

CHAPTER 18: SANITARY SEWER SYSTEMS

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18.00 INTRODUCTION AND GOALS

The purpose of this chapter is to provide guidance and outline specific standards for the design, construction and rehabilitation of the City's sanitary sewer infrastructure.

18.01 ADMINISTRATION

A. General:

1. *Definition of Sanitary Sewer System Components:* Sanitary sewer infrastructure is comprised of some or all of the following components, which are further defined in the following paragraphs:
 - a. Service laterals are generally small diameter sewers, 4 in. and 6 in. diameter, that connect the individual building waste plumbing piping to the sewer system.
 - b. Collector sewers are the sewers constructed in a public street, alley or easement to receive the waste discharged from the individual building service laterals. These sewers may serve one or more blocks before they discharge into larger interceptor sewers. Collector sewers are generally 8 in. or 10 in. diameter.
 - c. Connection Wyes: The connection point between the service lateral and the collector sewer is generally a "wye" depending on the configuration of the service lateral and collector sewer. Service laterals larger than 6 in. diameter usually are connected to the collector sewer at a manhole. Service laterals that require flow monitoring or sampling will also be connected to collector sewers at manholes.
 - d. Interceptor sewers are the sewers that carry the waste discharged from one or more collector sewers to the ultimate point of disposal or treatment plant. Occasionally, service laterals discharge directly into interceptor sewers where conditions do not permit a collector sewer or a collector sewer would be redundant. Interceptor sewers are generally larger than 10 in. diameter.
 - e. Manholes and cleanouts are installed on sewers to provide access for maintenance. Normally a small diameter pipe connected to the sewer pipe and brought to the surface of the ground is all that is necessary on service laterals. Manholes, underground structures built on the sewer and large enough for a man to enter, are constructed at pipe bends and periodically along the sewer line on collector and interceptor sewers.
 - f. Pumping stations are used to lift wastewater when there is not enough difference in elevation to flow by gravity, or when the inflow sewer is below the receiving sewer. The receiving sewer may be a gravity sewer or a force main.
 - g. Force Mains are the system of piping used to connect a pumping station to the interceptor sewer. It can be short, just conveying the wastewater from the pumping station to an adjacent interceptor, or in some instances, the pipe can convey the wastewater a considerable distance under pressure before discharging it.

2. *Sanitary Sewer System Ownership:*

- a. **City Sanitary Sewers:** The City owns and maintains a system of sanitary collector sewers, manholes, and cleanouts for the collection and transport of wastewater generated by users within the City.
- b. **UCSD Facilities:** The Urbana & Champaign Sanitary District (UCSD) owns and maintains the interceptor sewers even though they may be located within the City limits. The UCSD also owns and maintains the collector sewers in the unincorporated areas surrounding and adjacent to the City. All sanitary sewage pumping station facilities and force mains within the City limits and extra territorial jurisdiction are owned and maintained by the UCSD.
- c. **Lateral Ownership:** The sewer service lateral and connection “wye” are owned by the owner of the property served. Maintenance of these items is the responsibility of the property owner.
- d. **Private sewers:** Private sewers and connections to the City collector sewer that have been constructed for the benefit of a single property are owned and maintained by the owner of that property. This also applies to cases where there may be agreements made among two or more property owners to install a private sewer to benefit a group of properties. Where sewers are installed on private property such as a mobile home park or apartment complex, ownership and maintenance responsibility, including the connection point, is the responsibility of the property owners unless there are subdivision covenants or written agreements and easements which clearly indicate otherwise.

B. Jurisdiction:

1. *City and UCSD Jurisdiction:* The City has regulatory jurisdiction over sanitary sewer infrastructure, including private components, within the City limits. Maintenance responsibility remains with the sewer owner. Both the City and UCSD review design and inspect the construction of sanitary sewers outside the City and within the 1-1/2 mile extra territorial jurisdiction limit. These sewers are then maintained by the UCSD until the land the sewer is on is annexed to the City.
2. *Applicable Standards within Jurisdiction:* City standards, UCSD standards and Illinois Environmental Protection Agency (IEPA) requirements apply to sanitary sewer design and construction within the City limits and 1-1/2 mile extra territorial jurisdiction limit. The Illinois Department of Transportation, local drainage districts, or railroads may have additional standards or requirements for sanitary sewer construction within their jurisdiction.

