AUC
Alberta Utilities Commission

September 29, 2016

ATCO Pipelines
7210 - 42 Street
Edmonton, Alberta T6B 3H1

Attention: Mr. Graeme Feltham, P. Eng.
Vice President, Engineering & Construction

ATCO Pipelines
Radiographic Weld Inspections

Thank you for your information request responses of July 18, 2016.

Based upon the information received, it is apparent that ATCO Pipelines has developed an approach to investigate the integrity of the radiographic inspections completed in the ATCO Edmonton welding shop during the period of time from 2008 through 2015. The ATCO Pipelines investigation is considering both the quality of the radiographic inspection films as well as the quality of the welds. The goal of this process is to provide assurance that the welds that have been placed in pipeline service are confirmed to be suitable for service or to repair or replace any welds that are assessed as having defects that exceed thresholds and criteria established in the CSA Z662 standard. In some cases, ATCO Pipelines has reduced the operating pressure of the associated pipelines during the assessment process. In the July 18, 2016 information, ATCO Pipelines provided spreadsheet (b) summarizing the status of the review process at each of the 639 locations that are being assessed. In May of 2016, ATCO Pipelines had identified 378 geographic locations with potential defects. The reason for the increase from 378 locations to 639 locations has not been explained.

ATCO Pipelines indicated that it is prioritizing the review activities based upon higher population density and larger pipe diameters for 2016 work. However, using Class Locations 3 and 4 as a proxy for high population density, spreadsheet (b) indicated only one high population density/large diameter line location on the 508-millimetre Northwest Edmonton Connector had been inspected. At that location (Row 100), multiple defects were identified, no engineering assessment had been completed, and the operating pressure had been derated to 1,960 kilopascals (kPa) from the maximum operating pressure of 8,480 kPa. There was no assessment provided for the basis of the significant pressure deration.

Based on spreadsheet (b), these 639 locations involve approximately 35,210 welds. Thirty-four of these 639 locations had been inspected with defects identified at all 34 locations. The operating pressure was reduced at 33 locations. The complete rationale utilized to establish a lower operating pressure has not been provided. Engineering assessments were completed at 15 of these locations and a requirement for repairs was identified at 15 locations. Spreadsheet (b) indicated that no repairs had been completed. Of the 35,210 welds with potential defects, it

appears that 12,816 welds had been inspected leaving approximately 22,394 weld inspections outstanding.

Columns M and N of spreadsheet (b) provide reference to the date of an "engineering assessment" and the assessment disposition or conclusions. There is no explanation with respect to the nature of the engineering assessments, or who carried out the assessments. In that respect, CSA Z662 provides clarification between an engineering assessment[1] and an engineering critical assessment.[2] An engineering critical assessment, as more fully referenced in Annex J of CSA Z662, could be used to determine whether defects are fit for service with consideration of material properties, flaw information and applied stress. Alternatively, Clause 7.11 of CSA Z662 provides generic standards of acceptability for different types of welding flaws. ATCO Pipelines stated that it has hired an independent engineering consultant to perform both engineering assessments and engineering critical assessments.

Spreadsheet (a) provides the results of a radiographic film audit of 12,816 welds. There is an assessment of film quality and interpretations with respect to weld quality and defects. Of the 12,816 welds assessed, it appears that the films for 10,444 of the welds could not be interpreted. Of the remainder, the auditors agreed with the original film interpretation for 2,164 welds and disagreed for 208 welds.

The defects exceeding CSA limits are identified in spreadsheet (a) and categorized in column W by type such as porosity, slag, incomplete penetration, crack, lack of fusion, internal undercut, crater crack, hollow bead, external undercut and burn through.

Some of the information in spreadsheet (a) is difficult to interpret and appears to contain conflicting information. As an example, radiograph 1167 appears to show that the original radiograph quality was not acceptable, there was no Acuren interpretation of the radiograph, there was a crack, there was an Acuren interpretation of a 100-millimetre crack, the radiograph was a duplicate of X24 and that the radiograph should be reshot.

