# Structural Strengthening Using **External PT**

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# Why Strengthen?

- Natural aging
- Inadequate design
- Poor corrosion protection details/material quality
- Faulty construction
- Outside influences
  - Damage
  - Environmental
  - Changes in use
  - Increased safety requirements







# Solutions

- PT Repair
- Concrete restoration (epoxy injection/fiber wrap/water proofing)
- Structural renovations and strengthening
  - Steel brace frames
  - Section enlargement with internal PT
  - External PT with fire-protection





## **History of Post-Tensioning**

1960-1970: The Atlas Prestressing System 1960-1970: Buttonhead Post-Tensioning System

1970-1980: Extruded HDPE Strand Encasement Today: Optional 100% Encapsulation

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## **Post-Tension Repair**



# Concrete Restoration Epoxy Injection Fiber wrap







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### **Steel Brace Frames**



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#### Section Enlargement with Internal PT

- PT placed using cores, trenches, or newly enlarged concrete members
- Design evaluation is very similar to external PT

Longitudinal steel bar

PT strands

Addresses all fire ratings



## **External Post-Tensioning**

- Utilizes high strength cables, strands and steel bars to strengthen or restore the load capacity of structures
- Introduces external forces to the structural elements to offset the effects of external loads
  - Crack/Deflection Control
  - Increased Loads









#### **Considerations: Design of External PT**

- Anchor Zones
- Existing reinforcement



- Existing damage, corrosion, deterioration
- Modification to the existing member geometry
- Fire Protection









## Example 1 - Oakwood







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## **Example 2- Monterey**



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## **Project Documentation**







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# Thank You! Questions ?





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