



By **Bill Wilson**  
Editorial Director

# A feeding frenzy

WSDOT works under fire to get I-5 bridge up again

**P**atrick Fuller was just trying to make some dinner, but the last thing he wanted to do was feed anyone who would listen.

A section of Washington's I-5 Bridge over the Skagit River dropped on May 23 after a cross member of the steel truss bridge was struck by a truck. Fuller was attempting to wrap up his day at around 7:30 p.m. but quickly had to restart his on-the-job battery in an effort to shove servings of information into the ears of those who could help.

"I was on the phone a bunch with some temporary-bridge companies because I had a feeling that is what we needed to get in place," Fuller told *ROADS & BRIDGES*. "So I fed them some information and they started working on some plans for the configuration that we would need. Then I got a good night's rest, because I knew I would have a few busy weeks ahead of me."

## Picking up speed

What was needed the next morning was a good start. Fuller arrived at the scene to survey the damage and immediately started pushing through any and all kinds of permits he could think of, because the decision to go with either a temporary span or a permanent one right out of the gate still needed to be made. The only thing that was certain during the opening hours of May 24 was that the damaged section needed to be pulled from the water as soon as possible. However, the removal schedule of the 160-ft-long span was cloudy as well, because the National Transportation Safety Board (NTSB) was on-site and needed to examine certain pieces to complete its investigation.

"It was still a rescue operation," said Fuller on the first day after the collapse. "[The NTSB] was particularly interested in certain parts of the structure that failed, so those pieces were removed and set aside carefully."

Local businesses also were put in a fragile state. Per capita, the city of Burlington has the

highest sales tax revenue in all of Washington, so reviving the span any way possible in the least amount of time was top priority.

"There are a lot of Canadian shoppers that come down here as well as regional shoppers," remarked Fuller.

The Washington State Department of Transportation (WSDOT) mobilized barges with cranes and excavators with cutting devices to handle the debris. Divers also were welding and cutting, and it took about three weeks to clear the area. During that time it was decided that a temporary bridge would be slid into place for immediate relief followed by a permanent fix. An Acrow bridge, with sections coming from as far away as New Jersey, served as the fill-in. The assembly took place just north of the scene, and crews also did some patchwork on the piers. The collapse sheared off all of the anchor bolts for the bridge bearings.

During the first week of June WSDOT began working on the design-build contract to permanently replace the lost section. Because they were still dealing with the existing piers, the repair had to be of a certain weight, and contractors could go with bulb-T prestressed, precast concrete girders or steel girders. The winning bidder, Max J Kuney Construction, Spokane, Wash., and Parsons Brinckerhoff (\$6.88 million), decided to go with a bulb-T lightweight concrete girder design, and on July 12 work began on driving steel piles just downstream of the existing I-5 bridge. A total of 12 24-in.-diam. piles were installed to hold the new permanent structure, and 56 24-in.-diam. piles were placed for the skidding bents, which would help slide the permanent deck onto its final

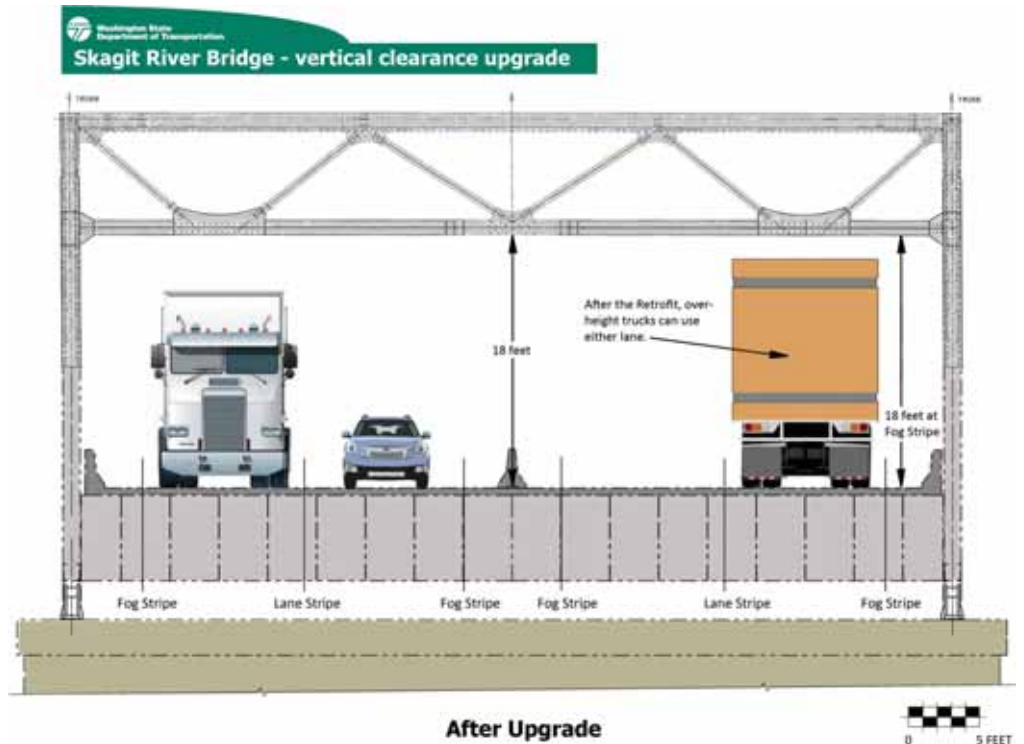
### I-5 bridge has deficiencies, but none is addressed in rebuild

