Joint Commission on Transportation Accountability

Overweight Vehicle Studies Update

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Engineering Principles

- Impact of overweight vehicles is different for pavements and bridges
- Pavements
  - Load on each axle is important
  - Equivalent Single Axle Loads (ESALs) allow for comparison of pavement damage between different vehicles (AASHTO)
  - Pavement is designed for lifetime ESALs, each vehicle consumes some portion
- Bridges
  - Total load, load on each axle, and axle spacing are important
  - Significant damage does not occur until load exceeds design standards, but fatigue damage occurs with each pass

Cost Analysis Methodology

- Can estimate the added maintenance cost from a single overweight trip or for blanket permits
  - Blankets based on assumed mileage
- Accounts for miles that trucks travel at less than full capacity in blanket permit fees; assumes trucks are full in single trip permit fees
- Could be used to establish fees for any vehicle (not just overweight vehicles)

Cost Analysis Methodology (Pavements)

- 2007 VDOT load-related Maintenance budget was allocated to vehicle classes according to damage (ESALs) imposed on pavements
  - Vehicle classes were defined by FHWA categories based on vehicle type, axle number, axle spacing
  - Weigh-in-motion (WIM) data from Virginia highways was analyzed to determine pavement damage (ESALs) caused by each vehicle class on average
  - ESALs based on axle weights of all vehicles crossing WIM sensors

- Cost per ESAL-mile traveled:

$$\frac{\text{Load-related Maintenance budget}}{\sum(\text{total vehicle ESALs x VMT})}$$

Cost Analysis Methodology (Bridges)

- **Damage functions for bridges are much more complicated than for pavements**
  - **Each bridge would have to be analyzed individually for each overweight vehicle because of differences in design**
- **Flat fee approach could be reasonable option**
  - **Flat fee per axle is common on tolled structures nationwide**

Findings

- **Permit fees for overweight vehicles can be estimated that relate axle weight and configuration to pavement damage using ESAL concept (AASHTO)**
- **For pavements, the fee was estimated at 3.56 cents per ESAL-mile**
  - **Based on 2006-2007 Virginia WIM and VDOT data**
  - **Could be updated periodically to account for changes in travel, haul weights and vehicle configuration**
- **For bridges, a flat fee could be assessed based on recovering a certain proportion of weight-related maintenance costs**
  - **Difficult to determine since each span of each structure would need to be analyzed independently for each load**

Applying the Method: Example Fees

Truck	Legal load (000 lbs)	Requested Overweight Load (000 lbs)	Assumed Distance (mi)	Existing Permit Fee	Potential Permit Fee (*pavement only*)
4-axle concrete truck	58	70	10,000	**$0 (annual)**	**$157 (B*)**
6-axle tractor trailer	80	100	50,000	**$140 (annual)**	**$1800 (B*)**
7-axle tractor trailer	80	132	335	**$45.50**	**$50 (ST*)**
9-axle tractor trailer	80	168	335	**$51**	**$63 (ST*)**

*** B - blanket permit, ST- single trip permit**

Overweight Permit Fee Administration

- **Pavement damage fees**
  - **Truck configuration and axle weights are reported in permit applications now**
    - ESALs can be readily calculated from this
  - **Estimated mileage would need to be reported to DMV**
- **Bridge damage fees**
  - **VDOT Structure and Bridge collects relevant data regarding overweight vehicles to assess the potential damage to bridges**
  - **Flat fees could be used for blanket permits & single trips**
- **Implementation details need further development**

Issues Related to Overweight Permit Fee Structure

- Should fees be based on pavement impacts, bridge impacts, or both?
- Fee is consistent with damage imposed but some fees are infeasibly large
  - Could establish brackets, flatten schedule
  - Tradeoff between damage-based fees and simplicity
- Whether to keep current exemptions in place
- Changes in trucking operations should be expected
  - Revenue projections difficult
  - Potential for less-damaging truck configurations

Concluding Remarks

- **A rational method is available for developing a damage (ESAL)-based fee schedule for pavements**
- **A reasonable approach for bridges would be a flat fee**
- **ESAL-related fees using the VTRC methodology *as a foundation* would provide incentives for axle configurations that are less damaging to pavements**