittings: ASTM D2680.
2) Joints: ASTM D2680, mechanical seal.

i. ABS (Solid Wall):

**SPECIFIER: Some agencies allow ABS solid wall pipe for leads only. Insist that a supplier or manufacturer provide current ASTM documents for pipe and material before considering the use of this pipe.**

1) Pipe and Fittings: ASTM D2751. SDR [ 23.5 ] [ 35 ].
2) Joints: ASTM D3212, elastomeric gasket.

j. ABS Composite (Truss):

1) Pipe and Fittings: ASTM D2680.
2) Joints: ASTM D2680, (mechanical seal).

k. Ductile Iron:

1) Pipe and Fittings: ASTM A746.
2) Cement Mortar Lining: ANSI/AWWA C104/A21.4.
3) Joints: Push-on.
4) [ Ceramic Epoxy Lining:

a) Protecto 401.
b) Apply in accordance with manufacturer's requirements.

5) [ Polyethylene Lining:

a) ANSI/ASTM D1248
b) Thickness: 40 mil. ]

6) Calcium Aluminate Cement Lining: Griffin Pipe Products.

l. PVC Profile (Corrugated):

1) Pipe and Fittings:

a) ASTM F949.
b) PVC Compound Cell Classification: ASTM D1784, 12454-B.

2) Manufacturers: Contech, A-2000; or equal.
3) Double Gasket Joints: ASTM D3212.

m. PVC Profile (Ribbed):

1) Pipe and Fittings:

a) ASTM F794.
b) PVC Compound Cell Classification: ASTM D1784, 12454-C.

2) Manufacturers: LOC Pipe, LOC PVC; or equal.
3) Joints: ASTM D3212.

B. Sanitary Service Leads (Laterals):

**SPECIFIER: Select on of the following Item No. 1's.**

1. [ Material: Same as sanitary sewer pipe unless indicated otherwise on the Drawings. ]

1. [ Material: Any of the materials listed for sanitary sewer pipe. ]

2. Wyes and Tees:

a. Sanitary Sewer 8-Inch or 10-Inch Diameter: Wye.
b. Sanitary Sewer 12-Inch Diameter or Larger: Tee.

3. Plugs or Stoppers:

a. Air-tight seal.
b. Removable without damage to pipe bell.
c. Capable of holding 5 psig.
d. Joints and gaskets to match sanitary sewers.

4. [ Laterals Installed by Directional Drilling:

a. Pipe: HDPE, ASTM D3035, SDR 13.5.
b. Joints: Butt heat fused. ]

2.2 MANHOLES

A. Type of Units:

1. As indicated on the Drawings.

2. Precast Reinforced Concrete:

a. Base Section:

1) ASTM C478.

2) Base riser section with integral floor unless constructing a manhole over an existing pipe, in which case base may be separate from riser.

b. Riser and Cone Sections:

1) ASTM C478.

2) Watertight Manholes: Provide four 5/8-inch threaded anchor bolts in cone section.

c. Joints: Premium: ASTM C443, [ 0-ring ] [ rubber ] gasket.
d. Pipe Connector: ASTM C923.

3. Radial Concrete Block:

a. Base Slab: ASTM C478, separate base slab.
b. Blocks:

1) ASTM C139.
2) Curvature: Radius to match manhole size specified.

c. Joints: Mortar: ASTM C270, Type M.

4. [ Interior Coating:

a. High build coal tar epoxy.

b. Interior surface preparation and coating application shall be in accordance with coating manufacturer's recommendations.

c. Coating shall be applied in not less than 2 coats:

1) First coat no less than 10 mils.

2) Second coat shall be applied to yield a total thickness not less than 22 mils in any one area.

d. Factory applied to precast units.

e. Field applied to connections to provide a continuous coating of interior surfaces.

f. Kop-Coat Bitumastic No. 300-M by Koppers; or equal. ]

B. General:

1. Steps:

a. Polypropylene plastic coated steel.
b. M.A. Industries PSI-PF; or equal.
c. Minimum: 10 inches wide x 5 inches deep.

**SPECIFIER: Make sure the casting(s) specified have a 24-inch clear opening.**

2. Manhole Castings:

a. Manufacturers:

1) Standard: [ Neenah, R-1763 ]; [ EJIW, 620 ]; [ EJIW 1040 ]; or equal.

