



Rehabilitation of Piping systems Using
Composite Materials

PASSION BROUGHT US HERE!



Advantages of composite repair

- Excellent chemical compatibility
- No hot works required
- No heavy equipment required
- Non-invasive application without shutdown
- Extend design life of compromised assets
- Can handle complex piping geometries , bends, tee`s, vessels, tanks etc
- Lightweight (No support systems required)
- High temperature resistance



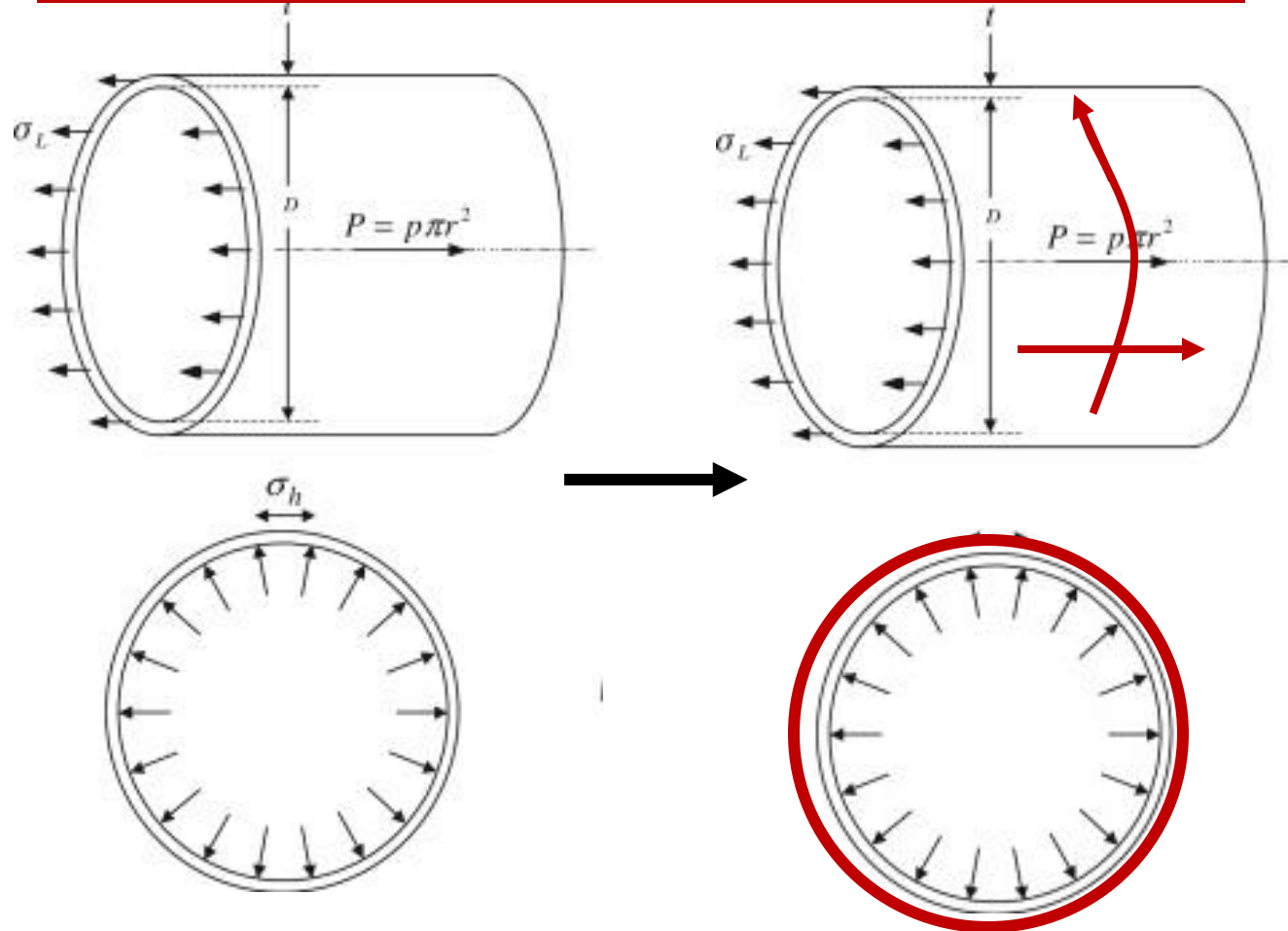
Applications of composite repair

- Thinning Piping
- Internal corrosion (Usually temporary repair)
- External corrosion (Can be very long term)
- Mechanical damage
- Ageing assets
- Weld anomalies on piping, vessels and tanks
- Transmission lines
- Heat exchangers
- Sour water lines
- Alky unit piping
- Steel tanks

