

Research Notes

Program Steering Committee (PSC): Geotechnical/Structure

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Title: California Permit and Fatigue Truck Load Development and Calibration

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TITLE:

California Permit and Fatigue Truck Load Development and Calibration

The project intends to produce revised California Load and Resistance Factor Design (LRFD) Load and Load and Resistance Factor Rating (LRFR) cases based on California Weight in Motion ((WIM) data for both overweight permit and fatigue truck loads along with associated standard bridge-deck designs, specifications, and detail sheets for Structures Design.

WHAT IS THE NEED?

Traffic loads used by Caltrans in LRFD and LRFR applications are based on truck data collected largely outside California in the early 1980's. Real truck loads are widely recognized to vary significantly from site to site, and from state to state. A substantial body of weigh-in-motion (WIM) data collected since that time indicates that California truck loads have increased and load distributions have become more variable. These trends are well correlated to accelerating rates of bridge deck deterioration. Thorough analysis of the WIM data and conversion into current LRFD and LRFR load factors for California are needed to improve bridge design and permit management practices.

WHAT ARE WE DOING?

Caltrans is engaging on a project to produce a revised permit vehicle and load factors based on California weigh-in-motion (WIM) data and permit routing policies. This project is conducting a thorough analysis of California WIM data to establish modern load and resistance factor design/load and resistance factor rating (LRFD and LRFR) specification. To aid in this effort, we have identified and reviewed research reports from national and state sources in which state-of-the-art WIM data were applied to bridge design and evaluation. Permit and fatigue load models and associated load factors for California will be recommended for adoption to the American Association of State Highway and Transportation Officials (AASHTO).

The research results from this project include a revision of the load models, load factors and a final report documenting the research effort process and results. These results will be developed to be

easily understood and readily implementable. This product will assist Caltrans in improving the safety and service life of California bridges and using the extensive WIM data collected over the past decade. New calibrated and WIM-data-based permit and fatigue load models vital to minimizing infrastructure costs, minimizing construction and maintenance related traffic congestion will be developed. The success of this project will also demonstrate to the rest of the nation a state-of-the-art product that will make California bridge design and evaluation the safest practice in the nation and in the world.

WHAT IS OUR GOAL?

To produce revised California Load and Resistance Factor Design (LRFD) Load and Load and Resistance Factor Rating (LRFR) cases based on California Weight -In Motion (WIM) data for both overweight permit and fatigue truck loads along with associated standard bridge-deck designs, specifications, and detail sheets for Structures Design. The project will also yield new or revised LRFR definitions regarding acceptable permit loads in Structures Maintenance guidance materials.

WHAT IS THE BENEFIT?

California will get an effective return on the extensive WIM data collected over the past decades to improve the safety and service life of its bridge. Extended service life is vital to minimizing infrastructure costs, minimizing construction and maintenance related traffic congestion and supporting effective goods movement throughout California and the nation.

WHAT IS THE PROGRESS TO DATE?

The data conversion for 2012 for all Caltrans Weigh in Motion has been completed. We will continue to complete all other sites for 2007 and then perform the same comparison with the 2008, 2009, 2010, and 2011 data to identify / confirm the sites with severe loads.

We have sorted and analyzed WIM data as required to develop a family of six permit truck configurations that will be used to issue annual permit, single permit, or super loads permit considering frequency of the permit trucks. A work plan has been prepared to review the Caltrans practice for permit issuance, in order to finalize load modeling.

We have checked the models for calibrating the limit states of Strength II design permit load rating, fatigue limit design, and deck design related to axle loads. Computer programs for these models have been tested for numerical analysis. Preliminary results are being evaluated.