

Weigh-in-Motion in North America

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WIM in North America

- Modern era starts in the 1950s – BPR system
- Next major advances in late 1960's – Radian
- Major increase in WIM use, late 1980's:
 - SHRP – LTPP
 - Weight enforcement screening



1980's and 1990's

- Wide Variety of WIM Technologies
 - Bending Plate
 - Bridge WIM
 - Capacitance Map
 - Hydraulic load cell
 - Piezo – ceramic
 - Piezo – film
 - Piezo – quartz



1980's – 1990's

- Globalization
 - Willingness to look both nationally and internationally
 - Canada
 - France
 - Germany
 - South Africa
 - United Kingdom
 - U.S



Current Use of WIM

- Three driving forces behind WIM
 - Long Term Pavement Performance Study (LTPP)
 - General traffic load information, especially for pavement design
 - Increased effectiveness of vehicle size and weight enforcement



LTPP

- Research quality traffic loads
- Research emphasis on
 - Consistency of load measurement
 - Effect of pavement roughness on vehicle dynamics and scale response
 - Short wave
 - Long wave



LTPP

- Research emphasis on
 - Data analysis
 - Loading patterns
 - Seasonality
 - Quality control procedures
 - Equipment testing
 - Accuracy under different speed / environmental conditions

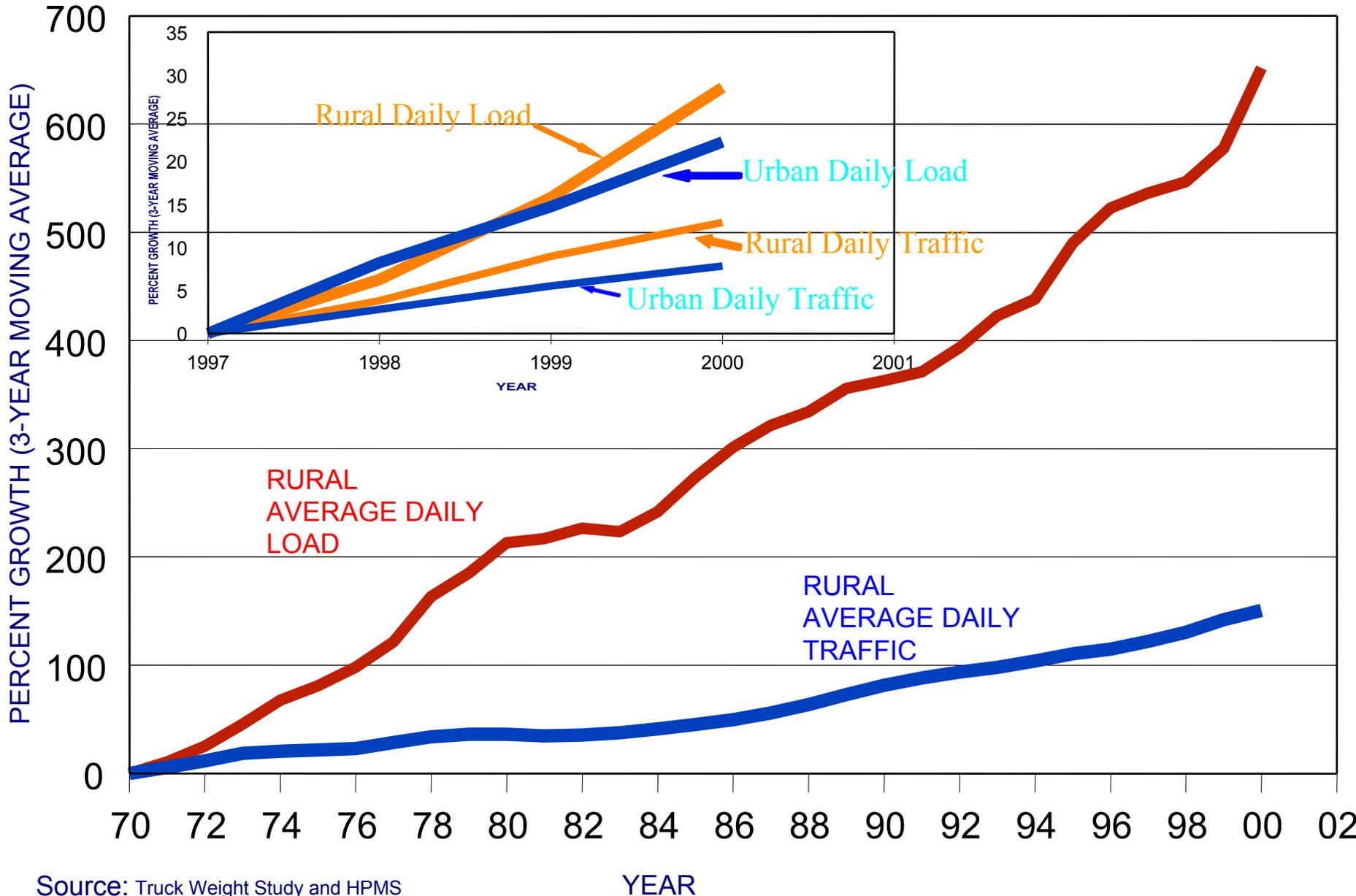


General Traffic Load Needs

- Larger state and provincial data collection needs
- Greater emphasis is now being placed on collecting data on truck travel
- Because data show increasing truck travel relative to other vehicles



COMPARISON OF GROWTH IN VOLUME AND LOADINGS ON THE INTERSTATE SYSTEM



Source: Truck Weight Study and HPMS

General Traffic Load Needs

- WIM has traditionally been collected, submitted to the federal agency, and then ignored
- The new AASHTO 2002 Pavement Design Guide will help change this attitude within highway agencies



General Traffic Load Needs

- New guidance from federal highway administration (TMG), designed to help meet AASHTO 2002 needs
- New pavement design guide will use load spectra and truck volumes by class as its traffic input



