

Executive Summary

Maine and Vermont Section 194 Pilot Program

6 Month Report

Section 194 of the 2010 Department of Transportation Appropriations Act provided for a 1 year heavy truck pilot programs in both Maine and Vermont. The pilot programs allow the States of Maine and Vermont to apply State laws and regulations on the Interstate System in those States replacing the current federal weight limits with State weight limits. This allows trucks with a gross vehicle weight above 80,000 pounds and tandem axle weight above 34,000 pounds on each State's Interstate System. The pilot program also exempts the States from following the Federal Bridge Formula B mandated by Section 127 of Title 23, United States Code.

Both States chose to apply their State laws to the Interstate System as allowed by these pilot programs. Maine now allows tractor semi-trailers up to 100,000 pounds gross vehicle weight on 6-axles and tandem axle weights up to a maximum of 46,000 pounds for many commodities on the non-tolled Interstate Highways (tolled interstate and a portion of free Interstate between the southerly terminus of the Maine Turnpike and the New Hampshire border was already exempt). Maine did not choose to allow other non-Federally compliant State truck weights onto the Interstate System. Vermont allows all trucks legal on their State highway system onto their Interstate highways including up to a maximum gross vehicle weight of 99,000 pounds on 6-axles, and trucks with tandem axles weighing up to a maximum of 36,000 pounds plus a 10 percent tolerance, which reaches 36,900 pounds.

The House and Senate Committees on Appropriations requested a 6 month report on the pilot programs:

Section 194 modifies a provision proposed by the Senate to establish a 1-year pilot program related to truck weight in the States of Maine and Vermont. The conferees direct the Secretary to report to the House and Senate Committees on Appropriations no later than 6 months after the start of the pilot program on the impact to date of the pilot program on bridge safety and weight impacts.

In addition the Secretary is directed to report on the Vermont Pilot Program after 2 years. That report will expand the examination to include effects on "highway safety, bridge and road durability, commerce, truck volumes, and energy use within the State of Vermont."

For the 6 month study the Secretary organized a team including the Federal Highway Administration (FHWA), Federal Motor Carrier Safety Administration (FMCSA), Maine Department of Transportation (Maine DOT), Maine State Police, Maine Bureau of Motor Vehicles, Vermont Agency of Transportation (Vermont AoT) and Vermont Department of Motor Vehicles (Vermont DMV). Given the short time frame of the study, the team utilized existing infrastructure data, engineering principles, and models that are established industry practice. There was insufficient time to acquire empirical data for this study as it takes years before there would be measurable impacts on the pavements and bridges.

Background on Bridge and Pavement Impacts

There are three aspects of truck weight that are interdependent and interact with the highway infrastructure – axle weight (loading), axle spacing, and gross vehicle weight. These truck characteristics have different impacts on pavements and bridges.

Bridges. For bridges, a truck's axle spread and its gross vehicle weight must also be taken into consideration. This is in addition to its axle group weights. The Federal Bridge Formula B (codified in 23 CFR §127 and currently enforced on the Interstate system, where it's not specifically exempt) takes into account both the number of axles and axle spreads in determining allowable gross vehicle weight to maintain bridge safety. Axle weights are more significant for short span bridges (those with spans shorter than the truck wheel base) and gross vehicle weight is more significant to medium and long span bridges (those with spans longer than the truck wheel base).

Pavements. The weight of the axle or axle group, such as tandems (a group of 2 axles) or tridem (a group of 3 axles), is the most important for understanding pavement impacts. Axle groups distribute the vehicle's load on the pavement. The more axles, the greater the weight that can be carried by the vehicle because the load is more distributed. This principal holds as long as the weight is properly spread across the axles so as not to concentrate the weight on any axle or axle group.

Bridge Impacts

FHWA conducted a screening level analysis of the Maine and Vermont Interstate bridge data to determine potential impacts of the heavier gross vehicle and axle weights on the pilot study's eligible Interstate Highways. The Maine DOT conducted detailed analysis for a small sample of bridges identified as potentially over-stressed. The Vermont DOT recently completed a 1-year load rating analysis for all Interstate bridges examining a 5-axle short wheelbase 90,000 pound truck (this is the truck that Vermont bridge engineers determined placed the greatest potential stress on bridges). The detailed analysis conducted by the States were intended to provide information regarding those Interstate bridges of highest potential risk to structural safety.