2) Watertight: [ Neenah, R-1916-F ]; [ EJIW, 1040PT ]; [ ]; or equal.

b. Solid covers; no vent holes.

3. Connection Between Manhole and Sewer:

a. Resilient Connector: ASTM C923.
b. Type 304 stainless steel bands in accordance with ASTM A167.
c. KOR-N-SEAL by NPS, Inc.; or equal.

4. Mortar: ASTM C270, Type M.
5. Brick:

a. Concrete: ASTM C55, Type I, Grade N.
b. Clay: ASTM C62, Grade SW.

6. Grade Rings: ASTM C478.
7. Concrete: MDOT 601 and 701, Grade PI or S2.
8. Waterproofing:

a. Bituminous: ASTM D449.
b. Cement: Masonry filler [ ].

2.3 MISCELLANEOUS

A. Pipe Deflection Test Gage:

1. Manufacturer: Cherne Industries, Inc.; or equal.
2. Mandrel:

a. 10-inch for 8-inch to 15-inch fin sets.
b. 24-inch for 18-inch to 48-inch fin sets.

3. Fin O.D.: Not less than 95% of base inside pipe diameter.
4. Minimum 9 fins.
5. Allowable Maximum Deflection: 5% of diameter.
6. Provide proving rings to verify accuracy of test gage.

PART 3 - EXECUTION

3.1 PREPARATION

A. Alignment and Grade:

1. If there is a grade discrepancy or an obstruction which is not indicated on the Drawings, notify Engineer and obtain instructions prior to proceeding.

2. Where sanitary sewer crosses water main:

a. Expose water main prior to laying sanitary sewer to verify existing depth.

b. Maintain minimum clearance of 18 inches unless otherwise indicated on the Drawings.

3. Control:

a. Laser Beam:

1) Check line and grade at:

a) Set-up point, 25 feet, 50 feet, 100 feet and;
b) 200 feet intervals thereafter.

2) Reset projector at each manhole with a 600-foot maximum.

3.2 INSTALLATION

A. General:

1. Install pipe, fittings and appurtenances in accordance with manufacturer's recommendations except as herein specified or indicated on the Drawings:

a. PVC Pipe: ASTM D2321.
b. [ ]

2. Prevent entrance of foreign material.

B. Pipe Laying:

1. Bearing:

a. Support entire length of pipe barrel evenly.
b. Provide bell holes at joints.

2. Direction: Commence at outlet and proceed up grade with spigot ends pointing in direction of flow.

3. Method:

a. Clean [ socket ] [ bell ], gasket groove, and spigot.
b. Set gasket.
c. Apply lubricant to spigot.
d. Center spigot end of pipe to be laid and push home against base of socket.
e. Center pipe to form a sewer with uniform invert.

4. Allowable Alignment Deflection:

a. Horizontal: [ 0.004 ] [ 0.20 ] feet.
b. Vertical: [ 0.004 ] [ 0.1 ] feet.
c. Slope: ± 5% of planned grade.

C. Jointing:

1. [ Lubricants and Gaskets ] [ Solvent Cement ]: To be furnished by pipe manufacturer.
2. [ Gaskets:

    a. Surfaces of Joint: Clean and dry before lubricant is applied.

    b. Take care in laying that the pipe does not shift and that gasket remains in a home position after assembly. ]

D. Manholes:

1. Base Section Placement: Full and even bearing.
2. Precast Units: Mortar joints and lift holes.
3. Block Units:

    a. Block: Set in full bed of mortar with key slots filled.
    b. Joints: Maximum 1/2-inch wide at inside face and wiped.

4. Top of Casting Elevation:

    a. Gravel Areas: 3 inches below surface.
    b. Bituminous Base Course: At base course grade.
    c. Final Bituminous Wearing Surface:

        1) At finished grade.

        2) Adjustment of castings from base course grade to finished grade is incidental.

    d. Ditches: 6 inches below ditch bottom or protruding not more than 6 inches above slope; as applicable.

**SPECIFIER: Manholes subject to flooding should have watertight covers.**

    e. Other Areas: As directed by Engineer or as indicated on Drawings.

5. Waterproofing: [ Prevent visible leakage ] [ ].

E. Service Leads (Sanitary Sewer Laterals):

1. Locations:

    a. Service lead locations indicated on Drawings are schematic only to represent approximate locations and total number.

    b. Confirm exact service lead location with [ property occupant ] [ Engineer ].

    c. Unless otherwise directed, install service leads at center of vacant property.

