OREGON'S BRIDGE REPAIR AND REPLACEMENT PROGRAM

by Tom Lauer, Oregon Department of Transportation

Reshaping the State's Highway System with Context-Sensitive and Sustainable Solutions

Few drivers today remember a time before interstate highways and clover-leaf interchanges allowed for the easy movement of traffic. Our modern road systems have become an integral part of our everyday lives. They provide for smooth access to just about anywhere motorists want to go and are a vital part of the distribution system that keeps stores stocked with goods.

So it was alarming to the public and freight haulers alike when in 2001, regular bridge inspections by the Oregon Department of Transportation (ODOT) showed that the state's bridges were weakening and many required immediate weight restrictions, detours, and emergency repairs. By 2003, ODOT had been forced to place weight restrictions on 140 bridges.

In March 2001, when Ford's Bridge on I-5 in southern Oregon was declared unsafe and in need of emergency repairs, the resulting detour sent large volumes of traffic—especially truck traffic—through the towns of Canyonville and Riddle for 20 days. The streets of these small towns were not designed for such high volumes of traffic. The delays in travel times associated with the detour and the disruption it caused to these two communities highlighted the seriousness of Oregon's highway bridge conditions.

The most problematic structures were the cast-in-place reinforced concrete bridges built between 1947 and 1962. A majority of these bridges (52 percent) showed diagonal-tension cracking, and nearly half of them were along the north-south I-5 and east-west

The construction method for 103 of the bridges slated for replacement has been determined, and 92 will be built from concrete.

Photos: ODOT.

The I-5 Coast Fork Willamette River Bridge is a pivotal part of Oregon's infrastructure that allows north-south travel.

ODOT's $1.3 billion OTIA III State Bridge Delivery Program is repairing or replacing nearly 300 bridges.

I-84 corridors, which carry the bulk of Oregon's commercial truck traffic. Reinforced concrete bridges built at that time were designed by a method that resulted in less shear reinforcement than is required by current design methods.

Unprecedented Investment in Bridges

The Oregon Legislature responded to this crisis in 2003 by enacting the third Oregon Transportation Investment Act, or OTIA III. The $2.46 billion package included $1.3 billion for the repair and replacement of bridges on the state highway system. Of the 365 bridges in ODOT's OTIA III State Bridge Delivery Program, the agency is repairing or replacing nearly 300 bridges on major corridors throughout Oregon in a 10-year period. OTIA III also provides funding to pave and maintain city and county roads, improve and expand interchanges, add new capacity to Oregon's highway system, and remove freight bottlenecks statewide.

For a half-century, Oregon's concrete bridges have supported growing traffic demands while requiring limited maintenance. Their prevalence has allowed engineers and contractors to hone the skills necessary to deliver bridges quickly, inexpensively, and on budget. And modern construction methods, such as precast, prestressed concrete beams, allow for speedy project completion.

On ODOT's bridge program, the construction method for 103 of the bridges slated for replacement has been determined, and 92 will be built from concrete. Eighty-three of those structures will use precast beams, and nine will be cast-in-place.

Innovative Delivery

Oregonians have not seen an investment of this magnitude in highway and bridge construction since the state's interstate freeway system was built in the 1950s and 1960s. The sheer size and scope of the bridge program meant that ODOT had to change how it does business. Were ODOT to take on the work itself, it would require a massive expansion of the agency followed by a dramatic downsizing once the work was complete. Instead, at the direction of the Legislature, the agency hired a private company, Oregon Bridge Delivery Partners, to assist in the management of the program. ODOT is making an historic shift from an agency that designs and constructs projects to one that manages the transportation system.

The bridge repair and replacement work is happening in five overlapping stages:

Stage 1, was completed in October 2006 and included repairs to bridges along the U.S. 97-U.S. 26 corridor from the California border to Portland, and from Bend to Ontario on U.S. 20. This created alternate north-south and east-west routes that truck drivers and motorists can use when construction starts on hundreds of bridges along I-5 and I-84.

Stage 2 is the largest stage, both in funding and in the number of bridges. It addresses bridges on two major passenger and freight routes in Oregon: I-84 and the northern portion of I-5 from the Washington border to the Eugene-Springfield area.

