

POST INSTALLATION INSPECTION - Item No.

Special Provision No. 499S04

November 2023

REQUIREMENTS FOR POST INSTALLATION INSPECTION

1.0 SCOPE

This Special Provision covers the requirements for post installation inspection procedures, acceptance, and repair methods for pipe culverts and pipe sewers.

2.0 REFERENCES

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

Ontario Provincial Standard Specifications, Construction

OPSS 409 Closed-Circuit Television (CCTV) Inspection of Pipelines

Ontario Ministry of Transportation Publications

MTO Forms:

PH-CC-701 Request to Proceed

PH-CC-702 Notice to Proceed

PH-CC-822-PIC Certification of the Installation of Pipe Culverts

Other

WRc Manual of Sewer Condition Classification (MSCC), Fourth Edition

3.0 DEFINITIONS

Acceptable Pipe Condition Status is the assessment designation assigned to an installed gravity pipe installation that has no deficiencies.

CCTV means closed-circuit television used to inspect a gravity pipe installation.

Direct Measurement means measuring pipe parameters such as diameters to determine deflections or the offsets/displacements at joints/service connections to ascertain pipe joint integrity in a gravity pipe installation using a measuring tape, pre-measured rod or other suitable measuring devices.

Gravity Pipe Installation means a constructed pipe system conveying surface waters under the influences of gravity only and can be a pipe sewer or a pipe culvert.

Inspection Assessment means evaluating the findings of a post installation inspection and quantifying the pipe condition status of the gravity pipe installation.

Laser Profiler means an instrument that uses a light ring to survey, locate, measure and report profile, deflection and dimensional attributes, including anomalies, in a gravity pipe installation.

Mandrel means an instrument equipped with an odd number of arms that is pulled through a flexible gravity pipe installation to determine deflection anomalies.

NASSCO means the National Association of Sewer Service Companies which certifies inspectors to perform inspection of pipe sewers and culverts and code viewed pipe conditions.

Pipe Condition Codes means the assignment of code designations to pipe attributes such as pipe materials, walls, joints, service connections or any other physical pipe characteristics.

Pipe Condition Status is the designation assigned to the gravity pipe installation based on the assessment of the post installation inspection results.

Pipe Condition Assessment Rating means the final gravity pipe installations' acceptance rating that is given to the pipe based on the evaluation of the final post installation inspection results inclusive of both original and additional test segments from the post installation inspection, referee post installation inspection and follow up repair inspection.

Post Installation Inspection means qualifying the final installed condition of gravity pipe installations using accepted surveillance and measuring methods.

Reject, Pipe Condition Status Assessment is the designation assigned to an installed gravity pipe installation, pipe lengths, pipe fittings and/or pipe service connections with deficiencies that cannot be repaired to maintain the structural integrity or design service life of the gravity pipe installation or has certain measurable pipe attributes that are below Owner acceptance limits.

Repair, Pipe Condition Status Assessment is the designation assigned to an installed gravity pipe installation, pipe lengths, pipe fittings and/or pipe service connections that have deficiencies that can be repaired to maintain the structural integrity and design service life of the gravity pipe installation.

Repaired, Pipe Condition Status is the designation assigned to installed gravity pipe installations, pipe lengths, pipe fittings and/or pipe service connections with a repair pipe condition status that have been repaired using acceptable intrusive repair measures.

Replacement means the removal of any gravity pipe installations, pipe lengths, pipe fittings and/or pipe service connections and reinstalling the gravity pipe installation, pipe lengths, pipe fittings and/or pipe service connections to contract specifications.

Threshold, Pipe Condition Status Assessment is the designation assigned to an installed gravity pipe installation, pipe lengths, pipe fittings and/or pipe service connections that have certain measurable pipe attributes that are beyond accepted construction limitations but are still within Owner acceptance limits and requires no remediation actions.

Test Segment means an individual sewer pipe run or pipe culvert that has been selected to have a post installation inspection performed on it.

