



U.S. Department
of Transportation

**Federal Highway
Administration**

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NHI Course No. 13151

SUPERPAVE for Senior Managers

Participant Manual



National Highway Institute

FOREWORD

These course materials were developed for the National Highway Institute by the National Asphalt Training Center II of the Federal Highway Administration. The NATC II, under contract to the Office of Technology Applications, resides at the Asphalt Institute's Research Center in Lexington, Kentucky.

The objective of this educational program is to briefly discuss the Superpave Mix Design System and how it is being implemented. It is intended to highlight the main issues for senior management personnel.

This manual contains copies of the slides to be used as reference throughout the two hours of discussion.

This manual was co-authored by:

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Asphalt Institute*

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October 1997

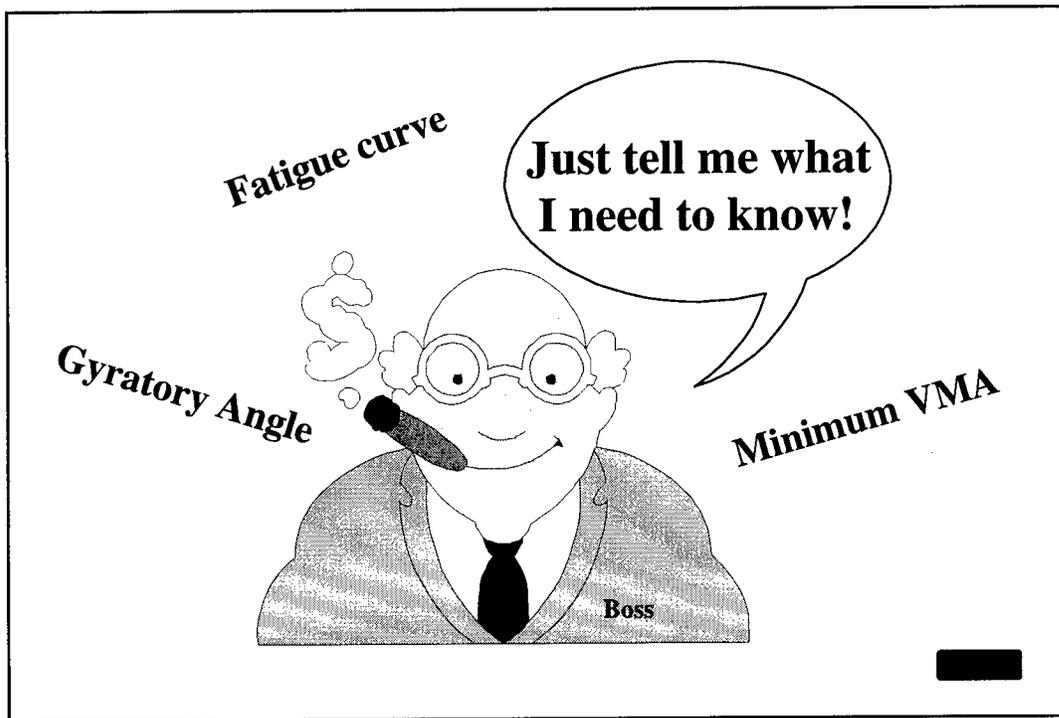
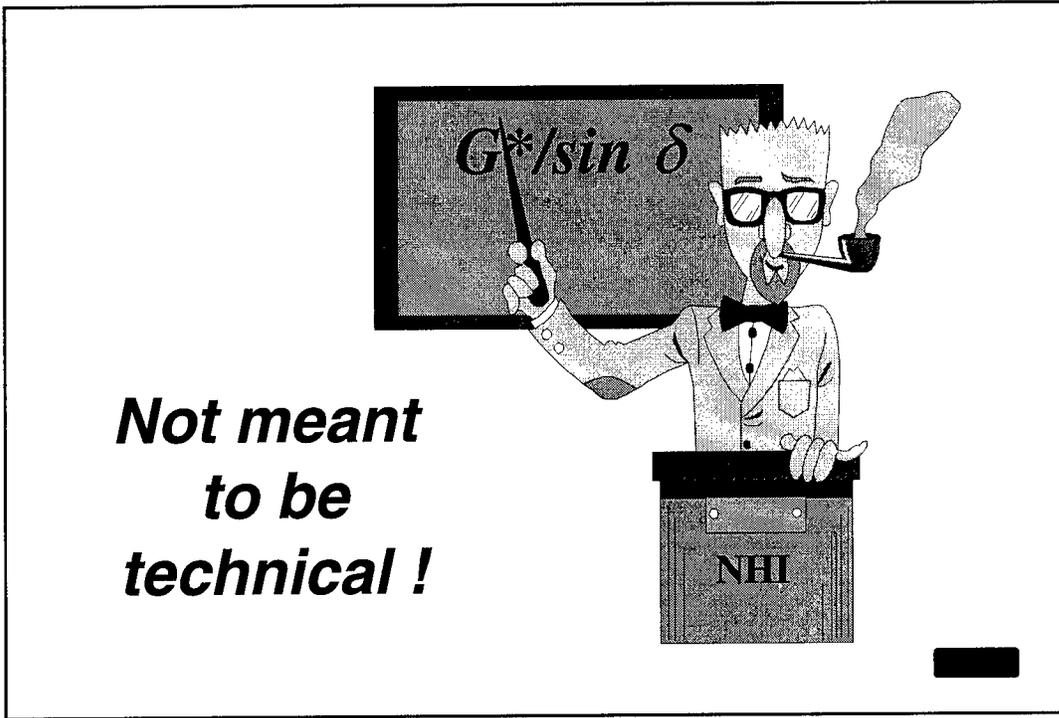
Superpave: For the Senior Manager



Federal Highway Administration

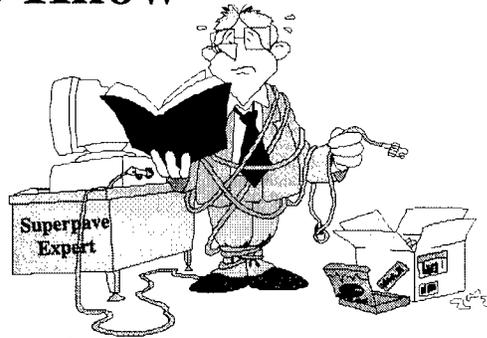
Intended Audience





What You Need to Know

- **What was SHRP ?**
 - ◆ ...Why did it happen ?
- **What did SHRP produce ?**
- **What is happening lately ?**
- **What are the concerns ?**



What was SHRP ?

...Why did it happen ?

What did SHRP produce ?

What is happening lately ?

What are the concerns ?

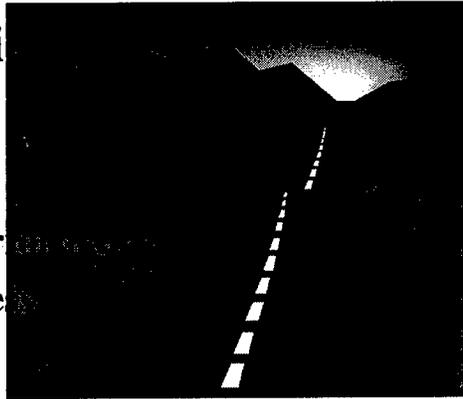
The need for Superpave



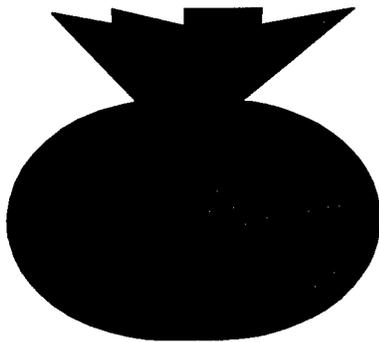
Strategic Highway Research Program

■ 5 Years, \$150 million

- ◆ *asphalt*
- ◆ cement and concrete
- ◆ long term pavement performance
- ◆ maintenance effectiveness
- ◆ bridge protection
- ◆ snow and ice control

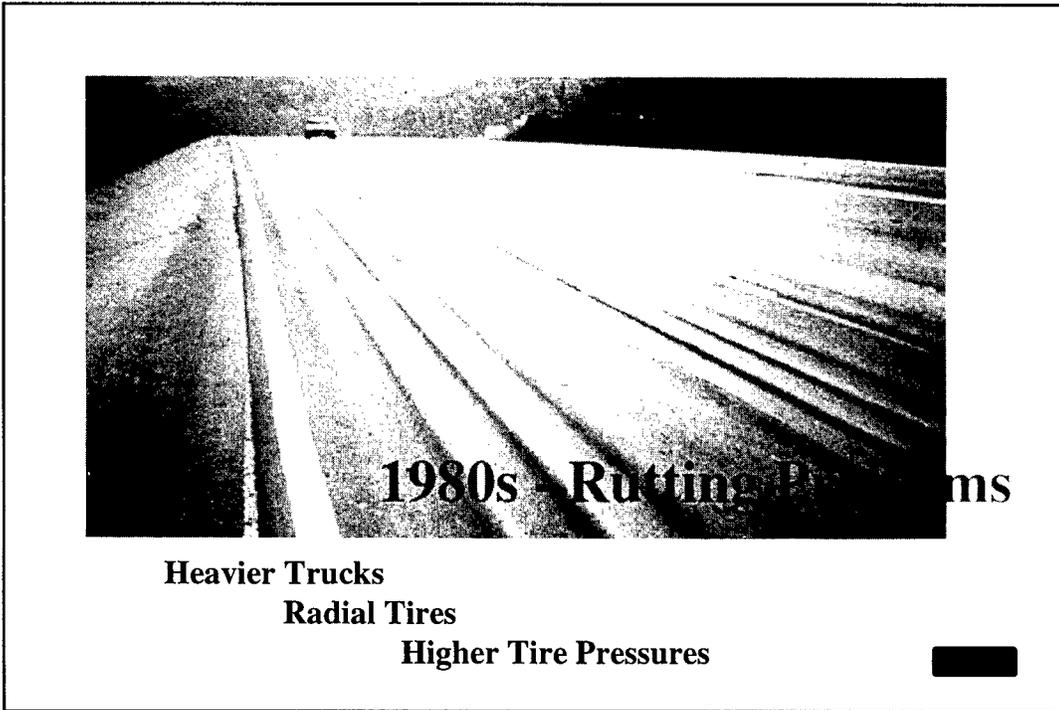
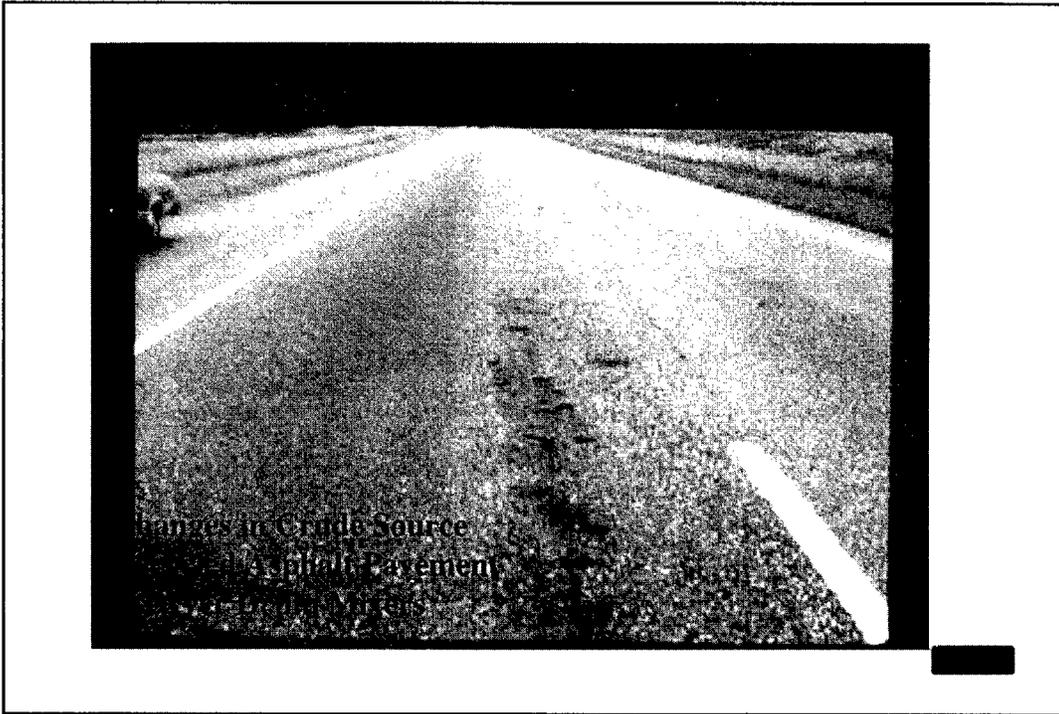