The I-5 bridge over the Skagit River was constructed just before the interstate program in the U.S. got started. When new interstate came around, it was decided to incorporate the pavement with the I-5 bridge.

"It's deficient in its geometrics in that the lanes aren't really wide enough, there aren't any shoulders really to speak of on the structure and it doesn't have the sight distance that meets current standards for today's speeds," said Fuller.

Fuller said in the future the bridge will have to be replaced with one that has at least three lanes in each direction, and the site-distance issues have to be corrected. Two interchanges on each side of the bridge also will need to be reconstructed, and the span would have to be longer. Currently it is 1,000 ft long. The future needs for flood control and dikes, as well as traffic, also will need to be considered in the design of a new bridge.

However, the Washington State Department of Transportation does not have any immediate plans to replace the I-5 bridge. Because federal funds were used for the emergency replacement following the collapse, crews had to use the existing framework.



**After Upgrade**  
The original sway frame, steel members in the top of the truss, had lateral supports that arched down. New steel members will be installed to eliminate the arch look.

resting place. The piles were driven 70-100 ft below the water line.

Concrete Technology, Tacoma, Wash., began casting the girders on July 9 about 100 miles away from the jobsite. Eight girders were needed, and when they arrived they were placed parallel to the river. This made the transporting of the girders to the top of the bents extremely difficult. Sickie Steel, Mt. Vernon, Wash., handled the maneuver, which called for a 500-ton Demag AC1300 crane on the bank and a 200-ton Manitowoc 4100 crane on a Flex-Float barge system on the river. It took 19 separate moves from each machine to

place each girder. The land crane picked one end of the girder, lifted it and swung it over to the barge crane. With one end secure, the land crane moved back over and picked the other side of the girder, and the two cranes simultaneously swung the girder 90°.

"That required several moves on both cranes' part as well as re-ballasting of the barge system, because as the girder moved and they adjusted the booms and changed the load on the barge they had to re-ballast as the girders were moved and actually set on the temporary piers," Fuller said.

The girders have very wide top flanges, so the distance between each girder was 12 in. except in the center where crews were going to cast a median barrier, which required a 4-ft-wide closure pour. Two end diaphragms and two jacking diaphragms, inserted in alignment with the temporary bents and slide rails, were installed next. All four were cast in place, as were the concrete barrier walls, one in the center and two located on each edge of the deck. A 1.5-in. micro silica deck overlay was then poured. Crews also had to construct pedestals on the existing piers to allow the new section of the bridge to line up with existing spans on each side.

### Moving in

Once everything reached the required strength, Omega Morgan, Hillsboro, Ore., the





The winning bidder decided to go with a bulb-T lightweight concrete girder design for the permanent span.

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heavy-lifting subcontractor, installed all of its slide rails and jacking and hydraulic systems. Two hydraulic systems were needed: one that sat under the temporary span and one that sat beneath the permanent span. So two types of jacks were used to move both the temporary Acrow bridge and the permanent section. A total of six vertical jack systems lifted the Acrow and four were used for the permanent section. Each vertical jack system had a lateral push-pull unit for the horizontal movement. It took less than two hours to pull the Acrow bridge out of the way, but the entire operation was 19 hours. According to Fuller, the permanent span had to be moved downstream of the roadway about a half an inch to fit.

“One of the challenges was removing some of the asphalt from the temporary span,” he said. “We also had to cut some plates that were used for the expansion joints on the temp span and that took a bit longer. It was a slow process moving the structure in, but it went rather smoothly.”

The gap engineers were targeting for each expansion joint was 1¾ in., and it averaged 1.5 in. The gap was filled with rapid-cure



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silicone, and to handle lateral earthquake loads girder stops—a total of three—were installed in between the girders.

On Sept. 15, after about two months of actual construction, I-5 was back in business, but the work is not complete. The main culprit of the accident, clearance distance, was being addressed at press time. The original sway frame, steel members in the top of the truss, had lateral supports

that arched down. New steel members were fabricated off-site and will be installed to eliminate the arch look.

“We got this done as quickly as humanly possible,” said Fuller. “There were a lot of hours on everybody’s part, but it was pretty exciting.” **R&B**

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