

Outstanding Shotcrete Project Award Winner

2008 Outstanding Underground Project

The Heartland Corridor Clearance Improvement

With sky-rocketing fuel costs for truck and air transport, moving freight over national railroads has become increasingly attractive to suppliers and manufacturers. With this increasing traffic demand, many railways have been challenged to find solutions to accommodate the increased volume. The solution, which has been under review and planning for a number of years, is clearance improvements to the railway system. This will allow for double-stacked containers to be moved seamlessly from state-to-state or coast-to-coast when all work has been completed.

Norfolk Southern Railway has embarked on the Heartland Corridor Clearance Improvement Project, which would allow for this seamless movement throughout its system. Tunnels with low clearance and other overhead obstructions would be altered or removed over 3 years to allow for double-stack train traffic. A design team worked tirelessly to design and implement an efficient and cost-effective clearance repair method.

The first of 28 tunnels on the Heartland Corridor Clearance Improvement Project stretches between Virginia and Kentucky. The Cowan Tunnel Project involved the removal of approximately 3304 lineal ft (1007 m) of existing concrete crown tunnel liner. This involved grinding the liner to meet required clearance, installing approximately 7800 rock bolts, as well as applying approximately 2300 yd³ (1758 m³) of steel fiber-reinforced shotcrete. The necessity to complete the repair areas and return the railroad to service at the end of each 10-hour shift was a challenge, to say the least. This was a confined tunnel 3304 ft (1007 m) long on a single track, where 2300 yd³ (1758 m³) of shotcrete was required.

Road headers were used to remove the tunnel liner, which later was removed to stockpile using railway-supplied air dumps and company-owned hy-rail car movers. Areas were thoroughly scaled of loose debris, rock bolts were installed in predrilled holes, and drain fabric was installed

prior to the application of shotcrete. A typical work train was outfitted with a volumetric batching machine, a gantry hoist system, and a custom shotcrete pump.

Crews were able to apply an average of 30 to 40 yd³ (23 to 31 m³) of shotcrete on a daily basis with minimal rebound and fall out. This was made possible using a prebagged, silica fume, fibrous shotcrete mixture as well as the application of the product by ACI Certified Nozzlemen. Shotcrete operations were overseen by a tunnel superintendent and an ACI Certified Nozzleman. The tunnel nozzleman applied the shotcrete in multiple layers at site inspectors' direction with very minimal rebound. The finished product far exceeded expectations of the owner. The lead project inspector remarked, "The nozzleman was one of the best I had worked with during my career and appreciated my demand for perfection." The nozzleman not only applied the shotcrete during this project but also provided assistance and training for other nozzlemen within the company looking to achieve their ACI certification.

The project was completed in late September of 2008. Crews then mobilized to another four tunnel projects in West Virginia. Similar means and methods were planned for these tunnels with completion dates in mid-2009.

The Heartland Corridor Clearance Improvement Project proved to be a challenging but very rewarding experience. The first tunnel in the project, the Cowan Tunnel, comprised the work of grinding the liner to meet required clearance, installing approximately 7800 rock bolts, as well as applying approximately 2300 yd³ (1758 m³) of steel fiber-reinforced shotcrete. With meticulous schedule planning, labor coordination, and equipment allocation, the team was able to achieve high shotcrete productivity without forgoing the efficiency of other tunnel work tasks. As the first of the 28 tunnels, this crew developed a standard of means and methods for future tunnel improvements in the project.

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Placing initial layers of fiber-reinforced shotcrete



Lattice girder tunnel supports within the layers of fiber-reinforced shotcrete (initial layer)



Shotcrete being applied near portal area. Spiling installed and shot in prior to the demolition of the adjacent panel



Lattice girder tunnel supports with final layers of fiber-reinforced shotcrete



Shotcrete being applied to tunnel walls by ACI certified nozzleman

Outstanding Underground Project

Project Name:

The Heartland Corridor Clearance Improvement

Project Location:

Radford, VA

Shotcrete Contractor:

Johnson Western Guniting Company*

General Contractor:

Johnson Western Guniting Company*

Architects/Engineers:

STV Whitehead, Hatch Mott McDonald,
and Rick Meredith

Material Supplier:

The Quikcrete Companies

Project Owner:

Norfolk Southern Railway

*Member of the American Shotcrete Association