

PIPELINE FACILITIES MANUAL

Intended for use by pipeline maintenance (PLM) crews, engineering staff, and operations staff, when planning or undertaking work which involves repair or maintenance of company pipeline facilities.

This manual consists of standards and procedures for the following sections:

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| 1. Planning and Preparation | 6. Pipe Repair and Modification |
| 2. Environmental Protection | 7. Pressure Tests |
| 3. Right-of-Way Maintenance | 8. Pipeline Integrity |
| 4. Trenching and Excavations | 9. Tank Maintenance |
| 5. Foreign Crossings | |

Section	Section Title	Section Description
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1	Planning and Preparation	<ul style="list-style-type: none"> • Contains procedures on how to effectively plan and prepare for pipeline maintenance activities. Included is information on the use of forms and job notification procedures. • Good planning is essential to all pipeline work activities. Good planning ensures pipeline maintenance and repair work is conducted safely and on schedule, and helps eliminate any potential problems. • Preparation is important to a safe work operation. Preparation ensures: <ul style="list-style-type: none"> ○ on-the-job training has taken place to the extent possible in preparing workers to work safety and efficiently ○ equipment and tools are in good, safe working condition
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		<ul style="list-style-type: none"> ○ fire extinguishers and safety equipment are maintained as required and ready for immediate use ○ necessary materials for the job are readily available ○ environmental protection measures are followed
2	Environmental Protection	<ul style="list-style-type: none"> ● Contains environmental protection measures to satisfy the requirements of regulatory agencies when maintaining or repairing pipelines and facilities.
3	Right-of-Way Maintenance	<ul style="list-style-type: none"> ● After any pipeline construction or maintenance activity, the right of way must be returned to as near its original state as possible. This section includes standards and procedures for right of way maintenance.
4	Trenching and Excavations	<ul style="list-style-type: none"> ● Many accidents involving pipelines are caused by maintenance or contracted work near the pipeline. Unsafe excavation practices can damage the pipeline and the environment, resulting in injury or fatality to workers and the public. Such damage can lead to expensive repairs as well as loss of revenue and essential services. ● The standards and procedures in this section will reduce the likelihood of damage to underground facilities and ensure pipeline work activities are completed in a safe and efficient manner.
5	Foreign Crossings	<ul style="list-style-type: none"> ● The standards and procedures in this section apply to all contractors, facility owners, and individuals who will be excavating using powered equipment within 30 m (100 ft) of the pipeline or its right-of-way (ROW), or who will be constructing a facility across, on, or under the pipeline or ROW.

		<ul style="list-style-type: none"> • Ensures compliance with pipeline crossing regulations. • A foreign crossing is a facility owned by one company that crosses the ROW or property of another company. In general, a facility includes (but is not limited to): <ul style="list-style-type: none"> ○ highway – any public or private road, road allowance, street, lane, parking lot or other public way ○ utility – irrigation ditch, drain, drainage ditch, sewer, dike, line for transmitting hydrocarbons or other substance, buried or aerial communication and electrical power lines ○ structure - any structure constructed or installed across, along, on or under the pipeline or ROW, i.e., shed, garage, swimming pool
6	Pipe Repair and Modification	<ul style="list-style-type: none"> • Pipeline repair and modification generally falls into two categories, emergency and planned work. Emergency work usually results from the occurrence of an incident, such as a leak condition. Planned work does not involve an incident, and there is ample time to study field conditions and organize work to control hazards. Planned work generally involves one of the following types: <ul style="list-style-type: none"> ○ placing a sleeve over the pipeline ○ replacing a section of pipe ○ lowering a pipeline ○ installing a mainline valve ○ tying in a connection to the mainline • Includes standards and procedures for the planned repair, replacement and relocation of a

