Structural Precast Concrete Repair Guidance Document

Description

The purpose of this guidance document is to provide the Michigan Department of Transportation (MDOT) with statewide consistency reviewing and approving structural precast (prestressed and non-prestressed) concrete repair submittals. It provides internal guidance for the minimum acceptable procedures to ensure a durable repair that will preserve the integrity of the fabricated structural element. MDOT uses a minimum 75-year bridge design life and any proposed repairs to the element should be consistent with the original design. MDOT's Structural Fabrication Unit is responsible for implementing the Department's quality assurance program for structural elements required to be accepted based on "Fabrication Inspection" per MDOT's Materials Quality Assurance Procedures (MQAP) manual and utilizes vendor inspectors to provide the shop inspection. The fabricator is required to notify MDOT's quality assurance inspector (QAI) prior to performing any approved repairs for the opportunity to perform verification inspection.

Structural precast concrete elements may contain defects from the fabrication process or are often damaged during formwork removal or shipping and handling. The fabricator's quality control inspector (QCI) is required to notify the MDOT QAI of all defects/damages that occur to the elements. The fabricator is responsible for submitting a NCR with proposed corrective action (repair plan) to bring the element into conformance if it is to be considered for incorporation into the project. MDOT will consider the corrective action and provide a response to the contractor in accordance with *MDOT's Structural Fabrication Nonconformance Reporting Process*. Submittal of a NCR does not guarantee approval since the defect/damage may have resulted in structural, durability, or aesthetic concerns that is not addressed by the repair plan. Repairs are not permitted to be performed until after the NCR has been approved and the QAI has been notified in a timely manner when the repair will take place. See *MDOT's Structural Fabrication Nonconformance Policy* for more information on when nonconformances can be incorporated into the project and associated price reductions. See *MDOT's Structural Fabrication Nonconformance Reporting Process* for more information on what NCR's are and how to submit them. Both of these documents can be found on the MDOT Structural Fabrication Unit website located inside the Structural Precast Concrete Fabrication Inspection Portfolio document.

MDOT Standard Repair Procedures

1. *Standard Structural Precast Concrete Repair Procedure #1: Air Hole
2. Standard Structural Precast Concrete Repair Procedure #2: Minor Surface Defect
3. Standard Structural Precast Concrete Repair Procedure #3: Major Surface Defect

4. *Standard Structural Precast Concrete Repair Procedure #4: Hot-Dip Galvanize
5. Standard Structural Precast Concrete Repair Procedure #5: Fiber Reinforced Polymer System
6. *Standard Structural Precast Concrete Repair Procedure #6: Epoxy Repair
7. Standard Structural Precast Concrete Repair Procedure #7: Epoxy Injection

*Indicates standard structural precast concrete repair procedure that does not require submittal of a NCR for MDOT approval; however, the fabricator is required to follow these procedures and notify the QAI when the repairs will be performed so they have the opportunity to witness. Fabricator must have copies of the standard repairs plans with them at all times.

MDOT's Structural Precast Concrete Specialist will consult with the Structural Fabrication Engineer and other technical resource areas when repair plans fall outside the scope of the above stated standard repair procedures. The following non-standard materials/procedures have been used in limited applications on past projects with success:

1. BASF HB2 (formerly Thoroc) for overhead structural repairs and when latex repair mixtures can't be bird-mouthed into the formwork.
2. BASF Emaco (#1) and Sika 123 Plust (#2) for non-structural applications when latex repair mixtures can't be bird-mouthed into the formwork. Note it is rare to have a non-structural repair application.
3. Non-structural crack repair: Healer sealer is a good non-structural crack repair to effectively impede moisture intrusion and chloride penetration.
4. Sealing exposed aggregate saw cuts: Healer sealer is a good product for sealing a saw cut edge. Water repellent treatment would be the second best option. Both products will be difficult to apply on a vertical surface.
5. Coating exposed steel reinforcement: Aluminum mastic epoxy is a good coating system to coat exposed steel reinforcement. The epoxy must be from a manufacturer that is listed in MDOT's MSG QPL (Section 915: Coating Systems for Steel Structures). The steel must be cleaned to SSPC SP 6 or better. The manufacturer's recommendations must be followed. A minimum of two coats of the aluminum mastic epoxy (see manufacturer for recommended min/max DFT) should be applied with the proper cure time between coats. An acceptable concrete repair material can then be placed over the coated steel reinforcement.

