PTI Journal *Case Study*

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By

NEEL KHOSA

Authorized reprint from: August 2014 issue of the PTI Journal

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The Buford Avenue Pavement Reconstruction project involved replacing a conventional reinforced concrete pavement with a post-tensioned concrete pavement for the University of Minnesota. The reconstruction of Buford Avenue occurred in a 220-foot stretch between Eckles Avenue and Buford Circle Road. The post-tensioned section was 102 feet long by roughly 32 feet wide (approximately 3250 square feet in area) (Fig. 1).

One distinctive aspect of the project was that the road was built on top of an underground building that needed to operate during the construction phase. Due to the deterioration of the concrete pavement, buses and other large vehicles would produce noise and vibrations from impact at deteriorated joints which transferred through the pavement to the underground Saint Paul Student Center and the bookstore. The deteriorated pavement allowed storm

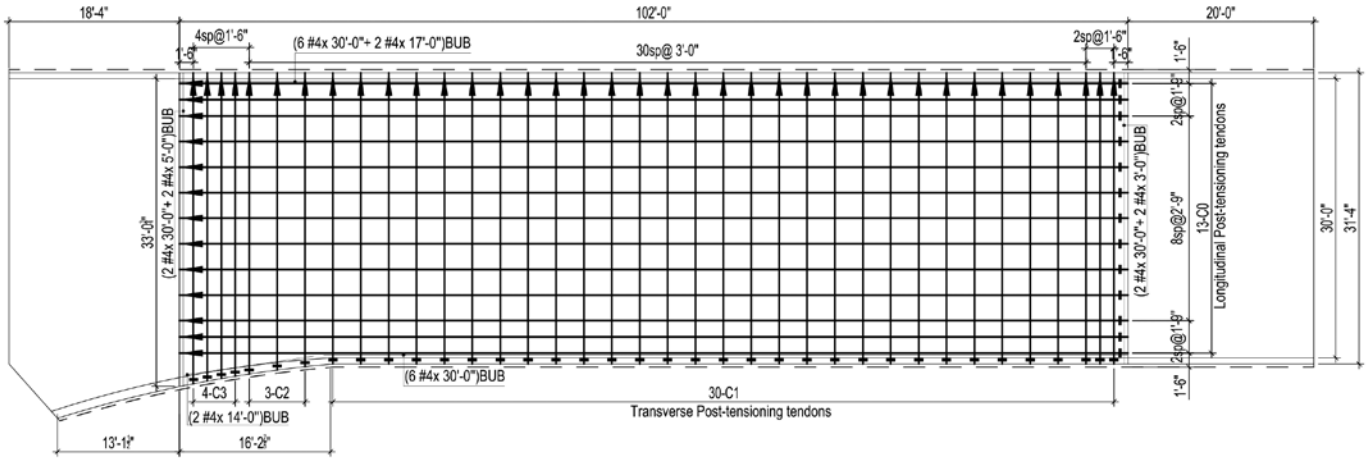

Fig. 1—Plan view of the pavement and tendon layout.

Fig. 2—Finished joint free pavement.

water runoff to leak through the cracks to the Student Center roof below, which had previously experienced minor water problems in the bookstore. Post-tensioning was chosen as the preferred structural system due to its ability to eliminate joints in the large pavement area over the underground building (Fig. 2) while maintaining a 7-in. concrete thickness. "The bus tires impacting the deteriorated pavement joints rattled merchandise on the shelves and caused ceiling tile to fall in the bookstore, creating anxiety for employees and customers. Now with the new pavement, all is quiet and calm in the student center and bookstore" said Jeff Johnson, PE, SEH Project Structural Engineer.

Justin Gese, PE, SEH Project Manager, explained that "we determined the new post-tensioning design was the best solution to meet the goals of the project," which were:

1. To minimize future maintenance on this segment of roadway and increase durability;
2. To minimize vibrations and noise caused by traffic due to presence of joints, and create a raised profile with additional insulation. The additional insulation also provided less heat loss from the Student Center below, which minimizes the impacts of future freezing-and-thawing cycles on the pavement above;
3. To minimize formation of cracks in the segment to prevent storm water runoff migration from the roadway to the roof below.

