REPAIR PROTOCOL - CRACKED SEWER SERVICE CONNECTION TEE FITTING CITY WIDE

Recommendation

The Commissioner of Engineering and Public Works recommends:

THAT Council endorse the protocol for the repair of cracked sewer service connection tee fittings as is outlined in this report.

Contribution to Sustainability

The recommendations of this report have been developed with consideration for the impact on the natural and built environments, and their potential social and financial implications.

Economic Impact

The adoption of this report will establish a mechanism to collect funds from private sector developers to facilitate the inspection, maintenance and ultimate replacement of sewer service connection tee fittings that develop cracks after installation. These funds will be deposited in the City's Sewer Reserve and used to replace the sewer fittings when required in the future, likely as part of a future road renewal project.

Communications Plan

The approved recommendations stemming from this report will be communicated to the private sector developers, engineering consultants and contractors through correspondence and the normal design, inspection and acceptance process.

Purpose

This report recommends the adoption of a protocol for the repair of cracked PVC sewer service connection tee fittings.

Background - Analysis and Options

The City's sanitary and storm sewer system consists of a series of underground pipes, manholes and service connections. According to information compiled in conjunction with the recent water and wastewater rate study, the City owned and operated close to 1,630 kilometers of sanitary and storm sewer in January 2008, which was valued at approximately $1.08 billion.

Each year, the City's sanitary and storm sewer systems are expanded through the process of land development. After a new sewer system has been constructed, City staff performs a number quality assurance tests on the system before it is put into service or given final acceptance. The purpose of these tests is to confirm the integrity of the new sewer, in particular that it is:

- clean and free of debris;
- free of defects
- acceptable shape and profile; and
- has adequate slope to convey sewage by gravity.

Currently, the most effective means of confirming the condition of a new sewer is by performing a visual inspection of the sewer through the use of a video camera. Accordingly, City standards

require that a complete camera inspection of all storm and sanitary sewers is conducted prior to the City issuing completion approval, and prior to the assumption of the municipal services if required.

Current camera technology allows the technician to manipulate the direction and location of the camera lens to obtain a 360 degree view of the sewer. This versatility together with improved picture quality in new cameras provide a full view of the pipe joints and service connection lateral fittings.

Over the last several years, camera inspections have revealed cracks along the joint in a small number of PVC sewer lateral tee fittings. To date, there are about 300 known cracked sewer fittings in new developments City-wide. It is unclear at this point what is causing these fittings to develop cracks. Information collected to date suggests that inadequate compaction of the bedding material or inherent defects in the fitting may be contributing factors. Cracked fittings are showing up at various locations throughout the City. In most cases, the crack does not affect the function or performance of the sewer lateral nor does it allow ground water to infiltrate into the sewer.

Generally, a cracked tee fitting is identified through the camera inspection before the final lift of asphalt is placed on the road. In this case, the developer is requested to replace the tee fitting by means of open excavation. Unfortunately, there are circumstances where the cracked tee is discovered after the top lift of asphalt has been placed on the road. The excavation of a finished road is done only when absolutely necessary in order to avoid a repair patch. Generally, repair patches present long term maintenance concerns because they are prone to differential settlement, edge cracking and can cause drainage and winter icing problems. In addition, a patch is esthetically undesirable and a long term scar on the road surface. Accordingly, in this situation, the consulting engineer for the development is requested to explore options and make a recommendation on the preferred repair solution which doesn't require the excavation of the finished roadway. In most cases, the use of a fiberglass tee liner is the recommended solution.

A tee liner is a fiberglass sleeve which is placed over an inflatable bladder and coated with a polymer. The bladder with the polymer coated liner fabric is pulled through the sewer into the repair location and then the bladder is inflated with hot water which forces the liner into place and cures the polymer. After the polymer has cured, the bladder is deflated and removed from the sewer leaving the tee liner in place. The cost of this type of repair is approximately $2,500 to $3,000 per fitting. Staff has investigated this method of repair and consulted with one contractor with expertise in this type of work. Based on this review, it was determined that this method of repair has been in use for over five years now with good success. Most contractors will provide a minimum of a five year repair warranty on a tee liner repair but a minimum 10 year service life is expected. Accordingly, it is anticipated that at some point in the future there will be a need to either reline the sewer fitting or replace it.

