SE Pavement Management & Design Conference 2006

Traffic In Pavement Design: Where we stand with M – E Pavement Design Guide

Leslie Ann Myers, Ph.D., P.E.

FHWA HQ Office of Pavement Technology

Washington DC

What's New and Different

NCHRP 1-37A is an Analysis Program

Models to predict change in distress and smoothness over time

Implications for Traffic Data

To get time series distress data, you've got to have time series traffic loading data.

20 year design ESALs won't cut it.

Hierarchical Input Levels

Level	Source	Usage
Three	Defaults	(Routine projects)
Two	Correlations	(Routine significant projects)
One	Project specific data	(Research, forensics and high level projects)

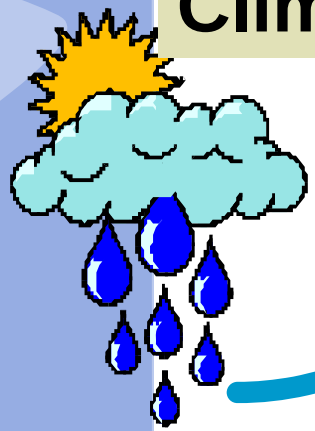
Design Inputs - Hierarchical Levels

Input levels can be mixed and matched

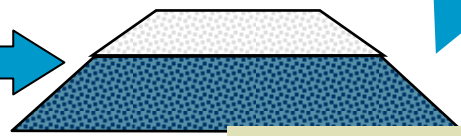
Damage calculations are exactly the same regardless of design input level

