

Technical Services Feature Story – Oregon City Arch Bridge



Oregon has a rich collection of historic bridges. These treasures often become part of the identity of the surrounding community and indeed the State. Included are those bridges that were built by Conde B. McCullough who was the State Bridge Engineer from 1919 to 1937. He brought a sophistication to Oregon's bridges that incorporated engineering efficiency tempered with economic practicality and polished with aesthetic appeal. McCullough, Oregon's Master Bridge Builder, was considered one of the top ten bridge engineers in the world and is responsible for those magnificent bridges up and down the Oregon Coast.

The Oregon City Arch (OCA) Bridge was one of the most challenging and satisfying accomplishments of McCullough's career. This beautiful arch bridge was built in 1922 and spans the Willamette River connecting the cities of Oregon City and West Linn. Both the bridge design and construction incorporated innovative ideas making this structure a "one of a kind" bridge in the world.

The roadway for this bridge is supported between two 350 foot arch ribs that rise 100 feet above the water. Anchoring these arch ribs are two decorative piers originally designed to house public restrooms. Although the arch span looks like concrete, it is actually a steel structure that was covered in Gunite.

Gunite is simply concrete that was sprayed onto the steel. It was invented in the early 1900s by Carl Akeley, a taxidermist who developed the method to create concrete animal sculptures. McCullough chose this type of coating rather than paint because he believed that it would better protect the bridge from the corrosive atmosphere caused by local industries.

Throughout the bridge, McCullough used inset panels with a hammered finish on the cast-in-place concrete. They created a decorative texture that contrasted with the smooth concrete surfaces. McCullough also built pylons at the bridge entrances and on the piers. This was the first time McCullough used pylons, a feature that harkens back to the obelisks of the ancient world and are a signature elements found on many of his later bridges. Decorative lights were mounted on the OCA's pylons, putting the finishing touch on this unique bridge.

Fast forward almost 85 years to 2006. The bridge guardrail system was deteriorating. Additionally, the Gunite was cracked and showed signs of water damage. Rust stains were visible but since the Gunite coated the bridge, there was no easy way to determine the extent of damage to the underlying steel. And, these were just the problems that could be seen from the sidewalk. It was obviously time to address these problems.

As with all of our historic treasures, ODOT was dedicated to preserving this heritage. The Bridge Preservation Unit joined with Region 1 forces and OBEC Consulting Engineers to rehabilitate the Oregon City Arch Bridge.

Rick Keene, Region 1 Project Leader, with the help of Susan Hanson Region 1 Community Affairs Coordinator navigated the project development process through very difficult public meetings. Their contributions continued during construction to ensure the public was kept informed and their concerns were addressed.

Dr. Bob Hadlow, Region 1 Historian, provided guidance throughout the project which balanced historic needs with current design requirements. From the rail system to the replicated lights, his efforts kept the project as authentic as possible and in good stead with the State Historic Preservation Office.

Working closely with Wayne Statler, Region 1 Project Manager, and Tim Smith, Region 1 Assistant Project Manager, difficult construction issues were identified and addressed ahead of time. Since project conception, one of the most daunting problems revolved around access. Because the utilities had to be relocated before construction, the utility companies installed a suspended scaffold deck below the roadway. Wayne and Tim successfully negotiated with the utility companies to leave the deck until the project was bid. This access paid off with enormous benefits reducing the risk to bidders and ensuring a lower bid costs. The Contractor assumed responsibility of the suspended deck and used it during construction.

Another big project problem revolved around removal of the existing Gunite without damaging the steel underneath. After long discussions, the team settled on looking into hydroblasting technology. This uses a high pressure water jet to pulverize the concrete covering leaving the underlying steel clean. Since the project team didn't know if it would work, Tim and Wayne hired a contractor to remove a portion of the Gunite as a demonstration project. The demonstration was such a success that the process became the only allowed method of removal. All of the potential contractors were invited to watch the demonstration which again served to reduce their risk and lower bid costs.

With the valuable information obtained from the demonstration project, Tim was able to foresee a potential problem with the volume of waste water. He quickly developed a solution that saved the project over four million dollars.

Throughout the project, OBEC Consulting Engineers provided flexible, timely responses which kept the project on track. It was great to work with consultant bridge designers as dedicated and passionate for the success of the project as ourselves.

The contributions of these and many others to the success of the project cannot be overstated and are too numerous to mention in this short article. The bridge was reopened on schedule with a three day celebration provided by the local communities. This is a project for ODOT to be proud of.

The wonderful synergy of the dedicated people inside and outside of ODOT ensured the successful completion of this award winning project. Our gratitude goes to all of the people involved.