

Longitudinal Joints

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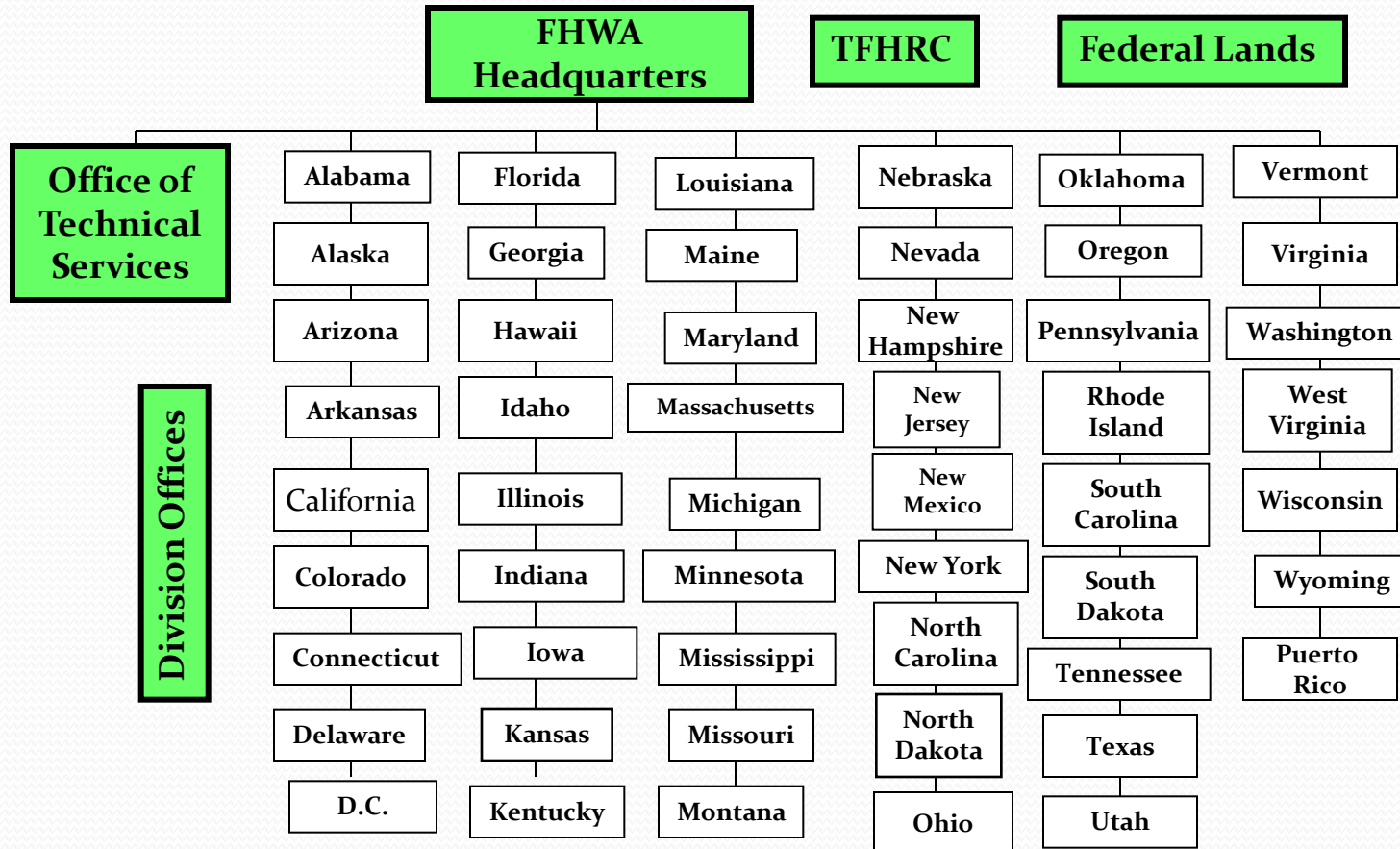
FHWA Resource Center

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Topics to be discussed:

- 1) FHWA and the LJ Workshops.**
- 2) Compaction Concepts.**
- 3) Longitudinal Joint Recommendations.**

FHWA Organization



Without Pavement, We Would Be Stuck in the Mud!