M-E Design Process

Climate

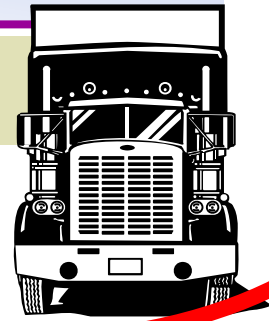


Materials

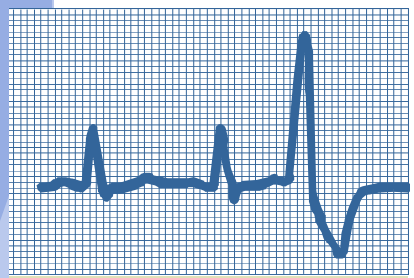


Structure

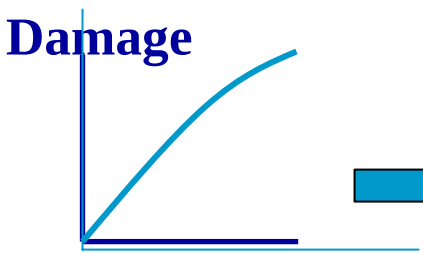
Traffic



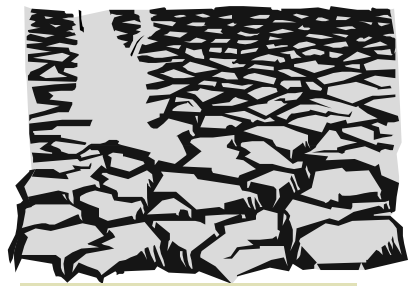
Calculations



Response

