Standard Structural Precast Concrete Repair Procedure #5: Fiber Reinforced Polymer System

Description

The following repair plan is for elements required to be reinforced with a fiber reinforced polymer (FRP) sheet and adhesive composite system due to surface defect, honeycombing, damage, etc. and would be used in conjunction with another MDOT standard structural precast concrete repair procedure or approved unique repair procedure. This FRP repair plan is in accordance with the latest Michigan Department of Transportation Special Provision for *Fiber Reinforced Polymer System for Prestressed Concrete Beam Repair* (hereafter referred as FRP SP). A MDOT approved FRP system from Table 1 of the FRP SP must be selected.

Submit the following items for MDOT's review and approval:

1. FRP manufacturer's product data sheet for the following: sheet, resin, and protective top coat;
2. Concrete surface coating manufacturer's product data sheet, federal color number, and swatch of the color proposed for coating. The coating color must match the color of the beam unless the beam will be concrete surface coated, which would require the coating color to match the concrete surface coating.
3. Manufacturer's recommended installation procedures;
4. Details of any construction device that may be attached to the structure during construction;
5. Quality control inspector (QCI) information (at a minimum the full name, FRP training, and FRP work history) for individual responsible for inspection and fabricator acceptance of FRP sheet and adhesive composite system; and
6. FRP manufacturer's on-site technical representative trained in the application of FRP sheet and adhesive composite system installation on concrete substrate. Representative must be physically on-site during startup of the FRP installation process to assist the fabricator and answer questions from the Department's representative.

Procedure

Below is the standard repair procedure for the FRP sheet and adhesive composite system. In general, the manufacturer's recommended installation procedures must be followed. In the event of a conflict, the more strict procedures must be adhered to:

1. Verify latex repair patches have been wet cured for 48 hours and air cured for 48 hours prior to installation of FRP sheet and adhesive composite system.

2. Grind all rough edges on latex repair patches smooth after they have completely cured.

3. Remove concrete dust from surface by blasting with minimum 90 psi oil-free compressed air.

4. Verify environmental conditions (dew point, humidity, concrete moisture content, and concrete substrate temperature) are within the FRP SP prior to placing primer and FRP sheet. Fabricator's QCI must possess one of the following endorsements:

    a. National Association of Corrosion Engineers (NACE) – National Coating Inspector Training and certification Program Session I: Coating Inspection Training;

    b. SSPC-C1 Fundamentals of Protective Coatings for Industry for Industrial Structures; or

    c. National Highway Institute (NHI) – Bridge Coating Inspection Course.

5. Apply the FRP primer and FRP sheet in accordance with the FRP SP.

6. FRP sheet must extend past the patch area by at least 3 inches in all directions, but extend across the entire bottom flange and up both sides of the web to the bottom of the top flange.

7. FRP sheet must be placed with fiber orientation perpendicular (90 degrees) to the beam's longitudinal axis.

8. Allow at least 24 hours for initial resin to cure prior to performing direct adhesion testing in accordance with ASTM D7522.

9. Completely cure the FRP sheet and adhesive composite system per the manufacturer's recommendations before applying the protective top coat per the manufacturer's recommendations.

10. After curing, check entire FRP wrap for any delamination by acoustic tap inspection per the FRP SP.

11. Use the project's *Special Provision for Concrete Surface Coating,* if available, to coat the FRP system in accordance with the manufacturer's product data sheet except as modified by subsection 716 of the MDOT SSC. If the project does not have concrete surface coating then a special provision will be provided.