

# In-Line Inspection of Pipelines

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## **ABSTRACT**

*This standard practice outlines a process of related activities that a pipeline operator can use to plan, organize, and execute an ILI project. This standard is applicable to carbon steel pipeline systems used to transport natural gas, hazardous liquids including those containing anhydrous ammonia, carbon dioxide, water including brine, liquefied petroleum gases (LPG), and other services that are not detrimental to the function and stability of ILI tools. This standard is maintained by Task Group 212.*

## **KEYWORDS**

*in-line inspection, pigging, pipelines, non-destructive testing.*

## Foreword

***In NACE standards, the terms shall, must, should, and may are used in accordance with the definitions of these terms in the NACE Publications Style Manual. The terms shall and must are used to state a requirement, and are considered mandatory. The term should is used to state something good and is recommended, but is not considered mandatory. The term may is used to state something considered optional.***

Since the transportation of hydrocarbons by pipeline began in the 1860s, the primary means of establishing pipeline integrity has been through the use of pressure testing. These tests have been most often performed upon completion of the construction of the pipeline. The completed pipeline segment has been pressurized to a level equal to or exceeding the anticipated maximum operating pressure (MOP). Government regulations have recently specified the test pressures, test media, and test durations that must be achieved for pipelines to be permitted to operate within their jurisdictions. However, until very recently, there have been no such requirements for pipelines to be periodically tested for integrity. Some pipeline operators have traditionally performed periodic integrity assessments in a variety of forms with varying degrees of success.

In the mid-1960s, pipeline operators began to use a form of instrumented inspection technology that has evolved into what is known today as in-line inspection (ILI). ILI is but one tool used in pipeline integrity assessment. The technology has now become so reliable that it holds a prominent place in many operators' integrity programs because when properly applied, ILI provides many economies and efficiencies in integrity assessment at a relatively small risk.

This standard practice outlines a process of related activities that a pipeline operator can use to plan, organize, and execute an ILI project. Guidelines pertaining to ILI data management and data analysis are included. A key companion guide to this standard is NACE International Publication 35100.<sup>1</sup>

This standard is intended for use by individuals and teams planning, implementing, and managing ILI projects and programs. These individuals include engineers, operations and maintenance personnel, technicians, specialists, construction personnel, and inspectors. Users of this standard must be familiar with all applicable pipeline safety regulations for the jurisdiction in which the pipeline operates. This includes all regulations requiring specific pipeline integrity assessment practices and programs.

This NACE standard was originally prepared by Task Group (TG) 212, "In-Line Nondestructive Inspection of Pipelines," in 2002 and was revised by TG 212 in 2010 and 2017. TG 212 is administered by Specific Technology Group (STG) 35, "Pipelines, Tanks, and Well Casings." This standard is issued by NACE International under the auspices of STG 35.

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## Section 1: General

- 1.1 This standard is applicable to carbon steel pipeline systems constructed of Grade B or greater material used to transport natural gas and hazardous liquids, including those containing anhydrous ammonia, carbon dioxide, water including brine, liquefied petroleum gases (LPG), and other services that are not detrimental to the function and stability of ILI tools.
- 1.2 This standard is applicable to free-swimming ILI tools, but is not applicable for tethered or remotely controlled inspection devices.
- 1.3 This standard provides recommendations to the pipeline operator based on successful, industry-proven practices in ILI.
- 1.4 This standard is specific to the inspection of line pipe installed along a right-of-way, but the general process and approach may be applied to other pipeline facilities such as hydrocarbon distribution and gathering systems, water injection systems, station piping, and isolated crossings of railroads, highways, or waterways.
- 1.5 ANSI<sup>(1)</sup>/ASNT<sup>(2)</sup> ILI-PQ<sup>2</sup> establishes minimum requirements for the qualification and certification of ILI personnel whose jobs require specific knowledge of the technical principles of ILI technologies, operations, regulatory requirements, and industry standards as applicable to pipeline systems.
- 1.6 API<sup>(3)</sup> 1163<sup>3</sup> provides requirements for qualification of ILI systems used in onshore and offshore gas and hazardous liquid pipelines. This includes, but is not limited to, tethered or free-flowing systems for detecting metal loss, cracks, mechanical damage, pipeline geometries, and pipeline location or mapping. This standard is an umbrella document covering all aspects of ILI systems, including procedures, personnel, equipment, and associated software. It is performance-based, but it does not define how to meet qualification requirements.

## Section 2: Definitions

**Aboveground Marker (AGM):** A portable or permanently installed device placed on the surface above a pipeline that both detects and records the passage of an ILI tool or transmits a signal that is detected and recorded by the tool.

**Anomaly:** An unexamined deviation from the norm in pipe material, coatings, or welds. See *imperfection* and *defect*.

**Appurtenance:** A component that is attached to the pipeline, e.g., valve, tee, casing, instrument connection, etc.

**Batch, Batching:** Separated volume of liquid within a liquids pipeline or of liquid within a gas pipeline. Sealing (batching) pigs are typically used for separation.

**Bellhole:** An excavation to permit a survey, inspection, maintenance, repair, or replacement of pipe sections.

**Bend:** A physical configuration that changes pipeline direction. A bend can be classified according to the centerline radius of the bend as a ratio to the nominal pipe diameter. A 1.5 diameter (D) bend would have a centerline radius of 1.5 times the nominal pipe diameter. A 3 D bend would have a centerline radius of three times the nominal pipe diameter.

<sup>(1)</sup> American National Standards Institute (ANSI), 25 West 43rd St., 4th floor, New York, NY 10036.

<sup>(2)</sup> American Society for Nondestructive Testing (ASNT), P.O. Box 28518, 1711 Arlingate Lane, Columbus, OH 43228-0518.

<sup>(3)</sup> American Petroleum Institute, (API) 1220 L Street NW, Washington, DC 20005-4070.