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Understanding Procurement Specifications When Purchasing Pipeline Materials

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Pipeline design and construction projects are unique and complex, whether the project is underground, aerial or offshore; a single crossing replacement or an entirely new pipeline; 500 miles or 500 feet. To successfully procure the materials needed for a new pipeline system, engineering professionals must have the technical experience, logistical knowledge and organizational systems in place to support the project's needs.

Typical design-bid-build (DBB) and engineer-procure-construct (EPC) pipeline projects are made up of multiple critical steps based on the project's procurement needs, but one thing is constant: The materials matter. Pipes, fittings, flanges and closures: If miscalculations are made or the incorrect material is purchased for the project, it could result in safety shortfalls, cost overruns, delays or equipment failures.

Pipeline Project Considerations

According to the American Gas Association, the natural gas industry has added an average of 20,724 miles of pipe annually from 1998-2020. When scoping and planning construction of a new pipeline prior to purchasing any of the materials and equipment that is needed, project managers and pipeline owners/operators consider several factors:

- The planned route of the pipeline.
- The necessary diameter and wall thickness of the piping system.
- The stress and forces imposed on the pipeline.
- Required burial depth or special lay provisions.
- Rights-of-way/land acquisition.
- Any environmental impact.
- Any unique material specifications.

After these factors are considered, a pipeline project moves from planning into the design phase, which is when the procurement process often begins. The procurement process is when members of the project team specify to a vendor the types of material and quantities needed to be purchased to complete the project, no matter if the customer is utilizing a DBB, EPC or any other project delivery method.

Procuring the Right Materials

Pipeline projects in the United States typically follow material requirements set forth by ASTM International and

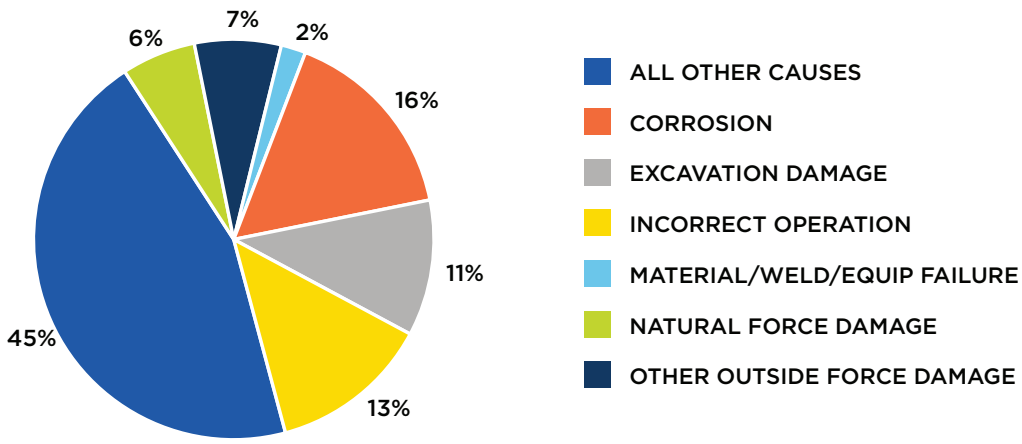

***Figure 1:** Pipeline incidents reported (2017-2021).*

the American Petroleum Institute (API). API 5L, for example, covers the manufacturing of seamless and welded steel pipe for use in a petroleum or natural gas pipeline, and is generally considered the material basis for domestic pipeline systems.

Depending on how and from which vendor(s) (internal or external) the material will be procured, a Bill of Materials (BOM) — or product structure — is the list of the materials, parts and equipment needed to complete a project. Usually submitted via a spreadsheet or online portal, it is critical for a project's success that project managers, engineers and supply chain staff are precise and accurate with their specifications of the material requested through the BOM. If the BOM is not correct and fails to meet design standards, issues can arise such as: The material delivered to the project site is wrong and must be returned to the supplier; the material does not fit and requires on-site modifications (if that's even possible); or the materials can be used in a pipe with a lower pressure or temperature rating or other reduction in system performance potential.

If the project team does not properly specify and select the right material, then it would not be fit for purpose and it typically cannot be put into service. Project managers can build flexibility into the design schedule and minor adjustments can be accommodated, but major changes due to purchasing errors can lead to schedule delays, liability issues and an increase in a project's overall cost.

Also important is a project team's strong understanding of the differences between short and long material lead times so a project isn't delayed as construction contractors wait on critical parts to be delivered to the job site. Short lead items often include small-diameter, simple materials manufactured domestically that are readily available. Long lead materials are items that can take a long time to acquire, such as materials produced overseas, custom-fabricated items or specialty equipment. Long lead items should be ordered early in the project life cycle.

Material Failure Rates

Along with a knowledge of the materials needed for a pipeline project, an understanding of how the materials perform in various situations is important, especially when it becomes necessary to deviate from industry standards. Aspects of the project worth considering can include: Is the project unique? Will the pipeline carry a new type of material? Will environmental factors add stress to the pipe? Answers to these questions can result in necessary modifications such as the wall thickness and tensile strength of the pipe or any pipe surface preparation, such as an internal corrosion coating.

Statistics collected by the U.S. Department of Transportation's Pipeline and Hazardous Materials Safety Administration show from 2017-2021, 16% of pipeline incidents occurred due to corrosion, totaling approximately $238.3 million in reported cost ($245.5 million in today's dollars). Add in failures in materials, welds and equipment, and the total rises to 61%, amounting to costs of $682.5 million.

Experience With Vendors

A thorough understanding of what individual vendors can provide is essential when working with the customer to procure the right materials for a safe and successful project. Many pipeline owners/operators have preferred vendors, choose to use certain types of equipment, or have robust specifications or requirements for their materials in their pipeline projects. They may also have different levels of maturity in their supply chains, such as internal systems or materials catalogs. Other companies, especially those smaller in size, may rely heavier on design firms to select the materials.

Traceability and Records

If it becomes necessary to evaluate a pipeline system currently in operation, a pipeline owner should have traceable, verifiable and complete (TVC) records of any material that was put into service. These records will help inform internal engineering and integrity teams, outside stakeholders, and regulatory compliance auditors on whether the pipe may need replacement due to material inadequacy.

With all pipeline projects, safety is the number one priority. Identifying and purchasing the correct materials for each project can safeguard against potential construction issues or future risks.

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