

**Construction Specification for
the Installation of Mechanical Repair Sleeves**

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TS 471.01 SCOPE

This specification covers the requirements for the installation of mechanical repair sleeves for rehabilitation of localized defects in existing local and trunk sanitary sewers.

TS 471.02 REFERENCES

This specification refers to the following standards, specifications or publications:

City of Toronto Standard Specifications

TS 4.01	Construction Specification for Sewer Bypass Flow Pumping for Local Sewers
TS 4.02	Construction Specification for Sewer Bypass Flow Pumping for Trunk Sewers
TS 409	Construction Specification for Closed-Circuit Television Inspection of Pipelines
TS 411	Construction Specification for Sewer and Maintenance Hole Cleaning

American Society for Testing and Materials

F2304	Standard Practice for Rehabilitation of Sewers using Chemical Grouting
F3110	Standard Practice for Proper Use of Mechanical Trenchless Point Repair Sleeve with Locking Gear Mechanism for Pipes of Varying Inner Diameter and Offset Joints

TS 471.03 DEFINITIONS

For the purpose of this specification, the following definitions apply:

CCTV means closed circuit television.

Sewer Section means the length of pipe connecting two maintenance holes.

TS 471.04 DESIGN AND SUBMISSION REQUIREMENTS

The Contractor shall prepare and submit the following:

- 1) Equipment operating procedures and systems.
- 2) Chemical grout information, if chemical grout is required for product installation:
 - a) Description of chemical grout materials to be used as per subsection Rehabilitation Products.
 - b) Description of proposed additives.
 - c) Manufacturers recommended procedures for storing, mixing, testing and handling of chemical grouts.
 - d) MSDS sheets for all materials to be used.
- 3) Identify the manufacturer and models of the packers and pumps to be used in the Contract.

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- 4) Upon completion of each pipe section, submit to the Contract Administrator a CCTV report showing the following data for the repair of each identified localized defect:
 - a) Location stationing of the repair of each identified localized defect.
 - b) Video recordings of repair sleeve installation.

TS 471.04.01 Temporary Sewer Bypass Plan

If the Contract Documents requires a temporary bypass or the Contractor, at their discretion, has determined that the sewer flow bypass is required to facilitate the installation of mechanical repair seals, the Contractor shall prepare a Temporary Sewer Bypass Plan according to TS 4.01 or TS 4.02.

TS 471.05 MATERIALS

TS 471.05.01 Safe Handling

All safety considerations required to be met by the Contractor including safe handling, mixing, and transporting of chemical grouts should be provided by the grout manufacturer/supplier, and should include safe operating practices and procedures, appropriate personal protective equipment (PPE) for the various grouting operations, and proper storage, transportation, mixing, and disposal of grouts, additives, and their associated containers.

TS 471.05.02 Rehabilitation Products

Mechanical Repair Sleeve

Product selection shall be at the discretion of the Contractor and shall be approved by the Contract Administrator prior to installation.

Sealing Grout

Sealing grout is product specific and shall only be used in accordance with the mechanical repair sleeve manufacturer recommendations. If grout is recommended, the Contractor shall seal all active infiltration with the applicable grout as per the mechanical sleeve manufacturer's specifications.

TS 471.06 EQUIPMENT

The Contractor shall provide all equipment necessary to complete the required spot repair. Equipment shall include a CCTV camera, inflatable flow through plugs capable of reducing the flow sufficiently, inflatable bladder to product installation, monitoring and recording of the repair process by a CCTV camera during the installation process, an air compressor capable of delivering product manufacturer recommended pressures, sufficient length of air-hose to extend from the point of repair to the above-ground air compressor, line pressure regulators and shut off valves, a winch system for transporting and positioning the sleeve at the point of repair, and flow control plugs.

TS 471.07 CONSTRUCTION

The work shall be conducted during periods of low flows and may require the use of flow through plug, or other similar method to reduce the flow to facilitate the rehabilitation of the localized sewer defect. Temporary flow bypass may be required in situations where flows are too high or where man entry is required to conduct product installation.

TS 471.07.01 Protect Sewer from Damage

The Contractor shall take satisfactory precautions to protect the sewer sections and appurtenances from damage that might be inflicted upon them by the use of repair equipment. Any damage inflicted upon a sewer section or other public or private property as a result of the Contractor's repair operations, regardless of the repair method used and regardless of any other circumstance which may contribute to the damage, shall be repaired by Contractor at no extra cost to the City.

TS 471.07.02 Confined Space Requirements

Contractor shall not enter any sewer section where hazardous conditions may exist until such time as the source of those conditions is identified and eliminated by the Contractor. Contractor shall perform all work in accordance with the latest Occupational Health and Safety Act (OHSA) confined space entry regulations. Contractor shall coordinate his work with local fire, police and emergency rescue units.

The Contractor shall meet or exceed the requirements of confined space entry as outlined under the Occupational Health and Safety Act. For all work in and around the sewer maintenance holes, a person qualified in confined space entry shall be present.

The Contractor shall incorporate the use of adequate gas detection and ventilation equipment at all times when working within maintenance hole structures and sewers.

TS 471.07.03 Installation of Mechanical Repair Sleeve

The intent of this process is to provide trenchless local sealing and repair of localized defects within the sewer section such as sealing of cracks, fractures, offset joints for the purpose of restoring capacity to the damaged section of the host pipe.