2. Alignment: Right angles to street centerline, except as indicated otherwise on the Drawings.

3. Grade: Uniform minimum of 1/8-inch per foot (1%).

4. Depth:

   a. Elevations at property line indicated on Drawings.

   b. If Drawings are not specific, depth shall be adequate to serve basement of existing building.

   c. At property line of vacant property or temporary structures, minimum depth shall be [ 10 feet ] [ or maximum depth possible ] [ as indicated on the Drawings ].
   d. Record depth of end of lateral below finished grade.

5. Risers:

   a. In event of high groundwater, risers may be required, which decision shall be made by Engineer.

   b. Required if sanitary sewer is more than 12 feet below finished grade.

6. Plugs: Plug ends air tight with standard [ disc ].

7. Markers:

   a. Install [ 2-inch x 2-inch ] [ ] [ wood ] [ ] marking rod at end of each service lead extending vertically from end of lead to within 3 inches of ground surface.

   b. [ Place 2-inch-long galvanized lag bolt in end of wood rod. ]

8. Witnesses and Measurements:

   a. Wyes and Tees:

      1) Measurement to center of nearest downstream manhole.
      2) Note manhole by number indicated on Drawings.

   b. Ends of Service Leads: 3 measurements to permanent surface features.

F. Connections:

1. To Existing Structures:

   a. Opening: No larger than needed for new pipe.
   b. Brick or Block Structure: Relay and repoint loose blocks and bricks.

2. For Future Use:

   a. 4-Inch Through 21-Inch Diameter: Plug with standard cap or disc.
   b. 24-Inch and Larger:

      1) Bulkhead with 8-inch thick brick and mortar.

2) 1/2-inch mortar plaster on outside of bulkhead.

3.3 CLEANING

A. Debris: Remove dirt and debris, including cemented or wedged material, from the inside of sewers and manholes.

B. Final Acceptance: Clean sewers and manholes before requesting final acceptance.

3.4 TESTING AND INSPECTION

A. Observation: By Engineer.

B. Notification for Testing: Arrange with Engineer following backfill, cleaning and pretesting.

C. Equipment and Manpower: Provide everything required for testing.

D. Alignment and Grade Tests:

1. Visual:

a. Each manhole to manhole section.

b. Mirrors or Lights: Adequate to illuminate the section

**SPECIFIER: The following laser beam test was suggested by a concrete pipe representative as a means of checking for deflection, etc. in plastic pipe. It may be overkill.**

2. Laser Beam:

a. At Laser Beam and Target:

1) At respective manholes.
2) Sequentially at 3/4-inch offset from:

a) Invert.
b) Crown.
c) Left 1/4 point.
d) Right 1/4 point.

b. One or More Laser Beam Discontinuous:

1) Remove and replace section.
2) Undamaged pipe may be reused.

E. Low Pressure Air Test for Leakage:

1. Required for All Types of Pipe.

a. Concrete Pipe: ASTM C924.
b. Clay Pipe: ASTM C828.
c. Plastic Pipe: ASTM F1417.

2. Test each manhole to manhole section following completion of service leads, risers and other appurtenances.

3. Pressure: Initially 4.0 psi greater than groundwater back pressure for 2 minute duration.

4. Pressure Drop:

a. Measure time interval for pressure drop from 3.5 to 2.5 psi greater than groundwater back pressure. Compare with the minimum test time. Measured time interval must be equal to or greater than the minimum test time.

b. Minimum Test Time for Various Pipe Sizes:

| Nominal Pipe Size, Inches | Time, T minutes/100 feet |
|---|---|
| 6 | 0.7 |
| 8 | 1.2 |
| 10 | 1.5 |
| 12 | 1.8 |
| 15 | 2.1 |
| 18 | 2.4 |
| 21 | 3.0 |
| 24 | 3.6 |
| 27 | 4.2 |
| 30 | 4.8 |
| 36 | 6.0 |
| 42 | 7.3 |

c. If the test section includes more than one pipe size, calculate the test time for each pipe size and add the times together to arrive at the total test time for the section.

