

### Introduction

Mirteq's steel primer and vinyl ester based, micro-fiber reinforced resins have been custom formulated for sealing and refurbishing steel structures, such as culverts and steel storage tanks - where hydrolytic stability and chemical resistance considerations are paramount.

With any steel rehabilitation project the first question that needs to be answered is whether the existing steel can withstand the required pressure after the steel surface is prepared for resurfacing. The answer will determine whether the steel requires a structural liner.

Sometimes the condition and structural integrity of the steel can only be determined after sand blasting to remove previous coatings and corroded steel.

The best way to prevent future corrosion, once the rust and other coatings have been removed, is to apply a corrosion resistant primer that chemically bonds to the steel surface regardless of ambient humidity. This then leaves no space for water, solutes, and oxygen to accumulate between the steel and the primer.

*“MIR-900/940/950 anti-corrosion resin systems for protecting steel structures are unique for a variety of reasons. They are tough, structural resins that have exceptional hydrolytic stability, excellent chemical resistance and use a combination of micro-fiber and nanotechnologies to optimize their overall performance.”*  
*Keith Mackenzie, CEO, Mirteq*

If the steel is structurally sound for its intended use then one coat of primer and 1/8 inch spray coating of MIR-950 is all that is required to seal the surface and complete the refurbishment.

If the steel is structurally unsound Mirteq's MIR-940 structural resin can be used with a glass laminate to re-build the inside surface and effectively refurbish the steel.

The exceptional structural performance of the MIR resins has been independently validated by the University of Newcastle<sup>(1)</sup>, Australia.

<sup>(1)</sup> *Flexural Tests of Composite Samples - March 2014* Professor Philip Clausen, The University of Newcastle  
*Finite Element Predictions of the Response of a Composite Pipe to Loading Report – June 2014*, Professor Philip Clausen, The University of Newcastle

## Surface Preparation

The surface to be coated has to be brought back to bare steel with no adhering coatings or rust before the application of Mirteq's relining products. The best way to thoroughly clean the surface is by abrasive blasting with a class Sa 2½ finish and 50 to 100 microns profile to ensure the chemical bond is not compromised in any way. The first primer layer then needs to be applied to a dried and dusted surface within 12 hours of sand blasting (or even sooner if there is moisture in the air). Moisture is the enemy during the coating process.

## MIR Structural Resins

MIR-940 and MIR-950 structural materials are manufactured from urethanes and epoxy vinyl ester resins. Unlike conventional fiberglass Mirteq's micro-fiber filled resins chemically bond with the steel primer, nanoparticles, and glass reinforcements.

This means that when a steel surface is coated with MIR's steel primer and MIR-940/950 series resins the surface of the steel is comprehensively sealed from the elements and the resin itself is impervious.

