PHMSA Final Rule

"Pipeline Safety: Gas Pipeline Leak Detection and Repair"

(49 CFR Parts 191, 192, and 193)

Important Updates/Notes

Significant work for this white paper was quickly conducted upon publication of the Final Rule on the PHMSA website in January 2025. However, the PHMSA Final Rule has not been formally recognized via publication in the Code of Federal Regulations (CFR) and was removed from the PHMSA website following the issuance of Executive Order: Regulatory Freeze Pending Review.[1] While requirements in the final rule may change based on current administration policies before being codified, the CMR still wanted to provide this white paper to sponsors to demonstrate the types of efforts that we are continuously pursuing.

Much research and time has been dedicated to understanding how to address and implement the PHMSA Final Rule both within the CMR and across other projects being conducted by GTI Energy. Should the rule not be published in the CFR, there are still important lessons learned and information that can be used by sponsors to update and streamline leak detection activities. Importantly should the rule get published in the CFR, utilities can be informed and prepared. We, at the CMR, think the Final Rule, while not in the CFR as of May 13th, 2025, is a good best practice to guide leak detection and repair. There is a summary of the current OTD projects related to rule at the end of this document in Table 2.

Introduction

On May 18, 2023, the Pipeline and Hazardous Materials Safety Administration (PHMSA) released a Notice of Proposed Rulemaking (NPRM) titled "Pipeline Safety: Gas Pipeline Leak Detection and Repair" in response to mandates in Section 113 of the Protecting our Infrastructure of Pipelines and Enhancing Safety (PIPES) Act of 2020. This proposed rule amends the Federal pipeline safety regulations in parts 190 through 199 of Title 49 of the Code of Federal Regulations (CFR) to address shortcomings in leak detection and repair (LDAR) standards for regulated distribution, transmission, and gathering lines. In addition to enhancing pipeline safety and environmental protection through emissions reduction, this rule encourages the use of and better reflects the capabilities of commercially available advanced leak detection technologies for LDAR purposes. Most notably, PHMSA introduced requirements for operator-established Advanced Leak Detection Programs (ALDP) and proposed an equipment performance standard of detecting all leaks 5ppm or greater within 5ft of the pipeline to ensure the timely identification and repair of leaks. The final rule issued on January 17, 2025, makes eight key amendments and additions to

1 Erin Kurilla, American Public Gas Association (2025). Status Update on the Leak Detection and Repair Finale Rule Amid Regulatory Freeze. Source.

the federal code related to leak survey practices, frequencies, and performance based on submitted public comments and recommendations from the Gas Pipeline Advisory Committee (GPAC). This policy brief focuses on the new leak survey requirements and standards introduced in §192.763 related to operator ALDPs and equipment performance standards.

Advanced Leak Detection Program Requirements

Operators of gas distribution, transmission, offshore gathering, and Types A, B, and C gathering pipelines are required under the newly created § 192.763 to establish an ALDP with the four elements described in Figure 1. The ALDP requirements introduced by this final rule do not apply to pipelines transporting gas containing 50% or more hydrogen by volume.

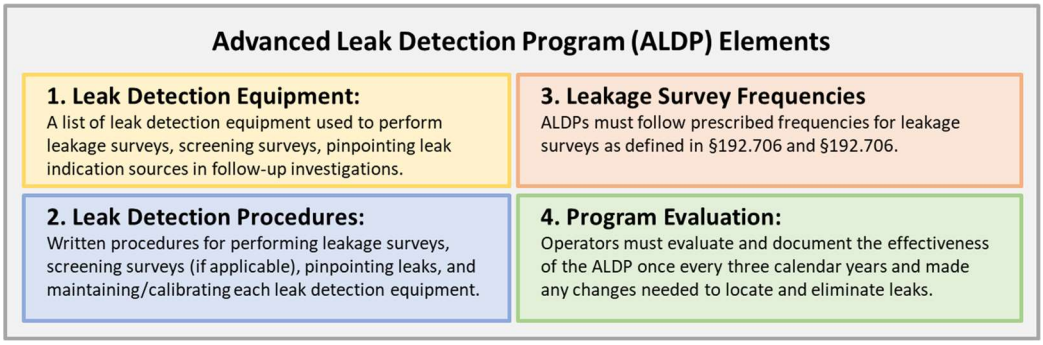

Figure 1: Requirements for the four elements within an Advanced Leak Detection Program (ALDP).

