Post-Tensioning Corrosion Evaluation and Mitigation

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Abstract

Corrosion of post-tensioned tendons can lead to wire/tendon break and possible bridge collapse. Water and improper grouting are the major issues that create potential corrosion problems in post-tensioned bridges. Water or excessive moisture presence and/or corrosive ion concentration have caused corrosion in the tendons. Formulated, prestressed strands with high-strength carbon fiber have been found to be a significant tendon corrosion problem in many bridges.

Post-tensioning corrosion evaluation (CE) correlates the moisture level to the corrosion condition of the tendons, tendon drying to remove water/moisture and injecting corrosion-inhibiting material can improve the environment for tendon and mitigate corrosion.

Causes of Post-Tensioning Corrosion

- Voids and moisture between strands and between wires
- Water bleeding from grout
- Great Segregation
- Water penetration due to floods
- Chloride-contaminated grout
- Soft grout and high corrosive ion concentration
- Dissimilar grouts in the same tendon

Post-tensioning corrosion damage:

- Inner wire corrosion due to the presence of voids and moisture
- Wire corrosion from inside-out caused by water penetration, resulting in wire break and concrete spalling

Post-tensioning corrosion evaluation:

- Visual inspection / test pits
- PT Corrosion Evaluation by moisture testing
- Chloride analysis of PT grout
- PH and chemical testing
- Petrographic analysis
- Scanning Electron Microscopy examination
- Cable Break Detection
- Corrosion Evaluation by Moisture Testing
- Use the expulsor to remove anchorage pocket from water/moisture to the tendon to evaluate the moisture content and its corrosion risk.
- Cable with moisture content greater than 0.5% is WET and has high corrosion risk.
- Cable with moisture content less than 0.3% is DRY and has low corrosion risk.

Post-tensioning corrosion mitigation:

- Cable cleaning
- Galvanic protection
- Cathodic protection
- Cable impregnation
- Concrete repair
- Dry the wet tendon/grout to remove the water/moisture from the tendons and the grout.

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In summary, the causes of post-tensioning corrosion and its mitigation technologies are presented in this poster/paper. The causes of tendon corrosion have significant implications for bridge owners and operators, and the mitigation technologies can help reduce the corrosion risks and improve the durability of post-tensioned bridges.