Pipeline construction at-a-glance.

Pipelines are the safest, most efficient and environmentally responsible way to transport natural gas and petroleum products.

From design and construction to operations and maintenance, safety is our number one value.

About this guide

Building and operating safe and reliable energy infrastructure – it's what we do and have done well for over 65 years. Our energy infrastructure assets are essential to millions of people across North America who rely on the energy we deliver every day to heat their homes, cook their food and fuel their vehicles.

Our pipelines are designed, constructed and operated safely and reliably every day. Our priority is to make sure our employees and contractors make it home safe and that our neighbours see us as a responsible and trusted community member. We recognize that no safety-related incidents are acceptable and we will not be satisfied until we reach our goal of zero incidents.

This book outlines the steps and processes involved in building a pipeline. All stages of pipeline construction are completed by TC Energy contractors that must meet our strict qualifications and standards.

Route selection

One of the most important elements when designing a new pipeline is determining the route the pipeline will take.

Where possible, TC Energy tries to minimize the route length and use existing pipeline rights of way or other linear disturbances that have previously established corridors, which will minimize the social and environmental effects.

If a new right-of-way must be established, TC Energy works with landowners, stakeholders and Indigenous communities to ensure that valuable information is gathered and incorporated into the final route.

Pre-construction activities

Three types of field surveys are performed prior to the various stages of pipeline construction. These surveys are used for project permitting and pipeline design.

- Civil surveys are conducted to locate facilities including the construction corridor and pipe centre line, work area boundaries, sensitive and/or environmental resources and any issue or resource that requires geo-referenced data.
- Environmental surveys are done to collect and identify unique environmental characteristics that exist along the proposed pipeline route, influence the pipeline routing decision making process and support the environmental assessment for the project.
- Geotechnical surveys are used in pre-determined locations to collect geological and soil data that support pipeline construction design.

Clearing, grading and topsoil stripping

Clearing begins when surveying is complete, including the removal of all trees and brush. This is followed by stripping and grading to create a safe work surface.

Our contractors separate and conserve the topsoil removed from the right-of-way so it can be replaced once construction is complete. Topsoil conservation ensures the land is returned to an equivalent land capability and productive capacity upon completion of the project.

Stringing

Pipe is ordered in advance of construction and stored at various locations near the right-of-way, providing easy access for the contractor for stringing. Stringing the pipeline involves laying out all the pipe adjacent to where the trench will be excavated.

Field bending

Depending on the terrain and route of the trench, the pipe may be bent using special machines to accommodate for these topographic changes. Once bent to the appropriate shape, the pieces of pipe are then lined up tightly with one another and are ready for welding.

Pipeline welding

Once the segments of pipe are lined up, welding commences. Various welding techniques and sophisticated technologies are applied to weld the pipe together in one string. A clamp secures joints of pipe together to ensure proper alignment of the welding surface. Each connection is inspected to meet strict safety and quality assurance requirements.

Weld inspection

Throughout construction, all welds are checked by an x-ray or ultrasonic process to verify each weld is sound. Weld testing provides sensitive and accurate inspection of the pipe welds and achieves a high degree of certainty over the integrity and safety of the pipeline.

Coating field welds, inspections and repairs of coating

The surface of the pipeline is coated for protection. A liquid-bond epoxy is applied to help protect the weld and the rest of the pipe.

After coating, a technique called “jeeping” is used to detect chips or flaws in the coating and if required, a new coat is applied to the affected area.

Trenching and ditching

A trench is dug along the right-of-way using backhoes and other specialized machinery. Pipelines are buried underground to a depth meeting or exceeding regulatory requirements and best management practices to protect them from disturbance while operating.

Lowering and tie-ins

Once the pipeline has been welded together it is lowered into the trench using a series of machines called sidebooms.

Before the pipe is lowered, the ditch is carefully inspected to ensure it is free of rocks, and other debris that could damage the pipe.

Pad and backfill

The trench is backfilled with the original subsoil and topsoil to cover the pipeline. In certain conditions where the terrain is rocky, padding may be required to protect the pipeline coating.

Testing and inspection

After the pipeline has been backfilled, a series of tests are completed. One key test is called hydrotesting, which verifies the pipeline's integrity. Water is placed into the pipeline and pressurized to a level higher than the pipe will experience during regular operation. If a leak occurs during testing, the affected section is repaired or replaced. The pipeline is not put into service until it has been tested and deemed safe.

Pre-operational tests such as in-line inspection or "pigging" may also be conducted to look for any pipeline irregularities. Specialized internal inspection devices called "smart pigs" travel through the pipeline collecting data. The data is then analyzed to determine if there are areas of concern that require further investigation.

Before
Near David City, Nebraska | Keystone Pipeline Construction | Photo taken June 15, 2009

After
Near David City, Nebraska | After restoration | Photo taken August 25, 2010

Clean up and reclamation

Following completion, great care is taken to return the land along the pipeline right-of-way as closely as possible to its pre-construction condition.

TC Energy's post-construction reclamation and monitoring program ensures that the equivalent land capability and biological diversity are maintained or re-established after construction.

Monitoring our operations

Once in service, our pipelines are regularly maintained and closely monitored 24 hours-per-day by highly trained TC Energy employees from a computerized control centre. This is one of the many ways TC Energy is able to closely monitor conditions along the pipeline to ensure it is operating safely for the public, our employees and the environment.

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