



**Fast Construction.
Permanent Protection.**



**FLEXSLEEVE®
FAST, SAFE, & LOW-RISK CONSTRUCTION
OF INTERNALLY COATED PIPELINES**

IPLOCA Novel Construction Session Fall 2023

Domestic Water

- Continental Water
- Desalinated Water



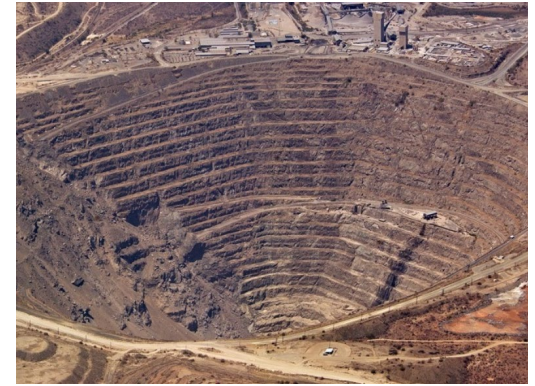
Oil & Gas

- Water Injection (clean & produced)
- Water Disposal
- Sour Oil & Gas
- CO² Injection



Mining

- Process Water
- Tailings Slurry
- Coarse Ore Slurry
- Concentrate Slurry
- Solution Mining (Brines)

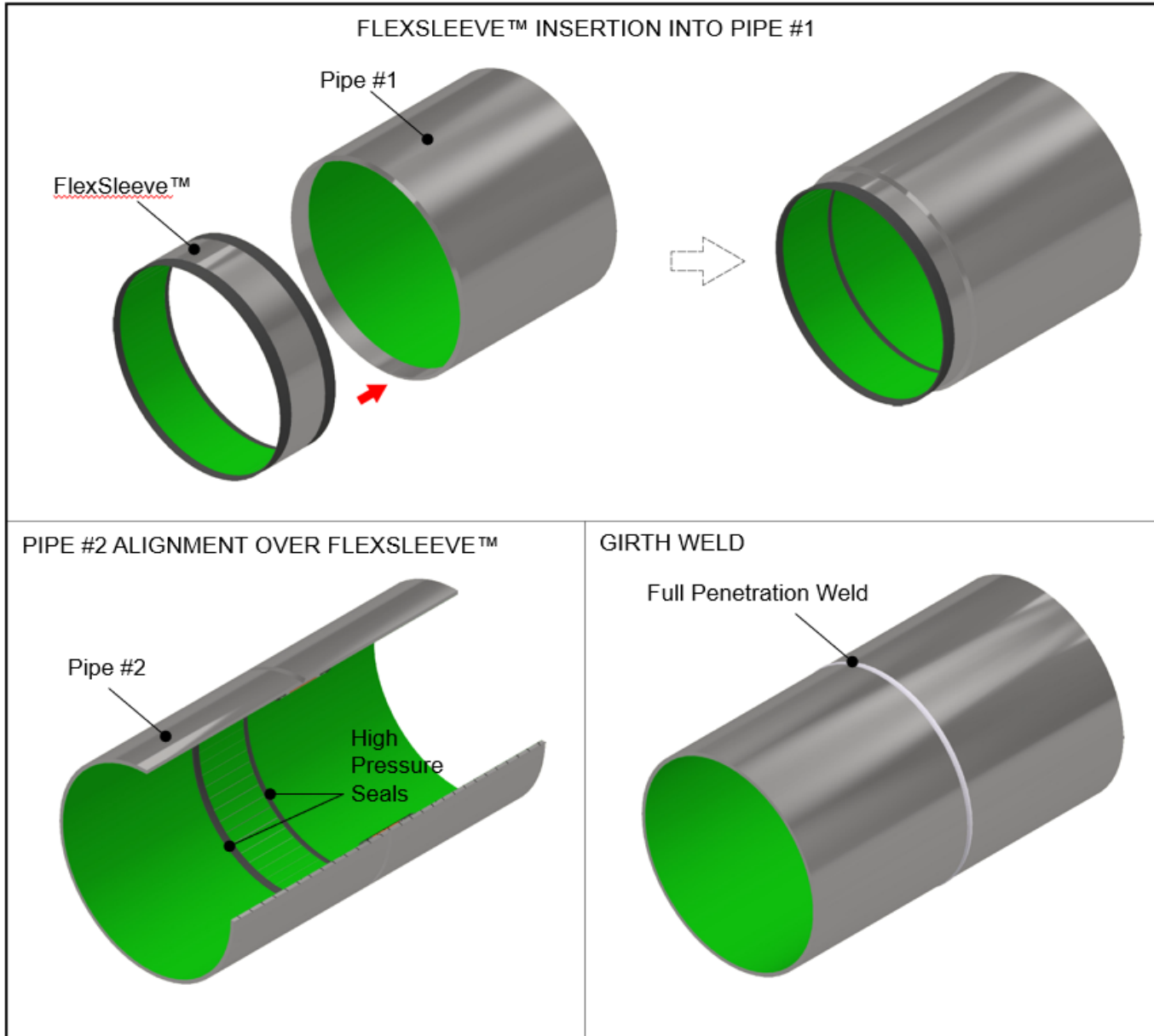




How to protect the interior of welded pipe joints from corrosion?

A flexible corrosion-resistant sleeve that withstands the heat from welding and seals off the weld zone from corrosion.





Manual Internal Joint Coating

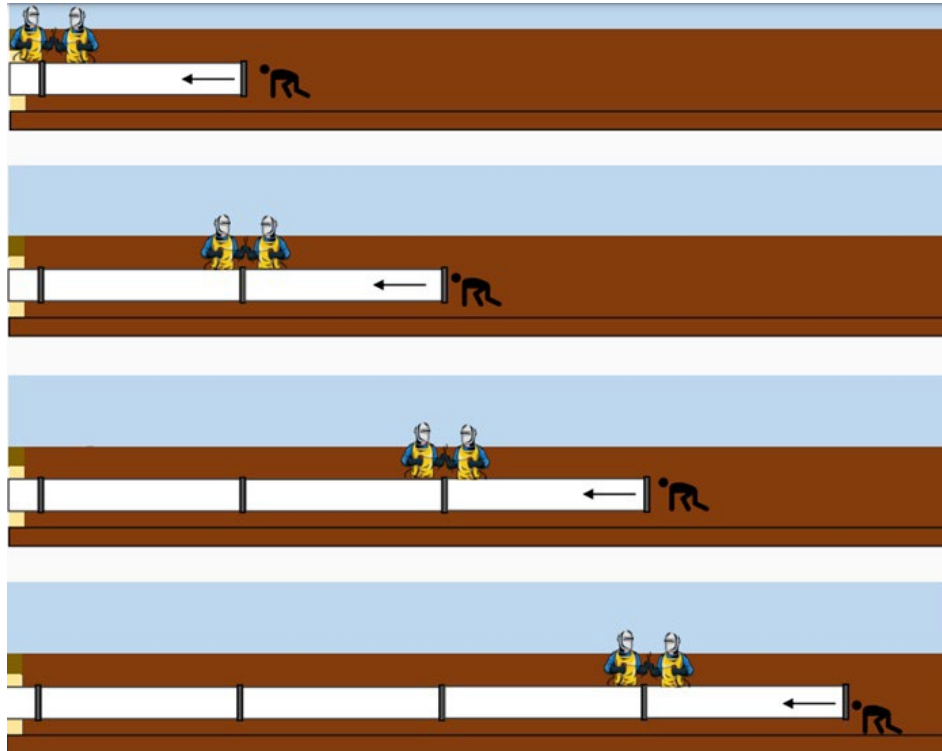
FlexSleeve® allows for faster, safer, and better-quality protection than manual internal joint coating.