Visual Observation Inspection means coding and describing the profiles, deflection and dimensional features, including anomalies, in a gravity pipe installation using direct human entry into the pipe sewer run or pipe culvert.

Zoom Camera means a stationary video camera fitted with a tele-objective zoom lens and high-powered floodlights and used to inspect a gravity pipe installation.

4.0 DESIGN AND SUBMISSION REQUIREMENTS - Not Used

5.0 MATERIALS - Not Used

6.0 EQUIPMENT - Not Used

7.0 CONSTRUCTION

7.1 Post Installation Inspection

Post installation inspection shall be carried on selected sampling at locations identified by the Contract Administrator.

7.2 CCTV Inspection

The pipe culvert or pipe sewer shall be inspected using CCTV inspection. The CCTV inspection shall be according to OPSS 409.

7.3 Cleaning and Flushing of Pipe Culverts and Sewers

At least 2 Business Days prior to the commencement of the post installation inspection, the pipe culverts and sewers shall be prepared for inspection by cleaning and flushing. The material from the cleaning and flushing operation shall be managed as specified in the Contract Documents.

8.0 QUALITY ASSURANCE

Acceptance shall be according to this Special Provision, including satisfactory completion of all replacement and remedial actions associated with identified deficiencies.

8.1 Post Installation Inspection Procedures

Upon commencement of the post installation inspection, the Contractor shall ensure that construction work is discontinued temporarily in the vicinity of a pipe culvert or pipe sewer being inspected until the inspection has been completed.

The post installation inspections shall be carried out on a number of test segments. The number of test segments inspected shall account for a minimum of 25% of the total number of pipe culvert installations in the Contract or 25% of the total pipe sewer length on the Contract for the purpose of confirming the quality of workmanship and acceptability of the pipe culvert installations.

For Contracts with less than four pipe culverts, a minimum of one test segment will be inspected. Test segments shall be selected by the Contract Administrator and inspected throughout their entire length.

If inspecting in a construction season, the number of test segments selected shall be apportioned across all construction seasons to comprise the total amount of test segments to be inspected.

Selected test segments constructed with rigid pipe materials shall be inspected using CCTV, zoom camera or by visual observations.

Selected test segments constructed with flexible pipe materials shall be inspected using CCTV, zoom camera or by visual observations and shall also be inspected for deflection using a mandrel, laser profiler or by direct measurement.

All CCTV, zoom camera or visual observation operations for a post installation inspection shall be performed by a certified NASSCO inspector. The certified NASSCO inspector shall also be responsible to carry out all mandrel, laser profiling or direct measurement operations on flexible test segments. Where defective, damaged, or improperly installed pipe is encountered, pipe condition status assessment shall be rated according to Table 1. The inspection report shall be submitted to the Contract Administrator.

All individual pipe lengths and/or joints in a test segment assessed with a repair pipe condition status shall be repaired. Repairs shall be according to Table 2. An MTO Form PH-CC-701, Request to Proceed and a repair proposal shall be submitted to the Contract Administrator within 5 Business Days after receipt of the test

segments' post installation inspection submissions and assessments. Repairs according to the submitted repair proposal shall not proceed until an MTO Form PH-CC-702, Notice to Proceed has been received from the Contract Administrator. All repair methods, measures and materials used shall be documented.

Pipe culverts and pipe sewers that are to be installed in a preloaded or surcharged condition as specified in the Contract Documents shall not be selected as a test segment. However, these pipe culverts and pipe sewers may be subject to a post installation inspection should poor performance and/or service arise after installation. Upon assessment of the post installation inspection submission, any repair or replacement issues shall be dealt with on a case-by-case basis.

The test bolts shall be randomly selected, and the installation shall be considered acceptable if the torque requirement is met in at least 90% of the bolts tested.

All individual pipe lengths and/or joints in a test segment assessed with a reject pipe condition status shall be replaced with new pipe lengths, service connections and/or joints as required.

