



Missouri Public Service Commission

Staff's Investigation Report

In the Matter of an Investigation into Spire Missouri Inc., d/b/a Spire's Compliance with The Commission's Rules Regarding Natural Gas Safety Found at 20 CSR 4240-40.030

APPENDIX A

FACTS

Spire Missouri Inc., d/b/a Spire

Case No. GS-2022-0047

*Industry Analysis Division
Safety Engineering Department
November 15, 2023 - Jefferson City, Missouri*

** Denotes Confidential Information **

Appendix A - Facts

**** Denotes Confidential Information ****

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APPENDIX A

Spire Missouri Inc. d/b/a Spire

Case No. GS-2022-0047

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I. EXECUTIVE SUMMARY

Spire Missouri Inc. (“Spire”) operates the two largest natural gas distribution systems in Missouri: Spire Missouri East and Spire Missouri West, serving approximately 1.2 million customers combined.¹ Spire Missouri East (formerly known as Laclede Gas Company) serves the St. Louis area and other communities in the eastern part of Missouri. Spire Missouri West (formerly known as Missouri Gas Energy) serves the Kansas City area and other communities in the western part of Missouri.

During an inspection of new pipeline facility construction conducted in August 2020, Staff observed that one of the Spire employees completing mechanical joints² on plastic pipe had not been requalified on the procedure within 15 months as is required by 20 CSR 4240-40.030(6)(H)3. As a result of this finding, Spire conducted a review of the requalification intervals of all of its employees and determined that more than 15 months had elapsed without requalification of 431 of its employees who performed mechanical joining. A total of 555 Spire employees in the Spire Missouri East operating area were qualified to complete mechanical plastic pipe joints on Spire’s pipelines at some point during 2020.³ Spire additionally identified two Spire employees who may have completed heat fusion plastic pipe joints⁴ without first being requalified in accordance with Commission rule 20 CSR 4240-40.030(6)(H)3.

¹ From Spire Inc. 2022 Form 10-K.

² Mechanical joints are made using a mechanical fitting to join sections of pipe. Types of mechanical fittings include stab type fittings, nut follower type fittings, bolted type fittings, and compression type fittings.

³ Spire’s response to Staff Data Request 0004.

⁴ Heat fusion as it applies to plastic pipelines is the process of heating two or more plastic pipeline components to a degree where when forced together the plastic of both pieces is allowed to flow and mix, resulting in a single fused piece once cooled. Heat fusion plastic pipe joints can be completed through various methods including butt fusion, saddle fusion, socket fusion, or electrofusion.

The typical course of action taken by Spire when the Company has observed an individual not following procedures with respect to plastic joining is for the Company to remove and replace any joints installed by that individual after such observance. Based on Spire's investigation into this matter, the 431 employees who were not requalified within 15 months may have installed mechanical joints in as many as 6,112 locations. While Spire keeps records of which materials are used on each project, it does not document the locations where each joint is installed within each project, or which employee completed the installation of specific joints within a project.

Spire has stated that in this circumstance, it would like to take a different approach to removal and replacement of the joints, and has provided reasons it believes that the joints should remain in service.

II. BACKGROUND

A. Spire Missouri East

On August 25-27, 2020, Staff conducted an inspection of new pipeline construction⁵ being performed in the Spire Missouri East operating area for compliance with the Commission's pipeline safety standards in 20 CSR 4240-40.030. Staff observed Spire crews complete work on four projects during the inspection. During this inspection, Staff observed five Spire employees complete mechanical plastic pipe joints.⁶ At the time of the inspection,

⁵ Construction inspections include observation of construction activity conducted on operator pipeline facilities by the operator or on the behalf of the operator, review of design documents, and review of other related records including plastic pipe joining qualification records.

⁶ Mechanical plastic pipe joints are made using a mechanical fitting to join sections of plastic pipe. 20 CSR 4240-40.030(17)(A)5. defines a mechanical fitting as a mechanical device used to connect sections of pipe and that the term mechanical fitting only applies to stab type fittings, nut follower type fittings, bolted type fittings, and other compression type fittings.

Spire did not have documentation of the employees' joiner requalification available for Staff to review.

Spire provided the dates that the five employees had most recently been requalified on the applicable joining procedures following the inspection. Staff confirmed that four of the five Spire employees had been requalified to join plastic pipe with mechanical fittings within 15 months as required by Commission rules.⁷ However, one of the Spire employees installing mechanical joints on August 26, 2020 had most recently been requalified on April 24, 2019, approximately 16 months prior to the date of Staff's inspection (approximately one month longer than the maximum 15 month interval between requalification).

Staff informed Spire following the inspection⁸ that failure to requalify this individual on the applicable procedures within 15 months of the previous requalification date was a probable violation of Commission rules.⁹ Staff requested information from Spire specific to joints completed by the individual Staff observed completing mechanical plastic pipe joints more than 15 months after their most recent previous requalification date, and before they were subsequently requalified. Staff additionally requested that Spire review its records with respect to the requalification of other Spire employees joining plastic pipe with mechanical fittings.

Spire performed an investigation of its records to determine which employees may have completed mechanical plastic pipe joints during a time interval when that employee had not

⁷ 20 CSR 4240-40.030(6)(H)1 requires that a person must be requalified under an applicable procedure once each calendar year at intervals not exceeding fifteen (15) months, or after any production joint is found unacceptable by testing under subsection (10)(G).

⁸ Also by letter, dated September 27, 2020.

