MISSOURI PUBLIC SERVICE COMMISSION

STAFF's GAS INCIDENT REPORT

Appendix A

Spire Missouri Inc. d/b/a Spire Missouri West

Case No. GS-2019-0015

Commission Staff Division
Safety Engineering Department
July 31, 2019 - Jefferson City, Missouri

** Denotes Confidential Information **

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STAFF's GAS INCIDENT REPORT

Appendix A

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APPENDIX A:

DETAILED DISCUSSION OF FACTS AND STAFF'S INVESTIGATION

Note: The detailed information presented in Appendix A was obtained through Staff's on-site investigation, interviews, Spire Missouri West ("Spire") records, information provided by Spire to Staff in responses to Staff Data Requests, and reports of other entities[1]. The information provided in the sections below summarizes Staff's investigation and the facts gathered during its investigation. To the extent that these facts were found to be necessary or helpful to address the incident cause and/or outcome, the facts are discussed in the body of Staff's Gas Incident Report; some of the facts that appear below may not be mentioned in the body of Staff's Gas Incident Report.

A. The Incident

At approximately 10:23 a.m. CDT on July 16, 2018, a natural gas fire occurred in and around an excavation near 1106 The Paseo in Kansas City, Missouri.[2] The approximate location is shown in Appendix B, Figure 1. At the time of the incident, a three-person crew was assigned to tie-in three new service lines to the gas main running parallel to The Paseo, and to abandon the existing services lines to 1100, 1106 and 1116 The Paseo.[3] The crew members performing the work were employed by a contractor working for Spire on Spire's natural gas facilities: ** _____ **, hereafter referred

[1] Including the Midwestern Regional Climate Center, wunderground.com, and Pipeline Data Mart [accessed through the United States Department of Transportation Pipeline and Hazardous Materials Safety Administration ("PHMSA") Portal].

[2] Spire responses to Staff Data Requests 0051 and 0067.2.

[3] Spire response to Staff Data Request 0025.

to as "Contractor". The incident occurred while this crew was abandoning the existing service line to 1106 The Paseo.[4]

An approximately 3-foot by 5-foot working space was excavated to a depth of about 3-feet to provide access to the service line and main[5] (*See* Appendix B, Figure 2 and Appendix C, Photograph 1). When the incident occurred, a contractor ** ____ _____ **, ("Contractor Employee A") was in the excavation working to abandon the service line, a contractor ** _____ **, ("Contractor Employee B") was standing nearby, and a contractor ** _____ **, ("Contractor Employee C") was in his company truck.[6] The following additional Contractor personnel were also working in the vicinity of 1106 The Paseo at the time of the incident: ** _____ ** ("Contractor Employee D") and ** ____ _____ ** ("Contractor Employee E"). Contractor Employee D was walking back to 1106 The Paseo from his truck at the time of the incident.[7] Prior to the incident, Contractor Employee D was working on the meter set for 1106 The Paseo.[8]

Without stopping the flow of gas to the main or service line, Contractor Employee A cut the plastic portion of the existing service line with a ratchet pipe-cutting tool. This resulted in gas escaping from the open line into the atmosphere.[9] When Contractor Employee A was unable to insert a fitting into the open line to stop the flow of

[4] Spire response to Staff Data Request 0001.

[5] Spire response to Staff Data Request 0010.1 and Spire Attachment to Staff Data Request 0002.

[6] Spire responses to Staff Data Requests 0003, 0003.1 and 0013.1.

[7] Spire response to Staff Data Request 0003.

[8] Spire response to Staff Data Request 0003.1.

[9] Spire attachment to response to Staff Data Request 0025.

gas, he used an electric reciprocating saw[10] (*See* Appendix C, Photograph 2) to cut the steel portion of the service line. Within a few seconds (at around 10:23 a.m. CDT), an ignition occurred and the gas fire began resulting in serious burns to both Contractor Employee A and Contractor Employee B.[11]

The Incident Staff Expert: Clinton L. Foster

B. Personal Injuries

Both Contractor Employee B (standing above the excavation) and Contractor Employee A (in the excavation) were injured during the incident and transported to the hospital. Contractor Employee B required inpatient hospitalization, and Contractor Employee A was taken to the hospital and was released after receiving treatment.[12]

Personal Injuries Staff Expert: Clinton L. Foster

C. Property Damage

Spire reported damages to Spire facilities. There were no reported public or non-operator (Spire) damages. Damages to Spire facilities and cost of repair were estimated by Spire to be $2,566, an estimated $3 of gas was lost and the estimated cost of Spire's emergency response was $500, for a total estimated cost to Spire of $3,069.[13]

Property Damage Staff Expert: Kathleen A. McNelis, PE

[10] In Spire responses and attachments to Staff Data Requests, this tool is sometimes referred to as a Sawzall.

[11] Based on attachment to Spire response to Staff Data Request 0025.

[12] Spire response to Staff Data Request 0013.2.

[13] Based on attachment to Spire response to Staff Data Request 0067.2.

D. Site Description

The incident occurred in and around an excavation in front of 1106 The Paseo in Kansas City, Missouri (*See* Appendix B, Figure 1). 1106 The Paseo is located on the 1100 block of The Paseo between East 11th Street and East 12th Street. The Paseo is a split boulevard that runs north to south, East 11th Street runs east to west and East 12th Street runs east to west. 1106 The Paseo lies between 1100 The Paseo and 1116 The Paseo (*See* Appendix B, Figure 2). The property at 1106 The Paseo includes a gated fence along the building side of the sidewalk running alongside The Paseo, and a grass curb strip[14] between the sidewalk and The Paseo (*See* Appendix C, Photograph 3). The excavation was located in the grass curb strip and sidewalk in front of the property (*See* Appendix B, Figure 2).

Site Description Staff Expert: Clinton L. Foster

E. Meteorological Data

On Monday, July 16th, the sky was partly cloudy or clear throughout the day. No precipitation was recorded by any nearby weather stations. Charles B. Wheeler Downtown Airport reported temperatures at the time of the incident to be 77-78 degrees Fahrenheit, with three (3) miles-per-hour winds out of the northwest.[15]

Meteorological Data Staff Expert: Clinton L. Foster

[14] The narrow strip of grass between the sidewalk and the street.

[15] Meteorological data was obtained from the Midwestern Regional Climate Center for Charles B. Wheeler Downtown Airport, Kansas City, MO and wunderground.com.

F. Natural Gas System

Natural gas service in Kansas City, Missouri is provided by Spire. Prior to this incident, the natural gas distribution mains supplying the 1100 block of The Paseo were four-inch diameter cast iron ("CI") pipe, and three-inch diameter polyethylene ("PE") pipe running north to south along the west side of The Paseo.[16] The mains were operating at a pressure of approximately thirty (30) inches water column[17] at the time of the incident.[18] The Maximum Allowable Operating Pressure ("MAOP")[19] established by Spire for these mains was 2.2 psig.[20] Service to 1106 The Paseo was provided by a two-inch diameter PE tee from the 3-inch PE main, which utilized a transition fitting to transition to a two-inch diameter steel service. This two-inch diameter steel service ran approximately forty-one (41) feet to the meter located on the northeast corner of 1106 The Paseo.[21]

Natural Gas System Staff Experts: Clinton L. Foster and John D. Kottwitz

[16] Spire responses to Staff Data Requests 0001, 0005, and 0007.

[17] Inches water column is a unit of pressure. 30 inches water column is approximately equal to 1.08 pounds per square inch.

[18] Spire response to Staff Data Request 0015.1.

[19] Maximum Allowable Operating Pressure ("MAOP") is defined in 4 CSR 240.030(1)(B) as the maximum pressure at which a pipeline or segment of a pipeline may be operated under this rule.

[20] Spire response to Staff Data Request 0015.2.

[21] Spire response to Staff Data Request 0008.