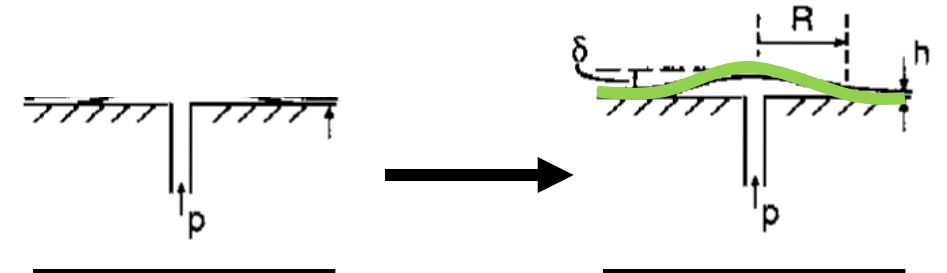


Composite Materials for Pipework Repair – How Composites Are Useful

Non-leaking Reinforcement

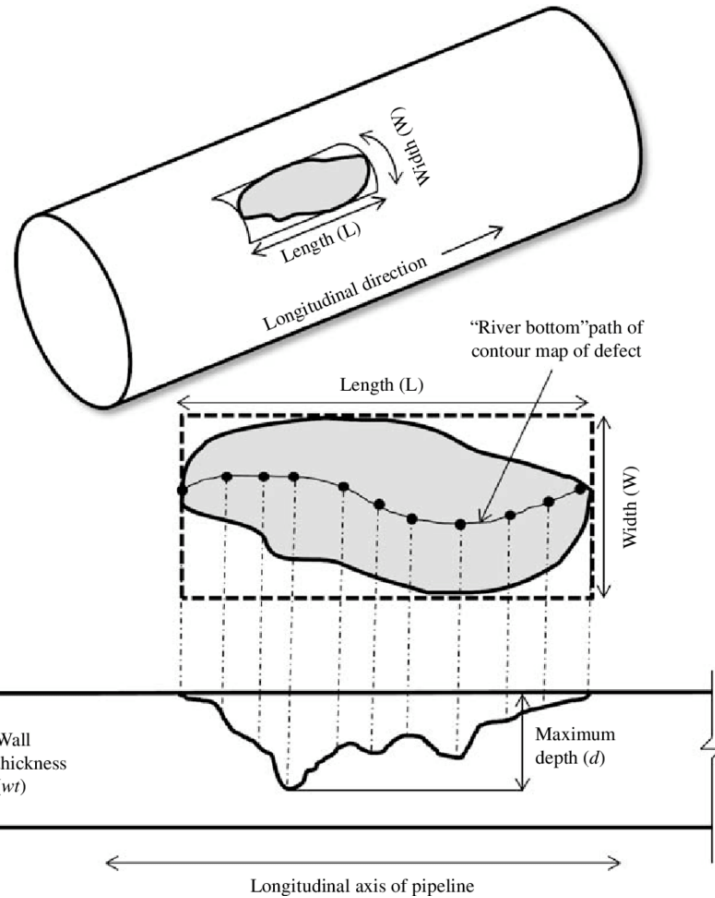


Leaking Defect Blister Mechanics

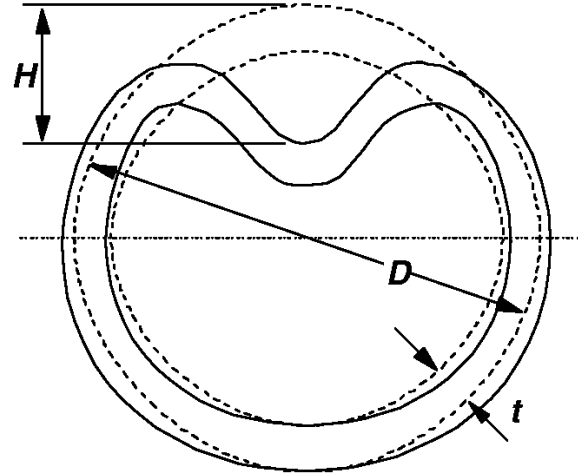


Composite Materials for Pipework Repair – Types of Defects

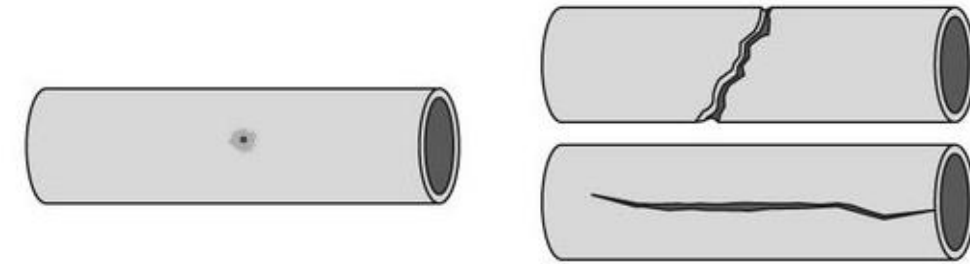
Non-leaking wall loss: Internal/External