⁹ 20 CSR 4240-40.030(6)(H)1. requires that no person may make a plastic pipe joint unless that person has been qualified under the applicable joining procedure. 20 CSR 4240-40.030(6)(H)3. requires that persons making plastic pipe joints must be requalified under applicable procedures once each calendar year at intervals not to exceed fifteen (15) months.

been requalified in accordance with Commission rules. Spire determined that 431 employees¹⁰ exceeded 15 months for requalification between April 13, 2020 and October 9, 2020, and that all employees had been requalified by December 16, 2020. Spire estimated that these employees may have completed mechanical plastic pipe joint installations at 6,112 locations during the time intervals between qualifications exceeding 15 months and requalification.¹¹

Spire additionally determined that two Spire employees in the Spire Missouri East operating area may have completed heat fusion plastic pipe joints¹² without being requalified within 15 months.¹³ Spire estimated that these two employees may have completed up to 345 heat fusion plastic pipe joints as part of two projects during the time interval when the employees had not been requalified within 15 months, and before they were subsequently requalified.¹⁴

B. Spire Missouri West

Staff conducted an inspection of new pipeline construction in the Spire Missouri West operating area on October 22, 2020. During that inspection, ** [REDACTED]

[REDACTED]

¹⁰ The initial estimate provided by Spire to Staff in a July 2, 2021 email was 436 employees. Spire’s response to Staff Data Request 0001.1 stated that the correct number of employees was 431. Spire’s response additionally stated that four duplicate employee counts and a spreadsheet formula error led to the initial employee count of 436.

¹¹ The initial estimate provided by Spire to Staff in a July 2, 2021 was 4,226 locations. Spire’s response to Staff Data Request 0010.1 stated that the correct number of potential locations was 6,112. Spire’s response stated that the initial location count was based on pressure test records, and the additional locations identified utilized timecard data to determine locations where a fitting may have been installed by an employee with lapsed qualifications. Spire’s response additionally stated that these additional locations were less likely to have joints installed by an unqualified person, but could not be ruled out.

¹² Heat fusion plastic pipe joints are made by heating plastic pipe, and fittings if necessary, to the point of melting and bringing pipe ends, or pipe and a fitting, together so that the plastic can fuse together and create a joint. Types of heat fusion plastic pipe joining include butt heat fusion, saddle or sidewall fusion, and electrofusion.

¹³ Spire’s response to Staff Data Request 0011.

¹⁴ Spire’s response to Staff Data Request 0011.3.

[REDACTED]

[REDACTED] 15 [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED] **

C. Remedy for Joints not Installed in Accordance with Commission Rules

Spire stated that its typical process is to repair, remove, and/or replace any piping or material that was installed outside prescribed guidelines at the time of construction.¹⁶ This is the approach that was taken with respect to the ** [REDACTED]

[REDACTED] ** However, in the Spire Missouri East operating area where a larger number of joints were installed, Spire has suggested that a different approach should be taken. Spire is suggesting that no immediate replacement actions be taken with respect to the mechanical plastic pipe joints completed by individuals in the Spire Missouri East operating area who were not timely requalified. Spire provided seven reasons it does not believe replacement of these joints is necessary, which Staff has analyzed in Section V. *Staff's Analysis of Spire's Position* of this report.

¹⁵ 20 CSR 4240-40.030(6)(H)1. requires that no person may make a plastic pipe joint unless that person has been qualified under the applicable joining procedure. 20 CSR 4240-40.030(6)(H)3. requires that persons making plastic pipe joints must be requalified under applicable procedures once each calendar year at intervals not to exceed fifteen (15) months.

¹⁶ Spire stated that this is its typical remedy in a July 2, 2021 email to Staff, as confirmed by Spire's response to Staff Data Request 0031. Spire further clarified that there have been no instances where Spire discovered employees who had lapsed qualifications and did not remove the joints as stated in Spire's response to Staff Data Request 0040.

III. SUBSEQUENT INSPECTIONS

Since the opening of this case, Staff has conducted routine natural gas pipeline safety inspections at Spire Missouri East and Spire Missouri West that included a review of joining requalification for individuals working on Spire's pipelines. These inspections included:

- Spire Missouri West Operations and Maintenance Records Inspections¹⁷ conducted October 19-20, 2021,¹⁸ and November 14-17, 2022;
- Spire Missouri East Operations and Maintenance Records Inspection conducted May 10-13, 2022;
- Inspections of new pipeline construction conducted in the Spire Missouri East operating area on April 25-28, 2022, August 1-4, 2022, November 7-10, 2022, December 13-14, 2022, June 12-15, 2023, and July 24-27, 2023; and
- Inspections of new pipeline construction conducted in the Spire Missouri West operating area on March 21, 2022, April 25-28, 2022, July 25-27, 2022, August 22-25, 2022, December 5-8, 2022, and July 17-20, 2023.

Staff did not identify any indications of subsequent violations of the requirements related to joiner requalification in 20 CSR 4240-40.030(6)(H)3. during these inspections.

However, during inspections of new plastic pipe installation, Staff observed **

[REDACTED]

¹⁷ Operations and Maintenance Records Inspections include a review of a broad range of operator records, documents, plans, and procedures including plastic pipe joining qualification records.

¹⁸ Staff's Inspection included a Spire demonstration of the typical plastic joiner qualification process as a follow-up to Staff's October 22, 2020 construction inspection in the Spire Missouri West operating area.

- [Redacted]

- [Redacted]

- [Redacted]

- [Redacted]

- [Redacted]

[REDACTED]

[REDACTED]

[REDACTED] **

IV. STAFF'S ANALYSIS OF SPIRE'S COMPLIANCE WITH COMMISSION RULES

A. Qualification Requirements for Persons to Make Plastic Pipe Joints

A total of 555 Spire employees in the Spire Missouri East operating area were qualified to complete mechanical plastic pipe joints on Spire's pipelines at some point during 2020.¹⁹ Between April 13, 2020 and November 25, 2020,²⁰ the interval between requalification on applicable procedures for mechanical plastic pipe joining exceeded 15 months for 431 of these 555 Spire employees in the Spire Missouri East operating area.²¹

Spire records document which work orders each employee has worked on, however Spire does not keep records regarding which employee completed specific joints within each work order.²² Additionally, Spire does not maintain records of the locations of individual joints installed on its pipelines. Spire reviewed records of materials pulled from its storeroom for each work order, work records of pipe footages installed, and general installation practices to estimate that up to 41,392 mechanical plastic pipe joints²³ may have been completed in 6,112

¹⁹ Spire's response to Staff Data Request 0004.

²⁰ Spire's response to Staff Data Request 0001.1 corrected the last date of expiration from October 9, 2020 to November 25, 2020.

