TREMCO PIPELINE EQUIPMENT

PETROSLEEVE® Repair Technology

PETROSLEEVE

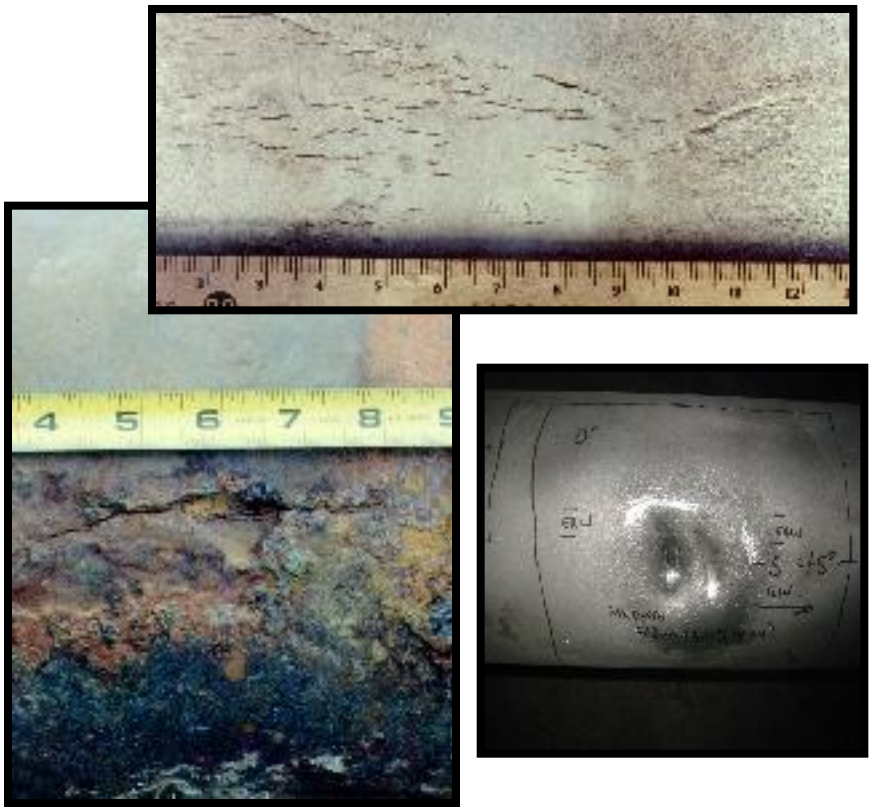
"Permanently repair pipe defects in 1 hour without welding to the pipeline or interrupting operations"

WHAT IS A PETROSLEEVE?

- Innovative Pipe Line Repair Technique
- Only Repair Technique that “Compresses” the Underlying Pipe
- No Welding To The Pipe Required

WHERE HAS IT BEEN USED?

- USA, Canada, Australia, France, Mexico, Dominican Republic and Papua New Guinea
- As of 2019 over 30,000 installations have been completed without a reported failure.
- Variety of Pipeline Owners
- Sizes ranging from 3" to 48"
- Gas, NGL, Oil, Sour Gas
- Corrosion, Cracks, Dents, Arc Burns



COST SAVINGS TO OWNERS

"Platte saved significant dollars by avoiding the time and expenses associated with nitrogen purges and pipe cutouts"*

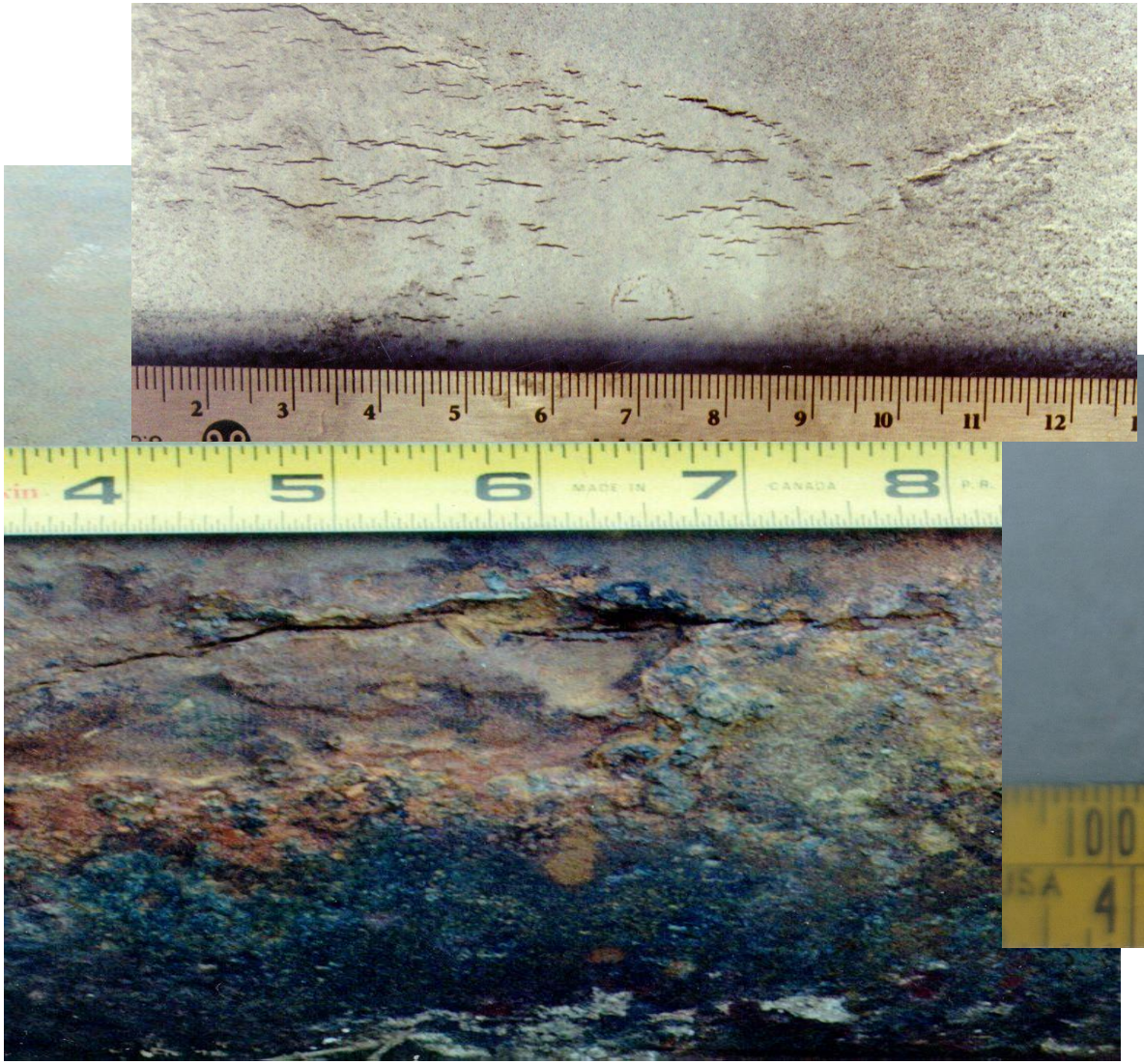
* 52nd Annual Pipeline Conference
San Antonia, Texas

COST SAVINGS TO OWNERS

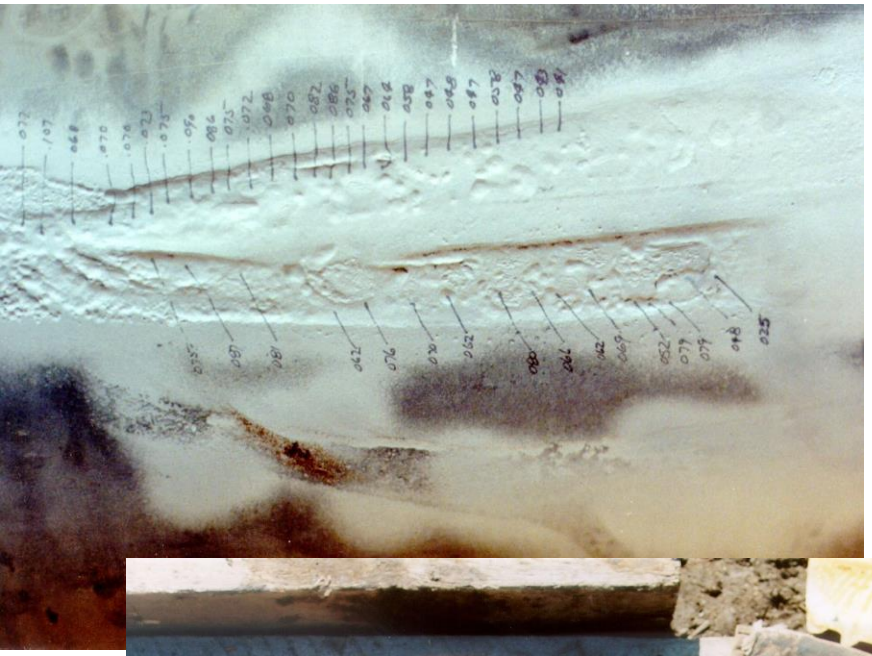
- One NPS 36 sleeve installation saved a large diameter pipeline operator millions in shut-down & repair costs

