

STORM SEWER DEVELOPMENT SPECIFICATIONS
CITY OF BROOKFIELD, WI
SECTION 16.00
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16.01 STORM SEWER PIPE

Pipe: Reinforced Concrete Pipe (RCP) shall meet the requirements of ASTM Designation C-76 and C-507 and Section 8.6.0 of the Standard Specifications.

Pipe laying shall in all cases proceed upgrade. Each pipe shall be laid true to line and grade and in such a manner as to form a close concentric joint with the adjoining pipe. Alignment of installed pipe shall appear straight to visual observations and shall be such that a full circle of light can be seen between manholes, etc., when sighting along all points of the pipe circumference. Each section of pipe shall be handled carefully and placed accurately. Each section of pipe shall be properly supported to ensure true alignment and an invert which is smooth and free from roughness or irregularity.

At all times, when Work is not in progress, open ends of pipe and fittings shall be securely and satisfactorily closed so that no undesirable substances shall enter the pipe or fittings. All pipe shall be laid in accordance with the respective manufacturer's recommendations.

Joints: Rubber gasket joints shall be used with reinforced concrete pipe and shall meet the requirements of Section 3.2.11 of the Standard Specifications.

Trench and backfill: The trench section including bedding, cover, and backfill materials according to the detail in the plans. Backfill containing frozen material shall not be placed, nor shall the trench be left open during freezing weather so that the temperature of the material near the pipe goes below freezing. All trenches shall be compacted by mechanical compaction according to 2.6.14(b) of the Standard Specifications.

CCTV Inspection: CCTV inspection of each and every segment of storm sewer from manhole to manhole shall be required and shall follow the requirements listed under the Television Inspection and Sewer Cleaning Specifications Section of these Specifications.

The inspection shall pan the manholes to show the structure vertically. Any protruding sump or cored in storm sewer line shall be cut flush to the inside wall of the storm sewer.

Acceptance: Prior to final acceptance, any horizontal/vertical misalignment, sags, offset joints or leaks shall be repaired.

16.02 STORM SEWER MANHOLES, CATCH BASINS, AND INLETS

Manholes, catch basins, and inlets shall be constructed according to the details in the plans and Section 3.6.0 of the Standard Specifications and shall meet the requirements of ASTM-C478.

The Contractor shall field verify the location and elevation of all connections to existing manholes prior to ordering precast structures to ensure the structures delivered to the site match the physical locations of the existing storm sewers to be connected. Precast sections are required.

16.03 RCP BOX CULVERT & RCP END SECTION

Pipe: The reinforced concrete pipe box culvert shall meet all the requirements of Chapter 3.2.7 (Precast Concrete Box Installation) and 8.8.0 (Precast Reinforced Concrete Box Sections) of the Standard Specifications.

Joints: Jointing is vital for RCP box culverts in reducing the migration of soil fines and water between box sections and their surroundings. Box culvert sections can be sealed between the joint with gasket, external wrap and/or mastic/butyl – installed per manufacturer’s specifications and ASTM C1677. A combination of joint sealants may be required to prevent infiltration/exfiltration.

Trench and backfill: The trench section including bedding, cover, and backfill materials according to the detail in the plans. Backfill containing frozen material shall not be placed, nor shall the trench be left open during freezing weather so that the temperature of the material near the pipe goes below freezing. All trenches shall be compacted by mechanical compaction according to 2.6.14(b) of the Standard Specifications.

Acceptance: Prior to final acceptance, any horizontal/vertical misalignment, sags, offset joints or leaks shall be repaired.

16.04 TELEVISION INSPECTION AND STORM SEWER CLEANING SPECIFICATIONS

TELEVISION EQUIPMENT

- A. Television equipment shall include television camera, television monitor, cables, power source, lights, and other equipment. The television camera shall be specifically designed and constructed for operation in connection with sewer inspection.
- B. The camera, television monitor, and other components of the video system shall be capable of producing a minimum 650 line resolution color video picture. The camera shall be mounted on skids suitably sized for each pipe diameter to be investigated or on a self-propelled transporter specifically sized for each pipe diameter.
- C. The camera shall have a 360 degree radial by 270 degree plan-and-tilt viewing field designed to provide a close up color viewing of sewer pipe walls and lateral entrances using a moving camera head and directional lighting.
- D. The camera shall be operative in 100 percent humidity conditions. Lighting for the camera shall minimize reflective glare. Lighting and camera quality shall be suitable to provide a clear, in-focus picture of the entire inside periphery of the sewer pipe for all conditions encountered during the work. Focal distance shall be adjustable through a range of from 6 inches to infinity.

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- E. The remote reading footage counter shall be accurate to one percent over the length of the particular section being inspected and shall be mounted over the television monitor. The location meter, for accurately recording the location of the camera with respect to the reference manhole, shall be a direct reading, above ground, friction clamp device or other suitable equipment. Marking on the cable requiring interpolation of manhole depth is not allowed. The meter shall be capable of reducing readings for reverse movement of the camera and shall be capable of being manually re-zeroed for each new setup.

