



The Commonwealth of Massachusetts
DEPARTMENT OF PUBLIC UTILITIES

PIPELINE ENGINEERING AND SAFETY DIVISION

INCIDENT REPORT

3 Magnolia Way, Peabody Massachusetts
March 8, 2007

PIPELINE ENGINEERING AND SAFETY DIVISION

Accident File 07 - 00

Location: Peabody, Massachusetts

Date of Accident: March 8, 2007

Gas Company: KeySpan Energy Delivery, New England

Estimated Property Damage: Over \$100,000 *

Injuries: 0

Report Issued - September, 2008

* Estimated by KeySpan Energy Delivery New England

TABLE OF CONTENTS

I.	<u>INTRODUCTION</u>	Page 1
	A. <u>Scope of this Investigation</u>	Page 1
	B. <u>Overview of Incident</u>	Page 2
II.	<u>THE DEPARTMENT'S INVESTIGATION</u>	Page 3
	A. <u>Description of the Site</u>	Page 3
	B. <u>Description of the Scene</u>	Page 4
III.	<u>ODORIZATION</u>	Page 5
IV.	<u>LEAK INVESTIGATIONS AND MAINTENANCE ACTIVITY</u>	Page 6
V.	<u>LEAKAGE SURVEY</u>	Page 6
VI.	<u>FAILURE ANALYSIS OF PIPE SAMPLE</u>	Page 6
VII.	<u>FINDINGS AND CONCLUSIONS</u>	Page 8
	A. <u>Findings</u>	Page 8
	B. <u>Conclusions</u>	Page 8

I. INTRODUCTION

A. Scope of this Investigation

The Pipeline Engineering and Safety Division (“Pipeline Division”) of the Massachusetts Department of Public Utilities (“Department”), formerly known as the Department of Telecommunications and Energy, pursuant to G.L. c. 164, § 105A and G.L. c. 82, § 40 (“Dig Safe”), has investigated a natural gas (“gas”) fire at 3 Magnolia Way, Peabody, which occurred on March 8, 2007 (“Incident”).¹ The operator of the pipeline was KeySpan Energy Delivery, New England (“KeySpan” or “Operator”).² In a report³ to the United States Department of Transportation (“U.S. DOT”) KeySpan reported the damages in excess of \$100,000 (Exh. 1). There were no injuries as a result of the Incident (*id.*).

As part of the Department’s annual certification process by the U.S. DOT, the Department must report to the U.S. DOT:

[e]ach accident or incident . . . involving a fatality, personal

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- 1 *“Incident”* means any of the following events:
(1) An event that involves a release of gas from a pipeline or of liquefied natural gas or gas from an LNG facility and
 (i) A death, or personal injury necessitating in-patient hospitalization; or
 (ii) Estimated property damage, including cost of gas lost, of the operator or others, or both, of \$50,000 or more.
(2) An event that results in an emergency shutdown of an LNG facility.
(3) An event that is significant, in the judgement of the operator, even though it did not meet the criteria of paragraphs (1) or (2).” 49 C.F.R. §191.3.
- 2 As a result of a merger completed in 2007, KeySpan is part of the National Grid utility system.
- 3 Form F 7100.1 is an incident report form that operators must tender to U.S. DOT within 30 days of an incident.

injury requiring hospitalization, or property damage or loss more than an amount the Secretary establishes, any other accident the [Department] considers significant, and a summary of the investigation by the authority of the cause and circumstances surrounding the accident or incident.

49 U.S.C. § 60105(c)

The purpose of this report is to inform the U.S. DOT of the cause and circumstances surrounding the Incident.

The Department has established procedures for determining the nature and extent of violations of codes and regulations pertaining to the safety of pipeline facilities and the transportation of gas, including but not limited to, 220 C.M.R. §§ 101.00 through 113.00. See 220 C.M.R. § 69.00 et seq. The Department also enforces the U.S. DOT safety standards for gas pipeline systems as set forth in 49 C.F.R. Part 192 ("Part 192"), G.L. c. 164, § 105A.