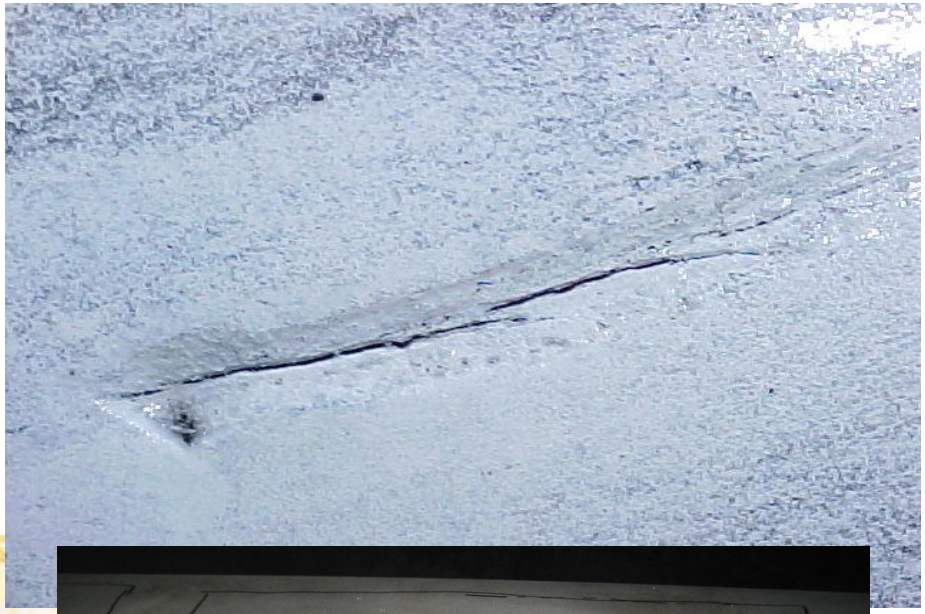
  * August, 2001

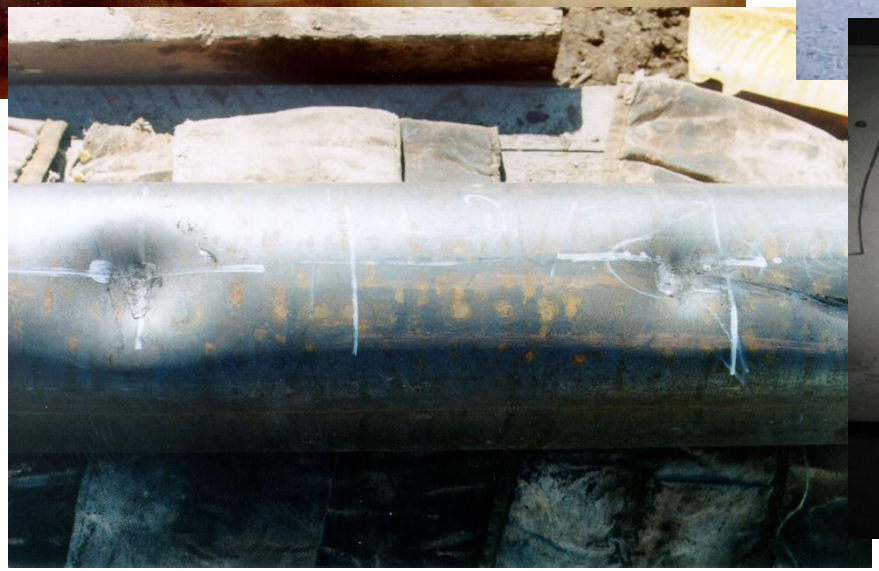
TYPICAL DEFECTS REPAIRED

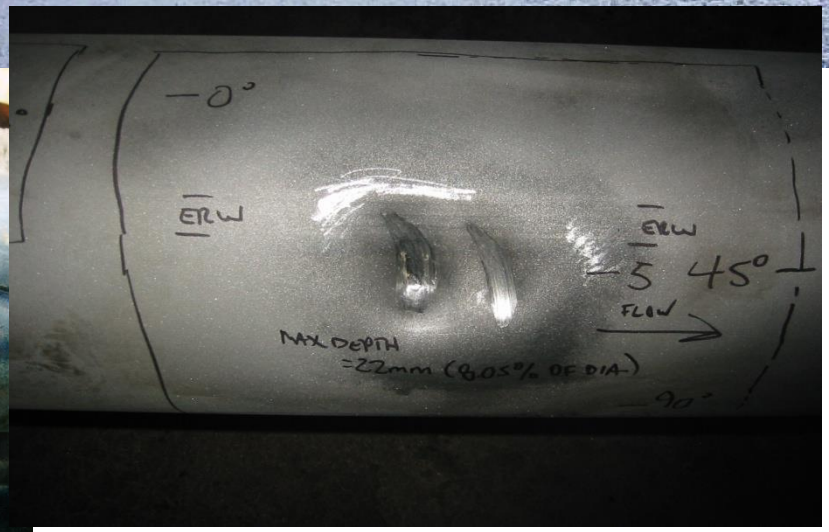


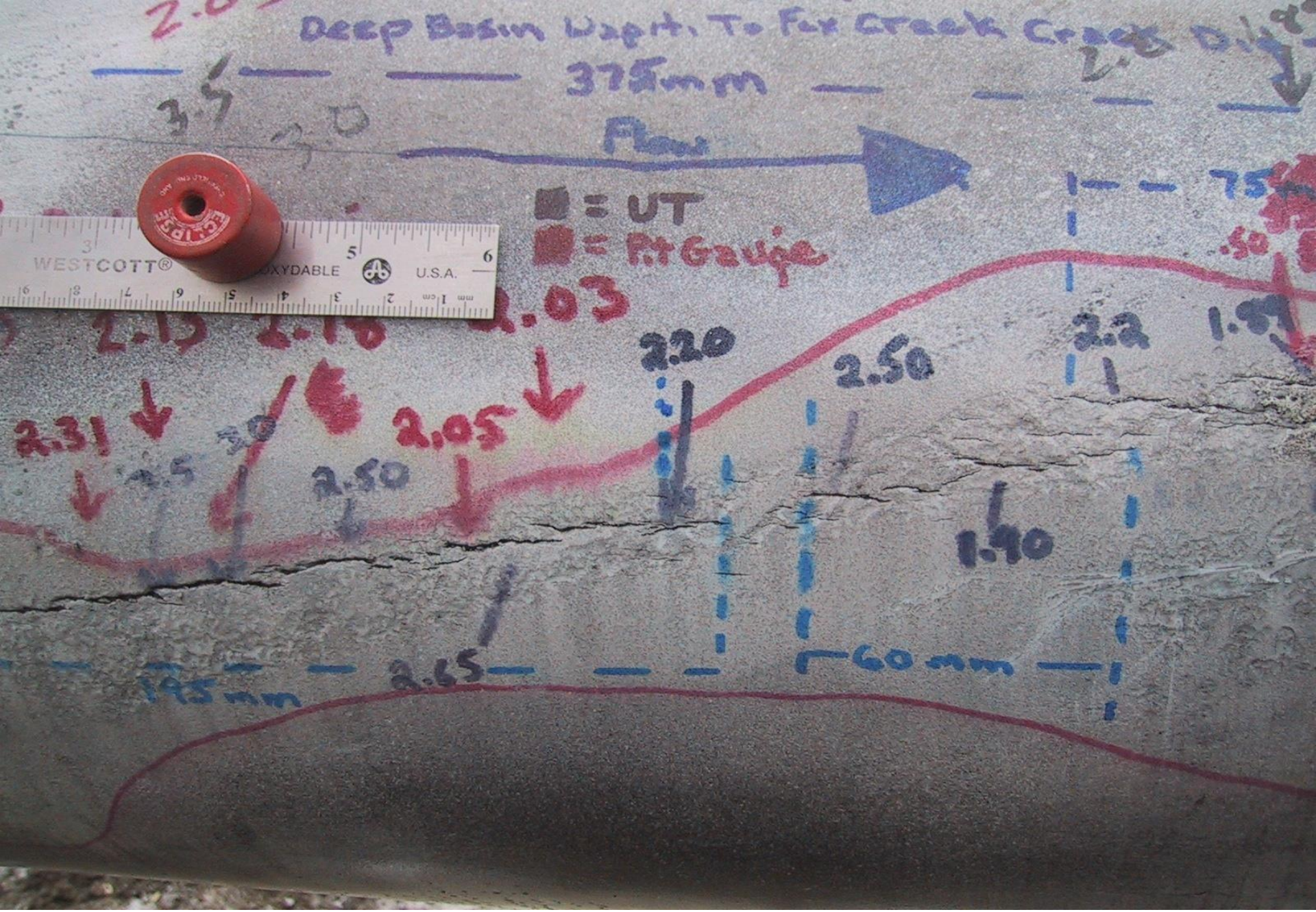
TYPICAL DEFECTS REPAIRED





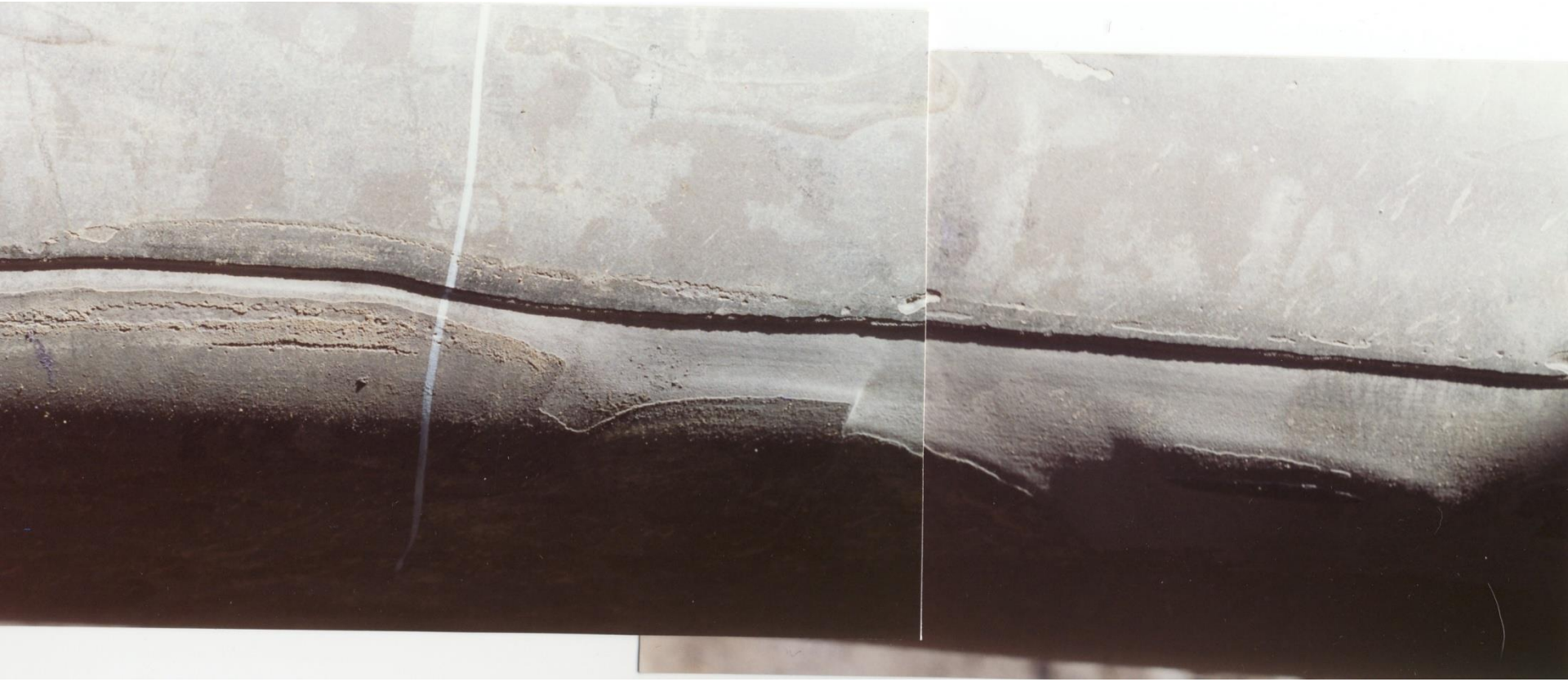





Deep Basin Depth To For Creek
375mm
Flow
= UT
= Pit Gauge
WESTCOTT®
U.S.A.
2.13
2.03
2.31
2.05
2.50
2.20
2.50