TELEVISION INSPECTION

- A. The camera shall be moved through the line in a downstream direction at a uniform rate, stopping when necessary to ensure proper documentation of the sewer's condition but in no case shall the television camera be pulled at a speed greater than 30 feet per minute. Manual winches, power winches, TV cable, and powered rewinds or other devices that do not obstruct the camera view or interfere with proper documentation or the sewer conditions shall be used to move the camera through the sewer line. If, during the inspection operation, the television camera will not pass through the entire span between manholes, the Contractor shall re-setup his equipment in an opposite manhole. No extra compensation will be made for this additional setup.
- B. In the event the section being televised has substantial flow entering the sewer between manholes, such that inspection of the sewer is impaired, the Contractor shall coordinate with the owner of the source of flow to have such flow temporarily stopped and/or reschedule television inspection of the particular section to a time when such flow is reduced to permit proceeding with the television inspection.
- C. When sewer line depth of flow at the upstream manhole of the section being televised is above the maximum allowable for television inspection, the contractor shall reduce the flow to permit proceeding with the television inspection. In addition, when the sewer line is sagged or depressed, the contractor shall attempt to suction out the sewage by using a sewer jet in close proximity to the television camera.

Where the flow in the sewer is such that the camera is more than 25% under water, the Contractor shall either restrict the flow in the sewer or use a jet to draw the sewage down in front of the camera. Where flow conditions are such that satisfactory televising cannot be performed and restricting the flow will cause backup problems, the Contractor shall provide for the flow of sewage around the section or sections of pipe to be inspected. The bypass shall be made by plugging the line at an existing upstream manhole and pumping the flow into a downstream manhole or adjacent system. The pump and bypass lines shall be of adequate capacity and size to handle the flow. The Engineer shall be furnished a detail of the bypass plan.

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- D. Whenever non-remote powered and controlled winches are used to pull the television camera through the line, telephones, radios, or other suitable means of communication shall be set up between the two manholes or the section being inspected to ensure that adequate communications exist between members of the crews.
- E. Accuracy of the measurement meters shall be checked daily by use of a walking meter, roll-a-tape, or other suitable device. Footage measurements shall begin at the sewer line point of penetration of the upstream manhole, unless specific permission is given to do otherwise. Footage, to the nearest tenth (0.1') of a foot, shall be shown on the video data view at all times.
- F. The lens of the camera shall be cleaned at each MH and when directed by the Engineer. Sewers shall not be televised during rainfall or periods when excessive clearwater is present in the sewer.

DOCUMENTATION OF THE TELEVISION RESULTS

- A. All CCTV footage shall follow PACP standard format and be performed by PACP certified personnel. CCTV video footage shall be provided using a USB compatible hard drive. The hard drive shall be purchased by the Contractor and shall be the property of the City after final submittal. The Contractor shall also provide a record plan of the televised sewer segments.
- B. Storm Sewer videos shall include the following information:
 - 1. Data view:
 - a. Date of TV inspection
 - b. Upstream and downstream manhole numbers
 - c. Current distance along reach (tape counter footage to the nearest tenth of a foot)
 - 2. Audio:
 - a. Date and time of TV inspection, operator name and name of adjacent street.
 - b. Verbal confirmation of upstream and downstream manhole numbers and TV direction in relation to direction of flow.
 - c. Verbal description of pipe size, type, and pipe joint length.
 - d. Verbal description and location of each service connection and pipe defect.
 - e. Type of weather during inspection.
 - 3. External Recording Markings:
 - a. Report number
 - b. Printed labels on tape container and tape cartridge with location information, date, format information, and other descriptive information.

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c. Contractor name

- C. Computerized logs shall include, but are not limited to, the following information:
1. Location of each point of leakage.
 2. Location of each service connection.
 3. Location of any damaged sections, nature of damage, and location with respect to pipe axis.
 4. Deflection in alignment or grade of pipe.
 5. Date, time, city, street, basin, sewer section, reference conditions.
Pipe diameter, pipe material, section length, and corresponding recording identification.
 6. Manhole depth.

STORM SEWER LINE CLEANING

A. Intent:

The intent of sewer line cleaning is to remove foreign materials from storm sewer lines only and restore the sewer to a minimum of 95% of the original carrying capacity and as required for proper inspection of the pipe and joints. Since the success of the other phases of work depends a great deal on the cleanliness of the lines, the importance of this phase of the operation is emphasized. It is recognized that there are some conditions such as broken pipe and major blockages that prevent cleaning from being accomplished or where additional damage would result if cleaning was attempted or continued. Should such conditions be encountered, the Contractor will not be required to clean those specific sewer sections. If in the course of normal cleaning operations, damage does result from preexisting and unforeseen conditions such as broken pipe, the Contractor will not be held responsible.