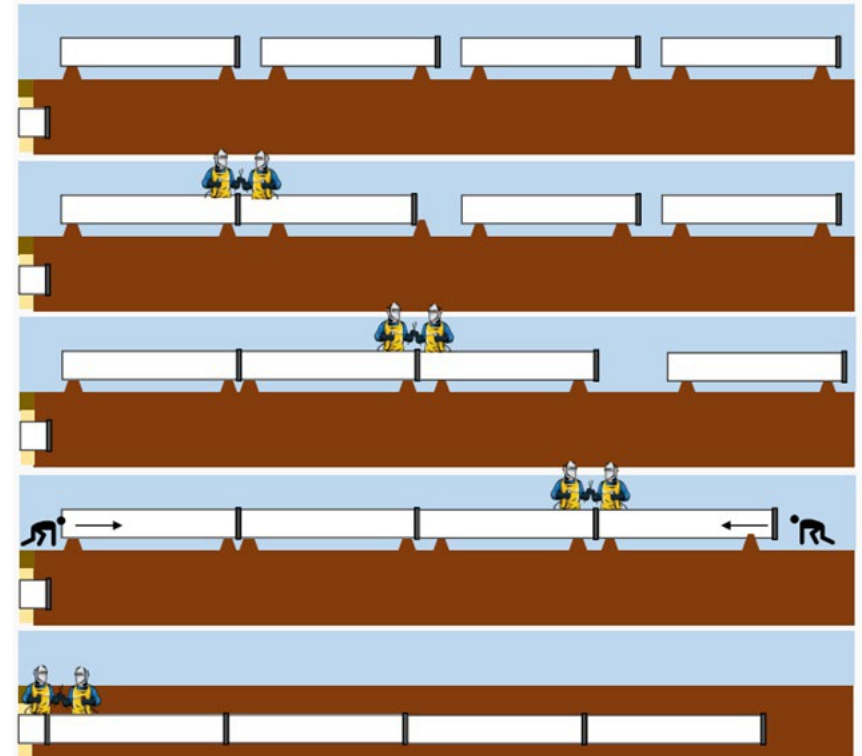
Fast String Construction with FlexSleeve

String construction outside the trench is much faster than construction one by one inside the trench.

FlexSleeve permits far faster tie-ins and significantly reduces project completion time.



Construction one by one in the trench

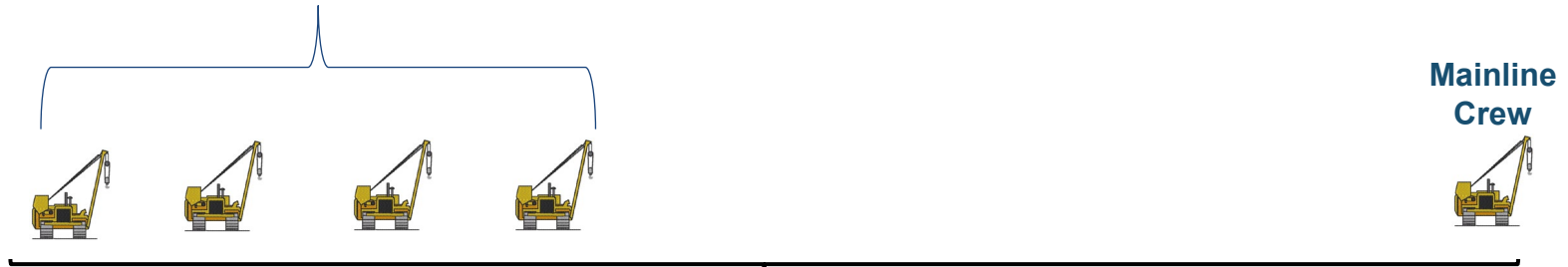


Construction with strings outside the trench

FlexSleeve vs. Manual Joint Coating

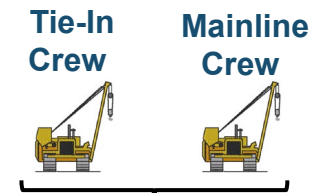
Internal joint coating & inspection is far slower than mainline welding crews.

Extra tie-in and lowering crews
required



Distance between mainline & tie-in crews gets farther and farther
as project progresses.

FlexSleeve eliminates the construction complexity.
Tie-in crew can follow right behind mainline crew.



Lubricant Application



Sleeve Insertion



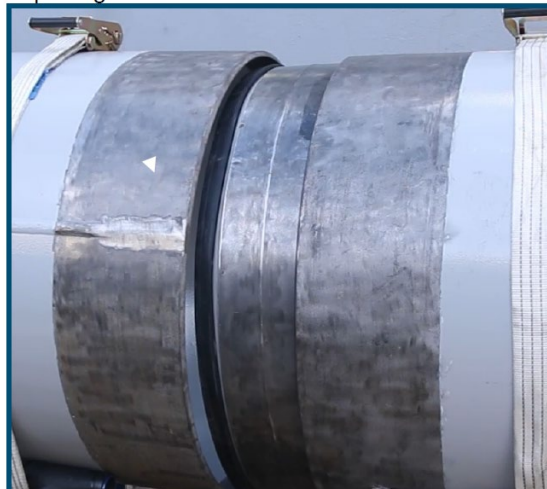
Sleeve Insertion



2nd Bore Seal Installation





Pipe Alignment





Set Weld Gap (V-Bevel)





- 

Flexibility: Thin, flexible profile adjusts to pipe ovality for easy insertion and consistent weld & seal quality.
- 

Sealing: Unique bore seal design accommodates pipe ID tolerance and utilizes sleeve flexibility to seal off weld zone.
- 

Heat Resistance: Wide, thick insulation keeps weld heat from damaging protective coating. Permits a long internal pipe coating holdback and normal welding time.
- 

Light Weight: Allows for easy handling and insertion.
- 

Large Diameter Pipelines: Flexibility, seal design, and light weight makes FlexSleeve suitable for pipe up to 80” diameter.
- 

Long Distance Pipelines: Fast and easy sleeve installation. Normal weld times. Functions with internal pipe alignment clamps for automatic welding.



