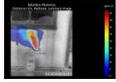


Evaluation of Meter Set Placement and Clearances



Research in this project was conducted to provide utilities and their customers with additional knowledge and more options regarding the placement of gas meter sets.

Project Description

Utilities are frequently challenged to find suitable locations to place natural gas meter set assemblies (MSAs) that satisfy the various codes and operation requirements. Additionally, meter-replacement services are on the rise due to the increase in main and service replacement efforts and increased customer loads. Consequently, operators are seeking a better understanding and possible revisions to the definition of safe clearances around the MSA.

In response, this project involved a testing program to evaluate the distribution of natural gas concentrations around leaks in outdoor meters and regulators.

Deliverables

The deliverables from this project include a Final Report summarizing the risk of gas accumulation, gas ignition and/or gas migration into a building for the various situations tested.

Benefits

This project provides utilities and their customers with additional knowledge and more options regarding the

placement of meter sets. Utilities are provided data to support meter set placement options and potentially support changes to applicable codes. Additionally, information developed through this project can be used to better manage risks through a company's distribution integrity management program.

Technical Concept & Approach

Specific tasks in this project included:

- **Codes and Standards Review**

Researchers performed a review of the various utility codes to determine the restrictions currently in place. The project team also reviewed the history in regards to how the current "clearance zones" were determined and if any prior research in this area exist.

- **Meter Set Leak Evaluation**

The project team performed an evaluation of MSA placement in relation to the sources of the leak. Concentrations of methane were measured at various distances away from commonly used regulator vents to identify how far one could safely install the vent from source of ignition. Tests were



performed in an outdoor building at the Gas Technology Institute testing facility. An array of gas sensors were used to monitor gas concentrations from 0% to 100% gas at 15-inch intervals and at various locations around the leak source.

Results

A variety of testing was conducted, including testing at various flow rates and gas-leak measurements taken with a special camera.

Tests at Low Flow Rates

These tests were performed at low pressures of 0.25 psig and small 1/16-inch-diameter pinhole leaks. The flow rate in these tests was about 3 SCFH (ft³/hour). This rate represented typical leaks detected in soap bubble tests of joints at the meter set.

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Tests at Medium Flow Rate

These tests were performed at a pressure of 0.25 psig and 1/8-inch-diameter pinholes, resulting in leak rates of about 11 SCFH. These leaks could be detected by sound and smell several feet away from the source. These tests were performed to evaluate the gas plume in various site conditions and at higher and more conservative flow rate.

Tests with Air-Intake Vents

Tests were performed at leak rates of about 11 SCFH and with various distances between the air-intake port and the leak source. A natural gas sensor was placed inside the port to measure any gas pulled into the duct. An airflow rate through the vacuum fan was applied at 200 SCFM (ft³/min) and gas concentration readings in the vent were negligible (at 0% to 0.1% gas) when the vents were at three feet horizontal distance from the leak source.

Tests at High Flow Rate

Tests were performed with leaks in the upstream line at 55 psig pressure. These high flow leaks commonly result in line shutoff and immediate repair. These tests were performed to identify clearance distance of the 5% gas readings in worst-case scenarios.

Gas Leak Measurements with Camera

Investigation of the “Rebellion Photonics” camera was



performed primarily to compare the leak plume image with the results of the gas sensors.

Some Findings:

- **Clearances to Windows and Building Vents**

For meters leaking at low flow rates (below 3 SCFH), gas readings at one foot from the source were less than the 5% gas ignition limit.

For meters leaking at medium rates (3 to 11 SCFH), readings less than 5% gas were at minimum clearances of three feet horizontal and five feet vertical.

Larger leak rates would result in 5% gas at more than six feet above the leak.

- **Clearance to Electric Meters**

Same as above for readings less than 5% gas.

- **Air Intake Vents**

At an airflow rate through the vent of 200 SCFM and the medium gas readings (less than 11 SCFH), gas reading inside the vent was negligible (around 0.1% gas) when the vent was at three feet horizontal or 45-degree diagonal distances from the leak source.

Status

The specific results of testing are detailed in a Final Report issued in October 2017.

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