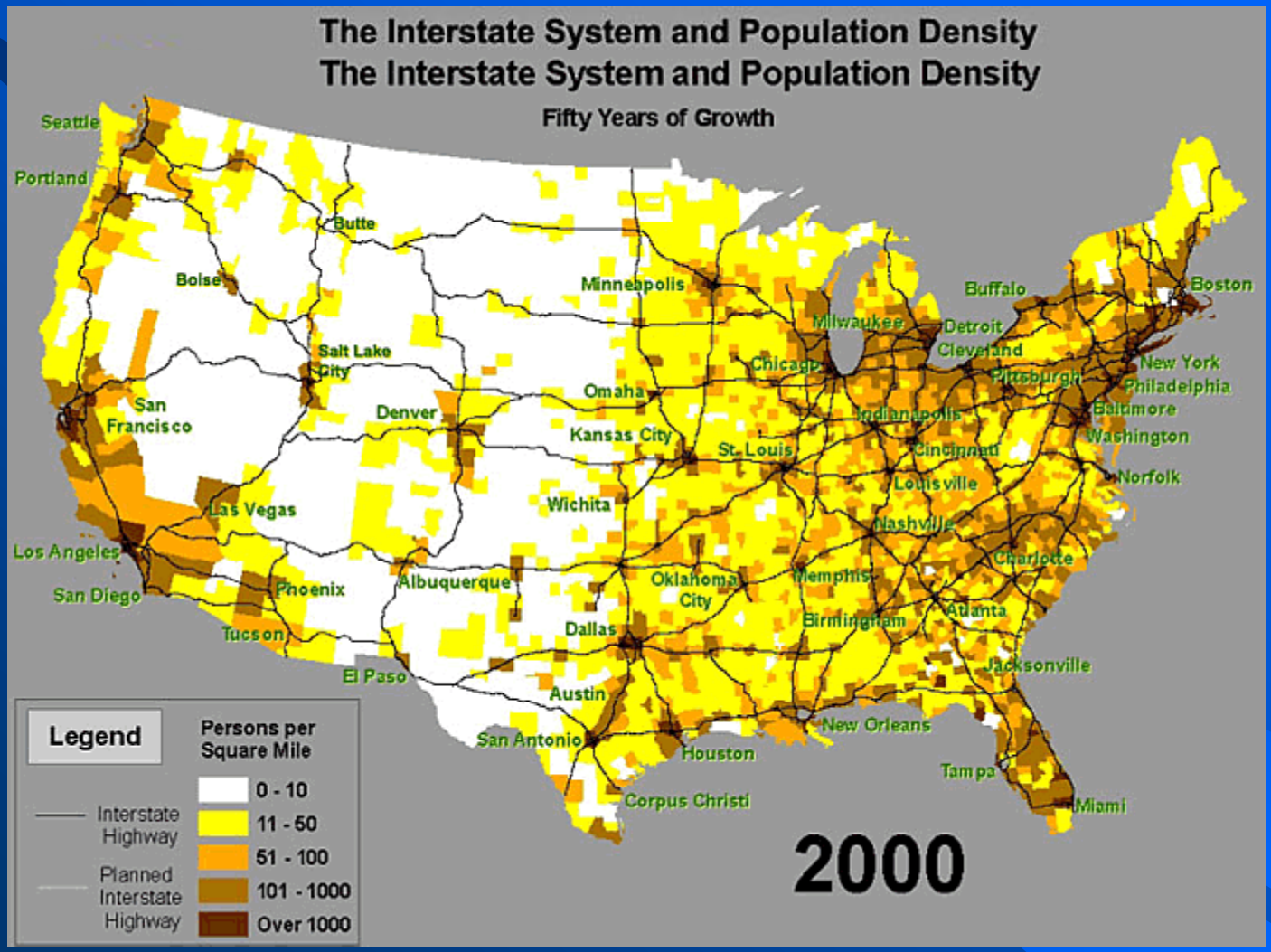
The Key Emphasis Areas FHWA Pavement Program

John D'Angelo
Office of Pavement Technology

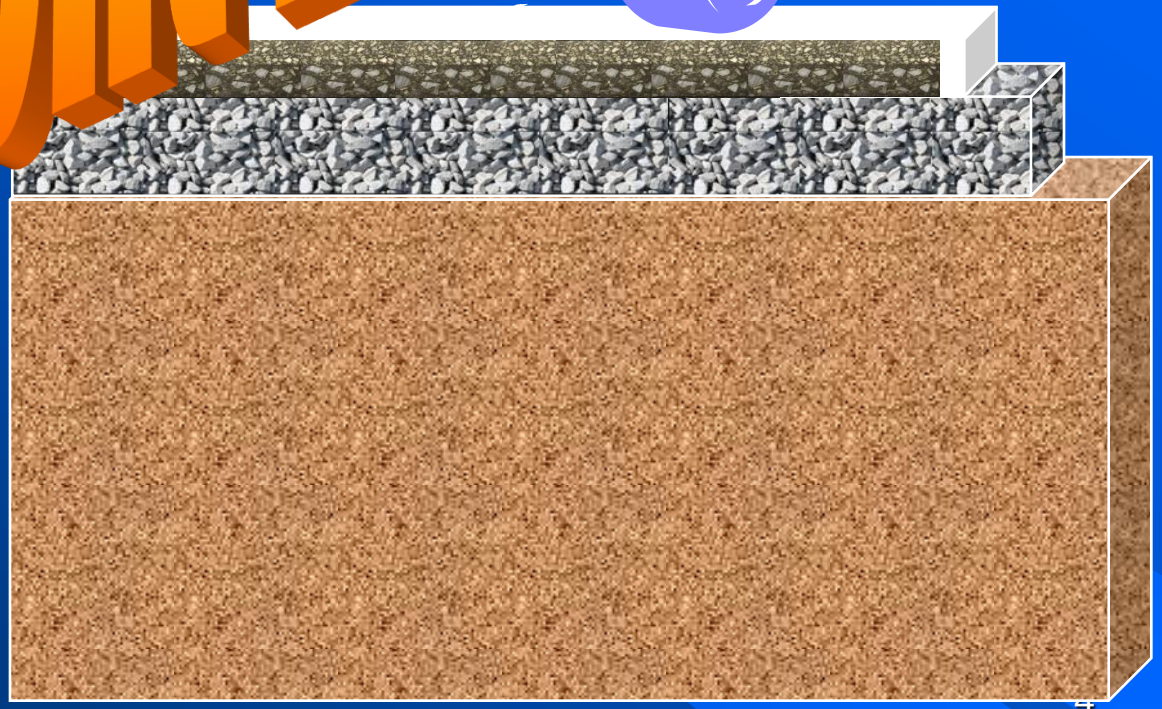
Growth of the Interstate



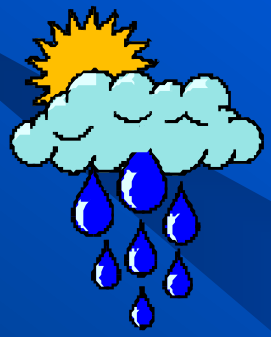
Future of the System

- We have to build
  - Faster
  - With better performance
  - And be environmentally sustainable

Pavement Design



The Big Picture

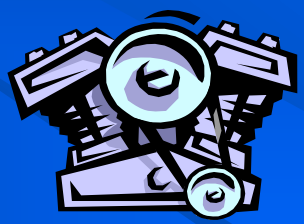


Climate Inputs

EICM

Material Properties

Traffic



Mechanistic Analysis

Transfer Functions

Predicted Performance

New Mechanistic Empirical Pavement Design Guide

- The research software is available.
- NHI Training class for using the current software is available.
- AASHTO has a pooled fund to create version 2.0, planned for release 2011.

