



COMPOSI-SLEEVE™

Span Application



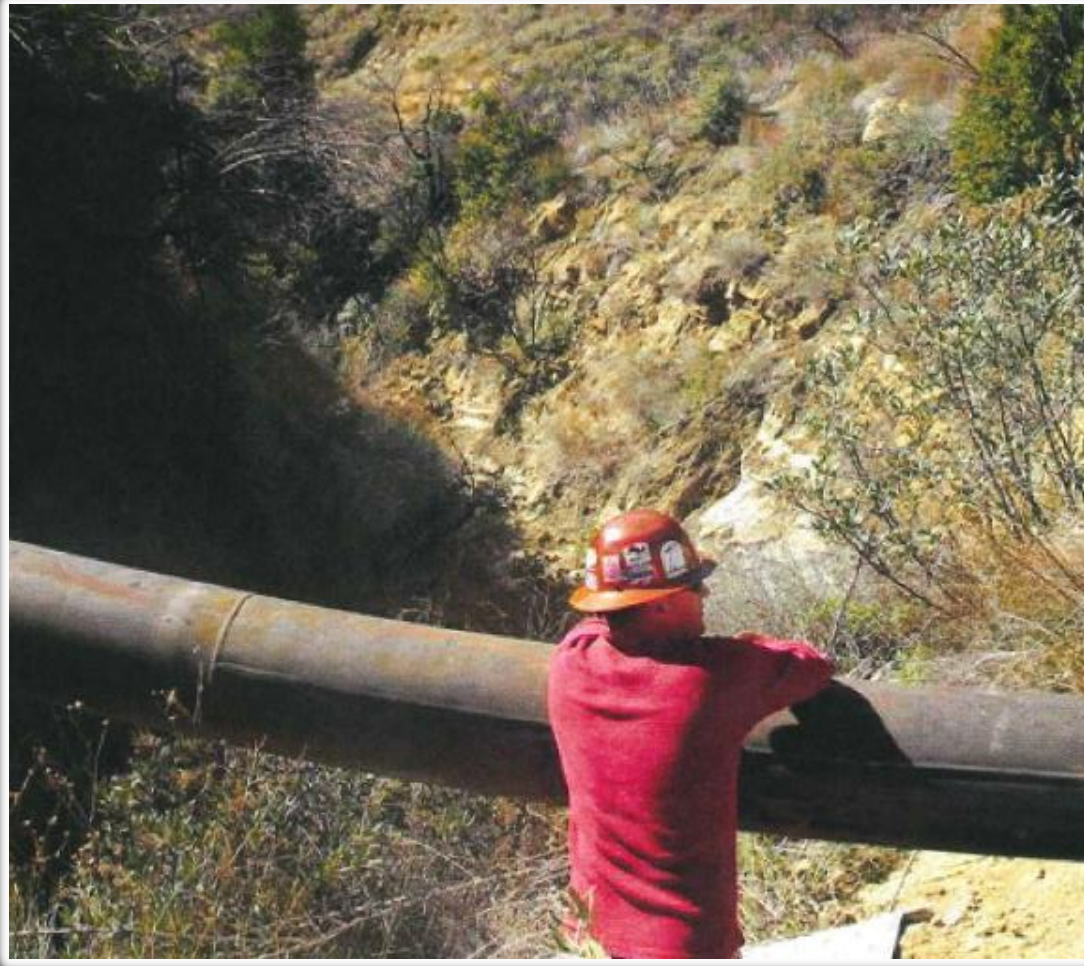


Span Reinforcement

Span Reinforcements are an expensive and difficult procedure... and necessary to protect against washouts and falling rocks. In many cases the pipeline must be taken out of service in order to make this type of repair.