The Contractor shall notify the Contract Administrator of all locations and associated existing conditions within each applicable sewer section where a mechanical repair sleeve is identified in the Contract Documents for sewer pipe spot repair. The Contract Administrator and the Contractor shall collectively review with the existing conditions for each defect and the Contract Administrator, at their discretion shall advise and provide direction to the Contractor whether to proceed with the mechanical repair sleeve installation or proceed with spot repair with the installation of chemical grout.

Acceptable Repair

The repair will be considered acceptable by the Contract Administrator when all free flow of infiltration is eliminated, all damage such as cracks/fractures is covered and the repair extends at least 200 mm into undamaged host pipe at both extremities of the repair with a tapered end section to create a smooth fluid flow transition. At completion of the work the entire installation is to be re-inspected by the Contractor using a CCTV camera and a record in the form of a CCTV video shall be prepared giving the address of the project and location of each completed repair. The installation shall be considered complete when the video record confirms that installation.

Deficient Repair

The repair will be considered deficient under the following conditions after installation

- product does not fit tightly against the pipe wall
- not all locks engaged
- product is misaligned within the pipe.

Where the installation of a mechanical repair sleeve is deficient, the Contractor shall rectify the deficiency(s) with a remedial method that is acceptable to the Contract Administrator. Where there is no remedial method acceptable to the Contract Administrator, the product shall be removed and replaced at no extra cost to the City.

Location of Spot Repair

The locations for the installation of the mechanical repair sleeve shall be listed in the Contract Documents.

TS 471.07.04 Site Preparation

Each section of pipe identified for the installation of a mechanical repair sleeve shall be thoroughly cleaned of all debris, calcite, roots, exposed gaskets or other foreign material that could affect the testing and sealing process. No additional payment will be made where additional cleaning is required to sufficiently install the mechanical repair sleeve to rehabilitate the defect. The Contractor shall review any previous CCTV records available at the pre-construction stage for the identified sewer sections to help identify any unusual cleaning requirements.

In addition to the normal cleaning practice, where calcite build-ups are visible, the Contractor shall remove the build-up to provide for a clean, smooth surface to apply the sealant and mechanical repair sleeve. The Contractor shall review the available CCTV videos to familiarize itself with the extent of calcite to be removed. In man entry sewers it may be necessary to prepare some joints with a quick set hydraulic cement so that the mechanical repair sleeve may seat and seal against imperfections such as concrete pipes with chips cracks and or visible aggregate. The Contractor shall ensure a minimum distance of 300 mm on either side of the proposed localized spot repair is adequately prepared.

TS 471.07.05 Flow Control

During the sewer repair, the flow in the sewer and from all connections shall be maintained. The Contractor shall make all the necessary notifications and arrangements with the owners of each building affected.

The Contractor shall provide all necessary materials for the completion of the flow control activity. The flow control method used shall be based on the site conditions present at the time of completion. All equipment necessary for the completion of the flow control operation shall be provided by the Contractor on a continuous, uninterrupted basis for the duration of the control period.

When sewer line flows are above the maximum limits to effectively conduct the inspection and sealing operation, flow control procedures shall be performed in accordance with the requirement listed below:

- 1) Flow control through the use of line plugs, pumps or siphons shall be provided in conditions where the depth of flow is above acceptable levels for proper completion of construction, inspection, cleaning or other sewer related activities.
- 2) A sewer line plug designed to permit control of a portion of the flow shall be inserted in the line upstream of the section being inspected. Depth of flow shall be reduced to acceptable levels throughout the inspection and immediately restored upon completion. The Contractor shall monitor flow levels upstream of flow control devices in order to ensure no adverse effect to sewer's function, for example flooding of services.
- 3) The Contractor shall be solely responsible for the removal of all equipment during sewer line flow control operations. In the event that equipment is lodged within the sewer pipeline, the Contractor is responsible for all costs incurred, including damages caused by; open-cut removal methods, and public or private flooding or surcharging. The Contractor shall provide complete restoration to the satisfaction of the Contract Administrator.
- 4) The Contractor shall ensure that all applicable provincial and municipal requirements for safety are satisfied throughout the course of the Work. This requirement shall include, but is not limited to, the equipment and procedures for traffic control, emergency first aid, gas detection, confined space entry and emergency rescue planning.
- 5) High flows may occur in the sewer system during rainfall events and spring snow melt periods. During these periods flow control may be difficult or unachievable. The Contractor shall take all necessary precautions to protect all public and private property from flood or damage caused by the Contractor's activities. The Contractor shall allow in its schedule for delays due to these occurrences. No additional payment or extensions of Contract Time will be allowed resulting from delays due to high flows during spring snow melt and rainfall events. The sewer shall remain in full operation during the repair process allowing for approximately five minutes of interrupted flow.

TS 471.08 QUALITY ASSURANCE – Not Used

TS 471.09 MEASUREMENT FOR PAYMENT

TS 471.09.01 Mechanical Repair Sleeves

For measurement purposes, a count shall be made of the number of mechanical repair sleeves installed.

TS 471.09.02 Plan Quantity Measurement

When measurement is by Plan Quantity, such measurement shall be based on the units shown in Pricing Form included in the Contract Documents.

TS 471.10 BASIS OF PAYMENT

TS 471.10.01 Mechanical Repair Sleeves – Item

Payment at the Contract Price for the above tender item shall be full compensation for all labour, Equipment and Material to do the Work.