



November 7, 2014

Vermont Gas Systems
Attn: Charlie Pughe, Project Manager
85 Swift Street
South Burlington, VT 05403

**RE: Addison Natural Gas Project (ANGP) – Review of Pipe Loading within VELCO Corridor
Vermont Gas Systems, Inc.
CHA Project No. 28757.1006.30000**

Dear Charlie,

As requested, CHA reviewed the live loading conditions on the transmission pipeline within the Vermont Electric Company (VELCO) right of way (ROW) for the Addison Natural Gas Project (ANGP). The review was performed to verify that the anticipated live loading conditions are within the acceptable factor of safety for the pipe. The review included calculations in general accordance with the American Petroleum Institute method, titled "Steel Pipelines Crossing Railroads and Highways" (API Recommended Practice 1102) and a review of the anticipated strain on the pipe using the method from the American Lifelines Alliance report titled "Guideline for Design of Buried Steel Pipe (July 2001)." The review was performed based on the specified materials, installation methods and calculation assumptions. Actual construction materials and methods are to be verified by Vermont Gas Systems, Inc. (VGS) to ensure the specified construction materials and methods are utilized and performed by the construction contractor. Our review is contingent on the Contractor adhering to the backfilling requirements detailed in the Contract Documents, specifically in the following sections:

1. Vermont Gas Systems (VGS) – Operation & Maintenance Manual, Part 192.319 Installation of Pipe in a Ditch, Section (b). This section states that pipe must be backfilled in a manner that "provides firm support under the pipe and prevents damage to the pipe and pipe coating from equipment or from the backfill material."
2. VGS Operating Procedures, "Excavation, Trenching and Backfilling" section, specifically the "Compaction – General" description.
3. VGS Operating Procedures, "Steel Pipe General", specifically Part E. which states "All backfill shall be compacted to avoid settling."
4. Technical Specification 312333

The pipeline within the VELCO ROW was designed as a Class 3 Location with a design factor of 0.5, in general accordance with Code of Federal Regulations (CFR) Title 49 part 192.111. The pipe to be used within the ROW is carbon steel with 12.75 inch outer diameter, 0.312 inch wall thickness, API-5L, Gr. X-65, PSL-2 with a Maximum Allowable Operational Pressure (MAOP) of 1440 pounds per square inch

(psi) and all longitudinal welds on the pipe will be Electronic Resistance Welds (ERW). The pipe will be buried with a minimum of 4 feet of soft silt cover soils using open cut construction methods.

As specified by VELCO, the live loading condition on the pipe were based on the American Association of State Highway and Transportation Officials (AASHTO) HS-20 + 15% truck loading with a single axle load of 36,800 pounds (lbs.) (18,400 lbs. wheel load) on an unpaved surface.

The live load capacity of the pipe was calculated in general accordance with API Recommended Practice 1102 using the computer program GasCalc 5.0 version 007 developed by Bradley B. Bean, PE. Figure 1, attached, is a summary of the calculation performed. The calculation verified that the assumed external loading conditions are within the accepted limit of the pipe for the hoop stress, total effective stress, girth weld fatigue and longitudinal weld fatigue.

Using the method included in "Guideline for Design of Buried Steel Pipe" it was also verified that the anticipated live loads on the pipe are within acceptable factors of safety for wall crushing, wall buckling and ring deflection.

Based on the API Recommended Practice 1102 calculation method and Guideline for Design of Buried Steel Pipe, the anticipated live loading conditions within the VELCO ROW are acceptable. VGS is to verify that the materials, trench conditions and installation methods are in accordance with the project contact documents and specifications.

If you have any questions regarding the information provided, please contact me at (802) 735-0374.

Sincerely,



Digitally signed by Brendan Kearns
DN: cn=Brendan Kearns, o, ou,
email=bkearns@chacompanies.co
m, c=US
Date: 2014.11.07 15:43:03 -05'00'

Brendan Kearns
Engineer II

Attachment (1)

cc: Peter Lind, VELCO Senior Project Manager

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