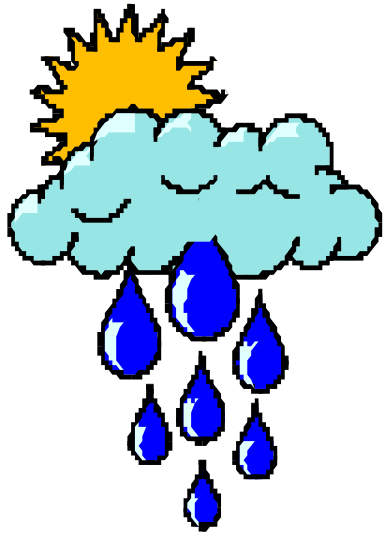


Damage Accumulation



Distress

Climatic Data

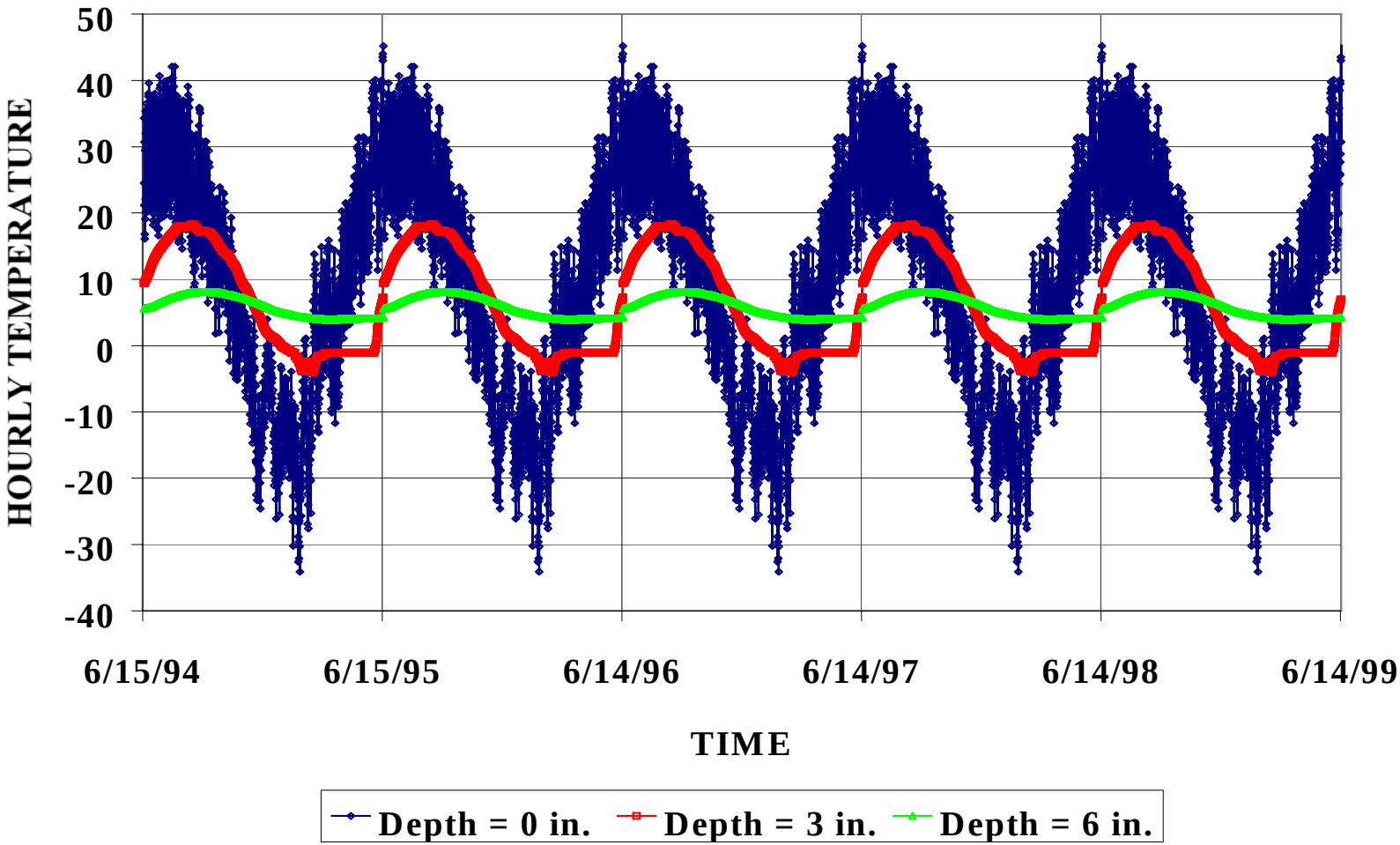


ENHANCED INTERGRATED CLIMATIC MODEL

EICM used to predict

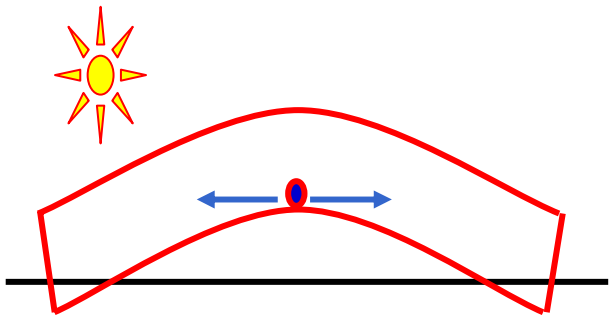
- Hourly temperature profile
- Monthly moisture gradient