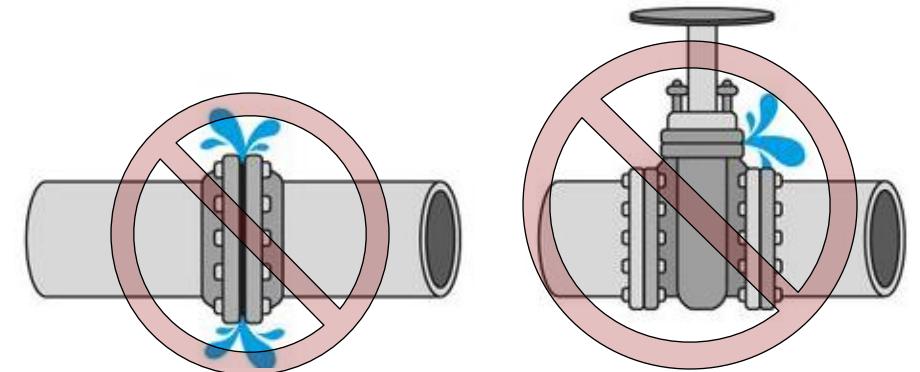
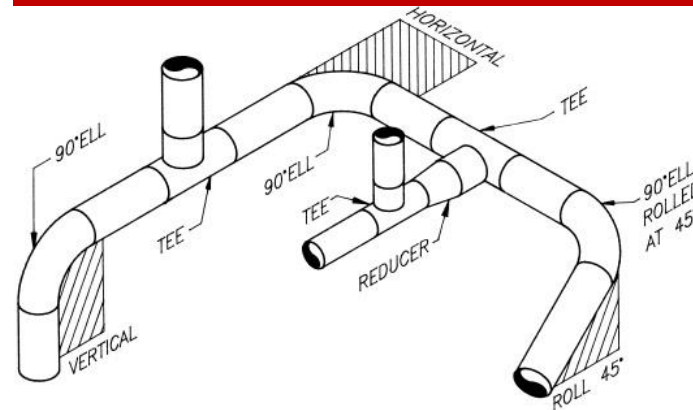
Mechanical Damage: Dents and Gouges



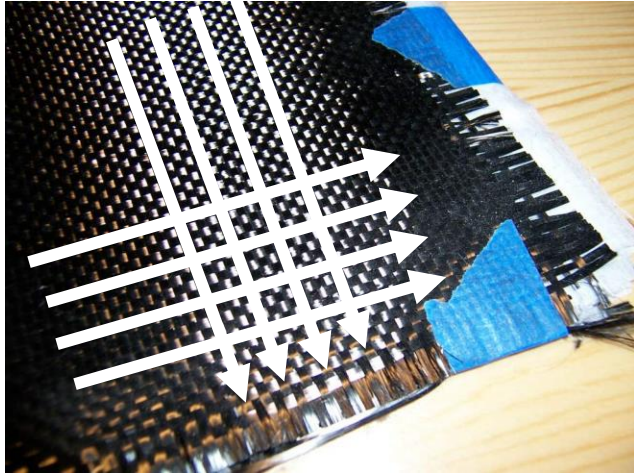
Leaking Defects: Pin-holes and Slots



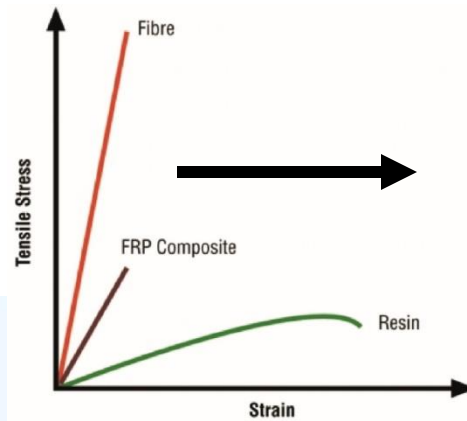
Components



Composite Materials for Pipework Repair – Directional Reinforcement



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Composite materials:

- **KEVLAR**
- High strength
- UV sensitive
- Moisture sensitive
- Hard to work with
- **FIBERGLASS**
- Lower strength
- Creeps over time
- Large quantity layers required, cumbersome repair on high pressures
- Shorter lifespan



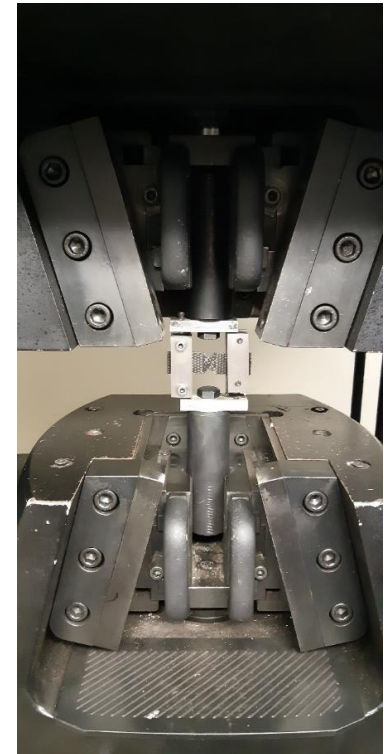
Composite Materials for Pipework Repair – Qualifications and Certifications



Approvals and compliance

- ASME B31.1; b31.4; b31.8
- ASME PCC2 – Bonded repair for High-risk applications
- ISO/TS Complies with standard for repair design
- Approvals and compliance have been reviewed by third party -180 Degrees Laboratory

Some testing has also been done by various other laboratories such as Aerosud and Scroobies. More than 100 in-house pressure tests performed up to 200 BAR
Approved by TuV in Europe



How does it work?

- **Prepare the surface**
 - Profile putty the uneven surface
 - Apply the primer layer
 - Saturate the fabric and wrap the pipe
 - Apply consolidation film
 - Final QC



Surface Preparation

Foreword:

Carbontech offers a wide variety of composite repair systems that utilize two-part, 100% solid epoxies as well as pre-impregnated systems. In order for the proper bond strengths and adhesion to be achieved, surface preparation is a vital component of the application process.

NACE 2 or equivalent (e.g. SSPC-SP-10 or SA-2 ½)

St 3 or equivalent (e.g. SSPC –SP-3)

St 2 or equivalent (e.g. SSPC-SP-2)

How does it work?

- Prepare the surface
- **Profile the uneven surface**
- Apply the primer layer
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How does it work?

- Prepare the surface
- Profile the uneven surface
- Apply the primer layer
- Saturate the fabric and wrap the pipe
- **Apply consolidation/PeelPly film**
- Final QC



How does it work?

- Prepare the surface
- Profile the uneven surface
- Apply the primer layer
- Saturate the fabric and wrap the pipe
- Apply consolidation film
- **Final QC**