Field applied joint patches often fail due to poor surface preparation, improper environmental conditions, difficulty getting the coating pinhole-free over the weld penetration, uneven thickness, and general difficulty properly applying and inspecting hundreds of patches in cramped quarters.

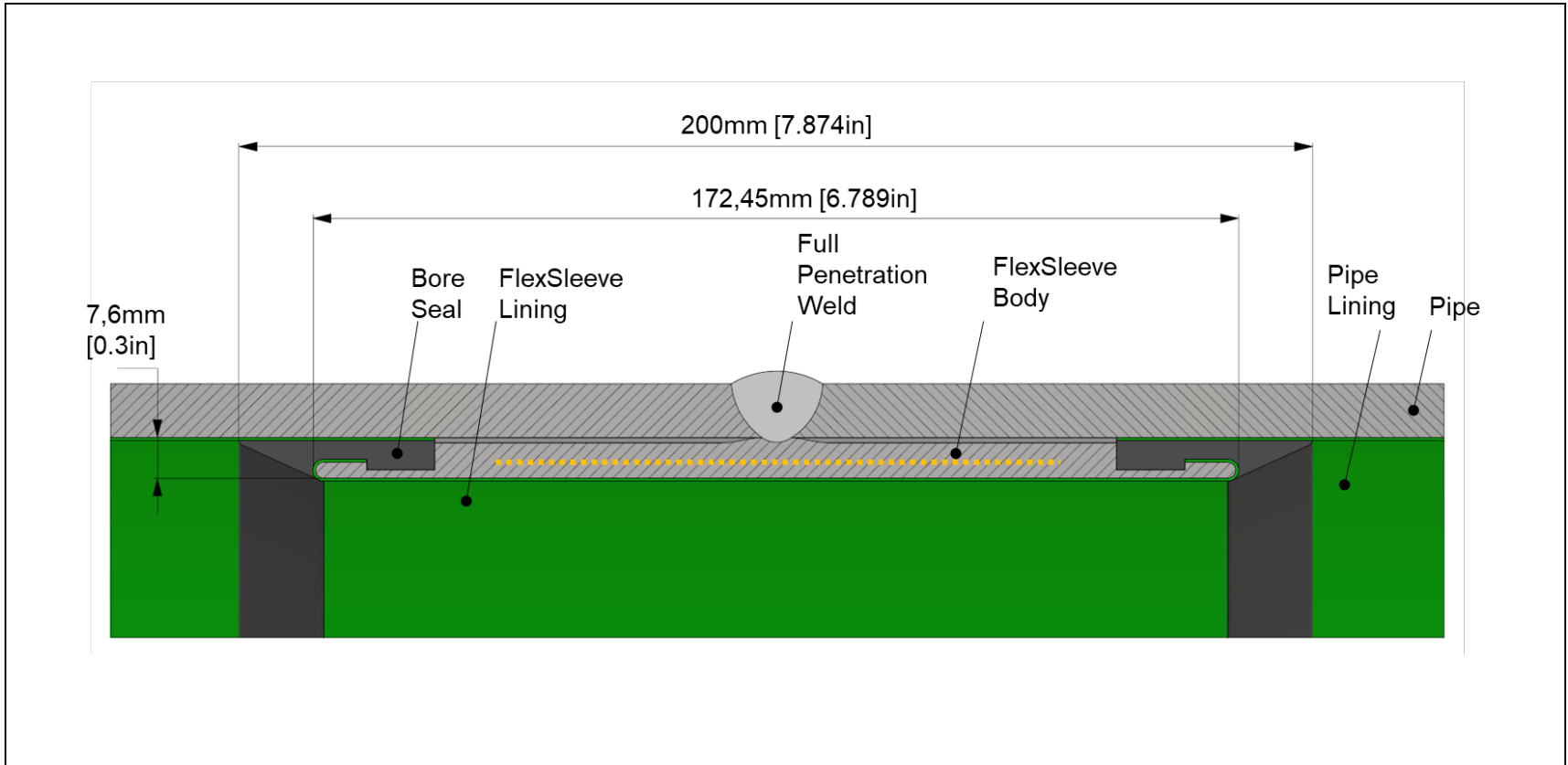
FlexSleeve's coating is applied and quality-controlled in a shop setting, allowing for repeatable joint protection quality.



Failed internal field joint coating – a common occurrence.

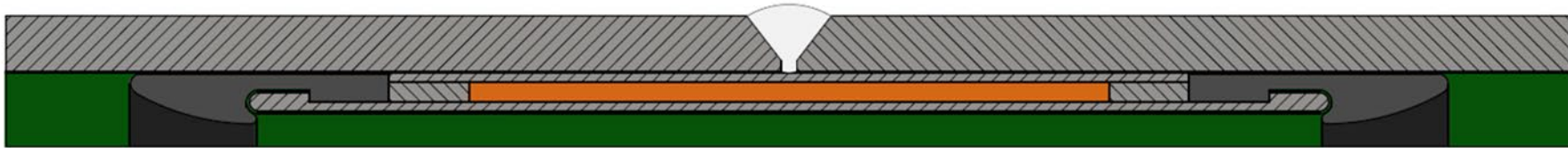


FlexSleeve coating is shop-applied and quality inspected before the welding even begins.

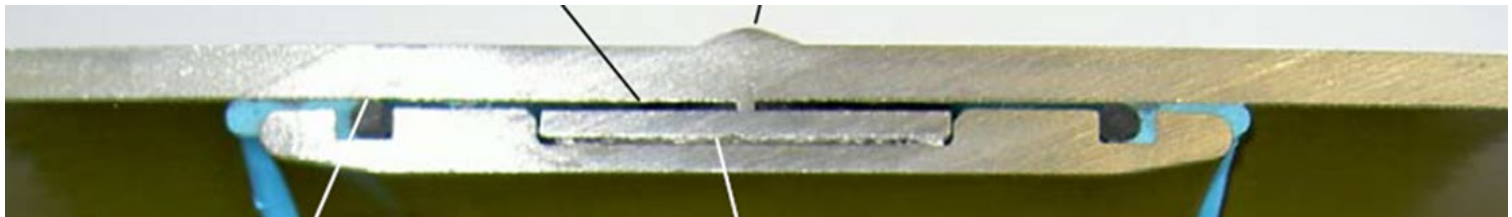


FlexSleeve allows the use of internal sleeves in large diameter pipelines due to its flexibility that conforms to pipe out-of-roundness.

