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 C

COMPARISON OF PHMSA INSTRUCTIONS TO SPIRE SOP

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 C – 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] **[1] Because Spire is using this SOP to gather data necessary for completing the annual reports required by 20 CSR 4240-40.020 (7)(A) to be submitted to PHMSA, Staff compared the leak cause descriptions in PHMSA's Instructions for Completing Form PHMSA F 7100.1-1 (revision May 2021) to the corresponding descriptions in Spire's SOP. Examples of differences between Spire's procedure for determining leak causes ** [redacted] ** and PHMSA's Instructions for Completing Form PHMSA F 7100.1-1 (revision May 2021), referenced in Section IV.D.3.1. *Spire's Compliance with the Requirements of 20 CSR 4240-40.020(7)(A)* of the report are provided below:

INCORRECT OPERATION

PHMSA describes incorrect operation as a leak resulting from inadequate procedures or safety practices, or failure to follow correct procedures, or other operator error. It includes leaks due to improper valve selection or operation, inadvertent over-pressurization, or improper selection or installation of equipment. It includes a leak resulting from the unintentional ignition of the transported gas during a welding or maintenance activity. Any leak that is associated with a component or process that joins pipe such as threaded connections, flanges, mechanical couplings,

[1] Spire's Confidential Response to Staff Data Request 0033.

welds, and pipe fusions that leak as a result from poor construction should be classified as "Incorrect Operation".

Spire defines incorrect operation in ** [redacted] **

Staff notes that Spire's SOP does not include leaks resulting from a component or process that joins pipe such as threaded connections, flanges, mechanical couplings, welds, and pipe fusions that leak as a result from poor construction in the category of "incorrect operation", as indicated in PHMSA's instructions. As noted below in comparison of the "material, joint and weld" descriptions, it appears to Staff that an individual following Spire's SOP would be more likely to incorrectly classify a leak resulting from poor construction practices than they would be to correctly identify the cause of the leak as incorrect operation.

CORROSION FAILURES

PHMSA describes corrosion failure as a leak caused by galvanic, atmospheric, stray current, microbiological, or other corrosive action. A corrosion release or failure is not limited to a hole in the pipe or other piece of equipment. If the bonnet or packing gland on a valve or flange on piping deteriorates or becomes loose and leaks due to corrosion and failure of bolts, it is classified as Corrosion. (Note: If the bonnet, packing, or other gasket has deteriorated to failure, whether before or after the end of its expected life, but not due to corrosive action, report it under a different cause category, such as G4 Incorrect Operation for improper installation or G6 Equipment Failure if the gasket failed.

Spire defines corrosion failure in ** [redacted] **

Staff notes that Spire's definition does not specifically state that this includes leaks caused by atmospheric, galvanic, and stray current corrosion, or the corrosion of valves, flanges, and bolts causing the fitting or component to come loose and leak. Also absent from Spire's SOP is guidance on how to distinguish between the causes of CORROSION, INCORRECT OPERATION and EQUIPMENT FAILURE if a bonnet, packing or other gasket has deteriorated to failure.

NATURAL FORCE DAMAGE

PHMSA describes natural force damage as a leak caused by outside forces attributable to causes NOT involving humans, such as earth movement, earthquakes, landslides, subsidence, heavy rains/floods, lightning, temperature, thermal stress, frozen components, high winds (Including damage caused by impact from objects blown by wind), or other similar natural causes. Lightning includes both damage and/or fire caused by a direct lighting strike and damage and/or fire as a secondary effect from a lightning strike in the area. An example of such a secondary effect would be a forest fire started by lightning that results in damage to a gas distribution system asset which results in an incident.

Spire defines natural force damage in ** [redacted]

[redacted] **

Staff notes that "natural force damage" and "other outside force damage" are separate leak categories in the PHMSA instructions for completing annual reports. In addition to what is included in Spire's SOP, PHMSA's instructions regarding natural force damage include leaks caused by high winds, including damage caused by impact from objects blown by wind and damage and/or fire as a secondary effect from a lightning strike in the area.

EXCAVATION DAMAGE

PHMSA describes excavation damage as a leak resulting directly from excavation damage by operator's personnel (oftentimes referred to as "first party" excavation damage) or by the operator's contractor (oftentimes referred to as "second party" excavation damage) or by people or contractors not associated with the operator (oftentimes referred to as "third party" excavation damage). Also, this section includes a release or failure determined to have resulted from previous damage due to excavation activity. For damage from outside forces OTHER than excavation which results in a release, use Natural Force Damage or Other Outside Force, as appropriate.

Spire defines excavation damage in ** [redacted] **

Staff notes that PHMSA's instructions include more detail regarding who causes the excavation such as first party, second party, and third party excavation damages, and includes leaks determined to have resulted from previous damage due to excavation activity. In discussing "other outside force damage", PHMSA's instructions state that activity involving digging, drilling,

boring, grading, cultivation, or other activities should be reported as "excavation damage". ** [redacted] **

OTHER OUTSIDE FORCE DAMAGE

PHMSA describes other outside force damage as a leak resulting from outside force damage, other than excavation damage or natural forces such as:

