




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 4 and RAP 7 can be found at:  
[http://www.concrete.org/education/Webcasts/RAP\\_Part\\_a.html](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

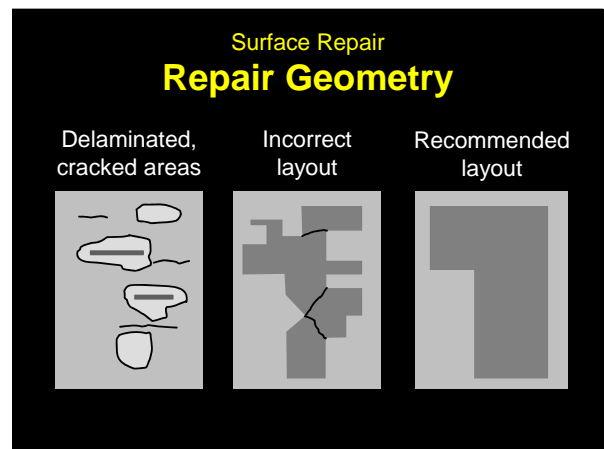
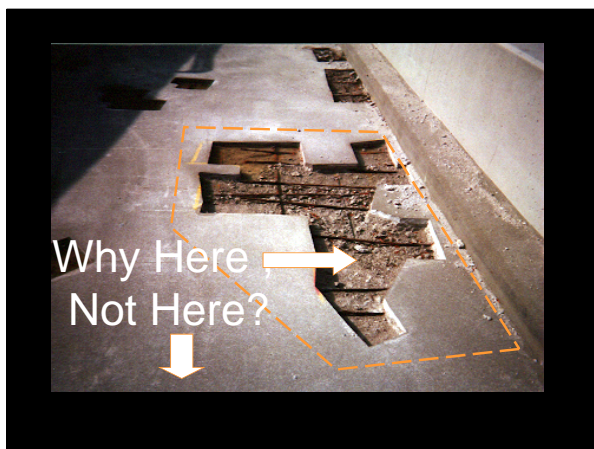
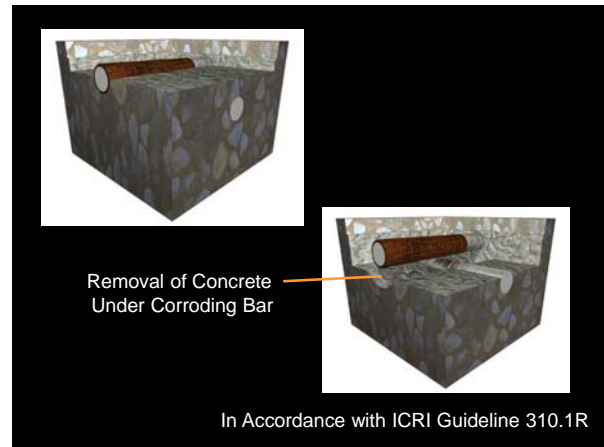