8.2 Post Installation Inspection Assessments

The Contract Administrator shall assess the post installation inspection submissions for each test segment inspected quantifying the pipe condition statuses as per the pipe condition codes shown in Table 1.

Within 20 Business Days of receipt of MTO Form PH-CC-822-PIC, Certification of the Installation of Pipe Culverts, the Contract Administrator shall for all test segments inspected provide the Contractor with copies of all test segment post installation inspection assessments. This shall serve as notification to the Contractor if further action, based on the test segments' pipe condition statuses, is required.

8.3 Replacement and Repair

8.3.1 Replacement

All individual pipe lengths and/or joints in a test segment assessed with a "reject" pipe condition status shall be replaced by the Contractor by installing new pipe lengths, service connections and/or joints as required.

The Contract Administrator shall, upon written notification from the Contractor that replacement operations have been completed, perform a replacement post installation inspection of all test segments where pipe lengths and/or joints have been replaced and shall assess the test segments' pipe condition statuses based on the replacement post installation inspection.

8.3.2 Repair

All individual pipe lengths and/or joints in a test segment assessed with a "repair" pipe condition status shall be repaired by the Contractor.

Table 2 lists Owner accepted repair methods and the pipe materials that the repair methods may be applied to.

The Contractor shall submit a repair proposal to the Contract Administrator within 5 Business Days after receipt of the test segments' post installation inspection submissions and assessments. The Contract Administrator shall review the repair proposal within 3 Business Days.

Upon approval by the Contract Administrator, the Contractor shall carry out the repairs of the pipe lengths and/or joints in the test segments in accordance with the approved repair proposal.

All repair methods, measures and materials used shall be documented.

The Contract Administrator shall, upon written notification from the Contractor that repair operations have been completed, perform a follow up repair inspection on the pipe lengths and/or joints in the test segments that have been repaired to confirm that the repairs have been made by the Contractor as approved.

If attempting to implement the submitted repair proposal, it is determined that the proposed repair measures cannot repair the test segment or portion of the test segment; the test segment or portion of the test segment shall be replaced.

The Contract Administrator shall, upon written notification from the Contractor that replacement operations have been completed, perform a replacement post installation inspection of the test segment in its entirety upon completion of the replacement of the test segment or portion of the test segment and shall assess the test segments' pipe condition statuses based on the replacement post installation inspection.

8.4 Acceptance

A pipe culvert or pipe sewer tender item shall be accepted based on the post installation inspection assessment of selected test segments for that tender item.

Inspected test segments shall be accepted or not accepted as follows:

Individual test segments or portions of a test segment and/or the joints in a test segment that received no pipe condition code are assessed with an acceptable pipe condition rating.

Individual test segments or portions of a test segment and/or the joints in a test segment that received a repair pipe condition rating, and where the Contract Administrator has confirmed that the Contractor has performed the repairs using non-intrusive repair methods, are deemed acceptable and shall be upgraded to a final acceptable pipe condition rating.

If there are more than two repair deficiencies per linear metre or a common repair deficiency is found on 15% or more of the pipe lengths or joints in the test segments inspected where non-intrusive repair measures were used to perform the repairs, the Contract Administrator shall randomly select, at a minimum, an equivalent amount of additional test segments for the post installation inspection.

Individual test segments or portions of a test segment and/or the joints in a test segment that received a threshold pipe condition rating are acceptable,

If there are more than two threshold deficiencies per linear metre or a common threshold deficiency is found on 25% or more of the pipe lengths and/or joints in the test segments inspected, the Contract Administrator shall randomly select, at a minimum, an equivalent amount of additional test segments for the post installation inspection.

Individual test segments or portions of a test segment and/or the joints in a test segment that received a repair pipe condition rating, and where the Contract Administrator has confirmed that the Contractor has performed the repairs using intrusive repair methods, are deemed to be adequate and the entire test segment shall be upgraded to a final repaired pipe condition rating,

If repair deficiencies were found and intrusive measures were used to repair an individual test segment or portions of test segments, the Contract Administrator shall randomly select, at a minimum, an equivalent amount of additional test segments for the post installation inspection.

