Post-Tensioning for the North Split Reconstruction Project

by Melissa M. Mariano, DYWIDAG-Systems International

The North Split Project in downtown Indianapolis, Ind., has signifcantly enhanced infrastructure and improved traffic flow in central Indiana by improving the Interstate 65/Interstate 70 interchange. (For an overview of the North Split Project, see the Spring 2024 issue of *ASPIRE*®.) A key component of this project involved the use of modern construction methods to construct an integral bent cap with longitudinal post-tensioning. The interchange geometry was a challenging constraint, which led to some bridges with long spans, high skews, and limited available clearance. The straddle bent addressed these challenges where Interstate 65 spans an Interstate 70 entrance ramp at a sharp 74-degree skew.

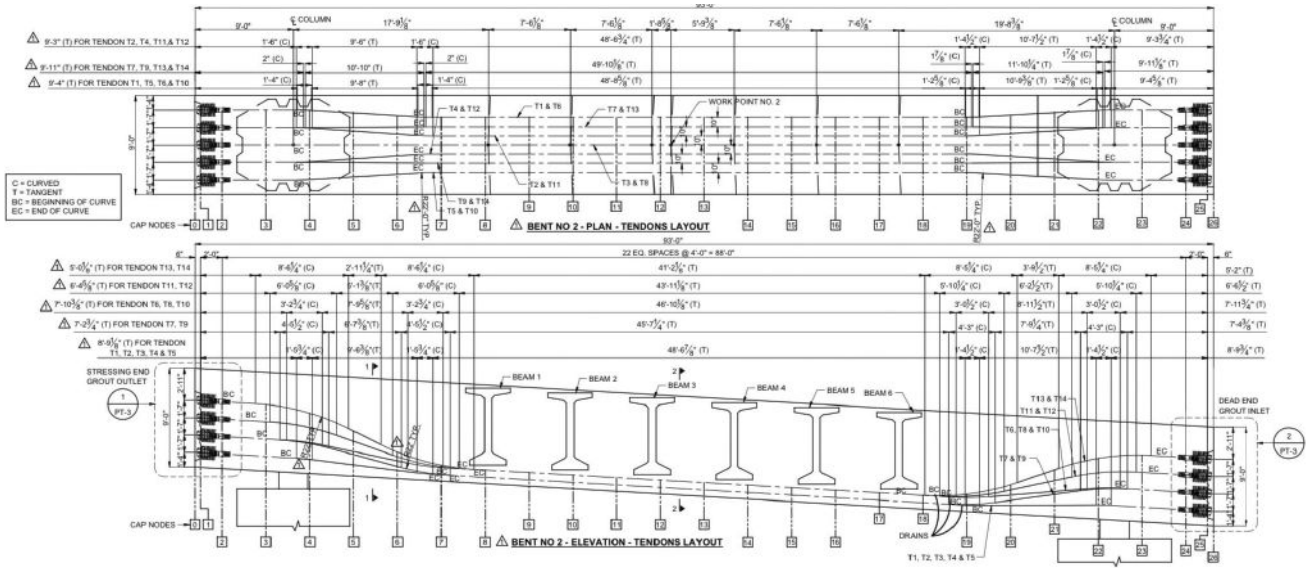
Introducing the post-tensioned straddle bent into the design allowed for longer structure span lengths while maintaining a shallower structure depth and providing the required minimum vertical clearance for the roadway traffic below. The use of the post-tensioning system was essential for supporting the heavy traffic loads passing through this interchange. For the cast-in-place concrete straddle bent that spans approximately 93 ft using a 9 ft × 9 ft cross section, the team used an innovative DYWIDAG multistrand-system design consisting of 14 tendons, each with nineteen 0.6-in.-diameter strands. One challenging aspect of the design was the prestressed concrete beams that are supported by the intermediate bent and whose ends are built integrally into the cast-in-place concrete bent cap. The versatility of the tendons allowed the tendon profile to accommodate the prestressed concrete beam ends that were embedded in the pier cap. After concrete placement, tensioning of the post-tensioning tendons could proceed in a single phase when the bent cap concrete reached a strength of 6000 psi and the deck concrete reached 4000 psi. A technician certified by the American Segmental Bridge Institute (ASBI) performed the tendon grouting in accordance with the grouting procedures specified in the Post-Tensioning Institute/ASBI's PTI/ASBI M50.3, *Specification for Multistrand and Grouted Post-Tensioning,* and PTI M55.1, *Specification for Grouting Post-Tensioned Structures*.[1,2]

Originally, DYWIDAG's scope was for material supply only. However, that scope expanded when the contractor, Superior Construction, approached

Falsework towers (far left) supported the prestressed concrete beams and the formwork of the straddle bent as the integral, cast-in-place concrete, post-tensioned cap was constructed. All Photos and Figures: DYWIDAG-Systems International.

A colloidal grout mixer was used to prepare the grout. The tendon grouting was performed by certified personnel in accordance with Post-Tensioning Institute/American Segmental Bridge Institute grouting specifications.

The approximately 93-ft-long straddle bent used 14 longitudinal post-tensioning tendons—each with nineteen 0.6-in.-diameter strands—within the 9 ft × 9 ft cross section.



The plan and elevation views of the straddle bent cap show the challenging geometry and limited available space for the 14 post-tensioning tendons. The post-tensioning system ensured that the minimum vertical clearance requirement could be met.

DYWIDAG to provide expertise in implementing the post-tensioning system. In addition to materials, DYWIDAG provided post-tensioning shop drawings, theoretical elongation calculations for tendon installation and tensioning, and a grouting plan. The partnership flourished under the expert guidance of DYWIDAG's project and field management team, whose expertise in post-tensioning systems was instrumental in delivering outstanding results. This collaboration helped the construction proceed smoothly throughout material supply, installation, tensioning, and grouting of tendons and exemplifies the importance of industry partnerships in delivering successful infrastructure projects that meet high standards of quality and safety.

With the innovative use of incorporating an engineered multistrand post-tensioning system into a straddle bent, in which the supported beam ends are embedded, the North Split Project sets a benchmark for future expansion of post-tensioning methodology in transportation projects.

References

1. Post-Tensioning Institute (PTI) and American Segmental Bridge Institute (ASBI). 2019. *Specification for Multistrand and Grouted Post-Tensioning*. PTI/ASBI M50.3-19. Farmington Hills, MI: PTI.
2. PTI. 2019. *Specification for Grouting of Post-Tensioned Structures*. PTI M55.1-19. Farmington Hills, MI: PTI.

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