

July 9, 2013

BY RESS & Courier

Ms. Kirsten Walli
Board Secretary
Ontario Energy Board
Suite 2700, 2300 Yonge Street
Toronto, Ontario
M4P 1E4

Dear Ms. Walli:

**Re: Union Gas Limited (“Union”)
Owen Sound Replacement Project
Board File # EB-2012-0430**

This letter is to update the Ontario Energy Board with respect to the above noted matter.

As part of Union’s annual review process of its distribution systems and their operation, Union determined that there was the potential for future reinforcement of the Waterloo Distribution system. With this information, Union undertook an analysis of the transmission pipeline being replaced and determined that a portion of that pipeline could be used as part of the Waterloo Distribution system.

In paragraph 28 on Page 5 of the pre-filed evidence, Union stated that the existing 6.3 kilometres of transmission pipeline between the Kitchener Gate Station would be abandoned in place and a new pipeline installed. It has been determined that a short 225 meter section of that pipeline south of the Waterloo Gate Station could be used as part of the distribution system for Waterloo. Using this section of pipe as part of the Waterloo Distribution system will result in an increase in capacity in the distribution system, reduce the pressure drop at the exit of the Waterloo Gate Station, and defer future reinforcement of the Waterloo Distribution system.

This 225 metre section of pipeline was replaced in 1981 as part of a road reconstruction project. The operating pressure of the Waterloo Distribution system will be 420 kPa versus the 3450 kPa the pipeline operated at while it was part of the transmission system.

As part of Union's standard operating practice for changing the operating pressure of a pipeline, Union has completed an Engineering Assessment following the CSA Z662-11 code for the section of pipe where the pressure will be downgraded. This Engineering Assessment has been sent to the TSSA. A copy of the Assessment is attached. Union has not included the appendices of this document as they contain detailed engineering information that Union does not believe should be placed on the public record.

If you have any questions or required additional information please contact Bill Wachsmuth at bwachsmuth@uniongas.com or 519-436-5457.

Sincerely,

[original signed by]

Bill Wachsmuth
Senior Administrator, Regulatory Projects
Encl.

cc: Pascale Duguay, Manager Facilities Applications
Zora Crnojacki, Project Advisor
George Adams

ENGINEERING ASSESSMENT

**MOP DOWNGRADE FOR PART OF THE OWEN SOUND LINE
ALONG FISCHER HALLMAN ROAD
FROM ERB STREET WEST TO WATERLOO GATE STATION**

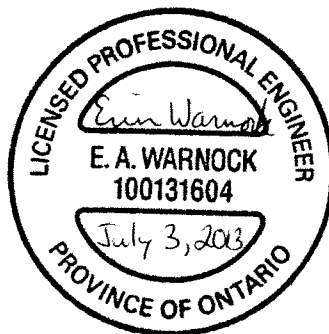


Union Gas, Ltd.

July 3, 2013

Performed by: Kurtis Lubbers, EIT
Pipeline Engineering

Approved by: Erin Warnock, P.Eng.
Pipeline Engineering



Privileged and Confidential

Background

Union Gas is replacing approximately 25 km of the Owen Sound Line between the Owen Sound Valve Site and the Waterloo Gate Station. The Owen Sound Line was constructed in 1958 and is inspected periodically as part of Union's integrity management program. Since 1958, multiple replacements have occurred on the Owen Sound Line as result of municipal relocation and integrity requirements. Results of scheduled inspections in 2011 have identified multiple integrity issues that could pose safety and security of supply concerns if not addressed. Investigative digs were also completed on the line subsequent to in-line inspection, and some of the more severe defects were removed from the line. The remainder of the line is scheduled for pipe replacement. This engineering assessment is required to determine if a section of approximately 225 m of the Owen Sound Line that was replaced in 1981 can be temporarily de-activated, reused and tied into the existing Waterloo distribution system.

A 225 m section of NPS 12 piping in the Owen Sound Line along Fischer Hallman Road between Erb Street West and Waterloo Gate Station in the city of Waterloo is proposed to be temporarily de-activated, reused and tied into the Waterloo distribution system. The current Maximum Operating Pressure (MOP) of this segment of the Owen Sound pipeline system is 3450 kPa and the MOP for the Waterloo distribution system is 420 kPa.

