



Surtreat SurCoPrimer on concrete to increase surface tensile yield strength in combination with the application of fiber reinforced polymer concrete reinforcements.

Background

The application of fiber reinforced polymer (FRP) on the surface of concrete members forms a monolithic structural reinforcement containing three components of strength. Carbon and glass fiber reinforced polymers that have yield strengths in the 100,000 PSI range, epoxy polymers that have yield strengths in the 10,000 PSI range and the concrete surface that has yield strengths in the 100 to 300 PSI range and represents the weak link in the monolithic reinforcement system.

ASTM D 7522 “Standard Method for Pull-Of Strength of FRP Bonded to Concrete Substrate” describes a quality control method for measuring the monolithic yield points for FRP on concrete by measuring the force required to pull-off a 2-inch diameter metal disc bonded to the FRP surface. The method describes 7 modes of pull-off failure 6 of which relate to polymer and fiber bond strengths with the 7th and objective mode being cohesive failure in the concrete substrate. The pull-off bond strength is express as MPa or PSI units. This same or similar dynamic surface pull-off strength methods can be used to measure the tensile yield strength of a concrete surface.

Measurement of concrete tensile yield strength before and after application of Surtreat SurCoPrimer.

Two sets of concrete surface strength measurements were made using the dynamic pull-off force method before and after the application of SURCOPRIMER.

The first set was run in the laboratory using 4X4X4 inch shotcrete type mix cubes having an average compressive strength of 5300 PSI, 4 of which were treated on 1 side with SurCoPrimer at rate of about 100ft²/gal and allowed to cure, and 3 were used as the untreated control. The following average measurements were recorded:

After Application of SurCoPrimer-----495 PSI

Before Application-----333 PSI

Increase in Strength-----162 PSI

The second set was run in the field on precast concrete elements having an average compressive strength of 3,300 PSI. SurCoPrimer was applied on one set of elements at rate of 100ft²/gal and allowed to cured for 25 days. The following average of 3 measurements were recorded:

After Application of SurCoPrimer-----530 PSI

Before Application-----307 PSI

Increase in Strength-----223 PSI

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The average increase in strength between the 2 sets of measurements is 193 PSI. There is a rapid increase in concrete surface strength immediately after application of SurCoPrimer and continues to increase with time. An increase of 200 PSI in the concrete tensile strength will give an increase of 86,400 lbs. of force in the total load distribution on a 1 X 3 ft (432 in²) area FRP layup.

Application of SurCoPrimer

SurCoPrimer is a water solution of chemically active silicates that penetrate tie surface of concrete and react with the cement to increase strength, reduce porosity, and inhibit reinforcing steel corrosion. Concrete surface must be free of any substances that would inhibit penetration of SurCoPrimer. Application can be made by several methods including brush, roller, and spray. The average target application rate is 100ft²/gal. If a second application is needed to reach the target rate, must be sure that all the first is adsorbed into the surface. Make one light spray of water on surface as soon as the surface is dry from the last application to ensure that all active ingredients have penetrated below the surface. This is important to avoid material remaining on surface from interfering with adhesive bond formation.