



# Repair and Rehabilitation Tech Notes

**Concrete Removal in Repairs Involving Corroded  
Reinforcing Steel (364.6T-02(11))**

**Use of Hydrodemolition for Concrete Removal in  
Unbonded Post-Tensioned Systems (354.8T-02(11))**

ACI Committee 364 - Rehabilitation  
The Concrete Convention and Exposition  
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# What are TechNotes?

- Single-topic guides
- Narrowly focused
- Goal: Provide direction on a particular issue
- Typically practice oriented



# Concrete Removal Involving Corroded Steel

ACI 364.6T-02(11)

## Question:

When corroded reinforcing steel is encountered in a repair, should the bar be undercut? How far should the bar be exposed along its length?

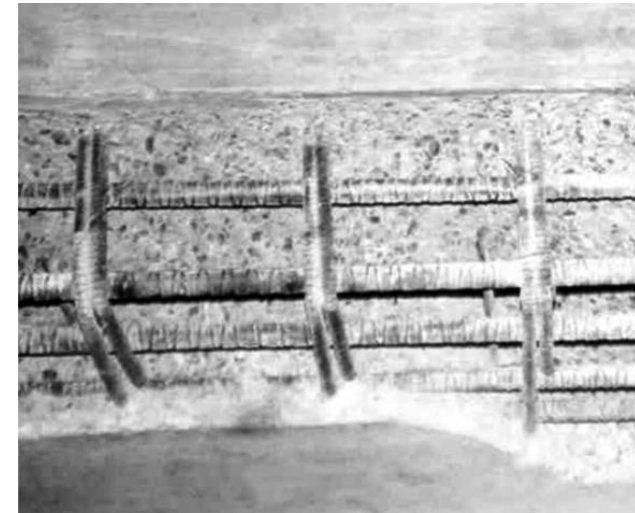
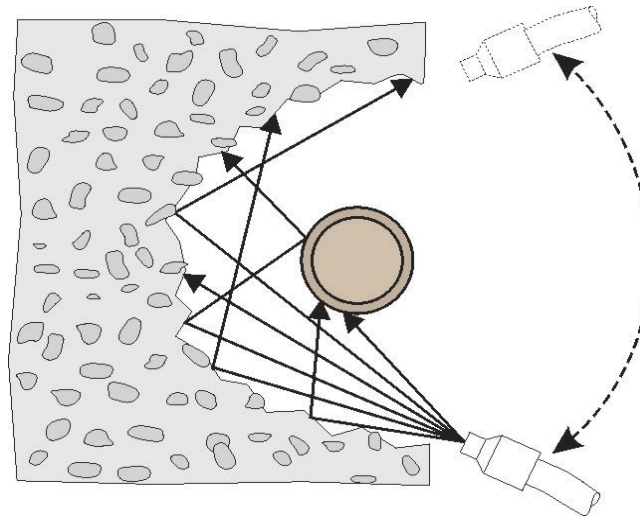
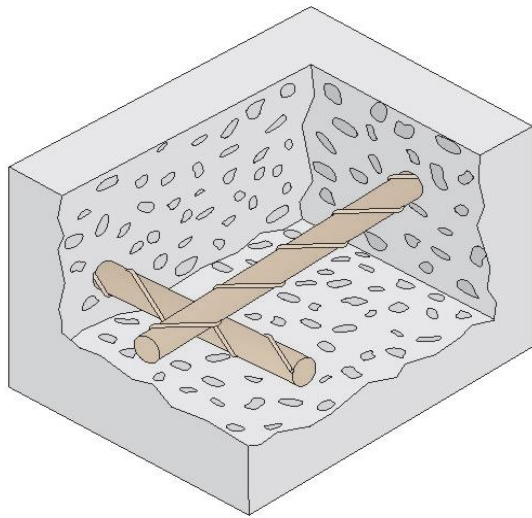


# Concrete Removal Involving Corroded Steel

ACI 364.6T-02(11)

## Answer:

- At least 1/4 in. plus the maximum aggregate size of the repair material.