²¹ Spire's response to Staff Data Request 0001.1 clarified that the correct number of employees whose qualifications lapsed was 431 rather than 436.

²² Spire's response to Staff Data Request 0016.

²³ Attachment 10.2 in Spire's response to Staff Data Request 0010.2.

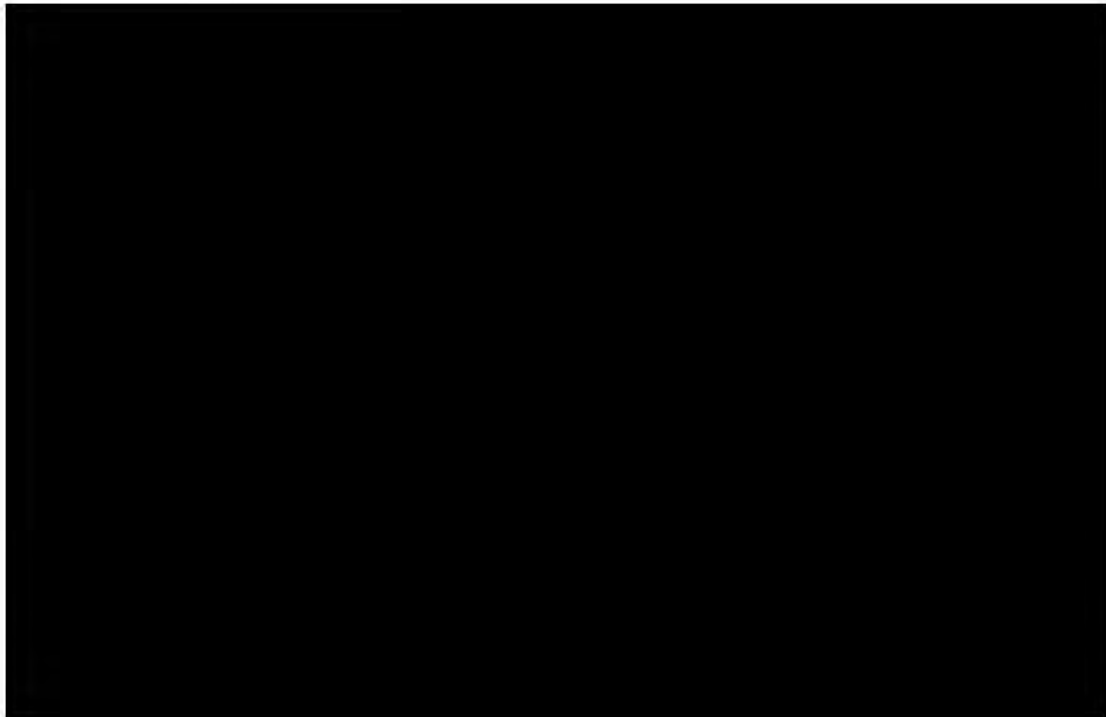
locations²⁴ in the Spire Missouri East operating area by employees during time intervals when requalification had not been completed within 15 months.

Staff reviewed Spire's requalification records to evaluate the amount of time each individual continued to install mechanical joints after they had exceeded 15 months for requalification. The amount of time ranged from ** [REDACTED]

** The average length of time that requalification exceeded 15 months was ** [REDACTED]

[REDACTED] **²⁵ Figure 1 shows the distribution of the lengths of time beyond 15 months for employee requalification.

**



[REDACTED]

**

²⁴ Attachment 10-supplemental in Spire's response to Staff Data Request 0010.

²⁵ Attachment 1 to Spire's response to Staff Data Request 0001.

A total of 274 Spire employees in the Spire Missouri West operating area were qualified to complete mechanical plastic pipe joints on Spire's pipelines at some point during 2020.²⁶ Spire's review of plastic pipe joining qualification records indicated that the interval for requalification for completing mechanical plastic pipe joints exceeded one calendar year or 15 months between qualification dates for one employee in the Spire Missouri West operating area.²⁷ ** [REDACTED]

[REDACTED] ** Additionally, a total of 163 contractor employees in the Spire Missouri West operating area were qualified to complete mechanical plastic pipe joints on Spire's pipelines at some point in 2020.²⁸ Based on Spire's review of plastic pipe joining qualification records for contractor employees, each contractor employee was requalified within 15 months to complete mechanical plastic pipe joints in 2020.²⁹

The interval between requalification of 21 Spire employees in the Spire Missouri East operating area to preform joining plastic pipe by heat fusion³⁰ methods exceeded 15 months in 2020.³¹ Nineteen of these 21 employees did not complete heat fusion plastic pipe joints prior to being requalified. Two of these 21 employees in the Spire Missouri East operating area may have completed up to 345 heat fusion joint installations as part of two construction projects in

²⁶ Spire's Response to Staff Data Request 0004.

²⁷ Attachment 2 in Spire's response to Staff Data Request 0002.

²⁸ Spire's Response to Staff Data Request 0005.

²⁹ Spire's Response to Staff Data Request 0003.

³⁰ Heat fusion used in this report refers to butt heat fusion, saddle heat fusion, and electrofusion.

³¹ Spire's response to Staff Data Request No. 0011.

the Spire Missouri East operating area prior to being requalified. The length of time that the two employees' heat fusion³² joining requalification exceeded 15 months were ** [REDACTED] [REDACTED] **³³ Spire does not maintain records of which employee completed each heat fusion joint. In order to estimate the number of heat fusion joints that may have been completed after the employees during the time interval when requalification had not been completed within 15 months, Spire reviewed records of materials pulled from its storeroom for each work order, work records of pipe footages installed, and general installation practices.³⁴

Spire records indicate that there were no instances in the Spire Missouri West operating area when the interval between requalification of a Spire or contractor employee completing heat fusion joints on Spire's pipelines exceeded 15 months between qualification dates in 2020.³⁵

In 2020, the interval between requalification on plastic pipe joining exceeded 15 months for:

- Four hundred thirty-one employees in the Spire Missouri East operating area who may have continued to complete mechanical plastic pipe joints on Spire's system,
- Two employees in the Spire Missouri East operating area who may have continued to complete heat fusion plastic pipe joints on Spire's system, and

³² Attachment 1 and Exhibit 11.1 in Spire's responses to Staff Data Requests 0001 and 0011.1 show that the employees' mechanical plastic pipe joining qualifications also lapsed. One employee's heat fusion and mechanical joining qualifications were lapsed for the same period of time, while one employee was requalified on heat fusion months prior to being requalified for mechanical joining.