Stage 3 includes bridges on southern I-5, from Eugene to the California border, and addresses bridge improvements to a significant portion of this major freight and passenger corridor.

Stage 4 will repair or replace bridges on vital freight corridors connecting coastal communities to I-5 and I-84 as well as key north-south routes in eastern Oregon.

Stage 5 will address routes and connections for rural areas within eastern and central Oregon and the coastal corridor south of Coos Bay. These routes are critical to passenger transportation and the transport of agricultural, timber, and aggregate products.

Eighty-three of the concrete bridges will use precast beams and nine will be cast-in-place.

Economic Impact

The bridge program is having a positive economic impact on Oregon. Over the life of the program, it will sustain an average of 2500 jobs each year, the majority of which will be filled by Oregonians. One of the key legislative mandates for the bridge program is to stimulate Oregon's economy by sustaining job and contracting opportunities, from project development through final bridge construction.

The economic benefits of the bridge program ripple out beyond the construction industry to local businesses in communities across Oregon. Related businesses such as materials and equipment suppliers are seeing an increase in trade, as well as local hotels, restaurants, grocery stores, and other businesses frequented by construction workers.

Through apprenticeship and job training programs, ODOT is building a skilled, diverse construction workforce that will be an asset for Oregon long after the bridge program is complete. The bridge program is helping train workers for family-wage, sustainable careers.

By developing a range of contract sizes, ODOT is giving Oregon contractors—including women, minorities, and emerging small businesses—opportunities to compete more effectively with larger national firms. As these small businesses grow and prosper, so will Oregon.

Most recently, ODOT launched the statewide rollout of a program intended to increase contracting opportunities for small firms. Originally piloted in the Portland metropolitan area, the Small Contracting Program for Professional and Technical Services gives small firms the opportunity to be selected as prime consultants for ODOT contracts, including those on the bridge program, valued at $74,990 or less.

Tom Nelson and Associates LLC is a 17-person specialty-surveying firm whose recent work includes staking the landmark Portland Aerial Tram. Through the Small Contracting Program, the firm has just signed its first contract with the state transportation agency. "We're excited about the chance to work directly for ODOT," said Tom Nelson, owner of Tom Nelson and Associates. "As an emerging small business, we really appreciate the commitment that ODOT managers have made to finding innovative ways to get us contracted and providing services."

On the Mt. Hood to Chemult Project, contractors stripped and cleaned reinforcement and shaped it into balls for recycling. More than 720 tons of material were recycled on this project.

30,000 cu yd of rubble from one bridge was reused as aggregate on another OTIA III project.

Keeping Traffic Moving

ODOT is committed to keeping drivers, communities, and transportation stakeholders informed about construction work as it happens. The agency is working to minimize traffic impacts, to help drivers plan their trips using alternate routes, and to keep travelers informed about delays where they exist.

Strong mobility planning is helping ensure that traffic keeps moving relatively smoothly during construction work. The bridge repairs are being grouped into logical bundles along each highway corridor. Bundling reduces cost by allowing contractors to achieve an economy of scale in doing design work, ordering materials, and mobilizing equipment and resources. It also helps traffic engineers make better plans to keep traffic moving during construction.

Record-Setting Concrete Beams

Beyond the planning phase, ODOT seeks ways to reduce traffic impact during construction. Materials selection, such as using precast, prestressed concrete beams, plays a large part in ODOT's mobility efforts. For example, ODOT used record-setting beams (the largest used in Oregon's history) on two key projects early in the program. The beams allowed for faster construction by reducing the number of beams, and, therefore, hours of labor required for installation. Because the projects can be completed more quickly, the impact on mobility is lessened. That, in turn, means less lost time and frustration for commuters, truckers, and other travelers.

The beams, an engineering milestone for the state of Oregon, were the crowning achievement of the Alder Creek Bridge on U.S. 26. Each beam weighed 135,000 lb, was 162.5 ft long, 7 ft deep, 4 ft wide at the top and 2 ft wide at the bottom. A single beam used more than 1 mile of reinforcement and 2 miles of prestressing strand. Simply put, at their installation in November 2004, these were the longest precast, prestressed concrete beams ever constructed and used in Oregon.

