



Oregon Department of Transportation

Research Notes

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Customized Live-Load Factors for Bridge Load Rating

The state-of-the-art approach to load rating bridges is the Load and Resistance Factor Rating (LRFR) method, supported by the Federal Highway Administration and the American Association of State Highway and Transportation Officials. This approach ensures a more uniform level of safety and reliability nationwide than past load rating approaches by statistically accounting for loading characteristics. This method has been implemented by ODOT.

The LRFR method incorporates live-load factors that account for the statistical variation of vehicle weights and the probability of multiple trucks on a bridge at the same time. The LRFR Manual provides factors that are thought to be representative of heavy truck traffic nationwide. However, the code also allows jurisdictions to develop live-load factors specific for the jurisdiction, using the same structural reliability methods applied in the code.

Live-load factors specific to ODOT-owned bridges were developed as part of a research project on characterizing truck loading, being conducted by Oregon State University. Development of these customized factors was possible because Oregon collects a large amount of high quality weigh-in-motion (WIM) data from sites around the state. The WIM data accurately reflect truck loads because there are few convenient alternative routes around WIM sites.

The data were used to account for traffic direction, freight route type (interstate or state), truck volume, seasons, location, and sampling effects. Overall, Oregon's heavy truck traffic

showed low statistical variation. Based on analyses, live-load factors were developed for ODOT's various rating vehicle configurations at three different levels of traffic volume. In all cases, the Oregon-specific live-load factors were lower than the factors provided by the LRFR Manual. This meant that ODOT could achieve higher load rating values by using the customized live-load factors. Higher load rating values translates into fewer bridge load restrictions and the subsequent repairs or replacement.

The lower live-load factors were due to the low level of overloads found in Oregon's truck traffic. Essentially, there is less uncertainty in Oregon's truck traffic that needs to be accounted for in the live-load factors, compared to national statistics. Reasons for Oregon's lower degree of overloads include the following:

- Low cost of overweight permits;
- The large number of such permits authorized;
- Easy access to the overweight permits;
- The weight mile tax that results in a lower tax for loads placed on more axles;
- Fostering the "Trusted Carrier" program that promotes load compliance; and
- The significant penalties imposed on non-compliant vehicles.

After Federal Highway Administration approval, the customized live-load factors have been incorporated into ODOT's load rating policy. As long as the statistical basis for the factors does not change, ODOT will be able to use the less stringent factors and still maintain the same level of safety as the rest of the nation.



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To obtain a copy of the research report *Calibration of LRFR Live Load Factors Using Weigh-In-Motion Data*, you may download it from the ODOT Research Web site at http://www.oregon.gov/ODOT/TD/TP_RES/ResearchReports.shtml, or contact the ODOT Research Unit by phone at the number listed below.



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