2.2
1.90
195 mm
2.65
60 mm

SCC


0.4m
0.3m
0.2m




WELD
FILL
SCARRING

PETROSLEEVES COVERING COMPLETE JOINT

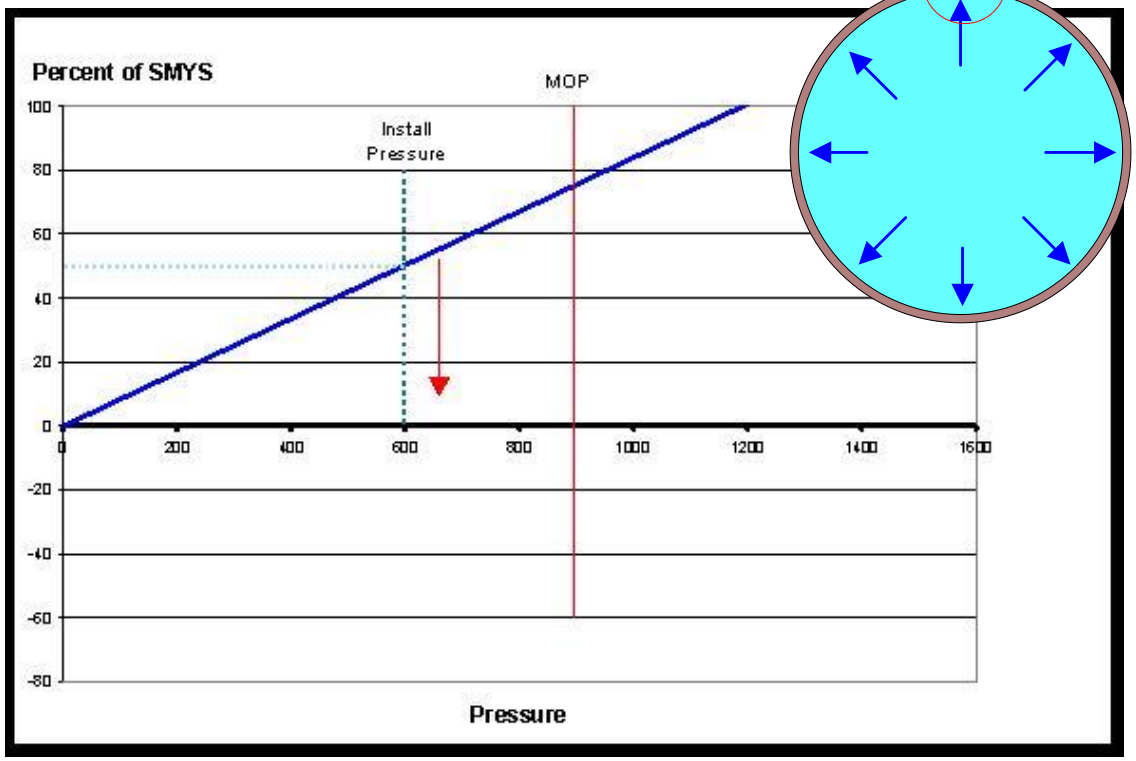
STEEL REINFORCEMENT SYSTEM

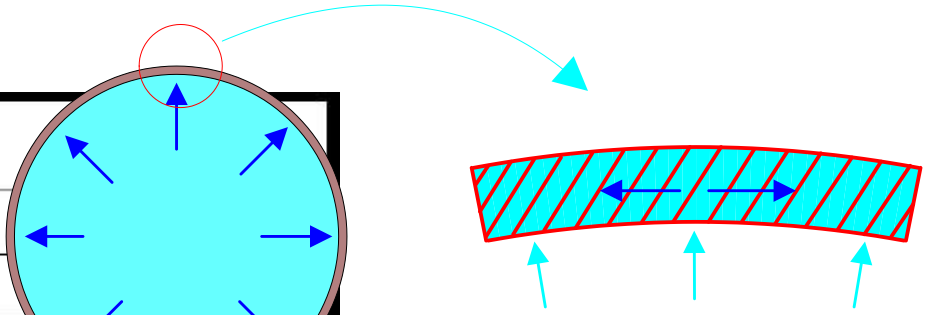
- Permanent Repair for Pipeline Defects
- Designed to be Installed without Interrupting Pipeline Service
- Designed to be Installed with **NO** Welding to the Carrier Pipe

