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Basics of Concrete Repair, Repair Application Procedures

- #7 Spall Repair of Horizontal Concrete Surfaces
- #5 Vertical and Overhead Repairs using Form and Pump
- #4 Vertical and Overhead Repairs using Form and Pour

Note: Content specific to RAP 4 and RAP 7 can be found at: http://www.concrete.org/education/Webcasts/RAP_Part_a.html

What We Will Cover

- Purpose of Repair
- When do I use these techniques
- How do I prepare the surfaces
- What are the safety considerations
- Preconstruction and Trial Repair
- Repair Procedure
- How do I check the quality of the repair

Repair Techniques
Surface Preparation
Surface Repair

The Process

- Condition
- Removal
- Material selection
- Surface prep
- Placement technique

Improper Surface Preparation

Before 1989

Concrete Removal

Chipping Hammer for Reinforcing Steel Detail Work

15# Hammer, No bigger than 30#

Removal of Concrete Under Corroding Bar
In Accordance with ICRI Guideline 310.1R

Why Here, Not Here?

Repair Geometry

Delaminated, cracked areas
Incorrect layout
Recommended layout
Surface Repair
Repair Geometry
beam section
slab or wall section
drift section

Repair Geometry
column section

Lost Cross Section My Significantly Reduce Structural Capacity

Not Recommended w/o Express Permission by Structural Engineer

Ergonomics

Sawcutting
Reinforcing Steel
Repair & Protection

Reinforcing Repair
Surface Preparation of Bars
- Cleaning required to remove bond inhibiting materials
- Heavy mill scale removed
- Heavy rust layers removed
- All oxide does not need to be removed
- Sandblasting preferred method
- Degree of blasting??

Reinforcing Repair
Preparation of Bars

Reinforcing Repair
Cleaning with wire wheel

Repair of Corroded Bars
Repair Damaged Reinforcement Under the Direction Of A Licensed Engineer

Lost Cross Section

Placement
- Moisture Conditioning
- Bonding Repair to Substrate
- Placement Techniques
- Quality Assurance
Surface Repair
Bonding Mechanism: Open Pores

Placement Process
- Moisture Conditioning
- Bonding Agents
- Material Placement
- Material Curing

Achieving Bond
Bonding Agents
- Are they necessary?
- Types

Achieving Bond
Quality Assurance
- Field Mockups
  - Evaluate Methods
  - Evaluate Materials
  - Evaluate Results

Sand Cement Slurry Broomed into Prepared Substrate

Moisture Conditioning
Dry Substrate?
Wet Substrate?
SSD?
Achieving Bond Quality Assurance

- Visual Evaluation

References Direct Tensile Pulloff Testing

- ASTM Standard 1583
  - Standard Test Method for Tensile Strength of Concrete Surfaces and the Bond Strength or Tensile Strength of Concrete Repair and Overlay Materials by Direct Tension (Pull-off Method)

- ICRI Guideline 210.3 2004
  - ICRI Guideline to Using In-Situ Tensile Pull-Off Tests to Evaluate Bond of Concrete Surface Materials
Placement Process

- Bonding Agents
- Moisture Conditioning
- Material Placement
- Material Curing

Placement Method Considerations

- Encapsulate Reinforcing Steel
- Uniform Material Delivery
  - No Segregation
- Complete Filling of Cavity

Placement Techniques

- Full and Partial Depth Slab Repairs
- RAP 7

Intimate Contact New Material to Substrate

Complete Full Depth Formwork
Repair Materials

- Ready Mix Concrete

Placement and Vibration

Placement Techniques

- Partial Depth Slab Repair
Repair Materials

- Ready Mix Concrete
- Packaged Repair Materials

Summary

- Preparation Critical Step in Achieving Long Lasting Repairs
- Bond Achieved with Open Pore Structure of Substrate
- Placement Method Creates Intimate Contact Between New and Old Materials
- Measure Quality To Ensure Proper Execution

Thank You!

Any Questions?

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