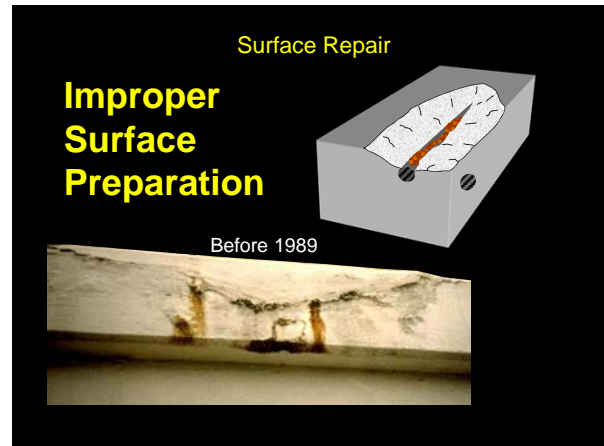
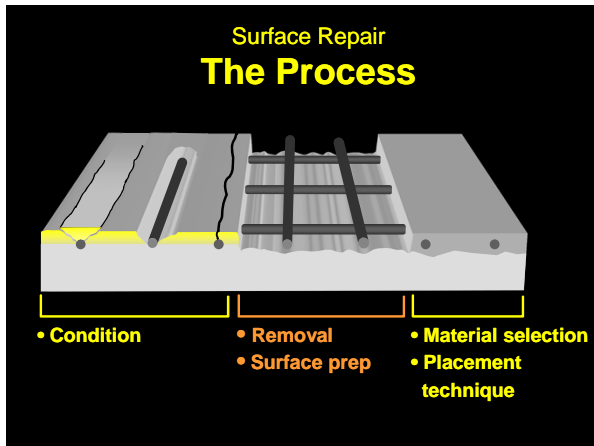
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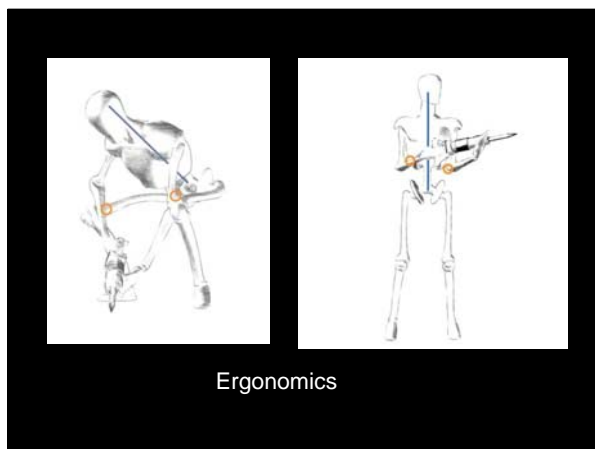
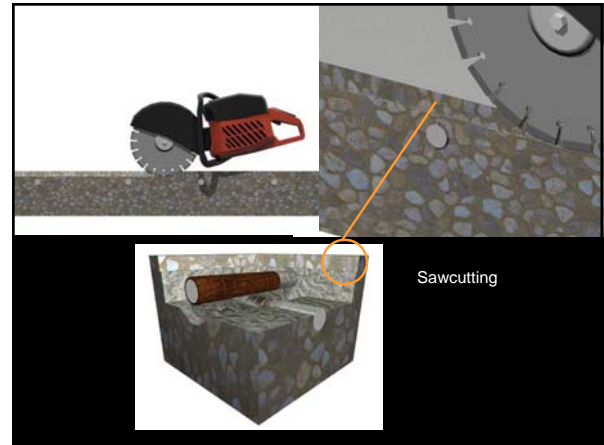
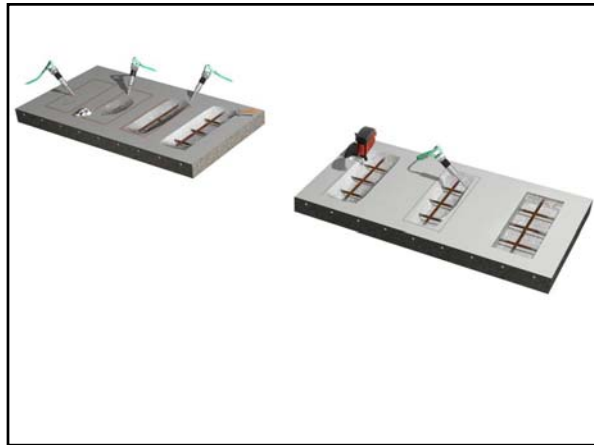
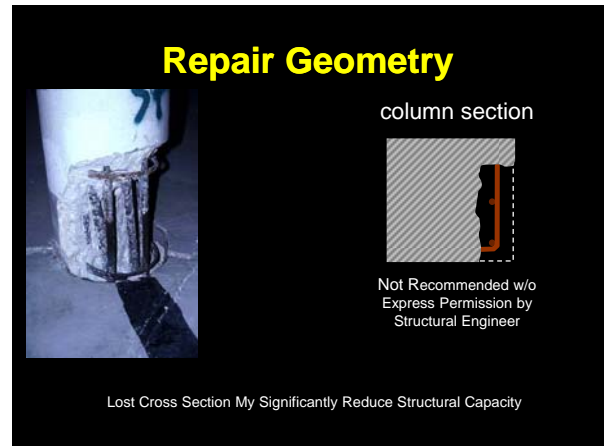
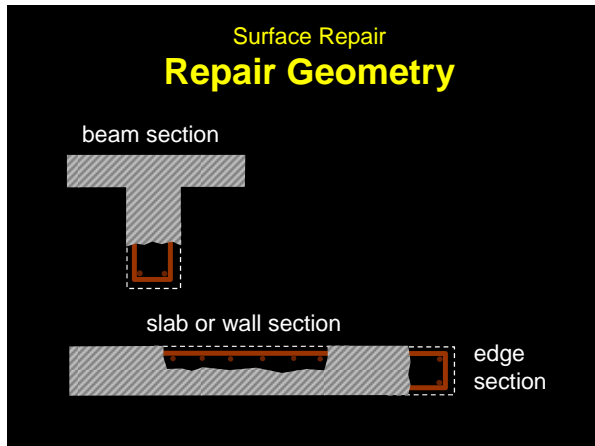
### What We Will Cover

