



# Process Pipe Repair & Renewal Systems

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## Process Pipe Repair & Renewal Systems

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## OVERVIEW:

# Process Pipe Repair & Renewal Systems



STRUCTURAL TECHNOLOGIES provides products, design support and turnkey installation for process piping repair. Our upgrade solutions strengthen leaking, damaged and/or weakened pipelines. We develop comprehensive technical solutions for critical process piping found within industrial facilities including refineries, chemical processing plants and power generation stations.

## APPLICATIONS

- Process piping
- Transmission & distribution piping
- Chemicals, oil, gases, water & steam lines
- Flares & blowdowns
- Girth welds on vessels & pipelines, straights, elbows, tees, reducers

## PIPE MATERIALS

- Carbon steel
- Stainless steel
- Ductile iron
- Reinforced concrete
- Prestressed concrete
- Polymer
- FRP
- Corrugated metal

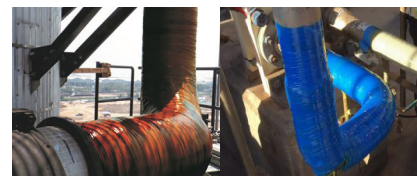
## ASME / ICC Certified Products & Design Support

From the identification of pipe repair needs, to selecting the proper product solution, STRUCTURAL TECHNOLOGIES pulls from its own line of industry proven products or other industry leading solutions, including the robust lineup of products from Neptune Research (NRI). Our repair solutions include rapid response to analyzing your problem, recommending the proper design solution and providing the proper product utilizing state-of-the-art composite systems that match your performance and construction windows in order to eliminate disruption to ongoing operations.



### StrongPIPE® V-Wrap™ Composites

High-strength glass and carbon composites along with a chemical resistant 100% solids epoxy. Provides long-lasting repairs in application temperatures ranging from -50° to 150°F, and exposure to a variety of salts, acids, and bases, as well as environmental factors



### Extreme Heat & Chemical Resistant Composites

Robust composite systems for extreme applications including temperatures up to <500°F (260°C) and chemical exposure, such as 98% sulfuric acid.







## PROCESS PIPE REPAIR & RENEWAL SYSTEMS

# Product Selection Guide



### Products & Design Support

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#### STRUCTURAL TECHNOLOGIES' StrongPIPE® V-Wrap™ Composites

	V-Wrap™ EG50	V-Wrap™ EG50B	V-Wrap™ C200HM	V-Wrap™ C400HM
Description	Field-saturated, uni-directional glass composite system used to repair internal and external corrosion. Low-cost system used for leaking lines and temporary repairs.	Field-saturated, bi-directional glass composite system used to repair internal and external corrosion. Low-cost system used for rapid, temporary repairs.	Field-saturated, uni-directional carbon fiber composite system used to repair internal and external corrosion. Fully structural for long term repairs.	Field-saturated, uni-directional heavy weight carbon fiber composite system used to repair internal and external corrosion. For rapid repairs requiring structural upgrade for long term service.
Application Temperature	50° to 90°F	50° to 90°F	40° to 100°F	40° to 100°F
Operating Temperature	-50° to 140°F	-50° to 140°F	-50° to 150°F	-50° to 150°F

#### Extreme Heat & Chemical Resistant Composites by NRI

	Thermo-Wrap™	Thermo-Wrap™ 500	Acid-Shield™	Viper-Skin®
Description	Field-saturated, bi-axial hybrid carbon & glass fiber composite system used to repair & reinforce internal or external corrosion at elevated temperatures.	Factory-saturated composite system compatible w/ temps <500°F (260°C). By eliminating the need for field-saturation, this product can be applied faster.	Field-saturated, chemically resistant, bi-directional fiberglass composite system used to repair corroded or damaged piping w/harsh chemical services such as 98% sulfuric acid.	Factory-saturated, bi-axial hybrid carbon & glass fiber composite system used to repair & reinforce internal or external corrosion.
Application Temperature	50° to 280°F	100° to 350°F	50° to 175°F	40° to 150°F
Operating Temperature	-50° to 300°F	-50° to 500°F	-50° to 212°F	-50° to 194°F





## PROCESS PIPE REPAIR & RENEWAL SYSTEMS

# StrongPIPE® V-Wrap™ Composites



STRUCTURAL TECHNOLOGIES provides a robust line of piping repair composite systems which can be used for moisture resistance. Our systems comply with ASME PCC-2 standards and are ICC ESR-3606 certified.