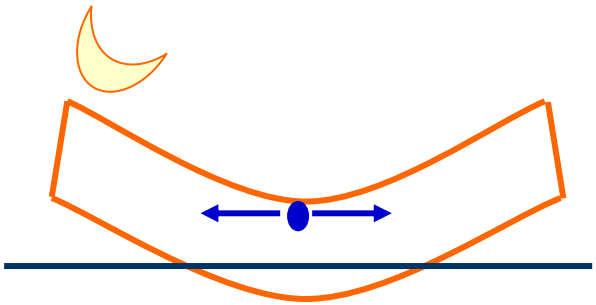
Hourly Temperature Profile: AC



Concrete Slab Temperature and Moisture Gradients

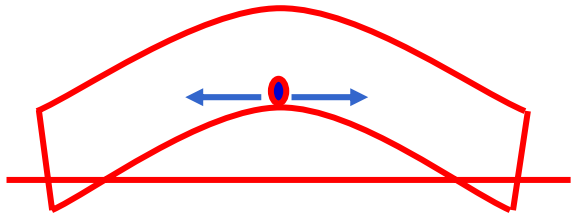
Curling



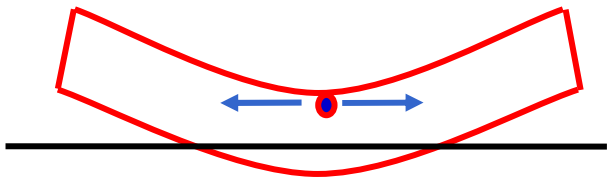


Warping

Slab wetter on top



Slab dryer on top



TRAFFIC INPUTS

Traffic Hierarchical Input Levels

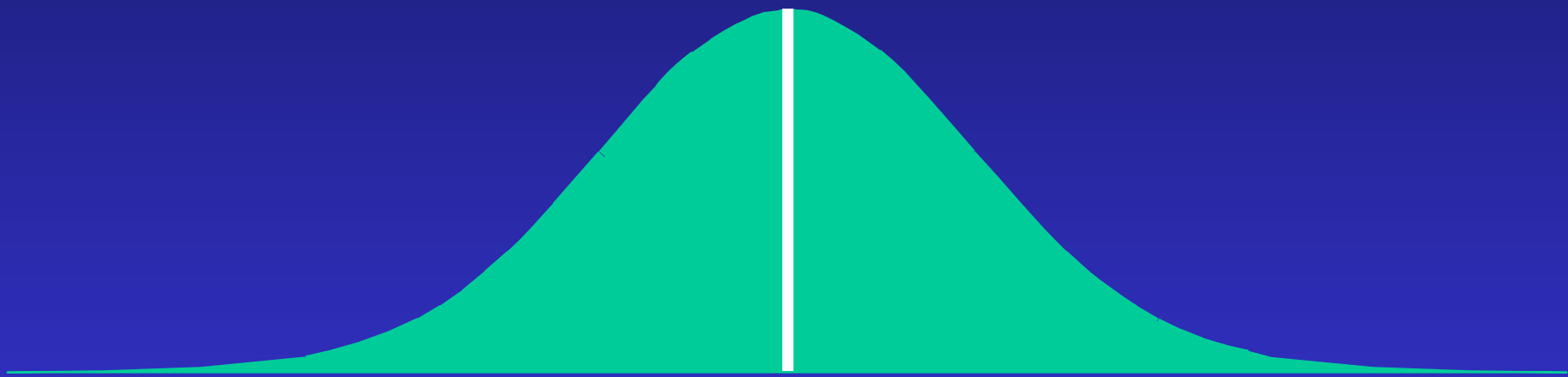
1 – AADTT with site specific AVC & WIM

2 – AADTT with Regional/Statewide data

3 – AADT & % trucks with TTC Group

Traffic Loading Variability

