



# TITANWRAP

MECHANICAL REINFORCEMENT SYSTEM  
APPLICATION PROCEDURE

## PRODUCT DESCRIPTION

The **TitanWrap™** mechanical pipeline reinforcement system is specially designed for the repair of overhead, buried and/or submerged pipelines and accessories. This system consists of:

**WrapFill 811™** A corrosion pitting/cavity repair putty that allows stresses to be transferred from the duct to the mechanical reinforcement system.

**Epoxy 314™** A patented, surface-forgiving, self-priming epoxy with exclusive moisture absorption technology, embedded in a carbon fiber reinforcement that supports transferred stresses.

**Carbon 12K™** A layer of carbon fiber with 12,000 fibers and more than 80,000 psi of mechanical stress, which, immersed in the previous epoxy, supports the loads on the structure.

Corrosion protection is at the same time provided by the applied reinforcement system and in a few cases additional protection with other coatings is used.

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## SURFACE PREPARATION

Prior to surface preparation, pre-cleaning per SSPC SP1 Solvent Cleaning using water or paint thinner should be performed to remove existing grease and/or dirt.

### **Abrasive Cleaning.**

To ensure maximum system performance, a NACE No.2/SSPC-SP 10 or better NACE No.1/SSPC-SP 5 NACE No.1/SSPC-SP 5 abrasive blast to near white metal is required over the entire surface with a minimum anchor profile of 1-4.5 mil (25-112.5 microns), this can be achieved by abrasive blasting or sandblasting.

### **Mechanical Cleaning.**

When this type of abrasive blast cleaning is not dangerous or impossible because a small area is to be repaired, the surface must be prepared by mechanical cleaning removing all scale, rust, paint, and loose foreign materials according to SSPC SP3 and preferably with bare metal mechanical cleaning according to SSPC-SP 11, always obtaining an anchor profile of at least 1 mil (50 microns).

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## CONDITIONS PRIOR TO REPAIR

Prior to the application of the **TitanWrap™** system in the case of dents (dent) or mechanical notches (gouge), they should be sanded and verified that residual cracks have been eliminated with penetrating dyes or magnetic particle inspection.

## NOTES:

- Any mechanical dent or gouge repair requires a mechanical repair procedure signed by **TitanWrap™** or its representative.
- In mechanical dents or notches, any residual cracking must be removed.
- In the case of dents or mechanical notches, there must be at least 60% of the residual wall in the affected area.

The depression of the dent or mechanical notch must be filled with **WrapFill 811™** putty, following the curvature of the duct or the respective corrosion profile.

Below are some practical examples of application conditions, See Fig. 1 and 2:



Fig. 1 – Cleaning done on this line revealed more damage than was visible during the initial inspection. Proper cleaning is essential for a good repair and excellent performance. Corrosion pitting that is visible should be filled with **WrapFill 811™**.



Fig. 2 – The surface preparation shown to the left is generally unacceptable. In cases where the pipe cannot be adequately cleaned, it should be noted that the final properties of the composite system may be compromised (such as inferior adhesion to the steel surface).

## APPLICATION CONDITIONS

There are no specific conditions of ambient humidity or ambient temperature for the application of the putty, the surface may be damp, however, grease or other contaminants must not be on the surface.

### APPLICATION OF WrapFill 811™ PUTTY:

Prior to the application of **WrapFill 811™** the surface must be completely free of dust, dirt, grease and other surface contaminants and must have been prepared using one of the two previous methods outlined in the SURFACE PREPARATION section above.

All sharp corners of corrosion pitting, dents, pitting larger than 1/8" (3mm) in diameter should be filled with the use of **WrapFill 811™** Putty See Fig. 3-5, **WrapFill 811™** cures quickly so no waiting time is required for the application of the mechanical reinforcement with **Carbon 12K™** composite material impregnated with **Epoxy 314™**.



Fig. 3 – The defect must be completely filled with **WrapFill 811™** repair putty and the surface must be level.



Fig. 4 – The defect must be completely filled with filler and must be flush to the surface.



Fig. 5 – Use a ruler to confirm the uniformity of the filler putty

## APPLICATION Epoxy 314™ + Carbon 12K™:

1. After filling and leveling the surface with **WrapFill 811™**, wipe the surface with a clean cloth and solvent cleaner. Remove any dust or foreign material from the surface of the pipe in the repair area.
2. Now you shall mix components A and B of the **Epoxy 314™**, this system provides the adherence of the polymeric compound to the substrate. This mix is 1:1. Use special paint rollers that do not leave microfiber residue and apply the epoxy coating around the circumference and longitudinally to the entire area to be repaired.



Fig. 6 – Application of **Epoxy 314™** in the area to be repaired.