Public Works operations staff has recommended that wherever possible cracked tees should be excavated and replaced. Since 2004, tee liners have been installed in several developments as a means of repairing the cracked tee without excavating the finished roadway. Camera inspections conducted in these areas in 2009 revealed that in a small percentage of the cases, the liner has partially delaminated from the pipe wall and partially obstructed the pipe. In addition, at several locations, the thickness of the liner has significantly reduced the pipe size such that the inspection camera will not pass through that section. In both these situations, sewage flows were not impacted significantly. These isolated cases are most likely due to improper installation of the tee liner rather than a representation of the performance of the product. Accordingly, the installation of any future tee liners will be closely monitored by City staff to ensure that the work is done properly by a qualified contractor. Staff will develop criteria for the proper installation of tee liners to assist with the inspection process.

Staff also conducted an informal survey of neighbouring municipalities and confirmed that other municipalities in the GTA including the Town of Whitby, Town of Richmond Hill and the Town of

Markham have accepted the use of a tee liner or chemical sealant/injection as a means of repairing cracked tees depending on the sewer depth, size of crack and location.

Accordingly, it is recommended that the following protocol be followed in the event that a cracked service lateral tee is identified:

1. Where the top lift of asphalt has not been placed on the roadway, the cracked sewer service connection tee fitting shall be excavated, removed and replaced.

2. Where the top lift of asphalt has been placed on the roadway, the cracked sewer service connection tee fitting may be repaired by means of a tee liner or other suitable trenchless technology subject to the developer providing the City with a cash contribution towards the ongoing inspection and maintenance of the tee liner, plus the cost of ultimately replacing the sewer service connection tee fitting in the future when necessary. The cash contribution shall be based on the present day cost of replacing the tee fitting. The current contribution is as outlined below:

Depth of Sewer	Cash Contribution per Fitting
2.5 to 3.0 metres	$5,000
3.0 to 4.0 metres	$6,500
4.0 to 5.0 metres	$8,200
5.0 to 6.0 metres	$10,000
Greater than 6.0 metres	Based on cost estimate

   The value of the contribution will be adjusted annually to account for increases in the cost of labour, materials, inflation and regular inspection.

3. If the City determines that the crack in the sewer service connection tee fitting cannot be adequately repaired by installing a tee liner or other acceptable trenchless technology then the sewer fitting shall be dug up, removed and replaced prior to the start of guaranteed maintenance.

Regular Inspections

The Public Works Department cleans and flushes the City's entire sanitary sewer system on an annual basis. In addition, camera inspections are carried out as needed to ensure the integrity of the sewer systems. Any segment of sewer that includes a repaired service connection lateral will be inspected more frequently in order to monitor the performance of the tee liner.

Relationship to Vaughan Vision 2020/Strategic Plan

This report is consistent with the priorities previously set by Council, in particular:

- Lead & promote environmental sustainability
- Maintain assets & infrastructure
- Ensure financial sustainability
- Plan and manage growth and economic vitality.

This report is consistent with the priorities previously set by Council and the necessary resources have been allocated and approved.

Regional Implications

This report has no implications on the Region of York.

Conclusion

The City's current practice which requires a developer to dig up and repair cracked tees in an unfinished roadway is consistent with other municipalities in the GTA. When a cracked tee is identified after the top asphalt has been placed on a road, alternatives methods of the repairing the cracked fitting should be explored in order to avoid excavating the new road surface. Staff is recommending that trenchless technologies, such as a fiberglass tee liner, be used subject to the developer providing the City with a financial contribution towards the ongoing inspection and maintenance of the tee liner, plus the cost of ultimately replacing the sewer service connection tee fitting when necessary in the future.

