SANITARY SEWER DEVELOPMENT SPECIFICATIONS rev. 2022

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14.01 SANITARY SEWER CONSTRUCTION

Sanitary sewer pipe shall be Polyvinyl Chloride (PVC) SDR 35 and/or SDR 26 as shown on the plans. Contractor shall install a tracer wire above all PVC sewer mains and laterals (see tracer wire section in special conditions, construction notes and City Standard Details).

Laterals and risers shall be PVC solid wall sewer pipe and fittings meeting the requirements of ASTM D-3034 and Section 8.10.0 of the Standard Specifications. PVC pipe shall be installed in accordance with the Section 3.2.6(i) and the City Standard Details. It shall have a pipe wall thickness equivalent to SDR 35.

Sanitary sewer shall be installed at the grades indicated on the plans.

The trench section shall be according to the City of Brookfield Standard Detail No. UTY-1.

Compaction of the backfill shall be accomplished by mechanical compaction of the trench in accordance with Section 2.6.14(b) of the Standard Specifications.

Density tests on backfill materials will be as specified or as directed by the Engineer. The Contractor will provide for all compaction testing. The Contractor shall re-compact all areas represented by failed density tests. The Contractor shall correct settlement resulting from the consolidation of backfill.

The Contractor shall remove all excavated material from the public right-of-way and/or easement areas.

14.02 JACK AND BORE SANITARY SEWER PIPE

Where shown on the plans a steel casing pipe shall be jack and bored in accordance with Section 6.2.0 of the Standard Specifications. The steel casing pipe shall meet the requirements of drawing File No. 49 of the Standard Specifications.

The Contractor is responsible for any necessary dewatering.

The Contractor shall submit a boring pit layout plan to be approved by the Engineer prior to initiating any construction. This layout shall clearly identify the boring and receiving pits including their locations and dimensions.

14.03 TRACER WIRE

Tracer wire shall meet the requirements listed in the City of Brookfield Sanitary Sewer Material Specifications. Non-wet bury insulated wire will not be accepted.

Tracer wire shall be taped to the top of all PVC and HDPE pipe. The tracer wire shall extend along the entire length of pipe in a continuous fashion.

Tracer wire shall be brought to the surface at each manhole and service lateral stub location according to the City of Brookfield Standard Detail No. SAN-1 and SAN-4.

Splices must be made utilizing a 3-way, direct bury, water proof tracer wire connector meeting the requirements listed in the City of Brookfield Sanitary Sewer Material Specifications. Soldering wires together is not allowed.

14.04 SANITARY SEWER TESTING AND QUALITY CONTROL

The following tests are required in accordance with the Standard Specifications:

- Leak testing per Standard Specifications Section 3.7.0
- Deflection testing per Standard Specifications Section 3.2.6(j)4 with the following exception: The dimensions of the testing device shall test for a maximum of 4 percent deflection. This test shall be performed no sooner than 30 days after backfilling of the line segment, but before final acceptance testing of the sanitary sewer.
- Vacuum testing of sanitary manholes per standard specification Section 3.7.6

Sewer CCTV video inspection footage shall be submitted to the City for every installed segment of sanitary sewer from manhole to manhole. All CCTV footage shall follow PACP standard format and the requirements listed under the Television Inspection and Sewer Cleaning Specifications. Prior to final acceptance, all leaks and defects shall be repaired.

14.05 SANITARY SEWER MANHOLES

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

Manholes shall be constructed according to the City of Brookfield Standard Detail No. SAN-1 and the Standard Specifications. Precast manhole sections shall be used.

The Contractor shall furnish and install an Internal/External Adapter Seal as manufactured by Adapter Inc., Oak Creek, WI or approved equal. Installation shall be in accordance with the manufacturer's recommendations. See the City of Brookfield Standard Detail No. SAN-2 for more information.

All new sanitary manholes shall be visually inspected for leakage.

