Oregon Seismic Safety Policy Advisory Commission

Policy Proposal Adopted 5-26-2010 .

Seismic Vulnerability of Oregon State Highway Bridges

Issue:

Need to retrofit state highway bridges and establish/maintain lifeline routes.

Findings:

In November 2009, the Oregon Department of Transportation (ODOT) published a report on the Seismic Vulnerability of Oregon State Highway Bridges, a culmination of a two-year study jointly conducted by ODOT and Portland State University (PSU). The report concluded that a large Cascadia Subduction Zone (CSZ) earthquake off the Oregon Coast would result in major widespread damage that would prevent vehicular travel on many segments of I-5, US 101 and all routes between I-5 and the coast. The report includes a discussion of possible mitigation strategies to reduce major mobility risks.

There are more than 2500 state-owned bridges in Oregon, and approximately 900 need to be retrofitted to mitigate earthquake damage. Although 15-20 earthquakes of magnitude 3.0 or less are felt each year in the Pacific Northwest, modern national seismic design specifications were not available for bridge design in Oregon until early 1990. Approximately 1600 of state-owned bridges are in a low risk category for earthquake damage. Those in the low risk category have either been retrofitted with seismic retrofits or were constructed after 1990 and have been built to adequate, current earthquake standards. With a majority of state owned bridges designed and built between 1950 and 1980, the State of Oregon would face a devastating situation if a major earthquake were to occur.

In the event of a major earthquake, ODOT has established lifeline routes that were developed in 1994 to help with the initial prioritization. The routes sometimes include portions of county roads and city streets that were thought to be useable after an earthquake. However, those designations are out of date and need to be reviewed since retrofitting has not necessarily followed the 1994 life line route recommendations.

Analysis identified the most vulnerable highway segments of the state highway system, leading to selection of appropriate earthquake scenarios. The report describes potential damage to state highway bridges from six representative earthquake scenarios that are thought most likely to occur in Oregon. The study found that highway mobility would be severely reduced after a major Cascadia Subduction Zone event, as well as after a significant crustal earthquake. It is likely the impacts of such an event would include:

- Dozens of bridge failures on US 101 would make the route impassable.
- All of the existing highways that connect US 101 to I-5 would be impassable due to bridge collapse and other major damage.
- Small segments of I-5 would be useable because we have replaced and strengthened a number of those bridges since 1990, including many in the Oregon Transportation Investment Act (OTIA) III Program. However, many older, obsolete overpasses would collapse onto I-5 and block the through traffic.

- Many older river crossings would also fail. Some essential statewide services that depend on the Willamette River crossings in Portland would be affected. For example, about 90% of the gasoline supplies for filling stations in Oregon are off loaded at private terminals near the Port of Portland. Damage to bridges in the Portland area would cut off gasoline deliveries following either a CSZ earthquake or large crustal earthquake.

The report considers possible mitigation, including bridge retrofit and strengthening to increase seismic resistance. However, current available highway funding is inadequate to achieve a minimum standard of seismic safety even on the interstate' and other critical routes.

Policy:

The Seismic Vulnerability of Oregon State Highway Bridges report offers a significant contribution that highlights a pressing need for the current and future safety of Oregon's highway system. OSSPAC supports ODOT's plan to undertake a more refined study to analyze each bridge on identified vulnerable routes and allow the agency to make specific recommendations on seismic retrofit priorities. OSSPAC support further study by ODOT to update existing lifeline route designations to incorporate recent replacements of vulnerable bridges and to ensure access is maintained to critical supplies and facilities.

New Seismic Transportation Reliability Plan
-Identify emergency seismic transportation routes, in partnership with local transportation agencies.

-Transportation routes should include the transportation system, including bridges, roads, tunnels, embankments, culverts, retaining walls, and so forth.

-Focus on Cascadia earthquakes' multi-hazards, including ground failures, landslides, and Tsunamis.

-Adopt a holistic approach:
- Consider possible impacts to critical infrastructure, including the energy sector and fuel supply hubs.
- Consider co-located lifelines, such as water mains on bridges and overhead electrical transmission crossings.
- Consider resiliency issues, such as available alternative routes.
- Prioritize using a strategic, cost-effective, risk-based management approach.
- Consider short, medium and long term actions, including MOUs for quickly securing temporary bridges before mitigation occurs.

-Create a Task force to assist with development and implementation of seismic transportation reliability plan

New Seismic Transportation Reliability Program
-Provide funding and internal ODOT infrastructure that supports implementing seismic transportation reliability plan.
-Manage mitigation activities until transportation system has resiliency from Cascadia earthquakes.