Asphalt Mix Performance Tester

The test can evaluate the rutting and fatigue response of the mix.

The equipment is relatively inexpensive and easy to use.

Provides input data for MEPDG

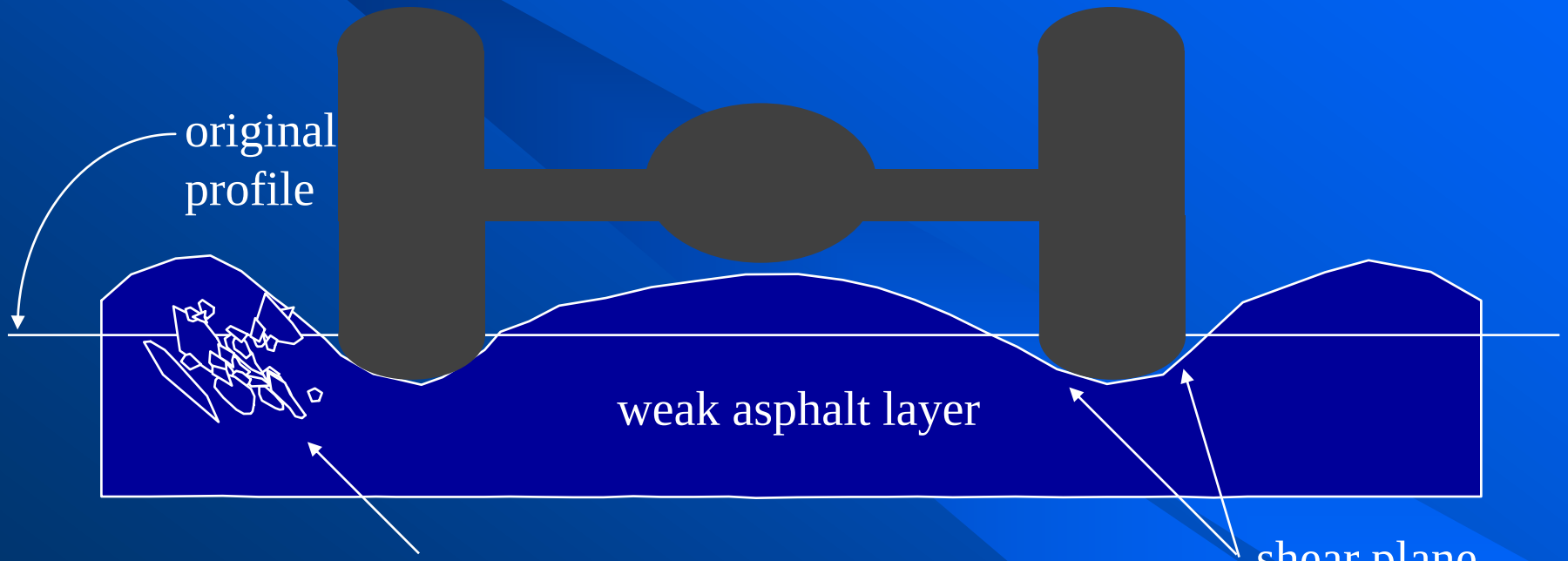
Can be used for Construction acceptance.

Asphalt Mix Performance Tester

- Existing pooled fund for purchase of the equipment.
- Establishment of a technician training school for operation of the equipment.
  - Joint effort with ARA, AAT, and NCAT
- Develop precision and bias for test procedure working with NCHRP and AMRL .

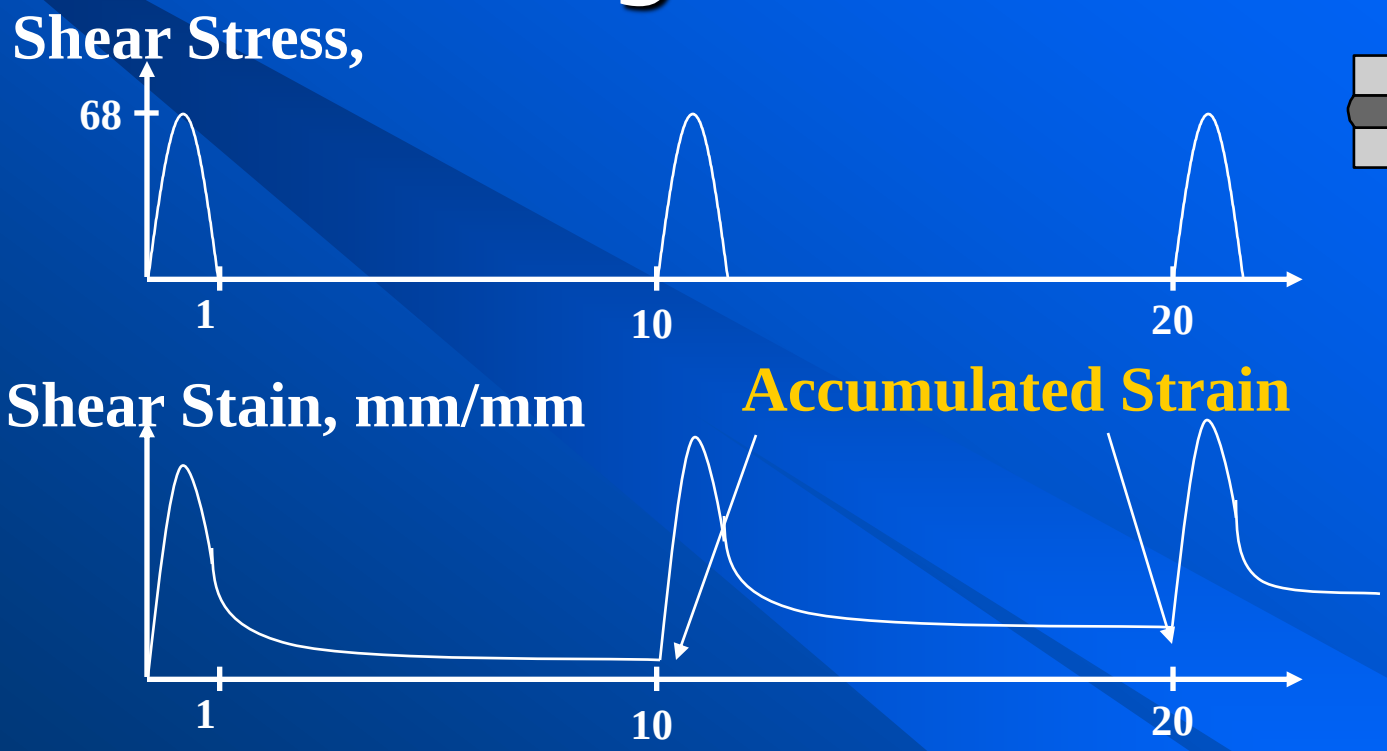

Binders

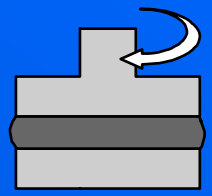
Rutting in Asphalt Layer



Movement and rotation of aggregate creates very high strain in the binder.