3. The next step is to saturate the **Carbon 12K™** fiber with its **Epoxy 314™**, to guarantee the adherence of the system to the primary coating. The following items are required in this step:
  - a. A table to apply with a plastic tablecloth to cover an area of approximately 1.5m by 3m long.
  - b. A duct (preferably PVC) with a diameter of 3-4" and 1.5 m long.
  - c. A set of brushes/rollers to apply **Epoxy 314™** on **Carbon 12K™** fiber.



Fig. 7 – Use of a table for impregnation of **Carbon 12K™** fiber with **Epoxy 314™**.

4. First line the table with a plastic tablecloth about 1.5m by 3m long. Attach the PVC duct to one end of the plastic tablecloth.
5. Then mix 1:1. of the resin components and curing agent components A&B of **Epoxy 314** in a homogeneous manner.
6. Then take one end of the carbon fiber and put it on top of the plastic tablecloth.
7. Apply the mixed resin to the carbon fiber and use the roller to saturate the resin to the carbon fiber. When you finish saturating the section of carbon fiber, turn it to its other side and apply more resin on the carbon fiber, checking to cover/saturate the **Carbon 12K™** with resin in its entirety, avoiding dry areas.
8. At this moment start to wind the carbon fiber already saturated with its resin in the PVC duct. Use this technique until you finish applying the resin to the carbon fiber.
9. Plan the wrap. In most applications, the wrapping methodology is spiral, but some applications require circumferential wrapping. The design sheet will help in the casing selection process. Generally, it is best to start the wrap at one end of the damaged area. If the damaged area is too long to complete the wrap before the resin cures the wrap should be done in sections. It is recommended to mark the areas of the pipe to be wrapped.

## Option 1 - Circumferential wrap:

1. Starting at the 12 o'clock position of the duct, remember to apply significant tension on the coil and wrap the prepared product around the pipe.
2. Continue wrapping until the specified number of layers is achieved.

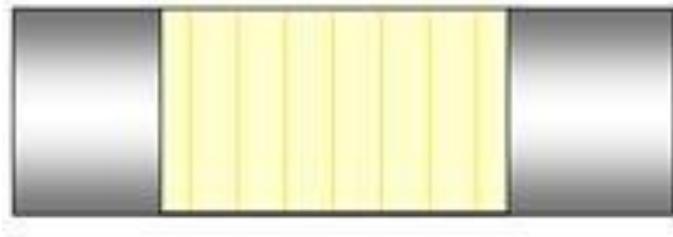


Fig. 8 - Option 1 - Multiple Layers Single Zone

3. If more than one roll of material is required to achieve the number of layers, overlap (overlap) the first roll with the second by about 6 inches (15 cm) and fill up to the required number of layers.
4. Press the end of the roll down onto the surface of the pipe. An assistant should hold one end of the wrapper. Remember to always maintain permanent contact with the pipe.
5. If there is an interruption during wrapping and the applied material begins to cure to the touch, brush or apply the primer to dry surfaces before proceeding with the rest of the wrapping.

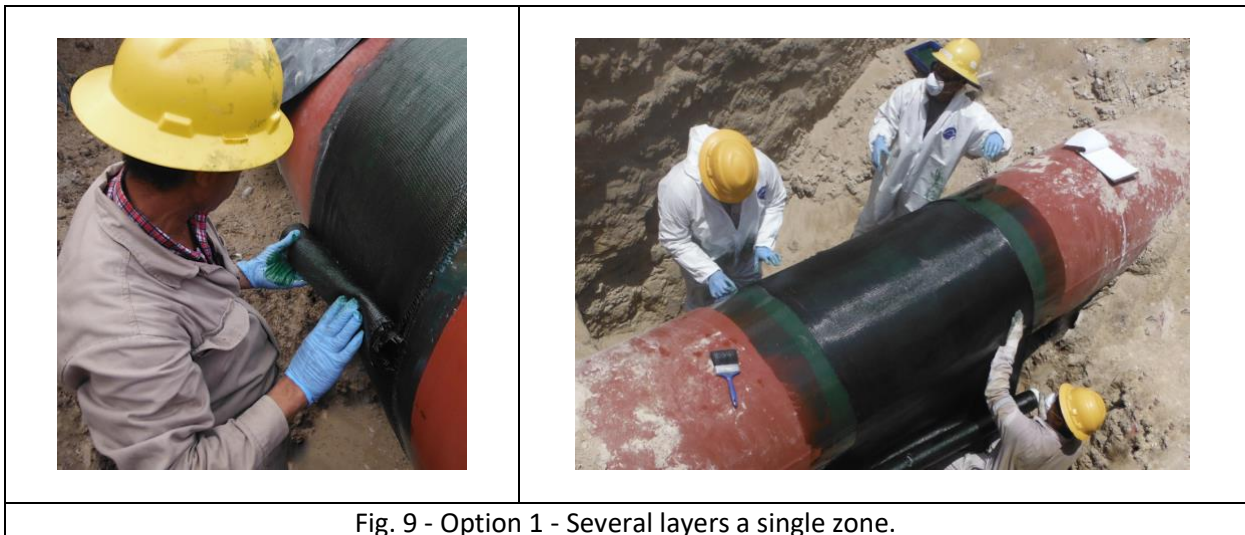


Fig. 9 - Option 1 - Several layers a single zone.