		<p>pipeline. It does not provide general safety standards for pipeline repair and modification. For general safe work practices, refer to the Safety Manual.</p>
7	Pressure Tests	<ul style="list-style-type: none"> • Industry standards and government regulations require pipeline and other facilities to be tested before commissioning to ensure their integrity. • Provides the criteria and procedures for conducting a pressure test, including test planning, instrumentation requirements, test practices, sample calculations, and documentation procedures.
8	Pipeline Integrity	<ul style="list-style-type: none"> • Maintaining the pipeline in as close to new condition as economically feasible is of primary importance. • Describes the corrosion control program for the pipeline system, external inspection procedures, and internal inspection procedures for launching and receiving pigs. • The purpose of this section is to provide the company with a defined process to meet the regulatory requirements with respect to corrosion surveys. <p>Measure Structure to Soil Potentials: To ensure continued protection of the system, field surveys are regularly conducted as per regulations. Each buried, in contact with the ground, or submerged pipeline facility under cathodic protection must be checked to determine whether cathodic protection is adequate. In addition, the regulations for hazardous liquids pipelines require that all breakout tank areas and buried pumping station piping are electrically inspected as to the need for cathodic protection and to provide cathodic protection where necessary.</p> <p>Conduct Close Interval Surveys: A close</p>