G. Project Details

The natural gas system in the immediate vicinity near 1106 The Paseo was undergoing abandonments[22], replacements[23], and upgrades[24] during the time immediately before and after this incident. The work being done in the immediate vicinity near 1106 The Paseo was part of a larger project to replace older pipe and ultimately raise the MAOP in the area from 2.2 pounds per square inch (psi)[25] to 58 pounds per square inch (psi).[26] The project included the replacement of the CI main with a new two-inch diameter PE main, and upgrading the existing three-inch PE main's operating pressure.[27] The two-inch diameter steel service line at 1106 The Paseo was to be abandoned and replaced by a new one-inch diameter PE service line.[28]

Project Details Staff Experts: Clinton L. Foster and John D. Kottwitz

H. Utilization of Contractors

Spire was using a contractor for the replacement and upgrade project described in the section immediately above (Section G. Project Details). In addition to the three-person Contractor crew at the incident location, Spire was using and has been using

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[22] Abandoned means permanently removed from service (4 CSR 240-40.030(1)(B)1.).

[23] The term replacement is used in the context of: "a new fixed asset or portion of an asset that takes the place of a discarded one" (Webster's Third New International Dictionary, Unabridged, Copyright 1976 by G. & C. Merriam Co., definition 2.b.)). Additionally, there are regulatory requirements regarding replacement of certain pipe materials. General requirements for required replacement programs are addressed in 4 CSR 240-40.030(15).

[24] "Upgrade" is a term used by Spire for a verification procedure to increase operating pressure in instances where an increase of MAOP as defined in 4 CSR 240-40.030(1)(B) is not required. The term "upgrading" is not synonymous with "uprating" as detailed in 4 CSR 240-40.030(11). Spire provided a copy of its verification procedure for this project in response to Staff Data Request 0006.

[25] Spire response to Staff Data Request 0015.2.

[26] Spire response to Staff Data Request 0001.1.

[27] Spire response to Staff Data Request 0005.

[28] Spire response to Staff Data Request 0001.

contractor crews elsewhere in the Kansas City metropolitan area[29]. On July 16, 2018, Spire was using 29 contractor crews from ** _____ ** and 10 contractor crews from ** _____ . **[30]

Spire has employees who are Contract Inspectors that inspect work performed by contractors. On July 16, 2018, 21 of the 26 Contract Inspectors in the Kansas City metropolitan area were working (5 were off on leave) plus one "step-up"[31] Contract Inspector.[32] Further, an inspection contractor was used to inspect the work of two contractor crews on July 16, 2018.[33]

The Spire Contract Inspector assigned to the three-person contractor crew working at the incident site was assigned to a total of five contractor crews for July 16, 2018.[34]

For the project at the incident location, the Company further responded as follows in response to Staff Data Request 0049:

> Routine oversight and inspection of the work of ** _____ ** at the project included routine jobsite visits throughout the day, advising on installation designs, managing tie-in processes, and reviewing project progress. There was no non-routine oversight of this project.

Spire also explained as follows:

> On the morning of the day of the incident, the Company contract inspector drove by to visit the construction crew near the work location

[29] Spire also uses Spire crews for construction work in the Kansas City metropolitan area.

[30] Spire response to Staff Data Request 0053.

[31] "Step-up" Contract Inspector refers to a Spire Maintenance Crew Person who was assigned to be a Spire Contract Inspector on July 16, 2018, as indicated in the Spire response to Staff Data Request 0053.

[32] Spire response to Staff Data Request 0056.1.

[33] Spire response to Staff Data Request 0053.

[34] Spire response to Staff Data Request 0053.

> but did not stop or inspect anything at the work site since work had not begun and the supervisor was not present with the crew.[35]
>
> On the morning of the day of the incident, the Spire contract inspector verbally confirmed the work schedule for that day with the contract crew foreman via phone.[36]

After driving by the Contractor crew at the incident location, the Spire Contract Inspector proceeded to another project location about four miles to the south where three of his assigned Contractor crews were working. The Spire Contract Inspector continued at that project and then returned to the Spire office, where he learned the incident had recently occurred. Other than driving by before work started for the day, the Spire Contract Inspector was not present at the incident location on July 16, 2018, prior to the incident occurring.[37]

Spire explained the intended procedure further:

> The Company's expectation is that all contractor construction crews have an ** _____ ** superintendent, Company contract inspector, and Company supervisor assigned to them. That expectation was fulfilled on the date of the incident and throughout the duration of the project.[38]

In addition to a Contractor superintendent, the Contractor also had a Contractor general foreman assigned to supervise the Contractor crew.[39]

Other than the Spire Contract Inspector's drive-by before work started, none of these assigned persons were at the incident location during work by the Contractor crew on July 16 prior to the incident and were not present at the time of the incident.

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[35] Spire response to Staff Data Request 0054.1.

[36] Spire response to Staff Data Request 0054.1.

[37] Spire responses to Staff Data Requests 0011, 0053, 0054 and 0054.1.

[38] Spire response to Staff Data Request 0053.

[39] Spire response to Staff Data Request 0054.

Staff requested a list of contractor work tasks that require a Spire Contract Inspector to be present during the work task, and specifically if a Spire Contract Inspector is required to be present when a Contractor project involves working with escaping gas and/or cutting a pipeline containing gas. Spire answered as follows:

> There are no work tasks that the Company requires a Company contract inspector to be present during. The Company only hires contractors that are qualified to perform all tasks required for a particular project.[40]
>
> The Company does not require a contractor [sic] inspector to be present when a contractor project involves working with escaping gas and/or cutting a pipeline containing gas.[41]

Staff also asked Spire for their contractor oversight procedures. Spire responded that there is no Spire-approved written policy or procedure for oversight and inspection of contractors working for Spire; however, Spire is in the process of standardizing policies and procedures across operational areas and will review whether to implement a new construction contractor inspection policy or procedures.[42]

Utilization of Contractors Staff Expert: John D. Kottwitz

I. Emergency Response [4 CSR 240-40.030(12)(J)]

The incident occurred at approximately 10:23 a.m. CDT ** _____ _____ ** employed by Spire, observed the fire and called for emergency responders and then called the Spire security center to report the incident.[43] Around the same time, a Kansas City Fire Battalion Chief noticed the incident

[40] Spire response to Staff Data Request 0055.

[41] Spire response to Staff Data Request 0055.

[42] Spire response to Staff Data Request 0049.

[43] Spire response to Staff Data Request 0002.

while driving by and stopped to assist.[44] An ambulance from The University of Kansas Hospital arrived on site at approximately 10:28 a.m. CDT and transported the injured individuals to the hospital.[45] At approximately 10:30 a.m. CDT, Contractor Employee E stopped the flow of gas by squeezing-off a 3-inch plastic main[46] at an excavation located near the intersection of East 11th Street and The Paseo (*See* Appendix B, Figure 2 for squeeze-off location). Spire's security center received a call from the off duty police officer at approximately 10:30 a.m. CDT and was informed that Kansas City Police and Fire were already notified. Spire's security center subsequently notified ** _____ ** a Spire Construction Supervisor at approximately 10:32 a.m. CDT.[47] The Construction Supervisor left for the incident site, and arrived at approximately 10:50 a.m. CDT. Two Contractor Managers arrived at the scene at approximately 10:55 and 11:00 a.m. CDT.[48] The Kansas City Fire Department was on site at 11:00 a.m. CDT.[49] A second Contractor crew was later called to the incident site to complete work on the 1100 block of The Paseo.[50] A Spire Contract Inspector was called to the scene, and directed the removal of a burnt portion of the three-inch diameter PE main. He remained on-site until the second Contractor crew completed work.[51]

Emergency Response Staff Expert: Brian J. Buchanan

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[44] Spire response to Staff Data Request 0013.

[45] Spire responses to Staff Data Requests 0002 and 0012.1.

[46] Spire response to Staff Data Request 0004.

[47] Spire response to Staff Data Request 0002.

[48] Spire response to Staff Data Request 0002.

[49] Spire response to Staff Data Request 0002.

[50] Spire response to Staff Data Request 0002.

[51] Spire response to Staff Data Request 0002.