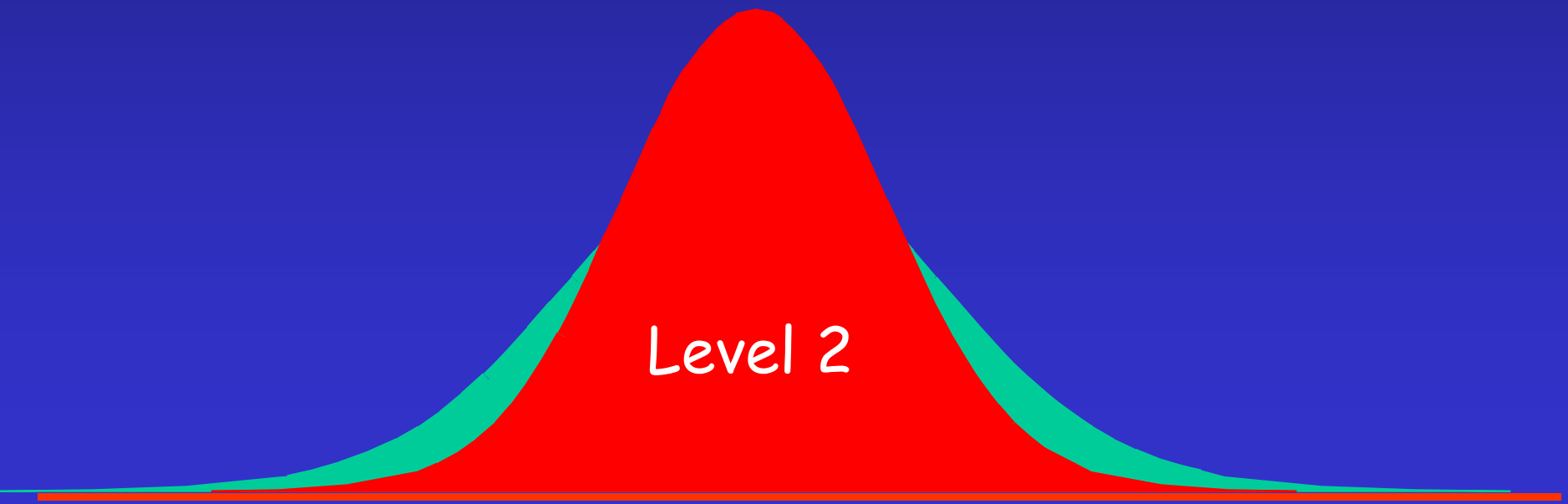
Normal Distribution



Mean Value

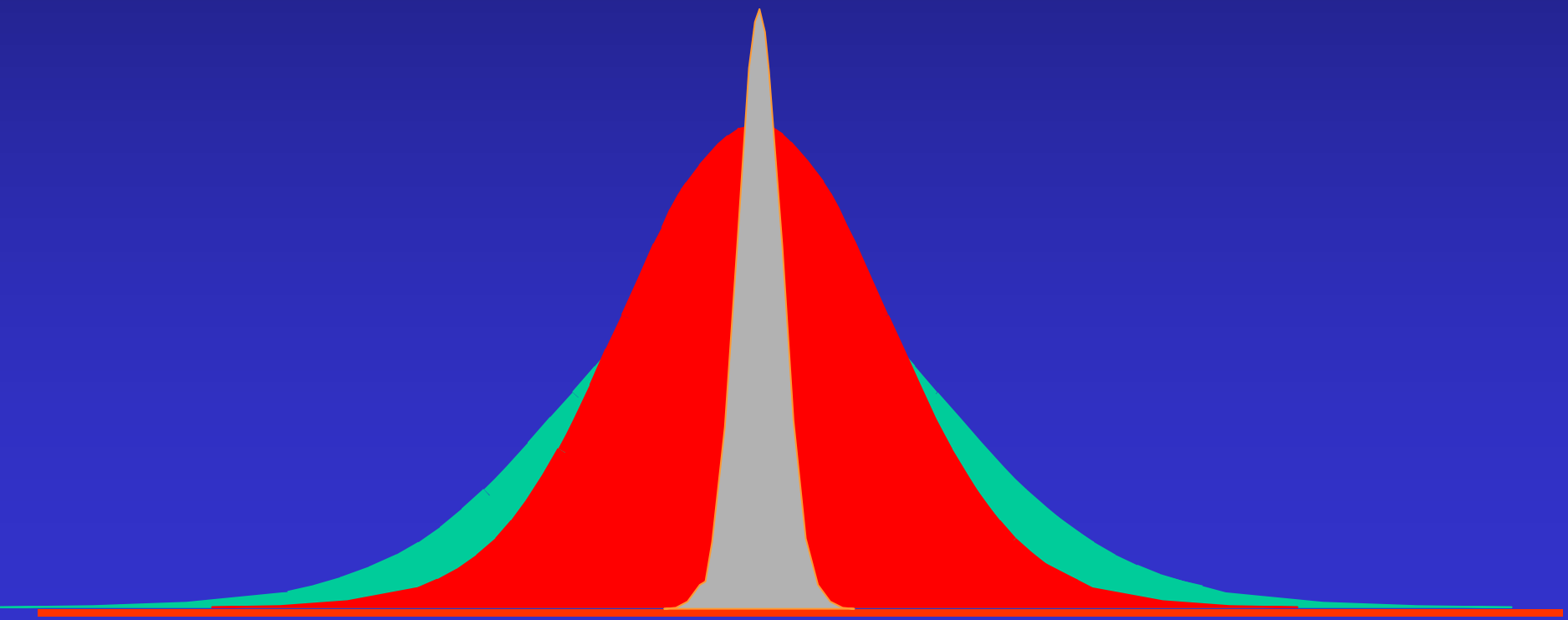
Hierarchical Inputs

Hierarchical Inputs



Hierarchical Inputs

Level 1



The Traffic Differences

1993 Guide

ESALs - Truck Equivalency Factors

M-E Pavement Design Guide

Axle Load Spectra

Traffic Requirements

Hourly axel loads …by load group

Stratified By

- Axle type
- Direction
- Design lane
- Lane location
- Month of the year
- Year of analysis

Traffic Module Output Files (Load Spectra)

