




American Concrete Institute®
Advancing concrete knowledge

**Field Guide to Concrete Repair
Application Procedures**

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ACI
WEB SESSIONS




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ACI
WEB SESSIONS

**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

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Note: Content specific to RAP 5 and RAP 7 can be found at:
http://www.concrete.org/education/Webcasts/RAP_Part_a.html

Agenda RAP 4,5 & 7

- Surface Preparation
- Placement Techniques
 - Full Depth
 - Form and Pour
 - Form and Pump
- Quality Assurance/Control

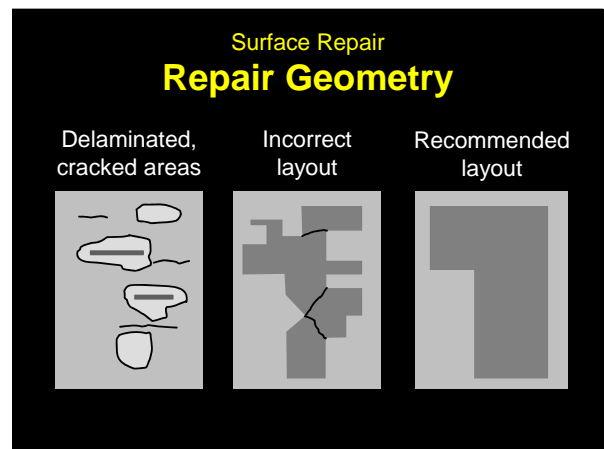
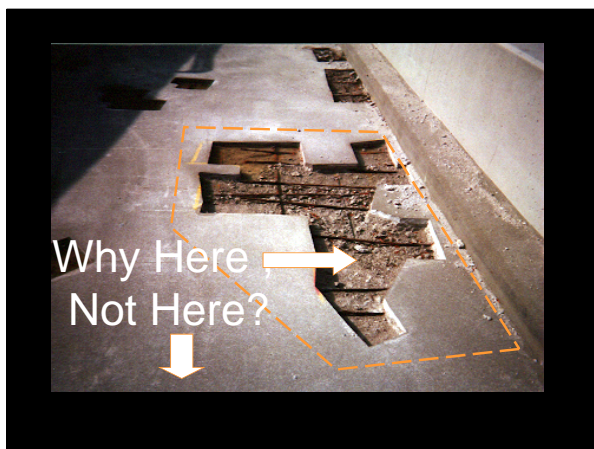
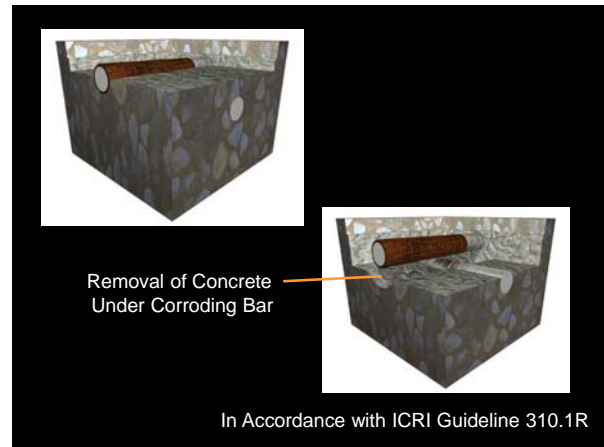
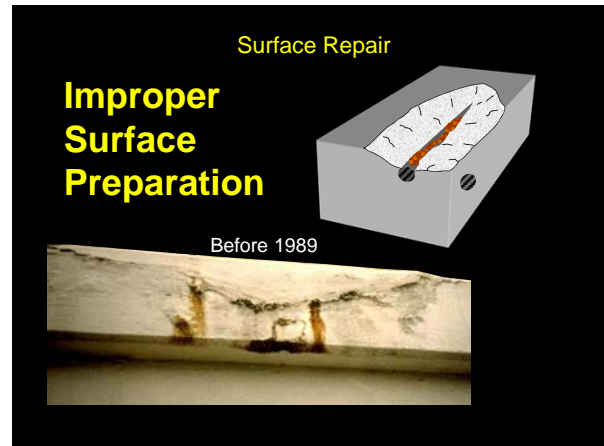
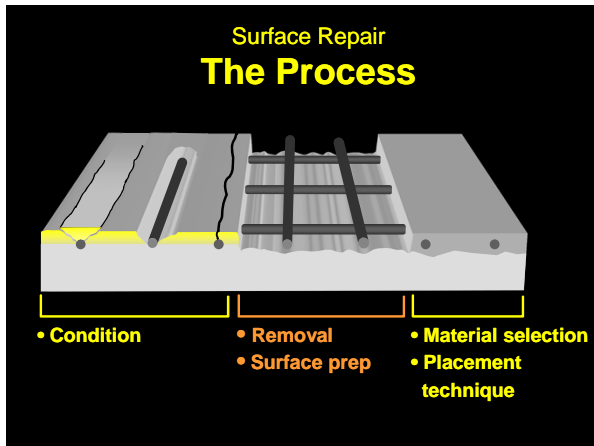
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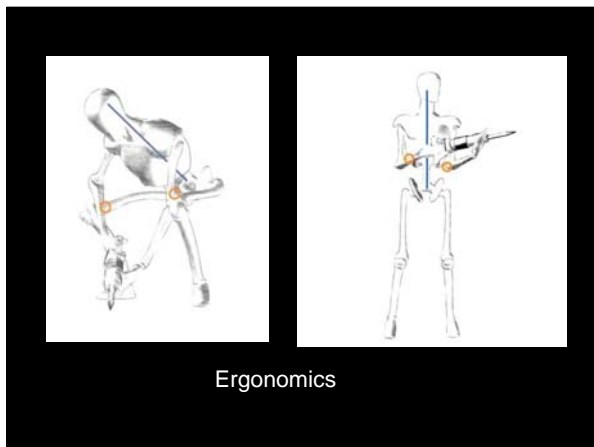
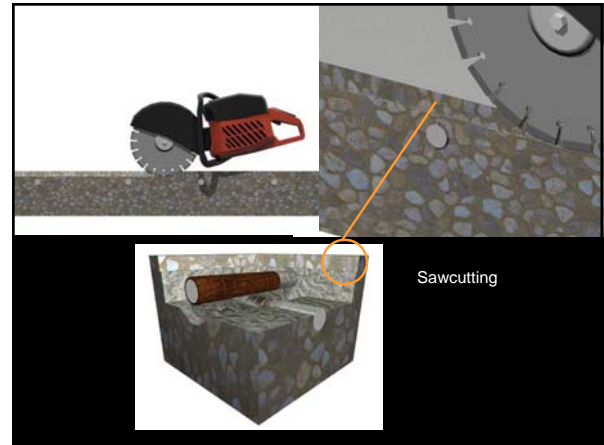
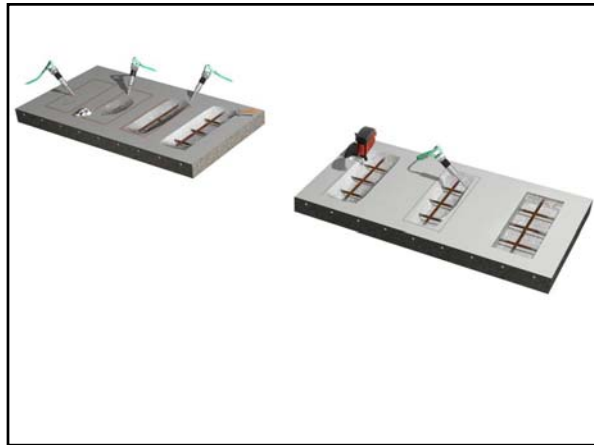
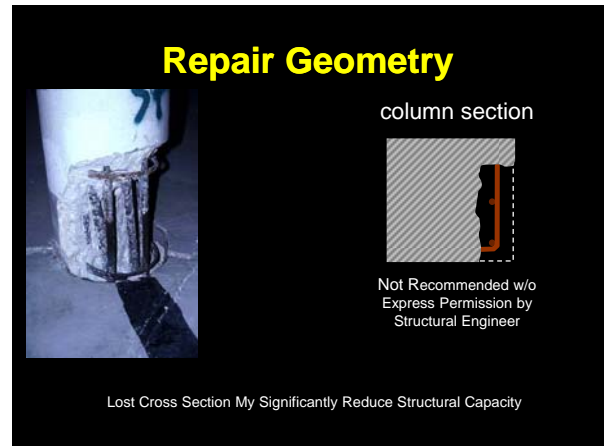
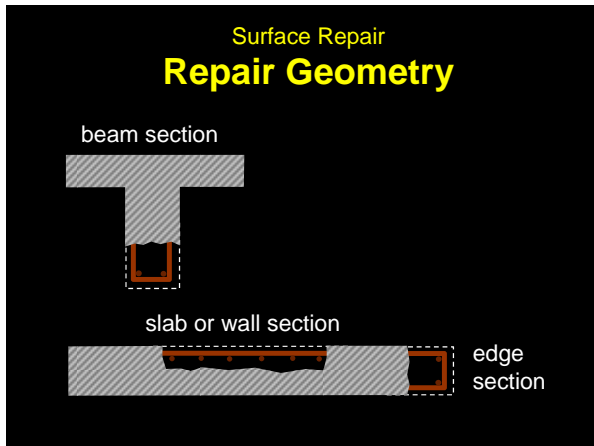
What We Will Cover

