

WHITE PAPER / PIPELINE INTEGRITY

# VERIFYING INTEGRITY OF NATURAL GAS PIPELINES

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An aging pipeline system coupled with unprecedented demands on U.S. natural gas production has prompted regulatory changes that transform the maintenance and safety requirements for natural gas pipelines. Key improvements to documentation and data collection seek to improve pipeline safety.



Significant growth in the production and use of natural gas in the U.S. has placed unprecedented demand on the country's aging pipeline system. As the U.S. pipeline system ages, incidents continue to occur, resulting in serious risks to life and property. In 2010, an incident in San Bruno, California, killed eight people, injured 51, destroyed 38 homes and damaged another 70. This event underscored the need for updates to PHMSA regulations.

Recently published changes to the PHMSA regulations transform maintenance and safety requirements of natural gas pipelines. The purpose of this rule is to increase the level of safety associated with onshore gas transmission pipelines.

With changing spatial patterns of natural gas production and an aging pipeline network, improvements to documentation and data collection are necessary to improve safety and efficiency. There are key changes and operational impacts connected with meeting compliance requirements efficiently.

## CHANGING THE RULES OF PIPELINE INTEGRITY

Phase 1 of changes to the PHMSA's 49 CFR Part 192, commonly referred to as the gas mega rule, focuses largely on the integrity of gas transmission pipeline systems. To improve integrity management and safety of natural gas transmission pipelines, PHMSA is requiring operators to confirm the material specifications and maximum allowable operating pressure (MAOP) of assets located within a broader range of locations and operating conditions. Operators must also begin assessing transmission pipeline segments within a broader range of location classifications.



## MAOP AND MATERIAL VERIFICATION

A significant portion of the phase 1 rule outlines documentation requirements that confirm the MAOP and material specifications of transmission pipeline assets within high consequence areas (HCAs), moderate consequence areas (MCAs) and Class 3 and 4 locations, as defined by 49 CFR Part 192. The newly defined MCA is an onshore area as defined in 192.903, containing five or more buildings intended for human occupancy; an occupied site; or a right-of-way for a designated interstate, freeway, expressway or other principal four-lane arterial roadway. Specifically, PHMSA requires operators to obtain and keep records on pipe and components, such as valves or fittings, for the life of the asset that document:

- Chemical composition
- Pipe diameter
- Pressure rating (if applicable)
- Seam type
- Strength test records
- Wall thickness
- Yield, or ultimate strength



PHMSA requires that records confirming MAOP and material properties must be traceable, verifiable and complete. If an operator does not have sufficient documentation for a specific pipe segment or component, and the asset is located in an HCA, MCA, Class 3 or Class 4 area, the operator will need to reconfirm the MAOP of that asset.

PHMSA outlines six approved methods for reconfirming MAOP:

- Pressure test
- Pressure reduction
- Engineering critical assessment
- Pipeline replacement
- Pressure reduction for pipeline segments with a potential impact radius less than or equal to 150 feet
- Alternative technology

The regulations also detail requirements for how operators should verify material properties. If operators do not have records on pipe and components, they must develop and implement procedures for conducting destructive and nondestructive tests to verify material properties. Material properties for on-line pipe components also must be verified. To verify material properties for a population of pipeline segments that are missing records, a sampling program may be implemented.

Perhaps the most significant change within the new regulations is the now limited applicability of Part 192.619, commonly referred to as the “grandfather clause,” for confirming MAOP. Prior to the new rulemaking, the grandfather clause allowed operators to confirm MAOP using the highest pressure recorded within a five-year period that pre-dated July 1, 1970. The grandfather clause allowed operators to verify MAOP on virtually all existing transmission pipeline segments



that were in service prior to July 1, 1970. The grandfather clause can now only be used to establish the MAOP of pipelines that operate under 30% specified minimum yield strength (SMYS) or pipelines that operate in a Class 1 or Class 2 area. This means that all previously grandfathered pipelines that operate above 30% SMYS within Class 3 and 4 areas, or within HCAs and MCAs, must have their MAOP reestablished.