³³ Exhibit 11.1 in Spire's response to Staff Data Request 0011.1.

³⁴ Spire's response to Staff Data Request 0011.3.

³⁵ Exhibit 11.2 in Spire's response to Staff Data Request 0011.2 only lists Spire employees in the Spire Missouri East operating area as having expired heat fusion qualifications.

- One employee in the Spire Missouri West operating area who may have continued to complete mechanical plastic pipe joints on Spire’s system.

As of June 6, 2023,³⁶ there have been 12 leak indications identified at locations where mechanical plastic pipe joints may have been installed³⁷ by Spire employees when the interval between requalification exceeded 15 months. As of June 11, 2023,³⁸ eight of these leaks have been repaired or eliminated by replacement.³⁹

From Spire’s responses to Staff data requests, Staff observed documented that Spire does not always expose and investigate the cause(s) of a leak, but instead at times abandons the leaking facility in place and installs a replacement facility.⁴⁰ Additionally, Staff learned that Spire has not tested any of the failed joints to determine if improper installation may have caused or contributed to the failure of the joints, although in some instances field notes ** [REDACTED] ** might suggest improper installation.

As of June 6, 2023,⁴¹ Spire had not identified any leaks on heat fusion joints that may have been completed by individuals who were not timely requalified on the applicable joining procedures.

³⁶ Date of Spire’s response to Staff Data Request 0015.8.

³⁷ As discussed in Section IV.A.2. *Spire’s 2020 Mechanical Joining Qualifications and Requalifications* of this report, Spire’s records document the employees who worked on each project, but do not show which employee completed specific joints. As a result of this gap in the available information, Spire provided information on leaks related to 2020 installations where an individual with lapsed qualifications completed work and a mechanical plastic pipe joint was installed.

³⁸ Date of Spire’s response to Staff Data Request 0015.9.

³⁹ Spire’s responses to Staff Data Requests 0015, 0015.3, 0015.6, and 0015.7.

⁴⁰ In some instances where abandonment of the leaking facility and replacement occurs Spire may not expose the leaking portion of the facility, and therefore does not completely investigate the cause of the leak. Staff further discusses these scenarios in Section IV. D. *Failure Investigation and Leak Repair Records* of this report.

⁴¹ Date of Spire’s response to Staff Data Request 0037.1.

B. Requirements to Follow Joining Procedures

As noted in Section III. *Related Subsequent Inspections* of this report, while conducting inspections of new pipeline facilities, Staff observed ** [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED] **

** [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED] **

⁴² Spire’s response to Staff Data Request 0043

C. Method for Determining Qualifications

Prior to identifying the lapse in plastic pipe joiner requalification, Spire used the following procedures and manufacturer's instructions to determine that each person making plastic pipe joints on Spire's pipelines were qualified in accordance with 20 CSR 4240-40.030(6)(H):

- ** [REDACTED]
- [REDACTED]
- [REDACTED]
- [REDACTED]
- [REDACTED]
- [REDACTED] **

⁴³ Spire's response to Staff Data Request 0020. ** [REDACTED]
[REDACTED] ** a copy of which was provided in Spire's Attachment 20 in Spire's response to Staff Data Request 0020.

⁴⁴ ** [REDACTED]
[REDACTED] ** a copy of which was provided in Spire's Attachment 20 in Spire's response to Staff Data Request 0020.

Spire provided and Staff reviewed copies of each referenced procedure. The ** [REDACTED]

[REDACTED]

[REDACTED]⁴⁵** did not contain procedures or methods for determining that each person making joints in plastic pipelines in a company's system is qualified in accordance with subsection 20 CSR 4240-40.030(6). Spire's procedure ** [REDACTED] ** for butt heat fusion, sidewall fusion and socket fusion and ** [REDACTED] ** for electrofusion each contained a procedures or methods for determining that each person making joints in plastic pipelines in a company's system is qualified in accordance with subsection 20 CSR 4240-40.030(6). However, neither Spire's procedure ** [REDACTED] ** for mechanical fitting installation nor the mechanical fitting manufacturer instructions provided by Spire contained methods for determining that each person making joints is qualified on the applicable procedures.

Spire additionally provided its Operator Qualification Plan as part of its method to determine that each person making joints on the Company's plastic pipelines is qualified in accordance with subsection 20 CSR 4240-40.030(6). Spire indicated that, as part of its operator qualification program, it compiles data management relating to mechanical joining qualifications in an Energy Worldnet (EWN) database.⁴⁶ The use of the EWN database to compile this data began in the early 2000s for the Spire Missouri West operating area, and in 2020 for the Spire Missouri East operating area.⁴⁷ Spire stated that when it first began tracking mechanical joining qualifications in EWN, the requalification interval and grace period was

⁴⁵ Spire's response to Staff Data Request 0020 and Attachment 20 to Staff's Data Request 0020. Included in Attachment 20 were the following manufacturer installation instructions for mechanical fittings: ** [REDACTED]

⁴⁶ Spire's response to Staff Data Request 0017.

⁴⁷ Spire's response to Staff Data Request 0018.