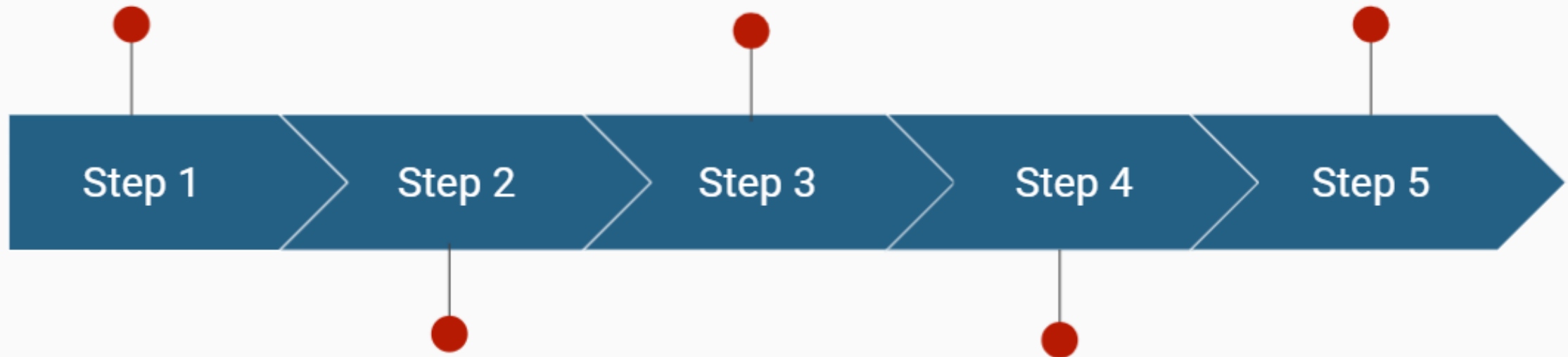


THE PROCESS

Client: Provides description of concern in Engineering Assessment Form

CT: Provide repair system in kit form.

QC documentation reviewed and retained for quality assurance and guarantees



Step 1

Step 2

Step 3

Step 4

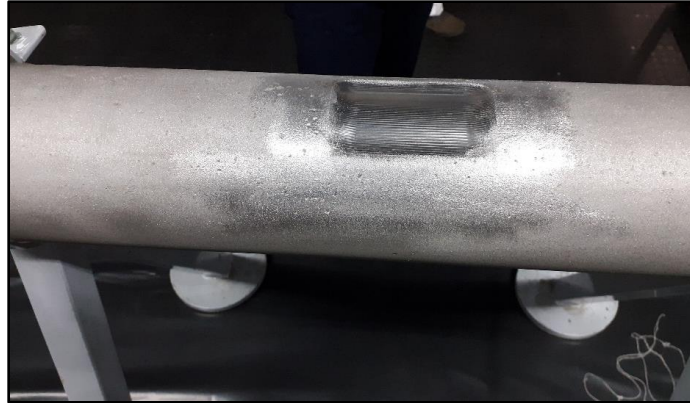
Step 5

CT Engineer: Assess concern and advise client.
1. Repair recommendation,
2. Engineering design report
(ISO 24817 & ASME PCC-2 Compliant)

Installation and QC by
trained and qualified
installers

PRODUCTS-PUTTY SYSTEMS

REVO-PUTTY¹⁷⁵



General Safety

What is epoxy resin?

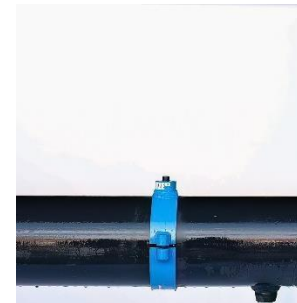
- Epoxy resin is a chemical that is part of an epoxy resin system. Carbontech epoxy systems are used because of their strong adhesive properties, chemical resistance and toughness.
- It contain epoxy resin, catalysts/curing agents, and diluents and/or other additives.
- Any of these chemicals on their own may cause irritant and/or allergic contact dermatitis.
- Cured epoxy resin (the fully hardened combination of the epoxy resin system chemicals) should be non-irritating and non-sensitising.

PRODUCTS-LEAK SEALING

Spitze Clamp

PRODUCT PERFORMANCE INDICATORS

Maximum Design Temperature	380°C
Maximum Design Pressure	200 Bar
Maximum Application Temperature (Viton bung)	250°C
Maximum Application Pressure	150 Bar
Minimum Allowable Operating Temperature	-60°C
Installation Time	10 Minutes
Minimum Pipe Diameter	1 Inch
Maximum Pipe Diameter	56 Inch
Shelve Life	No Limitation
Repair Lifespan	5 Year Design
Maximum Defect Diameter	25mm
Sub Sea Application	Spitze Subsea available in SAE 316 Stainless steel
Man Power required per installation	One
Applications	Elbows, Straight-line, Welds



Post Cure

Methodologies explained:

Space Heaters in tented areas – work great as uniform heating but is expensive and cumbersome (requires Hot work permit)

Pipe heaters/heat tracing – Supplies localized heating and is hard to control (requires Hot work permit)

Heat treatment (Can be dangerous if not carefully controlled and monitored) (requires Hot work permit)

Revomat (Inexpensive and safe way to heat piping uniformly) (requires Hot work permit)

* Please beware that systems like Heat treatment and electrical heat tracing must be insulated from the wrap, excessive heat can damage the wrap.