Individual test segments or portions of a test segment and/or joints in a test segment that received a reject pipe condition rating are not acceptable.

Of the individual test segments or portions of a test segment and/or the joints in the test segments inspected, if 10% or more of the test segments and/or joints received a reject pipe condition rating, the Contract

Administrator shall randomly select, at a minimum, an equivalent amount of additional test segments for the post installation inspection.

8.5 Referee Testing

The Contractor may request referee testing on individual test segments or portions of a test segment that received a “repair”, “reject” or “threshold” pipe condition status.

Referee testing may only be invoked within 5 Business Days of the Contractor receiving copies of the test segments’ post installation inspection submissions and assessments.

Referee testing shall be done through the following procedure:

- a) The Contractor shall identify the assessments of individual test segments or portions of any test segments that they disagree with,
- b) The Contract Administrator shall arrange for a referee post installation inspection to be performed by an independent NASSCO certified, third-party inspector using the same inspection criteria, type of equipment and techniques as was used for the original post installation inspection on the test segments under disagreement,
- c) The Contract Administrator shall assess the referee post installation inspection submission, which replaces the original post installation inspection submission, for each test segment or portions of test segments under disagreement which shall then be binding on both parties; and
- d) The Contract Administrator shall provide the Contractor with copies of the test segment referee post installation inspection submissions and assessments which shall serve as notification to the Contractor if further action, based on the pipe condition statuses, is required.

8.6 Final Pipe Condition Assessment Rating

The Contract Administrator shall assign final pipe condition assessment ratings (PCAR) as follows:

- a) A PCAR of “R” is assigned to those test segments that, either in part or in whole, initially received a repair pipe condition status and have been upgraded to a repaired pipe condition status;
- b) and for the remaining test segments:
 - i. A PCAR of “A” is assigned to the portion of the remaining test segments length that received an acceptable pipe condition status; and
 - ii. A PCAR of “T” is assigned to the portion of the remaining test segments length that received a threshold pipe condition status.

9.0 MEASUREMENT FOR PAYMENT

9.1 Actual Measurement

Measurement for a post installation inspection of pipe sewer shall be measured in metres on the ground surface along the centreline of the pipe sewer from the centre of one drainage structure to the centre of another drainage structure or outlet end of the pipe sewer.

Measurement for pipe culverts shall be in metres from one end of the pipe culvert to the other end of the pipe culvert.

When surface measurement cannot be obtained due to obstruction or traffic restrictions, measurements captured by CCTV meter-reading device shall be used.

9.2 Plan Quantity Measurement

When measurement is by Plan Quantity, such measurement shall be based on the units shown in the clause under Actual Measurement.

10.0 BASIS OF PAYMENT

Post Installation Inspection - 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.

The cost of traffic control for the post installation inspection shall be at no additional cost to the Owner.

Costs for the replacement and/or repair of test segments including but not limited to the associated costs for the reinstatement of the highway structure and all ancillary features previously constructed above the test segments shall be at no additional cost to the Owner. Costs for any delays associated with the repair and/or replacement of the test segments and the reinstatement of the highway structure and all ancillary features previously constructed above the test segments shall also be at no additional cost to the Owner.

The cost of referee post installation inspection according to the Referee Testing clause shall:

Where the assessment of the referee post installation inspection confirms the original pipe condition status, shall be at no additional cost to the Owner; or

Where the assessment of the referee post installation inspection upgrades the original pipe condition status, shall be full compensation for all labour, Equipment, and Material to do the work.; or

Where the assessment of the referee post installation inspection upgrades a portion of the original pipe condition status, be apportioned between the Contractor and the Owner based on the final upgraded and confirmed pipe proportions respectively.