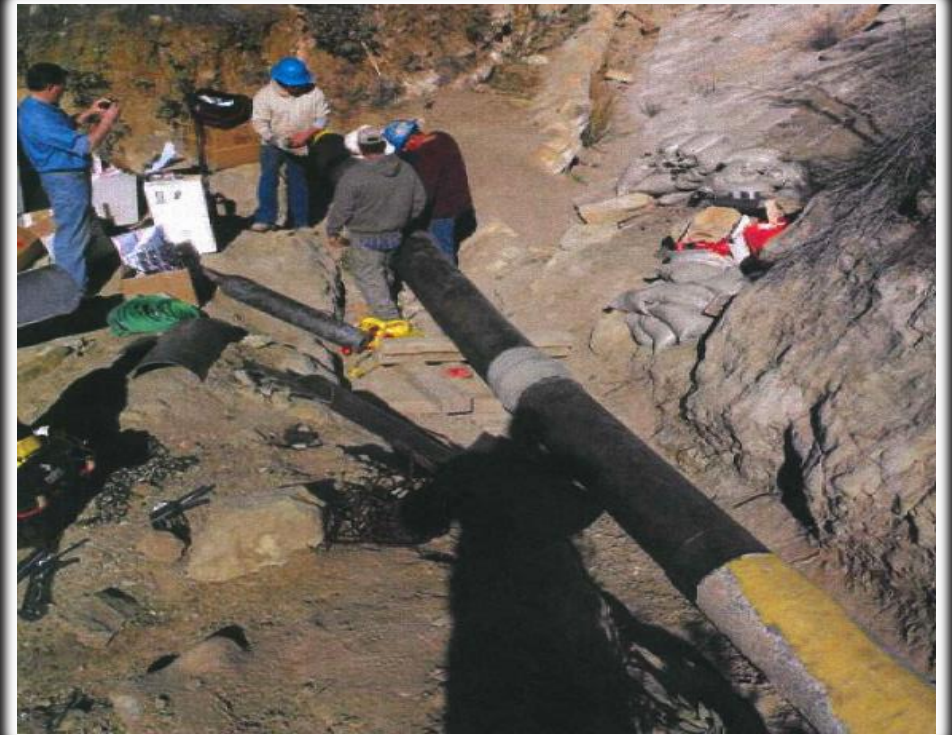
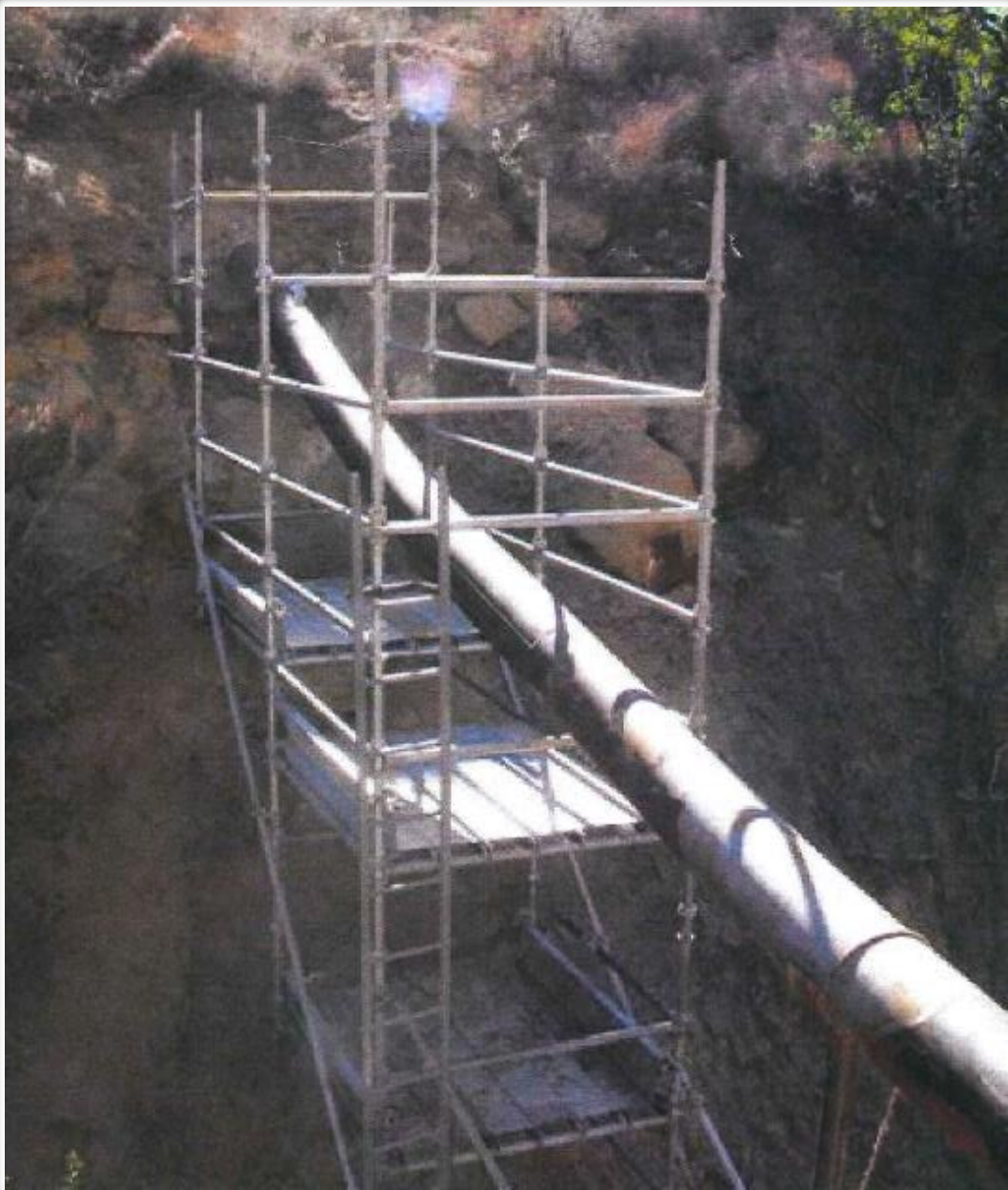
Western Specialties has the solution for span reinforcements in the Composi-Sleeve™... which is a patented pipeline repair solution that supports pipeline integrity and flow. It utilizes a military-grade chemical welding agent to repair pipeline anomalies (cracks, dents and corrosion) without taking the pipeline out of service.

