The Commonwealth of Massachusetts

DEPARTMENT OF PUBLIC UTILITIES

PIPELINE ENGINEERING AND SAFETY DIVISION

INCIDENT REPORT

88 Waltham Street, Maynard, Massachusetts
January 3, 2008

PIPELINE ENGINEERING AND SAFETY DIVISION

Accident File

Explosion

Location: Maynard, Massachusetts

Date of Accident: January 3, 2008

Gas Company: NSTAR Gas Company

Estimated Property Damage: $152,449*

Report Issued – May 12, 2010

* Estimated by NSTAR Gas Company

Table of Contents

I. INTRODUCTION

A. Scope of the Investigation

The Massachusetts Department of Public Utilities ("Department"), Pipeline Engineering and Safety Division ("Division"), pursuant to G.L. c. 164, § 105A and a Federal Certification Agreement as provided for in 49 U.S.C. § 60105, has investigated a release of natural gas ("gas") at 88 Waltham Street, Maynard, Massachusetts ("Incident").[1] The release of gas contributed to a fire and over $150,000 in property damage to the dwelling, as estimated by the operator of the natural gas facilities, NSTAR Gas Company ("NSTAR" or "Operator") (Exh. 1).

As part of the Department's annual certification process by the United States Department of Transportation ("U.S. DOT"), the Department must report to the U.S. DOT

> each accident or incident . . . involving a fatality, personal injury requiring hospitalization, or property damage or loss of more than an amount the Secretary establishes... and any other accident the [Department] considers significant, and a summary of the investigation by the [Department] 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 as to the cause and circumstances surrounding the Incident.

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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 liquefied natural gas or gas from an LNG facility and,
   a. A death, or personal injury necessitating in-patient hospitalization; or
   b. 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 judgment of the operator, even though it did not meet the criteria of paragraphs (1) or (2). 49 C.F.R. Part 191, § 191.3.

The Department has established procedures for determining the nature and extent of violations of codes and regulations pertaining to 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 Division 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 January 3, 2008, the owner of the residence ("owner") placed two kerosene-fired torpedo heaters in the home's crawl space to thaw frozen water pipes (Exh. 2). In the vicinity of the heaters was a ½ inch plastic gas line inserted into a ¾ inch steel gas service line (id.).[2] The approximate length of the service line in the crawl space was twenty six feet (Exh. 3). The operating pressure of the service line was 45 pounds per square inch gauge ("psig")[3] (Exh. 4).

At approximately 6:21 p.m., the Maynard Fire Department received an alarm. They arrived at the site at 6:23 p.m. to find a working fire (Exh. 5). According to the Maynard Fire Department report, "[f]irst attempts to contain the fire seemed successful but a broken gas line

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2 "Service line" means a distribution line that transports gas from a common source of supply to an individual customer, to two adjacent or adjoining residential or small commercial customers, or to multiple residential or small commercial customers served through a meter header or manifold. A service line ends at the outlet of the customer meter or at the connection to a customer's piping, whichever is further downstream, or at the connection to customer piping if there is no meter.

3 The term, "psig," refers to the pressure expressed in pounds 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 psig gauge were not connected to any pressure source, it would read zero even though it is actually sensing 14.7 psi at sea level.

from the street flashed twice, command ordered the building evacuated and requested the gas company to respond as soon as possible (id.)." The Maynard Fire Department report concluded that the cause of the fire was likely the use of a space heater in a confined area to thaw frozen pipes (id. at 2).

II. BACKGROUND

Waltham Street is in a residential area of Maynard. The neighborhood consists of multi-family two and three-story dwellings and some single family, one-story dwellings. The Incident occurred in a two-story, single family building at 88 Waltham Street. NSTAR stated that a two inch steel gas main,[4] installed in 1924, underlay Waltham Street (Exh. 4). The operating pressure of the gas main at the time of the incident was 45 psig (id.). The main was installed at a depth of 30 inches (Exh. 6). A 21 foot section of bare steel service line with a plastic insert supplied gas to 88 Waltham Street (Exh. 7).

III. THE DEPARTMENT'S INVESTIGATION

A. Description of the Scene

On Wednesday, January 9, 2008, at 8:54 a.m., the Division received a call from an independent fire investigator (Exh. 8). The investigator reported that at around 6 p.m., on January 3, 2008, a "gas related" fire had occurred at 88 Waltham Street, Maynard, MA (id.). The investigator also reported that a 30 foot gas line existed in the basement/crawl space, before the meter (id.).

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[4] "Main" means a distribution line that serves as a common source of supply for more than one service line.

On Friday, January 11, 2008, at approximately 8:45 a.m., two investigators from the Department's Pipeline Engineering and Safety Division arrived at the scene. Upon arrival at the scene, the investigators met with Jonathan Pfister, NSTAR Compliance and Corrosion Manager, and Chief Stephen J. Kulik of the Maynard Fire Department.

