Specific Usage: The ***CRS*** *Carbon-Ply Composite Repair System* will repair external corrosion on any pipe, restoring its structural integrity and preventing further deterioration. Also, external damage such as dents, gouges, fretting and wear can be repaired.

Installation Considerations: The ***CRS*** *Carbon-Ply Composite Repair System* involves pipe preparation by grit blasting, application of CARBON-PLY Defect Filling Repair Epoxy (DFRE) and CARBON-PLY CRS primer, wrapping the affected area with high modulus carbon fiber cloth and pressure saturating the cloth with CARBON-PLY CRS resin using a unique, patented* ***CRS*** *Carbon-Ply Composite Repair System* and installation procedure developed by ITW Polymer Technologies. Contact ITW Polymer Technologies for information about ***CRS*** *Carbon-Ply Composite Repair System* material quantities and methods based on the specific pipe size.

CRS Carbon-Ply Composite Repair System — Composite Properties

COMPRESSIVE STRENGTH: 12,345 psi (85.12 MPa)		ASTM D-695
COMPRESSIVE MODULUS OF ELASTICITYz: 3.61 x 10^5 psi (2,489 MPa)		ASTM D-695
POISSONS RATIO:	Axial – 0.035 Hoop – 0.32	ASTM D-3039
YOUNGS MODULUS:	Axial – 752,746 psi (5.19 GPa) Hoop – 9,616,002 psi (66.3 GPa)	ASTM D-3039
COEFFICIENT OF LINEAR THERMAL EXPANSION (50°F [10°C] to 170°F [77°C]): 0.116 x 10^{-6} in./in./°F		ASTM D-696
FLEXURAL STRENGTH: 89,775 psi (619 MPa)		ASTM D-790
FLEXURAL MODULUS OF ELASTICITY: 7.84 x 10^6 psi (54.1 GPa)		ASTM D-790
TENSILE ELONGATION AT BREAK: 0.618%		ASTM D-638
TENSILE STRENGTH:	Axial – 4,178 psi (28.8 MPa) Hoop – 109,996 psi (758.4 MPa)	ASTM D-638
TENSILE MODULUS OF ELASTICITY:	Axial – 0.9009 x 10^6 psi (6.2 GPa) Hoop – 8.612 x 10^6 psi (59.4 GPa)	ASTM D-638
COMPOSITE LAP SHEAR STRENGTH: >2,339 psi with Primer (16.1 MPa)		ASTM D-1002
SHEAR STRENGTH: 8,233 psi (56.8 MPa)		ASTM D-5379
SHEAR MODULUS: 6.17 x 10^5 psi (4.25 GPa)		ASTM D-5379
HEAT DISTORTION TEMPERATURE OF COMPOSITE: >400°F (204.4°C)		ASTM D-6604
CATHODIC DISBONDMENT @ 75°F (24°C) & 120°F (49°C): No visual undercutting or corrosion blistering observed		ASTM G 8-96
IMPACT TEST – MODIFIED GARDNER: 140-inch-lbs (15.8 N.m) using 4 lb weight with 5/8" Tip		ASTM G-14
SHORE D HARDNESS: 85		ASTM D-2583

*US Patents 7,367,362 / 7,387,138 / 7,426,942 / 7,500,494 / Other Patents Pending

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www.itwcompositepiperepair.com

CRS CARBON-PLY COMPOSITE REPAIR SYSTEM

09/2011

ITW Polymer Technologies

CRS CARBON-PLY COMPOSITE REPAIR SYSTEM

...for repairing non-leaking steel pipe

Meets and Exceeds PCC-2 Standard Kit Repairs:

- *External Corrosion*
- *Dents and Gouges*
- *Girth Weld Repair Areas*
- *Mechanical Damage*

Not all Composite Pipe Repair Systems are Created Equal.

New CRS. A Tough, Composite Repair System for the Toughest Jobs.

12 STEPS TO CRS EPOXY COMPOSITE PIPE LINE REPAIR


1) validation of damage


2) apply DFRE


3) smooth DFRE


4) apply di-electric primer


5) apply carbon fiber wrap


6) install steel mold


7) mix epoxy resin


8) add activated resin


9) apply pressure

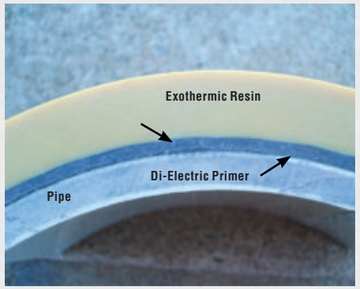

10) tie off and cure


11) remove steel mold


12) pipe repair complete

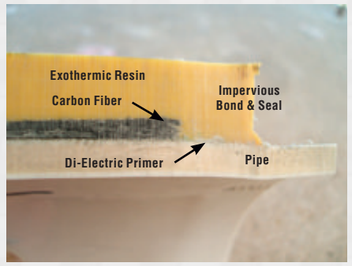
We Solve Pipe Repair Problems Our Competitors Have Given Up On.

Corrosive Attacks. Here's Your Best Line of Defense.



Carbon-Ply Cross Section

The ***CRS*** *Carbon-Ply Composite Repair System* is a non-metallic, monolithic carbon fiber composite repair system for damaged or corroded pipelines in high and low risk pipe and pipe work applications. The patented system is designed to permanently repair non-leaking pipe (Type A repair) with up to 80% external pipe wall loss due to damage or corrosion. The ***CRS*** *Carbon-Ply Composite Repair System* comprises: CARBON-PLY DFRE (Defect Filling Repair Epoxy), CARBON-PLY CRS Primer, high modulus carbon fiber and CARBON-PLY CRS Resin.



Carbon-Ply End Seal Cross Section

The ***CRS*** *Carbon-Ply Composite Repair System* system will permanently repair externally damaged pipe, restoring its structural integrity and preventing further deterioration. Also, the ***CRS*** *Carbon-Ply Composite Repair System* system can be used as a temporary repair for internal corrosion on piping.

The CRS Carbon-Ply Composite Repair System system meets and exceeds PCC-2 requirements.

Why should I specify and use the CRS Carbon-Ply Composite Repair System?

The ***CRS*** *Carbon-Ply Composite Repair System* system is the only cast-in-place monolithic composite repair system in the world. Check these features and benefits:

- CARBON-PLY CRS is monolithic – no laminates to delaminate.
- Fool-proof pressure saturation of the carbon reinforcing fabric.
- Can be used above ground and is UV-resistant.
- The standard CARBON-PLY CRS System has a heat deflection temperature of > 400˚F (204˚C).
- Fast curing with return to 100% of operation service within three hours of start of installation.
- Easy to install dry-wrap method.
- No messy roll-on or painting of resin to accomplish fabric saturation.
- Appropriate for application on pipe with up to 80% external wall loss due to third party damage or corrosion.
- The easiest to install composite system in the world.
- NO noxious orders or harmful vapors, as with other repairs.
- Any length repair without spiral wrapping issues.
- Makes all other composites totally obsolete.
- High modulus repair – best in industry.
- Lowers inventory costs.
- Longest resin shelf life.
- Small excavation.
- Minimal training.
- Impact-resistant.

Specify the CRS CARBON-PLY COMPOSITE REPAIR SYSTEM