Infrastructure Case Study: Concrete Column Rehabilitation

Edited by Kelly M. Page

Interstates 30 and 45, near downtown Dallas, Texas, are two of the most heavily traveled interstates in the state. Because these highways are such important links to the city, any work completed on them would have to be very sensitive to the traveling public.

It has been standard practice for the city of Dallas to stockpile its deicing materials for bridge decks under the bridges along Interstates 30 and 45. The chloride in the deicing agent, which has surrounded the bridge columns over the years, has caused severe corrosion of the concrete and steel, undermining the integrity of the columns. Once the deicing material was removed from around the columns, the extent of the damage to the columns was noted. These columns had to be repaired before any further section loss occurred and undermined the stability of the bridges. The Texas Department of Transportation (TxDOT) put the project out to bid with a plan of action for the repairs. Due to the high volume of traffic along these bridges, the project would be very sensitive to the traveling public and any support system installed to repair these columns would have to withstand live and dead loads.

Work began in August of 2003 after the support system for handling the heavy loads had been designed and fabricated. In areas were there was a significant section loss, the pier cap had to be shored while under traffic. The support system put in place had to be able to withstand live loads of one of the busiest interstates in the state. The contractor worked closely with TxDOT and its consulting engineer to create the best shoring system possible.

There were a number of different types of temporary support systems that had to be used to accommodate the various cap and beam configurations on the existing structure. Also, live loads required complex support structures and intensified the difficulty of the project. The shoring systems involved the use of four 200 kip (90,000 kg) shore towers, a series of beams, stiffeners, and pedestals. It also included the use of 100 ton (90,000 kg) hydraulic jacks, which required close monitoring of the pressure used.

The columns with significant section loss were encased with 6 in. of concrete using the following procedure. The area was sounded and then the limits of the area to be removed were score cut. The deteriorated concrete was removed to sound

concrete using hand-held pneumatic chipping hammers. The concrete was then sandblasted to achieve a fractured face and to remove any laitance and rust on the steel. A supplemental steel cage was then tied in place and a spray-applied corrosion inhibitor bonding agent was added. Sacrificial galvanic anodes were then placed in an effort to prevent future corrosion. Forms were then set and a DOT-approved concrete mixture was poured. Once the concrete reached its design strength, the shoring was removed. A similar process was used for isolated spalls using a prebagged rapid-setting repair mortar, except no shoring or forms were required.

Upon further inspection and once the job was underway, the magnitude of the deterioration was much greater than the contractor had initially anticipated. This included more columns with greater section loss than originally anticipated and larger columns that required more extensive shoring to include live load. The magnitude of the deterioration made this project a necessity and the addition of galvanic anodes ensures that the repairs will be able to avoid future corrosion. Once the project was completed, 37 columns with significant section loss had been shored and encased and over 3000 ft^2 (280 m^2) of patching had been completed.

The project was unique due to the high volume of traffic and heavy loads that were involved in the various shoring systems. The complexity of the support structures required to carry the live loads of the highway heightened the project.

The contractor was able to complete this project without one lane closure on these highways and with no inconvenience to the traveling public. If these columns had been repaired accounting for only the dead loads, then the severity of the lane closures on these busy highways would have been detrimental to thousands of motorists.

Dallas Interstates 30 and 45

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Hutchins, Texas

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