This report contains the methodology and results of an engineering assessment that was performed on 225 m of piping in the Owen Sound pipeline system to be temporarily de-activated and reused in the Waterloo distribution system in accordance with the provisions of Clauses 3.3.3, 3.3.4, 5.6.1, 5.6.2 and 10.15 of CSA Z662-11.

When reusing piping in a different pipeline system, the provisions detailed in Clauses 5.6.1 and 5.6.2 of the CSA Z662-11 must be followed. When de-activating and re-activating piping, the provisions detailed in Clause 10.15 of the CSA Z662-11 must be followed. An engineering assessment must be conducted to determine whether the existing piping is suitable for re-activation and reuse in a different pipeline system. The guidance provided by the CSA Z662-11 on conducting such engineering assessments is that they are to be based on factors such as consideration of the design, material, construction, operating and maintenance history and expected operating conditions, as required in Clause 3.3.3.1 of CSA Z662-11.

The engineering assessment described in this report includes a design, materials, construction, operating and maintenance history, and expected operating conditions assessment to confirm whether the existing piping is in conformance and suitable for the distribution pipeline system as specified by CSA Z662-11.

If the engineering assessment indicates that the piping would not be suitable for the new pipeline system, Union Gas must implement changes to make the piping suitable or not proceed with the change in system.

Where the engineering assessment indicates that the piping would be suitable for the new pipeline system, the piping will be tied into the new distribution system after following all recommendations provided at the conclusion of this assessment.

Introduction

A 225 m section of the NPS 12 piping in the Owen Sound Line along Fischer Hallman Road between Erb Street West and Waterloo Gate Station in the city of Waterloo is proposed to be temporarily de-activated, reused and tied into the Waterloo distribution system. This section of NPS 12 piping was replaced in 1981 to accommodate road construction along Hallman Road (now Fischer Hallman Road) in the City of Waterloo. The piping was designed and tested for a MOP of 3450 kPa. This section of NPS 12 piping is proposed to be removed from the Owen Sound Line and tied into a NPS 8 steel pipeline in the existing Waterloo distribution system which has a MOP of 420 kPa. This additional piping is required for reinforcement of the distribution system. An engineering assessment is required to verify the 225 m section of NPS 12 piping can be temporarily de-activated and reused in a different pipeline system. The scope of the system consists of approximately 225 m of NPS 12 steel piping along Fischer-Hallman Road between Erb Street West and Waterloo Gate Station in the City of Waterloo.

It should be noted that the piping to be reused will not be physically relocated when changing pipeline systems. The NPS 12 piping was going to be abandoned in place but is now proposed to be temporarily de-activated while remaining in place, then be reused and tied into the existing NPS 8 distribution system using new piping at both tie-in locations. The first tie-in location is at the north-west corner of the intersection at Erb Street West and Fischer Hallman Road. The second tie-in location is immediately downstream of the outlet valve at the existing Waterloo Gate Station. Both locations will be tied into an existing NPS 8 steel distribution main. The scheduling of this work will be based on site availability due to other construction activities in the road allowance and must be completed by the summer of 2014. See Figure 1 for a plan view of the piping to be reused and the tie-in locations. The existing 420 kPa MOP Waterloo distribution system is shown in cyan, the existing Owen Sound Line is shown in orange and the 225 m section of NPS 12 to be reused and tied into the distribution system is shown in yellow.



Figure 1: *Proposed Piping to be Reused*

This report presents the results of an Engineering Assessment including design, materials, construction, operation and maintenance history, and expected operating conditions assessment to confirm whether the existing piping is in conformance and suitable for the new pipeline system as specified by CSA Z662-11.

Information reviewed as part of this assessment process included the following:

- ❑ Materials and design information, including:
 - Material specifications including grade, diameter and wall thickness
 - Manufacturing specifications
 - Stress and pressure details
 - Service fluid and temperature range
 - Loading conditions
 - Non-destructive examination
- ❑ Construction Information, including:
 - Pressure testing information
 - Pipe depth of cover
 - External influences
- ❑ Operating and Maintenance Information, including:
 - MOP, and
 - Leak and Failure Records

- Cathodic Protection Records
- In-Line Inspection reports and results
- Condition of piping and any imperfections and repair methods
- Consequence analysis
- Expected operating conditions, including:
 - Existing and proposed land use and site information
 - Hazard identification
 - Additional considerations

Design, Materials, Construction, Operation and Maintenance, and Expected Operating Conditions Review

In this phase of the analysis, the design, materials, construction, operation and maintenance history, and expected operating conditions for the piping were reviewed to confirm whether they conform to the applicable requirements of CSA Z662-11 for the proposed change of pipeline system.