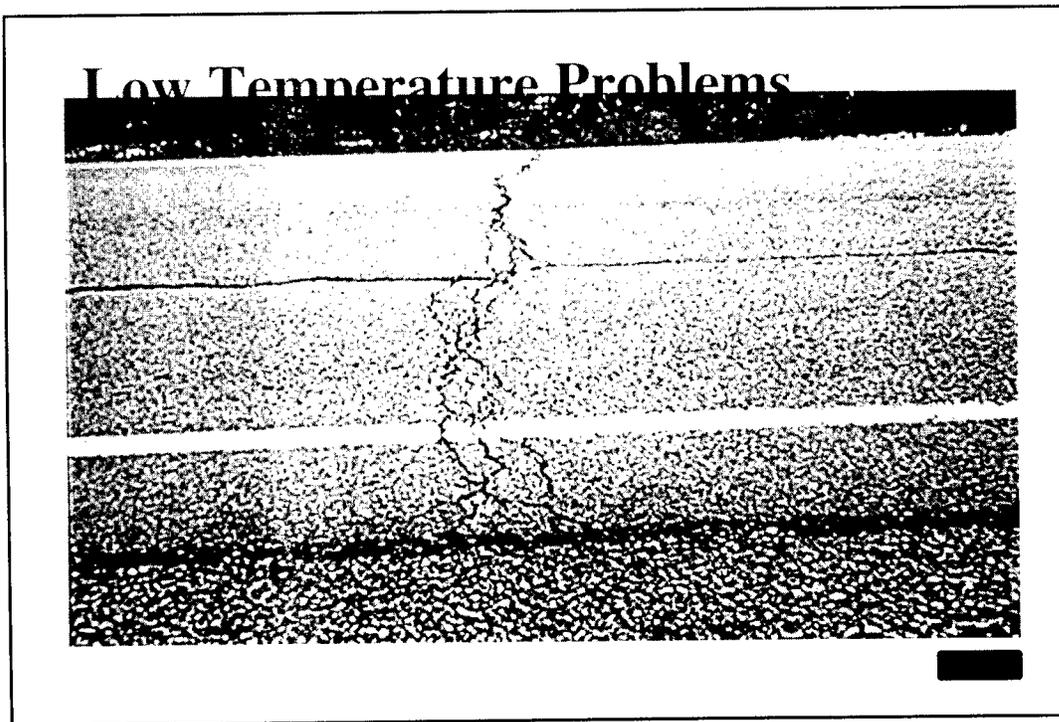
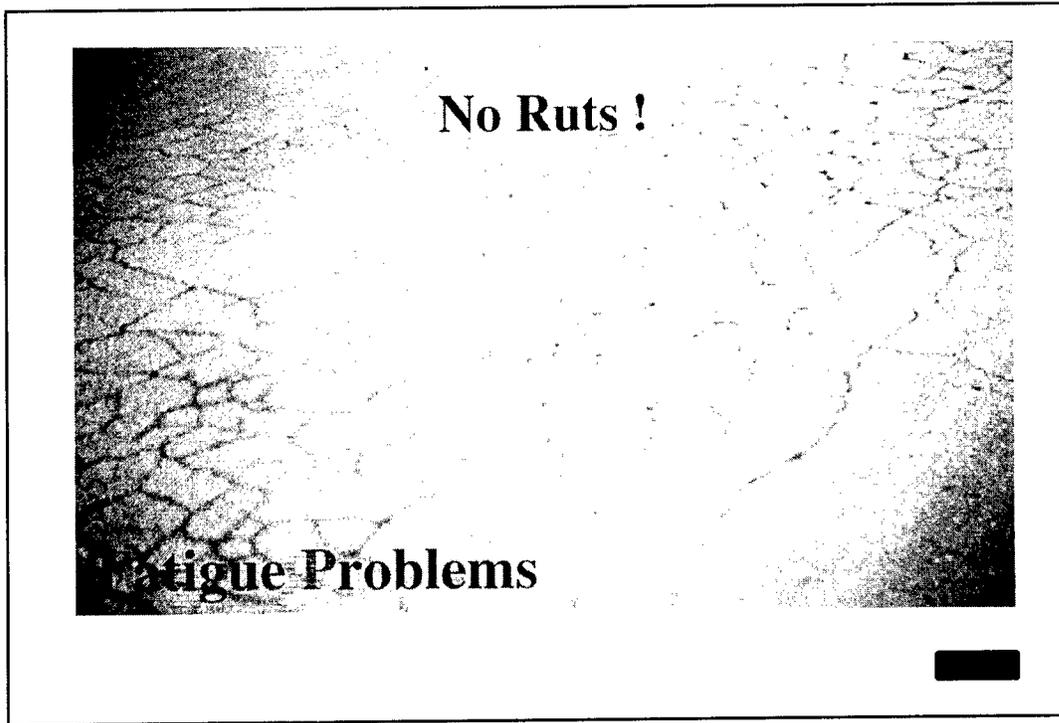
SHRP Asphalt Research

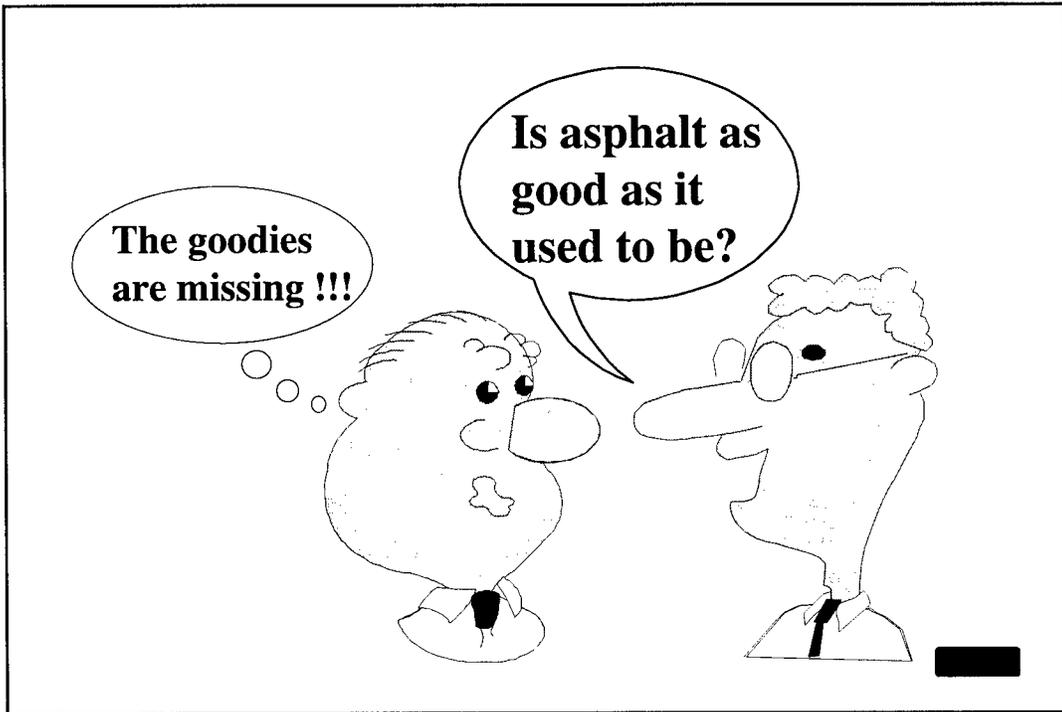


Why ?