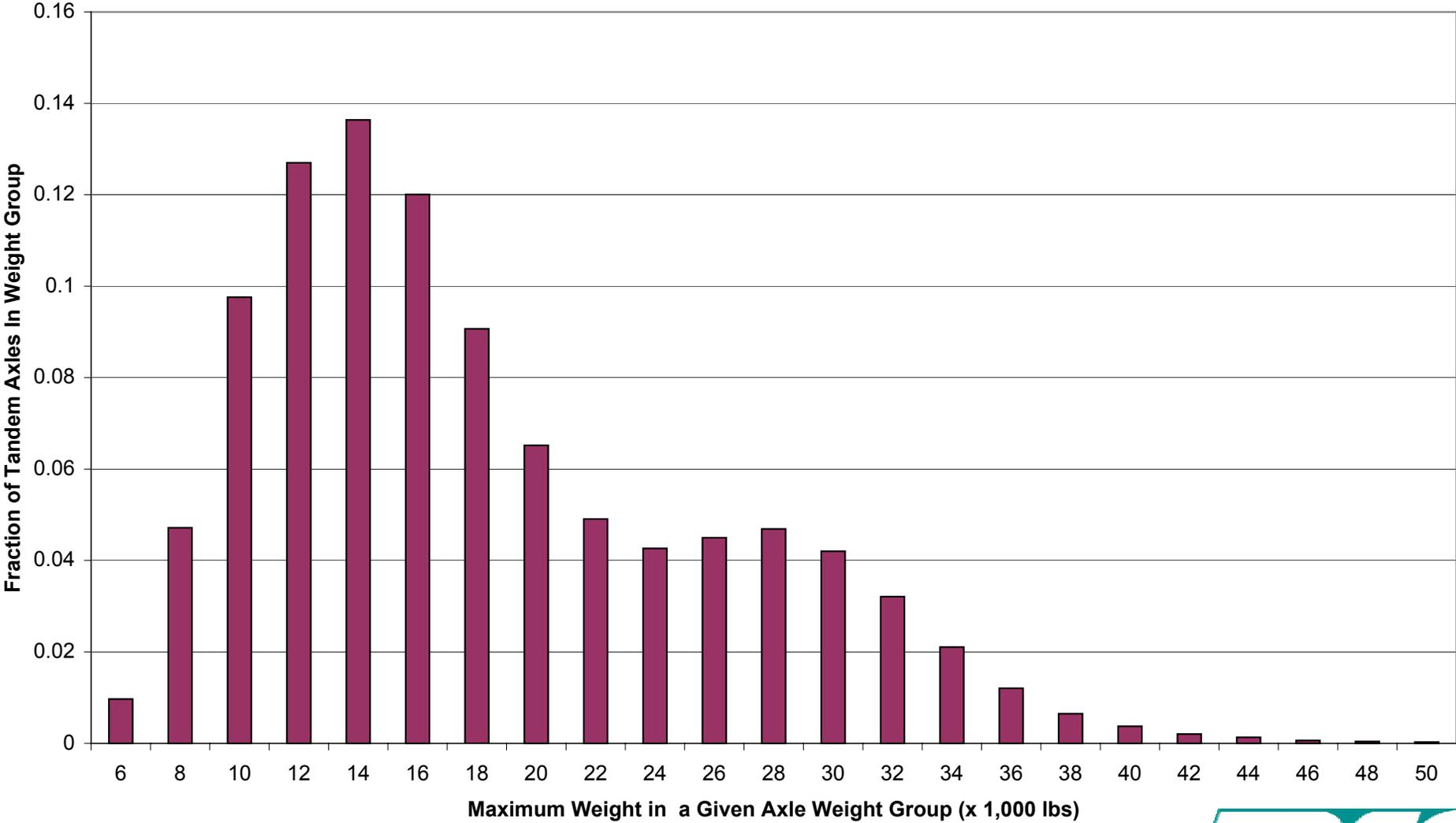
General Traffic Load Needs

- TMG defines “truck weight road groups”
- Objective:
 - Determine load spectra for
 - heavy
 - moderate
 - light
 - Because these different spectra result in very different pavement wear characteristics

