

PROTOCOL FOR DESTRUCTIVE TESTING OF THE GAS SUPPLY PIPE

MEE Project: AAV1801

Location of Loss: Aberdeen, SD

Date of Loss: February 6, 2018

Artifacts to be Tested: Gas Supply Pipe - Riser to Meter Set

Location of Testing: MEE, 13805 1st Ave N, Suite 400, Plymouth MN 55441

Date/Time of Testing: To Be Determined

This test protocol is intended as a guide to obtain the best possible information needed to reach the inspection objectives and is not intended to be all-inclusive or exclusive. As with all inspections of this nature, changes to the inspection protocol may be indicated by the results of previous tasks. The examination will proceed on a consensus basis considering input provided by the technical representatives of all parties present. The lack of objection or input will be considered as an agreement to the method. The method chosen for each task will attempt to minimize the negative impact to the artifact. In the event that consensus on how to proceed cannot be obtained, the final decision will be made by the property owner or its representatives. All participants will have the opportunity to examine and photograph the artifacts as needed throughout the inspection. All data generated by laboratory instruments during examination will be captured in digital format.

All participants in the examination will be required to sign in before entering the laboratory. No audio recording will be allowed during the examination. Any video recordings will be made with sound disabled.

The work performed for this examination may include inherently dangerous activities. By signing in, participants acknowledge that they understand the risks and will follow their company's health and safety program.

Protocol Tasks:

- I. Examine components visually and with light microscopy as received.
- II. Dimensional measurements of pipe components.
- III. Collect samples of deposits from the pipe.
- IV. Scanning electron microscopy/energy dispersive spectroscopy (SEM/EDS) of the pipe and/or the collected samples of deposits.
- V. Section pipe components for SEM/EDS analysis.
- VI. Clean pipes to remove nonmetallic deposits.
- VII. Repeat steps I - VI as needed.

- VIII. Section pipe for metallographic evaluation at or near location of suspected leak.
- IX. Metallographically prepare section(s).
- X. Examine metallographically-prepared section(s) as polished with light microscopy.
- XI. Etch metallographically-prepared section(s) with suitable etchant.
- XII. Examine etched section(s) with light microscopy.
- XIII. Hardness test the pipe material. Additional sectioning may be required for this test.
- XIV. Section the pipe for chemical evaluation. Chemical evaluation will be done by an outside lab after the completion of this inspection.