CENTER FOR TRANSPORTATION RESEARCH

PROJECT SUMMARY

Texas Department of Transportation

0-6897-S: Evaluate Specialized Hauling Vehicles (SHV) with Regard to Pavement and Bridge Deterioration and Posting Limits

Background

This study was performed to ensure that Texas complies with FHWA requirement that each state must conduct bridge force effects load rating analyses before permitting specialized hauling vehicle (SHV). An SHV is a modified single-unit (SU) truck with one to four additional liftable axles positioned either in front of or behind the drive axles or mounted on a hydraulic system that extends, when loaded, to lengthen the chassis. The SHV liftable axles are raised when empty or when the vehicle enters a construction or storage site to unload. Adding lift axles increases the allowable load by distributing the load across the axle groups and, in the case of an SU7, extending the chassis length to meet the Federal Bridge Formula requirements. SHVs are used in dump, construction, ready mix, solid waste, and other enhanced SU truck operations.

Figure 1. SU-7 dump truck with three liftable pushers and one liftable booster axle

What the Researchers Did

The research team developed a study plan to determine the number and types of SHVs operating in Texas based on statistical sampling that included manual, visual field data collection along routes and at fixed sites. In addition, 24-hour video traffic count data supplemented the manual counts. A total of 53,519 trucks were visually identified according to type, configuration, number of axles and liftable axles (if any), route, and date of sighting.

This information and TxDMV county-level truck registration data was used to estimate the number of SHVs operating in Texas by vehicle type, including rural and urban locations and roadway route types. Further, this data was combined with Department of Public Safety weight enforcement data and TxDOT Weigh-in-Motion data to determine average and standard deviation gross vehicle weight (GVW), axle and axle group weights, number of axles, axle loads, axle types (fixed or liftable), and axle spacing. In addition, the researchers employed a variety of other measures to thoroughly investigate SHV usage and regulation, such as meeting with trucking industry representatives at

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their job sites to collect SHV dimension and weight data using portable scales, interviewing SHV drivers, and other methods described in the full project report (0-6897-1).

What They Found

The total consumption rates for dump trucks increased as the numbers of axles and total GVW increased. However, consumption rates varied or decreased for ready mix and waste management vehicles with the addition of lift axles and higher GVWs. It is noted that dump trucks operate with up to seven axles with average loads of 80,000 lbs, which rivals the GVW of a fully loaded five-axle tractor-trailer dump truck.

An analysis was performed to determine the number and location of on- and off-system bridges that may require additional, project-level analysis for load posting. The SU-4 waste management vehicle with a lift axle in either the pusher or tag position controlled the majority of on- and off-system bridge postings required for SU-4 configurations (4,604 off-system and 1,372 on-system bridges). The AASHTO SU-5 configuration controlled load postings for 2,704 off-system bridges while the SU-5 ready mix truck controlled postings for 2,485 off-system bridges. The AASHTO SU-5 configuration controlled load postings for 561 on-system bridges while the SU-5 ready mix truck controlled postings for 874 on-system bridges. The AASHTO SU-6 configuration controlled load postings for 4,567 off-system bridges while the SU-6 dump truck controlled postings for 881 off-system bridges. The AASHTO SU-6 configuration controlled load postings for 1,203 on-system bridges while the SU-6 dump truck controlled postings for 407 on-system bridges. The AASHTO SU-7 configuration controlled load postings for 5,289 off-system and 1,608 on-system bridges. A GIS-mapping system was developed to show the location and controlling vehicle configuration for each of these bridges.

What This Means

The research team found that of the 53,519 total trucks counted, 5,693 (10.6%) were SU trucks. Of the 5,693 SU trucks, 967 (16.9%) were an SHV of some type. This figure allowed the team to develop representative SHV configurations to quantify SHV deterioration impacts to Texas pavements and bridge. Further, the researchers conducted an analysis of SHV safety performance in terms of crash history and operational characteristics; conducted an economic analysis of SHV operations in Texas; and prepared draft policy regarding SHV operations in Texas to minimize impacts on bridge and pavement load posting needs. Finally, the research team made recommendations regarding bridge load posting signage format for possible inclusion in the TxDOT Manual on Uniform Traffic Control Devices.

For More Information

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