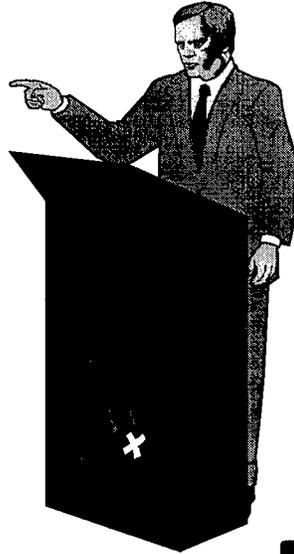






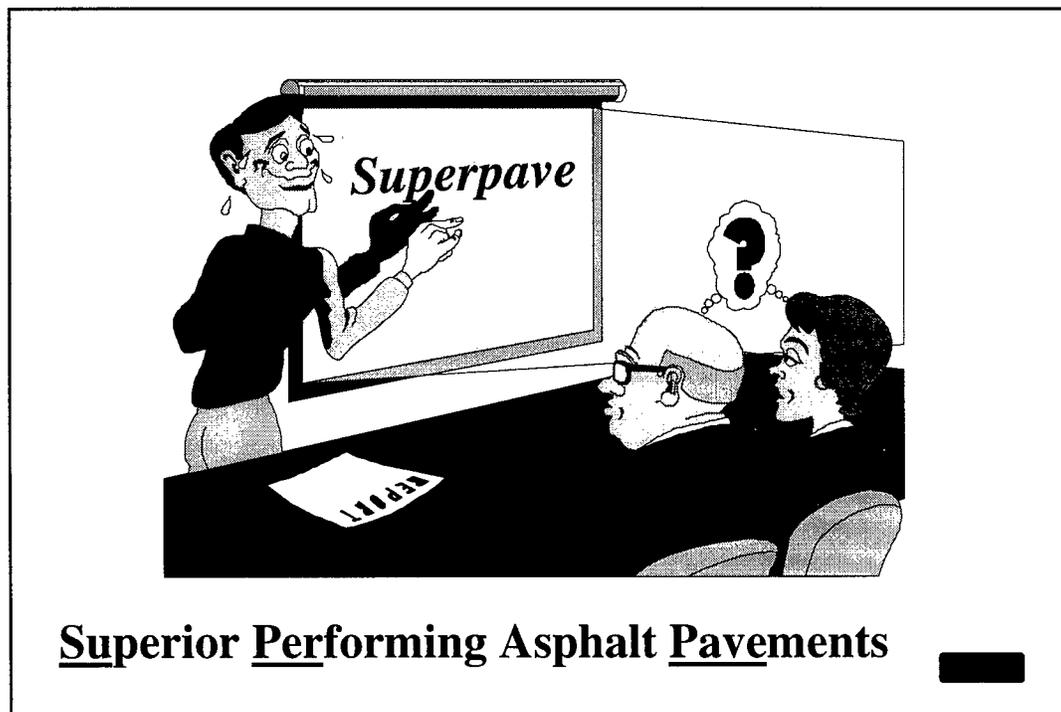
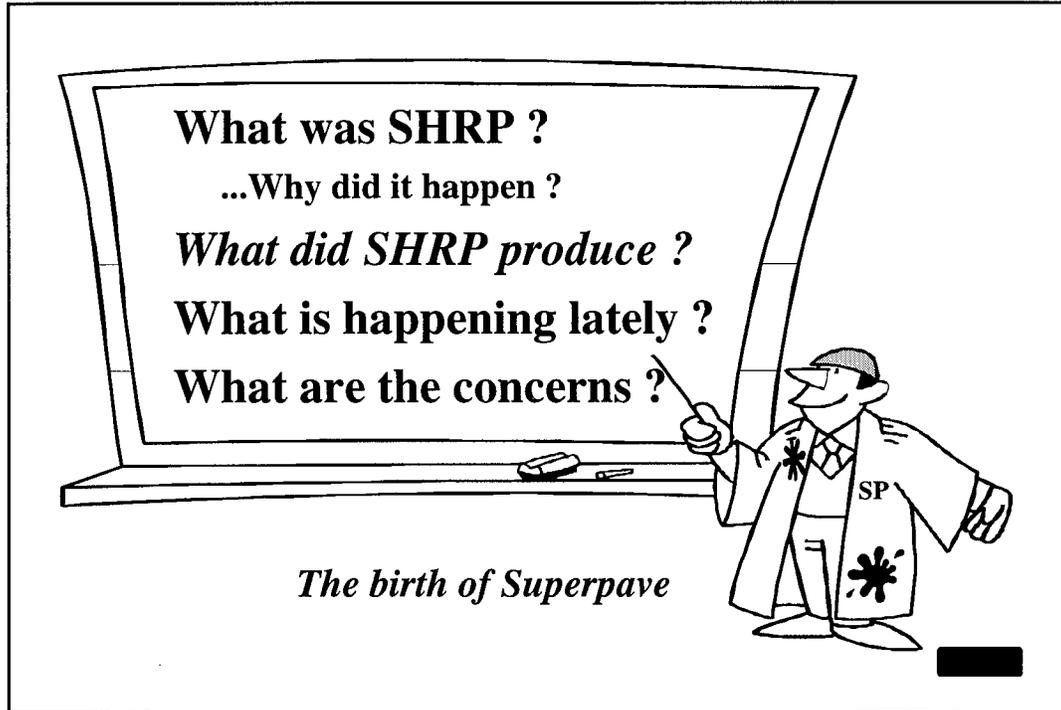


“We need a more robust asphalt cement...”



“Don’t forget about mix design and construction...”





Integrated System

■ Asphalt Binder Specification

- ◆ binder test methods & equipment

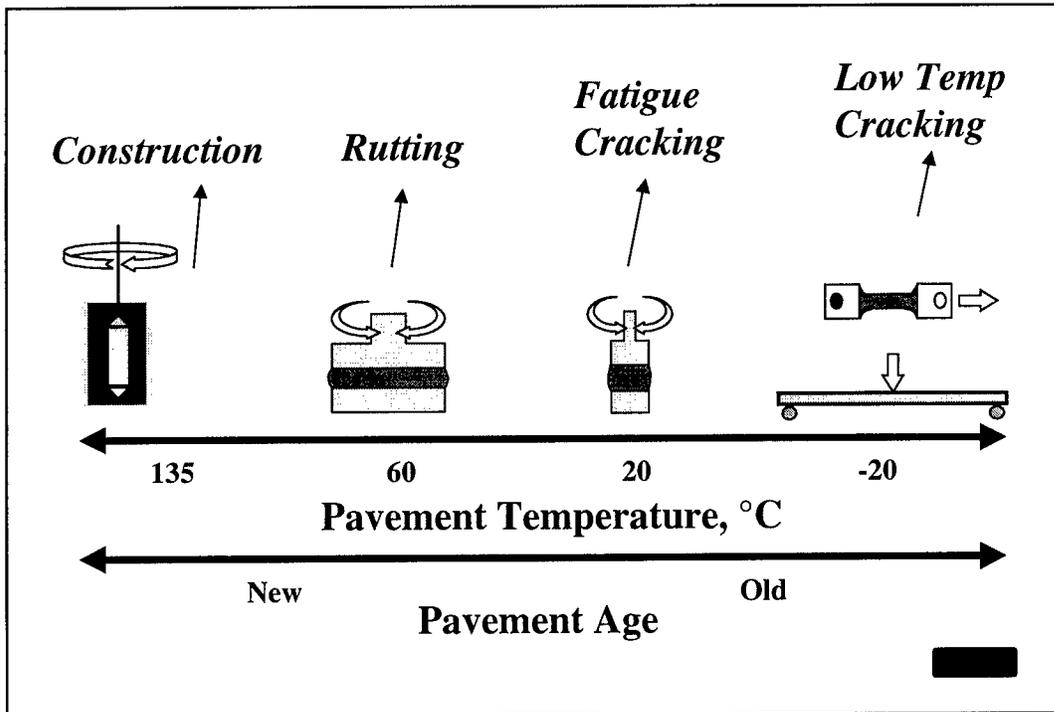
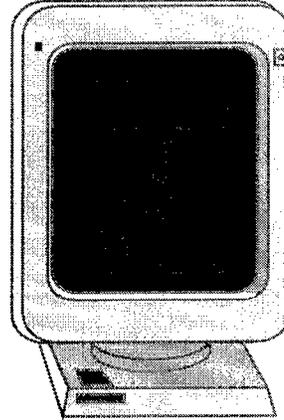
■ Mixture Design

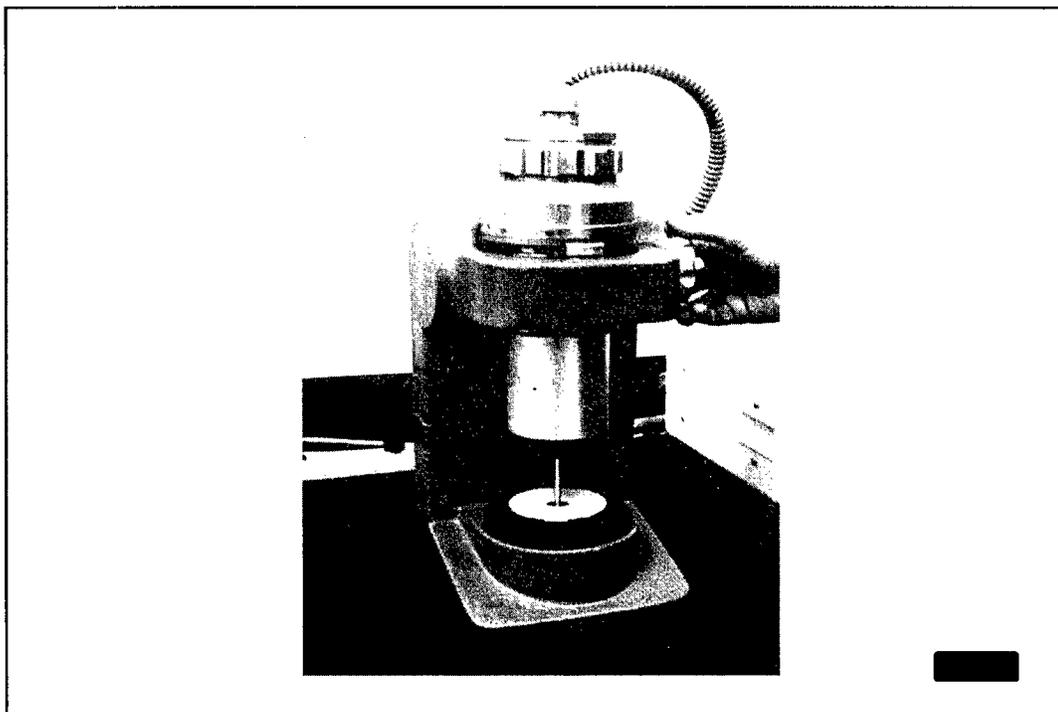
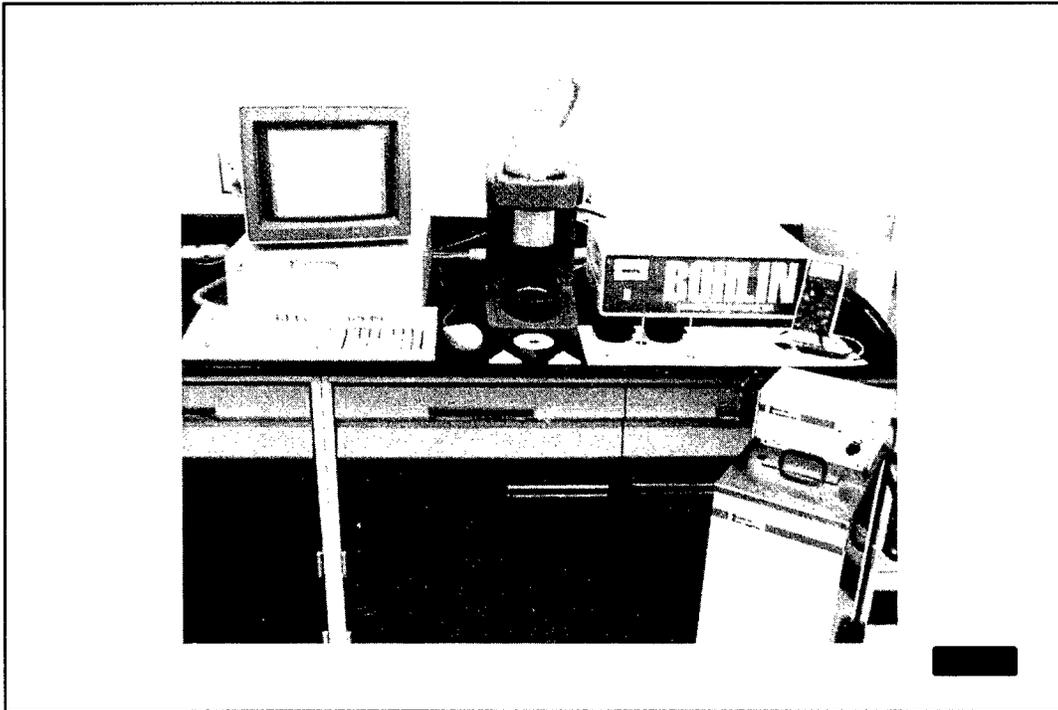
- ◆ component requirements
- ◆ volumetric proportioning
- ◆ new compaction equipment

