NATIONAL TRANSPORTATION SAFETY BOARD Office of
Railroad, Pipeline, and Hazardous Materials Investigations
Washington, D.C. 20594

Pipeline Operations / Integrity Management

Group Chairman's Factual Report

Report Date: 25 Oct 2018

Accident Information

Accident Number:	DCA17FP006
Location:	Millersville, Pennsylvania
Date:	July 02, 2017
Time (approximate)**:**	12:32 p.m. Eastern Daylight Time (EDT)
Material Released:	Natural Gas
Type of System:	Gas distribution pipeline
Owner / Operator:	UGI Utilities, Inc.
Property site:	206 Springdale Lane, Manor Township, PA.
Fatalities / Injuries:	1 Fatality / 3 Injuries
Damage / Clean-up Cost:	$ [data not provided by the distribution pipeline operator]

Contents

A. Group Members

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B. Accident Summary

On Saturday, July 2, 2017, at approximately 12:32 p.m. EDT, a natural gas-fueled explosion occurred at the single-family residence located at 206 Springdale Lane, Millersville, Pennsylvania. The explosion completely leveled the residence and damaged six neighboring homes, one which was subsequently condemned.

Local authorities initially condemned the residences to the left and right of the demolished home following an assessment of the damages (see Figure 1). The home at 201 Springdale Lane was subsequently repaired, while the home at 202 Springdale Lane was torn down and completely rebuilt.

Figure 1. Debris field at cul-de-sac area where the explosion the occurred

Prior to the explosion, a neighborhood resident walking in the area smelled natural gas and called the local gas utility, UGI Utilities, Inc. (UGI), at 10:26 a.m. About half an hour of the gas odor being reported, a UGI service technician [1] arrived to investigate. The technician confirmed a gas leak. An additional UGI technician and a Senior Supervisor arrived shortly thereafter. In response to UGI's Emergency PA One Call [2], a Lancaster Area Sewer Authority (LASA) employee also arrived on scene to mark the location of the sewer lines. About 15 minutes prior to the explosion, UGI personnel directed the resident of 206 Springdale Lane to evacuate the residence. She left her residence by personal automobile. At 12:15 p.m., UGI requested fire department support on scene. The first fire truck arrived at 12:28 p.m. and assumed a 'stand-by mode' position. The household explosion occurred about four minutes later.

[1] UGI refers to the service technicians as Mechanics, which have a 'grade' designation of I, II, or III, as determined by the degree of qualifications, experience, etc.
[2] Ref, and for further information, see http://www.pa1call.org/PA811/Public/.

As a result of the explosion, one UGI employee was killed and three others were injured; two UGI employees and the LASA employee. The three injured individuals were transported and admitted at a local hospital. They were released within days of the accident.

Following the accident, the buried natural gas main and service pipelines for the cul-de-sac homes were tested with air pressure. All segments held pressure, with the exception of the Permalock®[3] mechanical tapping tee on the main that connected the residential gas service line that served the destroyed dwelling. Subsequent inspection of the Permalock® mechanical tee revealed that it had two fractured Nylon bolts and leaked at the connection of the tee to the 2-inch main pipeline.[4] At the time of the accident, the operating pressure of the line was 54 pounds per square inch gauge (psig), as measured at the closest monitoring point that was located approximately half a mile away from 206 Springdale Lane.

C. Accident Sequence of On-Scene Events

On July 2, 2017, shortly after the call by a neighborhood resident of a gas odor at 10:26 a.m. near 202 Springdale Lane, UGI Dispatch made a call to a UGI Mechanic III to respond to the complaint. At 11:00 a.m., the Mechanic III arrived on scene. As the first responder, the Mechanic III was the first UGI representative on site and was responsible for assessing the presence of a leak and the emergency, and began his assessment to determine the presence of a leak. Consistent with UGI policy and training, the Mechanic III was required to follow UGI's leak survey procedure (Gas Operations Manual, Section 70.20). Under that procedure, the Mechanic III used gas detection equipment and other tools to gather readings and investigate the leak reported at 202 Springdale Lane.[5] The mechanic subsequently determined that the leak source was at 206 Springdale Lane, which was the adjacent residence.