* Post curing isolated lines may cause pressure build up in the system which could affect the repair (in the case of through wall repairs) The line needs to be vented to atmosphere to depressurize the post cure line.

* Line may be live during installation, in the case of through wall defects, line may only be put back in service after the wrap is cured.

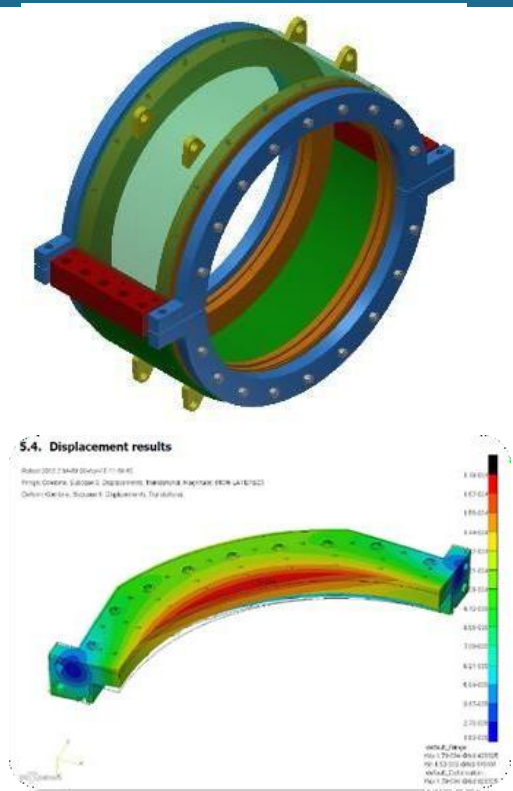
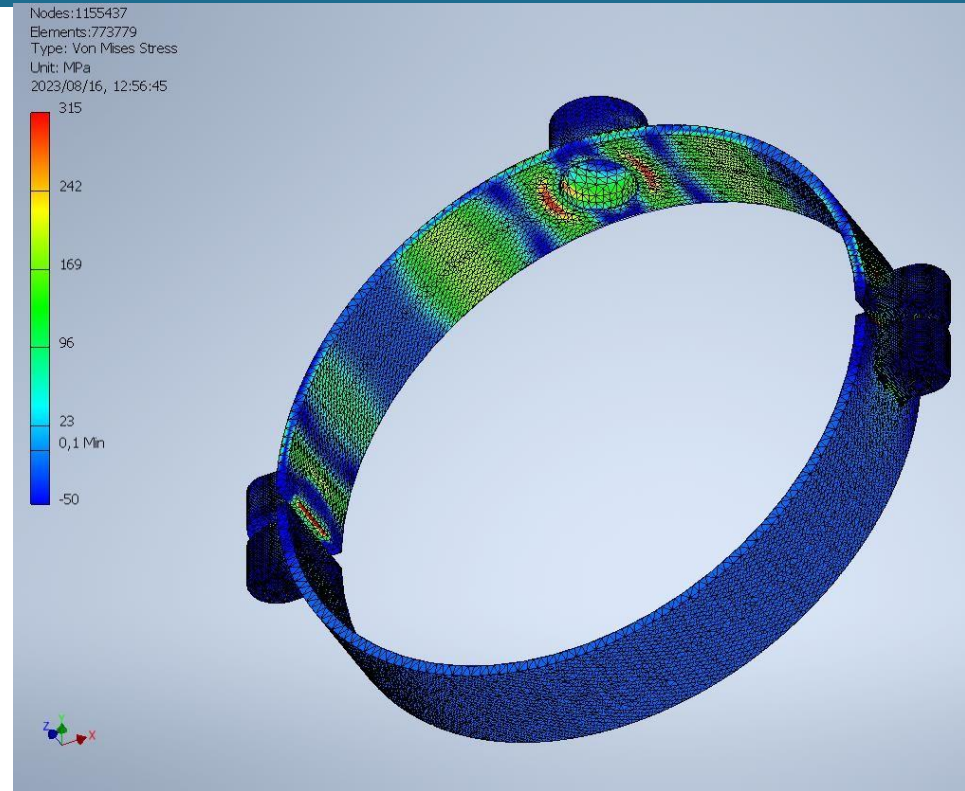
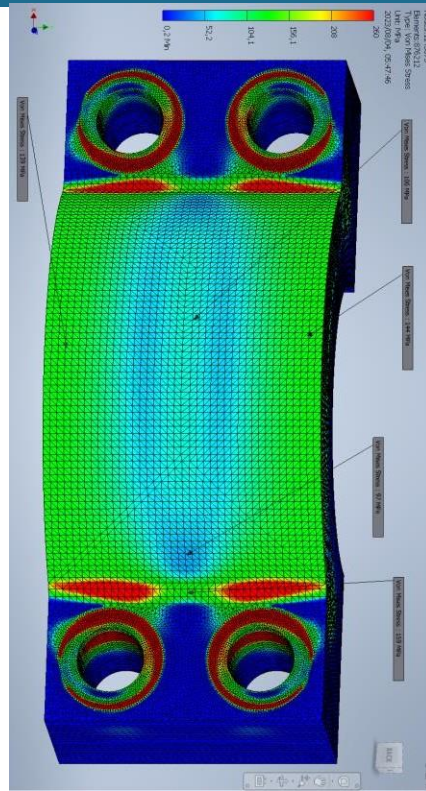
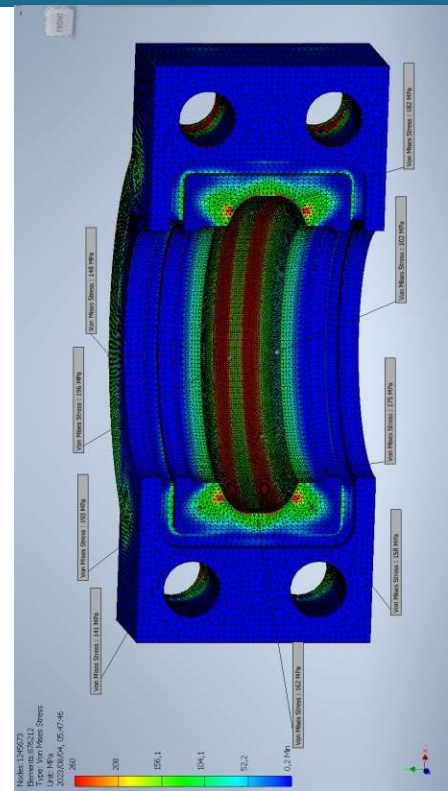
QUALIFIED WRAP INSTALLERS