Attachments

Attachment No. 1 - Sewer Service Connection Diagram

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Respectfully submitted,

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Commissioner of Engineering and Public Works

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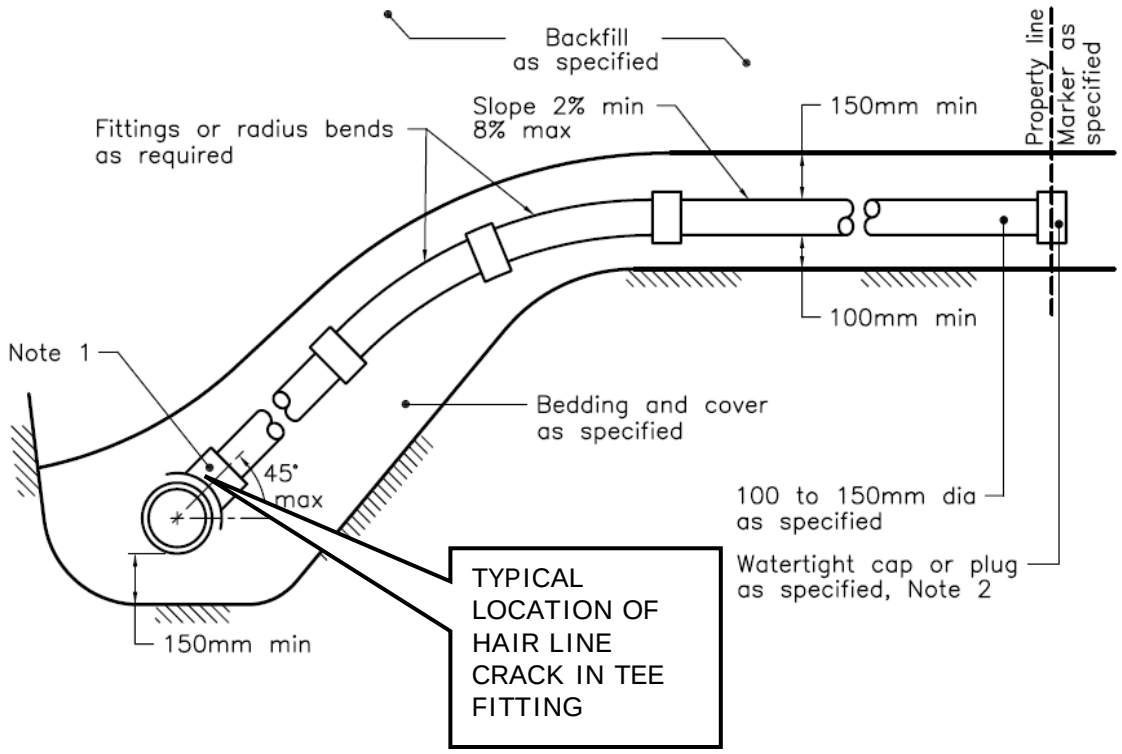
ATTACHMENT NO. 1



NOTES:

1 Service connections to the main pipe sewer shall be made using factory made tees or wyes, strap–on–saddles, or other approved saddles. Factory made tees or wyes shall be used for all service connections where the diameter of the main pipe sewer is:
   a) less than 450mm; or
   b) less than twice the diameter of the service connection.
2 Cap or plug at property line shall be adequately braced to withstand testing pressures.

A Maintenance holes shall be used at the main sewer to connect service connections greater than or equal to 200mm.
B For new construction, saddles must be installed on the main pipe before that pipe is laid.
C Approved cut–in tool must be used for field made connections.
D All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2005	Rev 1
SEWER SERVICE CONNECTIONS FOR FLEXIBLE MAIN PIPE SEWER		
	OPSD – 1006.020	