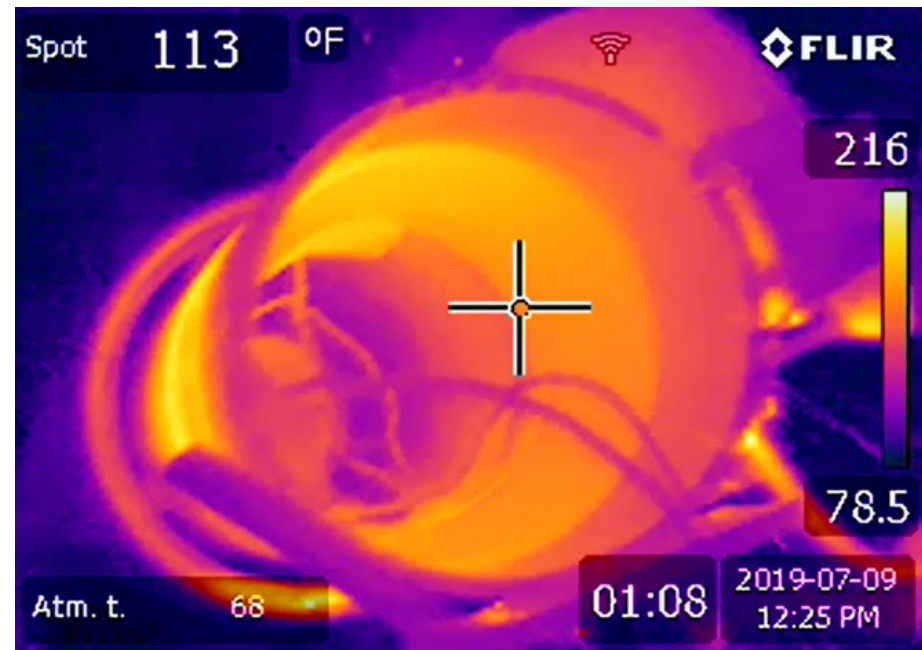
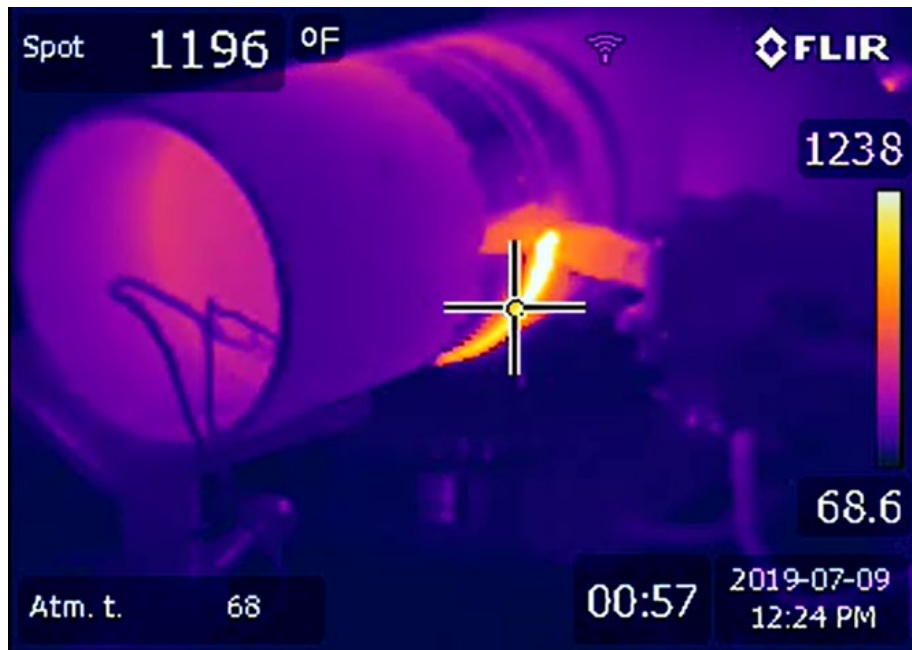
FlexSleeve®



Historical Sleeves (machined & rigid)



During welding sleeve temperature stays under dry heat temperature limit of sleeve coating material.