At 11:18 a.m., the Mechanic III called the Senior Supervisor of Operations Construction and Maintenance (Senior Supervisor), who was the designated on-call UGI supervisor at that time. The Mechanic III requested a response crew and informed the Senior Supervisor that there were high gas readings.[6] The Mechanic III informed the Senior Supervisor that he suspected that a mechanical tee was leaking, and that he measured a reading of 80% gas in the sewer and 98% gas over the tee.[7] Based on the gas readings, the Mechanic III identified the leak as a "C leak," or an emergency leak because of the high percentage of gas identified.[8] The Senior Supervisor contacted UGI Dispatch at about 11:20 a.m. and requested that they place an Emergency PA One

[3] The Honeywell Elster Perfection PermaLock® Mechanical Tapping Tee is a tee that can be installed on the main to supply the individual gas service to a gas customer without the need to shut down the natural gas main.
[4] See NTSB Materials Lab Report, 18-003, at page 4.
[5] Source: NTSB interview transcript of UGI employee(s).
[6] Source: NTSB interview transcript of UGI employee(s).
[7] Source: NTSB interview transcript of UGI employee(s).
[8] Source: NTSB interview transcript of UGI employee(s).

Call because, to respond to the confirmed leak, digging was anticipated at the accident location[9]; the Emergency PA One Call ticket was issued at 11:27 a.m.[10]

At approximately11:20 a.m., the Senior Supervisor began assembling a crew to respond to the leak. He did so using the duty roster maintained by UGI, which reflects employees who are on paid "on-call" status or who have volunteered to be available to respond to an emergency.[11] The Senior Supervisor made several calls between 11:25 a.m. and 11:44 a.m. to the Mechanic II Duty Operator who was on-call and is required to answer all calls for response during off hours, including weekends. That Duty Operator did not respond and was later terminated by UGI. The Senior Supervisor contacted the next Duty Operator appearing on the on-call list, who answered and responded to the scene. By approximately 11:50 a.m., the Senior Supervisor had assembled a 3-person crew that was responding to the site.[12]

The Senior Supervisor, having made calls to another Mechanic who was to be on his way shortly, decided to head to the scene as well. He considered the travel time for the replacement Mechanic II Operator and the fact that the initial odor call had been made nearly an hour earlier. The Supervisor considered time to be of the essence; hence, he decided that he would personally respond to the scene. The Senior Supervisor explained that prior to arriving on-scene he reviewed the location of the nearest valve to the site. On his way, the Senior Supervisor also contacted the UGI Engineer and informed her that he expected to shut down a main.[13] As the Duty Supervisor, the Senior Supervisor was allowed to exercise judgement to determine whether it was appropriate to squeeze-off the line or shut down a gas valve.[14]

Prior discussions had taken place between the Supervisor and other UGI employees as to the possibility of closing the valve on the main (See Figure 2); however, the Senior Supervisor made a decision to squeeze-off the main line because of his belief that doing so was the most rapid way of stopping the flow of gas.[15] During his NTSB interview, the Senior Supervisor described the following factors that also influenced his decision to squeeze-off the main line: (i) prior to arriving on the scene, he reviewed the location of the nearest valve to 206 Springdale Lane[16]; (ii) he considered that given the circumstances surrounding the leak, even if the valve were turned off, gas would continue to flow to the leak until the system lost pressure; (iii) while he had the opportunity to stop the flow of gas using an excess flow valve fused to the outlet of the tee, the excess flow valve would not stop the gas from leaking out of the mechanical tee[17]; (iv) the line could be quickly and successfully excavated and squeezed, as compared to the time necessary to reach the valve; and (v) a vehicle may have been obstructing access to the valve.[18]

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[9] Source: NTSB interview transcript of UGI employee(s).
[10] Source: UGI Dispatch Log.
[11] Source: NTSB interview transcript of UGI employee(s).
[12] Source: NTSB interview transcript of UGI employee(s).
[13] Source: NTSB interview transcript of UGI employee(s).
[14] Source: NTSB interview transcript of UGI employee(s).
[15] Source: NTSB interview transcript of UGI employee(s).
[16] Source: NTSB interview transcript of UGI employee(s).
[17] Source: NTSB interview transcript of UGI employee(s).
[18] Source: NTSB interview transcript of UGI employee(s).