Operators have until July 1, 2021, to document their plan and procedures for identifying assets covered within the new rule that do not meet the verification requirements for MAOP and material specifications. The plan must also include the process and procedures the operator will take to verify the MAOP and material properties of 50% of covered assets by July 3, 2028 and 100% by July 2, 2035.

Since these requirements are driven by class location and consequence area, operators will also need to undergo data collection to determine class locations and HCAs or MCAs. This will inform which assets need to be analyzed for MAOP and material verification.

## OPERATIONAL IMPACTS

The initial planning deadline requires operators to document their plan and procedures for identifying assets that require MAOP and material properties verification and the process and procedure to be used to verify the integrity of specific assets. Developing the compliance plan should be a relatively straightforward exercise:

- Define how you will determine which assets are covered under the new regulation, based on area classification and operating conditions.
- Define how you will determine if records are traceable, verifiable and complete.
- Outline the process and procedure to be used for verifying MAOP and material properties using existing documentation.
- Outline the process and procedures to be used to verify MAOP and material properties of assets that do not have traceable, verifiable and complete documentation.
- Provide a timeline for fulfilling the requirements within the prescribed time frames.

Once finalized, executing the plan could have significant operational and cost impacts. Every plan will be unique, depending on operator assets and the chosen methods for reconfirmation; however, most operators will need to:

- Integrate transmission line assessments into the overall maintenance plans.
- Facilitate MAOP and material property verification with the necessary tools and processes.
- Adapt current processes to efficiently gather, store and access records to meet compliance requirements of existing and planned assets.

## DATA COLLECTION

To carry out any plans and procedures that fulfill compliance requirements, operators must undergo a significant data collection and management effort to make informed decisions about which pipe segments need to be addressed. This could be particularly cumbersome for companies that have had numerous mergers and



acquisitions, do not have electronic records in place, or have siloed information across multiple operating units.

While the documentation effort is significant, operators should use this opportunity to learn as much about their assets as possible and not limit data collection efforts to current PHMSA requirements. For example, PHMSA does not currently require records of pipeline coating. However, if this information is available during the course of records research, it should be recorded for future reference so it can support long-term maintenance planning and reduce the need to repeat data collection efforts in the event PHMSA requires this data in future updates to integrity management regulations.

## DATA MANAGEMENT

Once data is collected, operators must determine how they will retain and access data for the life of an asset or component. A simple method for consolidating pipeline asset data is to input information into a pipeline features list spreadsheet. However, spreadsheet data alone is often not considered traceable and verifiable. If the spreadsheet records the traceable and verifiable source documents that contain the pertinent information by linking to those documents, the spreadsheet is then considered traceable

and verifiable. Operators can also look to identify existing or new systems, such as a records database, to store and update asset information and have plans and procedures in place for updating the asset database with records from maintenance and construction activities, such as the sampling programs described in the Phase 1 regulation.

## UPDATING OPERATIONS AND MAINTENANCE ACTIVITIES

An operator's compliance plan should include details of how the operator plans to verify unknown material properties. Before, if material properties were unknown, operators could make conservative assumptions. The new rulemaking describes the material properties that need to be determined and the interval at which they need to be tested. These requirements must be integrated into the overarching operations and maintenance activities.

Once the data collection efforts have identified pipeline segments that require MAOP reestablishment, the operator will have to determine the methodology to do so. This will likely result in projects and programs that include hydrostatic testing, pipeline replacement, pressure reductions and in-line inspection retrofits to reestablish MAOP and confirm material specifications.

## CONCLUSION

This final rule improves the processes for documentation and data collection necessary to enhance safety and efficiency to meet the emerging needs of today's natural gas pipeline infrastructure. The latest compliance and safety requirements help the operator make reasoned

safety choices for the aging pipeline system and help the industry preserve public confidence in its ability to do so. These significant improvements to quality and safety can, in the long term, reduce costs and minimize risk. A full-service engineering and construction firm can execute activities on MAOP reestablishment projects to cut the burden that operators shoulder while improving safety and compliance for the owner's system.

## BIOGRAPHY

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