5. Repair leaks and repeat tests until acceptable results are achieved.

F. Other Leakage Tests for Special Situations Only:

1. Requires prior approval of Engineer.

**SPECIFIER: ASTM C1103 option below is for 27-inch and larger.**

2. In accordance with ASTM [ C969 ] [ C1103 ].
3. Water Infiltration:

a. Groundwater: Minimum 2 feet above high point of pipe.
b. Allowable Rate: [ 200 ] [ ] gallons/inch pipe diameter/mile/day.

4. Water Exfiltration:

a. Water Test Elevation: Minimum 2 feet above higher point of pipe or groundwater elevation.

b. Allowable Rate: [ 200 ] [ ] gallons/inch pipe diameter/mile/day.

G. [ Deflection Test for Plastic Pipe:

1. Go, No Go Gage:

a. Pull go, no go gage through each section:

1) At least 30 days after completion of backfill.
2) Pulled by one person with no mechanical advantage.

b. Go, no go gage will not pass:

1) Remove and replace section.
2) Undamaged pipe may be reused.

2. Vibratory Re-rounding Device:

**SPECIFIER: Select 1 of the following:**

a. [ Use not permitted. ]
a. [ Obtain Engineer's prior approval. ]
b. Submit pipe manufacturer's written approval of equipment and method. ]

H. [ Internal Television Inspection of Sanitary Sewers:

1. General:

a. Inspect sanitary sewers using a closed-circuit color television camera.

b. Provide Engineer with video tapes in standard VHS format and written logs to document the internal television inspection:

1) Written logs shall note the location of sewer laterals and pipe deficiencies by distance from the upstream manhole.

2) The video tape shall include audio commentary regarding the sewer condition.

c. Engineer will review the video tapes and written logs to verify that the sanitary sewers were constructed in accordance with the Contract Documents.

d. The videotapes shall verify that the sanitary sewers are clean and free of sediment and debris to the satisfaction of Engineer. Sanitary sewers not satisfactorily cleaned shall be promptly cleaned and reinspected by closed-circuit color television camera.

e. [ Television inspection shall be completed, documentation of television inspection shall be provided and Engineer shall determine that the sewers were constructed in

accordance with the Contract Documents before payment for completed sections of sanitary sewer will be recommended to Owner. ]

2. Performance Requirements:

a. Inspection procedures and equipment shall meet the applicable standards as presented in the National Association of Sewer Service Companies (NASSCO) Recommended Specifications for Sewer Collection System Rehabilitation.

b. Each section of sanitary sewer between manholes shall be television inspected separately utilizing a video camera and related equipment specifically designed for the purpose of internal sewer inspection.

c. The camera speed shall not exceed 30 feet per minute.

d. The camera shall be stopped for no less than 10 seconds at the entrance manhole, each service lateral, exit manhole, and at points where the sewer is damaged or deficient.

e. Lighting for the camera shall be adequate to allow a clear picture of the entire periphery of the sewer and shall be varied as required to be effective for all pipe diameters inspected.

f. Cables and equipment used to propel the camera shall not obstruct the camera view or interfere with the documentation of the sewer conditions.

g. The video recording shall be on a continuous running tape and be recorded in the SP node of a standard VHS tape deck.

h. The mobile recording studio shall have adequate space to accommodate up to 3 persons for the purpose of viewing the video monitor while the inspection is in progress.

i. Whenever possible, the camera shall move in a downstream direction.

j. The location of the camera in the sewer shall be monitored by an accurate measuring system which records the distance traveled from the upstream manhole on the video tape.

k. Video tapes and written logs shall be clearly labeled with the Project name and location identification. ]

l. If sewer has dirt and debris which prohibits video inspection, the sewer shall be cleaned and re-televised at no expense to Owner.

**Drawings Indicate Go-No-Go gage for plastic pipe:**

**Paragraph Reference Indicate on Drawings**
**2.1 A.2.b.1) C76: C1, I, II, III, IV or V**
**2.1 A.2.f.1) ABS: SDR-35**
**2.1 B.1. Sanitary lead material**

| | |
|---|---|
| **2.2 A.** | **Type of manhole** |
| **3.1 A.2.b .** | **Clearance from water main** |
| **3.2 D.4.e .** | **Top of manhole elevation** |
| **3.2 E.1.a .** | **Service lead locations** |
| **3.2 E.2.** | **Lead alignment** |
| **3.2 E.4.a.** | **Lead elevation at property line** |
| **3.2 E.8.a.** | **Manhole numbers** |

END OF SECTION 33000