C. Permits:

Construction, rehabilitation, renovation and repair of sanitary sewers and services may require permits. Where permits are required, they shall be fully executed prior to initiating work.

1. *IEPA Construction / Operating Permits:*
 - a. **Regulations:** IEPA construction / operating permit requirements are covered within the following regulations:

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Illinois Administrative Code, Title 35: Environmental Protection
Subtitle C: Water Pollution, Chapter I: Pollution Control Board
Part 309: Permits
Part 310: Pretreatment Programs

- b. Regulation Availability: These regulations are available from the IEPA at the address below or on the web through the IEPA web page <http://www.epa.state.il.us/>
- Illinois Environmental Protection Agency
1021 North Grand Avenue East
Post Office Box 19276
Springfield, IL 62794-9276
217/ 782-0610
- c. Permits Not Required: In general, IEPA construction / operating permits are not required for sanitary service laterals for individual structures. However, IEPA has some exceptions for high-flow volumes (1500 gal. / day or more) and high strength or toxic wastewater. The IEPA regulations should be consulted for their specific requirements.
- d. Permits Required: IEPA construction / operating permits are required for the following construction activities:
- i. New collector and interceptor sewer construction
 - ii. Modification or repair to existing sanitary sewage facilities involving a change in capacity or location
 - iii. New pumping stations or modification to existing pumping stations
 - iv. A privately owned sewer or sanitary sewer service which discharges more than 1500 gal. / day. (Privately owned sewers serving mobile home parks may be governed by separate legislation.)
 - v. Sewers serving industrial users
- e. General Permit Requirements: Permit forms, instructions, and related schedules can be obtained from the IEPA at the address listed above. In instances where new sewers or pumping stations discharge into City collector sewers or UCSD interceptor sewers, City and UCSD approval must be obtained on the permit form. It is the responsibility of the person obtaining the permit to verify that adequate hydraulic capacity is available for the additional flow. The City will grant approval of the permit only when the applicant's portion of the permit is fully completed, including the signature of a Illinois registered professional engineer, and provision of satisfactory documentation of hydraulic capacity to the City Engineer.
2. *NPDES Discharge Permits*: Except for subdivision development and very unusual circumstances NPDES discharge permits should not be required for any sanitary sewer work under the jurisdiction of the City. IEPA regulations should be consulted for their specific requirements. Note that a NPDES construction permit will often be required for construction erosion control (See Chapter 22).

3. *City of Champaign Permit:*
- a. **General Requirements:** The City requires a permit for any sanitary sewer work within the City limits and the 1-1/2 mile extra territorial jurisdictional limit. A drawing will be requested where necessary to clarify the proposed work. Permits and inspection of sanitary sewers in new subdivision developments are handled through the subdivision review / inspection process.
 - b. **Permit Availability:** A copy of the City's "Sewer Extension and Right-of-Way Encroachment Permit" form is located in Chapter 25 as Standard Attachment 25.07a. Permits are obtained through the City's Permit Engineer at:

City of Champaign
Public Works Department
702 Edgebrook Drive
Champaign, IL 61820
217/351-4466
 - c. **Permit Fees:** There is a nominal fee required at the time the permit is obtained. If the work is within the City right-of-way, bond and insurance will be required.
4. *UCSD Permits:* All construction work on sewers that will require a City permit will also require a UCSD permit. To obtain additional information and secure the appropriate forms contact:

Urbana & Champaign Sanitary District
1100 East University Avenue
Post Office Box 669
Urbana, IL 61801
217/367-3409
5. *Other Permits:*
- a. IDOT Permits are not required for sanitary sewer construction work unless excavation or other work is required in the State right-of-way. IDOT should be contacted in the design stage at the address below. An approved permit shall be obtained prior to starting work in the State right-of-way.