TABLE 1
Gravity Pipe Codes and Associated Pipe Condition Assessment Status

Pipe Condition Assessment Status: Threshold <input type="checkbox"/> Repair <input type="checkbox"/> Reject <input type="checkbox"/> Not Applicable -							
Pipe Condition Codes	Pipe Code Description and Attributes	Rigid Pipe Applications			Flexible Pipe Applications		
		Water Tight (L*)	Fines Tight (F*)	Soil Tight (S*)	Water Tight (L*)	Fines Tight (F*)	Soil Tight (S*)
B	Broken pipe has noticeable displacement of cracked pipe wall segments where the breaks show half the pipe wall thickness or greater for thick-walled pipe or there is clear visible separation between pipe wall segments for thin (≤ 8.0 mm) walled pipe.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
CC	Circumferential crack having a width less than or equal to 0.3 mm is visible and apparent, but crack edges are not visibly open and the crack spans more than 1 but less than 2 clock reference segments (i.e., between 1 to 3 o'clock).	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	-	-	-
	Circumferential crack having a width less than or equal to 0.3 mm is visible and apparent, but crack edges are not visibly open and the crack spans 3 or more clock reference segments (i.e., greater than 1 to 4 o'clock).	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	-	-	-
	Circumferential crack is visible and apparent, but crack edges are not visibly open.	-	-	-	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
CL	Longitudinal crack having a width less than or equal to 0.3 mm is visible and apparent, but crack edges are not visibly open, and length is up to entire pipe segment.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	-	-	-
	Longitudinal crack having a width greater than 0.3 mm is visible and apparent, but crack edges are not visibly open, and the crack is longer than 1 m in length.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	-	-	-
	Longitudinal crack is visible and apparent, but crack edges are not visibly open.	-	-	-	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
CM	Multiple cracks (CC, CL, and CS) are several cracks that are visible and apparent, but crack edges are not visibly open.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
CNI	Service Connection intruding means that the connection is jutting into the drainage structure.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
CS	Spiral crack is visible and apparent, but crack edges are not visibly open, and the crack is $\geq 1/3$ and $\leq 1/2$ of individual pipe length.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	-	-	-
	Spiral crack is visible and apparent, but crack edges are not visibly open, and the crack is $\geq 1/2$ of individual pipe length.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	-	-	-
	Spiral crack is visible and apparent, but crack edges are not visibly open.	-	-	-	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
CX	Service Connection defective means that the connection is damaged or incorrectly positioned.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

Pipe Condition Assessment Status: Threshold <input type="checkbox"/> Repair <input checked="" type="checkbox"/> Reject <input checked="" type="checkbox"/> Not Applicable -									
Pipe Condition Codes	Pipe Code Description and Attributes		Rigid Pipe Applications			Flexible Pipe Applications			
			Water Tight (L*)	Fine S Tight (F*)	Soil Tight (S*)	Water Tight (L*)	Fine S Tight (F*)	Soil Tight (S*)	
CXI	Service Connection defective and intruding means that the connection is damaged or incorrectly positioned and is jutting into the drainage structure.		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
D	Deformed Pipe determined by visual techniques.	Right or left side only > 5% and ≥ 2 clock references (i.e., greater than 1 to 3 o'clock).	-	-	-	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		Upper or lower left or right quadrants > 5% and ≥ 2 clock references (i.e., greater than 1 to 3 o'clock).	-	-	-	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
	Deformed Pipe determined by deflection measurement.	≤ 750 mm	> 5% and ≤ 7.5%	-	-	-	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
			> 7.5% and ≤ 10%	-	-	-	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
		> 750 mm	> 10%	-	-	-	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
			> 5% and ≤ 7.5%	-	-	-	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
		> 7.5%	-	-	-	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
DE	Settled deposits in the pipe blocking > 10% of cross-sectional area, regardless of material composition.		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
DI	Dropped invert of individual pipe lengths or at end of sewer run or culvert.		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
FC	Circumferential fracture is a crack where the edges are visibly separated with an opening width that is ≤ 0.3 mm and is ≤ 1 clock reference segments (i.e., between 1 to 2 o'clock).		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	-	-	-	
	Circumferential fracture is a crack where the edges are visibly separated with an opening width that is ≤ 0.3 mm and is > 1 and ≤ 2 clock reference segments (i.e., between 1 to 3 o'clock).		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	-	-	-	
	Circumferential fracture is a crack where the edges are visibly separated with an opening width that is ≤ 0.3 mm and is more than 2 clock reference segments (i.e., greater than 1 to 3 o'clock).		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	-	-	-	
	Circumferential fracture is a crack where the edges are visibly separated with an opening width that is > 0.3 mm and > 1 and ≤ 2 clock reference segments (i.e., between 1 to 3 o'clock).		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	-	-	-	
	Circumferential fracture is a crack where the edges are visibly separated with an opening width that is > 0.3 mm and is more than 2 clock reference segments (i.e., greater than 1 to 3 o'clock).		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	-	-	-	
	Circumferential fracture is a crack where the edges are visibly separated.		-	-	-	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	

