

Award-Winning Road Widening Using Precast Boxes and SCC a First for WSDOT

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The **award-winning widening** of a section of State Route 520 between the West Lake Sammamish Parkway interchange and State Route 202 in King County between the cities of Redmond and Sammamish, Washington recorded two firsts for the **Washington State Department of Transportation (WSDOT)**. The widening marked the first time that WSDOT allowed the construction of a 3-sided precast box storm water detention vault system within the traveled way of its infrastructure. It was also the first time that **self-consolidating concrete (SCC)** was used on a WSDOT project. The construction of the vault was required to treat stormwater runoff from the roadway to protect salmon and other fish in nearby streams and rivers. The use of SCC provided a high quality precast product, virtually eliminating the need for patching and dry finishing after removing the formwork. SCC may now be considered on other WSDOT projects.

A partnership between WSDOT and the contractor, Tri-State Construction Inc. (TSI) led to an overall construction schedule with a path to substantial completion in 33 months rather than the 45 months provided in the contract. If the team assembled by WSDOT and TSI had decided to construct the required two-vault detention system by the cast-in-place method, construction would have taken longer than the schedule allowed. The precast method gave the project the best opportunity to fit the aggressive schedule. Precasting the boxes for the vaults was done offsite and ran concurrent to preparation work needed prior to the arrival of the box sections.

Oldcastle Precast acted as both supplier/producer and lead structural designer. The three-sided precast box structure has been used for years by the WSDOT for short span bridges and box culverts, but on this project, the new **Load and Resistance Factor Design (LRFD) standards** had to be included in the engineering. The segmented, precast vault design ingeniously used a 24 foot wide, 3-sided structure with precast base slabs and baffles. Oldcastle's design utilizing the basic three-sided box with additional engineering for increased traffic loading including the LRFD requirement, minimal cover, precast floor, baffle, and end sections was instrumental in obtaining approvals for construction.

The original vault design called for a 30-foot wide section. The widest precast box span that Oldcastle could design using the new vehicle loading requirements was 24 feet. To make the 24-foot wide precast sections work, TSI's personnel worked with Oldcastle designers to lengthen the vaults to accommodate for the lost storage capacity with the narrower 24-foot sections. This included redesigning the storm drainage on the inlets and outlets and locating cleanout ports at appropriate locations.



The use of SCC by Oldcastle in the production of the boxes increased installation efficiencies and reduced the amount of preparation and grouting for the waterproofing application. Since the structure was designed as a [detention system](#), waterproofing the structure from groundwater infiltration was necessary. In addition to the standard butyl sealant, the crew used a high strength non-shrink grout on all seams inside and out prior to backfilling. The outside joints were covered with a cross laminated, two-ply polyolefin sealer. Upon completion, the inside of the structures was coated with Xypex, a unique chemical treatment for waterproofing.

Installation of the box sections began on schedule. The new design shortened the previous nine month construction sequence to two months, completing the installation in the middle of October, a full month before the required November 15 winter shutdown for underground work. TSI was able to build enough grade to keep winter construction activities above the existing ground surface and outside of sensitive areas, while implementing a revised Best Management Practices plan that minimized risk for the upcoming work. This led to completing Phase 2 of work prior to the upcoming spring/summer construction season, which aided in meeting the aggressive early completion goal.

By focusing on timely project delivery, the contract was substantially completed ahead of schedule and under budget with the roadway open to the public. The final overall contract cost, including change orders, totalled approximately \$1,000,000 under the bid amount. The project was honored on January 7, 2009 with the “2008 Partnership for Excellence in Contract Administration Western Washington Projects Greater Than \$10,000,000” from WSDOT Headquarters.

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