- Concrete should be removed along bar length until bar is free of corrosion products



## Discussion: Why is undercutting important?

- High chloride concentration (>1%) or carbonation of concrete surrounding repair may accelerate corrosion around repair area
- Removal of concrete surrounding corroded bar helps prevent a situation where a portion of the steel is depassivated while another part is still passive

### “Ring Effect”

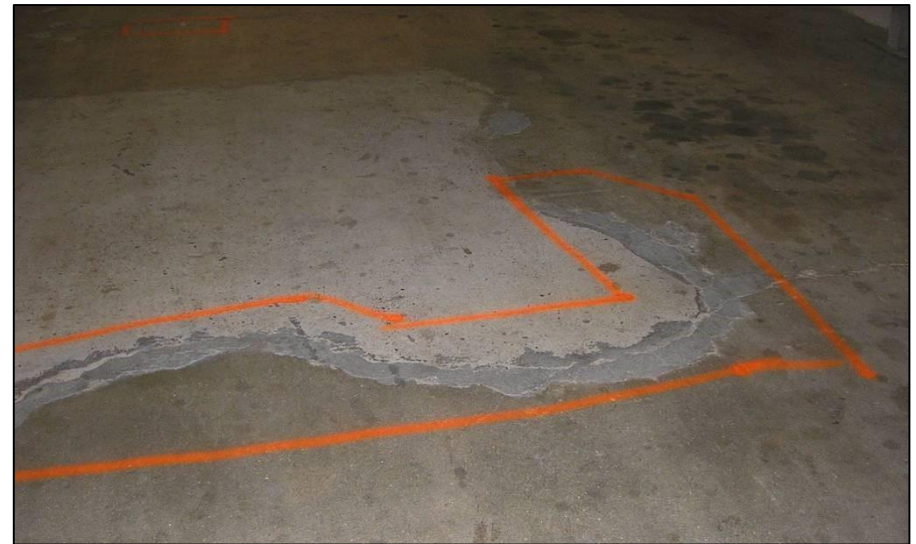


Photo: Previous repair area with delaminations along perimeter





# Summary:

- When corroded reinforcing steel is encountered in a repair, surrounding contaminated concrete should be removed and the bars should be undercut and exposed along their entire affected length.



# Hydrodemolition for Concrete Removal in Unbonded Post-Tensioned Systems

ACI 364.8T-02(11)

## Question:

Should hydrodemolition be used to remove concrete when unbonded post-tensioned systems are exposed in the removal process?



# Hydrodemolition for Removal in Unbonded Post-Tensioned Systems

ACI 364.8T-02(11)

## **Answer:**

Hydrodemolition is **not** recommended for concrete removal if there is a possibility that unbonded post-tensioned systems are within the concrete removal zone.





# Discussion: Why not?

- Very high-pressure water, 20,000 to 40,000 psi
- May accidentally undercut embedded anchors and result in explosive release of prestressing force
- Damage to tendon sheathing
- Water may penetrate into the tendon, corrosion
- Slurry in sheathing can make replacement of PT tendons difficult/impossible



# Hybrid approach: Hydro + chipping hammers at tendon locations





# Hybrid approach: Hydro + chipping hammers at tendon locations



# Summary:

- Hydrodemolition is **not** recommended for concrete removal in the presence of unbonded PT tendons
- Sheathing damage; Corrosion due to water infiltration





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- Pat Winkler, Rampart Hydro Services
- Cindy Garman, SK&A MD | Structural Engineers
- Brent Stephens, SK&A MD | Structural Engineers
- Thano Drimalas, The University of Texas at Austin





# Questions?

## References:

- ACI 364.6T-02(11): Concrete Removal in Repairs Involving Corroded Reinforcing Steel, Tech Note
- ACI 354.8T-02(11): Use of Hydrodemolition for Removal in Unbonded Post-Tensioned Systems, Tech Note
- ICRI Guideline No. 310.1R–2008: Guide for Surface Preparation for the Repair of Deteriorated Concrete Resulting from Reinforcing Steel Corrosion
- ICRI Guideline No. 310.3R–2014: Guide for the Preparation of Concrete Surfaces for Repair Using Hydrodemolition Methods