Providing wrap training compliant and in accordance with
ASME PCC 2 and **ISO TS 24817**

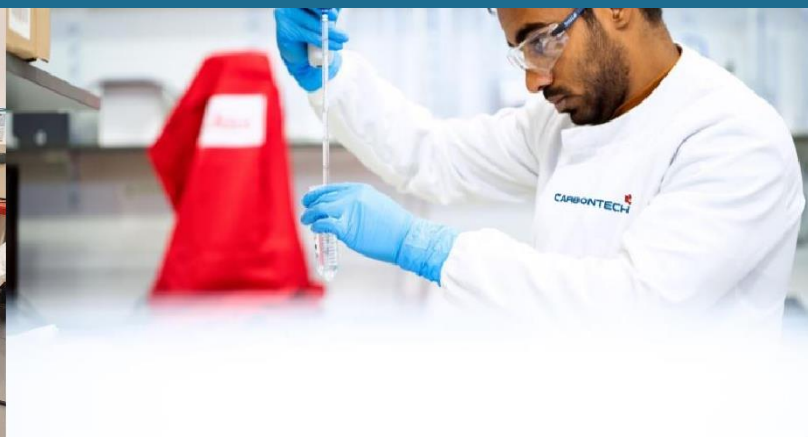
PERTH, AUSTRALIA ● JOHANNESBURG, SOUTH AFRICA ● SINGAPORE ● VUREN, NETHERLANDS ● TULSA O.K. USA



CONSULTING ENGINEERING SERVICES



Composite materials, pressure vessels structural reinforcement, FEA's



Quality Control

Important Documentation:

Revowrap ITP Doc. This document outlines the general responsibility of the installer, process owner and 3rd party inspection companies.

Revowrap Method Statement Doc.: This document prescribes specific information on methodologies/procedures on the different wrap systems and outlines standards that is to be followed during the wrap application.

Revowrap Quality control Doc. This documentation outlines the minimum required quality control measures to take when installing the Revowrap products.

Design Calculations: This document outlines the specific requirements for the repair: e.g. repair length, amount layers, repair system etc.

CONTACT OUR TEAM FOR MORE INFORMATION

Whether you have a question about our product specifications, trials, pricing, need a demo, partnership or anything else, our team is ready to answer all your questions. Talk to a composite expert near you.