The Composi-Sleeve™ chemically welds (fuses) two steel half sleeves to the damaged pipe to repair the anomaly... that adds structural support and reinforcement to the pipe. It is one of the few pipeline repair solutions worldwide that holds the ASME PCC-2 certification and is D.O.T. and PHMSA Compliant.



NOTE: This span reinforcement project was in California (and within a environmentally protected area). Western Specialties was selected for this project because of the sustainability of the Composi-Sleeve and the skilled (and careful) craftsmanship.

COMPOSI-SLEEVE™



NOTE: Using Composi-Sleeve on a span adds structural support and reinforcement by applying another layer of steel to the pipe. Additionally, the seams of the steel sleeves can be oriented to address the vertical load and potential horizontal load. Also, the additional structural support and reinforcement protects against falling or sliding soil, rocks and boulders.



When to use for spans...

...need of a structural support & reinforcement.

...need of keeping the pipeline in service.

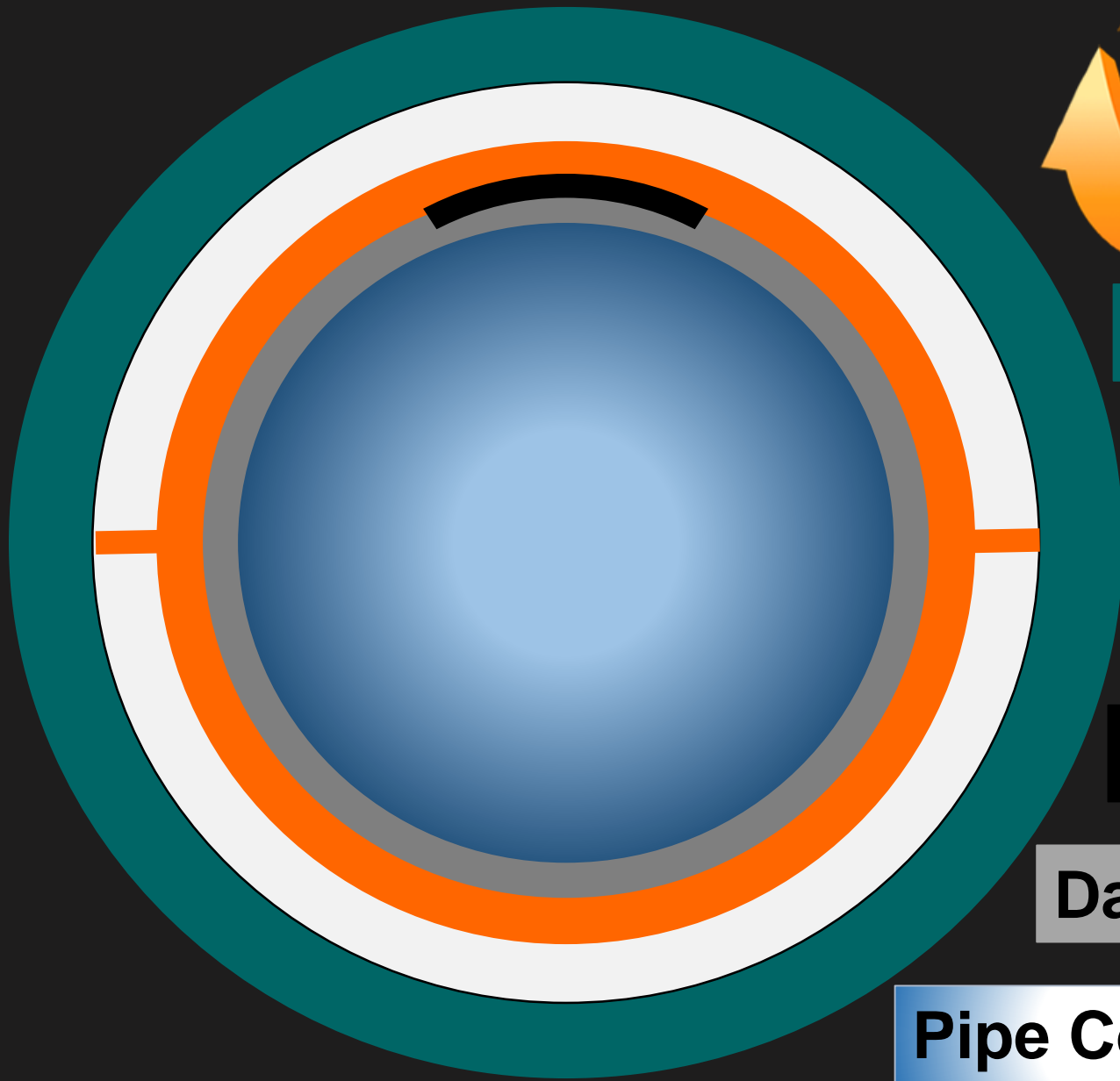
...need of D.O.T. compliant solution.

...need of meeting PHMSA requirements.

...need of ASME PCC-2 certified solution.



COMPOSI-SLEEVE™



Composite Wrap Material

Carbon Steel Half-Shells

Chemical Welding

Load Transfer Material

Damaged Pipe Material

Pipe Content

NOTE: The seams of the steel sleeves can be oriented to address the vertical and potential horizontal loads of a span.



Evidence Demands a Verdict.



A collage of technical reports and documents related to the ComposiSleeve™ Pipeline Repair System. The documents include:

- ASME PCC-2 Qualification Testing for the ComposiSleeve™ System**: Prepared for Western Specialties, LLC, dated August 2011. Issued by Stress Engineering Services Inc.
- Evaluation of the ComposiSleeve™ Pipeline Repair System**: PN1151033CRA, Prepared for LMC Industrial Contractors, Inc., Avon, New York, dated June 2011. Issued by Stress Engineering Services, Inc., Houston, Texas.
- Results Summary of Recent Survival Testing**: ComposiSleeve™ and Ultra-Wrap™.
- Western Specialties Load Transfer Burst Testing**.
- Load Transfer Study**.
- Ultra-Wrap™ and ComposiSleeve™ Load Transfer Summary**: Preliminary Results, dated 20 January.
- ComposiSleeve™ Preliminary Results**.

A prominent red banner across the center reads: **100% Third Party Testing**.

STRESS ENGINEERING SERVICES INC. logo is visible on several documents.