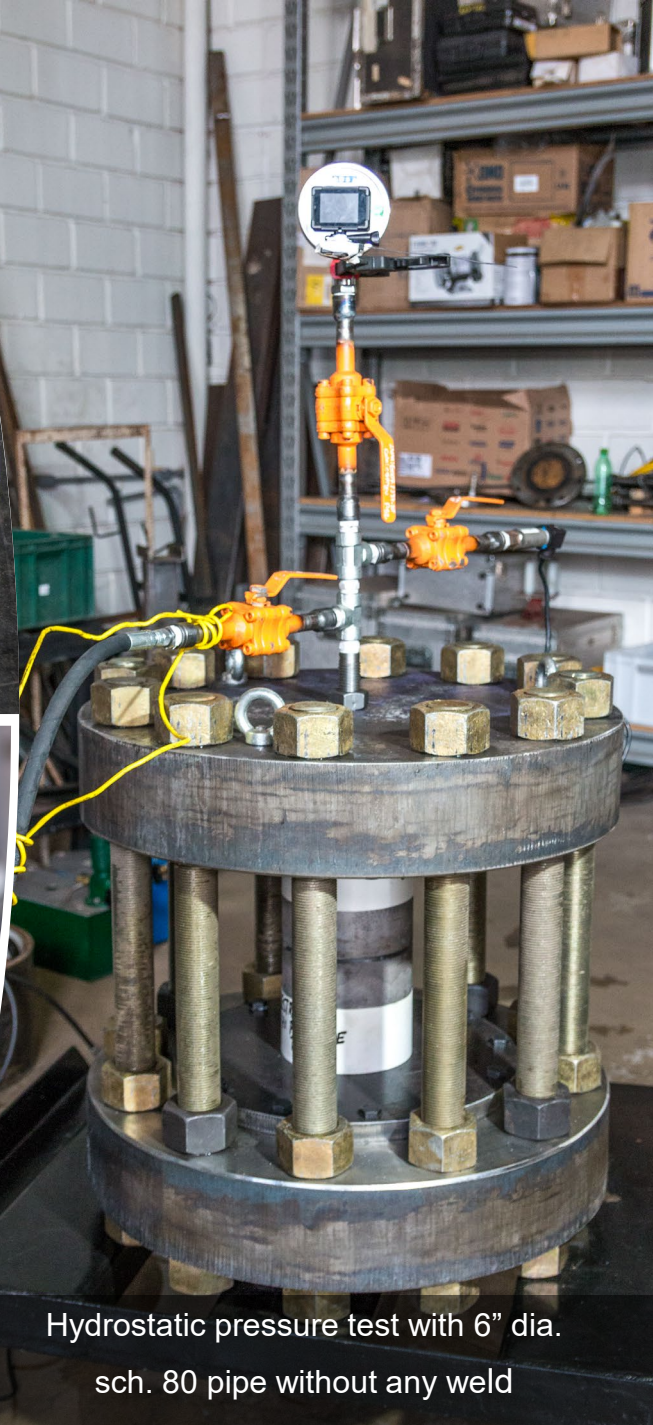


Infrared image of pipe exterior during welding

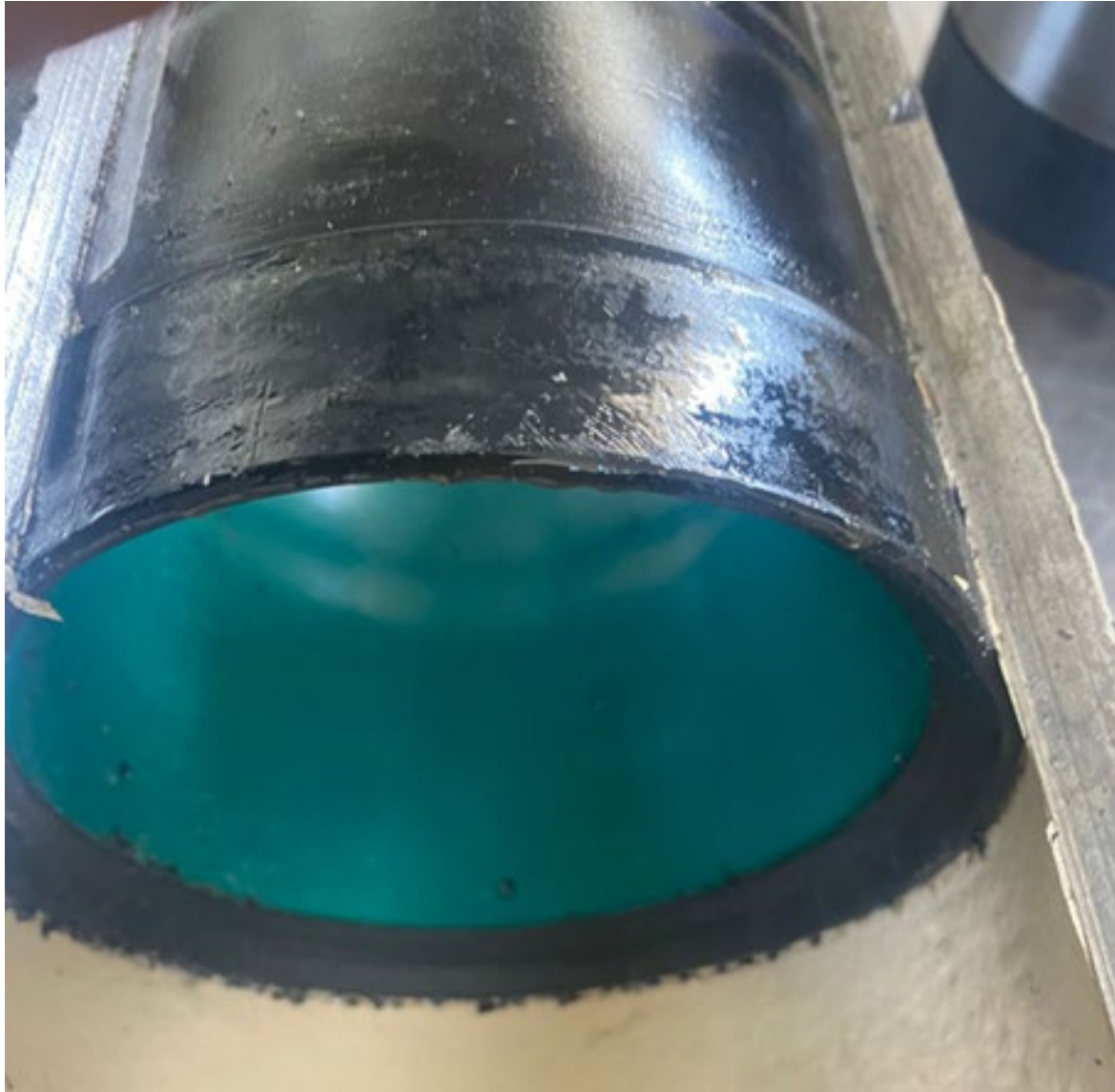
Infrared image of joint interior a moment later

The Seal Test

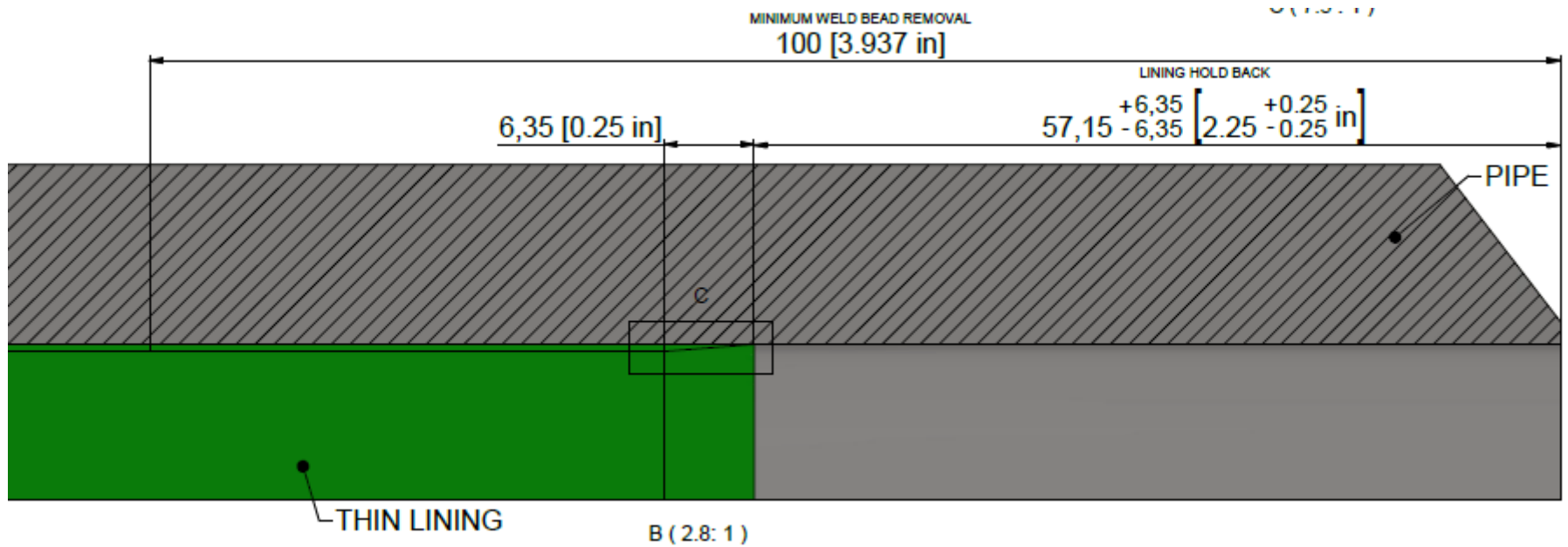
The pipe is charged to pressures exceeding 300 bar (4,350 psi) without any weld at all.