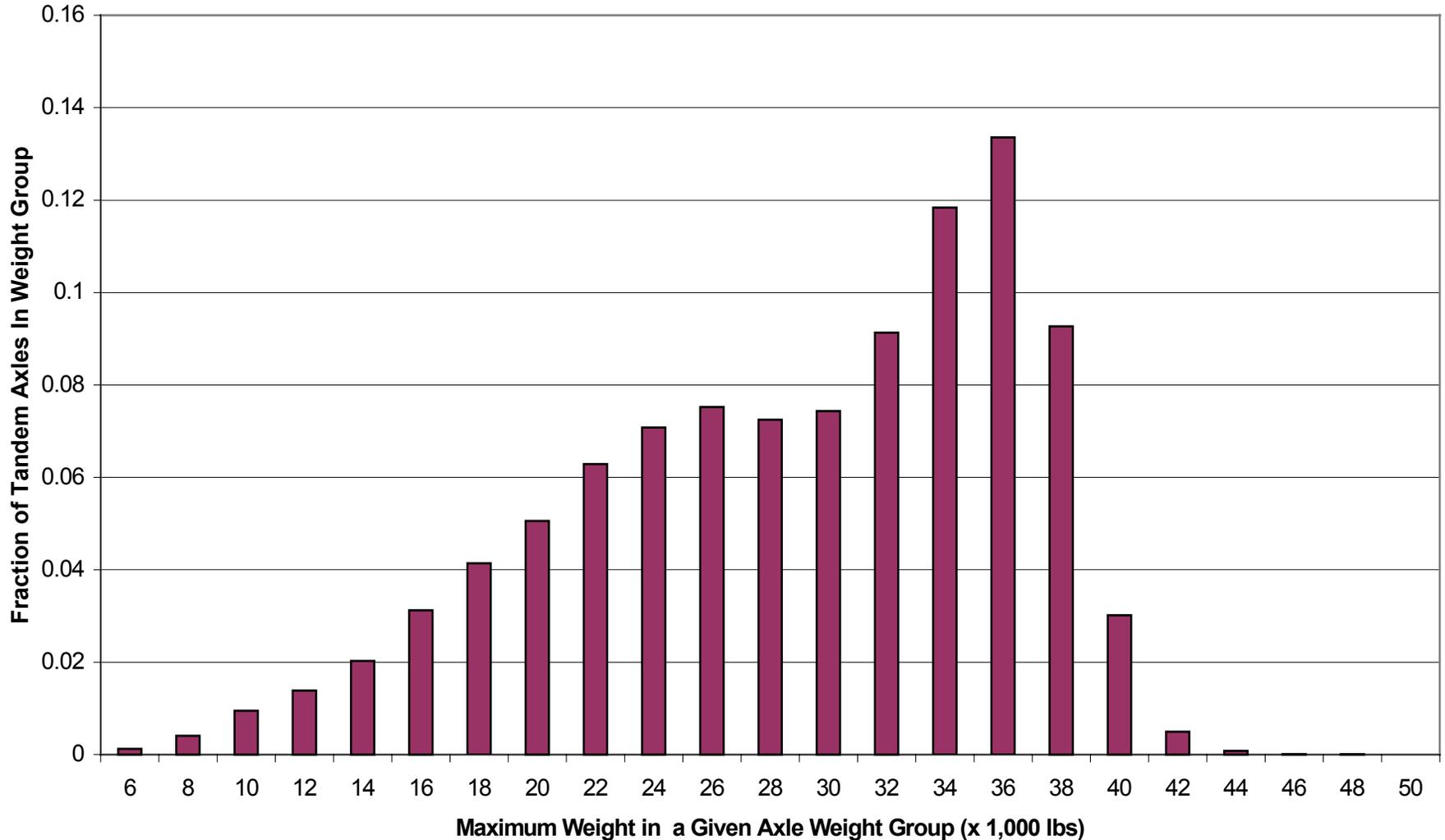


Tandem Axle Load Distribution

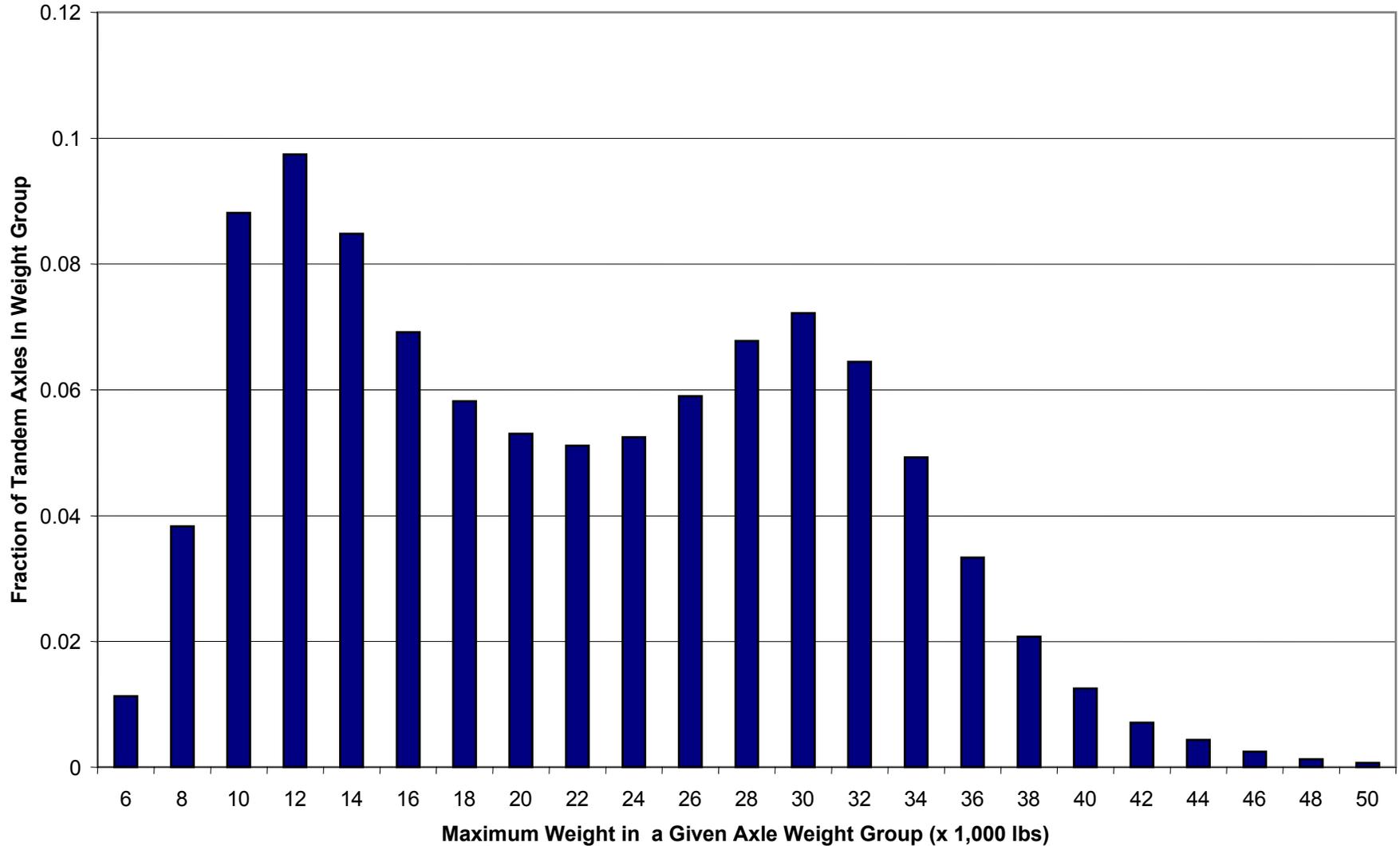
Lightly Loaded Trucks



Tandem Axle Load Distribution Heavily Loaded Trucks



Tandem Axle Load Distribution – Mixed Truck Loads



ESAL Comparison

Lightly Loaded Tandems = 0.186 (flexible)

Moderately Loaded Tandems = 0.355

Heavily Loaded Tandems = 0.666

Simple conclusion:

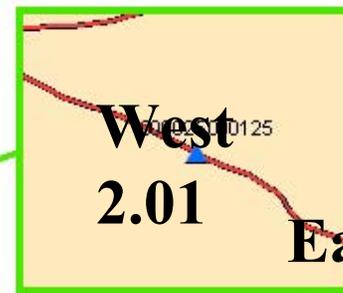
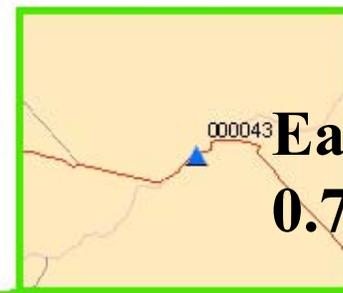
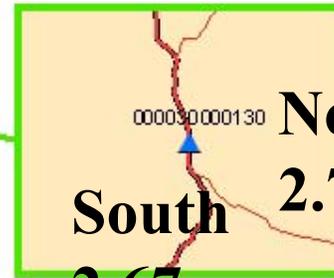
**Not knowing the loaded/unloaded
condition can equal a 3X error in life
expectancy**



California

Rural WIM Sites

Urban WIM Sites



▲ Weigh In Motion Site

Enforcement

- Significant increase in use of WIM for sorting
 - More effective use of staff
 - More efficient truck travel
 - Incentives to legal truckers



Enforcement

- CVISN Program
 - Commercial Vehicle Information Systems and Networks
- Part of Intelligent Transportation System efforts
 - Combine regulatory data (taxes), with weight data, and safety records



CVISN

- Electronic tag attached to truck allows connection to database
- WIM scales plus tag reader allow weight data to be associated with a specific vehicle tag and regulatory information