Figure 2 -- Location of gas shut-off in relation to accident site

The Senior Supervisor also stated that he received a phone call on his way to the site from the Mechanic III, the UGI first responder on scene, who informed him that he measured 11% LEL in the basement at 202 Springdale Lane and was having trouble gaining access to the house located at 206 Springdale Lane.[19] The Senior Supervisor informed the Mechanic III that he should do whatever was necessary, including a forced entry, to clear the house at 206 Springdale Lane.[20] The Mechanic III continued to attempt to make contact with the resident at 206 Springdale Lane.[21]

In response to UGI's Emergency PA One Call [22], a Lancaster Area Sewer Authority (LASA) employee arrived on scene at approximately noon, to mark the location of the sewer lines. [23]

Shortly after 12:00 p.m., the Senior Supervisor arrived at the scene and continued making calls from his vehicle to management and others keeping them abreast of the situation at hand. [24] Within ten minutes of arriving on scene, the Senior Supervisor made an assessment that the fire department was needed and at 12:14 p.m. he called UGI Dispatch to request that they contact 911, which occurred at 12:15 p.m.[25] The Mechanic II arrived on-scene at 12:19 pm.

The Senior Supervisor then left his vehicle, grabbed a shovel, and began unearthing the gas main with the Mechanic II. UGI procedures allowed for hand digging to address a gas leak without a

[19] Source: NTSB interview transcript of UGI employee(s).
[20] Source: NTSB interview transcript of UGI employee(s).
[21] Source: NTSB interview transcript of UGI employee(s).
[22] Ref, and for further information, see http://www.pa1call.org/PA811/Public/
[23] Source: NTSB interview transcript of LASA employee.
[24] Source: NTSB interview transcript of UGI employee(s).
[25] Source: NTSB interview transcript of UGI employee(s).

response to an Emergency PA One Call to first identify underground facilities. The Senior Supervisor and the Mechanic II both began digging up the main at the location of the gas leak using hand shovels.[26] Eventually they reached the stone screenings and underground warning tape surrounding the gas main, where they began making preparations to install the 'squeeze-off tool'[27].[28] After the gas main was uncovered, the Mechanic II went to retrieve the squeeze-off tool from his truck.[29]

In concert with the excavation that was underway, the Mechanic III reported that he was reading 20% LEL at the stoop of the residence (206 Springdale Lane) and that he had trouble getting the occupant to respond to his knock at front door.

The Mechanic III had visited the residence to the left of the accident home (202 Springdale Lane) two times and had conversed with two individuals that were in the home at the time. The LEL reading on the first visit was 10%. Having returned thirty minutes later, he advised the couple that there was no need at the time to evacuate the premises as the percentage of gas LEL was now at 11%, less than UGI's 20% LEL threshold for resident evacuation.

While the main line was being excavated, the occupant of 206 Springdale Lane finally responded to the Mechanic III's many attempts to gain access to the home.[30] Based on the gas percentage readings in the home reading of 20% LEL, the Mechanic III decided to evacuate the home. The occupant requested permission to drive her personal vehicle out of the garage. The Mechanic III did not allow the occupant to use her garage door opener; however, he did manually open the garage door and allowed the occupant to start her vehicle, whereby, the occupant drove out of the garage and into the neighborhood and departed the area. The electrical power to the neighborhood remained activated at the time of the accident.[31]

The Mechanic III then went to the left side of the accident home (206 Springdale Lane) where the meter was located, and was near the gas meter at approximately 12:32 p.m. when the explosion occurred. The two gas employees that were digging at the main line in front of the home, had fully excavated the plastic main and were ready to squeeze-off the plastic main line when the explosion occurred. The representative from LASA had been walking in the cul-de-sac when the explosion occurred. The Mechanic III was killed, while the other three workers were injured from the blast.

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[26] Source: NTSB interview transcript of UGI employee(s).

[27] Generally described, a squeeze-off tool is a mechanical devise that's found in certain pipeline operations that utilize plastic pipe, in which the tool principally consists of two parallel-positioned bars (also referred to as "jaws") that compress around the outside diameter of the pipe, which results in a stoppage of the pipeline flow (ref, and for further information, see "General Guidelines for Squeezing Off Polyethylene Pipe in Water, Oil, and Gas Applications", © The Plastics Pipe Institute, Inc. 2017, Irving, TX; [Internet] https://plasticpipe.org/pdf/tn-54.pdf).

[28] Source: NTSB interview transcript of UGI employee(s).

