Bridge Construction: The Moyie River Bridge

From an Email from Larry Adams, December 2009

Nearly 500 feet above the Moyie River in northern Idaho, this bridge was constructed during the 1962-64 construction seasons and required much intestinal fortitude from the inspectors.

Larry Adams wrote that he first came to work for the Bureau of Public Roads (BPR) in September 1958 and was sent to work "for Project Engineer **Jerry Dodge** to work on the Dixie road (Elk City cut-off road)." He spent four years on that project working "as an Engineering Aide, doing work as a chain man, materials tester, weight man, etc."

Later he was transferred to a road construction project in St. Maries, Idaho. "I stopped by **Walt Smith's** office to report in and get information on where to park my trailer. Walt asked if I would like to continue on to Bonners Ferry, Idaho, to work on a bridge project, as **Larry Fisher** had just moved down from there and didn't want to move back."

He agreed to the move and relocated his trailer to Bonners Ferry, then continued on to Moyie Springs. When he arrived, he found "there was no one to report to. The Engineer and his assistant were in transit. Not knowing what to do, I went to **Dale Jackson's** office in Bonners Ferry. He was the construction project engineer on the Copeland-Porthill road project." Larry offered to help on that project until the rest of the crew arrived at Moyie Springs, but "Dale said they didn't need any help, so I did what I like to do: fish."

After a few days, Resident Engineer **Gerald Lind** and Assistant **Don Olson** arrived and Larry was able to report to his assignment. "The project was for $1,200,000 to Northern Construction and Imperial Construction, a joint venture," he remembered.

"The first order of work was to lay out the bridge," he said, recalling that "**Joe Gautier** also helped on the lay out." They began by establishing base lines "using a direct second theodlite, a low variation measuring chain supported every 25 feet, to establish the abutments and piers and their reference points. After months of triangulation we officially moved the end of the bridge point established by the Location Engineer, **Gordon Mead**, by one half inch.

Larry took a break from the project "to go help Project Engineer **Ron Barger** in Freedom, Wyoming." They finished the Wayan-Freedom project, one he'd worked on the previous year, then he was sent back to Bonners Ferry for survey work before being officially transferred to the Moyie Bridge for the concrete operation.

When he arrived, "**Ted Hickman** was on the project to oversee the grading operation and help with other work." The work completed to that point included "pier 1 footings, pier 2 footings and 2nd lift of columns, the base of pier 3, the footings of pier 4, and the footings of pier 5....

"The construction of the bridge was done by a highline," Larry said, describing it as "a tower before the beginning of the bridge and a tower past the end of the bridge, a cable, I think, 2 inches in diameter from tower to tower on which a carriage rode. The towers could be moved sideways each way.

"When the substructure concrete was completed, the 110-foot plate girders were set in spans 1 and 2. The girders were composite with the deck by shear connectors (Nelson studs). A row had 4 studs welded to the top flange. They varied 6 inch spacing at the abutments and piers and longer spacing at mid span. You had to walk pigeon-toed between them, or walk on top of them."

Larry admitted that "Don and I didn't like walking that way, so we walked on the bottom flange and held onto the studs." This drew some kidding from one of the Ironworkers, **Don Vick,** who suggested it was fear that kept them from walking up on top. Larry said "it wasn't very long (before) the fear was gone."

"The next (step) was to set the 85-foot plate girders in the end span, pier 5 to abutment 2....The setting of the steel was by a subcontractor, Don L. Cooney of Seattle, Washington," he said, and he and Don Olson had to follow up with an "inspection and ... check the torque of the bolts, in this case at the diaphragms." This time, he said, "Don and I didn't walk on the bottom flange."

The subcontractor took one look at the wrench they were using "and let us use their torque wrench. It was a lot easier to use than the one from Property and Supply.

"It took 160 pounds of pull on the end of the wrench to get an audible click indicating the bolts were tight. We checked 10 percent of a bolt pattern; if a bolt was loose we checked the whole pattern. Finding a loose bolt just about caused you to dirty your pants. There were approximately 35,000 high strength bolts throughout the bridge."

Describing the bridge, Larry said "the truss span lengths are 270 feet, 378 feet, and 270 feet; the height is 30 feet at pier 2, center span, and pier 5, and 50 feet at piers 3 and 4. The truss control points are every 27 feet and called a panel point known as L0, L1, L2, etc., to L17, the center of the truss. Work began at pier 5 with false-work towers at L3 and L7. The chord members are two panel points, so to get to L3, the chord member had to be bolted together; this was done on the ground. These chords were set and assembly began. From L3 to L7 was done by the cantilever method and also from L7 to pier 4 (L10) and on to L17. The same method was used from Pier 3 to pier 4 and on to L17. The fabrication of the steel and layout of the bridge matched perfectly.

"We actually measured the height of the bridge with a 500-foot chain and it was 461 feet to the water level.

"At this point, Gerry Lind when back to the Idaho Division office (where he was working as the assistant Bridge Engineer)," Larry recalled. "He did the concrete design for the bridge (and) Don assumed the bridge duties.