Leak Detection Equipment

Operators must include **a list of leak detection equipment for use within their ALDP**, specifying which will be used in screening and leakage surveys, and in follow-up surveys to pinpoint the source of leak indications. Each instrument must be qualified as meeting the performance standard applicable to the equipment and its intended use (see Performance Standards section for more detail). Equipment *must be validated at least once* prior to use as part of an ALDP through operator-performed testing using a known concentration or amount of gas, or by providing evidence of manufacturer-performed validation testing. Records validating a device must be maintained by the operator for 5 years after the model is no longer used in an ALDP.

Leak Detection Procedures

Operators must develop **written procedures for each leak detection equipment** included in their ALDP, including procedures for *performing screening surveys, leak surveys, and follow-up investigations for pinpointing leak sources*. Any leak survey method that does not include locating the leak source must have a follow-up investigation to pinpoint the leak and criteria for prioritizing indications for follow-up investigation. Pinpointing the source of leak indications can be performed by 1) using a handheld instrument with the appropriate minimum sensitivity; 2)

applying a soap solution directly to the pipe and visually inspecting leak indications; or 3) visually locating leaks when pipeline is submerged in water.

Procedures must define under which *environmental conditions* (wind, temperature, humidity, etc.) and within what *operational parameters* (facility type, range, survey speed, etc.) equipment may be used. Operators must also have established procedures for the *maintenance and calibration* for each leak detection equipment included in their ALDP. These procedures for operating, maintaining, and calibrating equipment must agree with any manufacturer instructions available.

Leakage Survey Frequencies

Operators of both distribution and transmission lines **must follow the more frequent, risk-informed leak survey regimes** finalized in this PHMSA rule. *Distribution* survey regimes now consider risk factors of certain pipelines related to material (cast iron, unprotected steel, wrought iron, and plastics known to leak), design, and past operational and maintenance history in addition to their presence in or outside of a business district. Changes to *transmission* survey frequencies are based on a line's proximity to high-consequence areas (HCA) or a components susceptibility to leak. In the event of extreme *weather or natural disaster*, surveying of pipeline segments potentially damaged by scouring or movement of the pipeline or surrounding soil must be initiated within 72 hours after its is determined the area can be safely accessed and the personnel and equipment are available (Table 1).

Program Evaluation and Improvement

Operators are required to **evaluate and document the effectiveness of their ALDP** once every three calendar years (not exceeding 39 months). When evaluating the elements within their ALDP, operators must minimally consider the following:

- Current leak detection equipment performance & advances in detection technologies and practices
- Number of leaks initially detected by third parties, overall number leaks and incidents, and any changes to the operator's pipeline system
- Estimated emissions from leaks

Operators must *make changes to their program determined to improve the effectiveness of their ALDP by increasing the number of leaks located and eliminated* within their system. The rule in its final form does not include operator cost considerations as part of this evaluation and may underrepresent a significant barrier for improving operator ALDPs based on such criteria. Records documenting these changes must be maintained by the operator for 5 years after the date of change.

Table 1: Leakage survey frequencies for distribution and transmission lines.

Distribution Systems: Leakage Surveys (§ 192.723)				
Business Districts		1x per year; not exceeding 15 months		
Non-Business Districts		1x per 5 years; not exceeding 63 months		
	Cathodically unprotected distribution pipelines	1x per year; not exceeding 15 months		
	Pipelines known to leak (material, design, O&M history)			
	Pipeline systems protected by a distributed anode system			
Extreme Weather or Natural Disaster Survey		Initiated within 72 hours*		
Transmission Lines: Leakage Surveys (§ 192.706)				
Facility	***Class 1***	***Class 2***	***Class 3***	***Class 4***
Valves, flanges, pipeline tie-ins with valves and flanges, launcher, and receiver facilities	2x per year; not exceeding 7 ½ months		2x per year; not exceeding 7 ½ months	4x per year; not exceeding 4 ½ months
Pipelines known to leak (material, design, O&M history)				
Transmission lines in an HCA.				
Pipelines transporting gas in conformity with § 192.625 without an odor or odorant	1x per year; not exceeding 15 months			
All other pipelines	1x per year; not exceeding 15 months			