In some cases, column S of spreadsheet (a) indicates the image quality was unacceptable, yet there is an Acuren interpretation of the radiograph in column W of spreadsheet (a), which would seem to indicate that the radiograph was usable, although there may be a recommendation by Acuren to reshoot.

In many cases there is no reference to a rejectable defect in column V of spreadsheet (a), and there is an Acuren interpretation of the result in column W, so it is unclear of the intended

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[1] **Engineering assessment** — a documented assessment of the effect of relevant variables upon fitness for service or integrity of a pipeline system, using engineering principles, conducted by, or under the direct supervision of, a competent person with demonstrated understanding and experience in the application of the engineering and risk management principles related to the issue being assessed.
Note: *General requirements for engineering assessment are specified in Clause 3.3.*

[2] **Engineering critical assessment** — an analytical procedure, based upon fracture mechanics principles that allows determination of the maximum tolerable sizes for imperfections in fusion welds.

distinction, or who has made the interpretation between different columns (Acuren or the original reviewer or someone else).

In column V of spreadsheet (a) there are three instances where a crack is identified and five instances where a crater crack was identified. In column W, which is the Acuren interpretation, there are significantly more instances of cracks. In many cases, Acuren has recommended that these be accepted, although in many cases Acuren recommended these radiographs be reshot where the image quality was unacceptable. Presumably, the radiograph was good enough to make an interpretation, but not quite good enough to meet all criteria. In any event, for the eight cracks in column V, Acuren accepted two of them and rejected six. This appears to indicate a potential concern with cracks at some locations. The presence of cracks in these reports may be problematic and CSA Z662 Clause 7.11.15 indicates that cracks are unacceptable. There is no reference to crack defects in the spreadsheet summary attachment (b) by location, but no cross-referencing methodology between the two spreadsheets was provided.

Columns Z and AA of spreadsheet (a) have comments respecting radiograph duplication, where it appears that some radiographs may have been inappropriately utilized for multiple applications. No details respecting this circumstance were provided.

ATCO Pipelines has indicated that it plans to prioritize the re-inspection of large diameter welds in populated areas and expects to complete any necessary repairs to those by the end of 2016, with the remainder planned to be completed by 2019 or earlier. ATCO Pipelines has identified a 2016 to 2019 capital program for $18.3 million in its 2017-2018 general rate application to complete this work. This general rate application capital program was developed on the premise that engineering critical assessments would be completed to assess identified weld defects, rather than undertaking a more costly approach to replace all prefabrication welds with indications of weld defects.

Please provide the following updates:

- A discussion of whether any cracks or crater cracks have been identified, and the intended approach to prioritize and deal with any cracks.

- An update on the progress of the re-inspections and repairs, particularly with respect to the larger diameter pipelines in urban areas that were planned to be completed in 2016.

- Confirmation that the current approach to assess defects is by engineering critical assessment, who is completing the engineering critical assessments, the written procedures to conduct the engineering critical assessments, and a sample of any completed engineering critical assessments.

- Further explanation of the methodology used to determine the reduced operating pressure at locations where the operating pressure has been reduced and a sample of any assessments for reduced operating pressure that have been completed.

- An explanation of the increase in locations from 378 on May 31, 2016 to 639 on July 18, 2016 and confirmation that 639 is still considered as representative.

- An explanation of how the columns in spreadsheet (a) were determined, who determined them, and how they are intended to be interpreted.

- An assessment of the methodology utilized to prioritize and establish the timing for the proposed program execution including an assessment of the risk associated with the contemplated four-year program.

- A current work plan describing the steps being undertaken to identify and remedy weld defects, who is undertaking the steps, and their timing.

- Quarterly updates of spreadsheet (b).

Should you have any questions, please contact the undersigned at 403-592-4434 or by email at brian.shand@auc.ab.ca.

Yours truly,

Brian Shand, P. Eng.
Director, Gas Facilities
Facilities Division

Attachment

cc: Mr. Howard Wallace
Alberta Energy Regulator