New Multi-Stress Recovery Test to replace the current Rutting Criteria





Standard Test Procedure developed for AASHTO

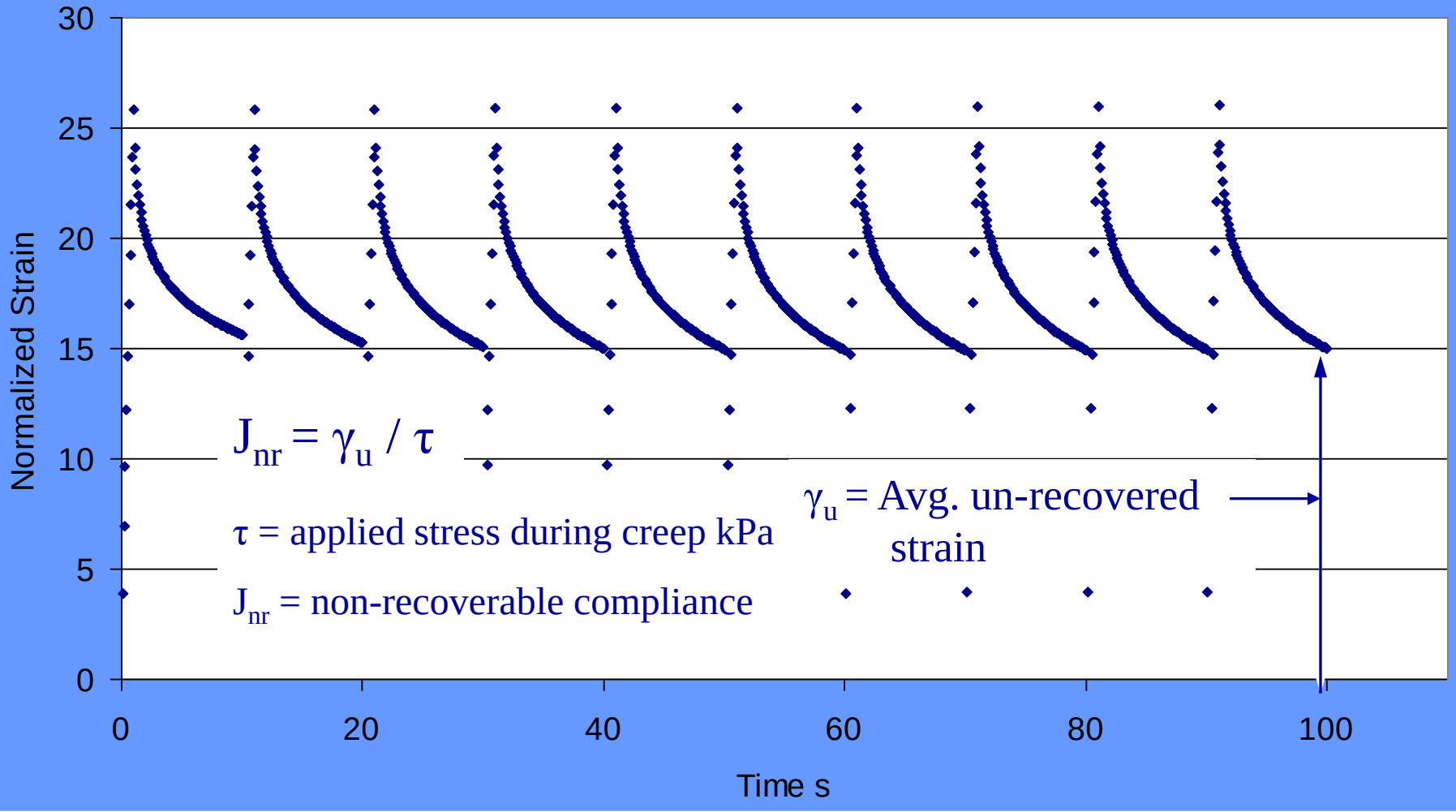
Standard Method of Test for

Multiple Stress Creep Recovery (MSCR) Test of Asphalt Binder Using a Dynamic Shear Rheometer (DSR)

AASHTO Designation: TP 70-08

American Association of State Highway and Transportation Officials
444 North Capitol Street N.W., Suite 249
Washington, D.C. 20001

