

# ODOT U.S. Highway 26 Dennis L. Edwards Tunnel Project

By Larry Totten and Reg Ryan

In early 2010, the Oregon Department of Transportation (ODOT) determined that, for safety reasons, a series of basic repairs, including relining and lighting improvements, had to be commenced on the 70-year-old Dennis L. Edwards Tunnel, located 34 miles (55 km) west of Portland.

After the constructibility review of the project in early 2010, ODOT held a series of public meetings asking the public whether the vertical clearance of the tunnel should also be addressed as part of the project to improve freight mobility to and from the Oregon Coast. Public input was especially important to this project because the tunnel is regularly used by inland commuters to access the Oregon Coast communities that rely heavily on tourism. The daily average of 6700 motorists increases dramatically through the spring and summer months, with a seasonal peak in August of 15,000. A strong, consistent outpouring of citizen input against this proposal determined that the vertical clearance improvements would no longer be an option; the coastal residents were concerned that a lengthy repair to the tunnel would stifle already-lagging coastal tourism. ODOT estimated that the project would originally take 12 to 13 weeks and that the tunnel would reopen by the end of May, just before the high season for coastal tourism would commence.

Johnson Western Gunite Company (JWG) began work on the tunnel in January 2011. The shotcrete work consisted of relining the existing 800 ft (244 m) long tunnel, improving drainage, lighting, and long-term stability of the tunnel. The existing tunnel liner was a combination of much of the original timber arch ribs and various previous repairs using steel set and reinforcing bar reinforcement and shotcrete. JWG initially started work on the project using shotcrete and rock bolts to support the tunnel during removal of the aging timber sets. Almost immediately, it was apparent that these means and methods would not work due to poor and unstable ground conditions. The weather was colder and wetter than anticipated, and unexpected soft, damp, and unconsolidated tunnel rock conditions complicated the application of shotcrete to the tunnel lining.

Due to these unstable conditions, the original end-of-May completion date was at risk, thus jeopardizing completion before the much-anticipated beginning of the coastal tourism season. Because ODOT recognize their commitment to the communities that use the tunnel, it was critical that the design be modified to accelerate the construction process in a safe and timely manner. It was important to all concerned that the tunnel reopen as soon as possible, so ODOT and JWG immediately started discussions to review and consider alternative repair methods.

JWG submitted a value engineering proposal to leave in the existing lagging, shoot between the existing sets, and then remove the sets after the shotcrete had reached the required strength. After discussion and negotiation, this method was accepted and JWG continued with the new removal and relining plan. As these sets were removed, reinforcing bar was installed and steel fiber-reinforced shotcrete was applied as the final support and liner. Shotcrete was placed up to 18 in. (460 mm) in thickness with two mats of steel reinforcement and 80 lb/yd<sup>3</sup> (36 kg/m<sup>3</sup>) of steel fiber.

Shotcrete was a significant benefit in this project, as no formwork was required. Shotcrete was applied in the tunnel at night and because formwork was not needed, there was no blockage of the roadway, thus allowing the tunnel to be





reopened every morning to the motoring public. Using shotcrete for this critical tunnel repair not only saved ODOT time and money but also maintained a good relationship with the coastal residents who used the tunnel to commute through on a daily basis.



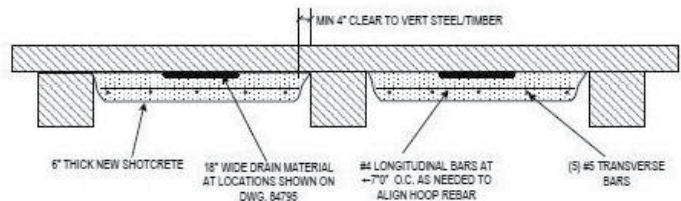
**Larry Totten** is the current President of Johnson Western Gunitite Company. He has also served as a Project Manager and Chief Estimator during almost 30 years with the company. He received his MS and BS in civil engineering and is a member of ASA, the American Society of Civil Engineers, the American Concrete Institute (ACI), and the Associated General Contractors of America. He holds contractors licenses in six states and is a licensed professional engineer in California. He is the Chairman of the Laborers Craft Committee of the Associated General Contractors of California. His industry leadership includes membership in ACI Committee 506, Shotcreting; Chairman of the Northern California Laborers Trust Fund; and Past President of ASA.



**Reg Ryan** has dedicated his entire career to the construction industry, specializing in mining, shotcrete, slope stabilization, tunnels, and difficult access projects. From Iqaluit in the Arctic Circle to Belize in Central America, Ryan has stepped up to numerous challenges with innovative ideas and designs. With over 30 years of experience in the industry, when Ryan hears "it can't be done," he draws on his depth of knowledge and unwavering determination to figure out a creative solution to make it happen. Ryan served as Vice President with Johnson Western Gunitite from 1999 to 2012. He now continues with Superior Gunitite as Senior Project Manager/Estimator after Johnson Western Gunitite merged with Superior Gunitite.

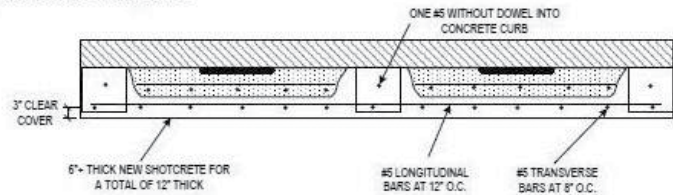


#### SHOTCRETE LAYER # 1



Note: 1. For Mat #1, center (3) #5 polyester resin bonded dowels to be embedded into the concrete curb between each set of timbers. [Depth of Embedment = 6" Length of Bar = 36" total]  
2. No rebar dowels into concrete curb for mat #2.

#### SHOTCRETE LAYER # 2



## 2011 Outstanding Repair & Rehabilitation Project

### Project Name

Dennis L. Edwards Tunnel, U.S. Highway 26

### Project Location

Manning, OR

### Shotcrete Contractor

Johnson Western Gunitite Company\*

### General Contractor

Johnson Western Gunitite Company\*

### Architect/Engineer

Shannon & Wilson, Lochner Consulting Engineers

### Material Suppliers/Manufacturers

The Quikrete Companies\* and Cemex

### Project Owner

Oregon Department of Transportation (ODOT)

\*Corporate Member of the American Shotcrete Association