DISPELLING THE MYTH ABOUT UNBONDED PT BUILDINGS

Christopher Fulton, B.Sc.(Eng.)
Lindsey Tourand, P.Eng.
Parsons Brinkerhoff Halsall Inc.
Deterioration of Unbonded PT

- Moisture during construction
- Moisture during service
- Mechanical damage
The Evolution of Unbonded PT

The Study

Goal of the study was to answer:

What is Tendon Failure Rate?

What is the Cause of Failure?
The Study

Data Collected:

Acoustic Monitoring Records for 26 Structures

Visual Review of 246 Tendon Failures from 7 Structures
Background on Acoustic Monitoring
Background on Acoustic Monitoring
Study Part 1 –
Review of Acoustic Monitoring Records
Breakage Rates

Average Annual Wire Breakage Rate by Structure Type

Number of Structures

Average Annual Wire Breakage Rate

Hi-Rise Structure  Parking Structure
Breakage Rates

Average Annual Wire Breakage Rate per 100,000 ft² by Structure Type

- Hi-Rise: 1.0
- Parking: 6.5
- Parking (Adjusted): 3.6
Study Part 2 –
Review of Tendon Failure Causes
Causes of Tendon Failure

Corrosion from Moisture
Causes of Tendon Failure

Mechanical Damage
Causes of Tendon Failure

Anchor Slippage
Causes of Tendon Failure

Causes of Post-Tensioned Tendon Failures in Interior Spaces
(72 Tendon Sample Size)

- Moisture During Service: 28%
- Mechanical Damage: 22%
- Moisture Prior to Service: 17%
- Anchor Slippage: 8%
- Understressed from Construction: 10%
- Unknown: 15%
Causes of Tendon Failure

Causes of Post-Tensioned Tendon Failure in Exterior Slabs
(174 Tendon Sample Size)

- Moisture During Service: 95%
- Moisture Prior to Service: 5%
What Does It All Mean?

Large percentage of PT tendon failures are the result of moisture entry or mechanical damage during service. These failures can be mitigated through regular preventative maintenance.

The stigma that unbonded PT structures are unpredictable and costly to maintain may not be deserved.
Special Thanks

Study Co-Authored by Stephan Trepanier, Partner at Edison Engineering

Acoustic Monitoring data provided by Pure Technologies Limited
DISPELLING THE MYTH ABOUT UNBONDED PT BUILDINGS

Questions?

Christopher Fulton, B.Sc.(Eng.)
Lindsey Tourand, P.Eng.
Parsons Brinkerhoff Halsall Inc.