J. Spire Plans/Procedures

Spire's currently effective Emergency Plan: "Spire Missouri West O&M Standard 3110V", effective date 3-24-2017, was provided as an attachment to Spire's response to Staff Data Request 0022. The Contractor was required to follow the Spire Missouri West Standard 3110V.[52]

Spire stated that it provided the Contractor with the entire Operations and Maintenance ("O&M") manual, including the Emergency Plan on December 15, 2016, and has provided the Contractor with updated Standards since that time, as changes are made.[53]

At the time of the incident, Spire required the Contractor's employees to follow both the Spire Missouri West Operator Qualification Program and the Contractor's own Operator Qualification Program.[54] According to Spire, the Contractor is responsible for providing training on Spire procedures to its employees.[55] The Spire individuals who conducted the initial review of the Contractor's operator qualification program prior to the Contractor performing any work on Spire's pipeline facilities are no longer with Spire, and therefore the scope of their study is not known[56].

According to information provided by Spire, each member of the Contractor crew was trained on:

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[52] Based on Spire response to Staff Data Request 0022.1.

[53] Spire responses to Staff Data Requests 0022 and 0023.

[54] Spire response to Staff Data Request 0039.1.

[55] Spire response to Staff Data Request 0022.

[56] Spire response to Staff Data Request 0040.

a. Procedures to test for hazardous atmospheres.[57]

b. Use of Personal Protective Equipment ("PPE").[58]

c. The operation of a fire extinguisher and to verify full charge and proper visual inspection on a daily basis with a monthly documented inspection and annual third-party inspection.[59]

According to information provided by Spire, the Contractor crew had or did not have the following items available to the Contractor crew at the incident location at the time of the incident:

a. Contractor crew had gas detection equipment consisting of a Bascom-Turner, Gas Sentry CGI-201[60] for testing hazardous atmospheres.[61]

b. Contractor crew had a fire-resistant suit, a fire-resistant hood, and an Allergo Model A-300 supplied air respirator.[62]

c. Contractor crew did not have a safety retrieval harness and life lines.[63]

d. Contractor crew had a fire extinguisher at the jobsite in the vicinity of the excavation. The fire extinguisher was not used or attempted to be used to extinguish the fire.[64] However, during Contractor's investigation, it was determined that the fire extinguisher was not properly charged at the time of

[57] Spire responses to Staff Data Requests 0010, 0010.1 and 0010.2.

[58] Spire responses to Staff Data Requests 0010.3, 0010.4 and 0031.2.

[59] Spire response to Staff Data Request 0010.2.

[60] A Bascom-Turner, Gas Sentry CGI-201 is a type of Combustible Gas Indicator manufactured by Bascom-Turner.

[61] Spire response to Staff Data Request 0010.3.

[62] Spire response to Staff Data Request 0010.3.

[63] Spire response to Staff Data Request 0010.3.

[64] Spire response to Staff Data Request 0033.

the fire.[65] It was also determined during Contractor's investigation that Contractor Employee C was aware that the fire extinguisher was not ready for use and failed to take action to remedy the problem.[66] Spire stated in response to Staff Data Request 0037.1: "One day before the incident, the foreman told the general foreman that he needed to go to the yard to get a replacement fire extinguisher, but he failed to do so."[67]

According to information provided by Spire, all members of the Contractor crew were trained in the operation of a fire extinguisher and were trained to verify full charge and proper visual inspection on a daily basis and a monthly documented inspection.[68] Annual fire extinguisher inspections by a third-party are maintained on the inspection tag for each fire extinguisher. The monthly inspections are also documented on the inspection tag.[69] According to Spire, the daily visual pre-use inspections required by the procedure were not necessary as the Contractor does not utilize cartridge-type fire extinguishers.[70] According to the Contractor, the extinguisher and the annual inspection tag for this extinguisher were not retained following the incident.[71]

Spire procedures require the removal of sources of ignition from the excavation when gas is being vented into the open air, this would include a ratchet pipe cutting tool

[65] Spire response to Staff Data Request 0037.

[66] Spire response to Staff Data Request 0037.

[67] Spire response to Staff Data Request 0037.1

[68] Spire response to Staff Data Request 0010.2.

[69] Spire response to Staff Data Request 0036.3.

[70] Spire response to Staff Data Request 0010.2.

[71] Spire response to Staff Data Request 0036.3.

and a Sawzall.[72] Spire Missouri West (formerly Missouri Gas Energy "MGE") Standard 2540D, Paragraph 2.3 requires removing the sources of ignition from the excavation.[73]

Since the acquisition of Missouri Gas Energy by Spire, Spire has reviewed Spire Missouri West, formerly MGE, policies and procedures with all contractors through training and has provided them with an electronic copy of all applicable procedures.[74] Additionally, ENERGY WorldNet, Inc. ("EWN")[75] was present at a meeting in December 2016 to facilitate the discussion of how Spire would be performing the reviews of contractors based on Spire Standards.[76] Spire utilizes EWN for Spire's operator qualification training and evaluations.[77] For an employee of the Contractor to be considered qualified to perform the covered task "squeeze -off of main pipe," Spire requires computer-based training modules and performance evaluations.[78] For a Spire employee to be considered qualified to perform the covered task, Spire requires computer-based training modules (which include written exams) and performance evaluations.[79] Spire's Contract Inspector verifies Operation Qualification ("OQ") records for all individuals assigned to a project prior to commencement of work.

The results of Spire's failure analysis (*See* Section P) were that Spire's training and emergency procedure programs were sufficient with respect to the construction

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[72] Spire response to Staff Data Request 0031.1.

[73] Spire response to Staff Data Request 0031.1.

[74] Spire response to Staff Data Request 0040.

[75] ENERGY WorldNet, Inc. is a third party provider of operator qualification training, testing and record maintenance.

[76] Spire response to Staff Data Request 0040.

[77] Spire responses to Staff Data Requests 0056.2 and 0056.3.

[78] Spire responses to Staff Data Request 0041.2 and 0041.7.

[79] Spire responses to Staff Data Request 0041.2 and 0041.7.

conditions and that the incident resulted from the Contractor employee's decision to not follow established procedures. Spire's investigation determined that the cause of the incident was that proper procedures were not followed in that the covered task was performed using a Sawzall.[80] Spire stated that it expected the "main pipe" to be squeezed off in the excavation at the service tee for 1100 The Paseo.[81] Spire's Contract Inspector stated that his expectation was verbally communicated to the Contractor construction crew on the Friday before the incident.[82] Spire stated that it only hires contractors that are qualified to perform all tasks required for a particular project.[83]

The contractor was required to follow Spire Missouri West's Prevention of Accidental Ignition Standard, 2540D,[84] and O&M Standard 3545C, Hazardous Atmospheres.[85]

Spire Plans/Procedures

Staff Experts: Brian J. Buchanan, Clinton L. Foster,
John D. Kottwitz and Kathleen A. McNelis, PE

1. *Prevention of Accidental Ignition [4 CSR 240-40.030(13)(X)]*

Spire's procedures addressing the requirements of 4 CSR 240-40.030(13)(X) are in Spire Missouri West Construction Standard 2540D, Prevention of Accidental Ignition.[86] This procedure requires, among other things that when gas is being vented into

[80] Spire response to Staff Data Request 0043.

[81] Spire response to Staff Data Request 0041.1.

[82] Spire response to Staff Data Request 0011.

[83] Spire response to Staff Data Request 0055.

[84] Spire responses to Staff Data Requests 0009 and 0009.1.

[85] Spire responses to Staff Data Request 0010 and 0010.2.

[86] A copy was provided in response to Staff Data Request 0009.

the open air, potential sources of ignition shall be removed from the area (Standard 2540D, Section 2.3).

An approximately 3-foot by 5-foot working space was excavated to a depth of about 3-feet to provide access to the service line and main (*See* Appendix B, Figure 2).[87] When the incident occurred, Contractor Employee A was in the excavation working to abandon the service line, Contractor Employee B was not in the excavation but was standing nearby, and Contractor Employee C was in his truck.[88] Signs and barricades were in place around the excavation.[89]

Without stopping the flow of gas to the main or service line, Contractor Employee A cut the plastic portion of the existing service line with a ratchet pipe-cutting tool, resulting in gas escaping from the open line into the atmosphere.[90] When Contractor Employee A was unable to insert a fitting into the open line to stop the flow of gas, he used an electric reciprocating saw to cut the steel portion of the service line. Within a few seconds (at around 10:23 a.m. CDT), an ignition occurred and the gas fire began resulting in serious burns to both Contractor Employee A and Contractor Employee B.[91]

Prevention of Accidental Ignition

Staff Experts: Brian J. Buchanan and Kathleen A. McNelis, PE

[87] Spire response to Staff Data Request 0010.1 and Spire attachment to Staff Data Request 0002.