For these specialized applications, we use our products in combination with our certified installation capabilities of our specialty contracting companies to provide a single source approach to increasing the reliability of your process piping systems.

### Applications:

- Process piping
- Transmission & distribution piping
- Chemicals, oil, gases, water & steam lines
- Flares & blowdowns
- Girth welds on vessels & pipelines, straights, elbows, tees, reducers



	V-Wrap™ EG50	V-Wrap™ EG50B	V-Wrap™ C200HM	V-Wrap™ C400HM
Description	Field-saturated, uni-directional glass composite system used to repair internal and external corrosion. Low-cost system used for leaking lines and temporary repairs.	Field-saturated, bi-directional glass composite system used to repair internal and external corrosion. Low-cost system used for rapid, temporary repairs.	Field-saturated, uni-directional carbon fiber composite system used to repair internal and external corrosion. Fully structural for long term repairs.	Field-saturated, uni-directional heavy weight carbon fiber composite system used to repair internal and external corrosion. For rapid repairs requiring structural upgrade for long term service.
Typical Applications	<ul style="list-style-type: none"> <li>• Chemical processing lines</li> <li>• Girth welds, straight segments</li> <li>• Low temperature environments</li> </ul>	<ul style="list-style-type: none"> <li>• Chemical processing lines</li> <li>• Girth welds, straights, elbows, tees</li> </ul>	<ul style="list-style-type: none"> <li>• Transmission &amp; distribution pipelines, chemical processing lines</li> <li>• Long term service capability, can be designed as equivalent to replacement</li> <li>• Mechanical dents and defects</li> </ul>	<ul style="list-style-type: none"> <li>• Rapid repair of transmission &amp; distribution pipelines, chemical processing lines</li> <li>• Long term service capability, can be designed as equivalent to replacement</li> <li>• Girth welds, straights, elbows, tees</li> </ul>
Application Temperature	50° to 90°F	50° to 90°F	40° to 100°F	40° to 100°F
Operating Temperature	-50° to 140°F	-50° to 140°F	-50° to 150°F	-50° to 150°F



## StrongPIPE® V-Wrap™ Chemical Resistance Guide

The below table summarizes the chemical resistance of the StrongPIPE® V-Wrap™ system exposed to a variety of salts, acids, and bases, as well as environmental factors. All results are classified by percentage of weight lost at the end of the exposure time, unless otherwise specified. The StrongPIPE® V-Wrap™ system is shown to be resilient against many strong chemicals up to a minimum of 30 days. For additional chemical testing and prolonged exposure testing, contact STRUCTURAL TECHNOLOGIES.

Chemical Name	Symbol	24 Hours	7 Days	30 Days	<b>E</b> = Excellent (0-5%) <b>G</b> = Good (5-10%) <b>A</b> = Acceptable (10-15%) <i>*Classified by retention of mechanical properties</i>
Aluminum Sulfate (25%)	$Al_2(SO_4)_3$	E	E	E	
Ammonium Bisulfate (25%)	$(NH_4)HSO_4$	E	E	E	
Ferric Chloride (25%)	$FeCl_3$	E	E	E	
Hydrochloric Acid (10%)	HCl	E	E	E	
Hydrochloric Acid (20%)	HCl	E	E	G	
Sodium Bisulfite (10%)	$NaHSO_3$	E	E	E	
Sodium Bisulfite (20%)	$NaHSO_3$	E	E	E	
Sodium Bisulfate (25%)	$NaHSO_4$	E	E	E	
Sodium Bromide (25%)	NaBr	E	E	E	
Sodium Hydrosulfide (15%)	NaSH	E	E	E	
Sodium Hydroxide (10%)	NaOH	E	E	E	
Sodium Hydroxide (50%)	NaOH	E	E	E	
Sodium Hypochlorite (5%)	NaClO	E	E	E	
Sodium Hypochlorite (10%)	NaClO	E	E	E	
Sodium Hypochlorite (15%)	NaClO	E	E	E	
Sodium Hypochlorite (6% @ 110F)	NaClO	E	E	E	
Sulfuric Acid (10%)	$H_2SO_4$	E	E	G	
Sulfuric Acid (50%)	$H_2SO_4$	E	E	G	
Salt Water (@73°F)*	-	E	E	E	
Salt Water (@120°F)*	-	E	E	E	
Salt Water (@140°F)*	-	E	E	E	
Freeze/Thaw (20 cycles)*	-	-	-	E	
Water Resistance (@100°F)*	-	E	E	E	
Alkaline*	$Ca(CO_3)$	-	-	G	
Dry Heat (@140°F)*	-	-	-	G	