Pipe Condition Assessment Status: Threshold <input type="checkbox"/> Repair <input checked="" type="checkbox"/> Reject <input checked="" type="checkbox"/> Not Applicable -							
Pipe Condition Codes	Pipe Code Description and Attributes	Rigid Pipe Applications			Flexible Pipe Applications		
		Water Tight (L*)	Fine S Tight (F*)	Soil Tight (S*)	Water Tight (L*)	Fine S Tight (F*)	Soil Tight (S*)
FL	Longitudinal fracture is a crack where the edges are visibly separated with an opening width that is ≤ 0.6 mm and the crack is ≥ 1/3 and ≤ 1/2 of individual pipe length.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	-	-	-
	Longitudinal fracture is a crack where the edges are visibly separated with an opening width that is ≤ 0.6 mm and the crack is > 1/2 of individual pipe length.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	-	-	-
	Longitudinal fracture is a crack where the edges are visibly separated with an opening width that is > 0.6 mm and the crack is ≥ 1/3 and ≤ 1/2 of individual pipe length.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	-	-	-
	Longitudinal fracture is a crack where the edges are visibly separated with an opening width that is > 0.6 mm and the crack is > 1/2 of individual pipe length.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	-	-	-
	Longitudinal fracture is a crack where the edges are visibly separated.	-	-	-	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
FM	Multiple fracture (FC, FL and FS) are several cracks where the edges are visibly separated.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
FS	Spiral fracture is a crack where the edges are visibly separated with an opening width that is ≤ 0.6 mm and the crack is ≥ 1/3 and ≤ 1/2 of individual pipe length.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	-	-	-
	Spiral fracture is a crack where the edges are visibly separated with an opening width that is ≤ 0.6 mm and the crack is > 1/2 of individual pipe length.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	-	-	-
	Spiral fracture is a crack where the edges are visibly separated with an opening width that is > 0.6 mm and the crack is ≥ 1/3 and ≤ 1/2 of individual pipe length.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	-	-	-
	Spiral fracture is a crack where the edges are visibly separated with an opening width that is > 0.6 mm and the crack is > 1/2 of individual pipe length.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	-	-	-
	Spiral fracture is a crack where the edges are visibly separated.	-	-	-	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
H	Visible hole in the pipe sewer wall.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
ID	Infiltration dripping is water dripping into the pipe through a fracture with crack width opening ≤ 0.6 mm but not in a continuous flow.	-	-	-	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
	Infiltration dripping is water dripping into the pipe through a fracture with crack width opening > 0.6 mm but not in a continuous flow.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
	Infiltration dripping is water dripping into the pipe through a joint (JDM) but not in a continuous flow.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Infiltration dripping is water dripping into the pipe through a joint (JDL) but not in a continuous flow.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>