[88] Spire responses to Staff Data Requests 0003 and 0003.1

[89] Spire response to Staff Data Request 0035.

[90] Attachment to Spire response to Staff Data Request 0025.

[91] Based on attachment to Spire response to Staff Data Request 0025.

2. Precautions to Protect Personnel [4 CSR 240-40.030(12)(C)2.J.]

Spire's procedures addressing the requirements of 4 CSR 240-40.030(12)(C)2.J. are in Spire Missouri West O&M Standard 3545D, Hazardous Atmospheres.[92]

This procedure requires, among other things:

- Atmospheres where a hazardous atmosphere exist or could reasonably be expected to exist, such as in or around excavations and confined spaces, shall be tested before employees enter (Standard 3545D, Section 3.0);
- In all excavations where there is reason to suspect the presence of a flammable gas (e.g., leak repair), the atmospheric environment in and around the excavation shall be tested with a combustible gas indicator ("CGI") before personnel are allowed access (Standard 3545D, Section 5.2);
- When workers are required to be within the hazardous environment there must be an additional person assigned to observe the workers' activities and warn about changes in conditions or initiate rescue activities if necessary (Standard 3545D, Section 5.4);
- In atmospheres that have been identified as hazardous additional Personal Protective Equipment ("PPE") shall include, but may not be limited to, fire retardant suit and hood, respiratory protection and rescue equipment in addition to the Personal Protective Equipment items normally required for the tasks being performed (Standard 3545D, Section 6.0); and

[92] A copy was provided in response to Staff Data Request 0010.

- A fire extinguisher shall be placed at a location upwind of the excavation and shall be staffed by an employee trained in the operation of a fire extinguisher (Standard 3545D, Section 7.2).

In response to a Staff Data Request asking for an explanation of how the hazardous atmosphere testing was conducted for the excavation at 1106 The Paseo, Spire responded: "Based on the [Spire] incident investigation, proper procedures were not followed at this location; therefore, hazardous atmosphere testing was not conducted but ** _____ ** were trained on these procedures."[93]

Although a fire extinguisher was provided, Spire stated that it was not properly charged at the time of the fire, and that Contractor Employee C was aware that it was not ready for use.[94]

Spire's response to Staff Data Request 0010.3 indicated that Contractor Employee C failed to assign an additional person to observe the worker's activities and warn about changes in conditions.

Although a fire-resistant suit, fire-resistant hood, and an Allergo Model A-300 supplied air respirator were available at the construction site at the time of the incident,[95] the Contractor work crew did not utilize this equipment.[96]

Precautions to Protect Personnel Staff Experts: Brian J. Buchanan and John D. Kottwitz

[93] Spire response to Staff Data Request 0010.2.

[94] Spire response to Staff Data Request 0037.

[95] Spire response to Staff Data Request 0010.3.

[96] Spire response to Staff Data Request 0025.

3. Mechanical Joining [4 CSR 240-40.030(6)(B)]

Spire's procedure to comply with the requirements of 4 CSR 240-40.030(6)(B) General, (6)(F) Plastic Pipe, and (8)(J) Service Lines are provided in Spire Missouri West Construction Standard 2240E. In response to Staff Data Request 0063, Spire indicated that the sections of Spire Missouri West Construction Standard 2240E that were applicable to the work being completed at 1106 The Paseo were Section 2.0-General and Section 7.0-Mechanical Joints for Plastic.

Paragraph 7.3.1 of Spire Missouri West Construction Standard 2240E, Mechanical Joining, requires that the flow of gas be terminated when PE pipe size ½-inch CTS[97] through 2-inch IPS[98] are to be joined using a Permasert™ coupling.[99]

Based on the response to Staff Data Request 0025, at the time of the incident, the individual completing the abandonment of the existing service line to 1106 The Paseo was attempting to install a Permasert ™ coupling as a cap for the 2-inch diameter plastic stub remaining on the main from the existing service line.

Mechanical Joining Staff Experts: Clinton L. Foster and Kathleen A. McNelis, PE

K. Operator Qualification [4 CSR 240-40.030(12)(D)]

Spire provided copies of ** _____ _____ ** and ** _____

[97] CTS means Copper Tube Size. Copper Tube size polyethylene pipe is sized like copper pipe and is also manufactured with the Outside Diameter (OD) as the controlling dimension. Copper Tube Size or CTS pipe is commonly referred to as tubing.

[98] IPS means Iron Pipe Size. Polyethylene pipe sizes identified by IPS diameters designate the nominal inside diameter for 12-inch and smaller IPS pipe, and outside diameter for 14-inch and larger IPS pipe.

[99] Permasert™ is a registered trademark for a type of mechanical coupling manufactured by Elster Perfection.

____ ** in response to Staff Data Request 0039. Contractor employees were required to follow ** _____ _____ ** and were expected to follow ** _____ _____ .[100] _____ _____ ____ ____[101] _____ _____ **[102] Spire indicated that a review of the Contractor's operator qualification program, ** _____ ____ **, was completed by Spire at some point prior to the Contractor performing any work on Spire's pipeline facilities, but the individuals who conducted the initial review are no longer with Spire, and the scope of their examination is unknown.[103] Spire has not conducted a subsequent review of the Contractor's operator qualification program.[104] Spire stated that, in order to ensure through evaluation that contractor employees are qualified and have the necessary knowledge and skills to perform tasks in a manner that ensures the safe operation of pipeline facilities, Spire has reviewed Spire policies and procedures with all contractors through training and has provided them with an electronic copy of all applicable Spire procedures. Additionally, EWN was present at

[100] Spire response to Staff Data Request 0039.1.

[101] The attachment to Spire response to Staff Data Request 0039 indicates that any reference to Missouri Gas Energy in the attachment now refers to Spire Missouri West.

[102] Attachment to Spire response to Staff Data Request 0039.

[103] Spire response to Staff Data Request 0040.

[104] Spire response to Staff Data Request 0040.1.

a meeting with Spire in December 2016 to facilitate the discussion of how Spire would be preforming the reviews of contractors based on Spire standards.[105]

In response to Staff Data Request 0041, Spire stated that it expected the covered tasks of squeeze-off of main pipe, service abandonment, service installation, and an increase in operating pressure of existing plastic main to be performed during the project at the 1100 block of The Paseo. Spire expected these covered tasks to be performed based on a verbal discussion between the Spire Contract Inspector and the Contractor, however Spire also stated that the Contractor may deviate from the discussed plan at its discretion provided proper Spire procedures are followed.[106] Spire indicated that no documentation of Spire's expectations of which covered tasks the Contractor will perform is provided to the Contractor.[107] Spire also stated that the covered tasks of service abandonment, live gas work, squeeze off of main pipe, and service installation were actually performed during the project at the 1100 block of The Paseo.[108]

4 CSR 240-40.030(12)(D)8.A.(II) requires that qualification records shall include identification of the covered tasks the individual is qualified to perform. Staff requested from Spire the identification of the covered tasks each Contractor employee working at the project at the 1100 block of The Paseo was qualified to perform from Spire. Spire indicated this information could be found in Exhibit 26, an attachment to Spire's response to Staff Data Request 0026.[109]

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[105] Spire response to Staff Data Request 0040.

[106] Spire response to Staff Data Request 0058.

[107] Spire response to Staff Data Request 0058.

[108] Spire response to Staff Data Request 0041.

[109] Spire response to Staff Data Request 0026.5.