"Next was superstructure concrete. The deck was in two parts: 6 inches of lightweight concrete (topped with) 1 inch of regular. The lightweight concrete couldn't be over 110 pounds per cubic foot. The aggregate was expanded shale.

"The idea was to pour and finish the lightweight out far enough and get back and cover it with topping before it set." When that didn't work, "the topping was put on later. After much discussion, name calling, finger pointing and whatever else, a decision was made" on another method "that did work on the rest of the deck pours.

"To get the topping to bond to the lightweight on the first pour, we required the contractor to use epoxy that could bond to a wet surface. Epoxy was applied and topping poured and finished," Larry said. "A couple of weeks later, Don wondered if it bonded, so I took a hammer and pounded on the surface. Clack! Well, most of the topping didn't bond. We found out later the contractor was diluting the epoxy with gasoline. They did it right the next time.

"The concrete was poured by using 2-6 cubic yard concrete buckets and transported by the highline to a bellboy that had radio access to the operator to position the buckets." Larry recalled one instance when "I was using the level to set overhang grades and suddenly I was lying on the deck. I got up and wondered what had hit me." He found that "the level was damaged. I got up looked around and saw a full 6-yard concrete bucket traveling" away from him, down the highline. "I had been hit in the back of my neck with the bucket. My hard hat couldn't stop the bucket."

In spite of that incident, he remembered, "there were only a couple of minor injuries to any of the workers and inspectors. There was 32 claims submitted by the contractor."

Larry remembered that they also had a trainee on the job named **Reed Brown**. "Where he (is now), I don't know," said Larry, but "during the steel work....I know he was the first of us to get to pier 4." Don and Gerry were both graduates of the BPR training program themselves, and Don kidded him about that accomplishment: "Don told him, 'anyone can crawl.'"

Stories in this series have been developed by Marili Green Reilly from interviews, email, and correspondence. Retirees with stories to share about their early work at the Bureau of Public Roads are invited to email marili.reilly@dot.gov.


The Coeur d'Alene Press

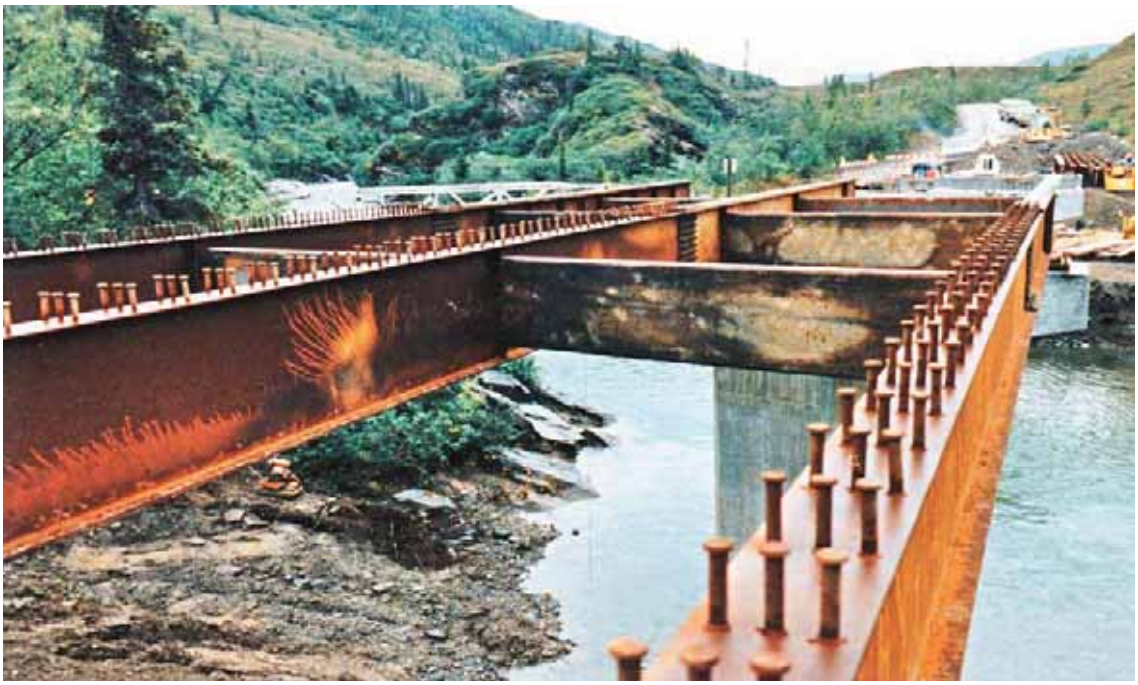
High Span Nearly Finished

Florida Coast Swept By Dora

Navy Plane Down; Three Known Dead

Twin Falls

Larry Adams provided these pictures, noting that "This is how we checked the bolts. I'm the one on the bottom with the torque wrench. The others are Ironworkers. I was working with Tom Neunaber on the Horsetail Falls Bridge on the North Cross State Highway."



"These are Nelson studs (shear connectors) on the Moose Creek bridge in Denali National Park. You can see the problem with walking on the top flange. These were evenly spaced, whereas on the Moyie River Bridge they varied."