		<p>interval survey (CIS) provides a means for pipeline companies to investigate corrosion levels and coating condition on buried or submerged pipelines without the need for excavation. Undetected corrosion or coating damages, degradation and defects can have an impact on the long-term integrity of a pipeline. Being aware of corrosion levels and coating conditions throughout the pipeline make it possible to proactively guard against pipeline failures.</p> <p>Test to Detect Interference: Interference is the uncontrolled and undesirable effect of alternating or direct voltages and/or currents that interfere with a pipeline’s cathodic protection system. Interference can result in accelerated corrosion damage, and in extreme cases can threaten worker safety. The ability to detect interference makes it possible to proactively ensure pipeline integrity and worker safety.</p> <p>Inspect and Test Bonds/ Isolation Devices: Monitoring of the cathodic protection is done by taking readings from the pipeline by means of wires bonded to the pipelines, isolation devices are used on pipelines that require protection from electrical currents that exist on adjacent pipeline or structures. Regardless of the component or its precise function, the proper operation of bonds and isolation devices are integral to effective functioning of cathodic protection systems.</p> <p>Measure Soil Resistivity: Soil resistivity is an electrical characteristic of soil or groundwater that affects the ability of currents to flow through the soil or groundwater. Resistivity measurements aid in the determination of potentially corrosive environments, in the design of cathodic protection systems, and in the</p>
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		<p>determination of the soil composition.</p> <p>Maintain Test Leads: Cathodic protection (CP) systems are installed to mitigate the impact of corrosion on the pipeline. Test leads are required at regular intervals along the pipeline in order to monitor and test the performance of such CP systems. This task focuses on the installation and maintenance of test leads. Cathodic protection and CP systems are also discussed.</p> <p>Inspect Rectifiers: One method of corrosion control is to cathodically protect each pipeline system by the installation of a rectifier, which supplies electrical power to the impressed-current ground-bed system. In order to maintain the protection afforded by the rectifier, the rectifier must be inspected on a regular basis.</p> <p>Inspect Buried Pipe When Exposed: In the construction of pipelines, the materials used to fabricate the pipe are engineered to withstand all of the normal operating forces within the pipeline. However, the environment they are in, either below or above ground affects pipelines. This task focuses on inspection of buried pipe when it is exposed for any reason.</p> <p>Inspect & Perform Prevention Methods for Atmospheric Corrosion: Externally applied coatings provide a cost-effective means for protecting pipelines exposed to the atmosphere against corrosion. Corrosion weakens the structural integrity of a pipeline by reducing its pipe wall thickness or initiating cracking mechanisms, making it potentially unsafe for the transportation of liquid and gas products. Ensuring compliance with this regulation requires workers with knowledge of the principles of corrosion, corrosion assessment, types of anti-corrosion coatings, and the preparation, application, inspection and maintenance of anti-</p>
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		<p>corrosion coatings. The purpose of this task is to provide the pipeline operator with a defined process to meet the requirements with respect to the prevention of atmospheric corrosion.</p> <p>Measure Pipe Wall Thickness: Internal and external corrosion can reduce pipe wall thickness to the point where the pipe can no longer withstand normal operational stresses, resulting in a leak. Welding performed on an in-service pipeline with inadequate wall thickness may result in a “burn-through” and fire. Pipeline safety regulations require that operators either repair or replace pipe with insufficient wall thickness, or reduce pressure in that section to ensure safety of persons and property.</p> <p>Install Bonds: Cathodic protection is often used to control external corrosion of pipelines. Monitoring of the cathodic protection is done by taking readings from the pipeline by means of wires bonded to the pipelines. This task focuses on installing bonds.</p> <p>Install Galvanic Anodes: One method of corrosion control is to cathodically protect a pipeline system by the installation of galvanic anodes. The primary purpose of a galvanic anode is to generate enough current to protect the pipeline from corrosion. This task focuses on installing galvanic anodes.</p> <p>Install Rectifiers: One method of corrosion control is to cathodically protect each pipeline system by the installation of a rectifier that supplies power to the impressed current grounded system. This task focuses on installing rectifiers.</p> <p>Install Impressed Current Groundbeds: One method of corrosion control is to cathodically protect each pipeline system by the installation of an impressed current system. The primary</p>
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		<p>purpose of impressed-current groundbeds is to cathodically protect the pipeline from corrosion. This task focuses on installing impressed current groundbeds</p> <p>Repair Shorted Casings: Government regulations require pipelines crossing railroads or highways to have the proper reinforcement (casing) to support the anticipated traffic loads. In many applications, the casing will require proper electrical isolation from the pipeline to allow for corrosion control. Shorted casings or failure to obtain proper isolation can be verified by carrying out voltage tests using test leads and test stations.</p> <p>Monitor for Internal Corrosion: One way of reducing the risk of internal corrosion is to operate the pipeline in such a way that water and other impurities are kept in suspension. In reality, the pipeline cannot be run in this manner. A proven way to reduce internal corrosion is to add corrosion inhibitors into the pipeline to slow down the rate of corrosion. In order to understand and mitigate internal corrosion, a pipeline monitoring system and monitoring program are required</p> <p>Inject Corrosion Inhibitor: In the transportation of hazardous liquids in a pipeline or the transportation of natural gas in a transmission line, there may be a risk of corrosion to the internal pipe surface. The internal corrosion proceeds by means of an electrochemical reaction. Corrosion inhibitors can be injected into the flowing pipeline to slow or impede the internal corrosion process. Regulations also require the completion and retention of appropriate documentation associated with the implementation and monitoring of the internal corrosion control program.</p>
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		<p>facilities. Failure to properly locate and identify facilities may cause accidental trespassing, damage to facilities, personal injury and/or harm the environment. This task provides instruction for those responsible for maintenance and proper positioning of pipeline signs and placards.</p> <p>Place and Maintain Line Markers: ROW inspections include checks for leaks and other development affecting the safety and integrity of the pipelines. Inspections of the ROW and adjacent areas help protect nearby urban or rural areas. Inspections confirm that the ROW is properly marked with signs, is free of litter and can be easily accessed by emergency and maintenance equipment. This task focuses on the inspection process, not on specific maintenance or other corrective actions arising from ROW inspections. However, the module does specify the procedures for reporting improper activities, changes, or abnormal conditions along a ROW.</p> <p>Inspect Surface Conditions of Right of Way: The largest single cause of pipeline failures is damage from outside sources. Excavation damage by third parties causes two-thirds of these reported failures. Outside force failures have declined with the expansion of industry-sponsored "One-Call" systems. Accurate depth measurements and following established line-locating procedures are important in maintaining the integrity of pipelines. If the pipeline is not accurately located, excavation may result in damage to the below-grade facilities. This can result in a product release, environmental impact, and exposure to toxic or flammable pipeline products.</p> <p>Temporary Marking of Buried Pipeline Prior to Excavation: Government regulations calls for hazardous liquid pipelines and natural gas</p>
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9	Tank Maintenance	<ul style="list-style-type: none"> • Tank maintenance is conducted to maintain the structural integrity of tanks, to ensure environmental and safety standards are met, and to ensure current tank operation meets the required purpose. • Outlines the standards and procedures for maintaining tanks, including inspecting, painting, cleaning, and repairing.