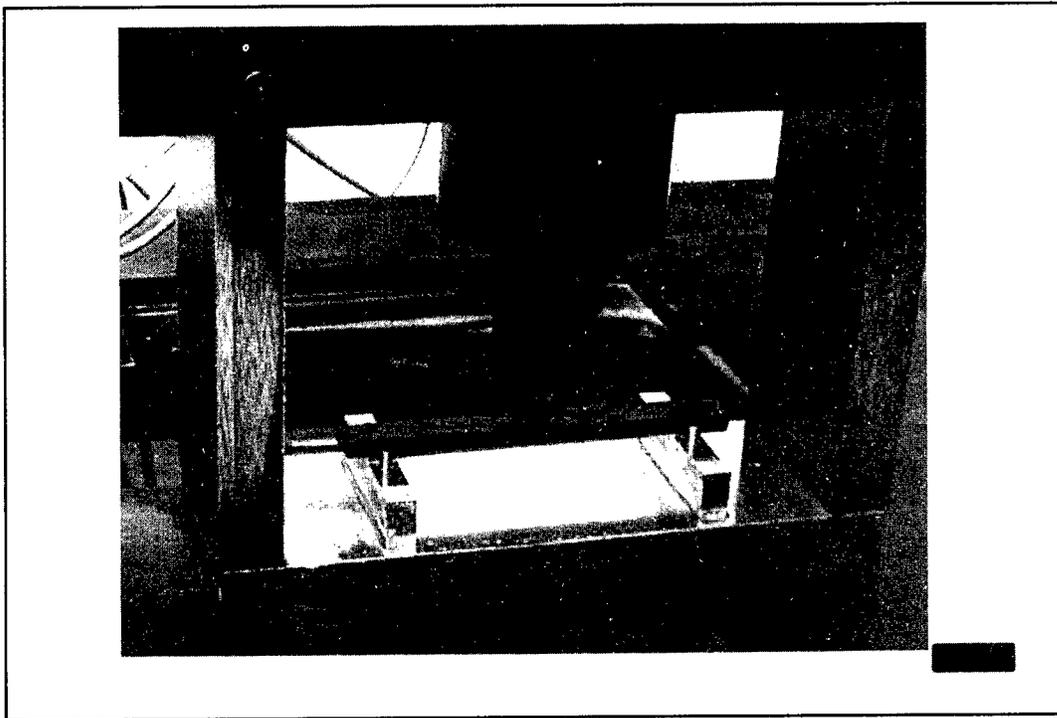
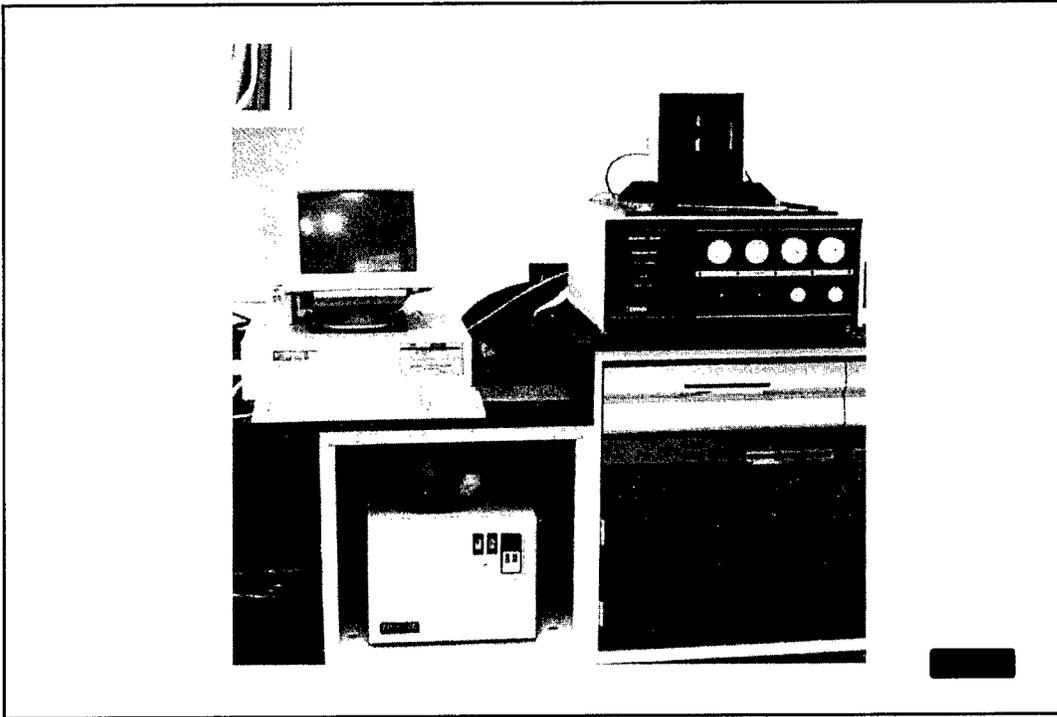
■ Mixture Analysis

- ◆ mixture performance testing

■ Software



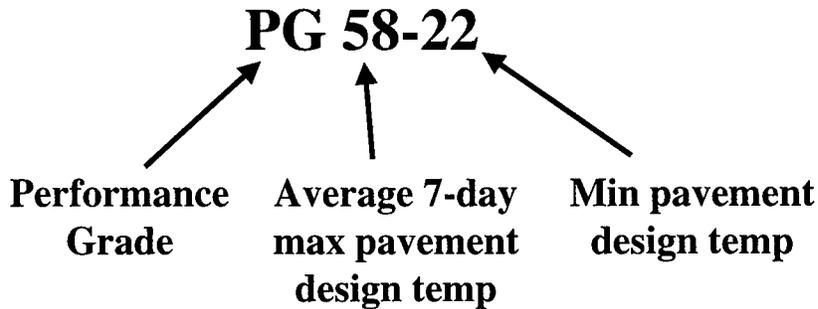




Avg	Spec Requirement Remains Constant	PG 58	PG 64	PG 70	PG 76	PG 82
1-		46	52	70	76	82
	$\geq 230^\circ\text{C}$					
	$\leq 3 \text{ Pa}\cdot\text{s @ } 135^\circ\text{C}$					
	$\geq 1.00 \text{ kPa}$	46	52	70	76	82
	(ROLLING T...					
	$\geq 2.20 \text{ kPa}$	46	52	70	76	82
	(Dynam...					
	(PRESSURE AGING VE...					
20 Hours, 2.07 M		100	100 (110)	100 (110)	110 (110)	
	≤ 5000					
	Test Temperature Changes					
$S \leq 300 \text{ MPa}$	$m \geq 0.300$					
	Report Value					
	$\geq 1.00 \%$					

Superpave Asphalt Binders

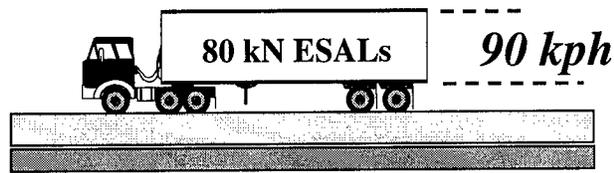
■ Grading System and Selection Based Primarily on Climate



Superpave Asphalt Binders

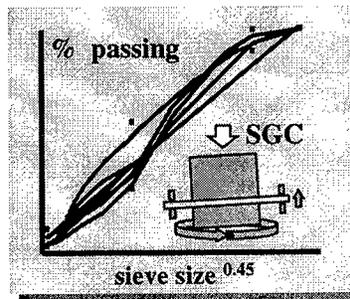
■ Binder Selection Also Based on

- ◆ traffic speed
- ◆ amount of traffic



Two Key Features of Mix Design

*Rigorous
Material Selection*

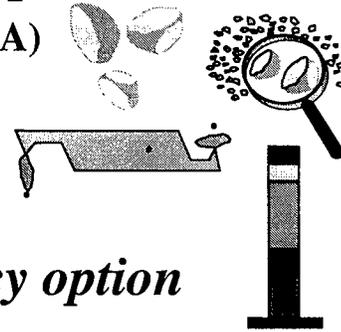


*Volumetric Design
by Superpave
Gyratory Compactor*

Aggregate Properties

■ Consensus Properties - *required*

- ◆ coarse aggregate angularity (CAA)
- ◆ fine aggregate angularity (FAA)
- ◆ flat, elongated particles (F & E)
- ◆ clay content (SE)