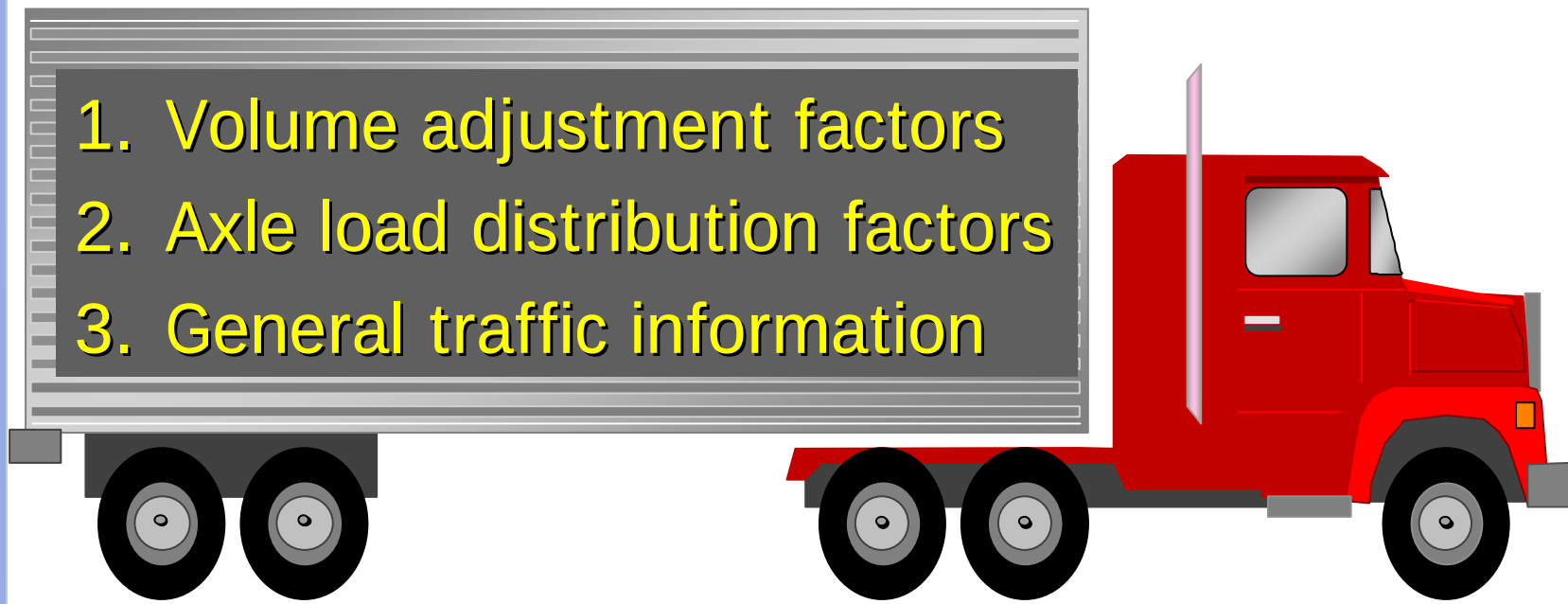
Year	Month	Hour	Axle Type	Load Group				
				0-2	2-4	4-6	..	x-y
i	j	k	Single					
			Tandem					
			Tridem					
			Quad					

The matrix for a A 20 year design will have:

5760 hours = 20 years x 12 Months x 24 Hours

Model Traffic Input Categories

1. Volume adjustment factors
2. Axle load distribution factors
3. General traffic information



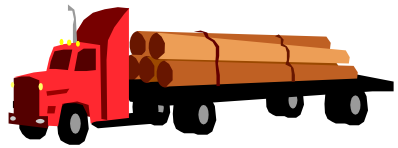
What traffic inputs are needed for design?

Traffic Module Inputs

Input Parameters	Input Level		
	1	2	3
Inputs Required to Compute AADTT			
AADTT for Base Year	√	√	
AADT and Percent Trucks for Base Year			√
Directional Distribution Factor	√	√	√
Lane Distribution Factor	√	√	√

Truck and Axle Load Distribution Factors

Input Level	1	2	3
			√



Use Truck Traffic Classification (TTC):

- Select one of the 17 Groups
  - TTC Selection is based on functional classification and overall distribution of the major truck classes (buses, single unit trucks, single-trailer trucks, and multi-trailer trucks)
- Defaults derived from LTPP Data