Spire provided qualification records of the individuals performing these covered tasks, at the project at the 1100 block of The Paseo in response to Staff Data Request 0026. The records indicated that Contractor Employee A completed qualification evaluations through EWN, and Contractor Employee C completed qualification evaluations through MEA Energy Association ("MEA")[110]. The records indicated that Contractor Employee E completed qualification evaluations through EWN and MEA. Spire stated that Contractor Employee B, and Contractor Employee D had not yet been qualified to perform any covered tasks.[111]

In order to connect the qualification records with the covered task list included in ** _____ ____ **, Staff requested and Spire provided lists of evaluations through EWN necessary for Spire to consider an individual qualified to perform each of the covered tasks expected to be performed and each of those tasks actually performed at the 1100 block of The Paseo.[112]

For the covered task of squeeze-off of main pipe, Spire requires the following EWN evaluations to be successfully completed in order for an individual to be considered qualified to perform the covered task:

[110] EWN and MEA are third party providers of operator qualification evaluations, each with differing training methods and evaluations. The difference in the two means that, although an individual can be qualified to perform the same covered task under each provider, the evaluations required will be different for that same covered task.

[111] Spire responses to Staff Data Requests 0026.2 and 0026.4.

[112] Spire in responses to Staff Data Requests 0041.7, 0041.8, 0041.9, 0041.10, 0041.11, 0041.12 and 0041.13.

Computer Evaluations[113]:

- EWN- CBT-AOC Failure to Follow Procedures
- EWN-CBT-AOC Flammable Gas Atmosphere
- EWN-CBT-Squeeze Off Plastic Pipe
- EWN-CBT-AOC Inoperability of a Pipeline Component
- EWN-CBT-Squeeze Off Steel Pipe

Performance Evaluations[114]:

- EWN-PE-Squeeze Off Plastic Pipe
- EWN-PE-Squeeze Off Steel Pipe[115]

For the covered task of service abandonment, Spire requires the following EWN evaluations to be successfully completed in order for an individual to be considered qualified to perform the covered task:

Computer Evaluations:

- EWN-CBT-AOC Inoperability of a Pipeline Component
- EWN-CBT-AOC Flammable Gas Atmosphere
- EWN-CBT-Temporary Isolation of Service Lines and Service Discontinuance

Performance Evaluations:

- EWN-PE-Temporary Isolation of Service Lines and Service Discontinuance[116]

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[113] These computer evaluations can consist of computerized training modules, and computerized written examinations.

[114] Performance evaluations can consist of field evaluation of an employee performing a covered task under the direction and observation of a qualified individual, or performing a simulation of the covered task.

[115] Spire response to Staff Data Request 0041.7.

[116] Spire response to Staff Data Request 0041.8

For the covered task of service installation, Spire requires the following EWN evaluations to be successfully completed in order for an individual to be considered qualified to perform the covered task:

Computer Evaluations:

- EWN-CBT-AOC Inoperability of a Pipeline Component
- EWN-CBT-Pressure Test: Nonliquid Medium-MAOP Less Than 100 psi
- EWN-CBT-Pressure Test: Nonliquid Medium-MAOP Greater Than or Equal to 100 psi
- EWN-CBT Leak Test at Operating Pressure
- EWN-CBT-AOC Flammable Gas Atmosphere
- EWN-CBT-Visually Inspect Pipe and Pipe Components Prior to Installation
- EWN-CBT-AOC Failure to Follow Procedures
- EWN-CBT-Joining of Plastic Pipe-Stab Fittings
- EWN-CBT-Joining of Pipe: Compression Couplings
- EWN-CBT-Joining of Pipe-Threaded Joints
- EWN-CBT-Joining of Pipe-Flange Assembly
- EWN-CBT-Installation of Steel Pipe in a Ditch
- EWN-CBT-Joining of Plastic Pipe-Butt Heat Fusion: Manual
- EWN-CBT-Joining of Plastic Pipe-Sidewall Heat Fusion
- EWN-CBT-Joining of Plastic Pipe-Electrofusion
- EWN-CBT-Joining of Plastic Pipe-Socket Heat Fusion
- EWN-CBT-Abnormal Operating Conditions-Buckled or Dented Pipe
- EWN-CBT Installation of Plastic Pipe in a Ditch
- EWN-CBT-Install Tracer Wire

Performance Evaluations:

- EWN-PE-Pressure Test-Nonliquid Medium MAOP Less Than 100 psi
- EWN-PE-Pressure Test: Nonliquid Medium-MAOP Greater Than or Equal to 100 psi
- EWN-PE-Leak Test at Operating Pressure
- EWN-PE-Visually Inspect Pipe and Pipe Components Prior to Installation
- EWN-PE-Joining of Plastic Pipe-Stab Fittings
- EWN-PE-Joining of Pipe: Compression Couplings
- EWN-PE-Joining of Pipe-Threaded Joints
- EWN-PE-Joining of Pipe-Flange Assembly
- EWN-PE-Joining of Plastic Pipe-Butt Heat Fusion
- EWN-PE-Joining of Plastic Pipe-Sidewall Saddle Heat Fusion
- EWN-PE-Joining of Plastic Pipe-Electrofusion
- EWN-PE-Joining of Plastic Pipe-Socket Heat Fusion
- EWN-PE-Installation of Plastic Pipe in a Ditch
- EWN-PE-Install Tracer Wire

Evaluations Required by Spire if Performing Specialized Installations:

- EWN-CBT Installation of Plastic Pipe in a Bore
- EWN-PE-Installation of Plastic Pipe in a Bore
- EWN-CBT Installation of Plastic Pipe Plowing/Pull-In
- EWN-PE-Installation of Plastic Pipe Plowing/Pull-In
- EWN-CBT-Installation of Plastic Pipe by Plowing/Planting
- EWN-PE-Installation of Plastic Pipe by Plowing/Planting[117]

[117] Spire response to Staff Data Request 0041.9.

For the covered task of an increase in operating pressure of existing plastic main, Spire requires the following EWN evaluations to be successfully completed in order for an individual to be considered qualified to perform the covered task:

Computer Evaluations:

- EWN-CBT-AOC Inoperability of a Pipeline Component
- EWN-CBT-Pressure Test: Nonliquid Medium-MAOP Less Than 100 psi
- EWN-CBT-Pressure Test: Nonliquid Medium-MAOP Greater Than or Equal to 100 psi
- EWN-CBT-AOC Report of Gas Odor/Liquid Release
- EWN-CBT Leak Test at Operating Pressure
- EWN-CBT-AOC Flammable Gas Atmosphere
- EWN-CBT-Visually Inspect Pipe and Pipe Components Prior to Installation

Performance Evaluations:

- EWN-PE-Pressure Test-Nonliquid Medium MAOP Less Than 100 psi
- EWN-PE-Pressure Test: Nonliquid Medium-MAOP Greater Than or Equal to 100 psi
- EWN-PE-Visually Inspect Pipe and Pipe Components Prior to Installation[118]

For the covered task of live gas work, Spire stated that the evaluations for the covered task of live gas work are completed by being qualified under other covered tasks in particular being performed.[119]

With regards to the covered task of squeeze-off of main pipe, Contractor Employee A successfully completed all the Spire required evaluations within the

[118] Spire response to Staff Data Request 0041.10.

[119] Spire response to Staff Data Request 0041.12.

39 months prior to the incident except: EWN-CBT-Squeeze of Steel Pipe and EWN-PE-Squeeze Off Steel Pipe. Spire stated that an employee can be qualified to perform the task of squeeze-off of main pipe on specifically plastic pipe if the employee successfully completes the evaluations regarding squeeze-offs on plastic pipe; that employee is not required to complete the evaluations regarding squeeze-offs on steel pipe, but through this process the employee would not be qualified to perform squeeze-offs on steel pipe.[120] With regards to the covered task of service abandonment, Contractor Employee A successfully completed all Spire required evaluations within the 39 months prior to the incident. With regards to the covered task of service installation, Contractor Employee A successfully completed all the Spire required evaluations within the 39 months prior to the incident except: EWN-CBT-Joining of Plastic Pipe-Socket Heat Fusion, EWN-CBT-Install Tracer Wire, and EWN-PE-Joining of Plastic Pipe-Socket Heat Fusion. Spire stated that Contractor Employee A did not perform the covered task of service installation at the project at the 1100 block of The Paseo.[121] With regards to the covered task of increase in operating pressure of an existing plastic main, Contractor Employee A successfully completed all Spire required evaluations within the 39 months prior to the incident.[122]

In order to connect the qualification records with the covered task list included in ** _____ **, Spire provided a list of evaluations through MEA necessary for Spire to consider an

[120] Spire response to Staff Data Request 0041.14.