14.06 SANITARY MANHOLE FRAME & CASTING

This special provision describes the installation of new sanitary manhole frame & casting as directed by the Engineer. Perform this work in accordance to the pertinent provisions of the Standard Specifications for Sewer and Water Construction in Wisconsin, 6th Edition and all amendments, except as herein modified.

Sanitary manhole frame & casting shall be Neenah R-1661 or approved equal. Perform work in accordance to the Standard Specifications for Sewer and Water Construction in Wisconsin, 6th Edition and all amendments. Set manhole frame & casting to finished grade. All work shall be per City of Brookfield Standard Detail No. SAN-1 and No. SAN-2.

14.07 SANITARY MANHOLE SEAL

This special provision describes the installation of a sanitary manhole seal. Sanitary Manhole Seal shall be Adaptor Internal/External seal ring or approved equal in accordance with City of Brookfield Standard Detail Plate No. SAN-1 and Plate No SAN-2.

Sanitary manhole seal, shall meet the material requirements of section 8.42.3 and the performance requirement of section 8.42.4 of the Standard Specifications for Sewer and Water Construction, 6th Edition and all amendments, except as herein modified.

Seals should be installed using methods that conform with Section 3 of the Standard Specifications for Sewer and Water Construction in Wisconsin, 6th Edition and all amendments. Install seals in accordance to the manufacturer's recommended installation procedures and per the City of Brookfield Standard Detail No. SAN-1 and No. SAN-2.

Install all sanitary manhole seal after the manhole has been adjusted to proper grade and prior to final restoration.

14.08 CONNECTION TO EXISTING SANITARY SEWER PIPES AND SERVICES

When connecting dissimilar pipe materials, field cutting and/or machining of pipe materials when necessary shall be made using only tools and methods recommended by the pipe manufacturer and approved by the Engineer. Breaking and chipping the pipe will not be allowed. Allowable connection materials are shown in the City of Brookfield Sanitary Sewer Material Specifications.

14.09 SALVAGING REMOVED SANITARY SEWER APPURTANANCES

All existing sanitary sewer appurtenances removed as part of this project including, but not limited to, manhole frames and lids, shall be salvaged and delivered to the City of Brookfield Maintenance Yard unless the City Inspector determines that it is not worth salvaging. All costs associated with salvaging and delivery of removed appurtenances shall be considered incidental.

14.10 STORM SEWER, CULVERT, AND WATER MAIN CROSSINGS

Contractor shall protect and support storm sewer and water main piping to facilitate sanitary sewer construction. If necessary, Contractor shall be responsible for reinstalling any storm sewer, water main, and/or culvert removed to facilitate the sanitary sewer

construction. Contractor shall also be responsible for replacing, in like kind, any storm sewer, water main, and/or culvert damaged as a result of the sanitary sewer construction**.** Storm sewer and/or sanitary sewer flows shall be maintained by the Contractor throughout the duration of the project.

14.11 FINAL PROJECT CHECKLIST/PUNCHLIST

As part of the final project check out, the Contractor shall:

a.) Insure continuity of the tracer wire for all sanitary sewers and service laterals installed by a method acceptable to the Engineer. The Contractor shall be responsible to make all required repairs to the tracer wire to insure continuity.

b.) Insure all areas are properly restored.

14.12 TELEVISION INSPECTION AND 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.

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.

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. Sanitary 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.
   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.

SANITARY SEWER LINE CLEANING

A. **Intent:**

The intent of sewer line cleaning is to remove foreign materials from sanitary 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 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 sanitary 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.

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.

F. **Root Removal:**

Roots shall be removed in sewer sections where root intrusion is a problem. Special attention should be used during the cleaning operation to ensure almost complete removal of roots from the joints. Procedures may include the use of mechanical equipment such as rodding machines, bucket machines and winches using root cutters and porcupines, and equipment such as high-velocity jet cleaners equipped with root cutters or root rippers. The Contractor may not use chemical root treatment.