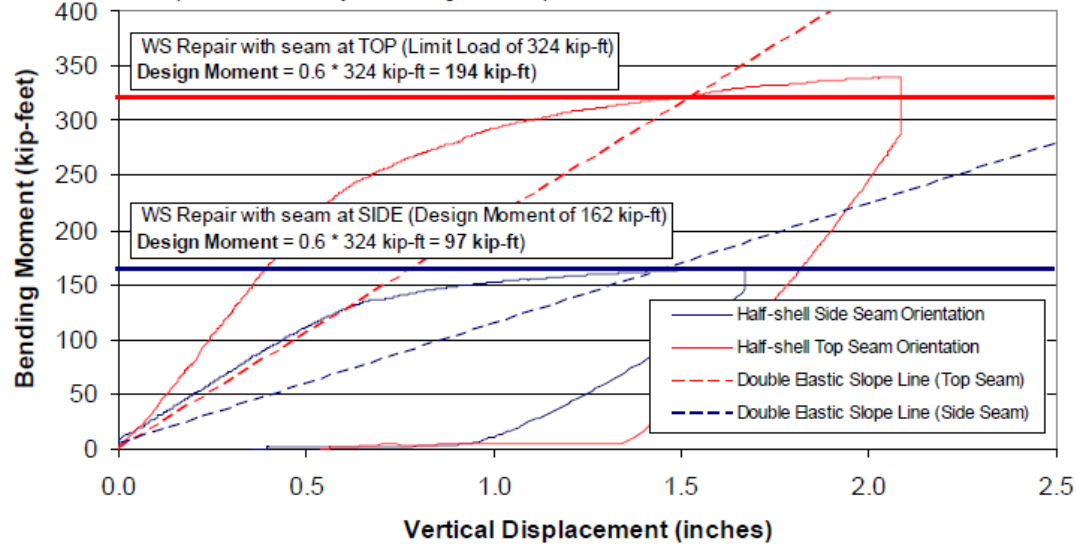


Bend Testing



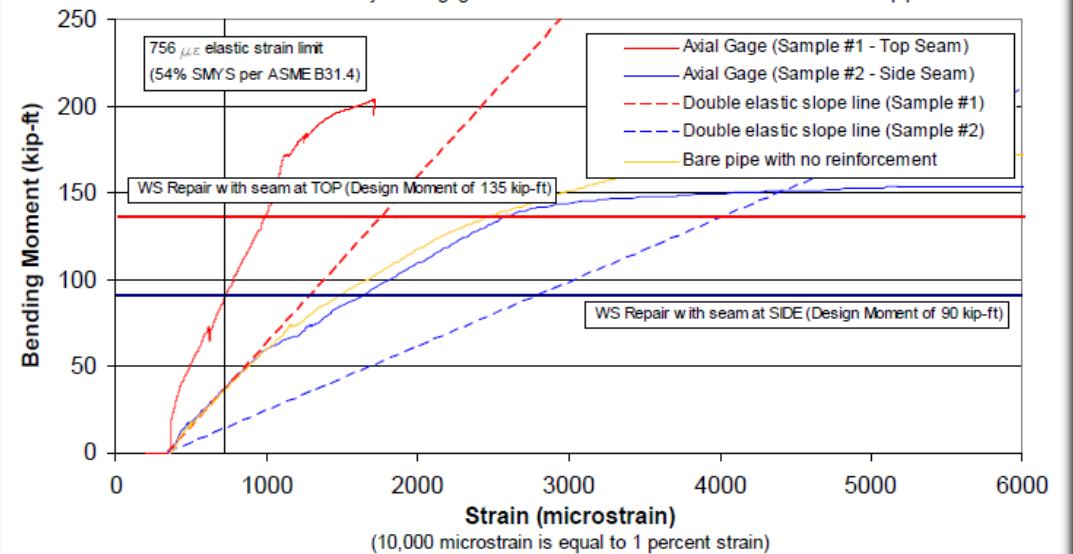
Bending Moment as a Function of Displacement

Three point bend test conducted to determine maximum capacity of Western Specialties steel-composite reinforced system. Design bend capacities for both seam orientations shown below.



Bending Moment as a Function of Axial Strain

Experimental results on the Western Specialties half-pipe bending reinforcement system with measurements taken by strain gages located beneath the reinforcement on the base pipe.






**REPAIR
ZONE**



BURST TESTING



**REPAIR
ZONE**

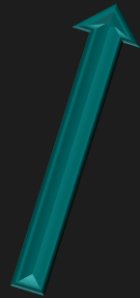
 **COMPOSI-SLEEVE™**

Quick Reference Guide

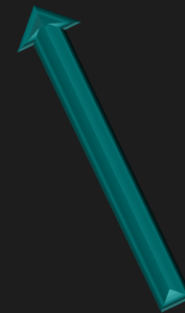
WHEN (Scenarios) TO USE	 COMPOSI-SLEEVE™	 ULTRA-WRAP™
76% or greater external wall loss	X	
Thru wall anomalies	X	
Internal corrosion	X	
75% or below external wall loss	X	X
Anomalies in high profile locations	X	
Anomalies on unique geometry		X
Cracks	X	



Repair Anomalies. Protect Pipeline Flow.



What it does.



The value delivered.