## Option 2 – Overlapping Application:

1. After the first wrap is applied, continue in a spiral to the far end. The wrap should be spiraled down the tube with no overlap or a maximum overlap of 20%. If the roll runs out, continue with another. Remember that significant tension must be applied over the course of wrapping around the pipe until the required number of layers have been applied.
2. When the roll has been completely applied, start the application of the new roll about 6 inches before where the first (previous) roll was finished. It is important to keep the same direction of origin, but keeping the same circular path with which, you started.
3. When you reach the end of the repaired site, a full circumferential wrap should be performed at this time. Begin the spiral of the fabric again to the direction of origin but maintaining the same circular path with which you started the application (clockwise or counterclockwise). The spiral must be such that the edge of each layer only touches the previous layer without overlapping or a maximum of 20% overlap.
4. When the required number of coats have been applied to the entire repair area and if any material is still available on the roll simply continue wrapping until the roll is finished.

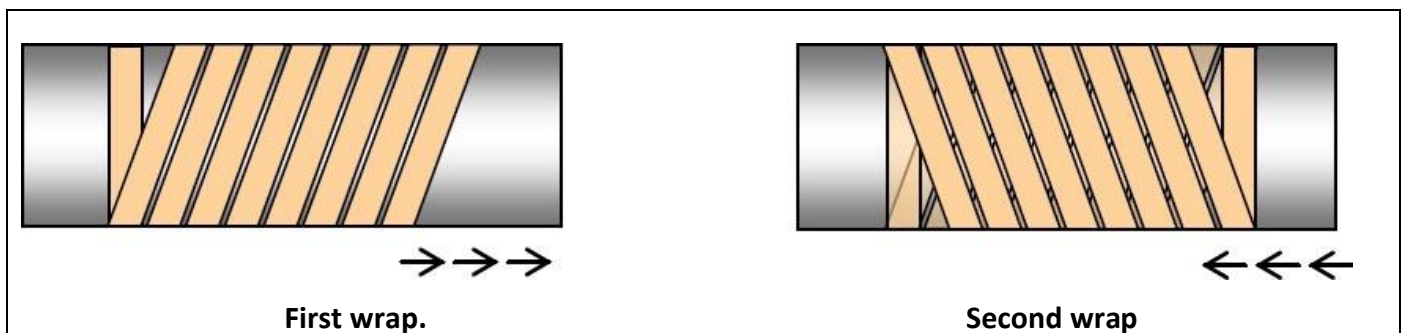


Fig. 10 - Option 2 – Overlap application

### Exceptions:

Release tension by going around or over obstacles. Continue wrapping around but still do not start pulling tension again until you are sure you are pulling TitanWrap™ away from the obstruction. Apply additional layers in these regions.

## QUALITY CONTROL

- Visual inspection to locate and correct areas with air pockets, wrinkles, or insufficient overlap.
- The hardness of the system 24 hours after application with a minimum value of 72 according to Shore D at 25 C.



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## SAFETY PRECAUTIONS

Please read and understand this document before handling or installing them.

Gloves, protective clothing, and safety glasses are required, other personal protective equipment may apply based on hazard analysis, factory authorized training is required for installation per ASME PCC-2 code.

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## TECHNICAL SERVICE

For any technical questions regarding the use of our products, let us support you by contacting our technical sales department.

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## WARRANTY DISCLAIMER.

TITANWRAP will not be in any case responsible for damages of any nature that may arise from improper use of the product. Before using it, the user must determine whether the product is suitable for its intended use, assuming all risk and liability that may arise from its use.

If it is proven that a product is defective due to material or manufacturing at the time of sale or does not meet the properties indicated in this technical sheet during the warranty period, the only responsibility of TITANWRAP will be to replace the buyer with the amount of product that appears defective. TITANWRAP does not assume any responsibility for any additional costs such as costs of manufacturing, removal, or re-application of the products. If TITANWRAP offers its client an express or implicit guarantee, or compensation that differs from those established in this technical sheet, said stipulation can only be altered by means of an agreement signed by the parties.