[121] Spire response to Staff Data Request 0041.15.

[122] Contractor Employee A's qualification records were provided in Spire's response to Staff Data Request 0026.

individual qualified to perform the covered tasks expected to be performed and each of those tasks actually performed at the 1100 block of The Paseo in response to Staff Data Requests 0060.2. For the covered task of squeeze-off of main pipe, Spire requires the following MEA evaluations to be successfully completed in order for an individual to be considered qualified to perform the covered task:

- 192-1414 Pipeline Shutdown, Startup or Pressure Change (MEA1167)
- 192-1418 Purging (MEA1170)
- 192-0101 Characteristics and Hazards of Natural Gas (MEA1459)
- 192-2011 Prevention of Accidental Ignition (MEA1185)
- 192-Abnormal Operating Conditions (MEA1291)[123]

For the covered task of service abandonment, Spire requires the following MEA evaluations to be successfully completed in order for an individual to be considered qualified to perform the covered task:

- 192-2014 Service Lines Not In Use and Service Discontinuance (MEA1186)
- 192-1418 Purging (MEA1170)
- 192-1401 Abandonment or Inactivation of Facilities (MEA1157)
- 192-0101 Characteristics and Hazards of Natural Gas (MEA1459)
- 192-2011 Prevention of Accidental Ignition (MEA1185)
- 192-Abnormal Operating Conditions (MEA1291)[124]

[123] Spire response to Staff Data Request 0060.2.

[124] Spire response to Staff Data Request 0060.2.

For the covered task of service installation, Spire requires the following MEA evaluations to be successfully completed in order for an individual to be considered qualified to perform the covered task:

- 192-1301 Leak and Strength Test-Service Lines, Mains, and Transmission Lines (MEA1156)
- 192-0803 Inspection for Damage (MEA1145)
- 192-1005 Mechanical Joints (MEA1151)
- 192-1003 Plastic Pipe-Butt Heat Fusion (MEA1149)
- 192-1004 Plastic Pipe-Sidewall Heat Fusion (MEA1150)
- 192-1002 Plastic Pipe-Electrofusion (MEA1148)
- 192-Abnormal Operating Conditions (MEA1291)
- 192-1408 Installation of Plastic Pipe (MEA1162)
- 192-0101 Characteristics and Hazards of Natural Gas (MEA1459)
- 192-2011 Prevention of Accidental Ignition (MEA1185)[125]

For the covered task of increase in pressure of existing plastic main, Spire requires the following MEA evaluations to be successfully completed in order for an individual to be considered qualified to perform the covered task:

- 192-0803 Inspection for Damage (MEA1145)
- 192-1301 Leak and Strength Test-Service Lines, Main and Transmission Lines (MEA1156)
- 192-0101 Characteristics and Hazards of Natural Gas (MEA1459)
- 192-2011 Prevention of Accidental Ignition (MEA1185)
- 192-Abnormal Operating Conditions (MEA1291)[126]

[125] Spire response to Staff Data Request 0060.2.

[126] Spire response to Staff Data Request 0060.2.

For the covered task of live gas work, Spire stated that the evaluations for the covered task of live gas work are completed by being qualified under other covered tasks in particular being performed.[127]

With regards to all of the covered tasks expected to be completed and those actually completed during the project at the 1100 block of The Paseo, Contractor Employee C had successfully completed all Spire required MEA evaluations within the 39 months prior to the incident.[128]

Contractor Employee E came to the aid of Contractor Employee A and performed a squeeze-off of plastic main pipe as part of the emergency response to the incident.[129] Based on the records provided in response to Staff Data Request 0026, Contractor Employee E was missing the Spire required EWN-CBT-Squeeze Off Plastic Pipe and EWN-PE-Squeeze Off Plastic Pipe evaluations through EWN to be qualified to perform the covered task of squeeze-off of plastic main pipe. Based on the records provided in response to Staff Data Request 0026, Contractor Employee E was missing the Spire required 192-1418 Purging (MEA1170)[130], 192-0101 Characteristics and Hazards of Natural Gas (MEA1459), 192-2011 Prevention of Accidental Ignition (MEA1185), 192-Abnormal Operating Conditions (MEA1291) evaluations through MEA to be qualified to perform the covered task of squeeze-off of plastic main pipe. Contractor

[127] Spire response to Staff Data Request 0041.12.

[128] Spire response to Staff Data Request 0026.

[129] Spire responses to Staff Data Requests 0025 and 0041.14.

[130] Staff understands that although Contractor Employee E did not complete 192-1418 Purging (MEA1170), the equivalent EWN module (EWN 1651 Purge-Flammable or Inert Gas) can be used in place of this module. Records provided by Spire show Contractor Employee E had successfully completed EWN 1651 Purge-Flammable or Inert Gas.

Employee A was nearby to Contractor Employee E when Contractor Employee E performed the covered task of squeeze-off of main pipe.[131]

Spire also indicated that the Spire Contract Inspector position requires OQ training and evaluations.[132] Spire provided the following list of training and evaluations necessary to be considered qualified to perform the work required of Spire Contract Inspectors:

- 1000 – Monitoring Cathodic Protection
- 1010 - Corrosion Prevention
- 1030 – Measure Corrosion
- 1080 – Testing & Inspection of Pipeline Facilities
- 1090 – Joining of Pipe
- 1100 – Plastic Pipe Fusion
- 1120 – Cast Iron Installation & Maintenance
- 1130 – Steel Pipe Installation & Maintenance
- 1140 – Plastic Pipe Installation & Maintenance
- 1150 – Above Ground Pipe Installation
- 1160 – Backfilling
- 1170 – Pipeline Coatings
- 1180 – Tapping and Stopping
- 1200 – Odorizes and Odorants
- 1210 – Gas Leak Investigation & Classification

[131] Spire response to Staff Data Request 0025.

[132] Spire response to Staff Data Request 0056.

- 1220 – Gas Leak Survey
- 1230 – Locating Underground Facilities
- 1240 – Pipeline Markers and Rights-of-Way
- 1250 – Damage Prevention
- 1260 – Pipeline Support
- 2040 - Fire School
- 2050 – Environmental Awareness
- 2060 – Fitting Recognition
- 2120 – Emergency Plan
- 2150 – NIMS/ICS Incident Response, Contract Inspection, and Personal Protective Equipment[133]

Spire provided the qualification records for its Contract Inspector assigned to oversee the work done by the Contractor, and the Spire Contract Inspector had successfully completed all the training and evaluations within the 39 months prior to the incident required to be considered qualified to perform the work required by Spire of its Contract Inspectors.[134]

Spire indicated that an investigation was conducted to determine if the performance of any covered task(s) caused or contributed to this incident.[135] Spire stated, "The Company's and Contractor's investigation determined that the cause of the incident was that proper procedures were not followed in that the covered task was performed

[133] Spire response to Staff Data Request 0056.2.

[134] Spire response to Staff Data Request 0056.3.

[135] Spire response to Staff Data Request 0043.

using a Sawzall. The individuals involved were either terminated or suspended from further work until requalification was completed under the OQ program requirements.[136]" Spire also stated with respect to Contractor Employee A, "The training and qualification of this individual were sufficient at the time he was trained and qualified. It is the Company's [Spire's] policy to revoke the qualifications of any individual who is found to have not followed Company [Spire] procedures in the field. Such employees must be re-trained and re-qualified prior to returning to the performance or supervision of field work.[137]"

4 CSR 240-40.030(12)(D)4.B. requires that personnel to whom this subsection[138] applies must possess the knowledge and skills necessary to carry out the procedures in the procedural manual for operations, maintenance and emergencies established under 4 CSR 240-40.030(12)(C)[139] that relate to the covered tasks they perform. Spire stated:

> Operations Training provided ** _____ ** with the entire O&M manual on December 15, 2016 and has provided them with updated Standards since that time as changes are made. ** _____ ** management is instructed to ensure employees are aware of these procedures and where to access them. Additionally, Spire procedures, and how to access them, is discussed during annual plastic fusion qualification classes.[140]

** _____

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[136] Spire response to Staff Data Request 0043.

