LPRO: Legislative Policy and Research Office

BRIDGES

BACKGROUND BRIEF

Approximately 6,800 bridges connect Oregon's 59,000-mile road and highway system. The road system is vital to the movement of citizens, visitors and freight. Bridges are points where the road system is especially susceptible to interruption. When officials must limit the weight of loads allowed on bridges, commerce can be seriously disrupted by requiring long detours for heavy trucks. Freight bottlenecks are also caused when bridges lack sufficient vertical or horizontal clearances.

The Oregon Department of Transportation **(ODOT)** owns and maintains 2,700 bridges on the state highway system. The majority of the remaining bridges are under the control of the local governments throughout the state.

ODOT inspects most state and local bridges every two years; those that are beginning to show signs of significant wear are inspected more frequently. Funding for bridge inspection, including inspection of local bridges is part of the ODOT Bridge Program. Maintenance and minor repairs for state highway bridges fall to ODOT maintenance crews and are covered in the maintenance portion of ODOT's budget. Bridge structural repair, rehabilitation and replacement are part of the ODOT Bridge Program within the Statewide Transportation Improvement Program **(STIP)**. In order to stretch limited funding, the ODOT Bridge Program is focused on an inventory-wide preservation program with very few bridge replacements.

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AGING BRIDGES

Most of Oregon's bridges are nearing the end of their "design life." Over time, in each successive construction era, bridge design life has increased: from 30 years in the 1930s to 50 years in the 1950s, to 75 years in the mid-1990s to 100 years or even 150 years with contemporary design and construction. The life of a bridge, though long, is not infinite. No series of continued repairs, regardless of how well timed, can continue to extend the life of a bridge forever. Eventually, all bridges will need to be replaced.

As of 2016, the median age of a state bridge is 49 years, with 54 being the most frequently occurring age. Approximately 13 percent of state bridges are currently 70 years or older. The passage of time, traffic, weather and the structural weight of the bridges themselves have taken their toll on older bridges that were designed for lower vehicle weights, slower traffic speeds and less traffic volume than are typical on Oregon's roads today. The service

life of a bridge is an estimate of the number of years a bridge may remain in service. The expected service life can vary depending on the quality of construction materials and methods, the quality and timing of maintenance activities, environmental factors and usage.

Based on current bridge conditions and increased maintenance, the average remaining service life of state bridges is 35 years, with the estimated total service life around 80 years. 1950s and 1960s bridges represent 40 percent of the state's bridge inventory. Many of these bridges were designed for loads weighing much less than allowed by state law since the mid-1980s.

Although Oregon bridges are considered safe (when load restrictions signs are obeyed), there are a large number of bridges with critical and near-critical conditions for which service life has been extended beyond a normal time period because of long-standing funding shortfalls for bridges. uch bridges require vigilance and dedication of inspectors and maintenance personnel to maintain safe conditions. However, there is a serious concern that those critical and near-critical conditions will grow at an increasing rate until a point in the near future that current staff will not be able to maintain them in working order. At that point, unpredictable failures are possible that will result in delays, detours and unplanned high-cost emergency repairs.

It is not considered cost effective to preserve bridges with weaker elements that cannot be corrected. However, because there is currently no identified funding to begin the process of replacing them, there is the potential for increased freight restrictions as the Interstate Era and older bridges continue to age.

Modern trucks are heavier than those in use when many of the state's bridges were designed and built. Also, changes in truck configurations, including the use of closely spaced drop axles, has increased loading on bridges. Examples of such trucks are modern gravel and concrete trucks with up to seven closely spaced axles. The number of miles traveled annually by trucks exceeding 70,000 pounds has increased from roughly 100,000 in 1965 to more than 1.5 million today.

In some cases, trucks exceed what older bridges were designed to carry. Enforcement of an 80,000-pound weight limit (or less) on a large number of Oregon's bridges would impose a number of costs on motor carriers, including the need to purchase additional trucks, hire additional drivers and pay higher weight-mile taxes. Those costs, when passed on to producers, would also have a negative effect on many business sectors, particularly manufacturing. The movement of large non-divisible loads, single items such as transformers and construction equipment weighing 150,000 pounds or more, would be seriously impacted by bridges restricted to 80,000 pounds.