Determination of J_{nr} Rutting Criteria

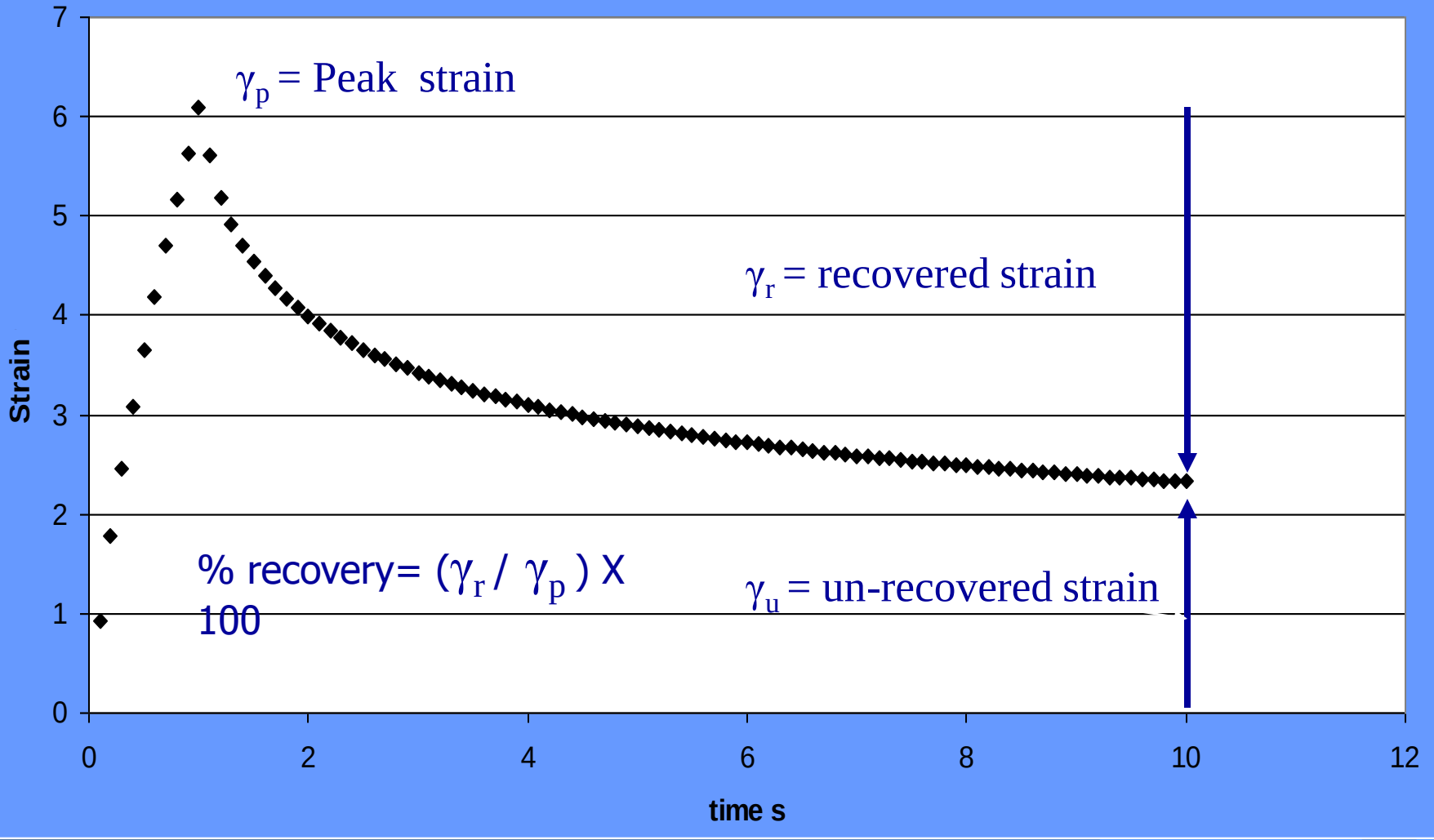


New MSCR Binder Spec AASHTO M320 Table 3

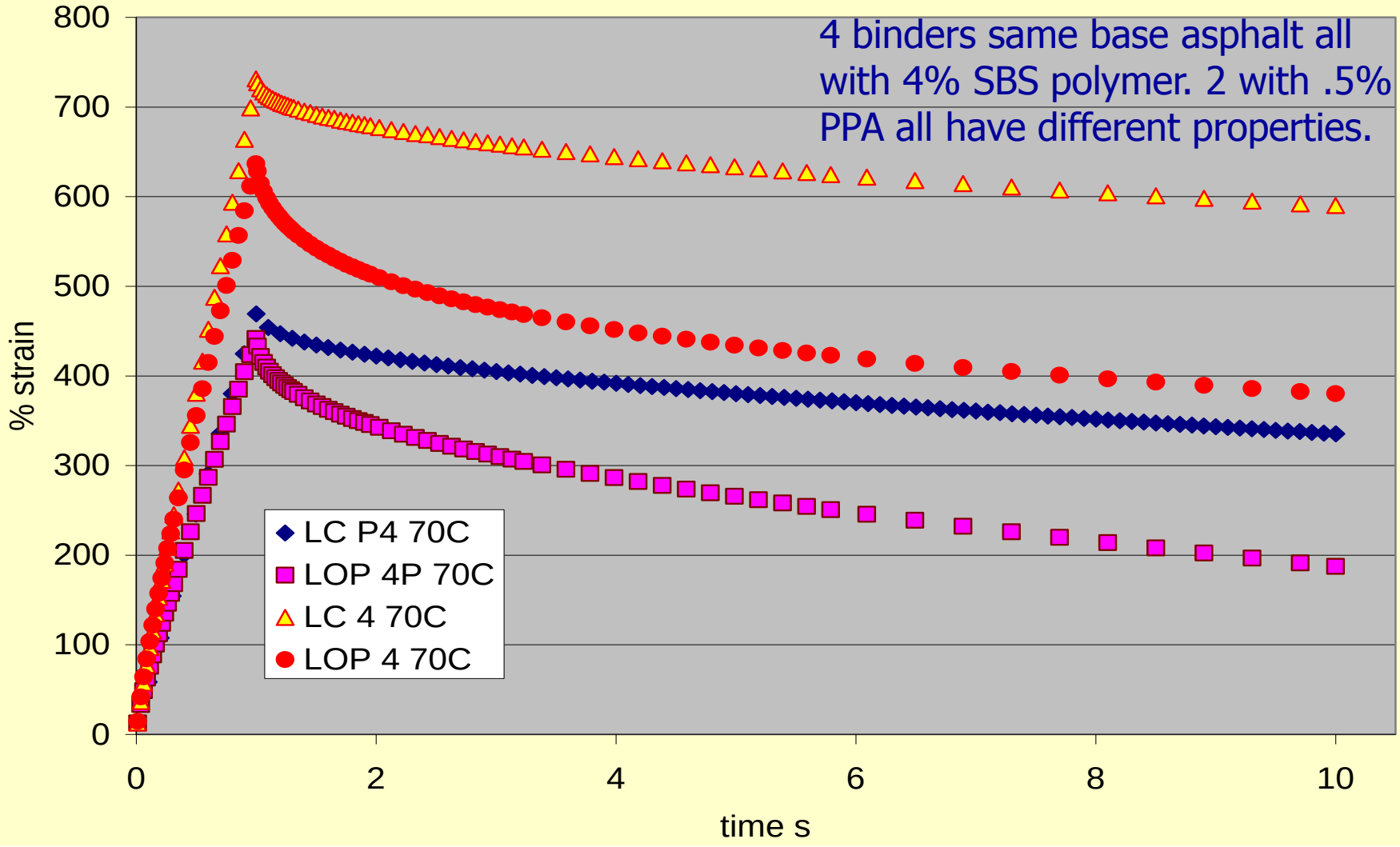
Original					
DSR G*/sinδ Min 1.0	64				
RTFOT					
64 Standard MSCR3.2 <4.0	[(MSCR3.2 – MSCR 0.1)/ MSCR 0.1] < .75	64			
64 Heavy MSCR 3.2<2.0		64			
64 Very heavy MSCR3.2 <1.0		64			
PAV					
S grade DSR G*sinδ Max 5000	28	25	22	19	16
H & V grade DSR G*sinδ Max 6000	28	25	22	19	16

Low temp BBR and DTT remain unchanged

What is % Recovered Strain Replacement of ER



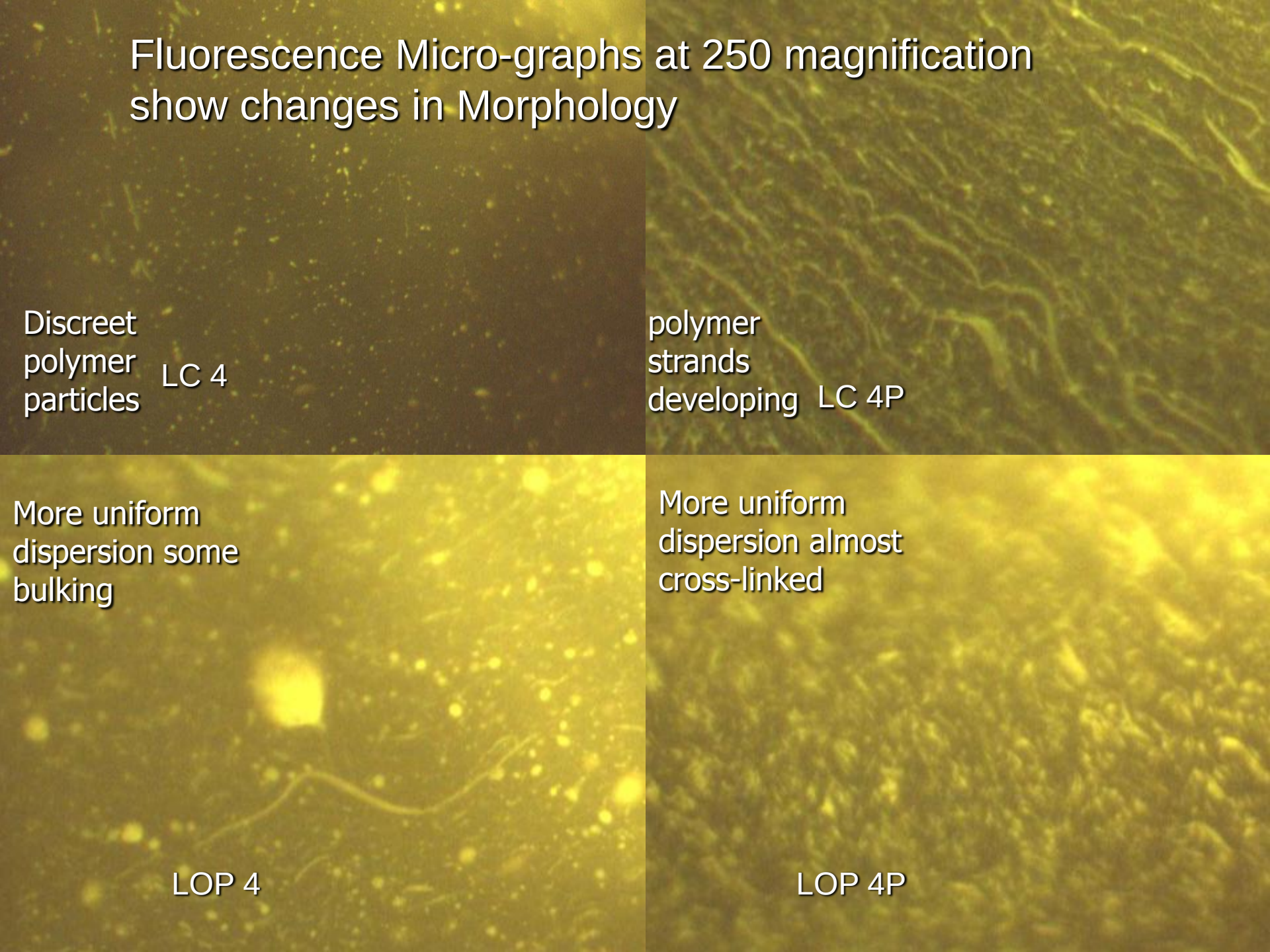
Polymer network effects response and temperature effects.