The records used for review include in-line inspection data, class location records, pressure test charts, job order documentation, GIS data (mapping system), Direct Current Voltage Gradient (DCVG) survey results and the Line Change Report # 2-5/640469/70-65 documentation including the project drawings and materials. The above records are required as per Clauses 6.1.5 and 10.4 in CSA Z662-11.

Materials Review Summary

Pipe

A review of the records in Appendix A indicates that in June of 1981, 496.8 m of NPS 12 piping was replaced with 565.8 m of NPS 12 piping to accommodate construction on Hallman Road in Waterloo (now Fischer Hallman Road). The scope of the piping replacement included piping along Hallman Road 39.6 m south of the centreline of Westridge Crescent to Waterloo Gate Station. The quantity of NPS 12 steel pipe consisted of 456.9 m of Grade 290, 7.1 mm nominal wall thickness (NWT) and 108.9 m of Grade 241, 9.5 mm NWT for three road crossings.

All pipe installed was manufactured according to CSA Z245.3 specifications for Category I requirements.

Fittings

A review of the records in Appendix A indicates that there were no fittings installed in 1981 within the affected area that fail to meet the pressure containing requirements of CSA Z662-11 for a MOP of 3450 kPa. The distribution system the piping is proposed to be tied into has a MOP of 420 kPa and therefore the piping meets the pressure containing requirements.

All elbows and caps were manufactured according to CSA Z245.10 specifications for Category I fittings. The stopper fitting was manufactured according to CSA Z245.3 Category I.

Design Review Summary

Service Fluid and Temperature

The piping is assumed to have been designed to service sweet natural gas at a minimum design temperature of -5°C. There are no proposed changes to the service fluid or design temperature.

Pressure and Stress Level

The section of piping to be reused is NPS 12 steel. The existing MOP for the piping is 3450 kPa and the proposed distribution system MOP is 420 kPa. For the distribution pipeline system, all piping must be in accordance with the requirements of CSA Z662-11 Clause 12. The hoop stresses in the pipe must not be greater than 30% of the specified minimum yield strength (SMYS) of the pipe.

The stress and pressure levels for all known pipe and fittings for both the existing and proposed MOPs are summarized in Table 1. The Waterloo distribution pipeline system to be tied into was designed to a MOP of 420 kPa. At this pressure, the hoop stresses of all known pipe and fittings on the piping in question are significantly below 30% SMYS and therefore meet this stress level requirement.

Table 1: Material Stress Levels

Material	Size	Install Date	Nominal Wall Thickness	Grade	Specification	% SMYS at 3450 kPa MOP	% SMYS at 420 kPa MOP
Pipe	NPS 12	1981	7.1 mm	290	Z245.3 Cat I	27.1	3.3
Pipe	NPS 12	1981	9.5 mm	241	Z245.3 Cat I	24.4	3.0
Cap	NPS 12	1981	5.5 mm	241	Z245.10 Cat I	42.2	5.1
Elbow 90D	NPS 12	1981	9.5 mm	241	Z245.10 Cat I	24.4	3.0
Elbow 90D	NPS 12	1981	7.1 mm	241	Z245.10 Cat I	32.7	4.0
Elbow 45D	NPS 12	1981	9.5 mm	241	Z245.10 Cat I	24.4	3.0

Minimum Wall Thickness Requirements

The minimum wall thickness requirement of Table 4.5 of CSA Z662-11 is 4.4 mm for NPS 12 plain-end pipe. The nominal wall thickness is 7.1 mm for the existing pipe. The minimum wall thickness requirement of Table 4.10 of CSA Z662-11 is 4.8 mm for uncased road crossings for NPS 12 pipe. The nominal wall thickness is 9.5 mm for the existing NPS 12 road crossing. There are no known locations along the affected area that fail to meet the minimum wall thickness requirements of these clauses.

Loading Conditions

The existing NPS 12 pipe installed in 1981 was analyzed for Severe Highway Loading (SHL) conditions in Ontario. This was completed to determine if the pipe meets all immediate and fatigue stress limits due to the expected surface loads. The pipe was analyzed for both the existing and proposed system MOPs. The pipe was determined to meet all immediate and fatigue stress limits based on the SHL loads for Ontario. The stress calculations summary data sheets are located in Appendix B.