Illinois Department of Transportation
Division of Highways/Division 5
Route 133 West
Post Office Box 610
Paris, IL 61944-0610
217/465-4181
 - b. Drainage district reviews and / or permits may be required for sanitary sewer construction within their easements or crossing their streams.
 - c. Railroad permit requirements vary. When work is anticipated in a railroad right-of-way the individual railroad should be contacted during the design stage and prior to starting any work.

18.02 STANDARDS

The most recent editions of the standards referenced herein shall govern new construction, rehabilitation, renovation and repair of sanitary sewers and appurtenances. The same standards shall also govern new construction and repair of sanitary sewer service laterals. In case of conflict between referenced standards and the criteria contained herein, the criteria in this chapter shall govern.

A. Reference Standards:

1. The City of Champaign Municipal Code
2. Sanitary Sewer Standards (SSS) – Urbana & Champaign Sanitary District and Affiliated Communities (See Appendix A)
3. Illinois Administrative Code, Title 35: Environmental Protection, Subtitle C: Water Pollution, Chapter II: Environmental Protection Agency, Part 370: Illinois Recommended Standards for Sewage Works (IRSSW)
4. Standard Specifications for Water and Sewer Main Construction in Illinois (SSWSMC)
5. IDOT, Standard Specifications for Road and Bridge Construction

B. Design Criteria: In general, detailed design shall meet the design criteria set forth in Subpart C of IRSSW and the following:

1. *Proposed Flow:* Proposed flow for domestic sewage discharge shall be determined in accordance with Subpart C of the IRSSW except that the peaking factor shall be 4.0 in all instances. Proposed flow for commercial and industrial sewage discharge shall be based on projected population equivalents for proposed facilities.
2. *Future Expansion:* Collector sewers shall be large enough and deep enough to be extended to provide service to upstream tributary areas of the City upon build out. Collector sewers shall end in a terminal manhole at the boundary of the development.
3. *Sewer alignment* shall be in accordance with Subpart C, Section 370.120 of the IRSSW except that no curvilinear alignments shall be allowed. See Chapter 15, "General Utility Location Requirements", for sewer location information.
4. *Depth:* Sewers shall have minimum cover of 42 in. to finished grade. Service lateral extensions from the sewer shall be installed to the property line and should be between 6 and 7 ft. deep below the finished ground surface at the property line.
5. *Service Laterals:* Service laterals shall comply with SSS Section 120 and the following requirements. New service laterals within the public right-of-way or easement shall be a minimum of 6 in. diameter. A 4 in. diameter service lateral may be installed on private property. For new sewers serving undeveloped areas a minimum 8 in. by 6 in. "wye" shall be provided for each individual lot. The fitting shall be located near the center of the lot unless the location of the service for the lot is known. The service lateral for each lot shall be extended to the property line. The service shall terminate in a manufactured bell and infiltration limiting plugs (gasketed) installed.

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Zero lot line units shall have a separate sanitary sewer cleanout that discharges in a common service sewer serving a maximum of two dwelling units. A 10 ft. permanent easement, 5 ft. on each side of the centerline of the common and unit service sewers, shall be reserved from the wye connection on the public sanitary sewer to the foundation line of each unit.