## PROCESS PIPE REPAIR & RENEWAL SYSTEMS

# Thermo-Wrap™ Heat Resistant Composites





## APPLICATIONS

- Process piping
- Transmission & distribution piping
- Chemicals, oil, gases, water & steam lines
- Flares & blowdowns
- Girth welds on vessels & pipelines, straights, elbows, tees, reducers



## COMPOSITE REPAIR SYSTEMS

STRUCTURAL TECHNOLOGIES provides a robust line of piping repair composite systems which can be used for high temperature and chemical resistance. For these specialized applications, we combine our comprehensive design and analysis services with the industry-leading products of Neptune Research (NRI) to help select a solution that matches clients' performance criteria and installation windows.

PRODUCT:	Thermo-Wrap CF™	Thermo-Wrap™ 500
		
<b>Description</b>	Field-saturated, bi-axial hybrid carbon & glass fiber composite system used to repair & reinforce internal or external corrosion at elevated temps.	Factory-saturated composite system compatible w/ temps <500°F (260°C). By eliminating the need for field-saturation, this product can be applied faster
<b>Application Temperature</b>	50° to 280°F	100° to 350°F
<b>Operating Temperature</b>	-50° to 300°F	-50° to 500°F



## Thermo-Wrap™ Composites Chemical Resistance Guide

NRI's pre-impregnated and field-saturated composites are manufactured to restore, protect and reinforce pipes, pipeline components, and civil structures. Proper glass and/or carbon fiber product and binding resin selection are critical to provide the longest life, lowest life cycle cost, best corrosion performance, and to minimize the risk failure in presence of chemical compounds in aggressive environments. This compatibility chart demonstrates that these systems are highly resistant to the most common aggressive corrosive chemicals.

Chemical	Thermo-Wrap™	Thermo-Wrap CF™	<b>E</b> = Excellent <b>G</b> = Good <b>A</b> = Acceptable <b>P</b> = Poor <b>NE</b> = Not Evaluated
Acetic Acid 20%	A	NE	
Acetone	G	E	
Ammonium Hydroxide 29%	E	E	
Copper Sulfate	E	E	
Diesel	E	E	
Diethanolamine	E	E	
Ethanol	E	G	
Ethylene Dichloride	G	A	
Gasoline	E	G	
Hydrochloric Acid, 40%	G	E	
Hydrofluoric Acid, 40%	P	NE	
Isohexane	E	E	
Isopropyl Alcohol	E	G	
Methanol	E	E	
Methyl Ethyl Ketone (2-butanone)	G	E	
NAPTHA	E	E	
Sodium Hydroxide (Caustic Soda)	G	E	
Sulfuric Acid, 40%	E	E	
Toluene	E	E	
Water	E	E	



## PROCESS PIPE REPAIR & RENEWAL SYSTEMS

# Acid-Shield™ Chemical Resistant Composites



## APPLICATIONS

- Process piping
- Transmission & distribution piping
- Chemicals, oil, gases, water & steam lines
- Flares & blowdowns
- Girth welds on vessels & pipelines, straights, elbows, tees, reducers



## COMPOSITE REPAIR SYSTEMS

STRUCTURAL TECHNOLOGIES provides a robust line of piping repair composite systems which can be used for chemical resistance. For these specialized applications, we combine our comprehensive design and analysis services with the industry-leading products of Neptune Research (NRI) to help select a solution that matches clients' performance criteria and installation windows.

