Defying Time: Durability of DYWIDAG DCP Bar Tendons After 30 Years

Case Study

The exceptional quality and performance of DYWIDAG Double Corrosion Protection (DCP) DYWIDAG THREADBAR® tendons were demonstrated when the bars of a university's football stadium were removed after 30 years of service. Subsequent testing revealed no degradation in either their structural integrity or effectiveness.

PRODUCTS
External Post-Tensioning System Using GR 150 Double Corrosion Protection (DCP) Threadbars

LOCATION
Northeast - USA

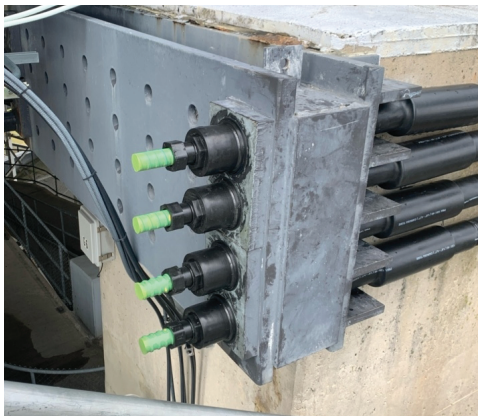
SCOPE
System Design
P-T System Supply
Installation, Stressing
Inspection & Testing

Context

During the 1990s, DYWIDAG was contracted for the exceptional responsibility of designing, supplying, and installing an external strengthening system for a new stadium expansion to one that had been originally constructed during the 1960s. Over 150 double corrosion protection (DCP) DYWIDAG THREADBAR® tendons were integrated across the stadium's reinforced concrete bents, which are the principal load-bearing components of the concourse areas and access ramps.

Crafted within a controlled temperature environment at a DYWIDAG facility, these GR 150 DCP THREADBAR tendons employed a groundbreaking technique that involved embedding an epoxy-coated bar tendon within a corrugated polyethylene duct. This duct was then positioned within a secondary duct made of high-density polyethylene. To ensure precise positioning within the duct, the bar tendon was centrally aligned, followed by a process of pressure grouting using cementitious grout.

Over the lifespan, DYWIDAG has performed multiple rounds of lift-off testing indicating force verification in line with engineered criteria. These tests show that DYWIDAG THREADBAR exhibits low relaxation properties. Following a period of thirty years in service, a representative selection of tendons situated in the most exposed positions on the exterior surfaces of the outer bents were extracted for examination and subsequent replacement with new tendons. The selected tendons earmarked for removal were meticulously labeled and transferred to a secure facility. Here, they underwent a detailed dissection and visual inspection to identify any indications of corrosion, wear, abrasion, or other surface irregularities. Subsequently, the THREADBARS were dispatched to an independent third-party laboratory for testing of their tensile strength.



Solution

The examination of the DYWIDAG DCP system, encompassing THREADBAR tendons along with anchor nuts and couplers, involved a comprehensive evaluation of their state. Initially, visual analysis was performed to document the external condition of the materials. Subsequently, the bar tendons underwent dissection to unveil their cross-sectional profiles, providing insights into the status of the grout, corrugated plastic duct, smooth plastic duct, and THREADBAR. Among these, four bar samples had their ducts and grout removed for a detailed assessment of the bar tendons' condition.

Both the yield and tensile strength of the examined THREADBAR exceeded the minimum guaranteed strength as specified in ASTM A722. The inspections and tests conducted affirmed that the overall structural soundness of the DYWIDAG DCP THREADBAR, anchor nuts, and couplers, had been effectively maintained throughout the three decades of their service. This favorable outcome can be attributed to the layered safeguarding mechanisms of the DYWIDAG-designed DCP system, its inherent durability, and the diligent maintenance efforts carried out over the years by DYWIDAG.