[137] Spire responses to Staff Data Requests 0025 and 0038.4.

[138] Subsection refers to 4 CSR 240-40.030(12)(D) Qualification of Pipeline Personnel.

[139] 4 CSR 240-40.030(12)(C) requires that, among other things, an operator shall prepare and follow for each pipeline, a manual of written procedures for conducting operations and maintenance activities and for emergency response.

[140] Spire response to Staff Data Request 0023.

_____
_____
_____
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_____
_____
_____ **[141]

In order to ensure that the Contractor crew individuals working at 1106 The Paseo possessed the knowledge and skills necessary to carry out the procedures in the procedural manual for operations, maintenance and emergencies, Spire stated, "The Company inspector[142] verifies OQ records[143] for all individuals assigned to a project prior to commencement of work. As part of operator qualification, contractor personnel were evaluated on the knowledge and skills necessary to carry out the procedures in the procedural manual for operations, maintenance and emergencies established by the Company that relate to the covered tasks they perform."[144] The Spire Contract Inspector is also responsible for ensuring that qualified individuals possess the knowledge and skills necessary to recognize and react to abnormal operating conditions, to recognize potential ignition sources, to recognize conditions that would likely cause emergencies, including equipment or facility malfunctions or failure and gas leaks, in order to predict the potential consequence of these conditions and take appropriate

[141] Attachment to Spire response to Staff Data Request 0039.

[142] "Company inspector" is the same Spire Contract Inspector mentioned above.

[143] Spire response to Staff Data Request 0026.

[144] Spire response to Staff Data Request 0044.

corrective action, and to take steps necessary to control any accidental release of gas and to minimize the potential for fire or explosion.[145]

Spire stated that, in order to ensure that the Contractor individuals working at 1106 The Paseo possessed the knowledge and skills necessary to know the proper use of firefighting procedures and equipment, fire suits, and breathing apparatus, ** _____ ** new hire safety orientation discusses the general principles of fire extinguisher operation, and the natural gas presentation in the orientation discusses controlling ignition sources in an emergency situation.[146] Spire provided documentation pertaining to the new hire safety orientation of the three individuals working on the Contractor work crew at 1106 The Paseo in response to Staff Data Request 0048.2.

Spire indicated that the Contractor work crew had been trained to utilize instruments and equipment that relate to the covered tasks they perform in accordance with manufacturer's instructions.[147]

Operator Qualification Staff Expert: Clinton L. Foster

L. Distribution Integrity Management Program ("DIMP") [4 CSR 240-40.030(17)]

In 2011 when the requirements of 4 CSR 240-40.030(17), DIMP, became effective, the company now known as Spire had three DIMP Plans – one for Missouri Gas Energy (at that time, a separate company from Laclede Gas), one for Missouri Natural (a former operating district of Laclede Gas) and one for Laclede Gas (at that

[145] As stated in Spire responses to Staff Data Requests 0015, 0042, 0045, 0046, 0047.

[146] Stated in Spire response to Staff Data Request 0048.

[147] Spire response to Staff Data Request 0010.3. Instruments and equipment included in this response are a Bascom-Turner, Gas Sentry CGI-201 (Combustible Gas Indicator), fire resistant suit and hood, and an Allegro Model A-300 supplied air respirator.

time, a separate Company from MGE). Currently, Spire has one combined DIMP Plan for its Missouri operations, and is in compliance with the requirements of 4 CSR 240-40.030(17).[148]

In its incident report provided to PHMSA,[149] Spire lists the apparent cause of the incident as "Incorrect Operation". "Incorrect Operation" is one of the threat categories that must be considered in an operator's DIMP. In the DIMP Plan that was effective for Spire Missouri West at the time of the incident, incorrect operation is identified as a potential threat to both mains and service lines. In response to a Staff Data Request[150] asking about the status of incorrect operation in Spire's currently effective DIMP Plan, Spire stated:

> The Company already ranks the threat of Incorrect Operations relative to other potential threats to its system. Currently, Incorrect Operations is not identified as a top threat and therefore does not require accelerated action to be taken. In the future, if Incorrect Operations is identified as a top threat the Company will review the drivers of elevated risk and create an accelerated action plan to address them.

In response to a Staff Data Request[151] asking if Spire's currently effective DIMP Plan addressed the possibility/risk of contractors working for Spire with respect to the threat of "incorrect operation", Spire stated:

> The Company's DIMP plan does not specifically address contractor work as a sub-threat of Incorrect Operations.

Distribution Integrity Management Program ("DIMP")
Staff Expert: Kathleen A. McNelis, PE

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[148] Staff conducts routine inspections of the DIMP Plans and DIMP implementation by the natural gas operators jurisdictional to the Commission. An inspection of Spire's DIMP was conducted in August of 2018.

[149] Commission Rule 4 CSR 240-40.020(6)(A) requires that each operator must submit a federal incident report on Form PHMSA F 7100.1 as soon as practicable but not more than thirty (30) days after detection of an incident required to be reported under 4 CSR 240-40.020(3). Spire's initial incident report was provided in response to Staff Data Request 0051 and its supplemental incident report was provided in response to Staff Data Request 0067.2.

[150] Spire response to Staff Data Request 0050d.

[151] Spire response to Staff Data Request 0050e.

M. Leakage Surveys and Leaks [4 CSR 240-40.030(13)(M) and 4 CSR 240-40.030(14)]

4 CSR 240-40.030(13)(M)1. requires that each operator of a distribution line or system shall conduct periodic[152] instrument leakage surveys. Prior to the incident, leakage surveys had most recently been conducted by Spire in the area July 5 through 9, 2018. No leaks were identified during this leakage survey and there were no known active leaks within a two block radius around 1106 The Paseo at the time of the incident.[153]

Leakage Surveys and Leaks Staff Expert: Clinton L. Foster

N. Odorization Records [4 CSR 240-40.030(12)(P)]

4 CSR 240-40.030(12)(P)1. requires that combustible gas in a transmission line or distribution line must contain natural odorant, or be odorized so that at a concentration in air of one-fifth of the lower explosive limit[154] the gas is readily detectible by a person with a normal sense of smell.

4 CSR 240-40.030(12)(P)6. requires that, to assure the proper concentration of odorant in accordance with this subsection,[155] each operator must conduct, at least monthly, odor intensity tests with an instrument capable of determining the percentage of gas in air at which the odor becomes readily detectible. The records of odor intensity tests performed by Spire in the distribution system serving the incident location demonstrated that the natural gas was readily detectable at gas-in-air concentrations of

[152] For the pipeline in the area within a two block radius around 1106 The Paseo, 4 CSR 240-40.030(13)(M)2.B. requires, at minimum, these instrument leakage surveys be conducted as frequently as necessary, but at intervals not exceeding thirty-nine (39) months, but at least once each third calendar year.

[153] Spire response to Staff Data Request 0019.

[154] Based upon a lower explosive limit ("LEL") at 4.5 percent gas-in-air, 4 CSR 240-40.030(12)(P)1. requires the odorant in natural gas to be readily detectable at a concentration of less than 0.90 percent gas-in-air.