B. Overview of Incident

On March 8, 2007, at 1:33 p.m., the Peabody Fire Department ("Fire Department") received an alarm for a fire at 3 Magnolia Way (Exh. 2). The Fire Department was at the scene at 1:40 p.m. (id.). The Fire Department, upon their arrival, found the fire extended three stories on the exterior building into the cockloft area (id.). They also believed that a natural gas service line to the building was on fire at the base of the building (id.). A search of the building was conducted and there were no occupants found (id.).

KeySpan was notified of the fire at 1:47 p.m. (id.). KeySpan was onsite at 2:10 p.m. to shutoff the service line to 3 Magnolia Way (Exh. 3). The service person was unsure whether the shutoff valve in the area of the building was a main or service valve, and requested

assistance (id.). The fire department shutoff the gas at the riser at 2:20 p.m (Exh. 2). The Fire Department reported that shutting the gas off at the riser stopped the flow of gas (id.). At approximately, 2:25 p.m., KeySpan service personnel shut the curb valve to secure the area (Exh. 3).

At 3:57 p.m., KeySpan notified the Pipeline Division of the fire at 3 Magnolia Way, Peabody (Exh. 3). The Department dispatched two investigators to the scene.

II. THE DEPARTMENT'S INVESTIGATION

A. Description of the Site

Magnolia Way is located in a residential area in Peabody. The area is comprised of several apartment residences. The structure at 3 Magnolia Way is a three-story wood building (Exh. 2). The building is comprised of four units, nos. 325, 326, 335 and 336 (Exh. 3). A two-inch plastic gas main, installed in 2005, underlies Magnolia Way (Exh. 4). The operating pressure of the main at the time of the incident was approximately 55 pounds per square inch gauge ("psig")⁴ (Exh. 5). A one-inch plastic service line was installed to 3 Magnolia Way in 2005 (Exh. 4). The service line was installed at a depth of three (3) feet (id.). The outside service riser contained a manual shut off valve (Exh. 3). The service regulator⁵ was mounted downstream of the valve along with four gas meters (Exh. 7). The regulator set point was 13

4 Pounds per square inch gage refers to the pressure expressed in points exerted on one square inch of surface area. The designation "gauge" indicates the readings are already adjusted to ignore the surrounding atmospheric pressure, which is 14.7 psi at sea level. If a psig gauge was not connected to any pressure source, it would read zero, even though it is actually sensing 14.7 psi at sea level.

5 A service regulator is a valve which reduces the pressure in the service line from the pressure in the main to the pressure provided to the customer

inches water column (“in. wc”) (Exh. 4).⁶ The maximum inlet pressure to the regulator was 125 psig (*id.*). The gas meters were installed on October 6, 2006 (Exh. 4). A curb valve had also been installed on the service line (Exh. 3). Approximately fifteen feet from the service installation was a Comcast cable vault (Exh. 6).

B. Description of the Scene

On March 8, 2007, at about 6:00 p.m., two investigators from the Department’s Pipeline Engineering and Safety Division (“Division”) arrived at 3 Magnolia Way. Representatives from KeySpan, Peabody Fire Department, and the State Fire Marshal’s Office were already at the scene.

The building had fire damage directly above KeySpan’s gas facilities servicing this building. The damaged area included the side of the building and a portion of the roof (Exh. 6). KeySpan’s facilities consisted of an outside service riser, regulator and four meters (Exh. 7). The regulator and meters suffered extensive fire damage. Approximately 15 feet from the gas facilities was a Comcast Cable vault and two air-conditioning units (Exh. 6). The vault suffered fire damage. The gas service line was initially shutoff at the riser by the fire department. KeySpan then shutoff the gas service at the curb valve (Exh. 8).