Unlike most infrastructure projects, Buford Avenue was designed with unbonded 0.6-in. post-tensioning tendons rather than precast or bonded post-tensioning tendons. 0.6-in. unbonded tendons have a final average force of approximately 38 kip (as compared to approximately 27 kip for 0.5-in. tendons). Encapsulated unbonded tendons were specified to meet the project's requirement of reducing long-term corrosion or other distress for 40 years. The transverse and longitudinal post-tensioning tendons were supported by intersectional chairs on top of precast concrete blocks (Fig. 3). The support system rested above compacted sand and insulation on top of the Student Center's underground bookstore.

Graham Construction successfully completed the $234,000 roadway repair project within 2 month window given by the University of Minnesota—in time for the Minnesota State Fair on August 13, 2010. Graham Construction hired AMSYSCO, Inc. to supply the unbonded 0.6-in. post-tensioning tendons for this expedited project. According to Neel Khosa, Vice President at AMSYSCO, "The Buford Pavement project illustrates the potential for utilizing unbonded post-tensioning in infrastructure projects such as concrete roadways or pedestrian bridges."

Neel Khosa *is the Vice President of AMSYSCO, Inc. He is the Chair of PTI CRT-30, a voting member of PTI M-10, the PTI Certification Advisory Board, and ACI 301-0E. Mr. Khosa has a MBA from the University of Chicago and a Bachelor's of Science in Civil Engineering from the University of Illinois. Lastly, he manages the corporate blog at www.amsyscoinc.com/our-blog which primarily deals with unbonded post-tensioned concrete.*

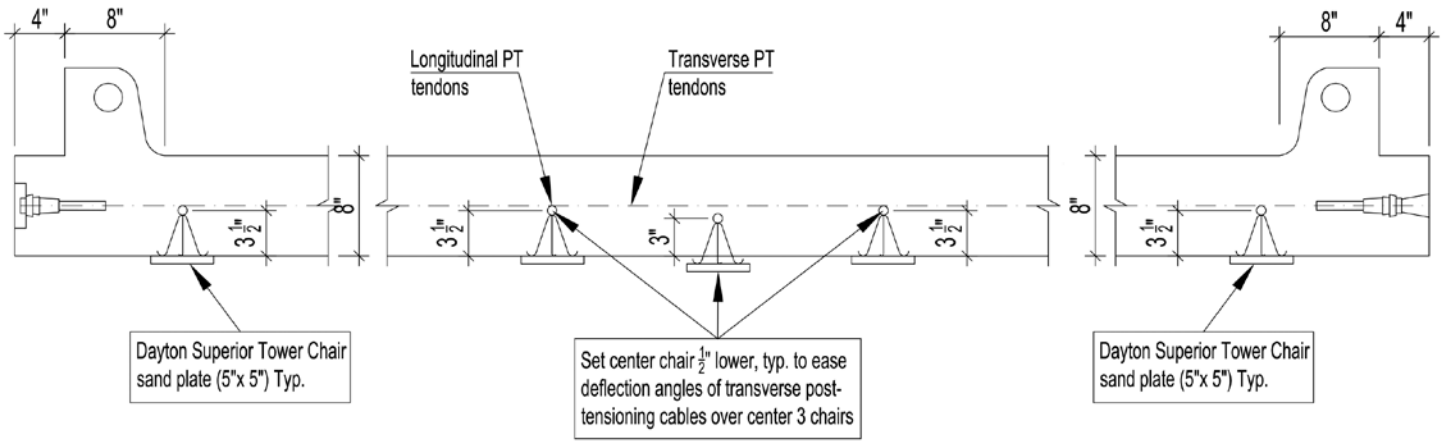

Fig. 3—Transverse section through the pavement.