TRANSITION TO BRIDGE PRESERVATION

The primary revenue sources for state highways, the motor fuel tax and weight-mile tax, are experiencing long-term decline as motorists change driving habits and more fuel-efficient vehicles enter the marketplace. As a result of these factors, ODOT has adopted new strategies to preserve the investment in roads and bridges. In selecting projects, ODOT has transitioned from a "worst first" approach to a focus on preservation. It is generally held that the investment needed to preserve the inventory in good condition is more cost-effective than paying for more extensive and expensive repairs and

replacements needed once the asset conditions have declined to poor condition.

ODOT's strategies for bridge preservation include:

- Protection of high-value coastal, historic, major river crossings and border structures by acting before costs become prohibitive;
- Giving priority to maintaining the highest priority freight corridors;
- Developing a bridge preventive maintenance program to extend the service life of decks and other bridge components;
- Bringing structurally deficient bridges to fair condition using partial rehabilitation; and
- Continued use of bridge inspection, health monitoring and improved deterioration prediction methods.

PROTECTION OF HIGH-VALUE BRIDGES

There are a small number of Oregon bridges that ODOT is attempting to maintain indefinitely. Preservation of these major historic bridges is important for their cultural value and the cost of replacement would far exceed revenues available to do so. It is anticipated that maintenance of these structures will require an increasing share of ODOT Bridge Program funding as the overall level of funds declines. Since these are exceptional bridges, ODOT has chosen, as a matter of policy, functional obsolescence and high-maintenance costs as a fair trade-off for preserving these priceless assets. Priority activities include bridge painting and use of special anti-corrosion methods and systems.

SEISMIC RISK

Although there has not been a major seismic event during our state's recorded history, the geologic record shows that Oregon can expect such earthquakes in the future. Forty large damaging earthquakes – each larger than magnitude 8.0 – have occurred here during the last 10,000 years, and scientists currently estimate that there is a 37 percent conditional probability that a Cascadia subduction zone earthquake of similar magnitude will strike Oregon within the next 50 years.

A large earthquake along the Cascadia subduction zone will cause widespread disruption of the transportation system, making rescue operations difficult, if not impossible. The majority of bridges in western Oregon were built before modern seismic codes were in place and are thus susceptible to serious damage in a major seismic event.

Seismic retrofitting, or strengthening, is a well-developed and well understood practice. It has been extensively accomplished in the neighboring states of California and Washington, which have had dedicated funding for this work. If no strengthening is done in preparation, the damage to the highway infrastructure during a major seismic event will result in sizable economic losses. It is estimated that with preemptive seismic strengthening, the economic losses would be reduced by 10 to 24 percent, depending on the level of investment.

The total investment cost to repair all seismically deficient bridges is in the billions of dollars. Planning for phased retrofitting is an option. Factors for such a plan include funding and preparing for rescue and recovery. ODOT has been working in cooperation with a variety of stakeholders and

decision makers to find solutions to the statewide problem.

OREGON TRANSPORTATION INVESTMENT ACT (OTIA)

The legislature in 2003 enacted the third Oregon Transportation Investment Act (OTIA III) in recognition of the importance to the Oregon economy of unimpeded freight mobility in important transportation corridors. OTIA III authorized ODOT to issue additional revenue bonds for highway improvement projects, including bridge repair and modernization. The measure increased vehicle registration and title transaction fees to help repay the bonds. The amount dedicated to bridge projects was divided between state bridges ($1.3 billion) and city and county bridges ($300 million). Projects were selected by the Oregon Transportation Commission with input from technical rating committees, the Oregon Freight Advisory Committee, Area Commissions on Transportation and stakeholders.

The OTIA III program is complete. In June 2014, ODOT dedicated the last of 149 bridges replaced by the program, the Sandy River Bridge on Interstate 84. A marked improvement in bridge condition performance measures resulted largely due to the OTIA III bridge program. Now that the program has ended, bridge conditions are primarily influenced by the State Bridge Program and Major Bridge Maintenance Program funding levels, which are decreasing.

LOCAL BRIDGES

ODOT is responsible for all bridges on state highways. However, state highways make up only 8,000 miles of Oregon's road system, compared to 33,100 miles of county roads and 11,000 miles of city streets. There are more than 4,000 bridges on county roads and city streets and those bridges must also be inspected, maintained and periodically replaced. ODOT administers contracts for the inspection of local agency bridges with funding from the local bridge program.

Federal funding for bridges is shared between state and local bridges. This process, and the selection process for local bridge projects, is outlined by formal agreement between ODOT and local agencies.

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