MSCR does a far better job of distinguishing between binders

Sample ID	Continuous Grade	Polymer	Acid	Temp C	J_{nr} 3.2kPa	ER	% Recovery 3.2kPa
LC	66.7-24.1		0	64C	3.12	5	0
LC 4	75.7-22.3	4% SBS	0	70C	1.85	73.8	19.2
				76C	4.55		5.96
LC P4	81.2-22.2	4% SBS	0.50%	70C	1.06	93.8	28.4
				76C	2.40		20.55
LOP 4	76.6-25.2	4% SBS from Concentrate	0	70C	1.18	86	40.3
				76C	2.35		37.02
LOP 4P	81.6-24.5	4% SBS from Concentrate	0.50%	70C	0.67	83	52.05
				76C	1.38		42.52

Fluorescence Micro-graphs at 250 magnification show changes in Morphology



New High Temperature Binder spec

- The new specification should be based on the non-recoverable compliance J_{nr} of the binder.
- All testing should be done at the pavement environmental grade temp to reflect response at actual operating temperatures.
- The test should be run at two stress levels 0.1 and 3.2 kPa ten cycles at each level. A comparison would be made to check how stress sensitive the binder is.
- Grade bumping should be done by halving the J_{nr} value.

Conclusions

- MSCR % Recovery can identify how the polymer, binder and processing will affect performance in one simple test.

Mixture Issues

WARM MIX ASPHALT TECHNOLOGY

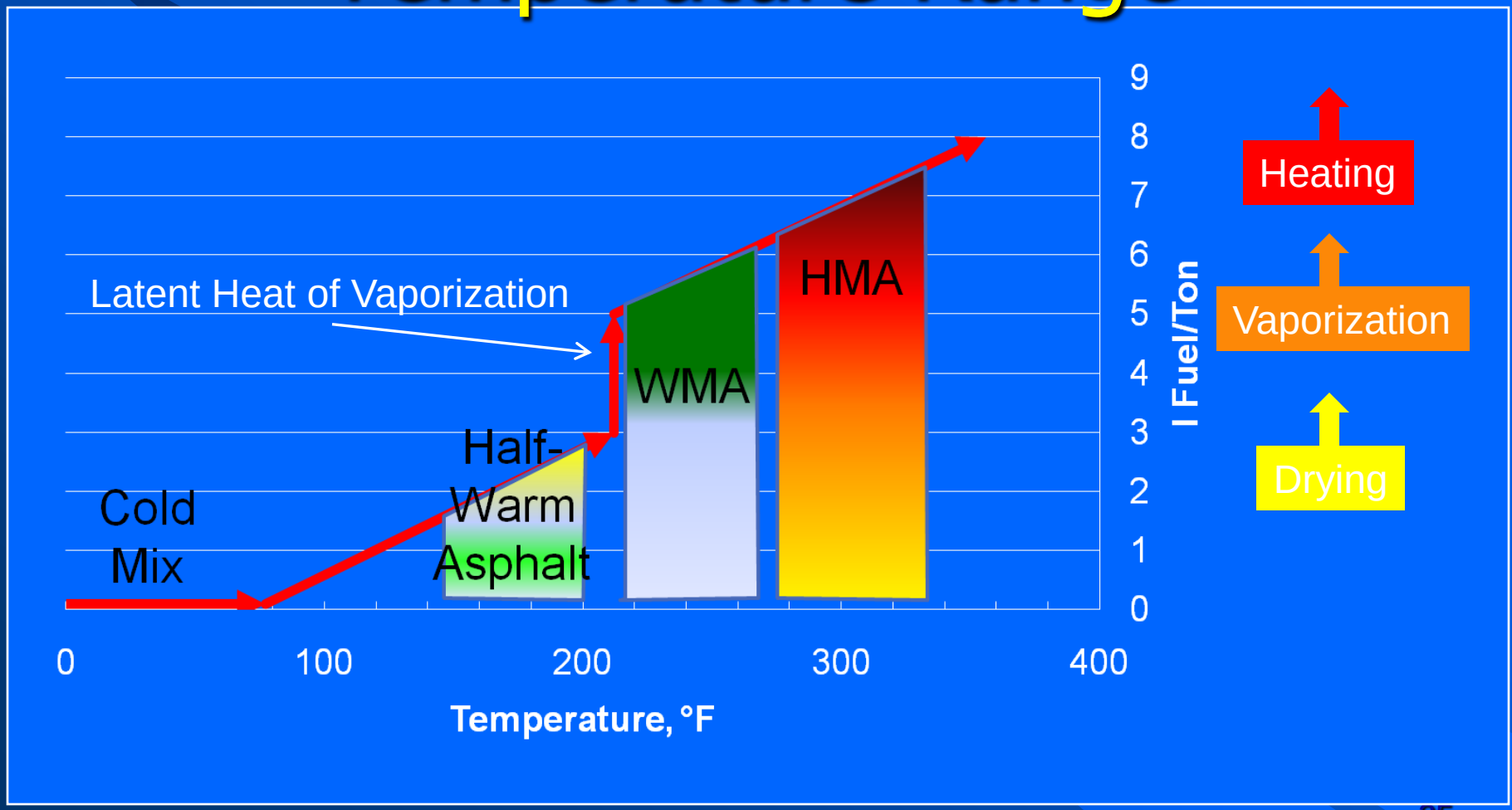
What is WMA?