ENGINEERING DESIGN

Compression has been used as an age old Engineering Solution

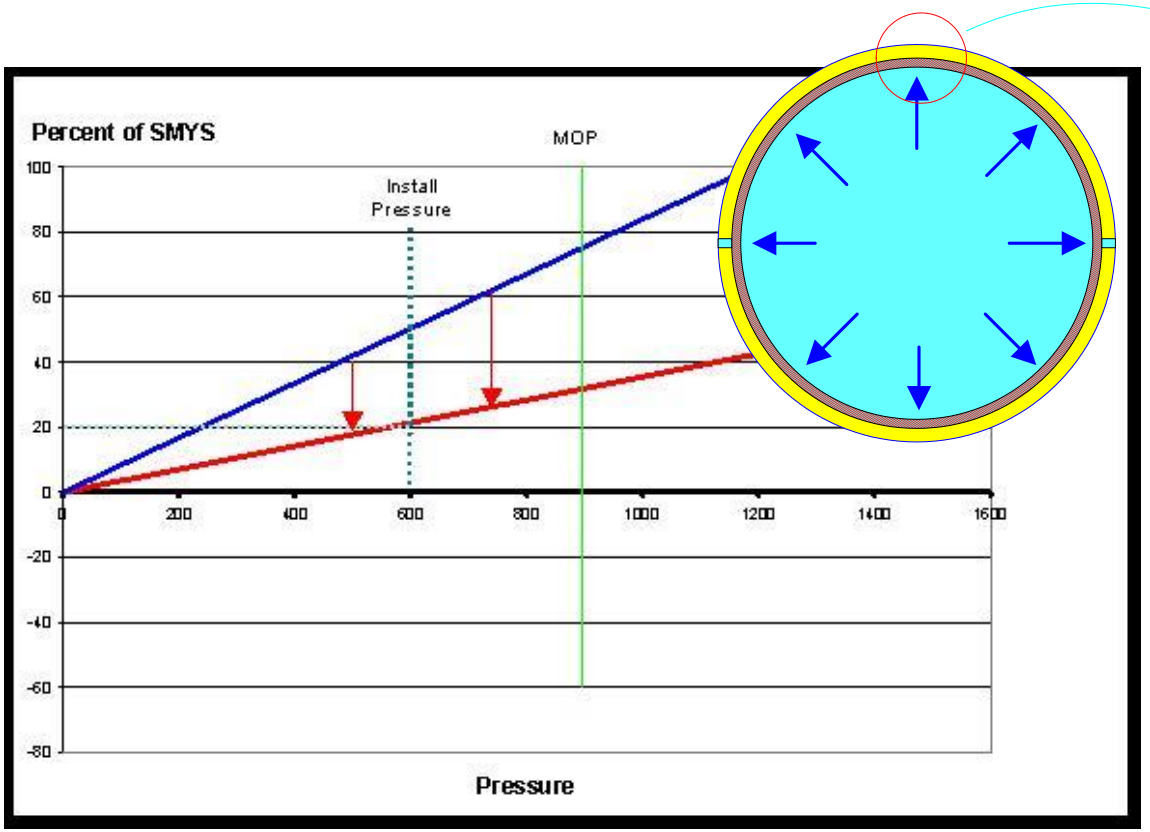
ENGINEERING DESIGN

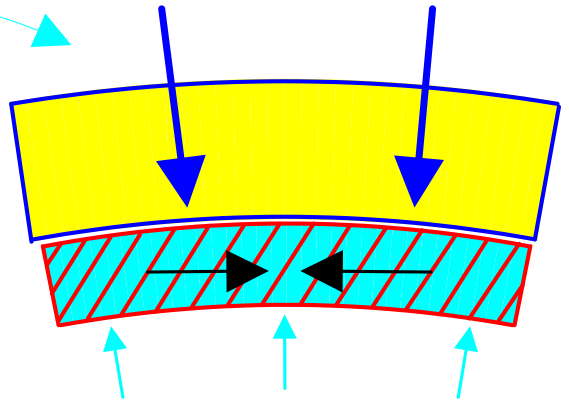




Operating Pipeline Stress Condition

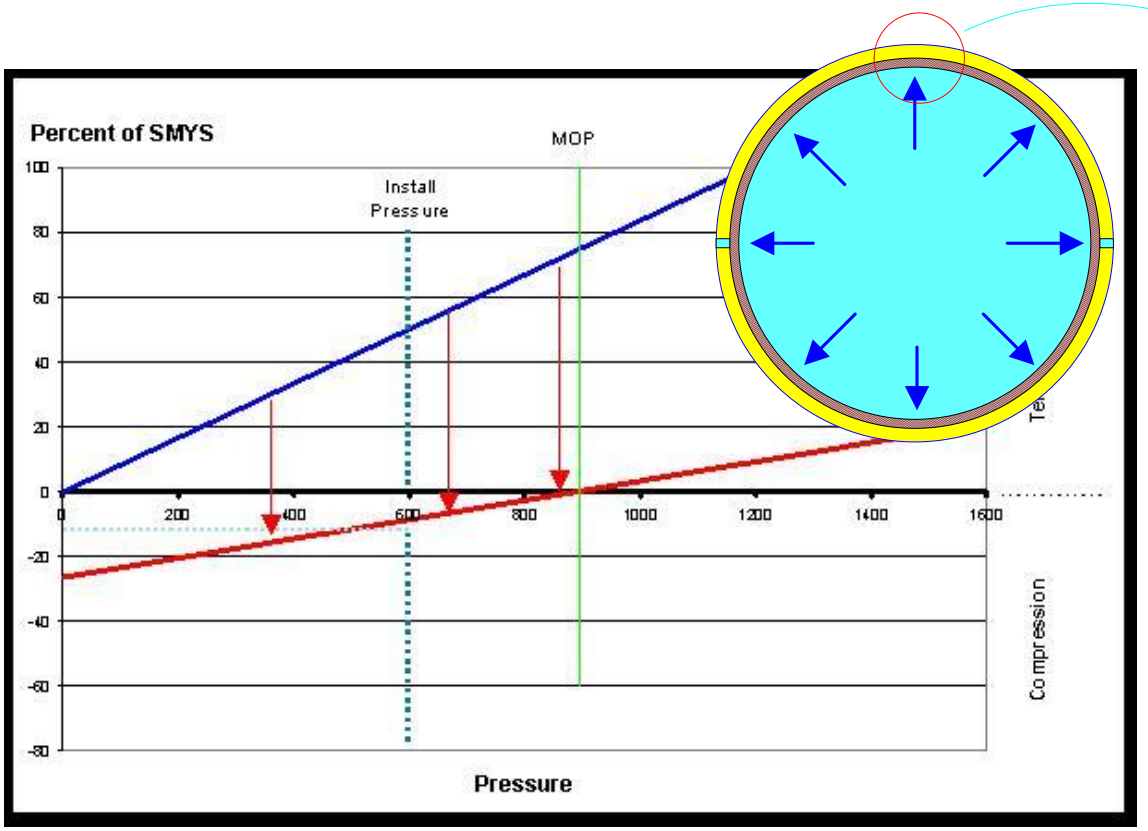
ENGINEERING DESIGN

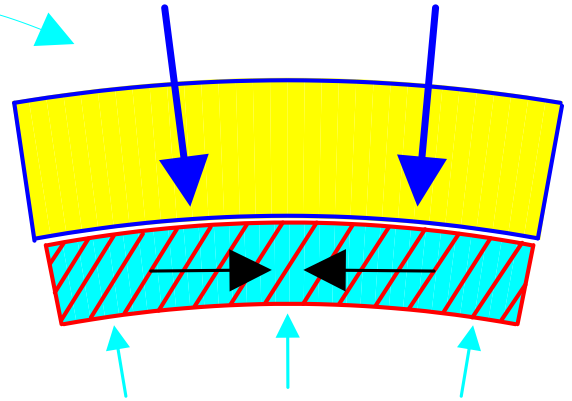




Forces are required to overcome pipe operating expansion

ENGINEERING DESIGN





Installation can achieve full compression throughout all operating ranges

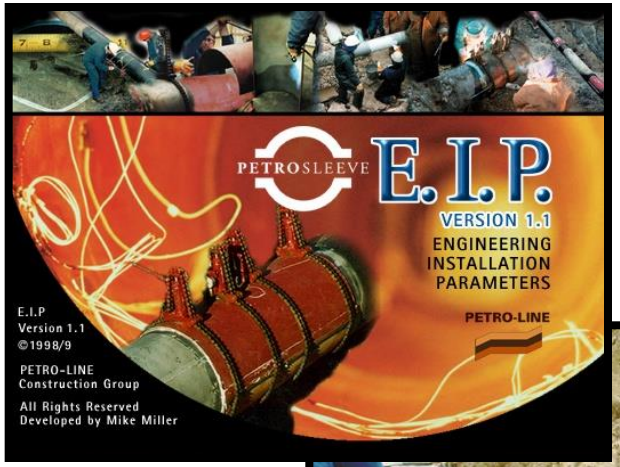
Pipe Stress (red line) after Sleeve Installation (Stress Concentrating Defect)