On the following day, the Division investigators requested that KeySpan pressure test the portion of the service line from the exposed curb valve to the service riser valve. The service line did not hold the 10 psig pressure test. The investigators observed leakage on the service riser valve and the insulating fitting above the valve (Exh. 6). Upon excavation of the

⁶ Inches water column is a measurement of pressure with 27.71 inches of water column equal to one psig.

service line riser and associated piping, the inspectors noticed what appeared to be a hole in the black rubber that encased the plastic service pipe (Exh. 9). There was also a section of corrugated steel that was exposed on the service (id.). The tracer wire that is used to locate the service pipe was found wrapped around the pipe. A section of the tracer wire had fused itself to the black rubber on the riser (Exh. 10). There were bubbled sections of the riser that was also located on the riser (Exh. 11). There were also other underground facilities in the area of KeySpan's facilities (Exh. 12). The next test the Division investigators requested involved excavating the service at the building wall. The test included pressure testing the service line from the curb valve to the building. The service riser was removed. The pressure test held at 62 psig for 23 minutes (Exh. 6). The service riser with shutoff, insulator, remains of the regulator, four meter manifolds and the melted meters were taken into custody by the State Fire Marshal's Office (Exh. 13).

III. ODORIZATION

The state regulation, 220 C.M.R. § 101.06(20), requires operators to odorize gas in their distribution systems. Gas must be "readily perceptible to the normal or average olfactory senses of a person coming from fresh uncontaminated air into a closed room containing [0.15 percent gas in air]." 220 C.M.R. § 101.06(20)(a). Operators are also required to conduct periodic sampling of odorant concentrations throughout their system (id.).

KeySpan conducts odorant sampling on a monthly basis.

On March 8, 2007, odor level tests were conducted at 3 Magnolia Way, Peabody after the fire (Exh. 14). The result of the test is as follows:

1. 3 Magnolia Way @ 9:30 p.m. - Odor level @ 0.09 percent gas in air
2. 3 Magnolia Way @ 9:30 p.m. - Odor level @ 0.06 percent gas in air

(Note: Readings taken by two different employees)

The odor detectability levels of gas in air ranged from 0.090 percent to 0.060 percent gas in air, indicating that the odorant levels were within the prescribed state regulation.

IV. LEAK INVESTIGATIONS AND MAINTENANCE ACTIVITY

A review of the submitted maintenance records indicates KeySpan did not perform any maintenance or repair work on the main and service at 3 Magnolia Way, Peabody (Exh. 15). In addition, there were no service calls to the four accounts at 3 Magnolia Way, Peabody (Exh. 16).

V. LEAKAGE SURVEY

In order to determine if other leak sources were contributing factors to the Incident, the Department reviewed the leak history of the mains and service to 3 Magnolia Way. Leakage surveys of gas main and services are required by federal and state regulations.

See Part 192 § 192.723(a) and 220 C.M.R. § 101.06(21). The week of August 25, 2006, a walking survey of the main and service was performed (Exh. 17). There were no leaks detected. After the Incident, KeySpan conducted a leak survey. The Operator detected no gas readings on the main or service to or in the area of 3 Magnolia Way (Exh. 18).

VI. FAILURE ANALYSIS OF PIPE SAMPLE

Massachusetts Materials Research, Inc. ("MMR") conducted the failure analysis of the 3 Magnolia Way pipe samples. The pipe samples included the following: meter manifold;

service standpipe; pigtail portion of service line; high pressure cock; regulator; tracer wire; regulator and meter remnants. The purpose of the testing was to determine if there were any failures in the pipe segments examined, and ascertain the probable cause of the failure.

MMR's analysis included visual inspection, leak test, chemical analysis, fracture analysis, and radiographic inspection.

On April 15, 2008, MMR submitted its results to the Department⁷. MMR's findings and conclusions are summarized below:

- The damage to the black polymer pigtail cover was OD-initiated, or "outside-in." This damage did not affect the gas-transporting yellow plastic pipe within the pigtail.
- The yellow plastic pipe was intact from the base of the pigtail to the transition fitting. The yellow plastic pipe was breached within the transition fitting. This and other internal transition fitting damage was consistent with melting caused by the heat of the fire. Firefighters' statements that shutting off the high pressure cock stopped the flow of gas indicate that this damage may have resulted from latent heat after the fire was put out. This also indicates that the transition fitting did not fail prior to the incident.
- The high pressure cock did not fail, as indicated by the firefighter's ability to stop the flow of gas by turning this valve to the "off" position.
- Differential melting of meters revealed that the source of the fire was at or very near the vertical standpipe assembly side of the gas equipment.
- Apparent heat damage on the upstream corner of the regulator mounting pad (facing down in service) indicates that the fire source may have been upstream of the regulator. In-situ photographs of the standpipe assembly after the fire revealed a non-plumb alignment of this region of piping, with the assembly bent at the universal joint union. Loss of meter assembly support during the fire would cause this bend, as the nylon gasket is less strong than the steel piping. However, if this joint was misaligned during installation, or shifted later prior to the incident, the resulting stresses on the gasket

⁷ The Department incorporates by reference the MMR Report, "Analysis of Jurisdictional Piping and Appurtenances From the 3 Magnolia Way, Peabody, MA, Incident (MMR Project No. 63797)". Copies of this report may be obtained by contacting MMR at 508-835-6262.

would encourage cracking, especially during cold weather.

- The yellow plastic pipe was medium density polyethylene, as intended.
- The black polymer pigtail cover was an aromatic polyester, likely poly(phthalate).
- The universal joint gasket material was Nylon 6, 6-co-6. This is the same material as the exemplar universal joint gasket.

Based on the results, MMR also concluded the following:

- No anomalies in the available gas equipment were revealed by this investigation that could have caused the release of natural gas at 3 Magnolia Way.
- Of the equipment available for investigation, only the universal joint gasket was too damaged to examine.
- The regulator and all four meters were melted in the fire.

VII. FINDINGS AND CONCLUSIONS

A. Findings

1. A two-inch plastic main was laid under Magnolia Way in 2005.
2. A one-inch plastic service line to 3 Magnolia Way was installed in 2005.
3. The structure at 3 Magnolia Way is comprised of four units. The meters servicing those units were installed in 2006.
4. The Peabody Fire Department received an alarm at 1:33 pm. They arrived onsite at 1:40 p.m.
5. The fire at 3 Magnolia Way extended three stories on the exterior of the building into the cockloft area.
6. KeySpan was notified of the fire at 1:47 p.m. They were onsite at 2:10 p.m.
7. The fire department shutoff the gas at the riser at 2:20 p.m.
8. KeySpan shut the curb valve on the service to secure the area at 2:25 p.m.
9. KeySpan notified the Division of the fire at 3 Magnolia Way, Peabody at 3:57 p.m.
10. Approximately 15 feet from the gas facilities was a Comcast Cable vault and two air-conditioning units. The vault suffered fire damage.
11. KeySpan pressure test the portion of the service line from the curb valve to the service riser valve. The service line did not hold the 10 psig pressure test. There was leakage on the service riser valve and the insulating fitting above the

- valve.
12. KeySpan removed the service riser from the service line and tested the service from the building to the curb valve. The pressure test held at 62 psig for 23 minutes.
 13. KeySpan met the odorization requirements of the state and federal pipeline safety regulations.
 14. KeySpan did not perform any maintenance or repair work on the main and service at 3 Magnolia Way.
 15. There were no service calls to the four accounts at 3 Magnolia Way, Peabody
 16. KeySpan conducted a walking survey of its mains and services on Magnolia Way the week of August 25, 2006.
 17. After the Incident, KeySpan conducted a leak survey of the main and service to 3 Magnolia Way and no leaks were detected

B. Conclusions

1. The analysis in the MMR report was based upon substantial evidence and the report conclusions are reasonable.
 2. MMR concludes that the source of fire may have been upstream of the regulator, but it was at or very near to the vertical standpipe assembly side of the gas equipment.
 3. The MMR report stated that there were no anomalies in the available gas equipment that could have caused the release of natural gas at 3 Magnolia Way.
 4. The breach in the transition fitting on the service line may have resulted from latent heat after the fire was put out.
 5. MMR determined that the high pressure cock on the service line did not fail.
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