Directional Sign



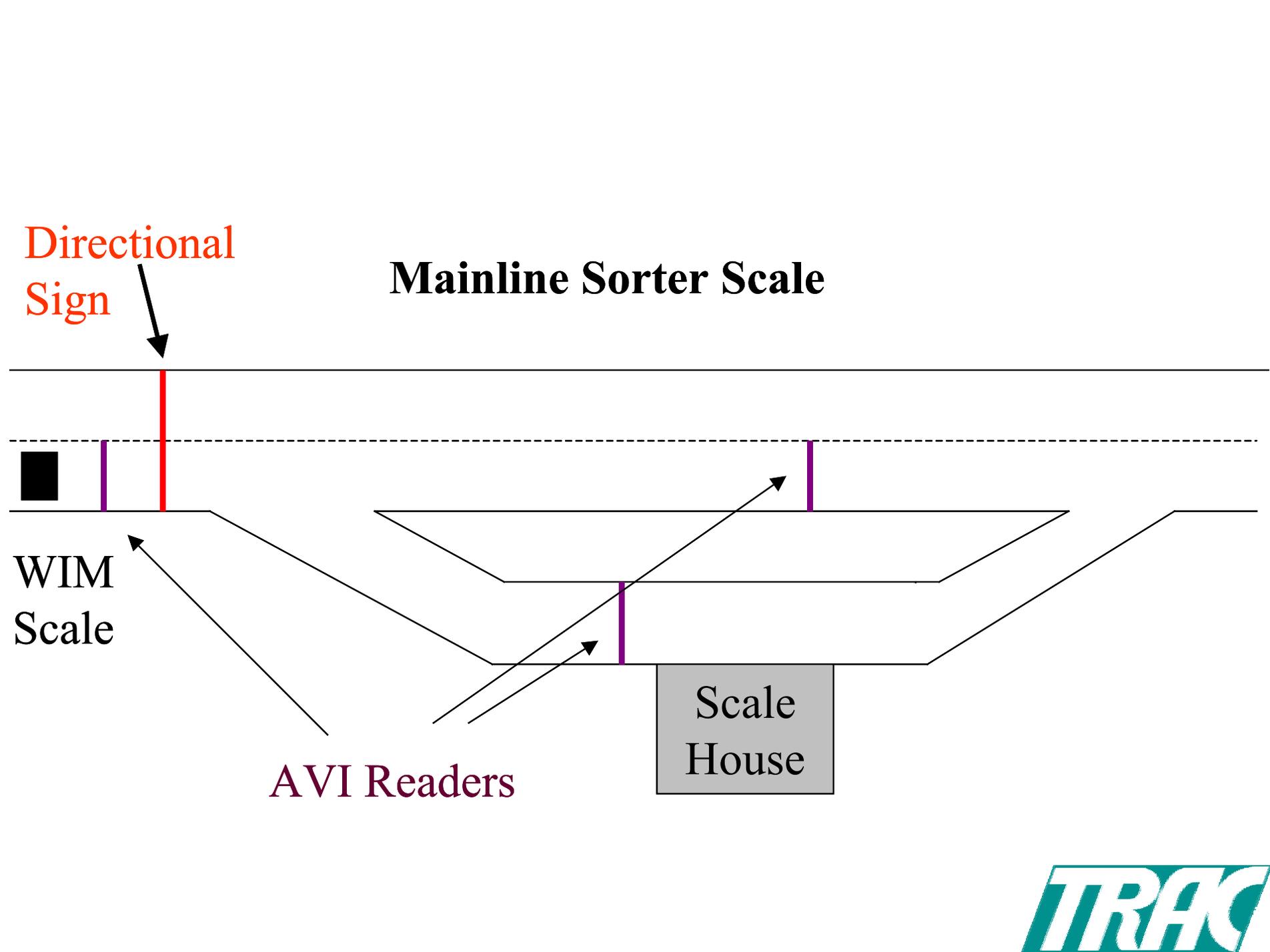
Mainline Sorter Scale



WIM Scale

AVI Readers

Scale House



Transponder Tags Used for Weigh-in-Motion (WIM)

Currently about 16,000 tags in use in Washington



Ridgefield I-5 Weigh-in-Motion Facility

CVISN – Pushes Equipment Performance

- Enforcement use + Mainline design requires
- High level of accuracy
- High level of equipment reliability
- Long equipment life



Ongoing Research

- Majority of Effort
 - Data analysis
 - Truck weight patterns and trends
 - Effects of NAFTA
 - Quality control methods
- Also
 - New system / technology testing



Ongoing Efforts

- Technology transfer
- Training
- Standards (E-1318)
- Best practices
- Analysis Software
 - VTRIS
 - HVTIS