### Hydrolytic Stability / Water Penetration

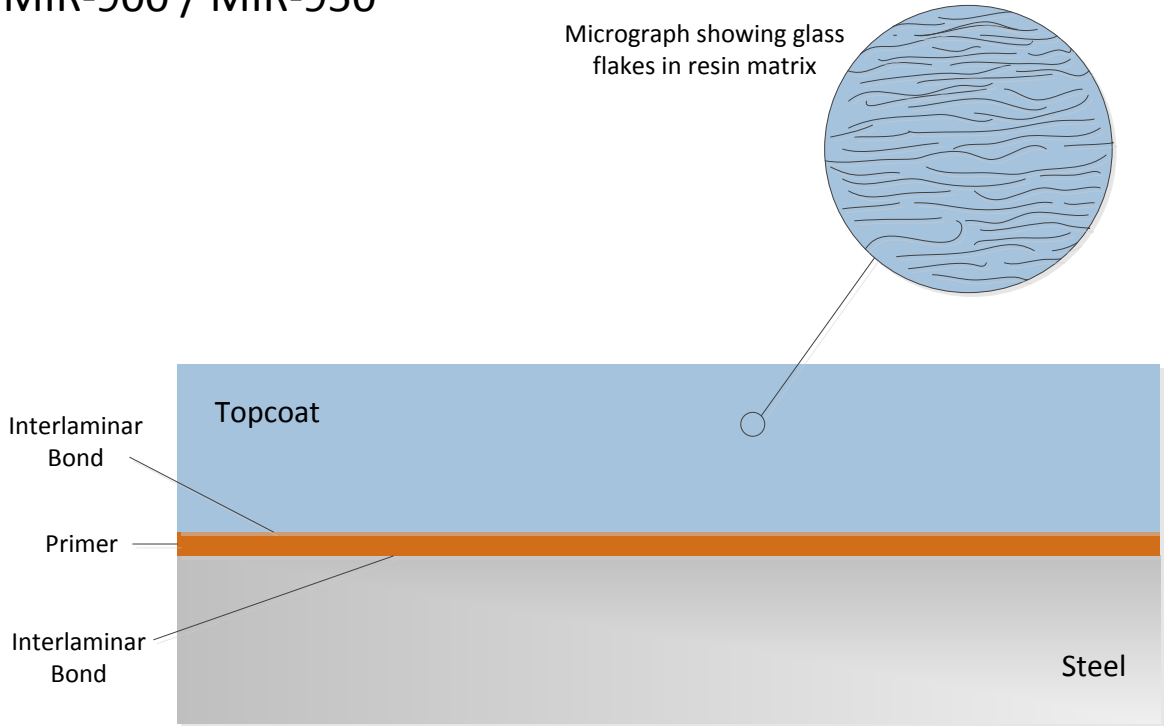
To vastly improve the chemical resistance and hydrolytic stability of the laminate, the glass flakes in the resin create a tortuous path within the resin matrix, which neither water nor oxygen can penetrate. (There are no inter-laminar boundaries within the coatings because each layer is chemically bonded to the layer below and the primer is chemically bonded to the steel).

Epoxy vinyl ester resins also have a constant, low MVTR (Moisture Vapor Transfer Rate) that does not increase with time. (Once cured, they are not affected by immersion in water because the water labile sites in the molecule are sterically hindered.)

All this technology means that the surface of the steel is comprehensively sealed from the elements. It is also resistant to most chemicals while the added micro-fiber reinforcements within the resin guarantees the structural integrity of the entire laminate system.

Mirteq's structural relining resins (MIR 940 and MIR-950) can all be applied with or without long fiber glass reinforcement. The thickness and type of MIR reinforcing material to be applied is largely dependent on the condition of the steel and the loads it will be subjected to.

## MIR-900 / MIR-950



## MIR-900 / MIR-940

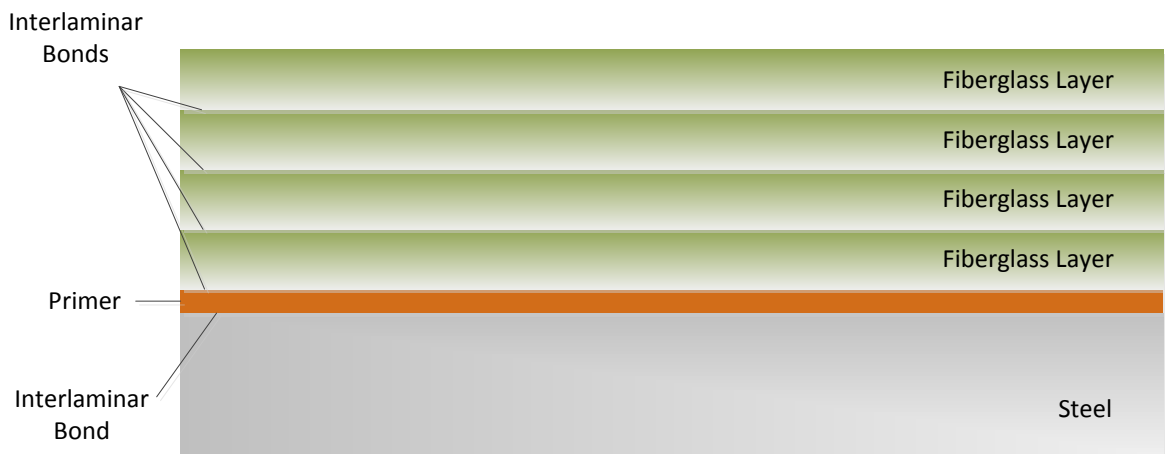


Figure 1: Sprayable MIR-950 (topcoat) and hand laid MIR-940 diagrammatic representation