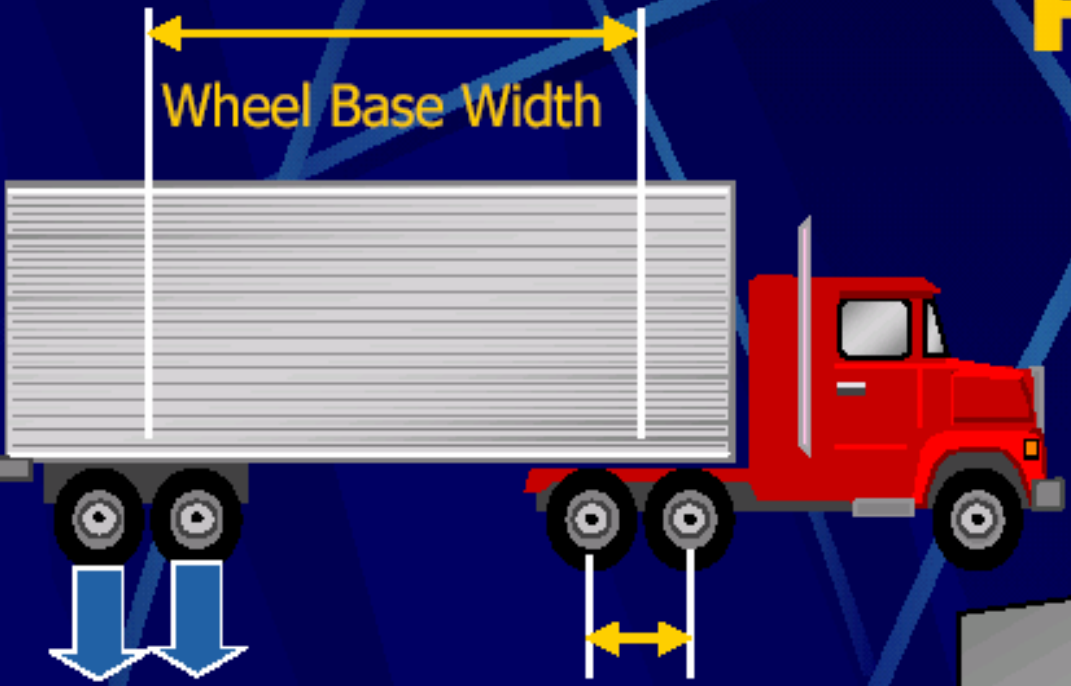
Traffic Module Inputs

Input Parameters	Input Level		
	1	2	3
Truck Traffic Volume Adjustment Factors			
Distribution Factors-Base YR	√	√	
Axle Load Distribution Factors	√	√	
Monthly Distribution Factors	√	√	√
Hourly Distribution Factors	√	√	√
Truck Traffic Growth Function/Factor	√	√	√

Traffic Module Inputs

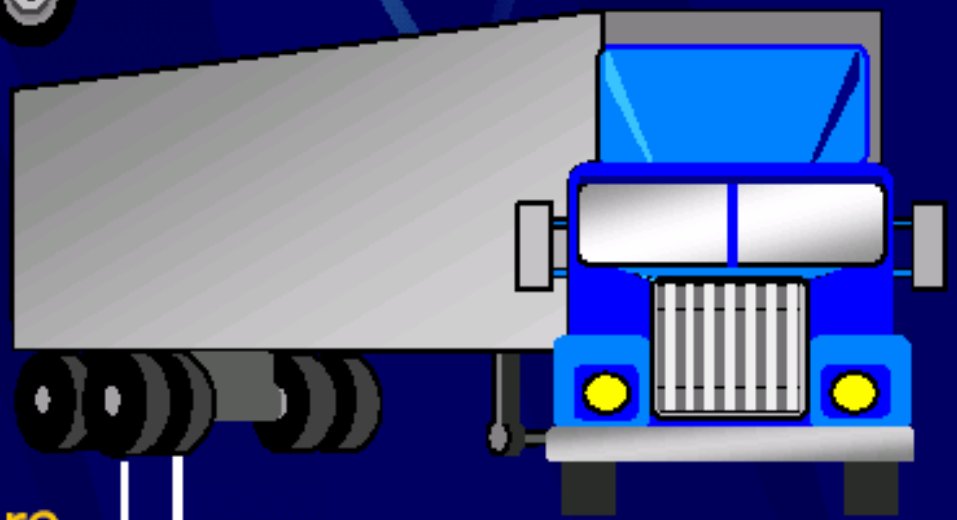
Input Parameters	Input Level		
	1	2	3
Axle Load Distribution Factors			
Axle Load Distribution Factors	√	√	
Truck Traffic Classification (TTC) Factor			√
General Traffic Information			
No. of Axle Types per Truck Class	√	√	
Axle Spacing	√	√	
Axle Load Groups	√	√	√
Tire Spacing/Axle Configuration	√	√	√
Tire Pressure	√	√	√