B. Cleaning Equipment:

1. High-Velocity Jet (Hydrocleaning) Equipment: All high-velocity sewer cleaning equipment shall be constructed for ease and safety of operation. The equipment shall have a selection of two or more high-velocity nozzles. The nozzles shall be capable of producing a scouring action from 15 to 45 degrees in all size lines designated to be cleaned. Equipment shall also include a high-velocity gun for washing and scouring manhole walls and floor. The gun shall be capable of producing flows from a fine spray to a solid stream. The equipment shall carry its own water tank, auxiliary engines, pumps, and hydraulically driven hose reel.
2. Mechanically Powered Equipment: Bucket machines shall be in pairs with sufficient power to perform the work efficiently. Machines shall be belt operated or have an overload device. Machines with direct drive that could cause damage to the pipe will not be allowed. A power rodding machine shall be either a sectional or continuous rod type capable of holding a minimum of 750 feet of rod. The rod shall be specifically heat-treated steel. To ensure safe

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operation, the machines shall be fully enclosed and have an automatic safety clutch or relief valve.

C. Use of City Water:

Water is available at the City's Water Utility building. Depending on time of year, water may also be available from select hydrants. A list of select hydrants can be obtained from the Water Department. Secure permission from the Water Department, obtain all necessary permits, and notify the Engineer and Fire Department before obtaining water from fire hydrants. The Contractor shall make his own arrangements and pay all costs for water, connecting to hydrants and transporting the water to the construction work. Upon payment of the fees, the City will furnish one hydrant meter setting with vacuum breaker, backwater valve and control valve. The Contractor shall be responsible for the installation of this meter setting valves at each location water is drawn. By using the meter setting, cross connections to and contamination of the City's water supply is minimized. The Water Department will bill the contractor based on the actual metered amount of water used unless otherwise determined by the City Engineer.

Hoses from hydrants shall not extend across roadways that are open to traffic unless they are properly protected from any wheel loads. Water main breaks caused by pressure surges introduced into the system from wheel loads or improper use of hydrants shall be repaired at the expense of the Contractor.

Use only special hydrant-operating wrenches to open hydrants. Hydrant valves must be opened "full", since "cracking" the valve causes damage to the hydrant. If any hydrants are damaged, the Contractor will be held responsible and shall notify the appropriate agency and the Engineer so that all damage can be repaired as quickly as possible. Fire hydrants shall be completely accessible to the Fire Department at all times. Upon completion of the work, the Contractor shall remove all temporary piping and facilities.

D. Cleaning Precautions:

During sewer cleaning operations, satisfactory precautions shall be taken in the use of cleaning equipment. When cleaning, precautions shall be taken to ensure that the water pressure does not damage or cause flooding of public or private property being served by the sewer. When water from fire hydrants is necessary to avoid delay in normal work procedures, the water shall be conserved and not used unnecessarily. No fire hydrant shall be obstructed in case of a fire in the area served by the hydrant.

E. Sewer Cleaning:

The Contractor shall clean all storm sewer sections cleaned from upstream to downstream using standard high-velocity jet or mechanically powered equipment. Selection of the equipment used shall be based on the conditions of lines at the time the work commences. The equipment and methods selected shall be satisfactory to the Engineer. The equipment shall be capable of removing dirt, grease, rocks, sand, deposits, and other materials and obstructions from the sewer lines and manholes.

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If mineral deposits exist that prevent the camera from completing the televising and that cannot be removed by standard equipment. Then heavy cleaning shall be required.

If cleaning of an entire section cannot be successfully performed from one manhole, the equipment shall be set up on the other manhole and cleaning again attempted. If, again, successful cleaning cannot be performed or the equipment fails to traverse the entire sewer section, it will be assumed that a major blockage exists and the cleaning effort shall be abandoned.

G. Material Removal:

All sludge, dirt, sand, rocks, and other solid or semisolid material resulting from the cleaning operation shall be removed at the downstream manhole of the section being cleaned. Passing material from manhole section to manhole section.

H. Disposal of Materials:

All solids or semisolids resulting from the cleaning operations shall be removed from the site and disposed of at the Contractor's expense. All materials shall be removed from the site no less often than at the end of each workday.

I. Bypassing Storm Water:

Where the flow in the sewer is such that the camera is more than 25% under water, the Contractor shall either restrict the flow in the sewer or use a jet to draw the water down in front of the camera. Where flow conditions are such that satisfactory TV'ing cannot be performed and restricting the flow will cause backup problems, the Contractor shall provide for the flow of sewage around the section or sections of pipe to be inspected. The bypass shall be made by plugging the line at an existing upstream manhole and pumping the flow into a downstream manhole or adjacent system. The pump and bypass lines shall be of adequate capacity and size to handle the flow.

J. Final Acceptance:

Acceptance of sewer line cleaning shall be made upon the successful completion of the television inspection and shall be to the satisfaction of the Engineer. If TV inspection shows the cleaning to be unsatisfactory, the Contractor shall be required to re-clean and re-inspect the sewer line until the cleaning is shown to be satisfactory.