Non-destructive Examination (NDE)

As per Clause 12.4.8.1 in CSA Z662-11, the requirements for uncased road crossings specified in Clause 4.12.3.1 (c) and (d) shall not apply. Non-destructive examination (NDE) is not required for circumferential joints associated with the crossing, and within the road right-of-way. Records as per Clause 7.14.9 in CSA Z662-11 are not required.

All new piping and tie-in work will have NDE performed to current Union Gas Standard procedures, which meet or exceed the requirements of CSA Z662-11.

Construction Review Summary

Minimum Depth of Cover

As stated in CSA Z662-11, Clause 12.4.7, the minimum required depth of cover is 0.60 m for distribution lines below the travelled surface of the road or in the road right-of-way. At the time of installation in 1981 the line change report documents a trench depth of 1.0 m with sand padding for the Hallman road replacement which correlates to 0.67 m of cover for pipe with an outside diameter of 323.9 mm. The proposed 225 m section of piping to be tied in to the Waterloo distribution system will meet these cover requirements. Although there is no reason to believe that this depth has not been maintained, depth of cover will be verified at both tie-in locations to the NPS 8 distribution piping. If the depth of cover is found to be less than the assumed 0.67 m, the Union Gas Pipeline Engineering department must be contacted before proceeding with any further work.

Pressure Test Review Summary

CSA Z662-11, Clause 8.8 outlines the requirements for pressure testing piping intended to be operated at pressures of 700 kPa or less; such piping shall not require a strength test, but shall be successfully leak tested. The minimum leak test pressure is 700 kPa for a MOP of 420 kPa as required by CSA Z662-11, Clause 8.3.3.1. The test duration is taken from company standards (C&M Manual, Table 3.22B.1) and in reference to CSA Z662-11, Clause 8.8.5. As per Clause 8.8.7 in CSA Z662-11, the documented pressure test records are shown in Appendix C. The documented pressure test information for the NPS 12 main indicates that it was tested with water to 7580 kPa for 27 hours. Therefore, the documented test pressure of the NPS 12 piping meets the requirements for the proposed distribution system MOP of 420 kPa.

Operation and Maintenance Review

Leak and Failure Records

Records indicate that there is no history of leaks along this section of piping.

Cathodic Protection Records

As per Clause 9.9.4 in CSA Z662-11, the Direct Current Voltage Gradient (DCVG) survey data provided in Appendix D, cathodic protection (CP) levels are acceptable along the 225 m section of NPS 12 piping. There are a few indications of coating

damage in a range that is considered moderate however these indications coincide with areas of adequate CP and ILI data indicates that there is no active corrosion associated with the coating damage. Additionally, there are no significant induced alternating current (AC) readings on this section of piping; therefore, overall integrity is expected to be good. Anodes complete with a test box must be installed as per direction from Corrosion Engineering. As per Clause 9.9.5 in CSA Z662-11, the condition of coating and any visible corrosion must be visually inspected at any locations that are exposed during the tie-in to the distribution system. This piping is being tied into the distribution system and therefore Clause 9.9.5 does not apply as per Clause 12.9.4 in CSA Z662-11. The pipe and coating should still be visually inspected in all exposed locations.

In-Line Inspection Records

A review of the most recent data by In-Line Inspection (ILI) conducted in May 2011 indicates a single external metal loss anomaly is present on the 225 m section of NPS 12 piping to be tied into the distribution system. The section of ILI data indicating the anomaly is shown in Appendix E. The ILI data indicates the depth of the anomaly is approximately 13% of the Nominal Wall Thickness (NWT). The length of the anomaly is approximately 58 mm and is located on the top of a segment of 7.1 mm NWT pipe in the road right-of-way. As part of the Union Gas Integrity Management Program (IMP), all ILI data is analysed and dig sites are prioritized using ILI response criteria. It should be noted that at the current MOP of 3450 kPa, this anomaly does not meet any of the ILI response criteria.