Spire stated that it changed the operator qualification program requalification interval for mechanical joining in EWN from three years not to exceed 39 months to every 12 months not to exceed 15 months in 2020.⁵⁰

Spire additionally stated that it developed a more formal Quality Assurance department that will have high-level oversight of the OQ Plan, OQ program, and monitoring of Operator Qualification expiration dates.⁵¹ Spire's Quality Assurance department routinely monitors qualification and requalification dates for contractors and Spire employees using the reporting and analysis functionality of the EWN system data.⁵² Spire's Quality Assurance department selects field audits by focusing on the type of work being completed. Auditors prioritize jobs where directional boring, pulling back of main, fusion/installation of main, and welding are being completed. If multiple jobs of the same type are being done, the auditor will randomly select which job will be audited. Auditors will check the qualifications for each individual present that is performing work for the Company on the selected project for all covered tasks observed. Spire's Quality Assurance department will conduct audits weekly and Spire plans to conduct an average of 1-2 field audits per week per auditor. Distribution Evaluators are responsible for conducting field audits of internal crews, and Quality Assurance Evaluators are responsible for conducting field audits of contractor crews.⁵³

⁵⁰ Spire's response to Staff Data Request 0018.

⁵¹ Spire's response to Staff Data Request 0035.

⁵² In Spire's Response to Staff Data Request 0035.1, Spire said that Spire's Quality Assurance department can also verify an employee's or contractor's qualification status by scanning the EWN OQ-QR readable card during periodic field audits. In Spire's Response to Staff Data Request 0035.2, Spire Stated that the field audit process is implemented by scanning the EWN OQ-QR readable cards with a cell phone, then reviewing the output from EWN compared to the work being completed by the employee in the field to verify that the employee is qualified. The output from EWN displays the employee's name, photo, qualifications, and the date their qualifications expire.

⁵³ Spire's response to Staff Data Request 0035.3.

Since 2020, Spire has updated its mechanical plastic pipe joining procedure and Operator Qualification Plan. The updates include changes to define the requalification interval for mechanical joining on plastic pipe to be annually not to exceed 15 months, which matches the requalification requirement set forth in 20 CSR 4240-40.030(6)(H)3. However, Spire additionally stated that there are not currently written documents, plans, or procedures that include information on the monitoring of Operator Qualification expiration dates by the Quality Assurance department or the field audit process.⁵⁴

Spire stated that its quality assurance auditors prioritize jobs where directional boring, pulling back of main, fusion/installation of main, and welding are being completed.⁵⁵

Spire stated that **

**⁵⁶ Spire has subsequently changed the operator qualification program requalification interval for mechanical joining in EWN from three years not to exceed 39 months to every 12 months not to exceed 15 months in 2020.

D. Failure Investigation and Leak Repair Records

Spire has submitted to the MOPSC completed Gas Distribution Annual Report Forms (Form No. PHMSA F 7100.1-1) for the Spire Missouri East operating area. The annual reports submitted for calendar years 2020 through 2022 have included eliminated or repaired leaks on mechanical plastic pipe joints that may have been completed by joiners during time intervals when requalification had not been completed within 15 months. On its annual report forms,

⁵⁴ Spire's responses to Staff Data Requests 0035.1 and 0035.2.

⁵⁵ Spire's response to Staff Data Request 0035.3.

⁵⁶ Confidential Attachment 31 to Spire's response to Staff Data Request 0031.

Spire includes the causes of leaks that have been eliminated or repaired during the calendar year.

Spire has prepared a manual of written procedures for conducting operations and maintenance activities and for emergency response as required by 20 CSR 4240-40.030(12)(C)1. During the course of this investigation, Staff has identified one instance where Spire did not follow a procedure in its written manual of procedures.

** [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED] **

Spire has included procedures for accident and failure investigation in Spire’s manual of written procedures as required by 20 CSR 4240-40.030(12)(C)5.

Spire provided a copy of its procedure for the testing of failed materials ** [REDACTED]

[REDACTED] ** that was in effect during the time that the leaks were eliminated or repaired at locations where mechanical plastic pipe joints were installed during time intervals

⁵⁷ The version of Spire’s procedure effective at the time that ** [REDACTED] ** was completed, according to Spire’s response to Staff Data Request 0042.1

when joiner requalification had not been completed within 15 months (Table 1 summarizes the leak repair information). ** [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED] ** Spire additionally provided a copy of its procedure for failure investigation **

[REDACTED]

[REDACTED] ⁵⁹ **

** [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED] **⁶¹

Spire stated in response to Staff Data Request 0033 that ** [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

⁵⁸ This corresponds to Commission rules 20 CSR 4240-40.020(7)(B), 20 CSR 4240-40.030(12)(L), and 20 CSR 4240-40.030(17)(E). Staff notes that 20 CSR 4240-40.020(7)(B) and 20 CSR 4240-40.030(17)(E) are now reserved. 20 CSR 4240-40.030(12)(C)1. requires that operators must have and follow procedures for conducting operations and maintenance activities, including procedures for 20 CSR 4240-40.030(12)(L) as required by 20 CSR 4240-40.030(12)(C)5.

⁵⁹ This corresponds to Commission rule 20 CSR 4240-40.030(12)(L). 20 CSR 4240-40.030(12)(C)1. requires that operators must have and follow procedures for conducting operations and maintenance activities, including procedures for 20 CSR 4240-40.030(12)(L) as required by 20 CSR 4240-40.030(12)(C)5.

⁶⁰ 20 CSR 4240-40.030(12)(C)1. requires that operators must have and follow procedures for conducting operations and maintenance activities, including procedures for 20 CSR 4240-40.030(12)(L) as required by 20 CSR 4240-40.030(12)(C)5.

⁶¹ Confidential Attachment 33 to Spire’s response to Staff Data Request 0033.

[REDACTED]

[REDACTED]

[REDACTED] **62

As of June 6, 2023,⁶³ Spire had identified 12 leak indications at locations where mechanical plastic pipe joints were completed during time intervals when requalification had not been completed within 15 months. Spire closed one of these 12 leaks without exposing the facilities after two subsequent rechecks at the location indicated no gas was present.⁶⁴ Spire has repaired or eliminated by replacement eight of the leak indications and provided copies of the leak repair documentation.⁶⁵ The relevant information from the leak repair documentation⁶⁶ for the leaks that Spire has repaired or eliminated by replacement is summarized in Table 1, including the leak causes to be included on Spire’s annual reports submitted in accordance with 20 CSR 4240-40.020(7)(A).⁶⁷

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⁶² Spire’s response to Staff Data Request 0033.