- 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??

### Reinforcing Repair Preparation of Bars

Concrete Substrate  
Reinforcing Steel  
Abrasive  
Abrasive Particle  
Nozzle

Abrasive Blast Cleaning

### Reinforcing Repair Cleaning with wire wheel

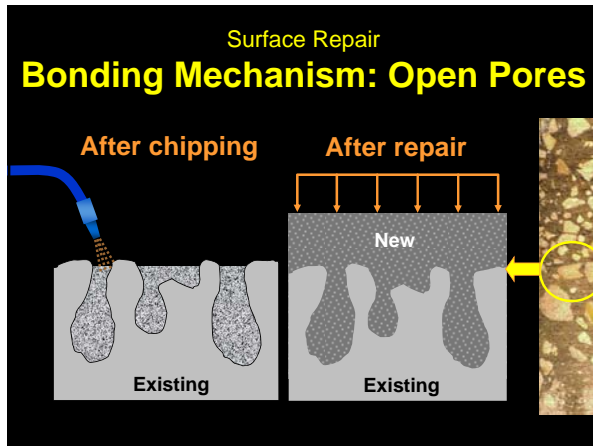
### Repair of Corroded Bars

Repair Damaged Reinforcement Under the Direction Of A Licensed Engineer

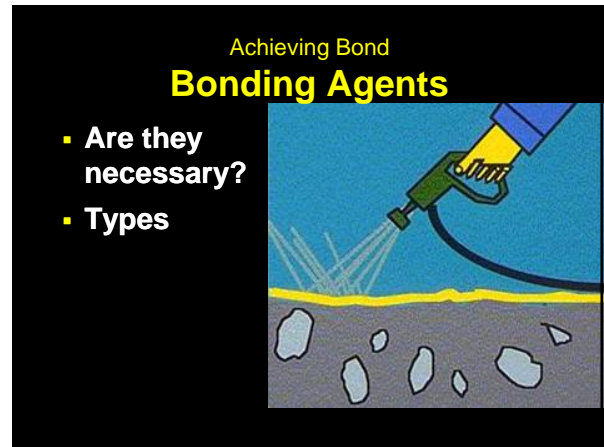
Lost Cross Section

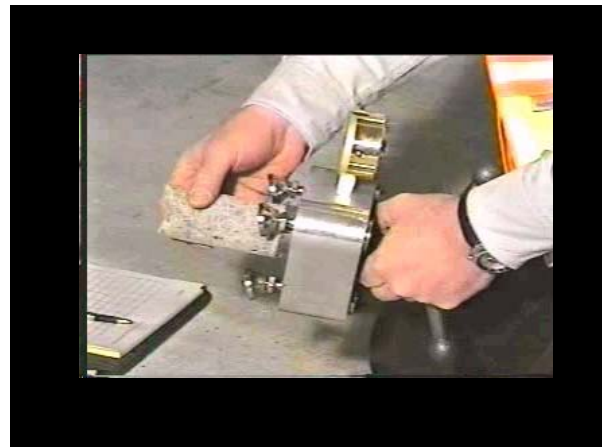
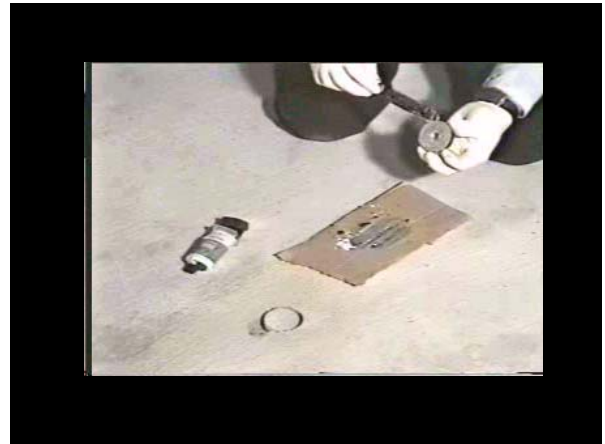
### Placement

