Application Methodology

for

RELinforce™ FRP STRENGTHENING SYSTEMS

I. General

This Application guide applies to the Reliance Industries Limited's FRP (Fibre Reinforced Polymer) composite strengthening systems, known as RELinforce™. It deals with CFRP system for structural strengthening & protection of the structural members of concrete and metal structures using carbon wrap technology. This application guide shall be read in parallelism with all project specifications, designs and calculations provided by the client, latest material technical data sheet (TDS) and material safety data sheet (MSDS).

II. Installation / Application process:

The generalize application steps for fabric wrapping for pipe or construction site are:

1. Surface Preparation.
2. Putty Application.
3. Saturant Application.
4. Fabric Wrapping Over the Saturant.
5. Final Coat of the Saturant.

Kindly note, these are basic steps for application of fabric for any laminating purpose to give an idea about the laminating process or the stages involved and enable the end user or contractor for initial planning and scheduling stages of work.

1) Surface Preparation:

- **Removal of Damaged and Unsound Concrete:**

  The effectiveness, integrity and performance of the RELinforce™ FRP wrapping System critically depend on the preparation and soundness of the substrate. Therefore, preparing a clean and sound substrate is the most important part of the entire application process. Environmental effects and corrosion of the reinforcing bars can cause damage to concrete or masonry. Any such concrete or masonry area that is determined by the engineer of record or other properly trained personnel to be damaged and unsound must be removed and repaired before application of the RELinforce™ FRP system. Defects in concrete substrate can compromise the strength of the system. Covering of carbonated or chloride-contaminated concrete with RELinforce™ FRP system without addressing the source of contamination will be detrimental to the effectiveness of the repair system.

- **Surface Preparation:**

  All sharp fins, protrusions, surface irregularities and unevenness shall be ground to a smooth surface with less than 1/32 inch in deviation. Surface preparation shall promote continuous intimate contact between the RELinforce™ material and concrete by providing a clean and smooth flat or convex surface. Disk grinders or similar equipment may be used to remove paint, stains and other surface substances that may affect the bond. Any surface protrusions caused by crack injection must be removed before application of the

RELinforce™ EP putty. For severe undulations and defects use RELinforce™ EP Mortar as per the shared data sheet. The surface must be completely cleaned of any dust, grease, oil, curing compounds, wax, stains, paint, surface lubricants, foreign particles, weathered layers or any other bond inhibiting materials. All corners and sharp edges shall be rounded or chamfered to a minimum radius of 3/4 inch or greater with an appropriate grinder.

2) Putty Application:

Once the substrate is thoroughly cleaned properly, use pressurized air blower for removal of dust from the substrate. All surface voids and undulations must be filed before wrapping process using RELinforce™ EP Putty. Such concrete surfaces must be first primed with RELinforce™ Fab S Saturating system prior to the application of the EP putty. RELinforce™ Fab S saturating system must be applied at ambient and surface temperatures between 10˚C and 38˚C. RELinforce™ EP putty should be applied as soon as the primer becomes tacky. EP putty will take 3 to 5 hours to cure, curing schedule may vary due to variation in ambient temperature. Once the Putty is cured, initiate the saturant layer application step.

3) Saturant Layer Application:

All resin systems supplied by RELinforce™ are two-component systems, containing a Part A (**Resin**) and Part B (**Hardener**). We will be using saturant RELinforce™ Fab S having mixing ratio of **100 Parts** Resin to **50 parts** Hardener (by weight). It is very important that the two parts are thoroughly mixed in proper recommended proportion for proper development of desired properties. Saturant Fab S Part A & Part B must be mixed for a minimum of 3 minutes or until a uniform color and consistency is achieved. No organic solvents or thinners should be used to thin the epoxies. If mixed resin begins to generate heat or display increased viscosity should not be used and discarded properly.

Epoxy systems generates exotherm during the curing time, mix only small quantities in containers with a large surface area to allow heat dissipation. The longer the epoxy components are left in the container, the more heat they will generate, resulting in hardening and wasting of the epoxy.

Calculate the quantity of the saturant RELinforce™ Fab S to be mixed as per the provided consumption. Apply the mixed RELinforce™ Fab S system to the substrate with the help of Roller. Let the applied saturant layer become tacky before applying the fabric.

4) Fabric Wrapping Over the Saturant:

Once the RELinforce™ Fab S is applied to the substrate, it will become tacky within 10-20 minutes, during this waiting period cut the fabric of required appropriate lengths. The fabrics and laminates provide the necessary strength in the primary direction of their fibers. Therefore, it is paramount that the plies and fibers in the fabric be oriented in the directions that are shown on the construction documents and drawings. The installed fibers must be free of kinks, folds, waviness and misalignments.

Once the fabric is applied to the substrate with the help of saturant, use hard PVC roller in the longitudinal direction of the fibers to impregnate the fiber with the saturant as well as remove the air bubbles in the lamination process. Repeat this process 2 - 3 times in order to wet the applied Carbon Fiber with the saturant properly without any air voids. The applied CFRP system will cure in 2-3 hours, during this period monitor and correct if there is any disbondment or dislocation of the fabric from the substrate.

5) Application of Final Saturant Coat:

The final coat of RELinforce™ Fab S saturant should then be applied onto the surface of the applied fiber layer once the fibers are firmly adhered to the substrate. The second coat of the saturant should be applied before 24 hours (for better bonding and mechanical properties, we recommend to apply the second layer within first 3 – 6 hours) from the application of the first layer of the saturant. Apply the remaining quantity of the saturant as per the given consumption calculations. The coated surface should be strongly squeezed in the fiber longitudinal direction 2 – 3 times with the help of hard PVC roller to impregnate the fibers.

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