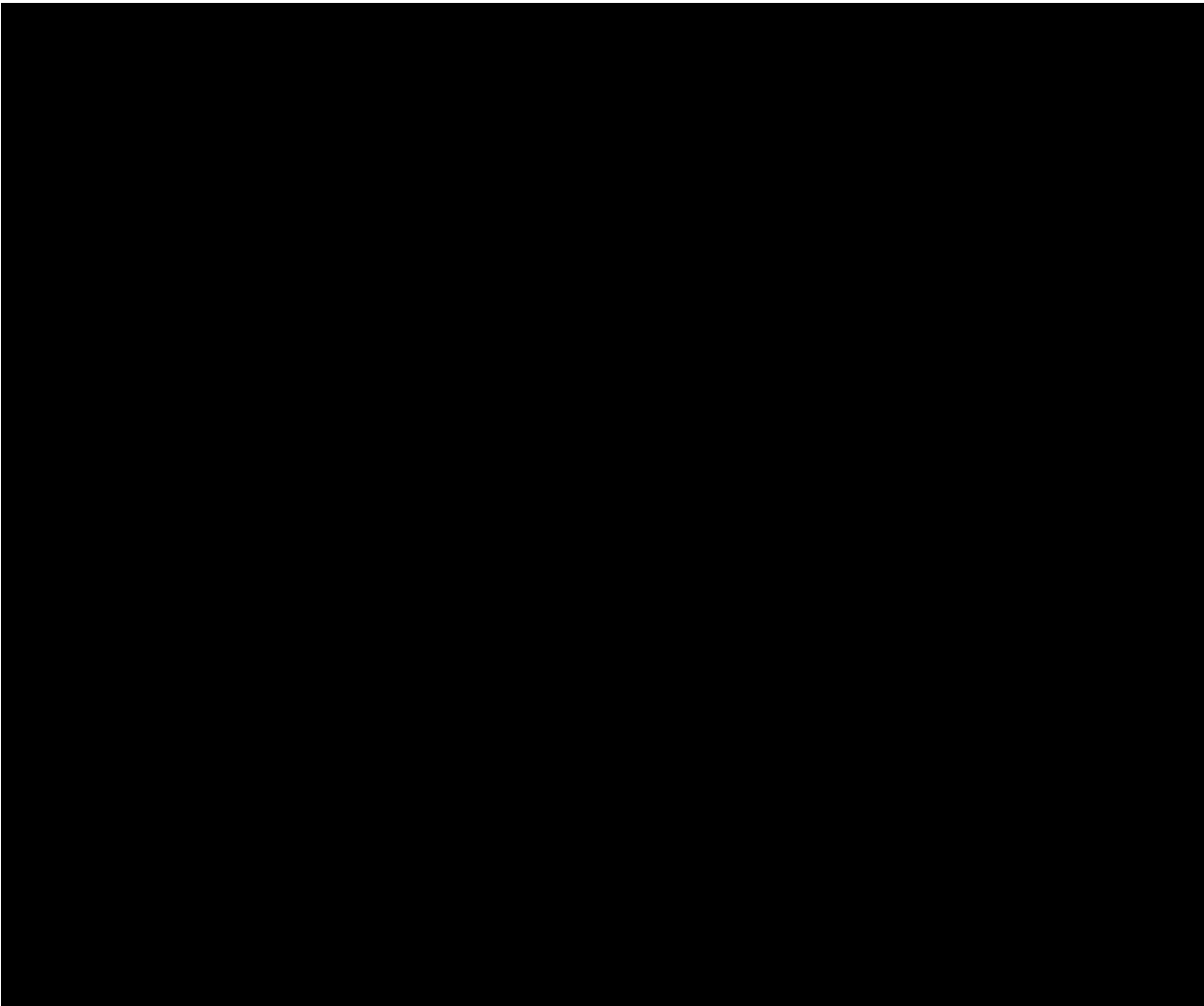
⁶³ Date of Spire’s response to Staff Data Request 0015.8.

⁶⁴ Spire’s response to Staff Data Request 0015.9. Spire uses the term “Class N rechecks” for rechecks of leak indications where no additional leak indications are found. Spire closes leaks that have two consecutive Class N rechecks, which are typically weeks apart to account for changing environmental conditions.

⁶⁵ Spire’s responses to Staff Data Requests 0015, 0015.3, 0015.6, and 0015.7.

⁶⁶ Leak repair documentation is required by 20 CSR 4240-40.030(13)(F)2.C.

⁶⁷ The leak cause data on annual reports is used to monitor the performance of an operator’s DIMP in accordance with 20 CSR 4240-40.030(17)(D)5.



⁶⁸ Leak repair information was provided in Exhibit 15.1, Confidential Attachments 15.3, 15.6, and 15.7 to Spire’s responses to Staff Data Requests 0015.1, 0015.3, 0015.6, and 0015.7, respectively.

⁶⁹ 20 CSR 4240-40.030(14)(C) defines leak classes. A Class 1 leak is a gas leak which, due to its location and/or magnitude, constitutes an immediate hazard to a building and/or the general public. A Class 1 leak requires immediate corrective action. A Class 2 leak is a leak that does not constitute an immediate hazard to a building or to the general public, but is of a nature requiring action as soon as possible. A Class 3 leak is a leak that does not constitute a hazard to property or to the general public but is of a nature requiring routine action. A Class 4 leak is a confined or localized leak which is completely nonhazardous.

⁷⁰ Spire’s responses to Staff Data Requests 0015.2, 0015.3, and 0015.6.

⁷¹ Action Taken field was not available on some of the leak repair documentation provided by Spire. For these actions, Staff submitted and Spire responded to data requests.

