Steel takes center stage

High-performance steel girders will support the Hilgard Interchange bridge.

Steel usually plays a "supporting" role in highway bridge construction. Under the familiar surface of concrete lies a critical network of rebar that literally steels concrete to support heavy loads such as cars and trucks.

But structural steel has a starring role in the OTIA III bridge program, too: about 10 percent of the bridges being replaced will be made of it.

"Steel is appropriate in certain conditions, because it is lighter and because it can be bolted together," said Steve Narkiewicz, Project manager in the Bridge Delivery Unit. "For longer spans or when a bridge is curved, steel can be the best solution."

The 148-foot-long girders for the Hilgard interchange replacement bridge, on Interstate 84 near La Grande, were perfect candidates for this material. To minimize mobility constraints, the proposed bridge will span I-84 entirely, with no piers on the roadway, thanks to the strength of high-performance steel.

Oregon Iron Works built the girders using weathering steel, which includes alloys that create a dark-brown patina of rust on the surface of the steel when it's exposed to the elements. Once the beams are covered, the patina protects them and they don't need to be painted, which lowers the need for — and the cost of — maintenance.

Another bridge that makes good use of steel beams, in this case, supplied by Fought & Company of Tigard, is a replacement bridge southwest of Springfield. The bridge sits above the Union Pacific Railroad tracks, part of the main freight and passenger transportation rail line between Oregon and California. There again, steel had an advantage because it could span more than 143 feet while maintaining vertical clearance over the tracks. A single span will increase the safety and stability of the structure by eliminating supports near the tracks that could be struck by a derailed train.

While precast concrete girders must be straight, steel girders can be curved horizontally by heating and cooling them repeatedly. On the bridge program, curved structures will be required to span several creeks, such as the bridge over Bear Creek (north of Ashland on Interstate 5) or over the North Fork of the John Day River. The longer beams offer the added advantage of keeping piers out of the water and thereby providing more fish-friendly habitat. In the case of the Elk Creek Bridge (near Elkton), curved steel beams are also making the structure lighter, so it will be easier to slide into place when hydraulic skids turn it into a rapid replacement project in September.

The economics of steel vs. concrete are difficult to calculate consistently. In general, steel costs more. But because steel is lighter, less concrete is required in the supporting columns and substructure. So steel can make a project more cost-effective by lowering construction or maintenance costs. Most often, the decision is based on the particular design required to do the best job of spanning a site.

As a natural resource, steel has a distinct advantage: it has no structural memory, so it can be recycled endlessly, and steel made from recycled material is just as strong as steel using virgin iron ore and coke. In 2006, two-thirds of the steel produced in the United States was made of recycled steel. When an old building or bridge comes down, it becomes something new.

"In Oregon, we're fortunate to have some really good recyclers," said Narkiewicz. "And building with steel helps Oregon's economy by spreading bridge program work to yet another group of companies and workers."

Traffic barriers: protection you don't notice 'til you need it

Many of us drive by traffic barriers without paying them much attention, only to learn of their importance when they prevent us, or one of our family members, from serious injury. These metal guardrail, concrete and cable barriers re-direct errant vehicles that have left the roadway and prevent them from hitting roadside obstacles such as trees or large rocks, going down steep terrain, or colliding with oncoming traffic. They may be located along the road shoulder or in the median of the highway, but no matter what kind or where exactly it's located, if it's properly designed and constructed, it substantially reduces the number of fatalities and serious injuries that occur on our highways.

Traffic barrier design has evolved over the past several decades, resulting in numerous styles and types. The Federal Highway Administration has established national safety standards for all types of barriers. Many of the older barriers in Oregon and around the country don't meet current FHWA safety standards and aren't providing the level of protection required for motorists.

As a result, FHWA has requested that ODOT develop a plan to bring traffic barriers into compliance with existing safety standards as a part of maintenance operations or highway construction projects. First, though, the department needed a thorough accounting of just what's out there, where it is and what shape it's in.

In 2004, based on existing knowledge, ODOT began creating a statewide listing of its various traffic barrier types and locations. At about the same time, ODOT was moving towards the "asset management" approach to managing public infrastructure. It didn't take long to discover that traffic barriers were one of many assets lacking information. It became clear that ODOT needed to develop and maintain a thorough, reliable inventory, including identifying a suitable location to store the data so it could be easily accessible to everyone.

The first attempt at collecting data came shortly before the Asset Management Pilot in Region 2. Roadway Engineering was eager to participate in the pilot to gain as much knowledge as possible about how and what data features should be collected.

After the pilot, staff began collecting traffic barrier information using the Digital Video Log. Much of the data collected can be gathered safely and efficiently using the DVL, but there are some instances where barriers are too far off the highway or the roadway alignment doesn't allow for viewing the details. A summer temporary was hired in 2006 and 2007 to assist in field verification of the data. Over the course of these two summers, staff traveled throughout the state verifying portions of every state highway. During the travels, staff encountered barrier types they didn't know even existed in the state!

With the initial inventory completed in the summer of 2008, staff is preparing for the next step. Working with the Transportation Data Section and Information Systems, staff will create data tables so the data can be uploaded into the Integrated Transportation Information System. It will then be possible to generate reports by Highway or District. This information will be used to establish a statewide plan for upgrading unsafe and substandard traffic barriers. Reports can also be generated to list the substandard barriers within highway construction projects. This information will allow for more informed decisions in scoping the project, estimating construction costs, and delivering the project.

Taking an inventory of traffic barriers was the first step in addressing a standards upgrade.

One thing the team discovered repeatedly during this process was how important it will be to keep the data up-to-date. Reliable information is essential for asset management to work, and knowing how valuable the AM tool is, it makes sense to do what must be done to keep the data accurate.

For more information on the inventory of traffic barriers, contact Heidi Shoblom in Roadway Engineering at (503) 986-3667.