** Preparations for the survey must begin within this time frame.*

Performance Standards

PHMSA's new performance standards are organized first by facility type, then survey type, and finally by survey method to better reflect the diversity of facilities, operating environments, and available detection methods. Operators may choose an equipment sensitivity standard for handheld or certain mobile equipment, a leak-rate standard for screening surveys, or other standards for surveys of pipelines located aboveground or inside of buildings.

Operators may request the use of an alternative performance standard, pursuant to PHMSA review. Any such requests must include information about the location, design, gas being transported, operational parameters, environmental conditions, and material properties and history of the pipeline, the proposed alternative performance standard, and a description of any leak detection equipment and procedures that would be used.

Transmission, Regulated Gathering, and Distribution Lines

The standards for distribution, transmission, and gathering lines are identical apart from the flow-rate standards for screening surveys (Figure 2). Each *handheld leak detection device* used in a *leak*

survey must have a minimum sensitivity of **5ppm or 5ppm-m**. This sensitivity standard also applies to *mobile leakage survey equipment*, though a follow-up investigation with handheld equipment is needed to pinpoint the sources of leak indications. Equipment used to perform *screening surveys* on *transmission or regulated gathering lines* must be capable of detecting releases **10kg/hr or more with a 90% POD**, while the flow-rate standard for *distribution lines* is **0.2kg/hr with the same POD**.

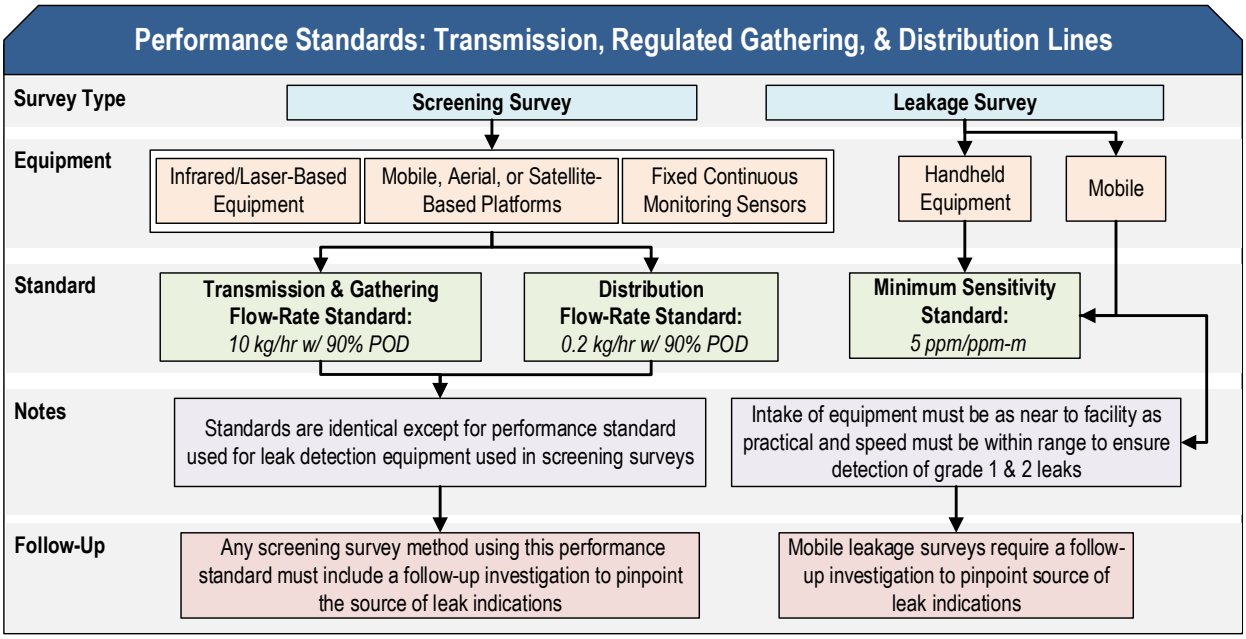

Figure 2: Performance standards for transmission lines, regulated gathering lines, and distribution lines.