G. **Material Removal:**

All sludge, dirt, sand, rocks, grease, 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, which could cause line stoppages, accumulations of sand in wet wells, or damage pumping equipment, shall not be permitted.

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. Under NO circumstance will the Contractor be allowed to accumulate debris, etc., on the site of work beyond the stated time, except in totally enclosed containers and as approved by the Engineer. The contractor will NOT be allowed to dispose of materials at the Fox River Water Pollution Control Center – Brookfield's treatment plant unless otherwise approved by the Director of Public Works.

I. **Bypassing Sewage:**

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 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. The Engineer shall be furnished a detail of the bypass plan. The bypass pumping system shall follow the requirements of specification Section 8.00 temporary Utilities.

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.

14.13 CITY OF BROOKFIELD SANITARY SEWER MATERIAL SPECIFICATIONS

MATERIALS

1. Sanitary Sewer Main
   All pipe used for public and private sanitary sewer shall be as follows:
   - PVC, ASTM D-3034, SDR 35 meeting the requirements of Section 8.10.0 of the Standard Specifications for Sewer and Water Construction in Wisconsin (Standard Specifications).
   - For depths of cover greater than or equal to 20 ft SDR 26 shall be used.

2. Sanitary Sewer Laterals
   All pipe used for sanitary sewer laterals shall be as follows:
   - PVC, ASTM D-3034, SDR 35 meeting the requirements of Section 8.10.0 of the Standard Specifications. Sanitary laterals shall be 6" in diameter.

3. Sanitary Force Main
   All pipe used for sanitary force mains shall be as follows:
   - AWWA C-900 meeting the requirements of section 8.51.2 or
   - HDPE, ASTM F-714, SDR 11 meeting the requirements of section 8.51.3

4. Sanitary Manholes
   Sanitary manholes shall conform to the following:
   - All manholes shall be precast reinforced concrete and have a minimum inside diameter of 48 inches.
   - Minimum wall thickness shall be per Table No. 1 in File No. 12 of the Standard Specifications.
   - Precast concrete manhole base, barrel risers, cone section and adjusting rings shall meet the requirements of ASTM C-478.
   - Manhole external seals shall be provided for each manhole and shall be manufactured by Adaptor, Inc.
   - Manholes shall be constructed per City of Brookfield Standard Details SAN-1, SAN-2, and SAN-3 vacuum tested in accordance with Section 3.7.6 of the Standard Specifications.
   - A minimum 4-inch diameter Butyl rubberized mastic external sealing band meeting or exceeding ASTM C877 (Type II) shall be used around all manhole joints.

5. Fittings
   All fittings used for sanitary pipe and laterals shall be as follows:
   - Fittings for sewer laterals shall be PVC, ASTM D-3034, SDR 35 and meet the requirements of Section 8.10.0 of the Standard Specifications.
   - Couplings for connecting dissimilar pipe materials shall be the Hulk Coupling manufactured by Fernco, Inc., a Max Adaptor One and Done universal repair coupling meeting ASTM C-1173 manufactured by Robar Industries LTD, a gasket straight SDR 26 PVC heavy wall sewer repair coupling (SDR 35 may be used if approved by the City) conforming to ASTM D-3034 and ASTM F-1336, or an approved equal non-shear coupling.
   - Lateral connections to an existing sanitary sewer shall be as manufactured by Inserta Tee or approved equal. Connections shall be made in the 10:00 or 2:00 position.

6. Tracer Wire
   Tracer wire for open cut shall be High Strength Copper Clad 10 AWG with color green for sanitary sewer as manufactured by Copperhead Industries or equal.

7. Tracer Wire Connectors
   Shall be a 3-way, direct bury, water proof connector Part Number 3W8-01 as manufactured by Copperhead Industries or equal.

8. Bedding, Cover and Backfill Materials
   Trench bedding, cover, and backfill materials shall be according to the City of Brookfield Standard Detail No. UTY-2.