6. *Manholes*: Manholes shall comply with IRSSW Subpart C and SSS Section 110.
 7. *Stream Crossings*: Where sanitary sewers must cross streams or drainage channels, design of the sewer shall meet the requirements of Subpart C of the IRSSW.
 8. *Pumping Stations and Force Mains*: Pumping stations and force mains are not allowed without UCSD approval.
- C. Materials**: In general, materials shall meet the requirements of the SSS (see Appendix A), Subpart C of the IRSSW, the SSWSMC, and the following standards:
1. *Sewers and Service Laterals*: Pipe materials for sanitary sewers shall meet the requirements of Section 100 of the SSS. Pipe materials for service laterals shall meet the requirements of Section 120 of the SSS.
 2. *Wyes*: “Wyes” for sewer service lateral connections shall meet the requirements of Section 141 of the SSS.
 - a. *Lined Sewers*: Where new service lateral connections must be made to sewer piping that has been lined, specially designed connectors shall be provided. The liner shall be carefully cut as recommended by the manufacturer of the connector using a core drill or hole saw as applicable and installing a flexible connector assembly such as Inserta Tee as manufactured by Inserta Fittings Co., or approved equal.
 - b. *Existing Sewers*: Where tapping existing sewers to install a new connector is permitted, the connector shall meet the requirements of section 142 of the SSS. Where “wyes” must be cut into existing concrete sewer pipe, clay or PVC “wyes” shall be used with adapter couplings.
 3. *Sewer Lining and Pipe Bursting Materials*: The material and method used for sewer relining and pipe bursting shall be reviewed on a case by case basis and subject to approval by the City Engineer.
 4. *Pipe Couplings*: Couplings shall meet the requirements of Section 143 of the SSS. Where pipes of dissimilar materials are to be joined, transition couplings specially designed to fit the different pipe materials and sizes shall be used. The use of concrete collars to couple sanitary sewer pipe shall not be allowed.
 5. *Manholes*: Sanitary manholes shall meet the requirements of Subpart C of the IRSSW, Section 32 of the SSWSMC, and Section 110 of the SSS and the City of Champaign Standard Manhole Detail (see Standard Attachment 18.01).
 - a. *Manhole Joints*: Only rubber “O” ring joints shall be allowed.
 - b. *Chimney Seals*: Internal chimney seals may be used only for existing manhole adjustment or rehabilitation at locations with a paved surface when

approved by the City Engineer. All chimney seals shall seal the entire chimney and the joint between the casting and the masonry.

- c. **Adjusting Rings:** In addition to precast concrete adjusting rings, injection molded high density HDPE plastic adjusting rings may be allowable upon approval of the City Engineer.
 - d. **Castings:** Castings shall be Neenah R-1713 provided with Type B self-sealing, covers, or approved equal. The word "SANITARY" shall be cast in the lid.
 - e. **Steps:** Manhole steps are not allowed.
6. **Bedding and Backfill:** Bedding materials shall meet the requirements of Section 20 of the SSWSMC, Sections 1003 and 1004 of IDOT, and Sections 130 and 150 of the SSS, except that for PVC pipe bedding only IDOT gradations CA-16, FA-5, FA-6, or FA-10 shall be used. The use of IDOT gradations FA-5, FA-6, and FA-10 as bedding material is not acceptable where there are wet trench conditions.
- D. Construction:** In general, the construction of new sewers and appurtenances and the rehabilitation and repair of existing sewers and appurtenances shall comply with the IRSSW, SSWSMC, and the SSS. All construction work shall also meet the requirements of other Chapters of this Manual.
- 1. **Sewers and Service Laterals:** Sewers and service laterals shall be installed in accordance with Sections 20, 21, 22, 31, 34, and 35 of the SSWSMC and Sections 130, 140, and 150 of the SSS.
 - a. **Bedding and Backfill:** Granular bedding and haunching shall be required on all pipes. Where PVC pipe is used, it shall be bedded, haunched, and backfilled to 1 ft. over the top of the pipe with selected granular backfill material, CA-16, FA-5, FA-6, and FA-10.
 - b. **Cleanouts:** Cleanouts shall be required on sanitary sewer service laterals within 5 ft. of the outside of the building foundation and a maximum of 100 ft. for 4 in. diameter and 150 ft. for 6 in. diameter from a previous upstream cleanout or "wye". Cleanouts should also be installed immediately upstream of a directional change in excess of 45 degrees, excluding wyes.
 - c. **Minimum Cover:** The minimum cover for sanitary sewer service laterals shall be 42 in. from the finished ground surface to the top of the pipe.
 - d. **Locate Service Laterals:** The location of the end of new service laterals shall be marked with a wood post (4 in. x 4 in.) extending a minimum of 1 ft., 0 in. above the finished ground surface. This location shall be at the right-of-way line if the sewer is located in the right-of-way and at the easement line if the sewer is located in an easement. Additionally, the outside of the sidewalk shall be marked with a permanent "S" when poured to mark the location of the lateral sewer services.
 - e. **Stream Crossings:** Where sanitary sewers must cross streams or drainage channels, construction shall meet the requirements of Subpart C of the IRSSW.