Portions of Pipeline Facilities Aboveground or Located Inside Buildings

A different set of performance standards may be used when surveying portions of pipe located aboveground or inside a building (Figure 3). *Handheld equipment* used in this scenario must meet a minimum sensitivity standard of **1% of the lower explosive limit (LEL) for methane gas, 500 ppm, or 500ppm-m,** and *fixed continuous monitoring equipment* with a minimum sensitivity of **500 ppm or 500ppm-m** may be used for facilities within the devices' effective range (as defined in the operator's procedures). *Non-optical continuous monitoring systems* (acoustic or pressure monitoring systems) may be used to survey exposed portions of transmission and gathering lines if the system is capable of detecting flowrates **10kg/hr or more with a 90% POD.** Alternatively, leak surveys may be performed on exposed pipe using a soap solution applied directly to the pipeline and visually inspecting for leak indications or using OGI in accordance with EPA emissions monitoring survey requirements.

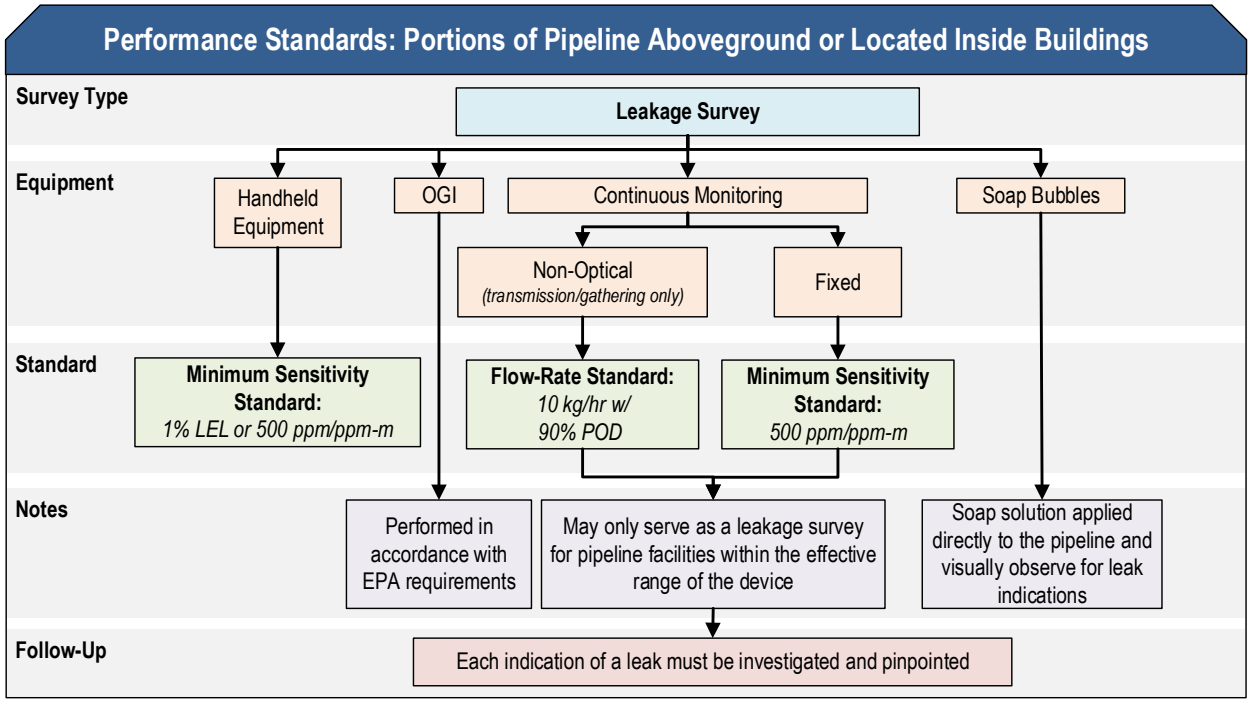

Figure 3: Performance standards for portions of facilities located aboveground or inside buildings.

