

# Stressing Our Roads

An adequate and safe road system is critical to the timely and efficient transportation of grain and farm machinery at harvest time. However,



changes in agricultural operations over the past 30 years are having a dramatic impact on Kansas's road system, and are affecting our ability to maintain that system.

The average size of a Kansas farm has increased from 574 acres in 1970 to more than 724 acres today. Modern agricultural practices have also produced higher yields per acre, which mean more grain to haul to market.

To increase efficiency, farmers are using larger-capacity wagons, hauling more bushels per trip to the elevator, and using much heavier equipment in their farming operations. This trend is stressing Kansas roads and bridges beyond the current capabilities to maintain them.

Because stress to pavements is related to a vehicle's axle weight, Kansas laws regulate the axle weights of most heavy vehicles using the roadways. The legal weight limits are 20,000 pounds for a single axle and 34,000 pounds for a tandem axle, with vehicles exceeding those limits needing a special permit. However, farm-related vehicles have different rules. No permit is required to authorize movement on any highway (except interstate) of farm tractors, combines, fertilizer dispensing equipment or other farm machinery. The same is true for machinery being transported to be used for work on farms (such as for terracing). Many vehicles used in farming operations exceed normal axle weight limits.

The heavier weight carried on semi-trailers is also a concern, but it is distributed over more axles, which reduces pavement damage. The design of

## Effect of different vehicles on roadway pavement

The following chart compares the stress on pavement created by a variety of heavy vehicles. The number of passes to failure indicates that some vehicle types shorten the life of pavement with significantly fewer passes.

| Type   | Axles  | # Passes to failure 6" PCC* | # Passes to failure 7" PCC* |
|--|--|-----------------------------|-----------------------------|
|  5-Axle Tractor-Semitrailer<br>80,000 lbs.                | 1 Single/2 Tandems                                   | 12,000                      | 135,000                     |
|  7-Axle Tractor-Semitrailer<br>96,000 lbs.                | 1 Single/2 Tridems                                   | 78,000                      | 175,000                     |
|  Grain Cart - 900 bu.<br>58,000 lbs. (20% on tow vehicle) | Tandem   | 200                         | 6,000                       |
|  Grain Cart - 875 bu.<br>57,000 lbs. (20% on tow vehicle) | Single   | <10                         | <30                         |
|  Grain Cart - 650 bu.<br>42,000 lbs. (20% on tow vehicle) | Single   | <30                         | 270                         |
|  Grain Wagon - 775 bu.<br>49,000 lbs.                     | 2 Singles  | 1,000                       | 60,000                      |
|  2 Grain Wagons - 450 bu.<br>31,000 lbs. each             | 4 Singles  | 106,000                     | 239,000                     |
|  Combine - Empty  | 2 Singles (1 tire on pavement)                       |                             |                             |
|  27,500 lbs. w/o corn head<br>32,000 lbs. w/corn head   | 18,000 front/9,500 rear<br>26,000 front/6,000 rear   | 3,790,000<br>887,000        | 8,468,000<br>1,980,000      |
|  Combine - w/240 bu.                                    | 2 Singles (1 tire on pavement)                       |                             |                             |
|  41,000 lbs. w/o corn head<br>46,000 lbs. w/corn head   | 27,500 front/13,500 rear<br>36,000 front/10,000 rear | 712,000<br>100,000          | 1,591,000<br>456,000        |
|  Large Row Crop Tractor<br>18,000 lbs.                  | 2 Singles<br>11,000 front/7,000 rear                 | 1,525,000                   | 3,410,000                   |
|  Liquid Manure Tanks<br>10,000 gallon - 96,000 lbs      | 2 Tandems<br>26,000 front/70,000 rear                | <10                         | <30                         |
|  7,500 gallon - 71,000 lbs                              | 1 Tandem   | <10                         | <30                         |

\* PCC - Portland Cement Concrete. Note - Structurally equivalent asphalt pavements may experience similar impacts. Source: Iowa Department of Transportation.

some farm equipment such as combines and tractors also helps reduce stress on roadways. However, the vehicles that carry heavy loads on a limited number of axles—one- and two-axle grain carts, grain wagons and liquid manure tanks—are creating significantly more stress on roadways. These farm implements are traveling with loads that are well over the maximum axle weights permitted for large commercial vehicles. As a result, the vehicles carrying heavy loads on a limited number of axles are using up the life of the pavement with significantly fewer passes.

**Stress on bridges** is also significantly increased by certain vehicle types. This stress, compounded by the fact that most implements of husbandry are exempt from bridge embargoes, may create serious safety concerns.

**What to do?** Because varying conditions exist, it is difficult to make generalized recommendations for improving road conditions. However, here are some ideas for how agencies can reduce the possibility for road damage at specific locations:

- design a thicker crushed aggregate base layer.
- budget for sufficient road maintenance based on road use in their area. Sometimes businesses that generate the heavy traffic will contribute part or all of the cost for upgrading key stretches of road.
- maintain a good crown on gravel roads.
- seal cracks in asphalt.
- maintain good drainage.
- budget for significant road improvements to carry heavy loads (asset management can help you determine the funds needed).
- discuss the problem with local law enforcement and judges and ask for better enforcement and steeper fines.
- set Spring weight limits if you have significant freeze/thaw problems.
- install geosynthetics on chronic problem areas on unpaved roads.

Sources:  
*Stressing Our Future* brochure, Iowa DOT, 1997.  
[http://www.nass.usda.gov/Statistics\\_by\\_State/Kansas/Publications/Annual\\_Statistical\\_Bulletin/2006/pdf/historic.pdf](http://www.nass.usda.gov/Statistics_by_State/Kansas/Publications/Annual_Statistical_Bulletin/2006/pdf/historic.pdf)



## The numbers on rural roads and bridges in Kansas

Miles of paved county & township roads .....8,061

Miles of gravel and earth county & township roads .....57,225

Number of bridges on local system.....20,425

Number of structurally deficient or obsolete local bridges .....4,243

Road data, 2006, KS DOT Local Projects.  
 Bridge data: KS DOT *Bridge Fact Sheet*, July 08.

**For more information, contact**

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 VHS or DVD format. Order online at [www.ksltap.org](http://www.ksltap.org)

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The changing picture of road stress in rural Kansas