■ Source Properties - *agency option*

- ◆ toughness
- ◆ soundness
- ◆ deleterious materials

Superpave Aggregate Gradation

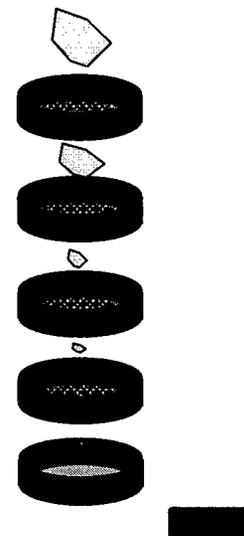
■ Use 0.45 Power Chart

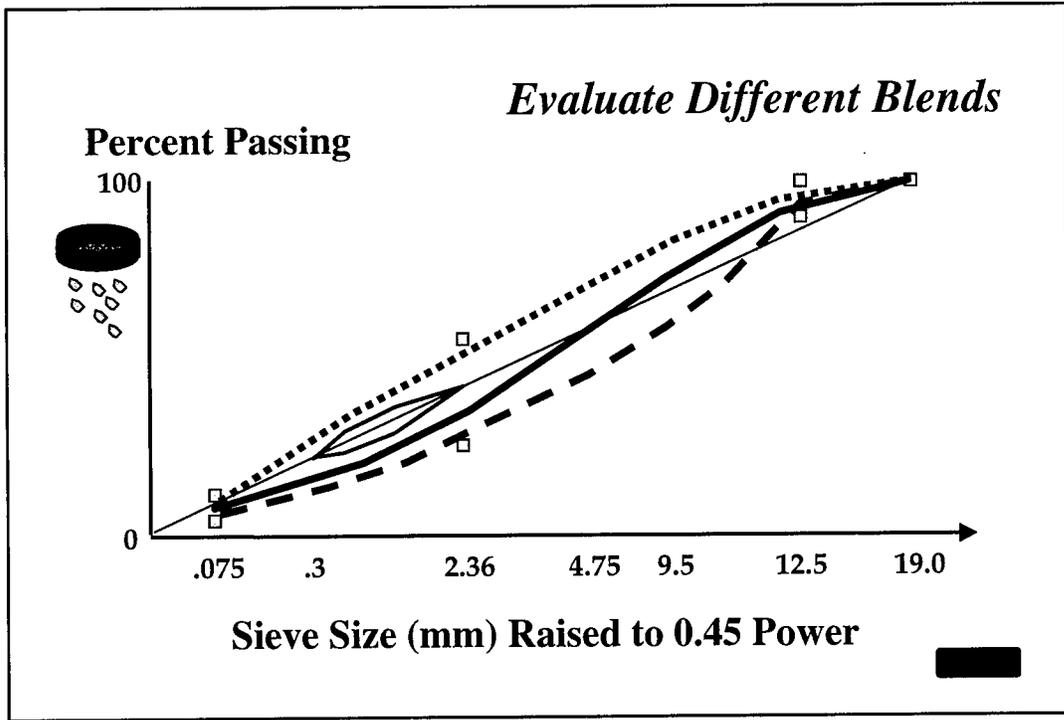
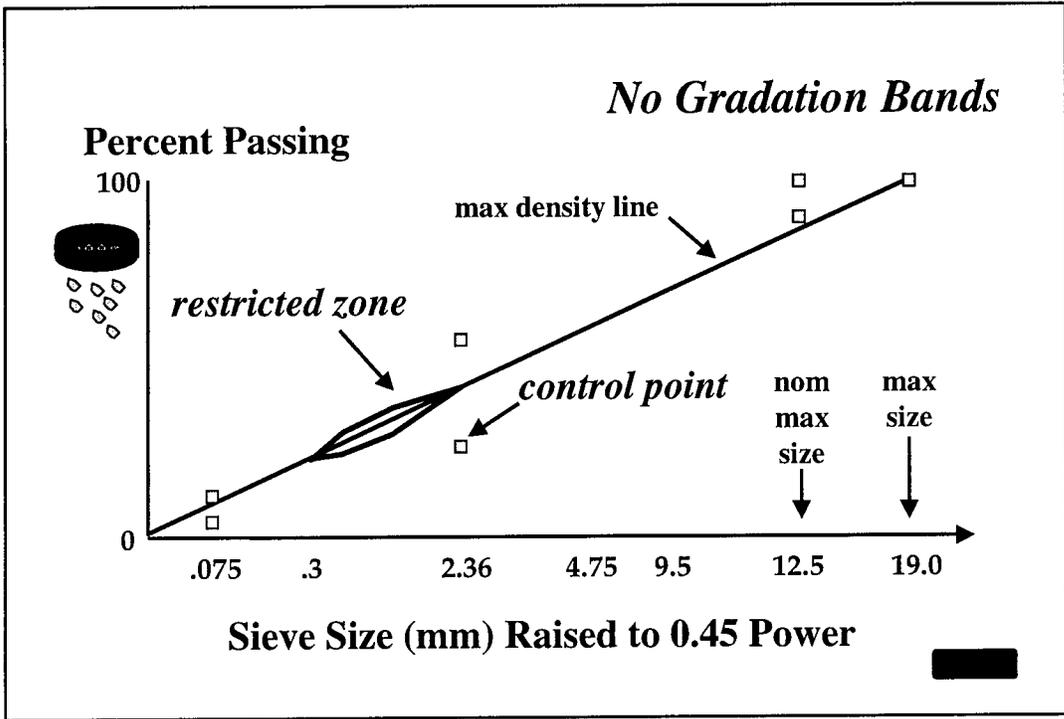
■ Blend Size Definitions

- ◆ maximum size
- ◆ nominal maximum size

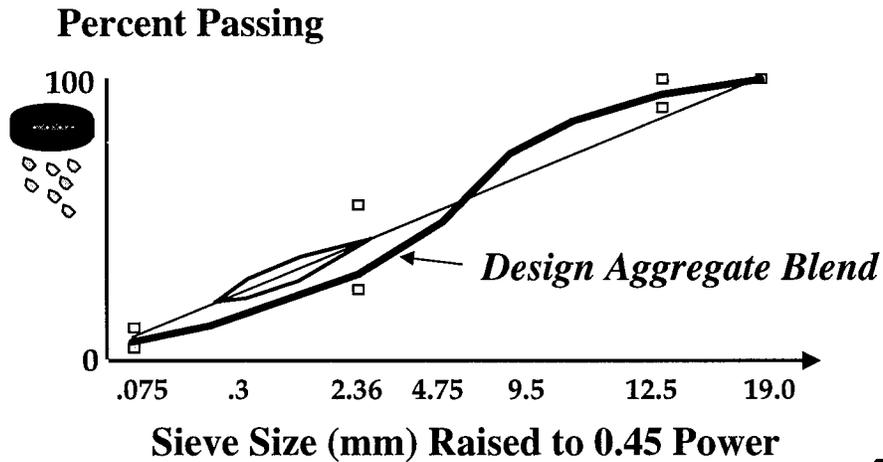
■ Gradation Limits

- ◆ control points
- ◆ restricted zone





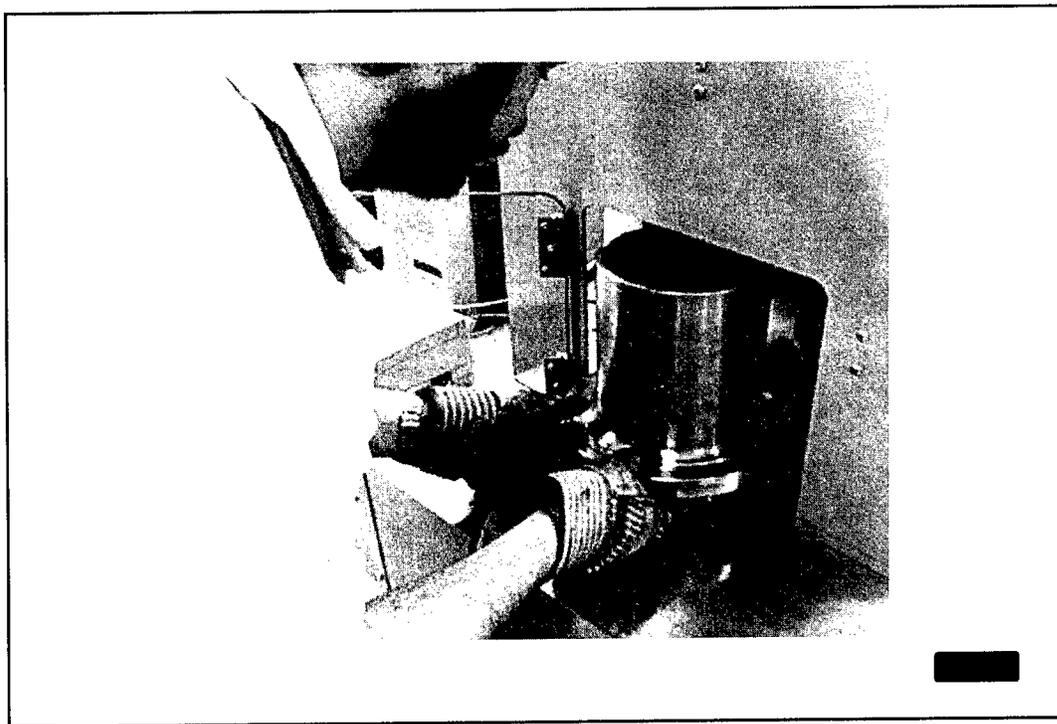
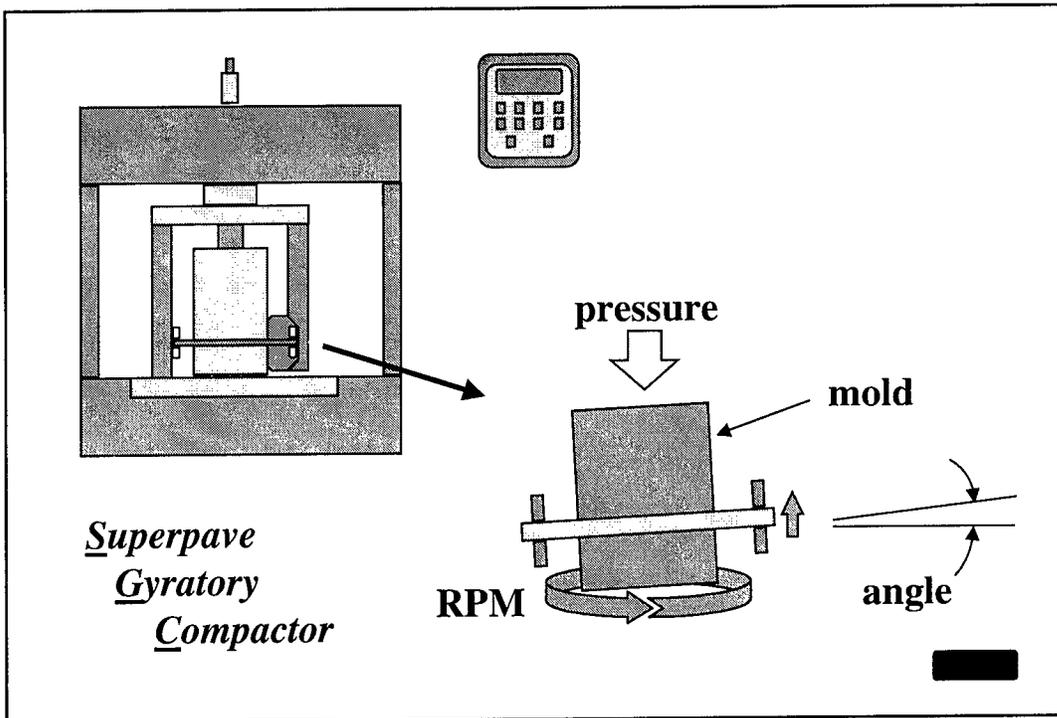
Selection of Aggregate Blend