[29] Source: NTSB interview transcript of UGI employee(s).

[30] Source: NTSB interview transcript of UGI employee(s).

[31] At 12:59pm, UGI Dispatch contacted the local electric power provider, PPL Electric Utilities (PPL), and requested that they shut off the power to the area affected by the accident. At 1:08pm, PPL confirmed that the electric power was shut-off and that their personnel were on site.

D. Description of the Operator

See Survival Factors – Factual Report, § 1.3 Natural Gas Retail Supplier/Distributor - UGI, for data of this topic-point.

E. Accident Site Description

See Survival Factors – Factual Report, § 1.2 Site Characterization – Pre-Event, for data of this topic-point.

F. Pipeline System

The natural gas main on Springdale Lane is plastic material installed on August 7, 1995. The maximum allowable operating pressure (MAOP) of the system main directly serving Springdale Lane is 60 psig. The pressure in the main at the time of incident was approximately 54 psig. This reading was taken from a supervisory control and data acquisition (SCADA) point located at the intersection of West Charlotte Street and Duke Street in Millersville .[32] The print line (embossed label) from the main removed on Springdale Lane shows the pipe as 2" IPS SDR 11 UPONOR, ALDYL A, ROTASONIC INSPECTED, PE - 2406 CDAD, T 04 190 - 040595 - -FOR GAS USE ONLY ASTM D2513 Rotasonic Inspected .[33]

The service line to the 206 Springdale Lane residence was installed in June of 1998[34], and was constructed of plain end, bare, ½-inch UAC 2000[35] plastic pipe manufactured by Uponor Aldyl Co. The total footage between the main and the meter at the residence was 50-feet.[36] The service line to the residence was protected with a 1-inch plastic pipe as a protective jacket. The jacket ran from the outlet of the service tee to the vicinity of the meter.

G. Mechanical Tapping Tees

See Safety Recommendation Report, “Installation of PermaLock® Mechanical Tapping Tee Assemblies”, Recommendation Number P-18-001 through -004, dated June 18, 2018, for data of this topic-point.

Supportive to the above referenced Safety Recommendation Report, an examination of the Mechanical Tapping Tee (recovered from the accident site) and related pipeline equipment, as well as an examination of exemplar equipment (from various sources, as described), was conducted by the NTSB Office of Research and Engineering, Materials Laboratory Division, the factual data of which was incorporated into Materials Laboratory Factual Report documentation,

[32] UGI supplied documentation “Pressure of main at the time of the incident”
[33] UGI supplied documentation “Pipe Material Properties”
[34] The installation preceded the promulgation of the U.S. Department of Transportation, Pipeline and Hazardous Material Safety Administration’s Operator Qualification regulations under 49 C.F.R. 192.801-809, 195.501-509.
[35] UGI supplied documentation “Service Line Data”
[36] UGI supplied documentation “Service Line Data”

Report Numbers 18-003 (dated May 8, 2018), 18-004 (dated May 8, 2018), 18-005 (dated May 8, 2018), 18-006 (dated May 8, 2018), and 18-007 (dated May 8, 2018).

H. Activities at Time of Accident

See Survival Factors – Factual Report, § 5.2 Summary Timeline of Activities Immediately Prior to the Explosion, for data of this topic-point.

I. Pipeline Integrity Management

See Survival Factors – Factual Report, § 4.2 System Integrity Plan, for data of this topic-point.

J. Regulatory Enforcement Action

On October 4, 2018, the Pennsylvania Public Utility Commission / Bureau of Investigation and Enforcement, issued an "I & E Formal Complaint", titled "Re: Pennsylvania Public Utility Commission, Bureau of Investigation and Enforcement, Complainant, v. UGI Utilities, Inc., Respondent, Docket No. C-2018-"[37]. This complaint, as an enforcement action of that regulatory agency, alleged a number of safety violations that occurred during the gas leak response on Springdale Lane, to which a cumulative civil penalty of $2,090,022 was proposed.

K. Initiatives Employed by UGI Subsequent to the Accident

See Survival Factors – Factual Report, § 7.2 UGI, for data on this topic-point.

Authorship

// s // Date: 25 Oct. 2018

Roger D. Evans
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Operations / Integrity Management - Group Chairman

[37] Reference, and for additional information, see http://www.puc.pa.gov/pcdocs/1588540.pdf.