Axle Configuration Parameters



Tire Pressure

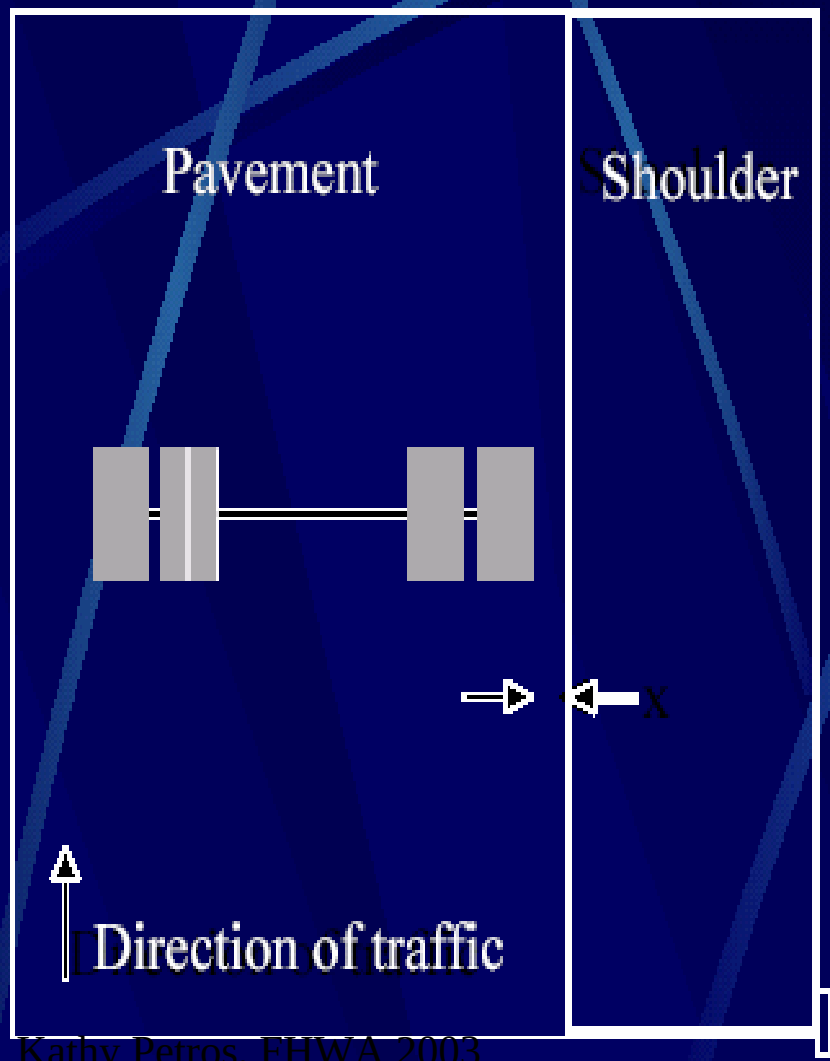
Axle Spacing



Dual Tire Spacing

Axle Width

Traffic Wander



Used to calculate pavement responses & the number of axle load applications over a point for predicting distress & performance.

- Mean wheel location = 18 in.
- Standard deviation = 10 in.
- Design lane width.

NCHRP 1-39

Traffic Data Collection, Analysis and Forecasting for Mechanistic Design

- Developed Software, TrafLoad
  - Reads C-card and W-card data
  - Manipulates data into 1-37A format
  - Intended to supply the traffic needs of 1-37A
- Report just out this Spring

Traffic Module Summary

- Extensive computations within traffic module for incremental damage accumulation
- Module is flexible, allowing the user to use other default values
- Default values based on LTPP data collected over time
- Historical traffic data are required, but this is consistent with requirements from LTPP and FHWA

Upcoming Traffic Workshops

2006

- Austin, Texas May 17 & 18
- Rocky Hill, CT September 18
  - Webcast
- New Brunswick, NJ TBD

Traffic Data for M-E Pavement Design

Questions?