2. *Manholes:* Manholes shall be installed in accordance with Section 32 of the SSWSMC and Section 110 of the SSS and the following.
 - a. *Rim Elevation:* The top of all manhole rims shall be set 2 in. above the finished ground surface in unpaved areas and flush with the pavement in paved areas. Castings shall be set in full beds of mortar.
 - b. *Groundwater Nipple:* Manholes shall be furnished with a 1/2 in. nipple, 10 in. long and female NPT coupling and plug mounted at the inside face of the manhole wall 12 in. above the outlet pipe.
 - c. *Manhole Fall:* Minimum fall through a sanitary manhole from inlet pipes to outlet pipe shall be 0.1 ft. and the maximum shall be 2 ft., 0 in. Where the fall is in excess of 2 ft., 0 in., an external drop type manhole shall be required per SSWSMC.
 - d. *Manhole Benches:* Cast in place concrete benches shall slope down 2 in. per ft. from the manhole wall to the edge of the flow channel.
 - e. *Locate Manholes:* For manholes constructed on new sewers intended to serve future development, a wood leader (4 in. x 4 in.) shall be installed adjacent to the manhole and brought to a point 3 ft. above the finished ground surface.
3. *Lining and Sleeving:* Lining and sleeving sewers, as well as other specialized trenchless repair techniques, shall be completed in strict compliance with the individual process manufacturer's written specifications and instructions and shall be approved in advance by the City Engineer. Reinstatement of service taps where sewers are lined shall be done in strict compliance with the individual process manufacturer's written instructions.
4. *Pumping Stations and Force Mains:* Construction of pumping stations and force mains shall meet the requirements of UCSD and Subpart D of the IRSSW.
5. *Restoration Work:* Surface restoration work shall be completed in accordance with the other chapters of this Manual, Section 21 of the SSWSMC, Section 180 of the SSS and the following.
 - a. The minimum thickness for sidewalk restoration shall be 6 in. and the minimum thickness for concrete alley surfaces shall be 8 in. Sidewalks across concrete alley entrances shall be thickened to 8 in. thickness.
 - b. Freshly placed concrete shall be guarded until it sets and hardens sufficiently to prevent people from writing, walking, riding bicycles, or otherwise marking or defacing the concrete in a permanent fashion. Contractor shall be responsible for replacement of defaced slabs at his expense.
 - c. Seeding mixture when used shall be Class I, lawn mixture per IDOT and SSWSMC.

E. Testing and Inspection:

1. *Sewers and Service Laterals:* Sanitary sewers and service laterals shall be tested in accordance with Sections 160 and 170 of the SSS and Section 31-1.11 of the