- 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







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??

A photograph showing several vertical reinforcing steel bars embedded in a concrete wall, with some surface rust visible.

Reinforcing Repair

Preparation of Bars

A diagram illustrating the abrasive blast cleaning process. It shows a cross-section of a concrete substrate with a reinforcing steel bar. Labels include: Concrete Substrate, Reinforcing Steel, Abrasive, Abrasive Pulse, and Nozzle. An inset shows a hand using a nozzle to clean a bar, labeled 'Abrasive Blast Cleaning'. To the right is a photograph of a red industrial sandblasting machine.

Reinforcing Repair

Cleaning with wire wheel

A photograph of a construction worker wearing a hard hat and safety glasses, using a wire wheel tool to clean a hole in a concrete wall.

Repair of Corroded Bars

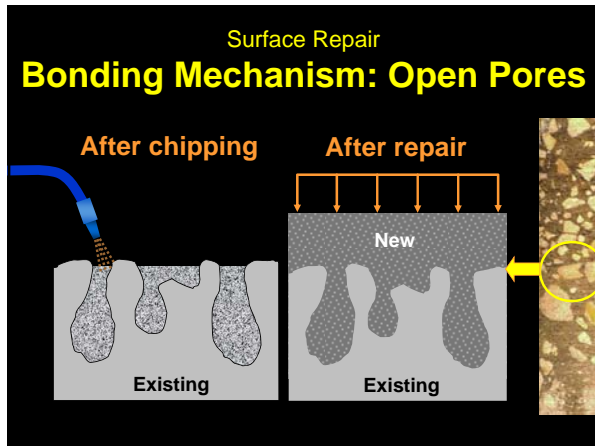
Repair Damaged Reinforcement Under the Direction Of A Licensed Engineer

A photograph showing a cross-section of a concrete wall with severely corroded and rusted reinforcing steel bars. A white circle highlights a specific area of damage, with an arrow pointing to it.