Hydrostatic pressure test with 6" dia. sch. 80 pipe without any weld



Pipe End Preparation



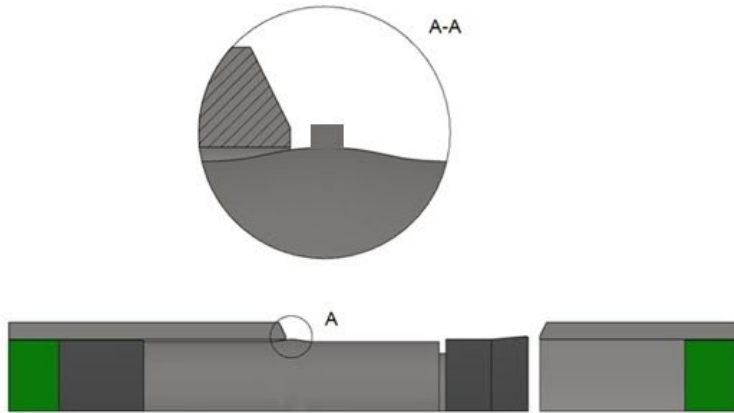


- FlexSleeve fits into factory pipe ends within diameter and out-of-roundness tolerance ranges per API 5L PSL 2.
- Pipe mill measurements to be supplied to LPS to determine actual pipe ID range.
- LPS may provide additional bore seal sizes if measured pipe ends are on the extreme ends of the ID tolerance range.