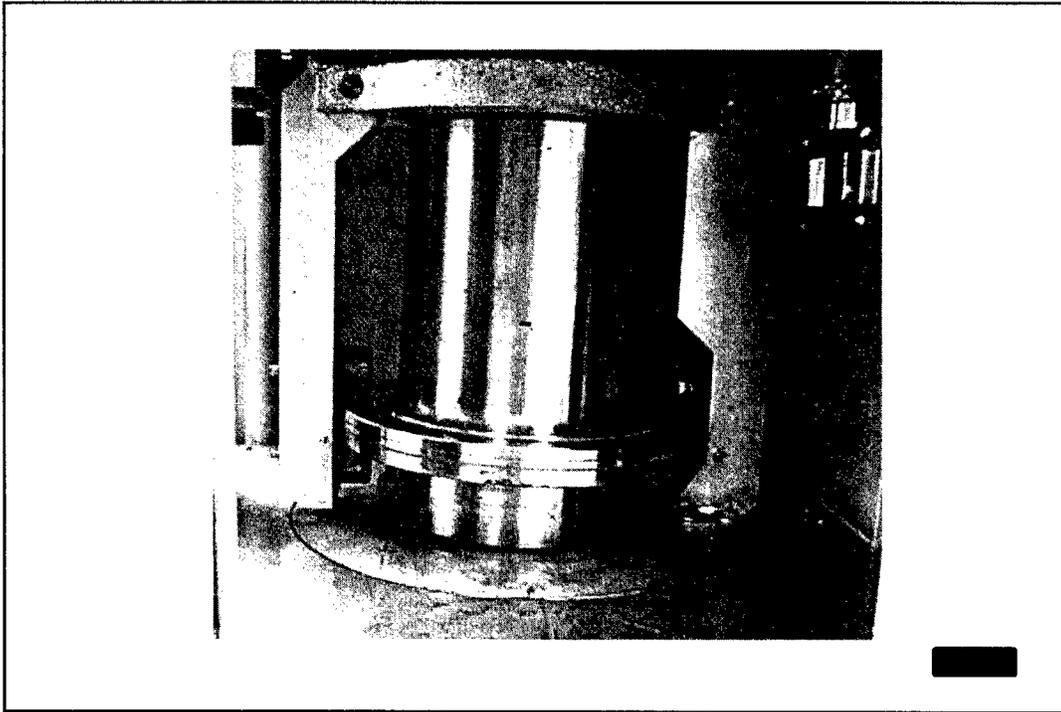


Goals of Superpave Compaction

- Simulates field densification
 - ◆ traffic
 - ◆ climate
- Accommodate large aggregates
- Measure compactability
- Conducive to Quality Control

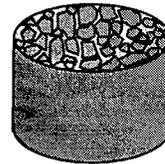
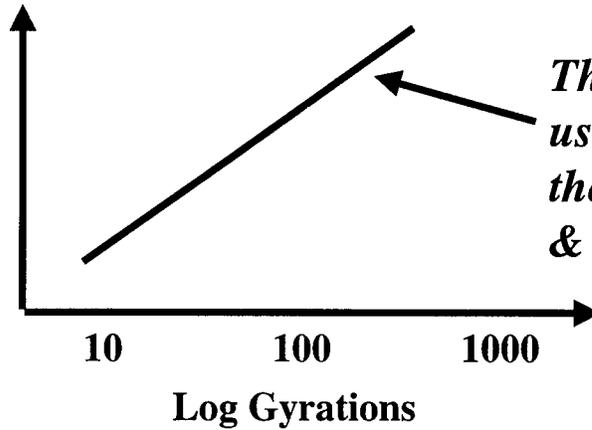






SGC Densification Curve

% Density

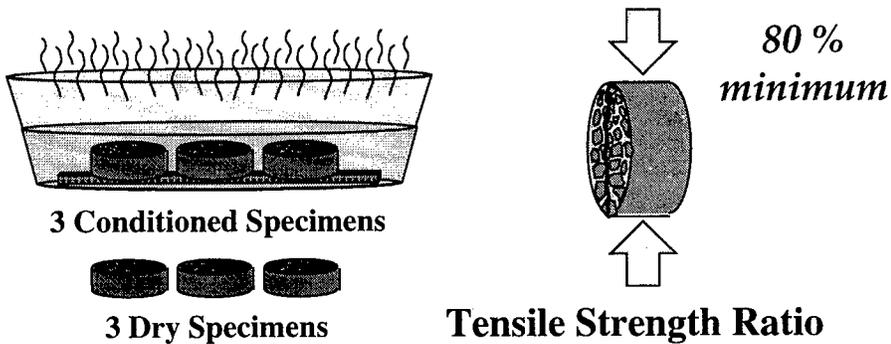


This info is used to select the proper blend & binder content

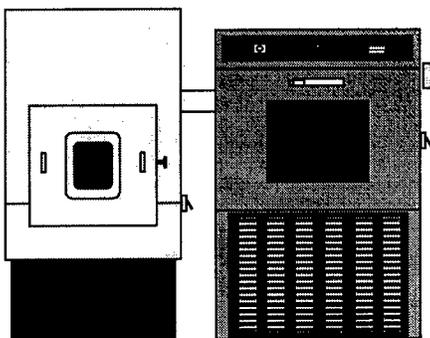
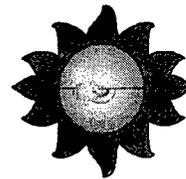
Moisture Sensitivity Evaluation

AASHTO T 283

■ Measured on Proposed Mixture

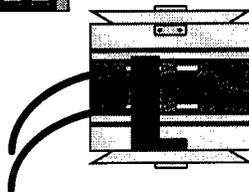


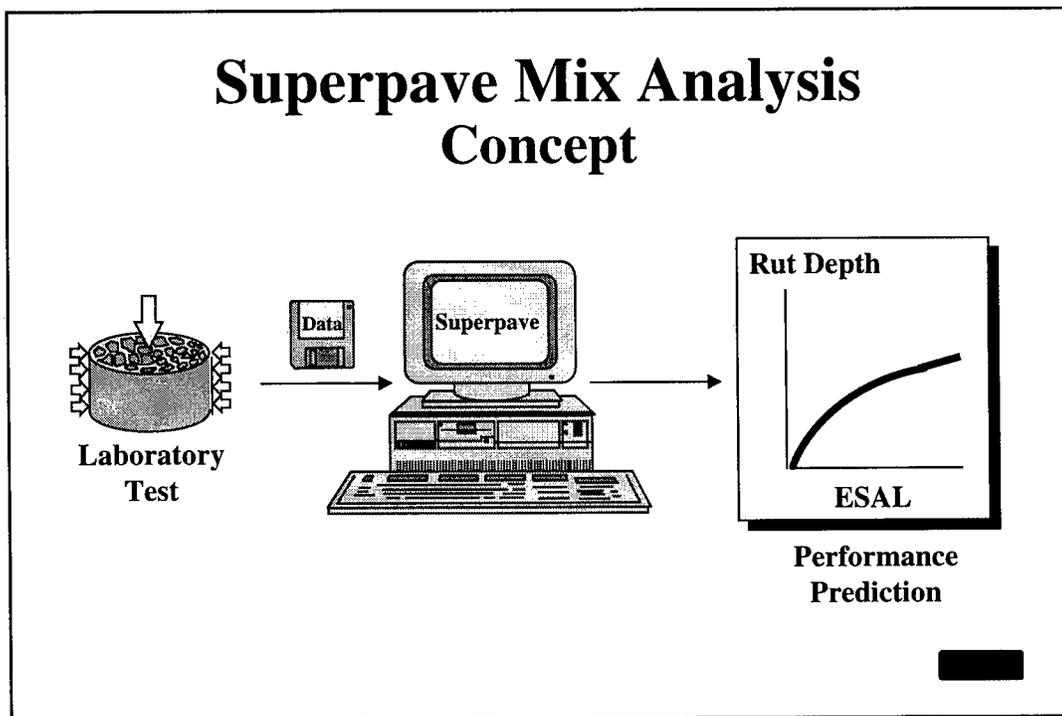
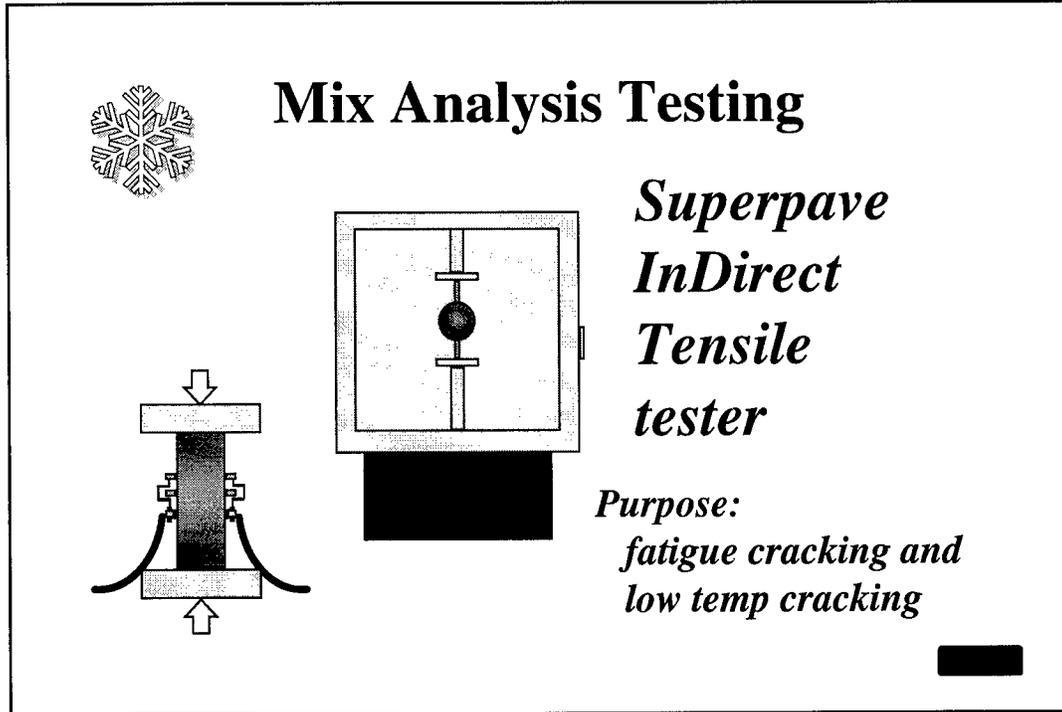
Mix Analysis Testing

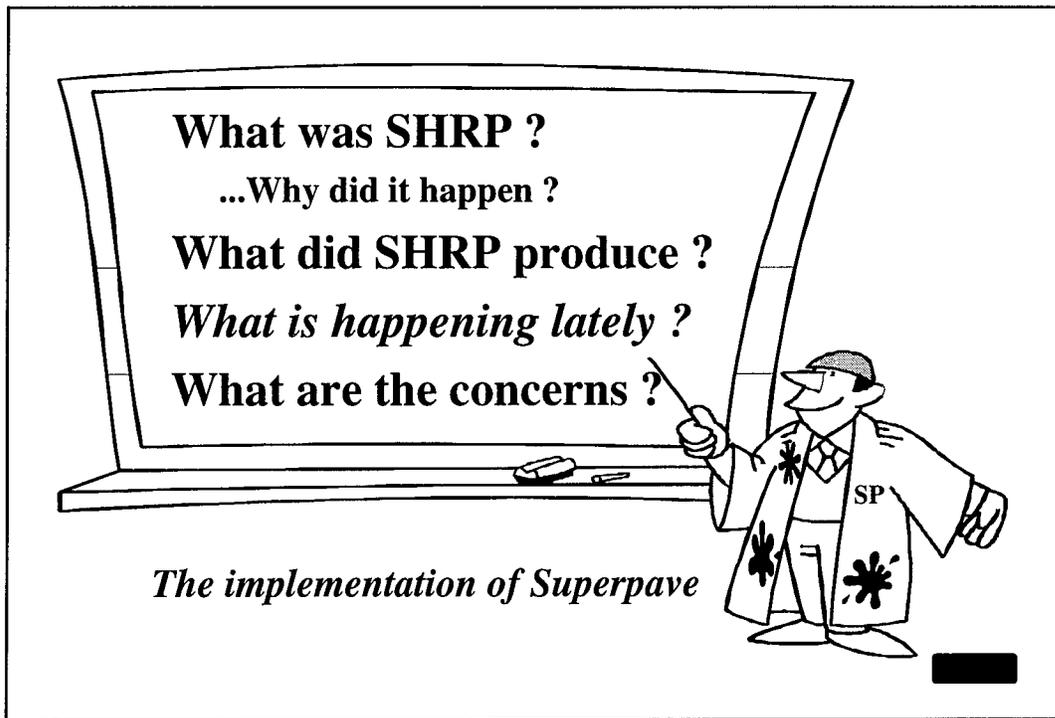


*Superpave
Shear
Tester*

*Purpose:
rutting and
fatigue cracking*







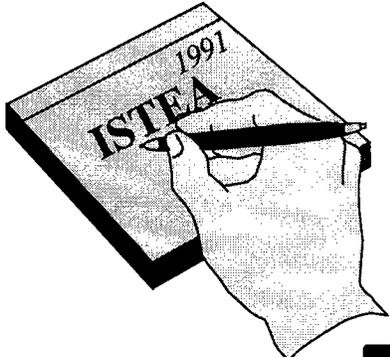
What was SHRP ?
...Why did it happen ?
What did SHRP produce ?
What is happening lately ?
What are the concerns ?