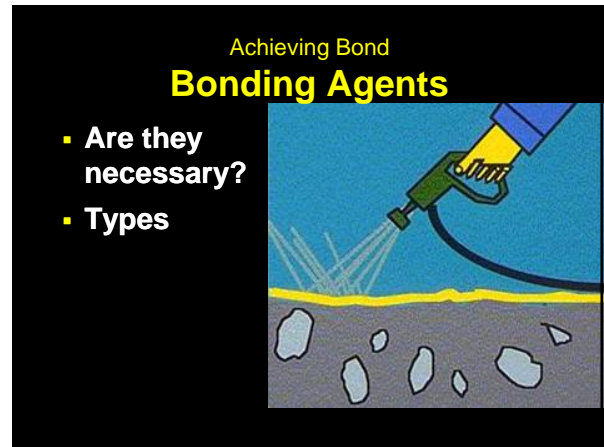
Lost Cross Section

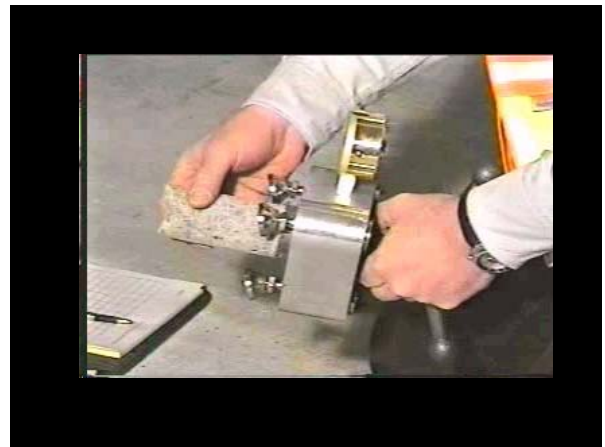
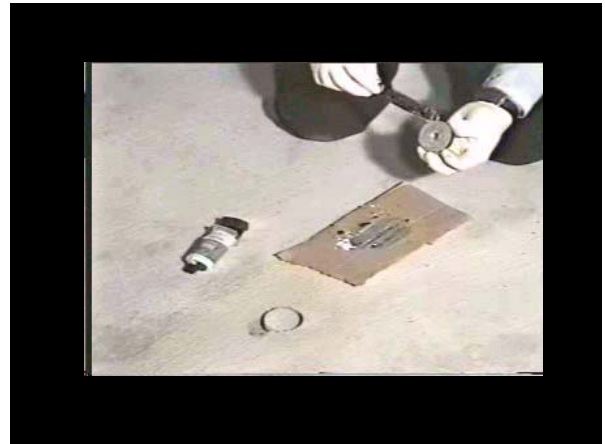
Placement

- Moisture Conditioning
- Bonding Repair to Substrate
- Placement Techniques
- Quality Assurance



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





Achieving Bond
Quality Assurance

- **Visual Evaluation**

Full Depth Core

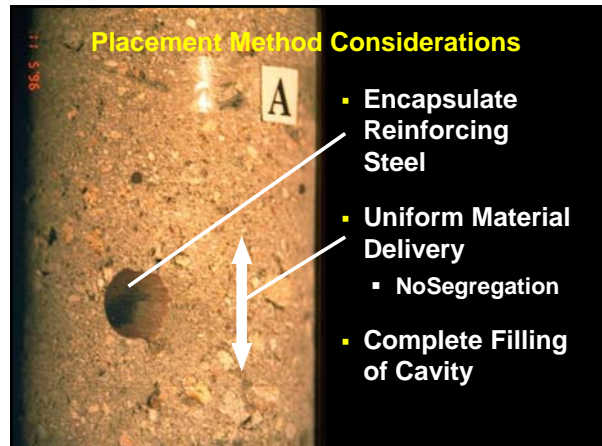
References Direct Tensile Pulloff Testing

- **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

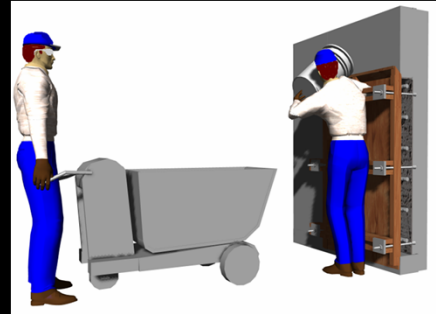


- Encapsulate Reinforcing Steel
- Uniform Material Delivery
 - No Segregation
- Complete Filling of Cavity



Intimate Contact
New Material
to Substrate

Surface Repair Form & Pour RAP #4



Surface Repair Form & pour before...



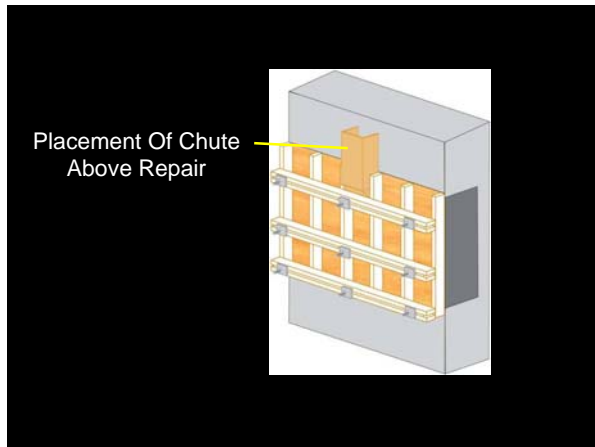
Surface Repair Form & pour formed...





One Sided Form Construction

- Formwork Construction
- Liquid Pressure of Concrete
- Design per ACI formwork Guidelines
- Chutes / Access to Place Material



Form and CIP

Keys to Success

- Formwork Construction
- Surface Conditioning
- Material Selection
 - Flowable
 - Non-Segregating
 - Low Shrinkage
- Placement Selection
 - Pump
 - Gravity Feed
- Curing
 - Forms in Place

Repair Materials

- Ready Mix
- Packaged Repair Materials

Column Repair

Manufactured Form Panels



Achieving Bond

- Vibration
 - Internal
 - External



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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