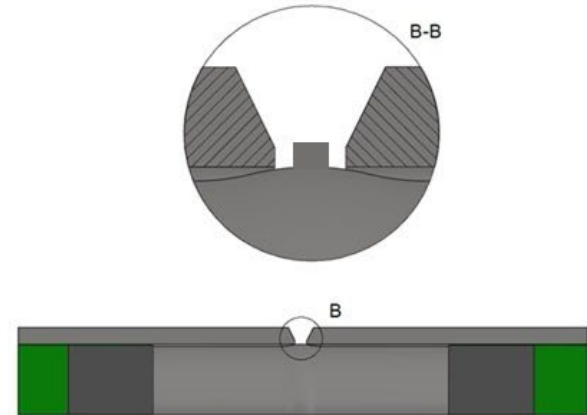


Welding with V-Bevel

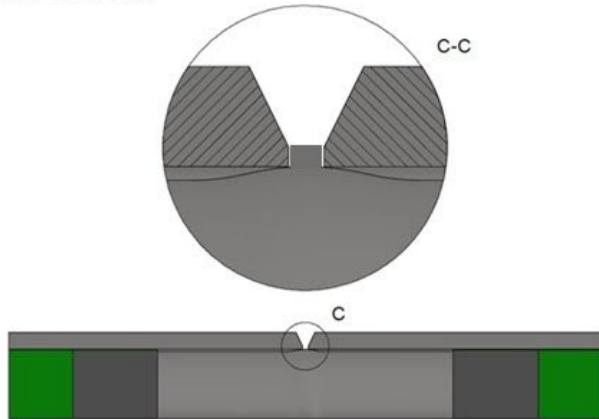
1. FLEXSLEEVE INSERTION INTO PIPE #1



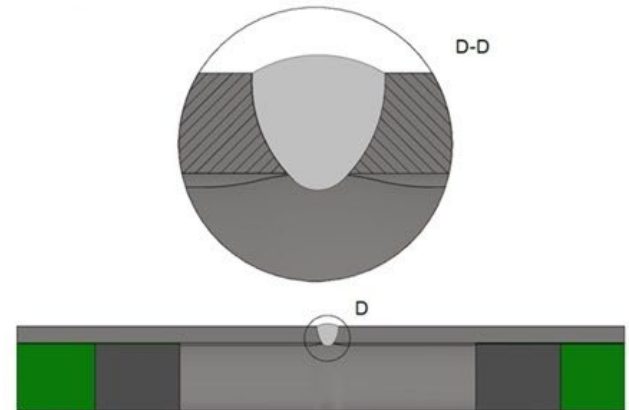
2. PIPE #2 ALIGNMENT OVER FLEXSLEEVE



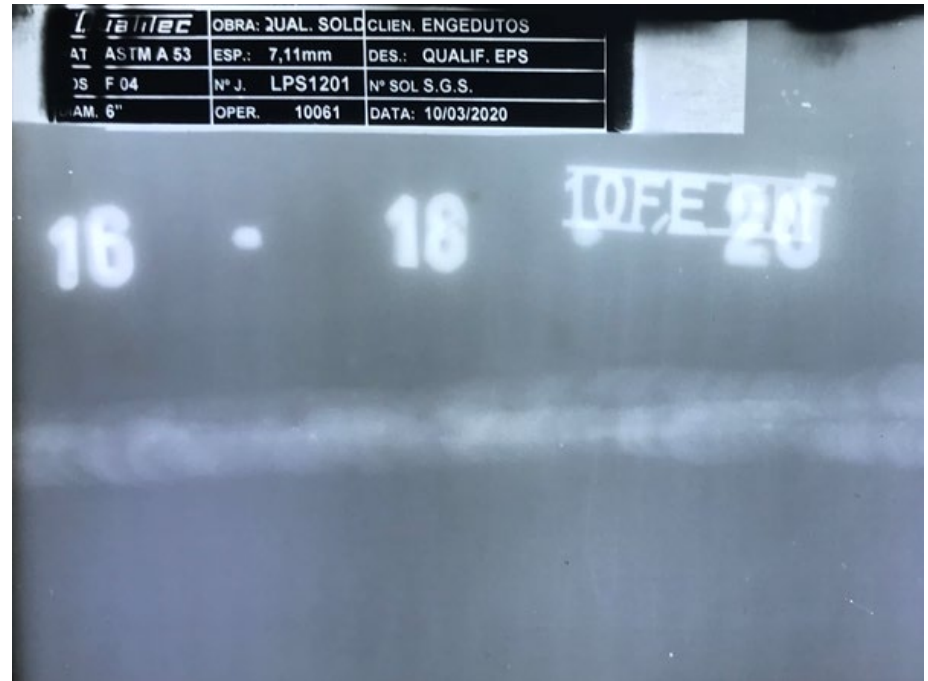
3. SET WELD GAP



4. GIRTH WELD

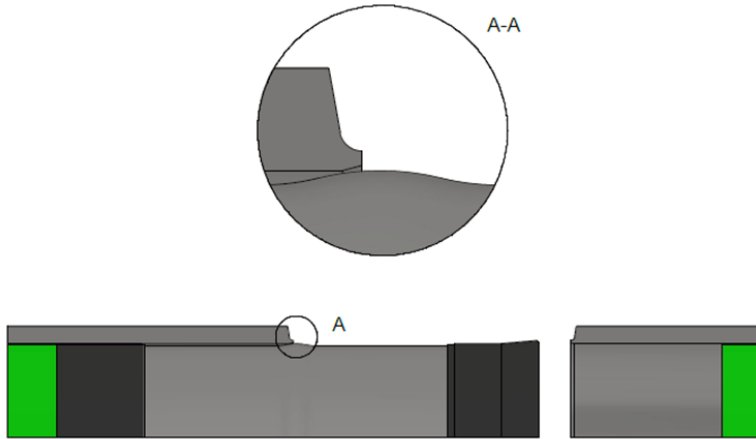


- Full penetration butt welds per API, ASME, and AWWA codes.
- FlexSleeve serves as backing ring for faster & high quality root pass.
- AUT, MUT, and RT examinations performed on completed welds are consistently approved by independent labs and inspectors.