[155] Subsection refers to 4 CSR 240-40.030(12)(P).

approximately 0.25 percent gas in air during the month prior to the incident.[156] In the six months prior to the incident, records of odor intensity tests performed by Spire in the distribution system serving the incident location demonstrated that the natural gas was readily detectable at gas in air concentrations varying between 0.15 and 0.30 percent.[157] Spire did not receive any notifications of a gas odor on July 16, 2018, within a one-block radius around the incident site.[158]

Odorization Records Staff Expert: Clinton L. Foster

O. <u>Missouri Public Service Commission Reporting Requirements [4 CSR 240-40.020)]</u>

Spire confirmed discovery of an incident meeting the reporting requirements of Commission Rule 4 CSR 240-40.020(2)(C) at approximately 1:00 p.m. CDT on July 16, 2018.[159] The incident reporting requirements in 4 CSR 240-40.020(3), (4), and (5) were completed as follows:

1. Spire made the initial telephone notification of a natural gas incident to a Staff member at approximately 1:00 p.m., CDT on July 16, 2018.[160]
2. Spire notified the United States Department of Transportation-Pipeline and Hazardous Materials Safety Administration (DOT-PHMSA) of a natural gas incident at approximately 1:06 p.m., CDT on July 16, 2018 (NRC Report Number 1218524).[161]

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[156] Spire response to Staff Data Request 0017.

[157] Spire response to Staff Data Request 0017.

[158] Spire response to Staff Data Request 0021.

[159] Spire response to Staff Data Request 0062.

[160] 4 CSR 240-40.020(4)(A) requires the operator to notify designated Commission personnel by telephone within two hours following discovery, unless emergency efforts to protect life and property would be hindered and then as soon thereafter as practicable, for each event which meets the natural gas incident reporting requirements.

[161] Spire response to Staff Data Request 0064.

3. DOT-PHMSA form PHMSA F 7100.1 titled "Incident Report – Gas Distribution System" was completed by Spire and initially submitted to Staff on August 15, 2018.[162] Spire also submitted the form to DOT-PHMSA electronically. A supplemental Incident Report was submitted to DOT-PHMSA on May 16, 2019,[163] with a copy provided to Staff in response to Staff Data Request 0067.2.

Missouri Public Service Commission Reporting Requirements
Staff Experts: Clinton L. Foster and Kathleen A. McNelis, PE

P. <u>Spire Investigation of Failure [4 CSR 240-40.030(12)(L)]</u>

Spire's failure analysis procedure for reportable incidents is in ** _____ _____ . ** This procedure requires among other things, an investigation and attempt to determine the incident cause (Section 2.3), and recommendations, if any, on corrective action needed to prevent a recurrence (Section 5.2.6). According to Spire, the results of its failure analysis[164] were as follows[165]:

> The results of the Company's failure analysis were that the Company's training and operator qualifications programs were sufficient with respect to the construction conditions and that the incident resulted from the contract employee's decision to not follow established procedures. In an effort to minimize the possibility of a recurrence, the Company will circulate a 'lessons learned' notification to all internal Field Operations employees concerning the events surrounding this incident by October 31, 2018. ** _____ ** has already circulated a 'lessons learned' notification to all contract crews concerning the events surrounding this incident and has disciplined the responsible employees. Furthermore, the Company will continue to address Company employees or contractor

[162] Initially a copy of the PHMSA F7100.1 report was provided to Staff via email on August 15, 2018. An additional copy was provided in response to Staff Data Request 0051.

[163] Information obtained by Staff through the PHMSA Portal.

[164] Spire response to Staff Data Request 0038.

[165] Spire response to Staff Data Request 0038.

employees according to Company policies who do not follow Company procedures.

Copies of Spire's and Contractor's "lessons learned" notifications are provided as Appendix D.

Spire Investigation of Failure Staff Expert: Kathleen A. McNelis, PE

Q. <u>Compliance with Drug and Alcohol Testing Requirements [4 CSR 240-40.080)]</u>

Spire provided copies of both the ** _____ _____ ** Spire Missouri West Alcohol Testing Policy Pipeline & Transportation, ** _____ ** in response to Staff Data Request 0030. While the ** _____ ** policy does not specifically state that ** _____ ** will conform to the requirements of 49 CFR Parts 40 and 199, ** _____ _____ _____ . **[166]

<u>Pre-employment testing:</u>

In response to Staff Data Request 0066, Spire provided documentation that the ** _____ ** employees involved in this incident were drug and alcohol tested pre-employment.

<u>Random Testing:</u>

In response to Staff Data Request 0067, Spire provided documentation that ** _____ ** employees were randomly tested at a rate of at least 50%. Further, Spire stated that in response to Staff Data Request 0066 that ** _____

[166] Spire's confidential attachment to response to Staff Data Request 0059.

_____

_____

_____

_____ **

Post-Incident Testing:

A Contractor work crew from ** _____

_____[167]

_____ **[168] were assigned to this project. The covered function being performed immediately prior to the incident was ** _____

_____ . **[169] Additionally, ** _____

_____ ** were involved in the emergency response.

In its August 15, 2018 Incident Report, Spire stated the cause of the incident as: ** _____

_____

_____

____[170] _____

_____

_____

[167] Spire confidential response to Staff Data Request 0003.

[168] Spire confidential response to Staff Data Request 0002.

[169] Spire confidential response to Staff Data Request 0001.

[170] Spire confidential response to Staff Data Request 0031.

_____

_____ [171] **

In response to Staff Data Request 0030, Spire stated that "** _____

_____

_____

_____

_____ **"

Based on Spire's response in the PHMSA 7100.1 Incident Report Form[172] and to Staff's Data Request 0030, it appeared initially as though two Contractor employees were tested post-incident as required by 49 CFR 199.225(a) as adopted by 4 CSR 240-40.080. However, the Management Information System ("MIS") reports[173] submitted by ** _____ ** for calendar year 2018 showed no post-incident drug or alcohol tests were performed.[174]

In response to Staff Data Request 0067.1, asking why the Drug and Alcohol Testing MIS Data Collection Form for ** _____

_____ **, Spire responded: ** _____

_____

_____

[171] Confidential attachment to Spire's response to Staff Data Request 0051.

[172] Confidential attachment to Spire's response to Staff Data Request 0051.

[173] For each large operator having more than 50 covered employees, drug and alcohol test results must be reported annually to the Pipeline and Hazardous Materials Safety Administration ("PHMSA") in the Office of Pipeline Safety of the U.S. Department of Transportation no later than March 15 of each year for the previous calendar year in a Management Information System ("MIS") report.

[174] A copy was provided by Spire in response to Staff Data Request 0067.

_____

_____ **

In response to Staff's Data Request 0067.2 questioning the discrepancy between the number of post-incident drug and alcohol tests reported in the MIS report provided in response to Staff's Data Request 0067.1 ** ____ ** and number of post incident drug and alcohol tests reported in Spires's PHMSA 7100.1 Incident Report Form ** ____ **, Spire responded:

> The Company was originally informed by ** _____ ** that two contract employees had been drug and alcohol tested as a result of the incident… Subsequent discussion with ** _____ ** has revealed that, while drug testing was requested by ** _____ ** from the hospital, ** _____
> _____
> _____ ** Therefore, the information provided in Part F of the Form PHMSA F7100.1 needs to be updated.

Spire submitted a supplemental Form PHMSA F7100.1 for this incident amending the number of employees tested to ** ___ ** and provided a copy as an attachment to Staff Data Request 0067.2.

Staff inquired in Data Requests why ** _____

_____ **. Spire's response indicated that ** _____

_____

_____ **

** _____

_____

_____

_____

_____

_____ [175] _____

_____ **[176]

None of the individuals assigned to the covered function or emergency response were tested for drugs or alcohol following the incident. In response to Staff Data Request 0065, Spire stated that ** " _____

_____ ." **

** _____

_____

_____ **[177]

Compliance with Drug and Alcohol Testing Requirements
Staff Expert: Kathleen A. McNelis, PE

R. Missouri Public Service Commission Staff Investigation

At the direction of the Pipeline Safety Program Manager, three (3) Safety Engineering Department Staff members and one Staff Counsel Attorney interviewed Spire and Contractor employees involved in the incident in Kansas City on July 25, 2018. Staff members also visited the incident site and viewed the physical information/material collected. Additional discovery has included submitting Data Requests to Spire and reviewing responses.

Missouri Public Service Commission Staff Investigation Staff Expert: Clinton L. Foster

[175] Spire confidential response to Staff Data Request 0013.2.

[176] Spire response to Staff Data Request 0068.

[177] Spire confidential response to Staff Data Request 0030.