Pipe Condition Assessment Status: Threshold <input type="checkbox"/> Repair <input type="checkbox"/> Reject <input type="checkbox"/> Not Applicable -							
Pipe Condition Codes	Pipe Code Description and Attributes	Rigid Pipe Applications			Flexible Pipe Applications		
		Water Tight (L*)	Fine S Tight (F*)	Soil Tight (S*)	Water Tight (L*)	Fine S Tight (F*)	Soil Tight (S*)
IG	Infiltration gushing is water entering the pipe through a fracture or joint under pressure but may not necessarily be a heavy flow.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
IR	Infiltration running is water running into the pipe through a fracture with crack width opening ≤ 0.6 mm and a continuous flow is visible.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
	Infiltration running is water running into the pipe through a joint and a continuous flow is visible.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
IS	Infiltration seeping is the slow ingress of water into the pipe through a fracture with crack width opening ≤ 0.6 mm but there are no visible drips.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
	Infiltration seeping is the slow ingress of water into the pipe through a fracture with crack width opening > 0.6 mm but there are no visible drips.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
	Infiltration seeping is the slow ingress of water into the pipe through a joint (JDM) but there are no visible drips.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Infiltration seeping is the slow ingress of water into the pipe through a joint (JDL) but there are no visible drips.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
JDL	Pipe lengths have slid apart at the joint with a separation distance between pipe length edges that is > 75 mm, however, there is no opening where the pipe fill material is visible.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
JDM	Pipe lengths have slid apart at the joint with a separation distance between pipe length edges that is ≥ 50 mm and ≤ 75 mm, however, there is no opening where the pipe fill material is visible.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
JX	Pipe junction defective means that the junction is damaged or incorrectly positioned.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
LD or LU	Line deviations up or down by > 5 and ≤ 10 degrees as applied to straight pipe run installations.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Line deviations up or down by > 10 degrees as applied to straight pipe run installations.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
LL or LR	Line deviations left or right by > 5 and ≤ 10 degrees as applied to straight pipe run installations.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Line deviations left or right by > 10 degrees and ≤ 20 degrees as applied to straight pipe run installations.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Line deviations left or right by > 20 degrees as applied to straight pipe run installations.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
OB	An obstruction is apparent in the pipe and is not a feature that has been built into or inserted into the pipe.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Pipe Condition Assessment Status: Threshold <input type="checkbox"/> Repair <input checked="" type="checkbox"/> Reject <input checked="" type="checkbox"/> Not Applicable -							
Pipe Condition Codes	Pipe Code Description and Attributes	Rigid Pipe Applications			Flexible Pipe Applications		
		Water Tight (L*)	Fine S Tight (F*)	Soil Tight (S*)	Water Tight (L*)	Fine S Tight (F*)	Soil Tight (S*)
OJL	Pipe lengths have slid apart at the joint displaying an opening where pipe fill material is visible and the opening width is > 75 mm.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
OJM	Pipe lengths have slid apart at the joint displaying an opening where pipe fill material is visible, and the opening width is ≥ 50 mm and ≤ 75 mm.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
SR	Sealing ring at the pipe joint is displaced and intruding into the pipe.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
SRB	Sealing ring at the pipe joint is broken.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
SSL	Surface Damage in the context of spalling where inner surface is splintered or chipped where total area coverage is > 1.0 m in length and > 2 clock reference segments in width (i.e., greater than 1 to 3 o'clock).	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	-	-	-
SSM	Surface Damage in the context of spalling where inner surface is splintered or chipped where total area coverage is ≥ 0.5 and ≤ 1.0 m in length and ≤ 2 clock reference segments in width (i.e., between 1 to 3 o'clock).	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	-	-	-
SWL	Surface Damage to pipe coating damage by abrasion, wear or other installation related damages on galvanized, aluminized Type II and/or polymer laminated steel pipes where the damage area's linear measurement is > 10% of individual pipe length and the damage area's widest width measurement is > 2 clock segments (i.e., greater than 1 to 3 o'clock).	-	-	-	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
SWL	Surface wear in the context of abrasion, wear or other installation related damages to the inner surface of HDPE and PVC pipe products where the damage area's linear measurement is > 10% of individual pipe length and the damage area's widest width measurement is > 2 clock segments (i.e., greater than 1 to 3 o'clock).	-	-	-	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
SWM	Surface Damage to pipe coating by abrasion, wear, or other installation related damages on galvanized, aluminized Type II and/or polymer laminated steel pipes where the damage area's linear measurement is ≤ 10% of individual pipe length and the damage area's widest width measurement is ≤ 2 clock segments (i.e., between 1 to 3 o'clock).	-	-	-	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
SWM	Surface wear in the context of abrasion, wear or other installation related damages to the inner surface of HDPE and PVC pipe products where the damage area's linear measurement is ≤ 10% of individual pipe length and the damage area's widest width measurement is ≤ 2 clock segments (i.e., between 1 to 3 o'clock).	-	-	-	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Pipe Condition Assessment Status: Threshold <input type="checkbox"/> Repair <input checked="" type="checkbox"/> Reject <input type="checkbox"/> Not Applicable -							
Pipe Condition Codes	Pipe Code Description and Attributes	Rigid Pipe Applications			Flexible Pipe Applications		
		Water Tight (L*)	Fine S Tight (F*)	Soil Tight (S*)	Water Tight (L*)	Fine S Tight (F*)	Soil Tight (S*)
X	Pipe section has lost its structural integrity or deformation is more than 25% in diameter change	■	■	■	■	■	■
<p>* Note:</p> <p>Gravity pipe sewer requirements are as specified in the Pipe Joints column of the Quantities - Sewer's contract sheets. The requirements are:</p> <p>S for soil tight (replaces N); F for silt or fines tight (replaces L); and L for water or leak tight (replaces H).</p> <p>Pipe Condition Codes are the standard condition classification codes as identified in the WRc Manual of Sewer Condition Classification (MSCC).</p>							