To add to this engineering feat, the company behind the innovation, Eugene, Oregon-based Morse Bros. (now known as Knife River Corp.), broke its own record in July 2005. Less than a year after casting and delivering the seven beams to the Alder Creek Bridge project, the manufacturer turned out seven larger beams.


Precast, prestressed concrete beams speed construction and decrease traffic delays.

The dimensions of the new record-setting beams were even more impressive: Each was 183.75 ft long, weighed 179,000 lb and contained 1.6 miles of reinforcement. The new beams were the first "BT-90" precast concrete beams ever built in Oregon. Morse Bros. delivered and installed the beams—carefully coordinating two cranes, one with a 350-ton lift capacity and one with a 200-ton lift capacity—at the Union Pacific Railroad overcrossing bridge just north of Chemult in southern Oregon. More details of this project are given in the Winter 2007 edition of *ASPIRE*.™

ODOT's bridge program is leading the way with innovations such as the massive precast beams that increase public safety and mobility, while safeguarding economic and environmental resources. With economic gains reaching all corners of the state, the citizens of Oregon are reaping the benefits of this major public effort. By the time the bridge program is complete, Oregon's highway system will be ready to support the state's growing economy for decades into the future.

Tom Lauer is Manager, Major Projects Branch, Oregon Department of Transportation.

For more information on this or other projects, visit www.aspirebridge.org.

Advertisers Index

Community Values

An innovative decision-making framework is guiding the bridge program. All stakeholders—businesses, communities, and special-interest groups—are an integral part of the process, and all opinions are carefully considered in determining how the bridges will be designed and built.

ODOT's innovative delivery approach—known as Context Sensitive and Sustainable Solutions, or CS³—addresses the preservation of scenic, aesthetic, historical, environmental, economic and other community values while building safe and enduring projects. This comprehensive strategy fosters accountability to the state's taxpayers, communities, motorists, and stakeholders.

CS³ enhances ODOT's standards of project safety and reliability. To that foundation, CS³ adds attention to socially and environmentally sustainable outcomes to the design and construction processes. The goal of the sustainability component is to get the job done—to repair or replace hundreds of aging state highway bridges—in ways that not only reduce negative impacts on the environment and communities, but also extend the economic, social, and environmental benefits of the program into Oregon's future.

Through CS³, ODOT is thoughtfully repairing or replacing bridges in ways that accomplish the program's goals:

- ODOT is building bridges designed to limit their impact on the natural environment. For example, using precast, prestressed concrete beams to create single-span structures eliminates footings in streams and thereby enhances habitat.
- ODOT is monitoring construction waste and equipment emissions, materials selection, and the life cycle and durability of the bridges. On one project, recycling nearly 25,000 tons of materials from a single demolished bridge saved more than $200,000.
- ODOT is tackling critical environmental stewardship issues such as watershed health, habitat connectivity, and life-cycle impacts. For example, installing a wildlife crossing bench—a graded area that ties into flat areas above and below a bridge—helps wildlife cross underneath the Crescent Creek bridge in central Oregon.
- To comply with 14 separate environ-mental statutes and permits, ODOT and 11 federal and state regulatory agencies developed program-wide performance standards and streamlined the time-consuming permitting process.

Involving the Public

An important part of the bridge program is making sure that communities affected by construction projects have opportunities to provide meaningful input into the design and construction of bridges. Extensive community engagement was critical in the historic Columbia River Gorge National Scenic area along I-84, which winds along the banks of the Columbia and skirts the shadow of Mount Hood. It is a lifeline that brings commerce as well as tourists into and through the gorge. Along this corridor are 26 bridges slated for repair or replacement. Each offers a vantage point from which to observe the beauty of the gorge and also provides a critical economic link for local communities.

Before design began in the gorge, ODOT worked closely with community members, stakeholders, and representatives of state and federal agencies to gather input and secure buy-in on design elements ranging from abutments and railings to landscaping and wildlife crossings. The resulting I-84 Corridor Strategy provides a framework of design guidelines to help ODOT manage and improve the interstate in ways that meet public safety and transportation needs while also meeting National Scenic Area provisions. The I-84 Corridor Strategy generated national attention, too: the American Council of Engineering Companies recently recognized ODOT with the 2007 Engineering Excellence National Recognition Award for the design guidelines.