VEHILCE-PAVEMENT INTERACTION

- Workshop on Super-Single Tires
- Mixture Design to Enhance Safety and Reduce Noise of HMA
- Pavement Response Model to Dynamic Loads

WORKSHOP

- Review of progress on the use and impact of super single tires on pavements
- Plan future activities in this area
- October 24-25, 2007
- Turner Fairbank Highway Research Center
- 12-15 U.S. and International participants

PAVEMENT MODEL

- Develop a fundamental model to predict the response of flexible pavements to traffic loads moving at a certain speed.

- To be used as an advanced analysis model for
  - Intersections
  - Heavy loads
  - Off-road equipments

PAVEMENT MODEL

ARC

I. Dynamic Load

- Truck suspension
- Road roughness
- Braking/Acceleration
- Speed

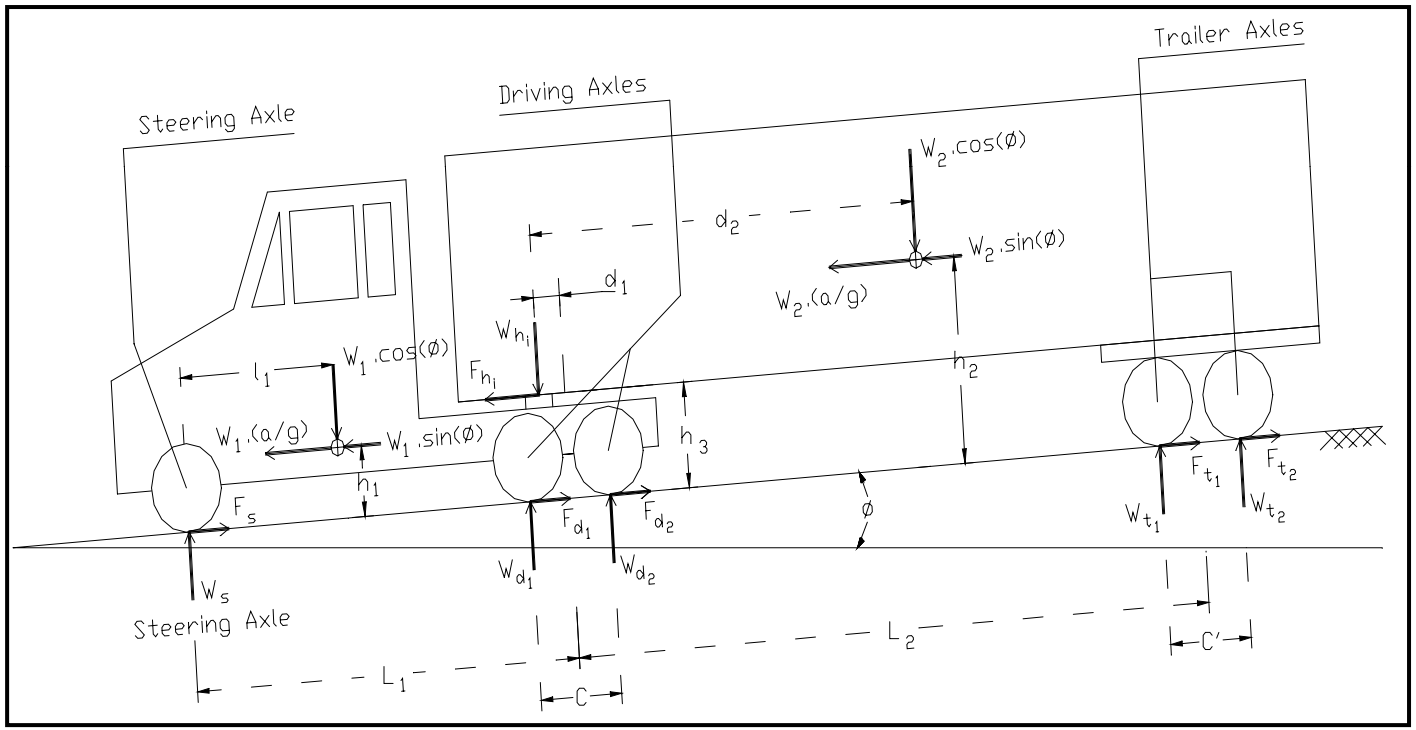
II. Tire-Pavement Interface

- Inflation pressure
- Tire type
- Tire load
- Speed

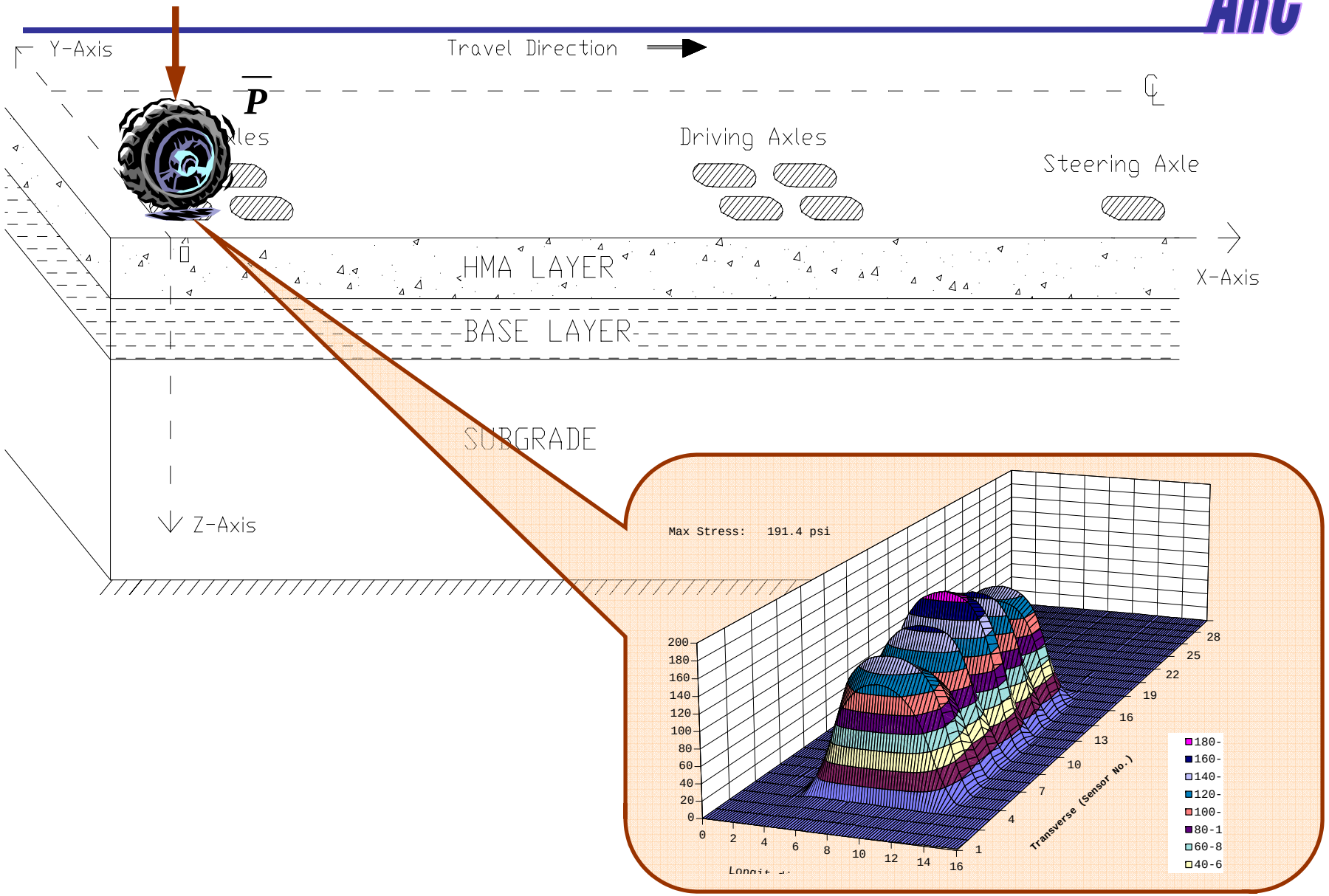
III. Pavement Response

- Inertia
- Material characteristics

PAVEMENT MODEL



Tire-Pavement Interface



III. Pavement Response

Material Characterization

- **HMA Layer: viscoelastic properties**
  - Dynamic modulus master curve
  - Inertia
  - Internal damping (phase angle)

  Unbound material: linear elastic properties
  - Modulus
  - Inertia
  - Internal damping

III. Pavement Response

Material Characterization

- HMA Layer: Variation of Dynamic Complex modulus with loading frequency

$$E^* = E' + i\,E''$$

where E' = Storage Modulus

E'' = Loss Modulus

For every loading frequency select E' and E''

COMPARISON OF MODELS

Condition	Current Practice	Proposed Practice	Future Practice
HMA	L-E	L-V-E	N-L-V-E
Base/SG	L-E	L-E	N-L-E
Loads	Static	Moving	Static
Pressure	Uniform	Any Dist.	Any Dist.?
Application	Simple	Moderate	Complicated

PAVEMENT MODEL

- Is it a Comprehensive Model: No
- Public Domain
- Time Efficient
- Short Term Delivery: 2-3 years

PAVEMENT MODEL

- Applicable to a Wide Range of Cases

- Improvements:
  - dynamic loads
  - dynamic behavior of pavement
  - non-uniform stress distributions
  - two-dimensional stress distributions
  - incorporates pavement roughness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