The investigators then entered the building basement and observed that the meter in the original basement had been removed by NSTAR (Exh. 11). The investigators also observed two bullet type space heaters in a crawl space facing the gas service (id.).

Also observed in the crawl space was an approximately twenty-six foot section of steel pipe which carried the inserted ½ inch plastic pipe from the stone foundation, through the crawl space, to the meter in the original basement (id.). The investigators observed a threaded coupling and two fittings on the service line approximately three feet from the wall entry point. The investigators also observed that the threaded couplings at the fittings appeared to be loose (id.). The investigators also observed water pipes and several other pipes in the crawl space.

1. Records of the Service Line to 88 Waltham Street

The original ¾ inch bare steel service line was installed in 1924 (Exh. 7). A 21 foot section of the service line was relayed with one inch bare steel on August 24, 1949 (id.). On February 5, 1982, the entire service was inserted with ½ inch plastic (id.). The company has no records of leaks on the service pipe (id.).

2. Leak Surveys of Service Line to 88 Waltham Street and the Street Main

On March 6, 2007, a mobile leak survey was conducted on Waltham Street and the surrounding area; there were no leaks found (Exh. 9). NSTAR conducted a walking leak

survey on the service line to 88 Waltham Street on January 11, 2008, gas readings were recorded from one percent gas to three percent[5] gas at the building foundation and ten percent gas a short distance from the foundation in the vicinity of a 90 degree bend in the service approximately ten feet outside the north side of 88 Waltham Street (Exh. 10). Also, a reading of ten percent gas was recorded in the street at the main (id.).

IV. FAILURE ANALYSIS OF THE PIPE SAMPLE

Altran Solutions ("Altran") conducted the failure analysis of the service line segment for this investigation. Department representatives observed all aspects of the failure analysis. In May, 2009, Altran submitted its results to the Department ("Altran Report").[6] Altran's analysis composed six subsections: Visual, Boroscopic, Sectioning and Examinations, Tensile Testing, Analytical Analyses, and Pressure Testing (id.). The purpose of the testing was to document the condition of the plastic service line, identify leaks, characterize deposits, leaks, and fracture surfaces.

Based on these tests results, a summary of Altran's major conclusions are as follows:

> The results of the testing and evaluation indicate the leakage failure of the pipe was due to application of localized high temperature, resulting in polymer melting and material flow. Several thermal and chemical analyses were performed on polymeric material from the leak site and, for reference, from distant portions of the pipe. No evidence of contamination or manufacturing defects was found, and no burning (charring) was seen. The mechanical, analytical and

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5 "Percent gas" includes all concentrations (measured as a percent of volume in air) of a flammable gas or vapor that will propagate flame when exposed to a source of ignition. Many common flammable liquids have very wide explosive ranges. The explosive range of all flammable gases and vapors will vary with temperature and pressure.

6 Copies of Altran's report may be purchased from Altran Solutions Corporation, 80 Fargo Street, Boston, Massachusetts 02210-2122, (617) 204-1000

> pressure tests suggest the material was not defective or measurably degraded from age. The noted deformation from twisting and bursting are consistent with softening of the material to the point where the internal gas pressure exceeded the lowered strength of the pipe wall causing the burst (id. at 12).

V. FINDINGS AND CONCLUSIONS

A. Findings

(1) The Maynard Fire Department received an alarm at 6:21 p.m. on January 3, 2008, reporting a building fire at 88 Waltham Street, Maynard, MA.

(2) An approximately twenty-six foot section of plastic gas service line was encased in steel and ran through a crawl space to the basement of 88 Waltham Street, Maynard.

(3) Water pipes also occupied the same crawl space.

(4) Department investigators found two bullet type space heaters in the crawl space.

(5) The space heaters were facing the gas service pipe.

(6) Department investigators observed a loose union on the steel gas service pipe in the crawl space.

(7) The Maynard Fire Department stated the unofficial cause was the use of a space heater in a confined area to thaw frozen pipes.

B. Conclusions

The Altran Report's conclusion that the plastic pipe failed due to the application of localized high temperature, resulting in polymer melting and material flow is reasonable, and based upon substantial and specific evidence. The likely source of the damage to the plastic service pipe was heat from two bullet type space heaters. The location of the release of gas into the atmosphere was possibly at the loose fittings of the steel pipe in the crawl space. The two space heaters are possible sources for the ignition of the released gas.

VI. NSTAR ACTIONS

On April 12, 2010, the Division issued a Warning Letter to the Operator. NSTAR Gas Company, 08-PLW-14. 220 C.M.R. § 69.03(1). The Division reviewed the circumstances of the Operator's post-Incident leak investigation, and had reason to believe that NSTAR may not have completed a leak investigation of certain leak locations the Operator identified after the Incident, consistent with its Operating and Maintenance Procedures. The Division requested that NSTAR provide records to demonstrate that it has notified all personnel that they must always implement, and follow, NSTAR Leak Investigation procedures.