Consequence Analysis

This section includes a summary of the review of the single anomaly detected by ILI, including failure pressure and failure mode. The anomaly was analyzed assuming the existing Owen Sound Line MOP of 3450 kPa. The anomaly was assumed to have a growth rate of 0.43% of NWT per year, which correlated to an additional 0.86% of NWT for a total of 13.86 % of NWT. The length of the anomaly was assumed to grow at a rate of 1.9 mm per year which correlates to a total anomaly length of 62 mm. The approximate anomaly depth and length was also increased by an additional 10% for tool tolerance. The analyzed anomaly characteristics after assumed growth and tool tolerance increases were 1.08 mm deep (15.2 % NWT) and 68 mm in length. The failure pressure (Pf) as determined by the Modified B31G (B31G, 0.85 dL) Method was 14998 kPa. The design factors used for this analysis were: Design Factor (F) = 0.8; Location Factor (L) for Class 3 location = 0.625; Joint Factor (J) = 1.0; and Temperature Factor (T) = 1.0. Taking the design factors into account for a Class 3 location, the Pf * (FLJT) = 7499 kPa. For a MOP of 3450 kPa, this results in an additional factor of safety = 2.2. For the proposed distribution MOP of 420 kPa, this results in an additional factor of safety = 17.9.

Therefore, the failure pressure multiplied by the applicable design factors was significantly higher than the proposed MOP of the distribution system. The failure mode was determined to be a leak even at a 100% through wall anomaly at a MOP of 3450 kPa. Union Gas Standard Operating Practices (SOPs) require all facilities to be leak surveyed on a specified frequency based on risk basis. Any potential leak would therefore be detected and remediated accordingly.

Pipe Condition Records and Imperfection Repairs

The single anomaly detected by ILI was analysed above according to Union Gas Pipe Assessment and Repair Procedures (2013). Analysis concludes the anomaly is not a defect and does not require repair. The NPS 12 section of piping is proposed to be tied into the existing distribution pipeline system and therefore the procedures mentioned above do not apply but were completed for safety and due diligence.

Expected Operating Conditions Review Summary

Land Use Analysis

A review of land use at this location indicates that during installation in 1981, this site was a Class 3 location. Since initial installation there has been no new significant development. Consequently, this remains a Class 3 location. The piping is proposed to tie into an existing distribution system, therefore class location requirements do not apply as long as the hoop stresses in the piping are not greater than 30% of the SMYS of the pipe.

Hazard Identification

No significant hazards are expected for this section of piping due to the significant decrease in piping operating pressure and stress levels after tie-in to the distribution piping system. The significant reduction in operating pressure is not considered to produce any additional public or occupational safety requirements. No long term significant environmental or economical impacts are expected.

Additional Considerations

Due to the significant decrease in piping operating pressure and stress levels after tie-in to the distribution piping system, no additional risk is expected for this piping. No further risk analysis or measures are being undertaken for this engineering assessment.

No procedure for change monitoring is being considered due to the significant pressure reduction.

Recommendations

A 225 m section of NPS 12 piping in the Owen Sound Line along Fischer Hallman Road between Erb Street West and Waterloo Gate Station in the city of Waterloo is proposed to be temporarily de-activated, reused and tied into the Waterloo distribution system. The current MOP of this segment of the Owen Sound pipeline system is 3450 kPa and the MOP for the Waterloo distribution system is 420 kPa.

The piping meets all requirements for the design, materials, construction, operating and maintenance history and expected operating conditions criteria in CSA Z662-11. The 225 m section of NPS 12 piping can be temporarily de-activated, reused and tied into the distribution pipeline system with the following requirements:

- ❑ Verify that the depth of cover meets the requirements outlined in the Construction Review Summary at both tie-in locations and two other sample locations (contact Pipeline Engineering if depth requirements are not met).

- ❑ Visually inspect all exposed piping for corrosion and any coating damage. Any corrosion detected must be assessed and treated including coating.
- ❑ Isolate the 225 m of NPS 12 piping to be reused. Deactivate the piping by welding caps at each tie-in location and filling with nitrogen at a pressure of 70 kPa until tied into the distribution system. Prior to reactivation, verify that the pressure in the piping has been maintained while deactivated.
- ❑ Install anodes and a test box as per direction from Corrosion Engineering and the local corrosion technician. Anodes should be installed at the time of deactivation.
- ❑ Ensure all tie-ins and new piping meet all Union Gas C&M Standard requirements, which meet or exceed the requirements of CSA Z662-11.
- ❑ Tie-in work to be completed by end of summer 2014.