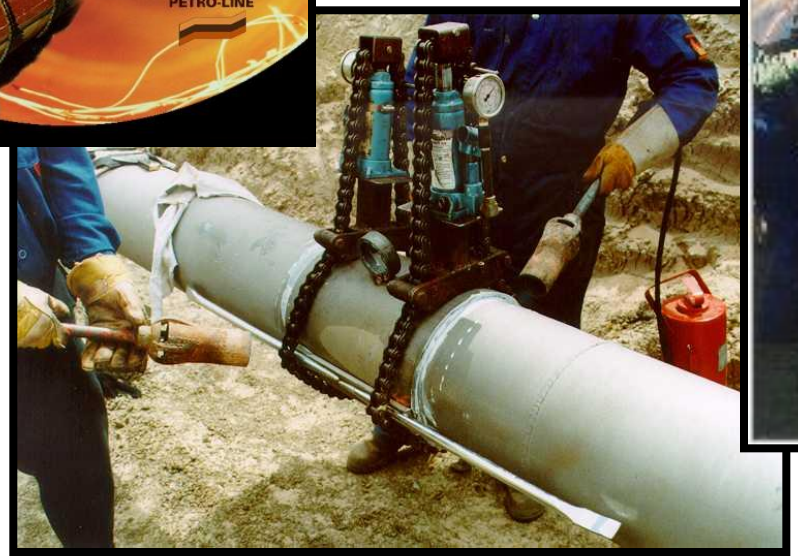
INSTALLATON – 30 T0 48 INCH

- Application of Epoxy

- Assembly

CALCULATED HEATING





WELDING

COMPLETED SLEEVE INSTALLS

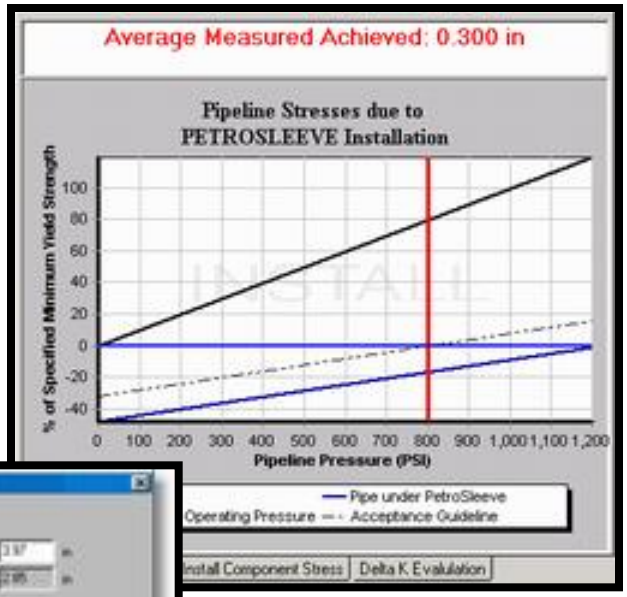
1 hour

Installation time

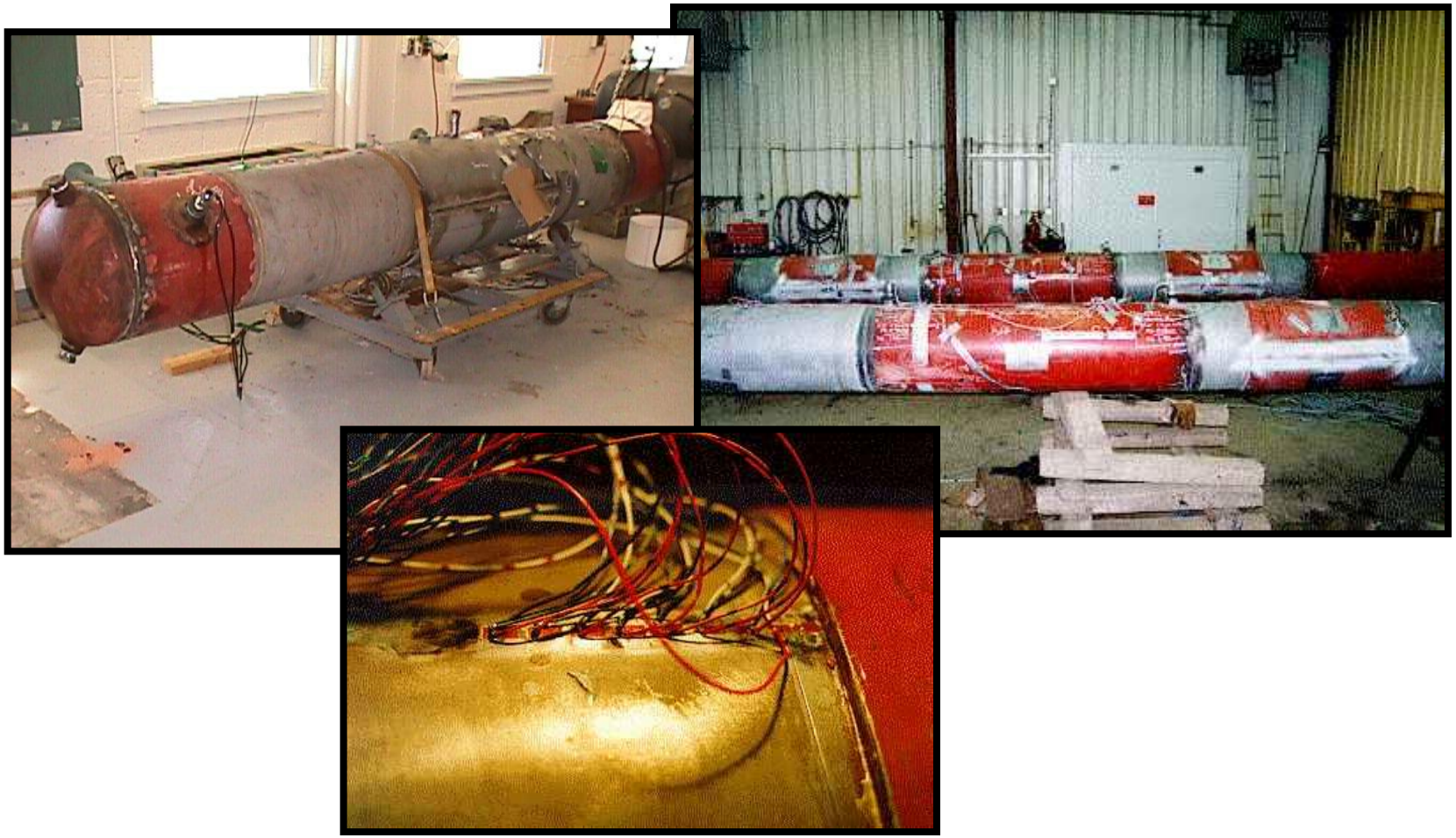
3 OF 42” SLEEVES

36 INCH SLEEVES INSTALLED IN TEXAS
August 2014

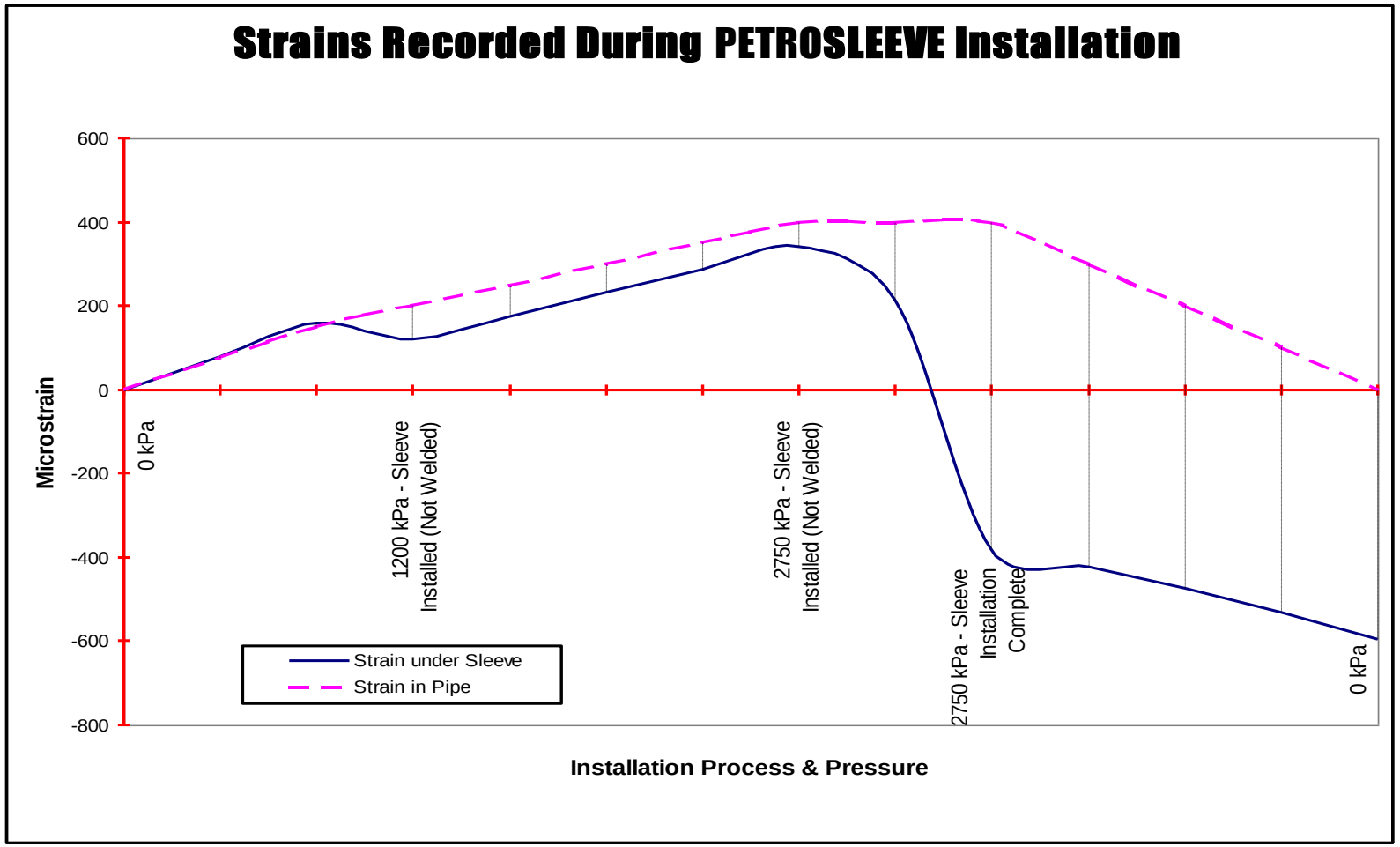
QUALITY CONTROL



