

# Research Spotlight

## Project Information

**REPORT NAME:** Review and Revision of Overload Permit Classification

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RC-1589

**TOTAL COST:** \$209,406

**COST SHARING:** 20% MDOT, 80% FHWA through the SPR, Part II, Program

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## Updating overload permit analysis to better serve MDOT and local agencies

MDOT allows commercial vehicles that exceed their Michigan legal load to cross state bridges if these vehicles qualify for and are issued an overload permit. When issuing overload permits, MDOT compares the permit vehicle to a set of 20 standard vehicle configurations. In this study, researchers used modern computing solutions to evaluate MDOT's current permitting process. The goal was to identify possible improvements to the process of permitting overload trucks and to develop a software package for Michigan local agencies to use in evaluating permit requests on local agency bridges.

### Problem

MDOT rates each of its bridges—some 5,000—to determine whether it can carry all Michigan legal loads. If a bridge meets all legal loads, it is also classified as to the maximum overload that it can carry. Operators of trucks that exceed Michigan legal loads must apply for and receive a permit to cross MDOT bridges. MDOT has issued approximately 6,000 overload permits annually since 2002. The current overload classification process relies upon a system of ratings that uses 20 overload truck configurations to generate acceptable overload parameters for each bridge. The load effect of a permitted vehicle must be lower than the effect of all 20 configurations for a permit to be issued.

For the past eight years, the MDOT office that determines load ratings has used Virtis (recently renamed AASHTOWARE Bridge Rating), a comprehensive bridge



Heavily loaded trucks must receive an overload permit to cross Michigan bridges. Permits are issued by MDOT for state-owned bridges or by local agencies for bridges in their jurisdictions.

analysis software program developed by the American Association of State Highway and Transportation Officials (AASHTO). This program is licensed by a majority of US States. Additionally, in 2010, MDOT began offering Virtis for free to all Michigan local agencies, to assist with modeling

*“The result of this research not only makes MDOT’s overload review process more robust, but also allows us to make our software available to local agencies for use on their bridge inventories.”*

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the approximately 7,000 bridges that fall within their jurisdictions. Updating the current analytical permit software (called BridgeOV) and developing a method to link the software to the Virtis database would provide a more refined and efficient analysis of overload permits.

However, Virtis cannot model all types of bridges in the MDOT inventory, and MDOT is still working to complete its Virtis database. Also, to date, not all local agencies have begun using Virtis. Creating a piece of software capable of working with, as well as independent of Virtis, and making the software available to local agencies, will help bolster MDOT’s efforts to standardize the overload permitting process across Michigan.

## Research

Researchers began by meeting with MDOT personnel from the two offices involved in bridge ratings and permit issuance. Investigators examined the processes that these offices use and the older software that offers simple analyses of overload requests based on the 20 bridge loading configurations.

In an interim report, researchers described the current process and suggested approaches that would allow more nuanced analysis based on bridge and truck characteristics. MDOT staff and

investigators discussed the options and agreed to changes to the bridge parameters and software.

Investigators then designed software solutions that would allow stand-alone use of Virtis in some cases, and use of the current BridgeOV software modified with additional functionality in other cases.

## Results

Following presentation of the interim report, MDOT and investigators agreed to add shear (loading stress at or near a bridge span support component) and span length to the permit analysis process and software. They also proposed four implementation approaches:

- Adding more data to existing software for an improved pass/fail analysis.
- Using new software that would allow for a more refined analysis based on span length.
- Using Virtis only and eliminating the 20-configuration method of analyzing permit requests.
- Adopting a combination of the first and third options that would accommodate non-Virtis users and allow continued development of the Virtis database to include all bridges.

MDOT selected the last option. Investigators made the BridgeOV software more robust by adding shear and span-length data, and offered a stand-alone version of Virtis for both state and local engineers to use in analyzing overload permit requests.

## Value

MDOT will continue to update its Virtis database to include all of its 5,000 bridges. Virtis accommodates both older Load Factor rating data and newer Load and Resistance Factor rating data, and considers a large variety of bridge types. The new permit analysis software provides users with the Virtis model to get an exact representation of each bridge or an updated process within the permit analysis software

to use when Virtis is not available.

The resulting permit review process, even when not employing Virtis, offers more flexibility for both local agency and state permit issuers. This will allow overload permitting in Michigan that is faster and more comprehensive, for both state-owned bridges and those owned by local agencies.

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### This final report is available online at

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