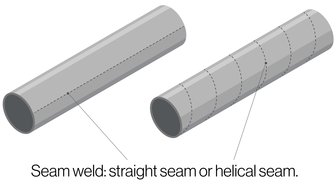
A study in strength: The pipeline welding process

The heart of Enbridge's business is the pipe in the ground—and the craftsmanship that keeps it strong.

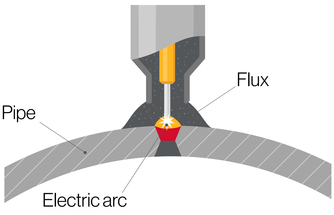
Enbridge uses the best available welding technology on our pipeline projects, like the Line 3 Replacement Project (L3RP). We go well beyond industry codes and standards, wherever we build our energy infrastructure, to ensure our weld joints—like our pipes—stay strong, healthy and fit for purpose.

In the pipe mill: Seam welds

Enbridge's L3RP supplier uses the Double Submerged Arc Welding (DSAW) process to assemble its pipe. This process is ideally suited to carbon-steel pipe, with high productivity rates, extremely low rejection rates, and quality results.



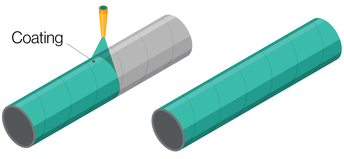
Seam weld: straight seam or helical seam.



The DSAW process:

- Automated welding machines make two passes, one from inside and one from outside
- The electric arc and molten weld are "submerged," or covered, beneath a bed of granulated flux
- This layer of flux protects the weld from atmospheric contamination

The pipe is then coated in fusion-bonded epoxy to prevent corrosion.



In the field: Girth welds

For Enbridge's Line 3 Replacement Project, and other major projects, crews move steadily down the pipeline right-of-way joining sections of pipe together via a series of girth welds. While this process, known as Gas Metal Arc Welding (GMAW), is largely automated, welding machines are operated by skilled and qualified welders.

The GMAW process:

1. Internal unit or "gooseneck" moves inside the pipe, performing an initial weld from the interior
2. External unit or "bug," circling the pipe on tracks, performs several more passes from the exterior to complete the weld and fill the ¼-inch gap

These external "fill" and "cap" passes are performed in portable shacks that offer protection from the elements

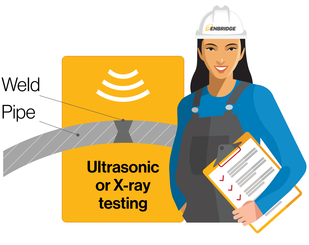
One girth weld takes about 30 minutes

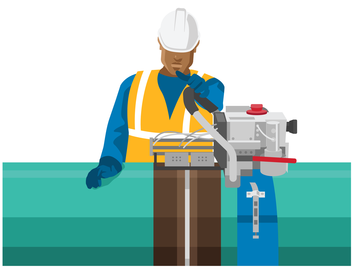
Welds are then coated with the same fusion-bonded epoxy to prevent corrosion.

Tried and tested: The weld inspection process

In the mill

- Seam welds are inspected by the pipe manufacturer using automated ultrasonic or X-ray devices
- Results are reviewed and audited by Enbridge inspectors





In the field

- Girth welds are inspected by an independent third party, primarily using automated ultrasonic devices
- Results are reviewed and audited by Enbridge inspectors
- As an extra Enbridge safety measure, some girth welds are delay inspected for enhanced quality assurance

Safety and reliability are built into Enbridge's energy infrastructure projects—before, during and after the construction phase.

ENBRIDGE
Life Takes Energy®

For more information on the Line 3 Replacement Project, please visit enbridge.com/line3US