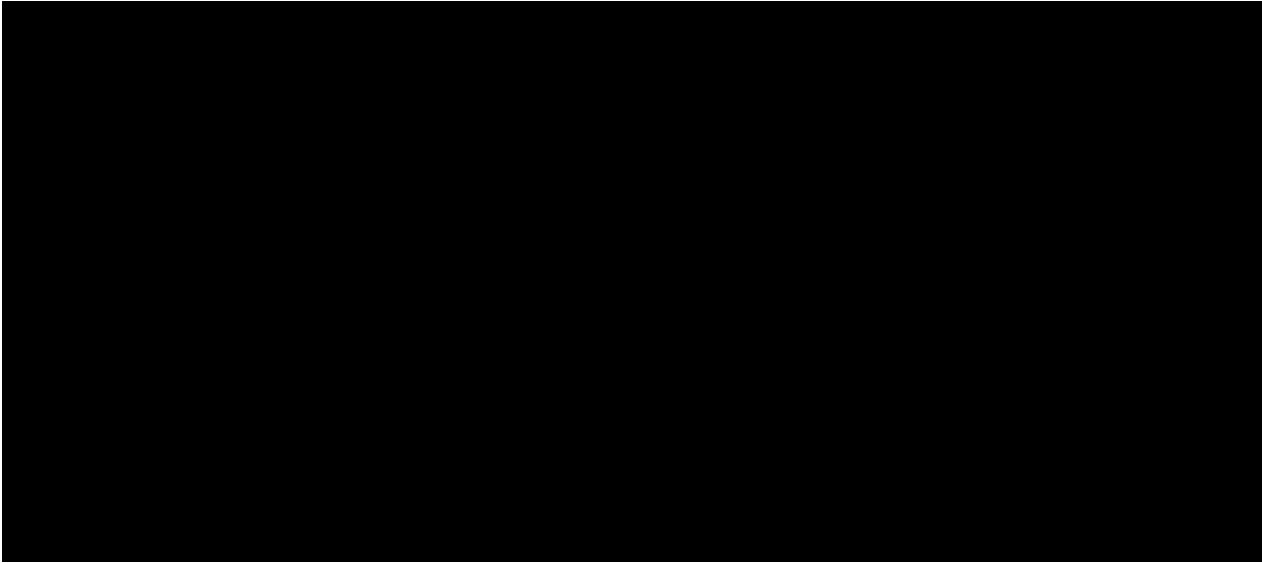
⁷² Leak Sub-Causes were not available on some of the leak repair documentation provided by Spire.

⁷³ Spire’s response to Staff Data Request 0015 – the leaking facility was not exposed because the entire service line was replaced to eliminate the leak.

⁷⁴ Spire’s response to Staff Data Request 0015 – the entire service line was replaced to eliminate the leak.

⁷⁵ Spire’s response to Staff Data Request 0015.3 – the leaking facility was not exposed because the entire service line was replaced to eliminate the leak.

⁷⁶ Spire’s response to Staff Data Request 0015.3 – the entire service line was replaced to eliminate the leak.



**

Spire provided copies of records of repaired leaks on mechanical plastic pipe joints that may have been completed by joiners when requalification had not been completed within 15 months, which is summarized in Table 1.

Spire has developed and monitored performance measures from an established baseline to evaluate the effectiveness of its Distribution Integrity Management Program (DIMP), including both the number of hazardous leaks and total number of leaks eliminated or repair, categorized by cause.

The definitions in Spire’s procedure to determine leak causes, ** [redacted] **, do not contain all of the information listed in PHMSA’s Instructions for Completing Form PHMSA F 7100.1-1.

Spire’s ** [redacted]



⁷⁷ Spire’s response to Staff Data Request 0015.7 – the leak was repaired by tightening the fitting, so the leak would not be reported on Spire’s annual report.

⁷⁸ Spire’s response to Staff Data Request 0015.9 – the leak was repaired by replacement from the tee to the curb, so the leaking facility was not exposed.

[REDACTED]

[REDACTED]

[REDACTED] **

Spire's procedure for determining leak causes, ** [REDACTED] **, does not set forth specific steps for determining and documenting the causes of leak.

Spire did not expose the leaking facility for [REDACTED]

[REDACTED] For [REDACTED], the leak was eliminated by replacing the entire service line, and the leak for [REDACTED] were eliminated by replacing a portion of the service line. Additionally, the documentation for ** [REDACTED]

[REDACTED]

[REDACTED]⁷⁹ **

- Spire reported the leak cause for [REDACTED] as "Pipe, Weld, or Joint Failure", however the leaking facility was not exposed.
- Spire reported the leak cause for [REDACTED] as "Pipe, Weld, or Joint Failure". The field notes for [REDACTED] stated ** [REDACTED] **.

Spire objected to Staff data requests for additional information regarding how Spire determined the leak causes for the above leak repairs as well as additional leak repairs that have occurred on other mechanical plastic pipe joints discussed within this report. During a June 17, 2022 meeting regarding the objections, Spire indicated that no additional, relevant information was available, beyond what had already been provided, regarding the leak cause determinations.

⁷⁹ Confidential Attachment 15.3 to Spire's response to Staff Data Request 0015.3.

**

[REDACTED]

[REDACTED]

[REDACTED]

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V. STAFF’S ANALYSIS OF SPIRE’S POSITION

Spire’s position as stated in its July 2, 2021 email, and reaffirmed in its response to Staff Data Requests 0021 and 0031, is that the mechanical plastic pipe joints that may have been completed by employees who had not been requalified within 15 months should remain in service and that the Company will monitor the joints for increased risk in the future. As a basis, Spire stated that:

- The requalification of the affected employees was begun in early October, soon after discovery of the condition.
- In the requalification process, the employee goes through a session of review and installation of a sample mechanical plastic pipe fitting in the presence of the qualifier. Each employee was able to complete a proper sample installation without any issues. The Company had a 100% passage rate.
- All of the mechanical plastic pipe fittings installed during this time in the field were completed using the approved installation procedures.
- None of the employees completing work during this timeframe were recent hires or new employees. Therefore, they had successfully made mechanical plastic pipe

⁸⁰ As discussed in Sections IV.D.3.1 *Spire’s Compliance with the Requirements of 20 CSR 4240-40.020(7)(A)*, IV.D.3.4. *Spire’s Compliance with the Requirements of 20 CSR 4240-40.030(12)(L)*, and IV.D.3.5. *Spire’s Compliance with the Requirements of 20 CSR 4240-40.030(13)(F)2.C.* of this report.

fitting installations over the prior months while qualified and were familiar with the approved installation process.