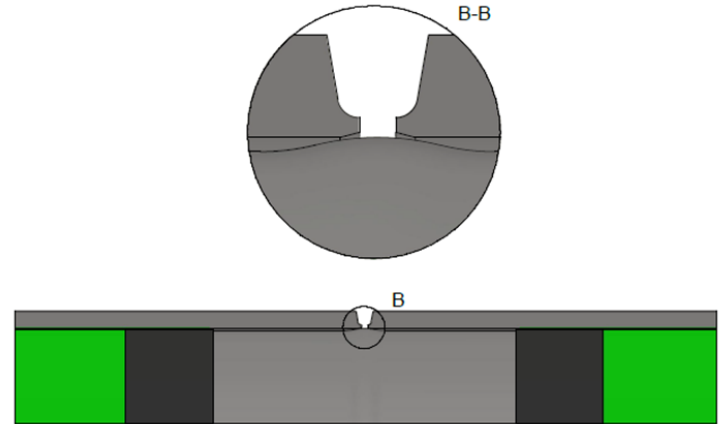


Automatic Welding with J-Bevel

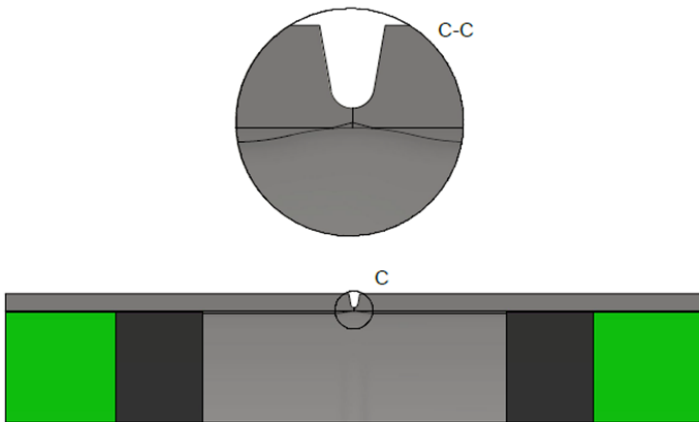
1. FLEXSLEEVE INSERTION INTO PIPE #1



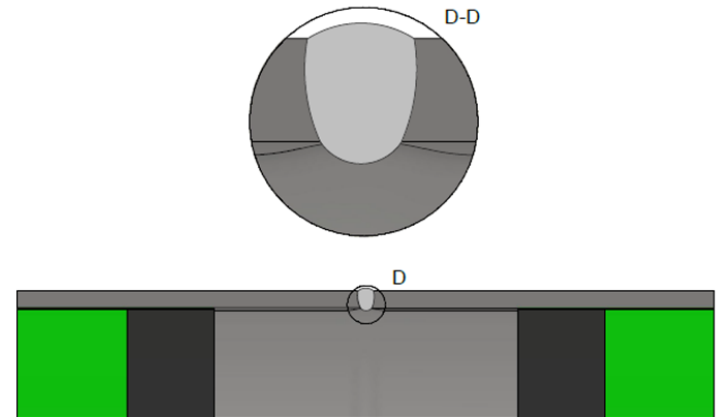
2. PIPE #2 ALIGNMENT OVER FLEXSLEEVE



3. FLEXSLEEVE HUMP DEFLECTION

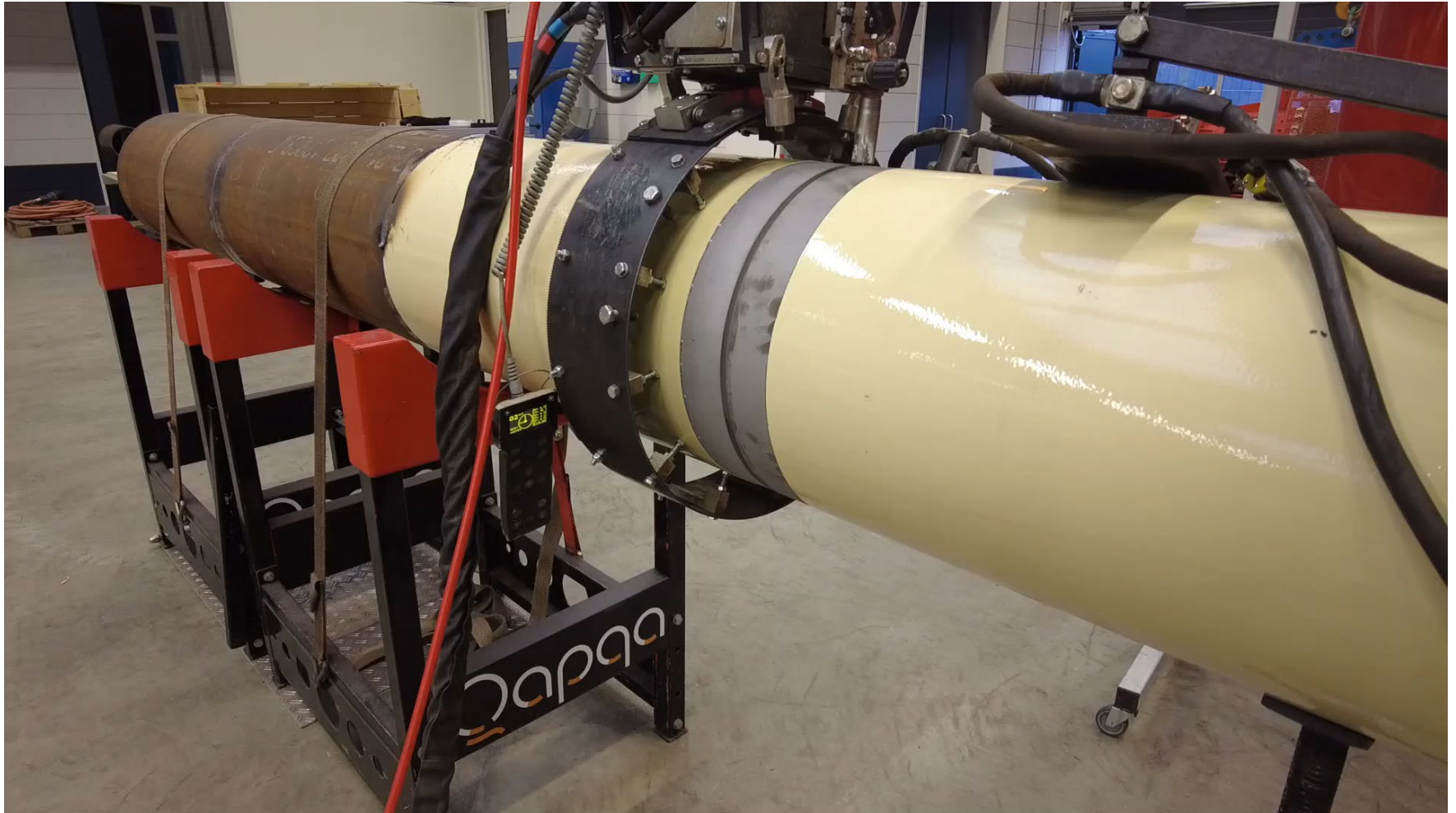


4. GIRTH WELD



FlexSleeve Inserted with ILUC

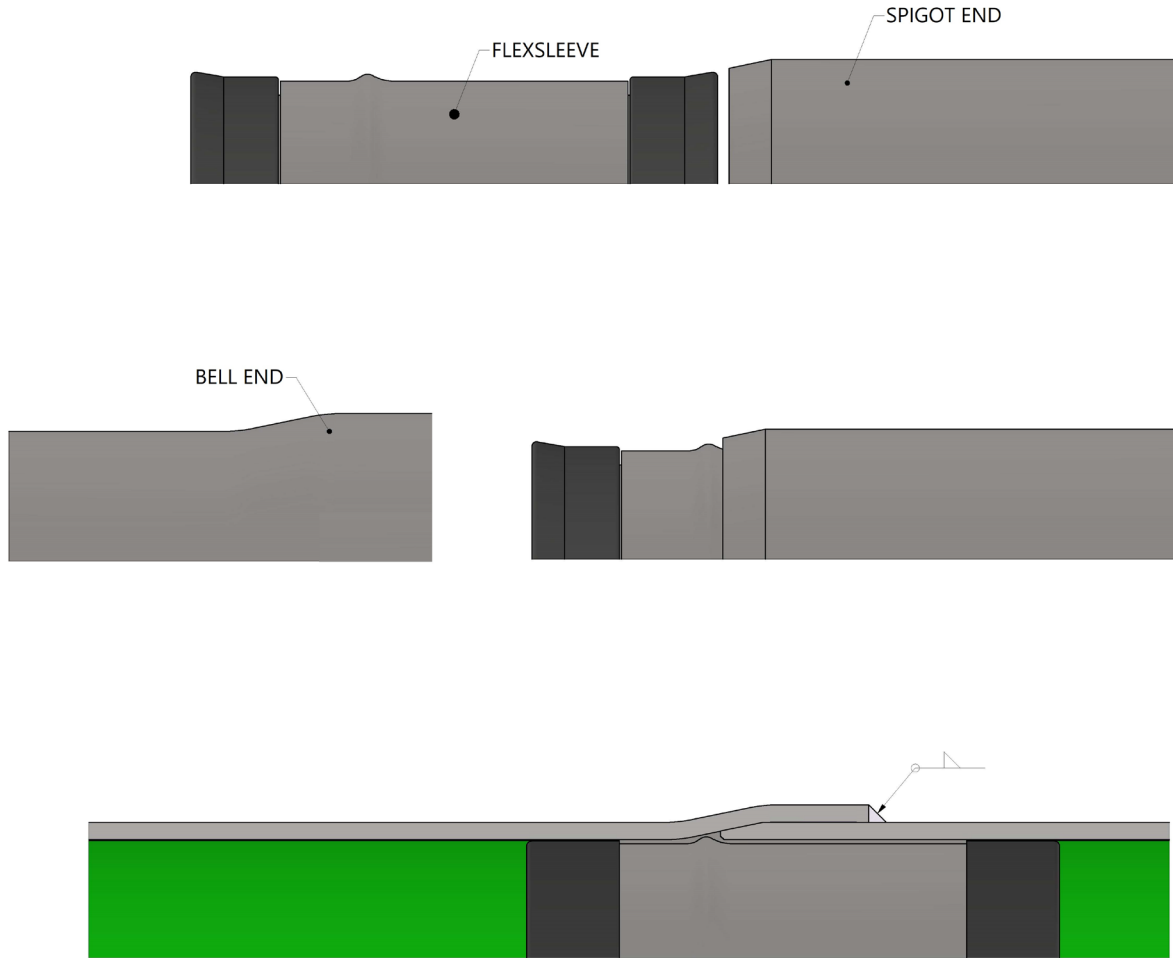








FlexSleeve® for Bell & Spigot Joints



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- 28" día. X 92km water line, spiral welded
- Epoxy lined
- COPASA Water Agency, Brazil
- Installed August – December 2021
- On-budget, on-schedule, hydrotested & in-service with no problems
- 2022 INOVAINFRA Construction Innovation Award (Brazil)



FLEXSLEEVE™ WELDED JOINTS FOR STEEL WATER PIPELINES



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