Acid-Shield™		
<b>Description</b>	Field-saturated, chemically resistant, bi-directional fiberglass composite system used to repair corroded or damaged piping w/harsh chemical services such as 98% sulfuric acid.	
<b>Application Temperature</b>	50° to 175°F	
<b>Operating Temperature</b>	-50° to 212°F	







## SPECIALIZED EVALUATION SERVICES: Pipeline Condition Assessment & Analysis

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*STRUCTURAL TECHNOLOGIES offers highly specialized assessment and analysis support services for concrete and steel pipelines that are designed to complement and enhance owners' in-house inspection program.*

Our comprehensive approach is designed to support owners in maximizing pipeline reliability with cost-effective strategies for life-cycle management. Our approach utilizes an established process that is tailored to meet facility-specific needs:



## Partnering for Risk-Based Pipeline Asset Management

STRUCTURAL TECHNOLOGIES partners with owners and their engineering team to integrate with existing in-house inspection programs. Our failure-risk based approach overlays ongoing inspections with enhanced condition assessment techniques, delivering a combination of data points used to drive risk ranking of pipe assets.

Risk of Failure Pipeline Criticality		Consequence of Failure (CoF)			
		NONE	LOW	MEDIUM	HIGH
Likelihood of Failure (LoF)	LOW	1	1	2	2
	MEDIUM	1	2	2	3
	HIGH	1	2	3	High Risk 3

- Age
- Settlement
- Pressure
- Joint type

- Environmental impact
- Service interruption
- Area / unit
- Criticality to process
- Criticality to facility

Risk-based ranking results are then used to create a prioritization plan identifying pipeline(s) or pipeline segments in need of repair, renewal or continued monitoring. This comprehensive partnering approach creates a proactive program which decreases risk and increases reliability.



## Pipeline Evaluation & Assessment Techniques

STRUCTURAL TECHNOLOGIES assists by helping select the most economical method and approach to assess the condition of pipelines. There are a wide variety of assessment technologies available in the marketplace, below is a summary of some of the more commonly used methods.

Visual Inspection						
Technology	Pipe Type(s)	Pipe Diameter	Hydraulic Requirements	Data Resolution	Pipeline Preparation	Intrinsically Safe
<b>CCTV</b>	All pipe types	2" +	Completely dewatered	Medium	Low	Yes
<b>Multi-Platform</b>	All pipe types	36" +	Completely dewatered	Medium	Low	Hermetically sealed low-power devices

Leak & Air/Gas Pocket Detection						
Technology	Pipe Type(s)	Pipe Diameter	Hydraulic Requirements	Data Resolution	Pipeline Preparation	Intrinsically Safe
<b>In-Line Acoustic</b>	All pipe types	12" +	Min Flow: 1.5 fps Min. Pressure: 15 psi	High	Medium	Hermetically sealed low-power devices
<b>Acoustic Correlators</b>	Concrete & ferrous	4" +	Surface Mount	Medium	Low	Hermetically sealed low-power devices

Electromagnetic						
Technology	Pipe Type(s)	Pipe Diameter	Hydraulic Requirements	Data Resolution	Pipeline Preparation	Intrinsically Safe
<b>Cylinder Assessment</b>	Ferrous & bar wrapped	6" +	Pig Launcher or 4" hot tap	High	High	Hermetically sealed low-power devices
<b>Cylinder Assessment &amp; Broken Bar Detection</b>	PCCP & bar wrapped	24" +	Internal Manned Inspections: Dewatered  External Inspections: Depressurized Internal free swimming technology while in service: Min Flow: 1.5 fps	High	Medium	Hermetically sealed low-power devices

## Implementation of Repair & Renewal Strategies

STRUCTURAL TECHNOLOGIES' services includes the integration of products and engineering design. Our StrongPIPE® product family includes solutions focused on the repair and renewal of all types of pipelines, including concrete, metallic and polymer-based. Our solutions also incorporate the services of our licensed contracting companies and their experience working in industrial and power facilities to provide repair and renewal solutions that maximize pipeline reliability.