- The mechanical plastic pipe fittings were pressure tested and the joints were soap tested at the time of the installation without any deficiencies or issues. If an issue would have been discovered, the approved installation procedures would have required the mechanical plastic pipe fitting to be replaced at the time of installation.
- Replacing the affected mechanical plastic pipe joints would divert resources from higher risk replacement priorities such as Low Pressure Overpressure Protection (“LPOP”)⁸¹ and cast iron.
- The added risks and costs of re-exposing the installs and evaluating or replacing the existing installed mechanical plastic pipe fittings outweighs the risk of leaving the current install in place.

Additionally, Spire’s position as stated in its response to Staff Data Request 0034 is that the heat fusion plastic pipe joints that may have been installed by employees who had not been requalified within 15 months, should remain in service and that the Company will monitor the joints for increased risk in the future. As a basis, Spire stated that:

- The Company strongly believes that the installs were done correctly.
- Both employees have a long tenure and have achieved the highest level of field installation job title within their career progression.

⁸¹ Staff notes that Spire defines the acronym “LPOP” in its application for waiver in Case No. GE-2022-0112. What Spire is referring to by LPOP are its legacy Reynolds regulator stations. These regulator stations do not have overpressure protection meeting the requirements of 20 CSR 4240-40.030 (4) (CC), 20 CSR 4240- 40.030 (4)(EE) 9 and 20 CSR 4240-40.030 4(FF) 3, 20 CSR 4240-40.030 (12)(M)2 and 20 CSR 4240-40.030 (13)(R)1G of the Commission’s Pipeline Safety Standards

- Replacing the installed joints would divert resources from higher risk replacement priorities, such as LPOP and cast iron.
- The added risks and costs of re-exposing the installs and evaluating or replacing the existing installed joints outweighs the risk of leaving the current install in place.
- The Company believes that there is no increased risk associated with these installations compared to other heat fusion joints.

A. Amount of Time between Requalification

1. Spire's Point

Mechanical Joining: The requalification of the affected employees was begun in early October, soon after discovery of the condition.

B. Requalification Results

1. Spire's Point

Mechanical Joining: In the requalification process, the employee goes through a session of review and installation of a sample fitting in the presence of the qualifier. Each employee was able to complete a proper sample installation without any issues, and Spire had a 100% passage rate.

C. Following Procedures

1. Spire's Points

Mechanical Joining: All of the mechanical fittings installed during this time in the field were completed using the approved installation procedures.

Heat Fusion Joining: The Company strongly believes that the affected heat fusion plastic pipe joints were installed correctly.

D. Personnel Experience

1. Spire's Points

Mechanical Joining: None of the employees completing work during this timeframe were recent hires or new employees.⁸² Therefore, they had successfully made mechanical fitting installations over the prior months while qualified and were familiar with the approved installation process.

Heat Fusion Joining: Both of the employees have a long tenure and have achieved the highest level of field installation job title within their career progression.

E. Pressure Testing

1. Spire's Point

Mechanical Joining: The fittings were pressure tested and the joints were soap tested at the time of the installation without any deficiencies or issues. If an issue would have been discovered, the approved installation procedures would have required the fitting to be replaced at the time of installation.

⁸² All of the employees whose qualifications expired in 2020 completed their initial qualification prior to 2019 – Spire's response to Staff Data Request 001.3.

F. Spire's Ongoing Replacement Programs

1. Spire's Points

Mechanical and Heat Fusion Joining: Replacing the affected mechanical and heat fusion plastic pipe joints would divert resources from higher risk replacement priorities such as LPOP and cast iron.

G. Added Risk and Costs

1. Spire's Points

Mechanical and Heat Fusion Joining: The added risks and costs of re-exposing the installs and evaluating or replacing the existing installed mechanical plastic pipe fittings and heat fusion joints outweighs the risk of leaving the current install in place.

H. No Increased Risk

1. Spire's Point

Heat Fusion Joining: The Company believes that there is no increased risk associated with these installations compared to other heat fusion joints.

VI. STAFF'S ANALYSIS OF REMEDIES

A. Spire's Proposed Remedy

Spire has proposed that the mechanical and heat fusion plastic pipe joints that may have been completed by employees with expired qualifications should remain installed as-is and Spire will monitor them for increased risk in the future.

B. Survey of Other State Pipeline Safety Programs

Spire has already updated procedures related to plastic pipe joining and Spire’s OQ Plan to require that individuals be requalified on plastic pipe joining procedures once each calendar year not to exceed fifteen (15) months. However, Spire’s OQ Plan does not require verification of requalification intervals each time Spire updates its OQ Plan.

VII. COMPARISON OF PHMSA INSTRUCTIONS TO SPIRE SOP

Staff asked Spire to explain the process the Company uses to determine the leak cause when a leak is eliminated or repaired and to provide a copy of each document, policy, and procedure that addresses determination of leak causes. In its confidential response, Spire stated that ** [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED] **83

INCORRECT OPERATION:

Spire defines incorrect operation in ** [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED] **

CORROSION FAILURES:

Spire defines corrosion failure in ** [REDACTED]

[REDACTED]

⁸³ Spire’s Confidential Response to Staff Data Request 0033.

[REDACTED]

**

NATURAL FORCE DAMAGE:

Spire defines natural force damage in ** [REDACTED]

[REDACTED]

[REDACTED] **

EXCAVATION DAMAGE:

Spire defines excavation damage in ** [REDACTED]

[REDACTED]

[REDACTED] **

OTHER OUTSIDE FORCE DAMAGE:

Spire defines other outside force damage in ** [REDACTED]

[REDACTED]

[REDACTED] **

PIPE, WELD, OR JOINT FAILURE:

Spire defines material and weld failures respectively in ** [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED] **

EQUIPMENT FAILURE:

Spire defines equipment failure in ** [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED] **

OTHER CAUSE:

** [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED] **