

## Study of the Impacts of Implements of Husbandry on Bridges

Traditional bridge design and load rating is based on codified procedures that examine the capability of a bridge to resist traditional highway vehicles. However, other vehicles, such as farm and agricultural vehicles (implements of husbandry), also use these bridges. These implements of husbandry have characteristics that are quite different from traditional vehicles; specifically, they tend to have different wheel spacing, track widths, wheel footprints, and dynamic coupling characteristics. Further, these vehicles typically carry loads that are greater than standard highway loads.

### Background

Currently, bridge rating engineers must make assumptions about how highway bridges resist implements of husbandry. Research is needed to more accurately characterize how applied loads from these vehicles are resisted. Specifically, we need to understand how these agriculture loads are distributed through the structural elements making up the bridge and to assess the magnitude of the dynamic loads the vehicles impose. Further, we need to know what methods of analyzing bridges for these loads are acceptable, so that accurate bridge ratings may be produced.

### Objective

The objective of this study is to determine how loads from implements of husbandry are distributed within a bridge structural system and provide recommendations for accurately analyzing bridges for their loading effects.

### Approach

To achieve this objective, the distribution of live load and dynamic impact effects for different types of



agricultural vehicles will be determined by load testing and evaluating two general bridge types. The types of equipment studied will include grain wagons/grain carts, manure tank wagons, agriculture fertilizer applicators, and tractors, among others. Once the effect of these vehicles is determined, recommendations for bridge analysis under loading from these non-traditional vehicles will be developed.

### Expected Outcomes

The product of this research will provide summaries of test protocols and associated results including measured lateral live load factors, measured live load impact factors, and general performance measures. Additionally, recommendations for analyzing bridges under loading from implements of husbandry will be made.

### Timeline

The estimated start date for this study is late 2010, with work scheduled for completion in approximately

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36 months, depending on the number of bridges tested.

**Cooperators**

Iowa State University, Bridge Engineering Center  
USDA Forest Service, Forest Products Laboratory

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