- Appears to allow a reduction in the temperatures at which asphalt mixes are produced and placed
  - Reduced viscosity at lower temps
    - Complete aggregate coating

Why WMA?

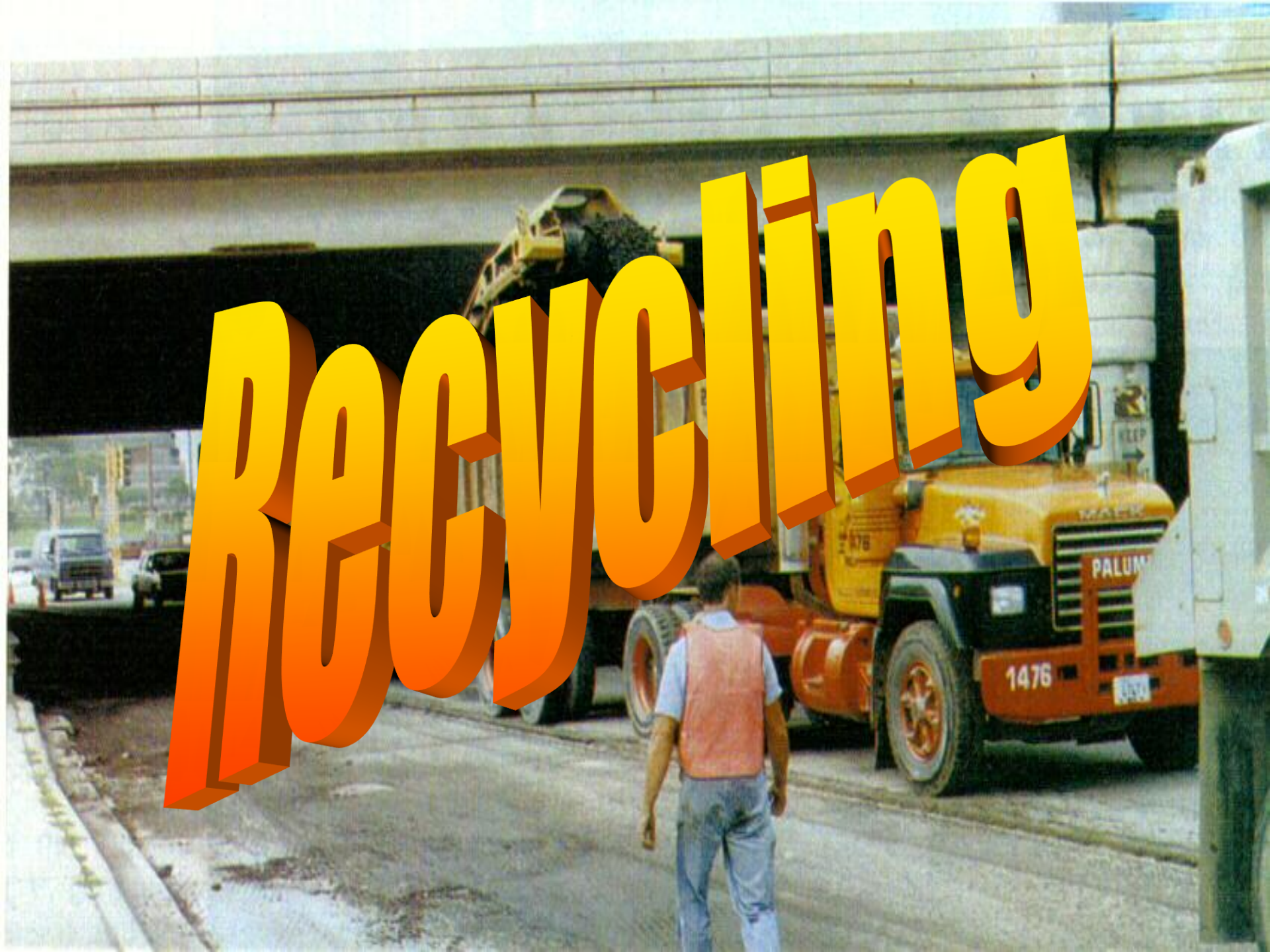
- Potential Advantages
  - Energy Savings
  - Decreased Emissions
    - Visible
    - Non-Visible
  - Decreased Fumes
  - Decreased Oxidation Hardening
  - Decreased Plant Wear