RIGOROUSLY TESTED

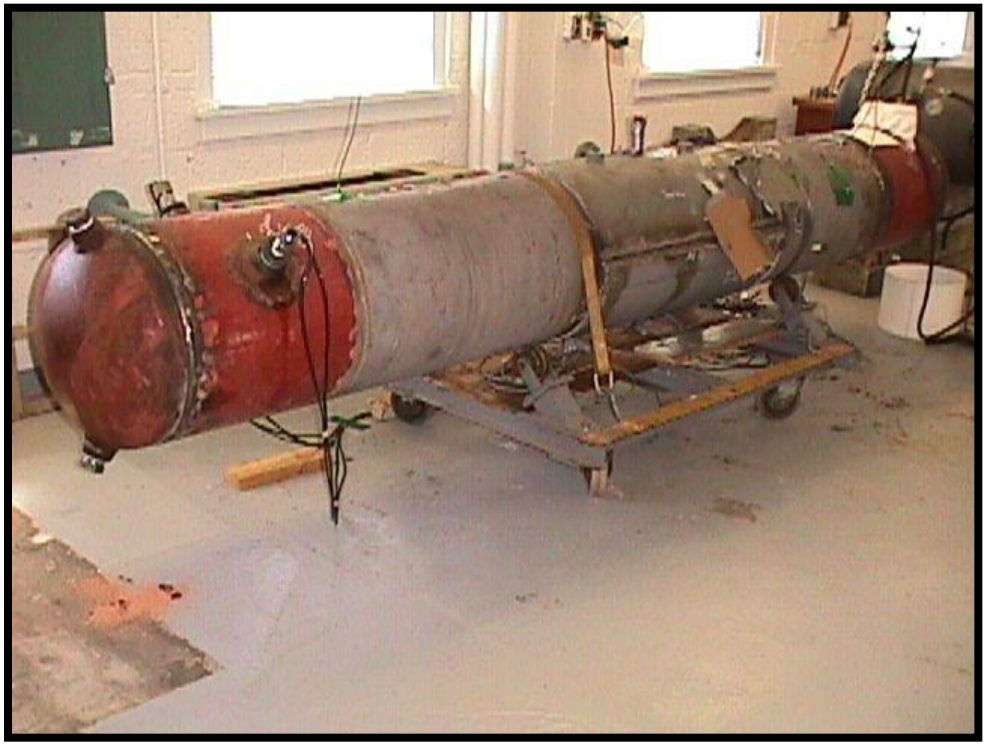


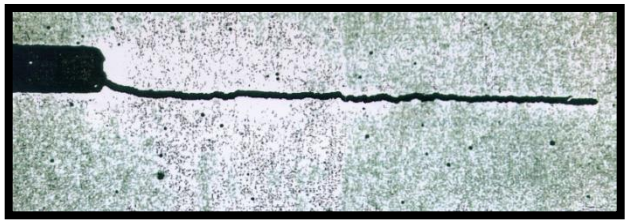
STRAIN ANALYSIS – DURING INSTALL

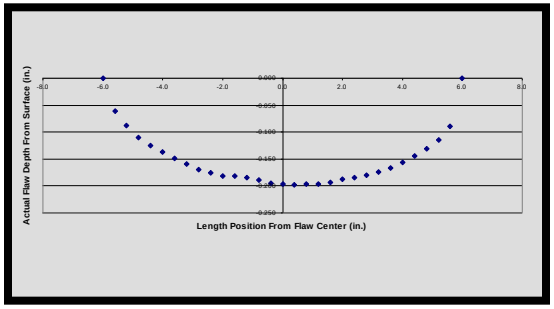


CYCLIC TESTING

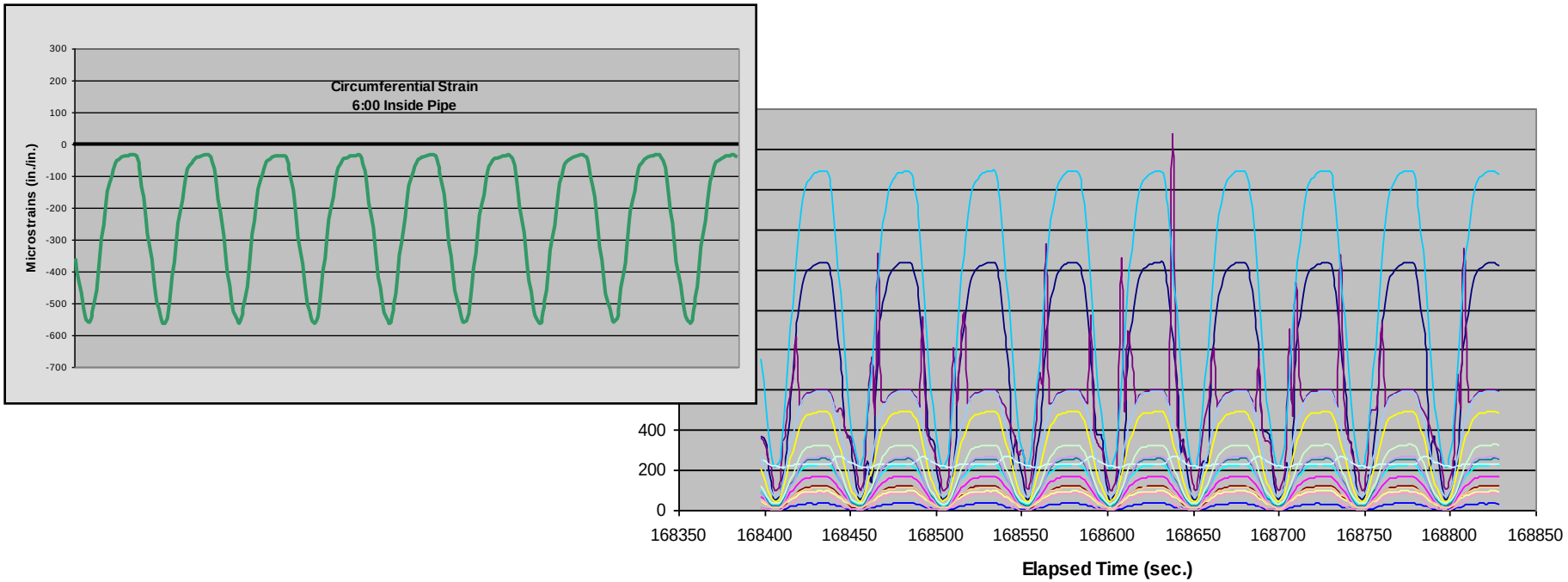
- 36,500 Cycles (2 Tests)







PRESSURE CYCLING RESULTS



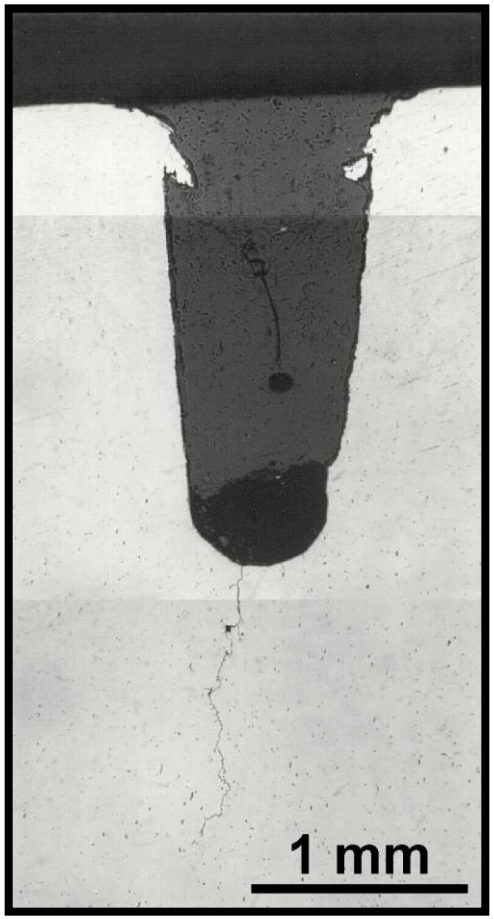
Strains Inside Pipe Under Sleeve at 6:00 Position