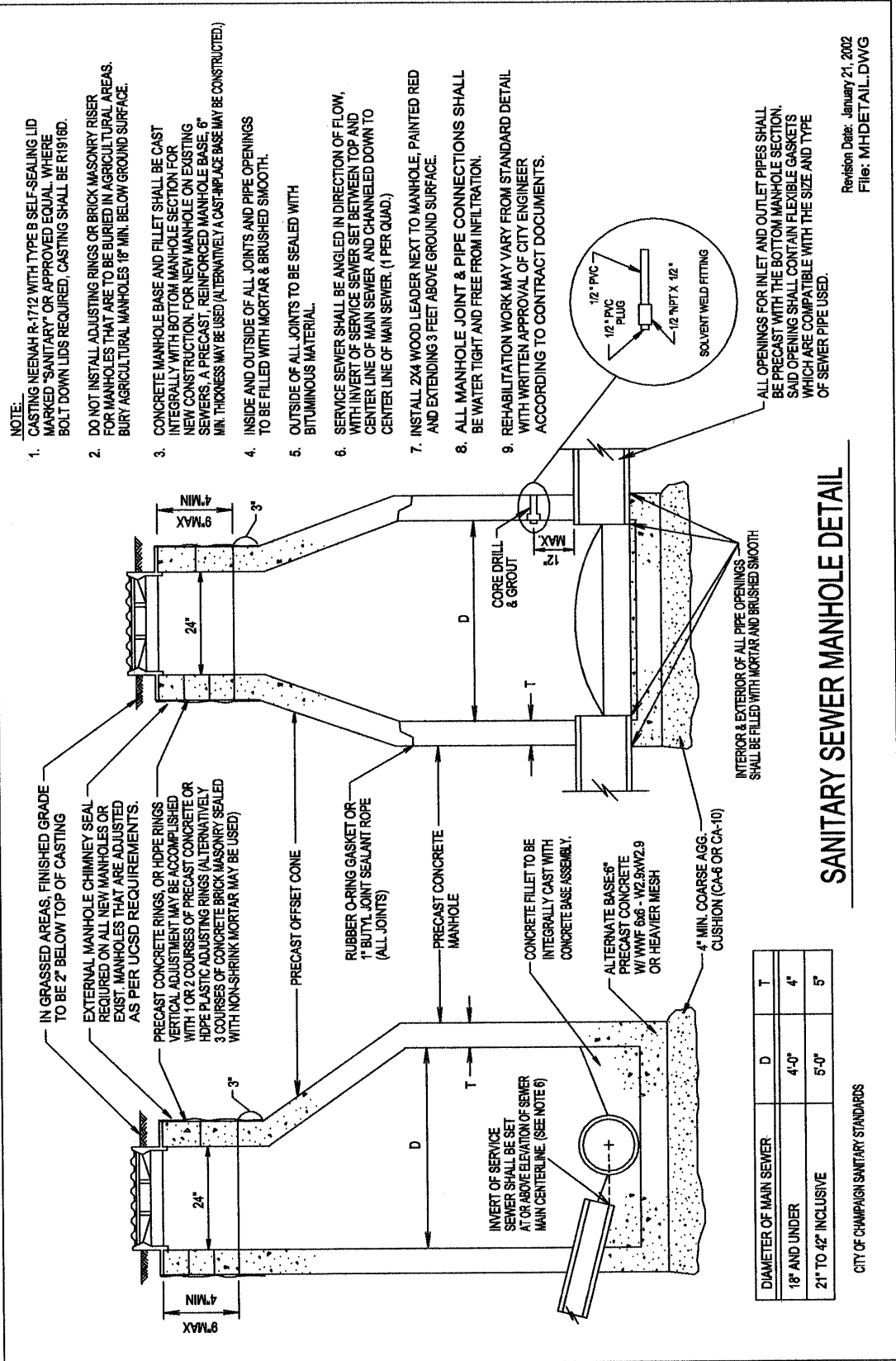
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SSWSMC. Deflection testing of PVC pipelines shall not be initiated until a minimum of 30 days after the entire reach to be tested has been backfilled.

2. *Manholes*: All new manholes shall be leakage tested with Subpart C of the IRSSW. (ASTMC 1244 Standard Test Method for Concrete Sewer Manholes by the Negative Air Pressure (vacuum) Test or ASTM C 969 Standard Practice for Infiltration and Exfiltration Acceptance Testing of Installed Precast Concrete Pipe Sewer Lines.) The leakage test shall include the joint between the casting and the manhole chimney.
3. *Repair Sections*: Repaired sections of sewer pipe shall be leakage tested as above in *Sewer and Service Laterals*. Where the City Engineer agrees that this leakage testing is not practical, or testing would require that sewer joints not completed as part of the work would be included in the test, the City may televise the line to visually check for infiltration and leakage. Televising would be initiated only after the work is completed and the water level in the trench is at least 2 ft. above the crown of the pipe. Additionally, if televising results or the visual checks are inconclusive, the City may request that each joint in the repair section be air tested by the developer of the sewer.
4. *Video Taping*:
 - a. *New Sewers*: After all testing has been completed, all new sewer systems over 300 feet long shall be televised by the developer. The televising shall be recorded in a format that is compatible with City video equipment. A copy of the videotape and a video log shall be transmitted to the City.
 - b. *Lining Rehabilitation*: All sewers which are lined or had other trenchless techniques repairs completed on them shall be televised before and after the work and a copy of the recorded video and video log furnished to the City.

18.03 STANDARD ATTACHMENTS

Attachment 18.01 - City of Champaign Sanitary Sewer Manhole Detail



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Standard Attachment 18.01