## Features & Benefits

### **Features:**

MIR-950 sprayable resin system

Chemical and water resistance

Fast setting thermosetting material

Resin matrix is visco-elastic

No leaching or absorption in the resin matrix

Can be UV stabilized if required

Paintable

### **Benefits:**

Speed with which the material can be applied

Prevents future corrosion

Structurally sound within 72 hours

Surface will not crack due to the expansion and contraction of steel

Cleaner water

Extends the life of the resin if exposed to direct sunlight

May be used outside

## Application

Primer:

- ◆ Brush application.
- ◆ Primer coat must be applied to a dry, dust free surface within 12 hours of sandblasting, or sooner if it is humid. (It is important that the newly sandblasted surface is not allowed to oxidize before the first primer layer is applied.)
- ◆ The MIR-900 primer must be touch dry before the MIR coating is applied.
- ◆ A second primer coat should only be applied if the first primer coat was applied more than 12 hours ago. (No more than 2 coatings should be applied).

Structural Coating:

- ◆ MIR-940 - roll out using woven rovings or apply with a chopper gun.
- ◆ Chopper gun - resin : glass ratio – (1.8–2 : 1).
- ◆ Maximum thickness per layer 1/8 inch.
- ◆ MIR-950 - spray directly onto the primed surface using custom spray equipment.

## Equipment Required

- ◆ Saturator / Chopper gun – 60 ft hose with ½ inch ID.
- ◆ Rollers.
- ◆ Paint applicators / brushes.
- ◆ Resin pump pressure – 0.35 MPa – 0.41 MPa (50-60 psi).
- ◆ Transfer pump (to pump the resin into the inside holding tank).
- ◆ Ventilation extractor (styrene will settle to the bottom of the tank and needs to be removed).
- ◆ Acetone and Dimethyl Phthalate for cleaning the equipment.

## Installation Warranty

Due to the chemical bonding within the coating system, if the steel surface is properly prepared and the material is applied correctly there is no place for liquids and air to accumulate.

As with any coating system, the outcome is therefore dependent on the condition of the tank and the quality of the remediation. Mirteq therefore warrants individual projects on a case by case basis.

For these reasons, the warranty of any liner made with MIR resins rests in the hands of the installer and end-users should ensure that they only use installers who are experienced with steel coating systems.

## Illustrations



*Figure 2: Hand-laid MIR-940 and spray application of MIR 950*



*Figure 3: Refurbished steel pipe using MIR 940/950 resins*



*Figure 4: Mirteq's custom made primer. Coated steel plate was bent 90° to fracture the MIR-950 coating. The coating was then ground away to expose and show off the tenacious chemical bond.*

## Appendix A: Physical Properties

<u>Properties at 77°F</u>	<u>Method</u>	<u>Units</u>	<u>MIR-940 Value</u>	<u>MIR-950 Value</u>
Flexural Strength	ASTM D790	MPa	280	135
Flexural Modulus	ASTM D790	GPa	14	6
Flexural Elongation @ Break	ASTM D790	%	4.5	4.5
Tensile Strength	ASTM D638	MPa	150	67
Tensile Modulus	ASTM D638	GPa	14	6.2
Density	ASTM D792	g/ml	1.6	1.3
Viscosity	ASTM D2196	cP	4,000	6,000
Thix Index	ASTM D2196	n/a	5.0	5.6
Glass Content	Formula	%	50	12.5
Styrene Content	Formula	%	45%	45%
Barcol Hardness, Ultimate (GYZJ-935 scale)	ASTM D2583		81	81
HDT*	ASTM D648	°F	221	221

\* topcoats are available to improve HDT

## Packaging

MIR-970 is available in 5 gallon and 55 gallon containers.

### **Disclaimer**

The technical data, recommendations and other information contained in this data sheet are provided in good faith and represent the best of our knowledge and experience at the time of printing. It is our users' responsibility to ensure that any of our products are used and handled correctly and in accordance with our instructions and recommendations, and only for the uses the product is intended. We also reserve the right to update any technical or user information without prior notice to users as a result of its ongoing research and development.

Country specific recommendations, depending on local standards, codes of practice, building regulations or industry guidelines, may effect specific installation recommendations.

The supply of our products and services is also subject to certain terms, warranties and exclusions, which may have already been disclosed to you in prior dealings or are otherwise available to you on request. You should make yourself familiar with them.

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