- 36,500 Cycles
- 100 psig to 1168 psig

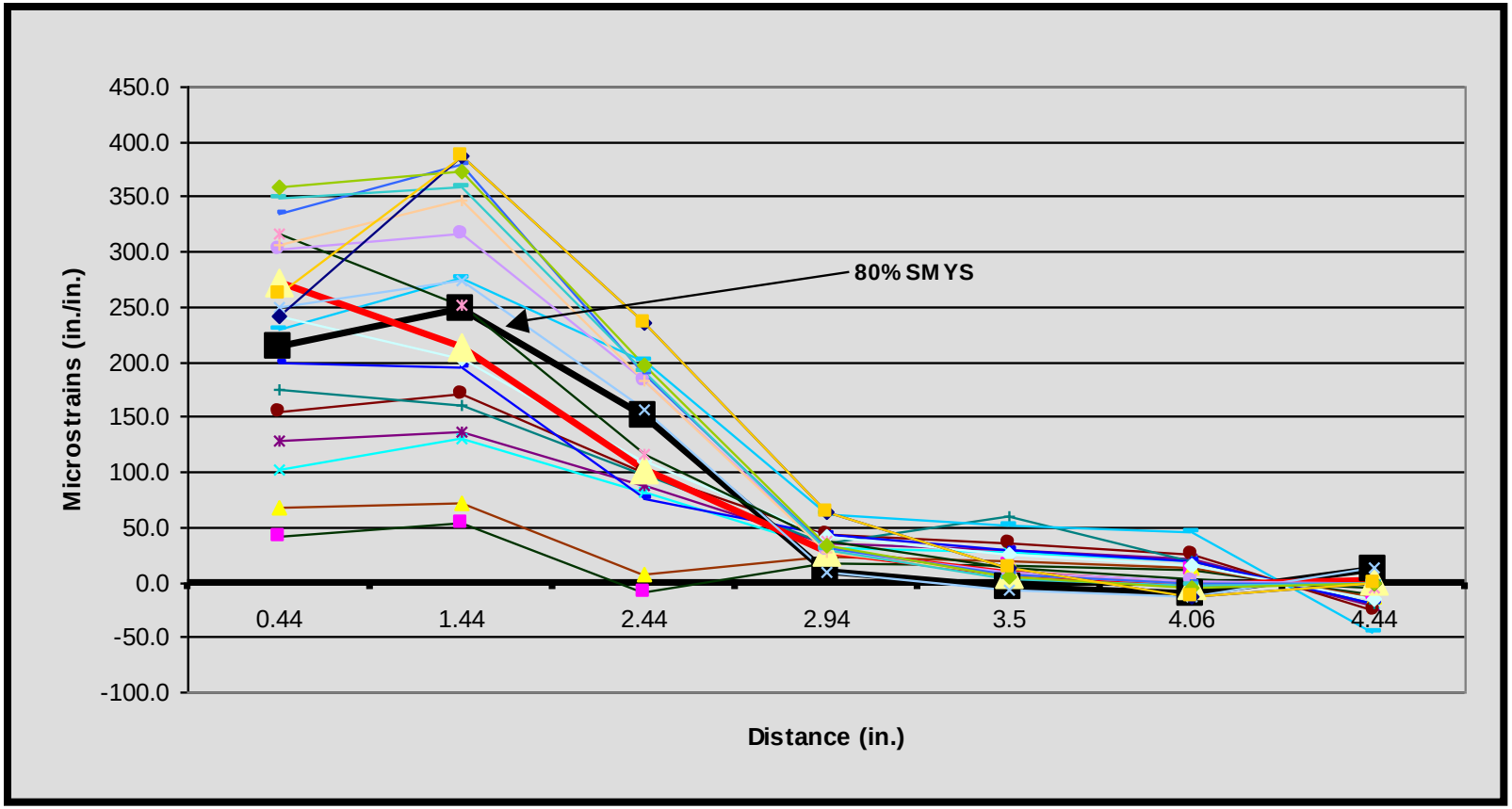
PRESSURE CYCLING RESULTS

Post Metallurgical Exam

NO GROWTH



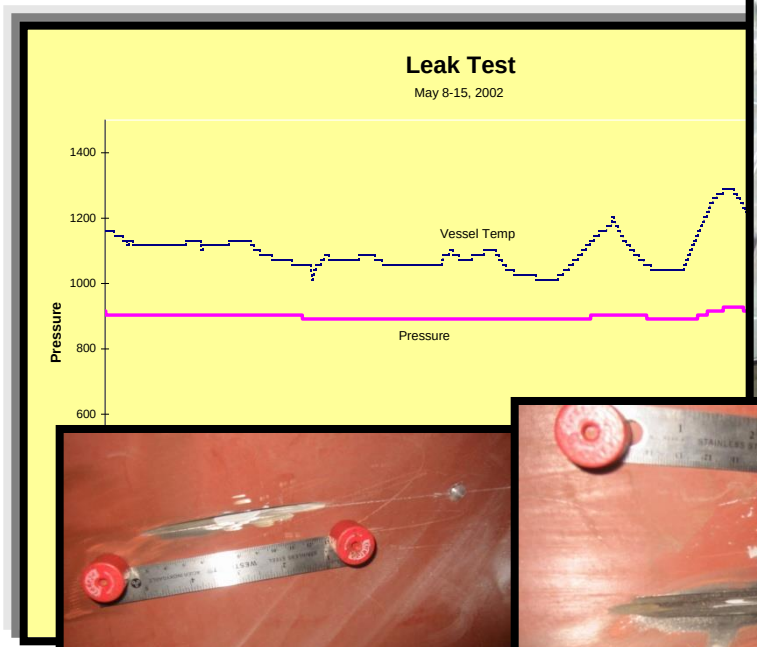
EDGE EFFECTS

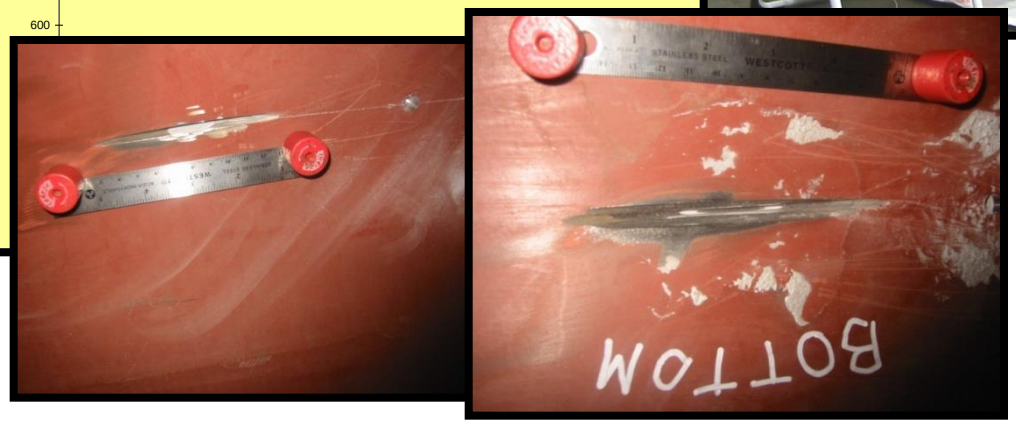


LONG TERM CONTAINMENT TESTING

OBJECTIVES:

- 4 through-wall defects,
- Long Term Pressure Test

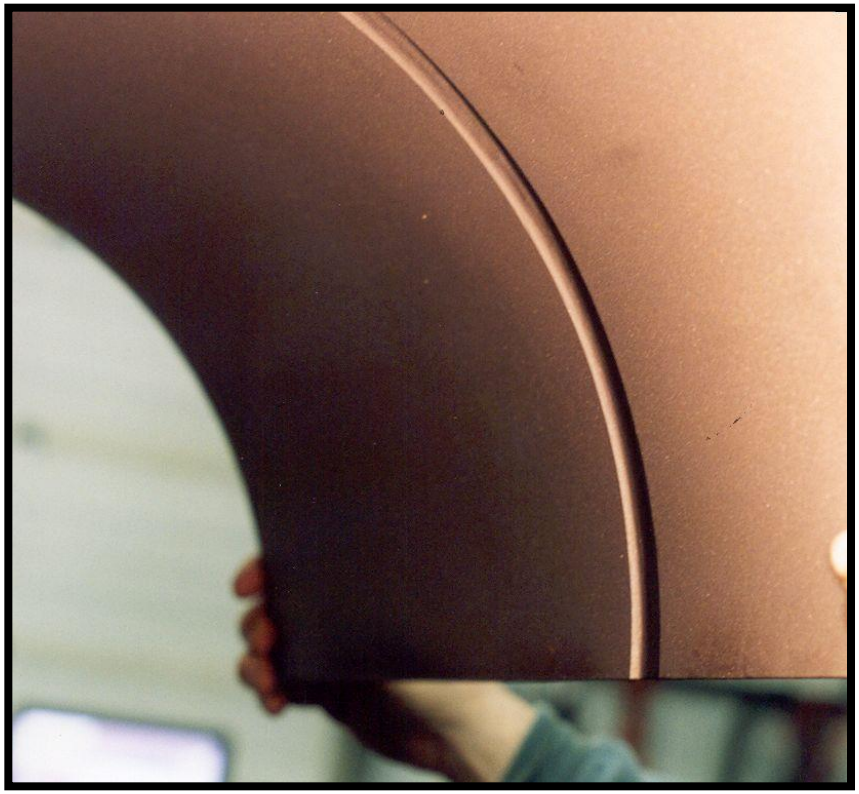




RESULTS – TO DATE:

- Initiated January 2002
- 4 through-wall defects
- No Leaks observed

INSTALLATION OVER GIRTH WELDS



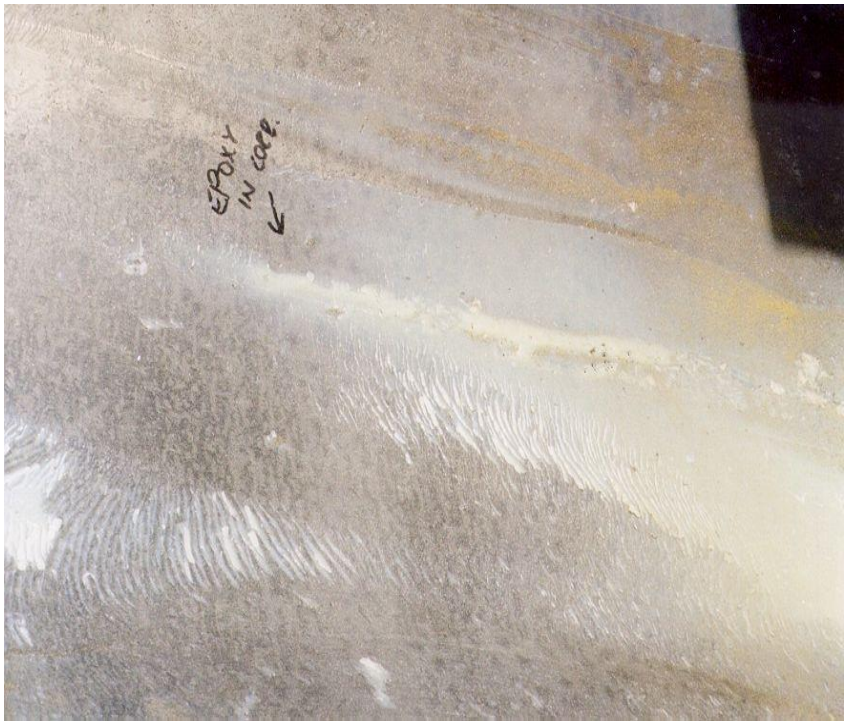
- Grooved Sleeve for Installation over Girth Weld