The implementation of Superpave

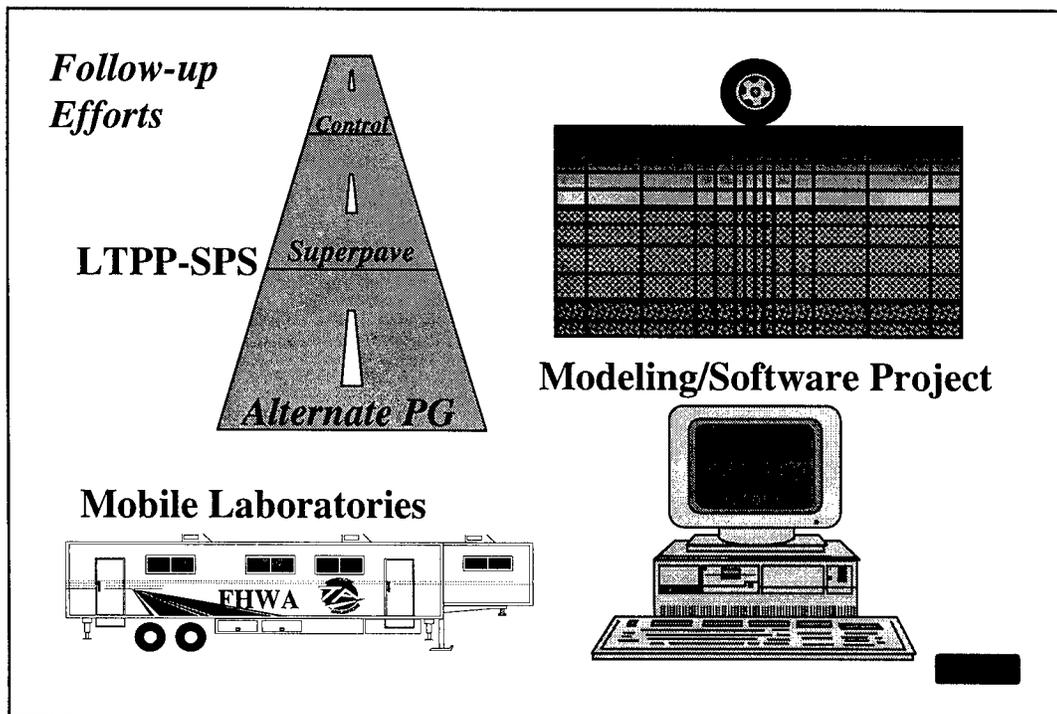
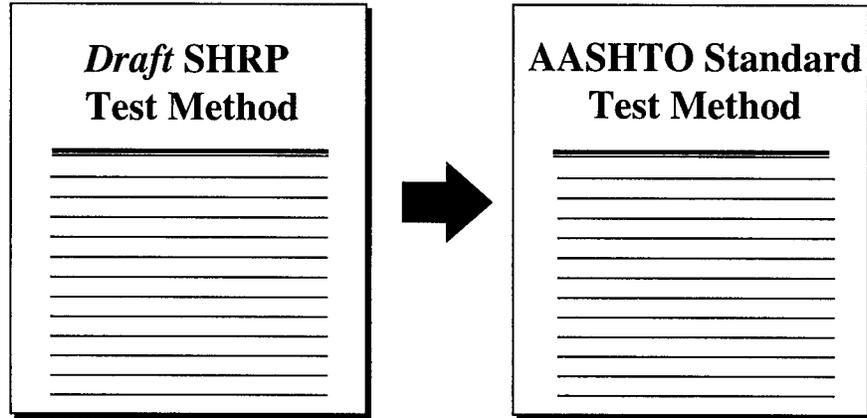
Implementing Superpave

■ **FHWA/State/Industry Partnership**

- ◆ pooled-fund equipment purchase
- ◆ AASHTO specifications
- ◆ LTPP continues
- ◆ NATC
- ◆ Superpave Centers
- ◆ Lead States
- ◆ *many others!*

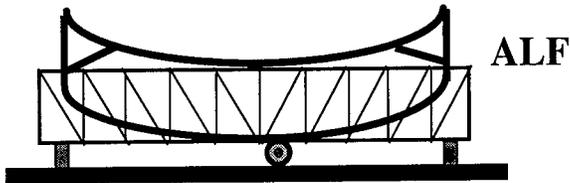
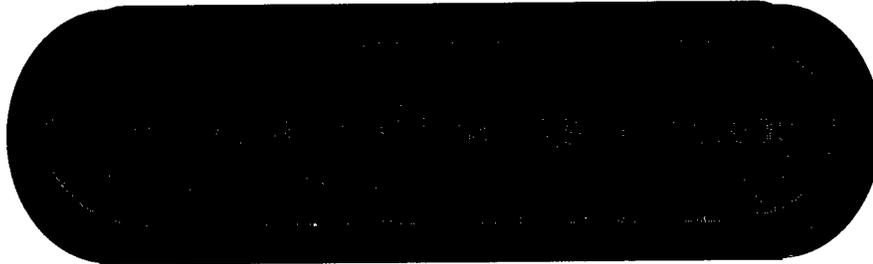


Methods and Specs



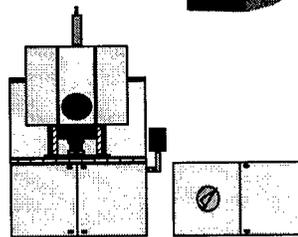
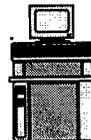
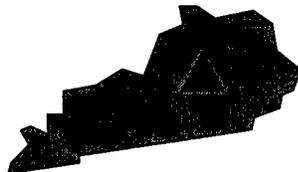
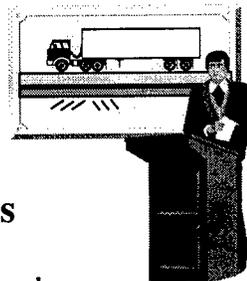
Controlled Superpave Test Sections

WesTrack



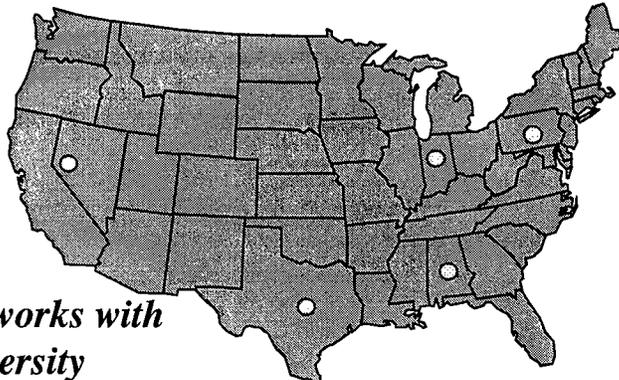
NATC II

- Continue binder & mix training
- Develop other training courses
- SST & IDT Ruggedness Experiments
- Laboratory testing
- Field Assistance