Classification of WMA by Temperature Range

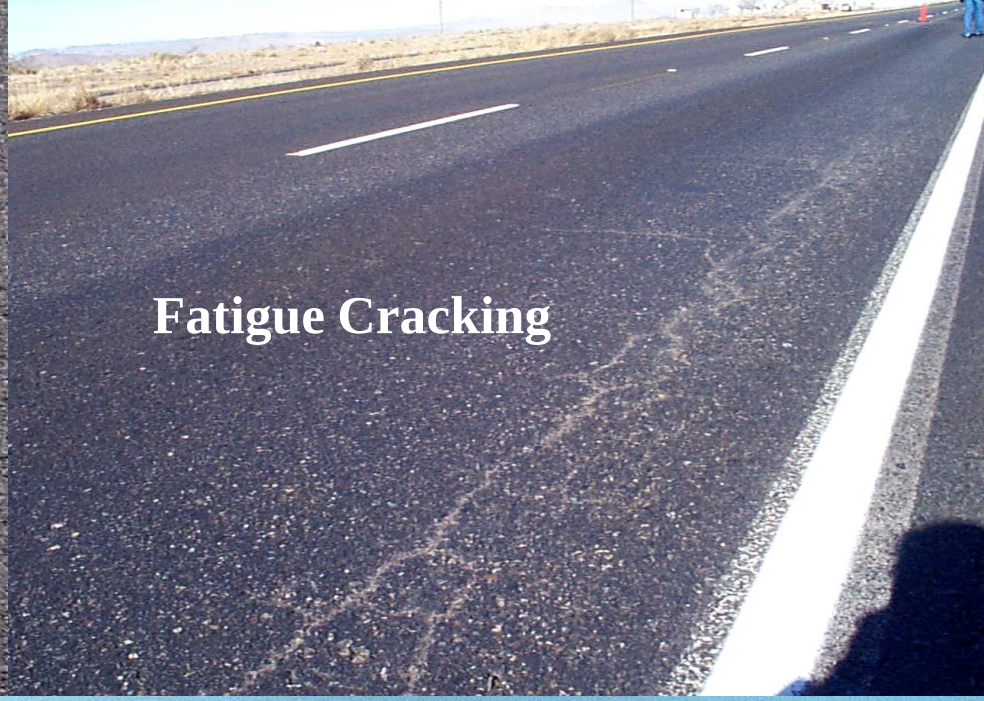


Warm Mix Asphalt

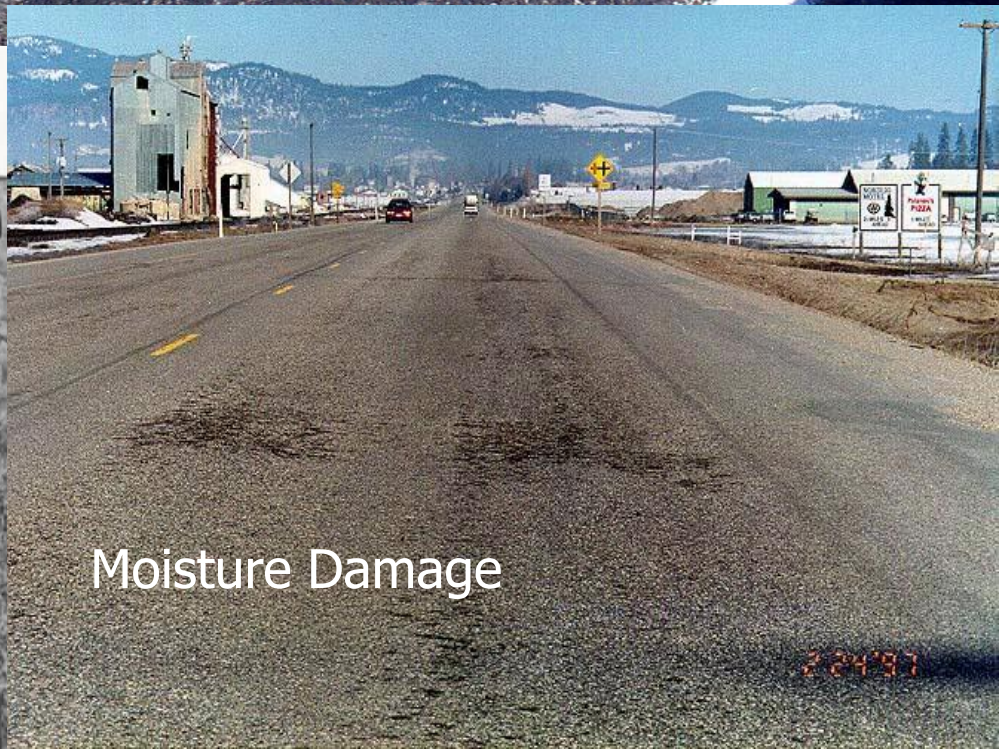
- Ongoing Technical Working Group
- European Scan May 2007
- Continued field trials
- Generic Construction Specs


Recycling
1476


Rutting


Fatigue Cracking


Low Temperature Cracking


Moisture Damage

Key Points 0f FHWA Recycling Policy

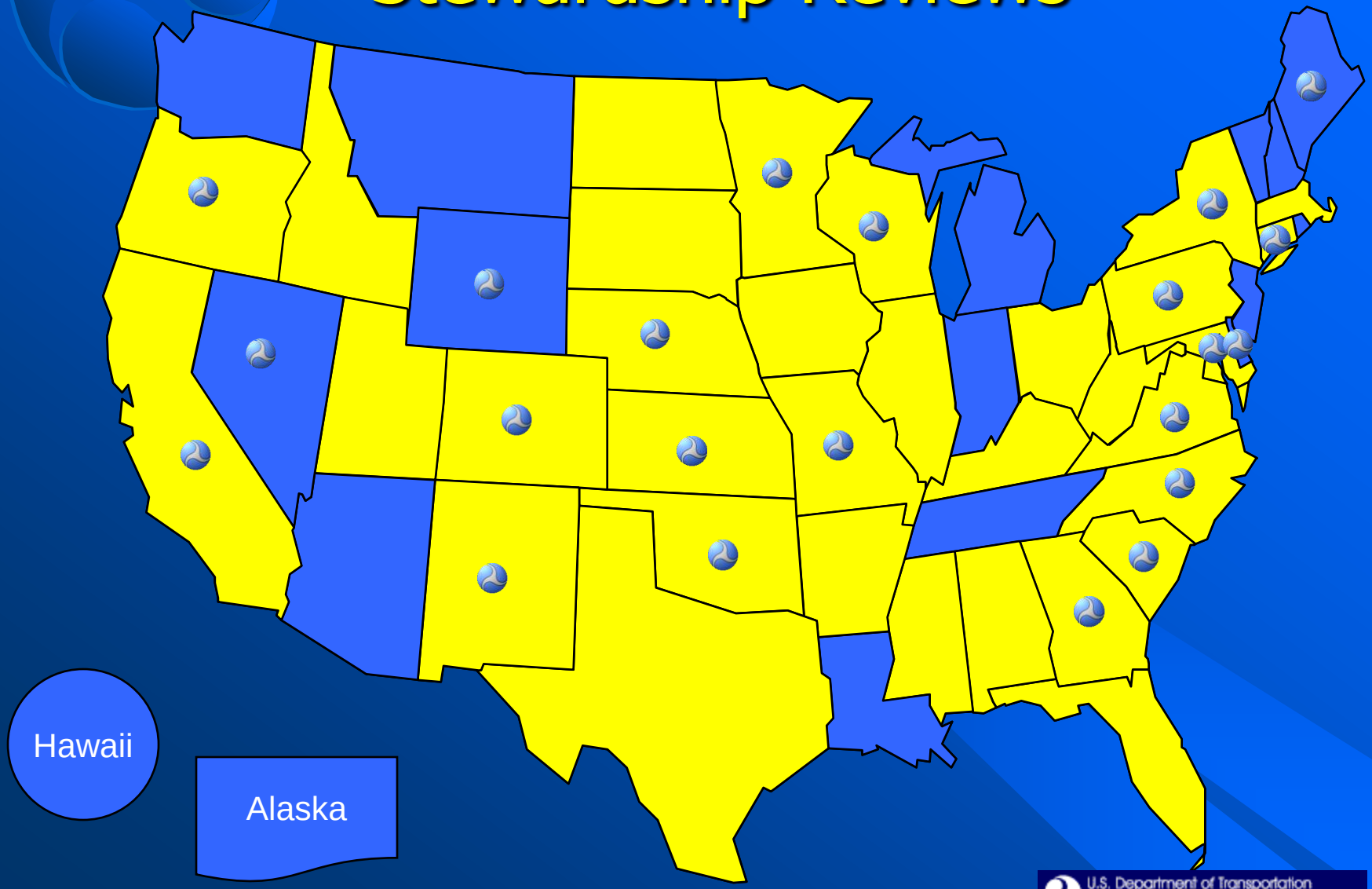
- Recycled materials should get first consideration in overall materials selection.
- Recycling can offer engineering, economic and environmental benefits.
- Engineering and environmental properties are important.
- Life Cycle Cost benefits assessment is warranted.
- Restrictions prohibiting recycled material that are without technical basis should be removed.

FHWA Plan on Current Status of Pavement Recycling

- What work is being done
  - A RAP Technical Working Group has been established.
  - This group includes government, industry and academia.
  - They will be used to guide the many activities to be accomplished.
  - pavement evaluation
  - Develop AASHTO Standard Practice for handling RAP