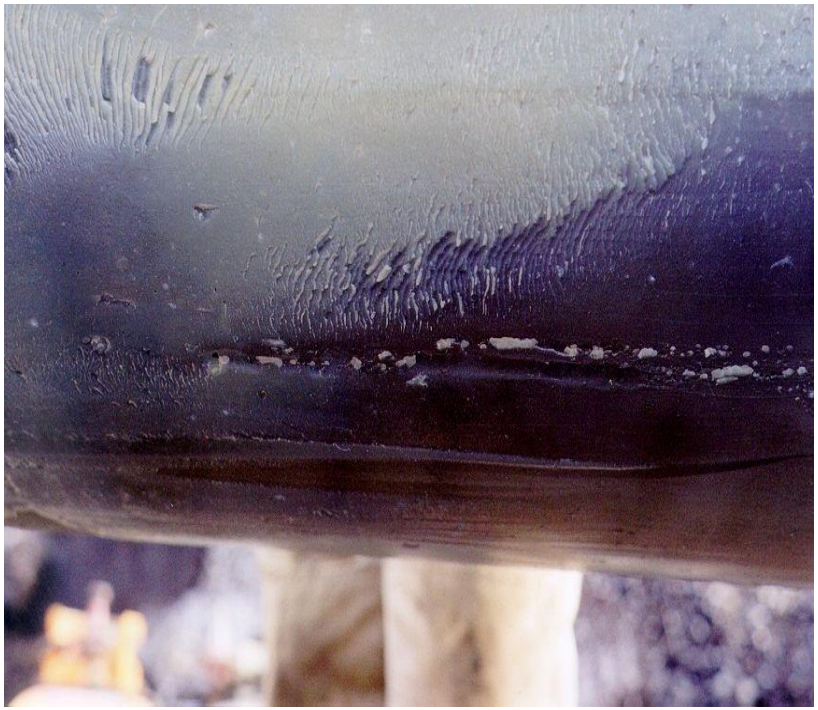
INSTALLATION OVER LONG SEAMS

- Spiral Seam Ground on 42” Pipe for Sleeve Installation

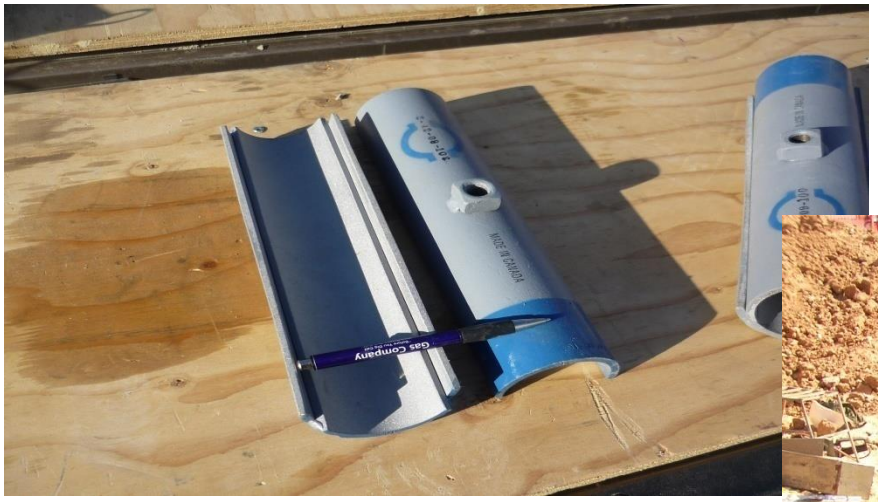
- Machined Groove in Sleeve for Protruding LongSeam

SLEEVE REMOVAL



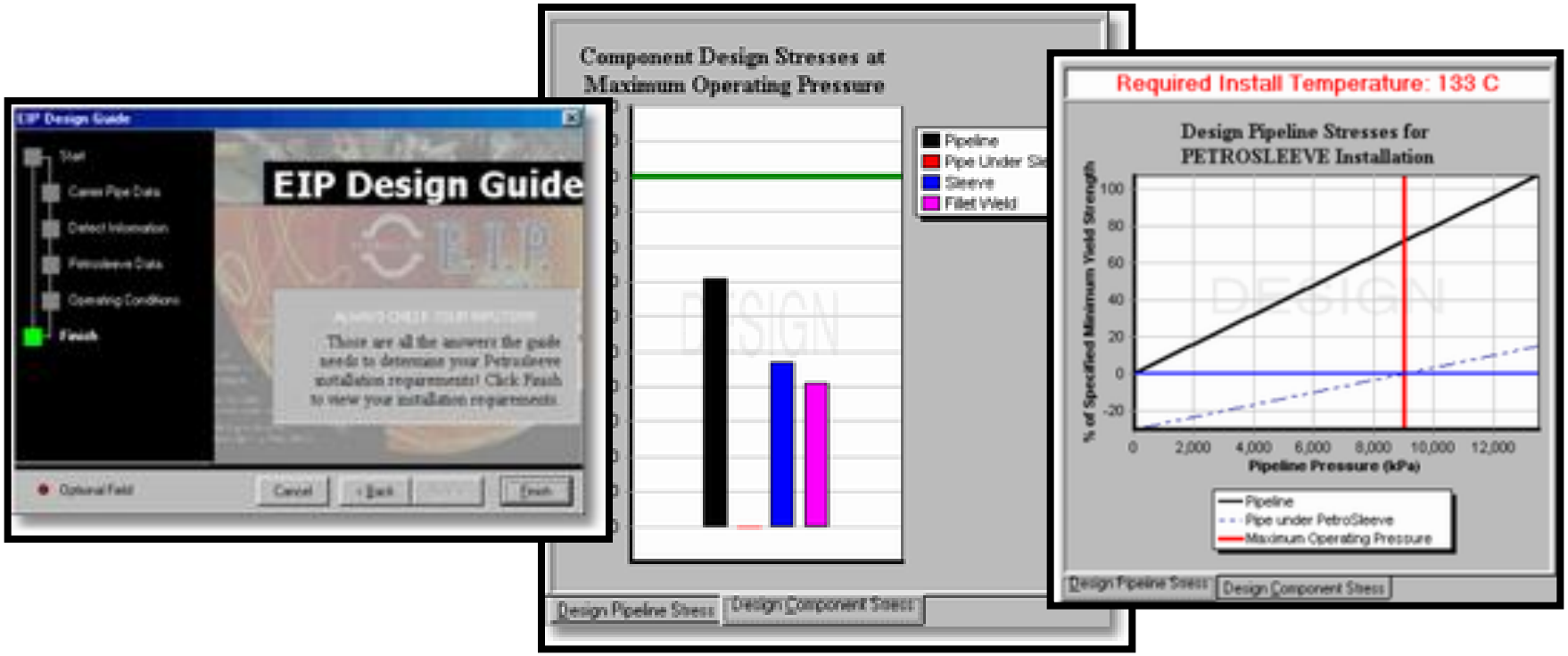


PETROSLEEVE SIZES 2” – 48”



EIP MODEL SOFTWARE

- This section describes the PetroSleeve



- EIP provided @ no charge for licensed users

TECHNICAL PAPERS

- IPC02 27079
- IPC04 0044
- IPC04 0445
- IPC2006 10060
- IPC2006 10030
- IPC2012 90674

PRCI PIPELINE REPAIR MANUAL

- Manual issued August 8, 2006
- Section 3.3.3.6 - Steel Compression Sleeves

OPS ACCEPTANCE
CSA Z662-07
PIPELINE CODE

- **OPS was approached, cyclic pressure testing information provided, and allowed the PetroSleeve to be used to repair cracking on the Platte Pipeline System**

- **CSA Z662-11 allows the PetroSleeve to be used to repair cracking and other defects**

C

Table 10.1
Limitations on acceptable permanent repair methods

(See Clauses 10.10.2.7, 10.10.4.2, 10.10.5–10.10.7, 10.11.1.4, 10.11.2.6, and 16.9.4.)

Type of defect	Grinding repair	Pipe replacement	Steel pressure-containment repair sleeve	Steel reinforcement repair sleeve	Steel compression reinforcement repair sleeve	Composite reinforcement repair sleeve	Hot tap	Direct deposition welding	Welding repair
Corrosion defect (see Clause 10.10.2.7)									
External	†	•	•	•	•	1	•	•	†
Internal	†	•	•	•	•	1	•	†	†
Gouge, groove, or arc burn (see Clause 10.10.3)									
On the pipe body, not in a dent	•	•	•	2	•	1, 2	•	6	†
On a mill seam weld, not in a dent	•	•	•	2	•	1, 2	•	†	†
On a circumferential weld, not in a dent	•	•	•	2	2	1, 2	†	†	†
Dent defect with a stress concentrator [see Clause 10.10.4.2(a)]									
On the pipe body or a mill seam weld	3	•	•	3	•	4	•	†	†
On a circumferential weld	3	•	•	3	2	†	†	†	†
Dent defect without a stress concentrator [see Clause 10.10.4.2(b)–(e)]									
On the pipe body	†	•	•	•	•	4	•	†	†
On a mill seam weld	†	•	•	4	•	4	•	†	†
On a circumferential weld	†	•	•	†	•	†	†	†	†

(Continued)

Table 10.1 (Continued)

Type of defect	Grinding repair	Pipe replacement	Steel pressure-containment repair sleeve	Steel reinforcement repair sleeve	Steel compression reinforcement repair sleeve	Composite reinforcement repair sleeve	Hot tap	Direct deposition welding	Welding repair
Pipe body surface crack (see Clause 10.10.5)									
Not in a dent	*	*	*	2	5	1, 2	*	6	†
Weld defect (see Clauses 10.10.6 and 10.10.7)									
In a circumferential weld	*	*	*	†	†	†	†	†	*
In a mill seam weld	*	*	*	†	*	†	*	†	†
Grind defect (see Clause 10.11.2.6)	†	*	*	*	*	1	*	*	†
Leak (see Clause 10.11.1.4)	†	*	*	†	†	†	†	†	†
Applicable repair clause reference	10.11.2	10.11.3	10.11.4.2	10.11.4.2	10.11.4.4	10.11.4.3	10.11.5	10.11.6	10.10.6

Legend:

Limitations additional to any specified in the applicable repair clause:

1 — This repair method is not acceptable for defects with metal loss in excess of 80% of the nominal wall thickness of the pipe.

2 — The stress concentrator (gouge, groove, arc burn, or crack) shall be removed by grinding as specified in Clauses 10.11.2.2 and 10.11.2.3 prior to the application of the sleeve.

3 — The stress concentrator (gouge, groove, arc burn, or crack) shall be removed by grinding as specified in Clauses 10.11.2.2 and 10.11.2.3 prior to the dent being assessed for acceptability as specified in Clause 10.10.4, with the depth of the ground area being excluded from the dent depth. This repair method is not acceptable unless both of the following apply:

(a) The dent is no longer a defect as described in Clause 10.10.4.2.

(b) The remaining cyclic life of the pipe is considered to be acceptable, based upon an engineering assessment that includes consideration of fatigue testing results for pipe without a sleeve.

(Continued)