Considerations

Key Differences Between Final Rule and NPRM Performance Standards

PHMSA's NPRM proposed a minimum equipment sensitivity standard of 5 ppm for all leak detection equipment used by operators in their ALDP and a program-wide performance standard requiring the detection of all leaks **5 ppm or greater when measured 5 feet** from the pipeline or within a wall-to-wall paved area. This standard was intended to reflect the minimum volume or leak rate detectable by commonly used handheld detectors during walking surveys, but resulted in concern over such a standard's applicability to non-point sensors, survey methods other than walking, and for segments other than distribution.

In response to these concerns, **the final rule establishes a technology-neutral, leak rate-based standard** which addresses the notable differences between survey technologies and methods for distribution, transmission, and gathering lines. More specifically, *an operator may now choose an equipment sensitivity or leak flow-rate standard* based on the facility type, survey method, and detection equipment commercially available to them. Leak flow-rate standards are available for screening surveys on distribution and transmission/gathering lines and include a 90% POD to better accommodate mobile, aerial, and satellite screening methods. This option is intended to encourage the use of commercially available methods capable of detecting larger leaks at a relatively lower cost.

The final rule also includes an **expanded and simplified equipment sensitivity standard** to accommodate the use of open-path IR- and laser-based detectors (5 ppm-m) and combustible gas

detectors (CGIs) (1% LEL or 500 ppm). Additionally, the **5 ft distance condition is omitted** since the concentration sensitivity standard is now an alternative to and not a proxy for a leak flow-rate standard.

Impact of Final Rule

PHMSA estimates that the new performance standards will improve leak survey effectiveness in detecting targeted leaks by over 10% (76.5% targeted leaks detected in traditional surveys, 90% detected in leak surveys meeting performance standard). The potential reduction in unintentional emissions resulting from this final rule in its entirety correspond to 54% from regulated gathering lines, 40% from transmission pipelines, and 13 to 30% from distribution pipelines.

GTI Energy is currently conducting several studies examining the feasibility and applicability of the technology and ALDP requirements described in PHMSA's final rule (Table 2). The results will improve understanding of current technology capabilities, develop standardized methods for verifying technologies, and aid operators in effectively designing and implementing leak detection programs for internal or regulatory compliance purposes.

Table 2: Current projects being conducted by GTI Energy related to PHMSA's Gas Pipeline Leak Detection and Repair requirements.

Project	Objectives
ALDP Tiered Survey Framework (7.24.d)	Define an initial framework of tiered layers of leak survey methods and their capability and identify gaps in knowledge required to formulate and structure the framework.
NPRM ALDP Performance Rule: 5ppm at 5 feet Evaluation (7.24.b)	Evaluate the NPRM ALDP performance standard of 5ppm at 5 feet based on detection performances of current walking survey methods and instruments.
Leak Survey Instrument Standards & Test Protocol (7.25.d)	Develop performance standards for pumped and laser based walking survey instruments and test procedures to validate compliance to PHMSA requirements.
Controlled Underground Leak Detection (7.25.h)	Establish a standardized performance assessment of walking survey technology by determining the probability of detections under controlled field conditions.
Data Driven Investigation of Inspection Intervals (8.24.d)	Use operator-provided data to substantiate the frequency of inspection intervals through analysis and modeling.
ALD Meta Analysis (8.24.h)	Analyze data from advanced leak detection deployments both across and within operators to provide insights into the correspondence of leak indications from different technologies and how the results differ across companies.
Examination of Environmental Factors Leading to Leak Attrition/Mitigation (7.25.c)	Provide a better understanding of the environmental factors leading to leak attrition for underground leaks to help operators make decisions that involve environmental or atmospheric factors to eliminate and mitigate emissions.

References

PHMSA Final Rule - Gas Pipeline Leak Detection and Repair - As submitted.pdf

Pipeline Safety: Gas Pipeline Leak Detection and Repair | PHMSA

Contact the Center for Methane Research at methane@gti.energy

*Or visit **www.gti.energy/center-for-methane-research-cmr/***