Appendix A – Air Hole

Figure 1. Air holes greater than 3/4” in any direction and greater than 3/8” deep.

Appendix B – Minor Surface Defect

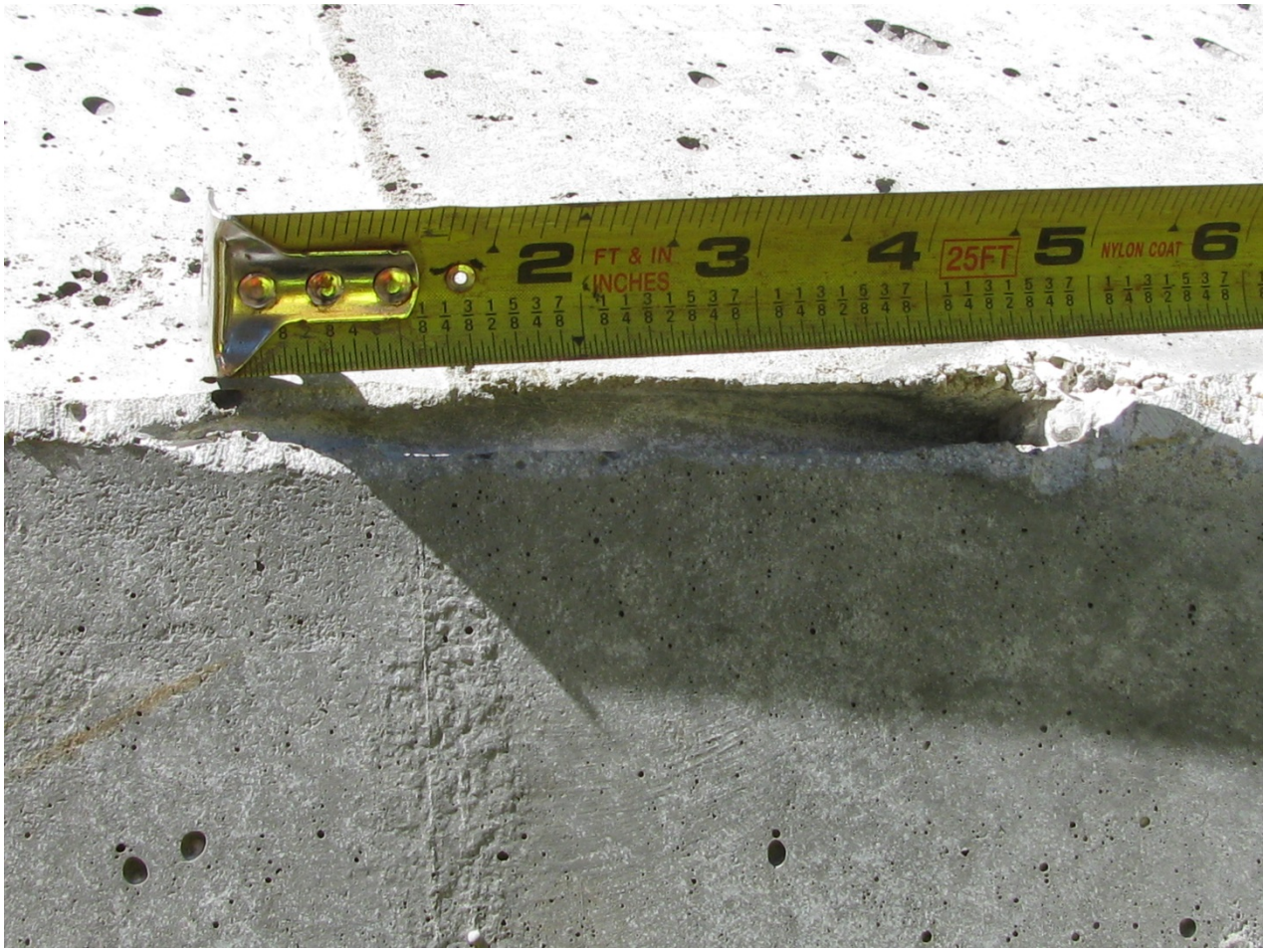

Figure 2. Rubber gasket crease

Figure 3. Moderate honeycombing along MI 1800 girder.

Figure 4. Moderate honeycombing at end of PCI beam.

Appendix C – Major Surface Defect

Figure 5. Broken corner at end of PCI beam.

Figure 6. Spalled bottom corner at end of box beam.

Figure 7. Spalled bottom corner at end of box beam.