



Photos courtesy of WYDOT

Up and Running in No Time

BY GREGG FREDRICK, P.E.

A severely damaged Wyoming highway bridge gets back on track within a matter of months.

WHEN A NORTHEAST WYOMING HIGHWAY BRIDGE was damaged by a truck on May 13 of last year, not only were travelers faced with a long detour but also the nation's most productive coal mine was cut off from a loading facility for the trains that carry its coal to power plants around the country.

Faced with this dilemma, the Wyoming Department of Transportation (WYDOT) and Thunder Basin Coal Co. cooperated to remove the damaged bridge, build a temporary bridge, and get the highway and coal road reopened in 18 days. They also worked with Roscoe Steel and Culvert of Billings, Mont. and contractor Reiman Corp. of Cheyenne, Wyo. to get a new permanent bridge fabricated and built in just 135 days.

Wyoming Highway 450 (WYO 450) passes through the coal-rich Powder River Basin, crossing over a haul road for Thunder

Basin's Black Thunder Mine, one of the nation's leading coal producers; the 86.2 million tons of coal the mine shipped in 2007 was nearly 9% of the nation's total supply.

The damaged bridge, about 12 miles southeast of Wright, Wyo., was a simple composite-steel welded-plate-girder span with a back-to-back abutment length of 90 ft and a clear bridge roadway width of 32 ft. The bridge's exterior girder had been pulled from the deck and both bearings, ending up on the abutment slope perpendicular to the bridge's centerline. The second interior girder was severely damaged as well, and many of the intermediate cross frames were distorted. The south edge of the deck deflected approximately 2 ft, but the bridge's abut-

A bridge on Wyoming Highway 450 sustained severe damage last May (above) but was back in commission by September (inset).



This 140-ft portable prefabricated modular steel truss bridge replaced the damaged span and allows for two lanes of traffic.

ments and retaining walls were undamaged.

WYDOT inspectors found the damage too severe to allow traffic to continue using it, and the Mine Safety and Health Administration wouldn't allow mine trucks to pass beneath it. WYO 450 carries an average of 1,800 vehicles a day, and the best available detour around the damaged bridge was 32 miles long and included unpaved county roads.

Worse yet, the mine's haul trucks were no longer able to get across the highway to a train-loading facility. The enormous trucks carry up to 320 tons of coal in a single load, enough to heat an average-sized home for more than 40 years, and they hauled as many as 300 of those loads under the highway every day. Thunder Basin shifted production to a portion of the mine on the other side of the highway, but with more than 100 power plants in 20 states depending on the mine for a steady supply of coal, it was important to get the haul road back in service as quickly as possible. "It was evident that the most expeditious and cost-effective repair strategy would be to remove and reconstruct the entire superstructure," said Keith Fulton, WYDOT's assistant state bridge engineer.

On the day the bridge was damaged, WYDOT sent the plans of the circa-1970 superstructure details, required plate sizes, and notice to proceed for purchasing steel to Roscoe Steel.

Three days later, hydraulic excavators from Black Thunder Mine removed the damaged bridge deck and girders in about four hours. At the same time, WYDOT

was beginning the design and details for the bridge replacement.

On May 19, WYDOT's maintenance crews began constructing a 140-ft portable prefabricated modular steel truss bridge manufactured by Acrow Corp. in Pennsylvania. The two-lane bridge is strong enough to carry highway loads due to its triple-single reinforced three-heavy side truss configuration. "The Acrow bridge is great," said Barry Bowersox, WYDOT's area maintenance supervisor. "It goes up quickly, it's strong, and it allows for two lanes of traffic."

With the aid of Acrow and cranes provided by the mine, the bridge was lifted into place and set on concrete footings behind the bridge abutments. Thunder Basin provided timbers for the back wall and hauled the material for the approach roadway. WYDOT maintenance crews placed and surfaced the approach ramps and bridge deck. By May 31, just 18 days after the bridge was damaged, the temporary bridge was opened to traffic and coal trucks began rolling underneath the highway again.

Roscoe had contacted mills around the country and found Chappell Steel had the required plates available for immediate shipment. They arrived in Billings 10 days after the order was placed. Roscoe used its in-house detailing staff to produce shop drawings, while WYDOT completed the field reviews, design calculations, and project plans.

"Utilizing our in-house detailing staff saved a significant amount of time" said Craig Jensen, Roscoe's bridge manager of

13 years. "Our detailer was familiar with the WYDOT shop drawing presentation and fabrication requirements."

Sending the shop plans as electronic files allowed instant access and afforded a quick review and approval of the shop drawings, said Paul Cortez, WYDOT's bridge inspection engineer. The bridge was originally constructed with weathering steel but because it was not readily available, the replacement girders were fabricated from ASTM A709 Grade 50 steel. The four girder lines were each 87 ft, 8 in. long, with K-type cross frames fabricated from angles. Fabrication began on June 13 and by the end of June, the girders and cross frames were painted and ready for delivery.

"This was not a typical project for us, and to be part of the team to help out in this situation was an opportunity we were glad to have," Jensen said. "There were some fortunate circumstances that made it possible, including an unexpected opening in our shop, the mill having the plates we needed in stock, and our working relationship with WYDOT."

WYDOT State Bridge Engineer Gregg Fredrick agreed, saying, "Our past relationship with Roscoe Steel and our confidence in their detailing and fabrication staff's abilities made it an easy decision to allow them to proceed with minimal information."

As contract plans were being developed, Thunder Basin built an at-grade detour crossing the mine's haul road, to be used when the temporary bridge was removed for construction of the replacement superstructure. WYDOT maintenance crews surfaced the detour.

On July 17 the Wyoming Transportation Commission awarded a \$473,000 contract to Reiman Corp. for construction of the new bridge superstructure, concrete deck, and approaches. The contract required work to be done by Oct. 15 and, once the temporary bridge was removed, work to proceed continuously until the new bridge opened to traffic.

After Reiman took delivery of the structural steel, stay-in-place deck forms, reinforcing steel, and bridge railing, Thunder Basin cranes removed the temporary bridge on Aug. 7 and traffic was routed onto the detour. The intersection of the detour and coal haul road was signalized, and the mine provided a safety officer there around the



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clock to make sure traffic moved smoothly.

On Aug. 18 Reiman began erecting the girders, and by Sept. 26 the new bridge was opened to traffic, just 4½ months after the original bridge was damaged and 19 days ahead of schedule.

“Everything came together quickly,” said Josh Jundt, the WYDOT resident engineer who oversaw the construction. “It all just clicked.” **MSC**

Gregg Fredrick is WYDOT's state bridge engineer.

Owner and Designer

Wyoming Department of Transportation

Steel Fabricator and Detailer

Roscoe Steel and Culvert Co., Billings, Mont. (AISC/NSBA Member)

General Contractor

Reiman Corporation, Cheyenne, Wyo.