All FHWA screening calculations, which are based on National Bridge Inventory (NBI) data and any available inspection records, are limited by the currency and accuracy of the data. Bridges are inspected on regular cycles as determined by the States in compliance with the National Bridge Inspection Standards, and calculations are based on standard simplified techniques. The detailed State analysis took into account updated bridge inspection reports, current/future maintenance plans and detailed mathematical modeling.

The screening analyses found the margin of safety on the bridges is reduced by the introduction of the heavier trucks the pilot program allows, which is intuitive as heavier trucks stress a bridge more than lighter ones. The screening analysis was conducted to measure whether the level of safety as a result of allowing trucks weighing more than 80,000 pounds is still above the minimum required by the AASHTO Bridge Design Specifications for routinely operating vehicles. The analysis found the Interstate bridge network to be in relatively good shape, but the screening did flag a few bridges that appear to approach the operating limit, which is the absolute minimum threshold established by the AASHTO Manual for Bridge Evaluation. When this limit is breached, the bridge is posted for lower limits.

Bridge engineers design bridges with large factors of safety to account for indivisible heavy permit loads, illegal overloads, etc. Unlimited use of the pilot study trucks reduces this factor of safety and therefore requires the states to strictly enforce weight limits and to carefully analyze all permit overloads. Furthermore, the states need to carefully monitor bridge conditions to insure no long term fatigue and deck damage threatens the serviceability of the bridges. These results highlight the need for further evaluation of those bridges, including more detailed stress analysis, increased monitoring through weigh-in-motion, and visual inspections. Active examination of those bridges continues at both the State transportation agencies and FHWA.

Pavement Impacts

For pavements, it is more important to control the axle-load limits than the gross vehicle weight. Heavier trucks could be accommodated without adverse effects to pavements, if the axle-load limits remain unchanged from the current 20,000 pounds on a single axle and 34,000 pounds on a tandem axle.. The number of axles traveling over the pavement is also a factor determining pavement wear. One is unable to estimate the pavement effects without a further understanding of the number of heavier axles on the Interstate system. FHWA and Vermont AoT will have a more complete understanding of the axle weights to be included in Vermont's full one year implementation report. The Maine-Vermont Pilot Programs have the potential to increase pavement damage on the Interstate by increasing the frequency of tandem axles weighing over 34,000 pounds. Tandem axles in the 34,000 to 40,000 pound range cause increased pavement damage, and any shift into this range from the less than or equal to 34,000 pound category could have very significant impact on pavement performance. For example, a 4 percent shift (in 34,000 to 40,000 pound category) would mean a 10 percent increase in damage. Any increase in the frequency of the greater than 40,000 pound axles would have even further detrimental effect

on pavement performance. What is not known at this time is how many trucks employing these potentially damaging axle configurations will use the Interstate, and how many that use the Interstate under the pilot program are shifts from the State system where heavy loads have been legal for some time. In allowing increased gross vehicle weight, it is extremely important to control the axle loads. Industry cooperation and law enforcement play a major role in helping to control axle loadings.

In relationship to axle loads, Vermont and Maine have initiated different implementations of the pilot study. Maine's pilot allows a 100,000 pound 6-axle truck with up to 46,000 pounds on a tandem axle unit and 54,000 pounds on a tri-axle group. Vermont's pilot allows several different short and long wheel base truck configurations currently allowed on Vermont State roads onto the Interstate Highways. These trucks may have up to 36,000 to 39,600 pounds on a tandem axle unit and 54,000 pounds on a tri-axle group. It is necessary to understand the utilization of these heavy axles to measure pavement impacts. Both Maine and Vermont provide shippers the opportunity to load more payload onto a truck by placing more weight over the tridem relative to the tandem axle group. Accurate loading is important for the tractor tandem – trailer tridem grouping because if the load is not correctly distributed over the two axle groups, then the tandem could be over loaded and that would increase the pavement damage.

In the long term, the heavier vehicles allowed under Maine-Vermont Pilot Study would cause definite and quantifiable additional pavement damage which could be managed through increased maintenance and potentially increasing the thickness of the pavement where necessary. To limit the potential pavement damage, axle loads should be tightly controlled either through industry cooperation and/or increased enforcement.

Summary

This 6 month study examined “the impact to date of the pilot program on bridge safety and weights”, and is limited by the available data and modeling techniques. To empirically measure and quantify the *impacts* on bridge safety and weight impacts would take somewhere in the range of ten to fifteen years to measure the consequences directly, as determined by FHWA bridge and pavement engineers. More detailed modeling analysis and an expansion of the empirical data will be utilized in the study of Vermont's full one year implementation.

Conclusion redacted