Construction

22 States Reviewed as part of QA Stewardship Reviews



Quality Assurance Stewardship Reviews

Where we are now …

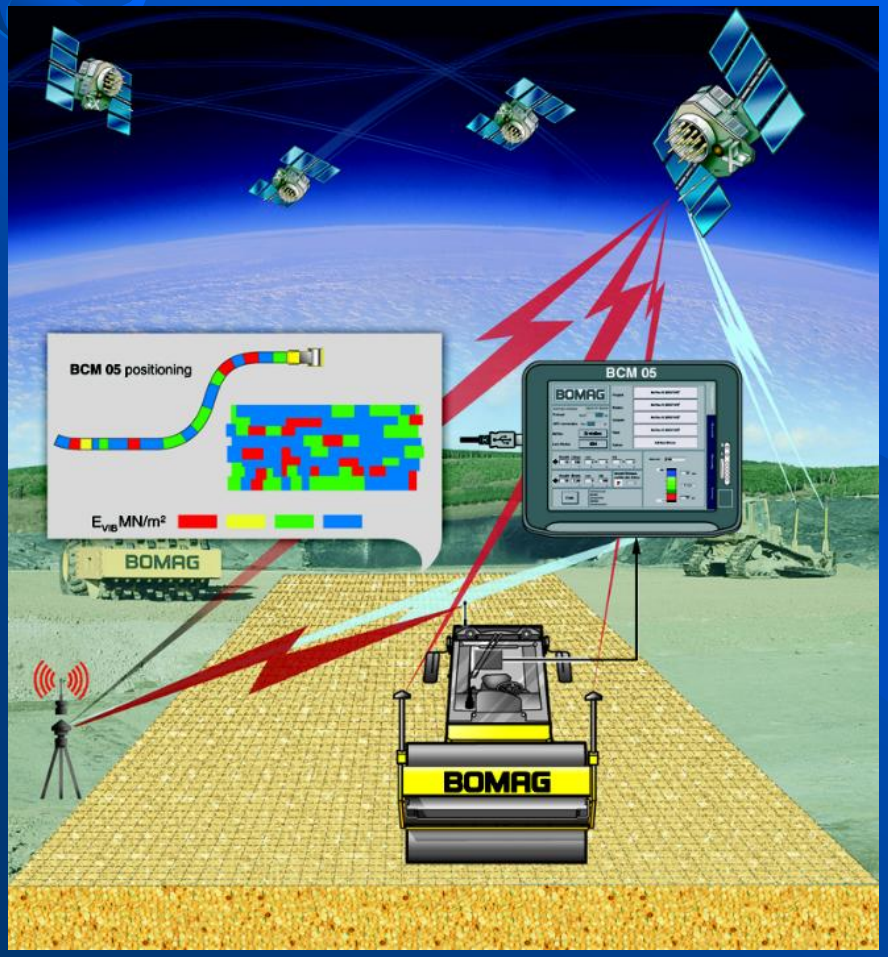
- Not enough State Verification Testing
- Not enough State personnel
- Reluctance to spend money on construction engineering – not even for consultants
- Ineffective validation procedures
- Increasing volume of projects/workload

Intelligent Compaction

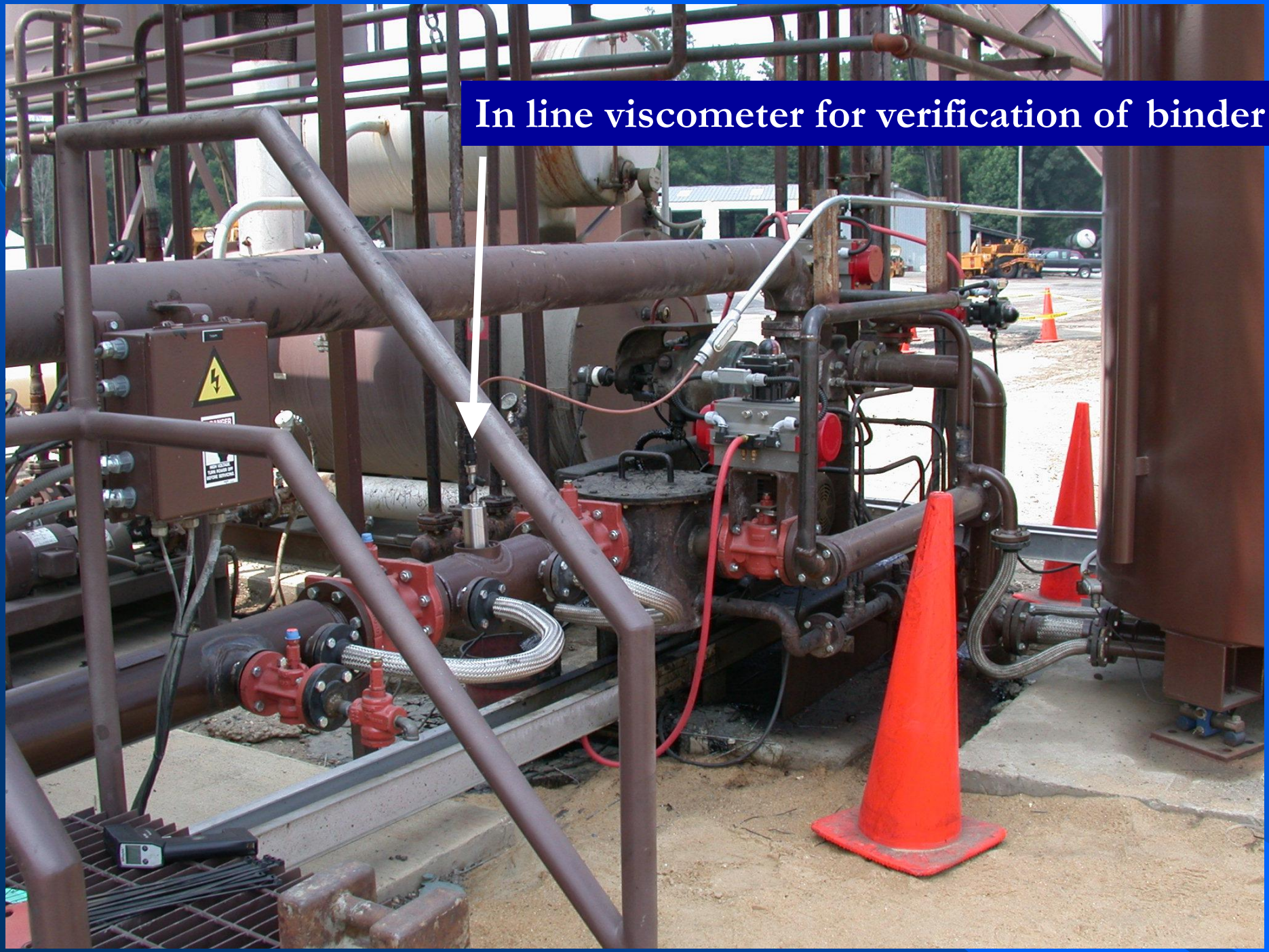
What is intelligent compaction?

- Automatic adjustable compaction equipment
- Selection of the most suitable equipment

GPS / positioning with reference station



At the mix plant are there other process that can be part of a QA program?


In line viscometer for verification of binder

No more dials and knobs in the modern plant.

Computer recordation

QA of the Future

- The QA will all be tied to Internet.
  - Direct down load of info to the owner.
  - Posting of data immediately to all parties.
  - Faster review and resolution of discrepancies.

Where We Are Going … Long Term

- Domestic Scan of other industries
- Move toward Quality Management Systems by all contractors and suppliers
  - Beyond ISO 9000 – sector specific requirement
    - Aerospace – AS9100
    - Automotive – ISO/TS16949
- Quality Based Selection and Procurement
- Design Build Warrant Maintain

Design Build Warrant Maintain - The Final QA?

- Long Term Warranty
  - Performance based contract
  - Guarantees product integrity
  - Contractor responsible for repair of defects or replacement
- Warranty Period
  - Pre specified for repair defects
- Present Warranty workshops to states.

… and beyond!

- Cannot continue on same path of regulate and enforce
- Cannot continue to police contractors trying to catch them in the act
  - System needed to match contractor's priorities in-line with agency's
  - Quality and long term performance

Thank You

Questions