- Nearby Industrial, Man-made or Other Fire/Explosion as Primary Cause of Incident (unless the fire was caused by natural forces, in which case the leak should be classified Natural Forces. Forest fires that are caused by human activity and result in a release should be reported as Other Outside Force),
- Damage by Car, Truck, or Other Motorized Vehicle/Equipment NOT Engaged in Excavation. Other motorized vehicles/equipment includes tractors, mowers, backhoes, bulldozers and other tracked vehicles, and heavy equipment that can move. Leaks resulting from vehicular traffic loading or other contact (except report as "Excavation Damage" if the activity involved digging, drilling, boring, grading, cultivation or similar activities.
- Damage by Boats, Barges, Drilling Rigs, or Other Maritime Equipment or Vessels so long as those activities are not excavation activities. If those activities are excavation activities such as dredging or bank stabilization or renewal, the leak repair should be reported as "Excavation Damage".
- Previous Mechanical Damage NOT Related to Excavation. A leak caused by damage that occurred at some time prior to the release that was apparently NOT related to excavation activities, and would include prior outside force damage of an unknown nature, prior natural force damage, prior damage from other outside forces, and any

other previous mechanical damage other than that which was apparently related to prior excavation. Leaks resulting from previous damage sustained during construction, installation, or fabrication of the pipe, weld, or joint from which the release eventually occurred are to be reported under "Pipe, Weld, or Joint Failure". Leaks resulting from previous damage sustained as a result of excavation activities should be reported under "Excavation Damage" unless due to corrosion in which case it should be reported as a corrosion leak.

- Intentional Damage/Vandalism means willful or malicious destruction of the operator's pipeline facility or equipment. This category would include pranks, systematic damage inflicted to harass the operator, motor vehicle damage that was inflicted intentionally, and a variety of other intentional acts.
- Terrorism, per 28 C.F.R. § 0.85 General functions, includes the unlawful use of force and violence against persons or property to intimidate or coerce a government, the civilian population, or any segment thereof, in furtherance of political or social objectives.
- Theft. Theft means damage by any individual or entity, by any mechanism, specifically to steal, or attempt to steal, the transported gas or pipeline equipment.

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

Staff notes that Spire's description does not include leaks caused by all possible damages from cars, trucks, or other motorized vehicles/equipment not involved in excavation as listed in PHMSA's instructions, leaks resulting from previous damage not related to excavation or theft.

PHMSA's instructions list examples of other motorized vehicles/equipment such as tractors, mowers, backhoes, and bulldozers.

PIPE, WELD, OR JOINT FAILURE

PHMSA describes pipe, weld or joint failure as a leak resulting from a material defect within the pipe, component or joint due to faulty manufacturing procedures, design defects, or in-service stresses such as vibration, fatigue and environmental cracking. Material defect means an inherent flaw in the material or weld that occurred in the manufacture or at a point prior to construction, fabrication or installation. Design defect means an aspect inherent in a component to which a subsequent failure has been attributed that is not associated with errors in installation, i.e., is not a construction defect. This could include, for example, errors in engineering design. Fitting means a device, usually metal, for joining lengths of pipe into various piping systems. It includes couplings, ells, tees, crosses, reducers, unions, caps and plugs. Any leak that is associated with a component or process that joins pipe such as threaded connections, flanges, mechanical couplings, welds, and pipe fusions that leak as a result from poor construction should be classified as "Incorrect Operation". Leaks resulting from failure of original sound material from force applied during construction that caused a dent, gouge, excessive stress, or other defect, including leaks due to faulty wrinkle bends, faulty field welds, and damage sustained in transportation to the construction or fabrication site that eventually resulted in a leak, should be reported as "Pipe, Weld or Joint Failure".

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

[redacted] **

Staff notes that Spire's SOP **[redacted] ** Manufacturing defects can also occur in plastic pipe and pipeline components. Additionally, Spire's SOP identifies **[redacted] ** PHMSA's instructions state "Any leak that is associated with a component or process that joins pipe such as threaded connections, flanges, mechanical couplings, welds, and pipe fusions that leak as a result from poor construction should be classified as 'Incorrect Operation'." For example, if a leak occurs due to incomplete fusion of a joint made at the time the pipe was installed, according to PHMSA's instructions, this should be attributed to INCORRECT OPERATION, not to PIPE, WELD, OR JOINT FAILURE as would be inferred from Spire's SOP.

EQUIPMENT FAILURE

PHMSA describes equipment failure as a leak caused by malfunctions of control and relief equipment including regulators, valves, meters, compressors, or other instrumentation or functional equipment, Failures may be from threaded components, Flanges, collars, couplings and broken or cracked components, or from O- Ring failures, Gasket failures, seal failures, and failures in packing or similar leaks. Leaks caused by overpressurization resulting from malfunction of

control or alarm device; relief valve malfunction: and valves failing to open or close on command; or valves which opened or closed when not commanded to do so. If overpressurization or some other aspect of this incident was caused by incorrect operation, the incident should be reported under "Incorrect Operation."

Spire defines equipment failure in ** [redacted] **

Staff notes that in addition to what is included in Spire's procedure, PHMSA's instructions include malfunctions of control and relief equipment including regulators, O-ring failures, gasket failures, seal failures, and failures in packing. PHMSA's instructions additionally includes leaks caused by overpressurization resulting from the failure malfunction of control or alarm devices, relief valve malfunctions, valves failing to open or close on command, or valves opening or closing when not commanded to do so. Additionally, Spire's SOP lacks the guidance provided by PHMSA for distinguishing between EQUIPMENT FAILURE and INCORRECT OPERATION causes.

OTHER CAUSE

PHMSA describes other cause as leak resulting from any other cause not attributable to the above causes. A best effort should be made to assign a specific leak cause before choosing the Other cause category. An operator replacing a bare steel pipeline with a history of external corrosion leaks without visual observation of the actual leak, may form a hypothesis based on available information that the leak was caused by external corrosion and assign the Corrosion cause category to the leak.

** [redacted] ** PHMSA's instructions state that a best effort should be made to assign a specific leak cause before choosing the "Other cause" category. ** [redacted] **