Superpave Regional Centers

- West Lafayette, IN
- State College, PA
- Auburn, AL
- Austin, TX
- Reno, NV

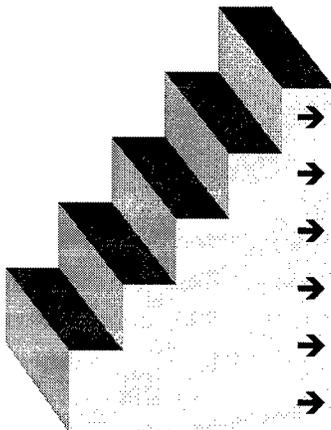


*Host state works with
Local University*

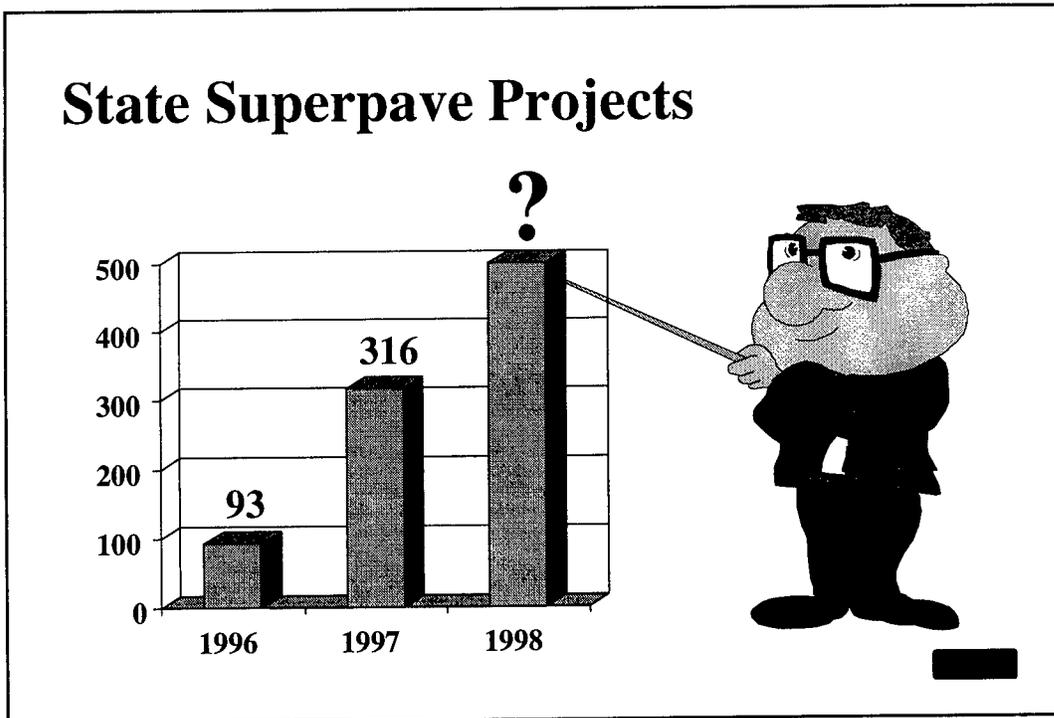
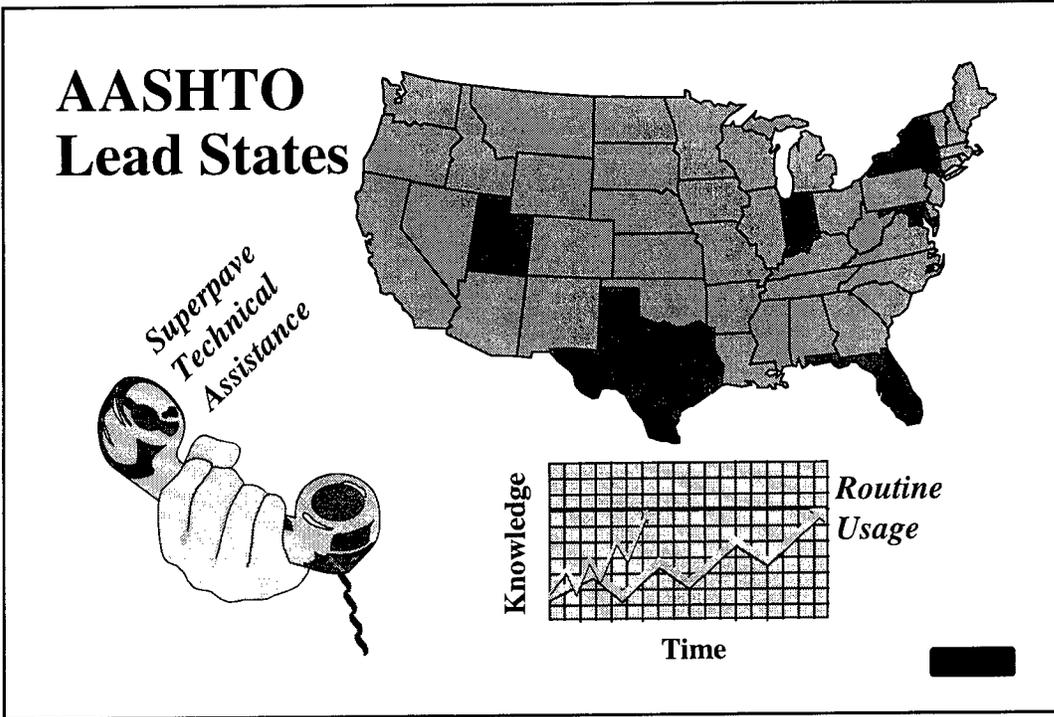
NCHRP

National Cooperative Highway Research Program

Superpave Research Studies

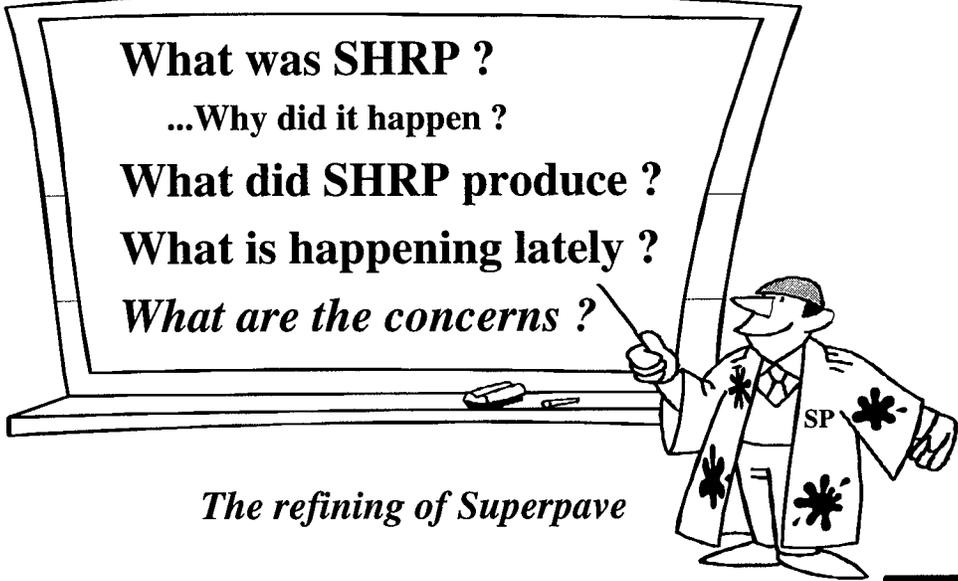


- 9-14, Restricted Zone Evaluation
- 9-13, Evaluation of T 283
- 9-12, Incorporation of RAP
- 9-10, Protocols for Modified Binders
- 9-9, Refinement of SGC Procedure
- 9-7, Field Procedures and Equipment



What was SHRP ?
...Why did it happen ?
What did SHRP produce ?
What is happening lately ?
What are the concerns ?

The refining of Superpave



“Our Current Mixes and Materials Won’t Meet Superpave Specifications.”

Maybe they shouldn’t!

How do you know... have you tried ?

Could you build a better “mousetrap” with Superpave ?



“What If We Have a Failure?”



**We have failures now...
will a Superpave failure be any worse ?**

Experience to Date

Very few failures

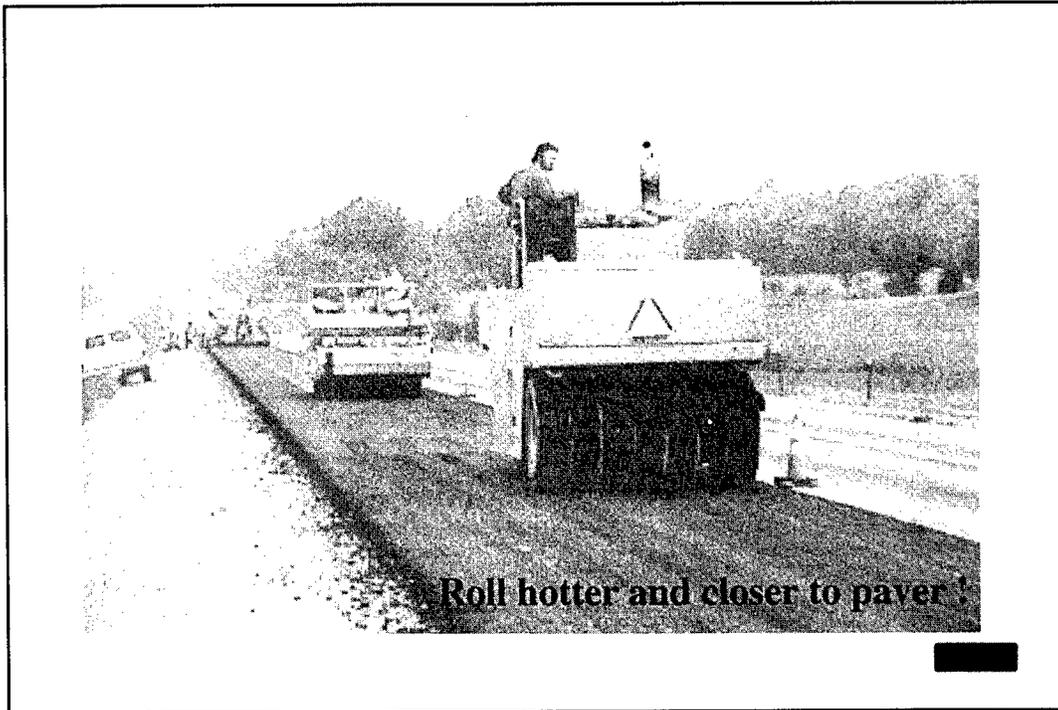
Very little rutting

Some construction difficulties

-- Usually overcome by

- minor changes to current paving practice**
- building a test strip first**





“All You’re Doing is Increasing the Cost of Mixes.”

Maybe...or maybe not.

Depends on :
binder selection strategy,
current mix design practice,
time and familiarity of industry,
and many other factors.

In some cases, the cost is less.

Extending paving life saves money !



What is the cost of a PG ?

Binder is 5 - 6 % wt. of mix

PG 64-22 - Likely AC-20 (say \$1)

**PG 70-22 - Maybe modified
AC-20 (?)**



**PG 76-22 - Likely modified
AC-20 (\$2-3)**



**“Superpave Will Require
Training of My Staff.”**



Yes it will!



“Superpave Isn’t Perfect Yet!”

“Some don’t like... *how it handles RAP,*
how it is used with QC/QA,
how I can’t use as much cheap sand,
the restricted zone,
gyratory won’t fit through the door,
it changed the weather,
it ruined my golf swing,
instant replay...”



General Experience

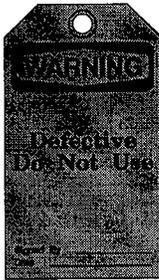
■ Superpave mixes

- ◆ perform better (rutting, cracking, moisture, aging)
- ◆ will compact
- ◆ do not segregate
- ◆ usually cost about the same



Just give it a chance !

Those Who Say “Not Yet”



- Never be perfect
- Always one more “rock”
- Don’t want it to work
- Have vested interest



- ◆ product
- ◆ equipment
- ◆ services



Expert Task Groups

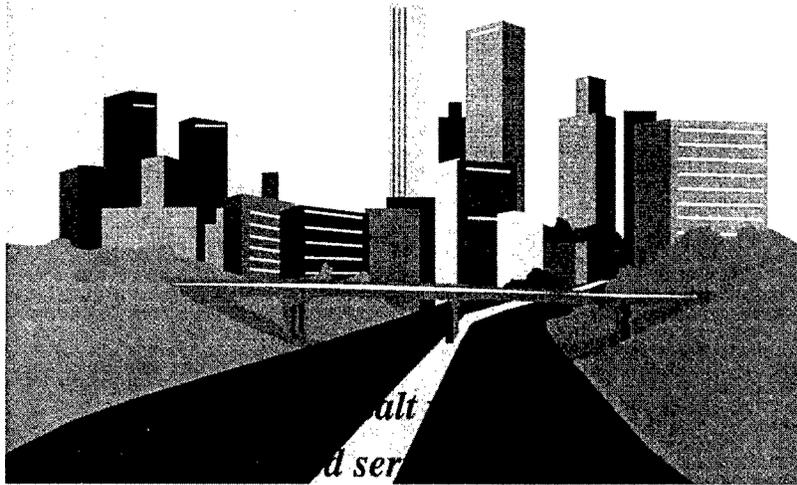


- Binder
- Mix
- Models

*Addressing the issues
based on real data !*



Final Payoff



The End