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



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





Achieving Bond  
**Quality Assurance**

- **Visual Evaluation**

Full Depth Core

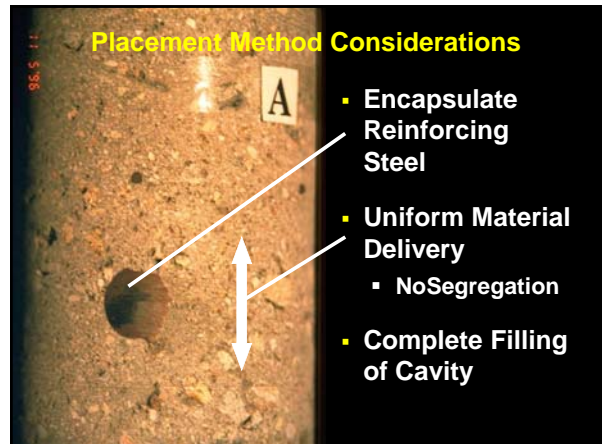
**References Direct Tensile Pulloff Testing**

- **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 & Pump RAP #5



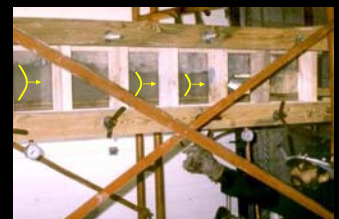
### Form and Pump Procedure

- Surface Preparation
- Surface Conditioning
- Formwork Erection
- Port Locations
  - 3 - 4 Ft. on Center
- Proper Venting



### Form and Pump Procedure

- Cavity Filling
- Vertical Repairs
  - Fill From Lowest Points
- Pump from Port to Port
- Monitor Pressure

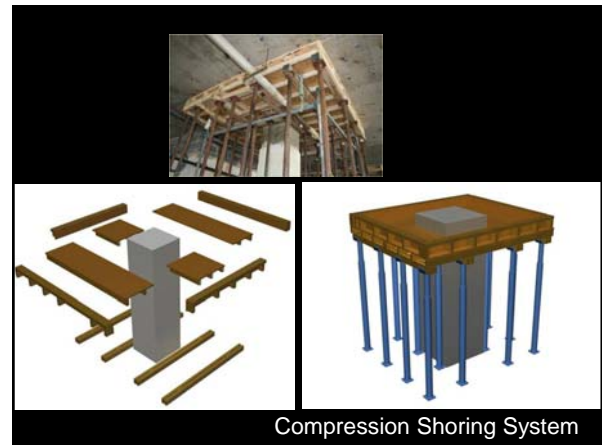
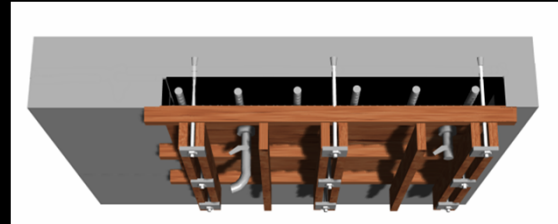


## Form and Pump Procedure

- Achieving Bond
- Expel Entrapped Air
- Form Pressurization
  - Gauge Pressure
  - Formwork Design Pressure
  - Communication
- Formwork Failures



## Tensile Anchor Attachment



## Flowable SCC Form and Pump



## 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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