**Table 2
Accepted Repair Methods**

Repair Method Impact	Repair Method	Pipe Material Application	Repair Method Description
Non-intrusive	Epoxy injection	Concrete	Filling entire fracture with epoxy material to seal against leakage.
	High pressure chemical grout	Concrete	Pumping chemical grout into entire fracture to fill the void(s) behind the pipe wall to preserve the structural integrity of the pipe and seal against leakage.
	Patching	Concrete	Filling spalled or chipped pipe wall areas with concrete material to prevent early exposure of reinforcing steel bars.
	Re-rounding	Steel, HDPE, or PVC	Reinstating a flexible pipe to the accepted construction tolerance or Owner acceptance limits.
Intrusive	Fold and form	Concrete	Placement of a length of softened pipe material into a pipe installation and expanding to "fit" the inner dimensions of the deficient pipe to seal against leakage and maintaining 90% of original flow area.
	Lining	Concrete	Insertion of a short length of smaller pipe into a larger gravity pipe installation and sealing the area between the pipes with grout to provide structural integrity and seal against leakage and maintaining 90% of original flow area.
	Internal sleeve	Concrete	Insertion of a complete smaller gravity pipe installation into a larger gravity pipe installation and sealing the area between the pipes with grout to provide structural integrity seal against leakage and maintaining 90% of original flow area.

WARRANT: Always with this tender item.

Always with OPSS 410, Pipe Sewer Installation In Open Cut, when:

- a) The total combined pipe sewer length of all pipe sewer tender items is greater than or equal to 500 m;
or
- b) If the total pipe sewer length of all pipe sewer tender items is less than 500 m, at least one sewer pipe run will be constructed with a pipe diameter greater than or equal to 450 mm and is greater than or equal to 100 m in length.

Always with OPSS 421, Pipe Culvert Installation In Open Cut, when:

- a) The total combined pipe culvert length of all pipe culvert tender items for a given project, excluding entrance culverts, is greater than or equal to 400 m.
- b) Pipe culvert or a section of one is in difficult to access or environmentally sensitive areas, or
- c) When recommended by a project manager or regional contract Engineer.