Washington-Richmond road, 1919

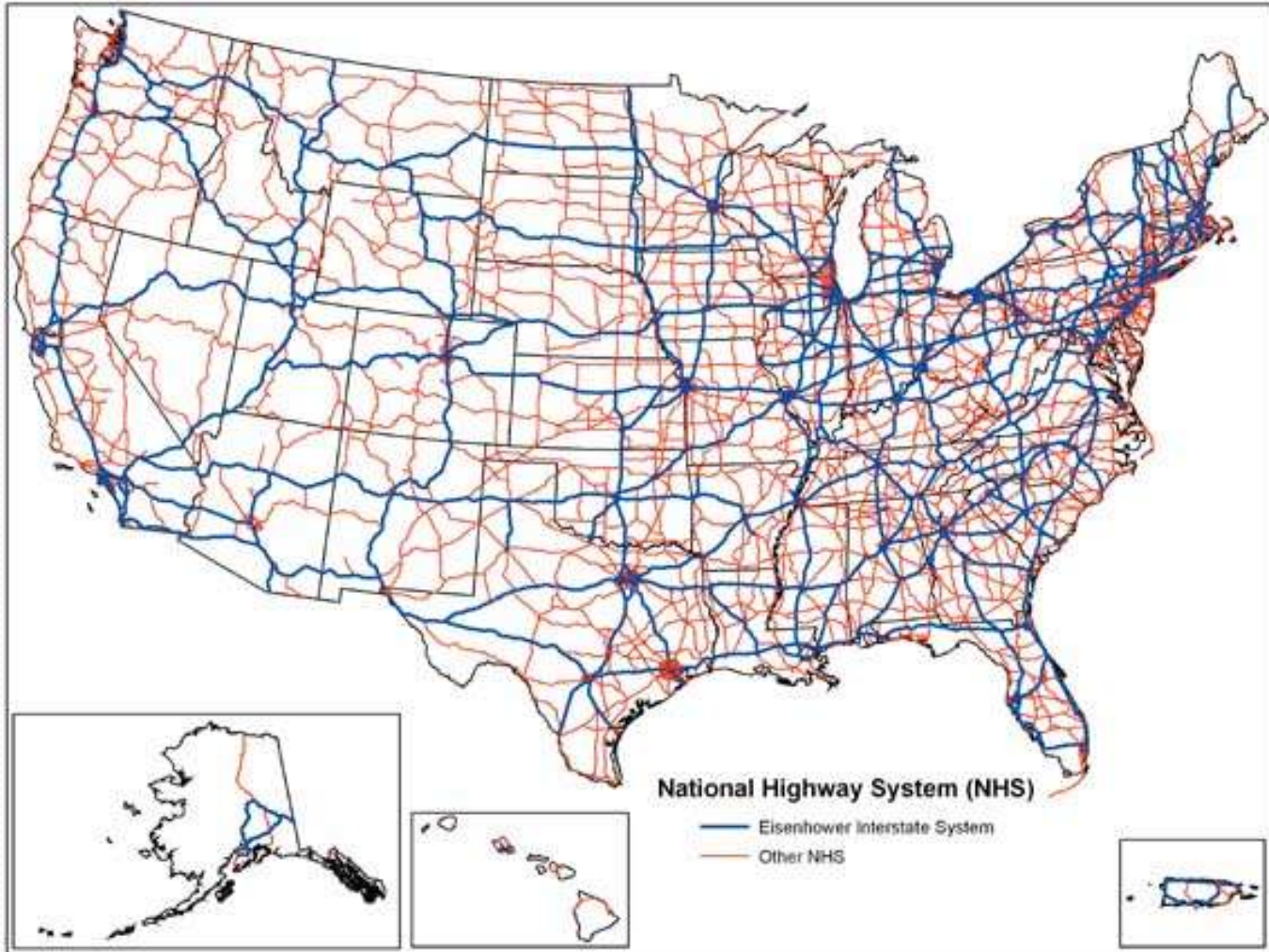
NMAH, Archives Center, API Collection

We've Come a Long Way.....



4 Million Miles of Roads

600,000 Bridges



Statistics We Should Know:

Federal = 3%

State = 20%

Local = 77%

2/3 are Paved (1/3 Unpaved)

94% of Paved have an Asphalt Surface

The Federal Role:

- Promote uniformity, quality, and safety aspects of highway construction and maintenance.
- Develop, promote, and provide new technologies and training.
- Stewardship of the Federal-aid program and its investments.

Society Depends on Our Public Infrastructure

SOCIAL INTERACTIONS

ECONOMIC TRANSACTIONS

INFRASTRUCTURE

Roads, Bridges, Airports, Water Systems, Wastewater Systems,
Gas, Electric, Telephones, Waterways, Coastal Facilities, Parks, Etc.



**Take Good Care of What
We've Already Built!**

**When we repair or
reconstruct our pavements -
the goal is to do it right!**

FHWA Pavement & Materials Program

Process to Deliver National Pavement Network That Is:

- Safe
- Cost Effective
- Long Lasting
- Effectively Maintained



Best Practices for Specifying and Constructing HMA Longitudinal Joints

A Cooperative Effort between
Asphalt Institute & FHWA



West Virginia 4-hr Pilot Workshop

Jan 11, 2012

Tom Harman - "Overall this was a Home run"



Compaction of Longitudinal Joints

– Challenging Issue for Years

- **1970's and 1980's – told not to test!**
- **Mid-1990's – RMAUPG identified LJ's as a major issue, created a LJ Task Force**
- **Much Research, Many Opinions**
 - **NCAT Study**
 - **NAPA – Notched Wedge Joint Publication**
 - **FHWA/AI Search for Best Practices – 2012 Workshops**



Photo by
James Scherocman, P.E

**Longitudinal
Joints
are Still
a Challenge
for Many
Agencies.**

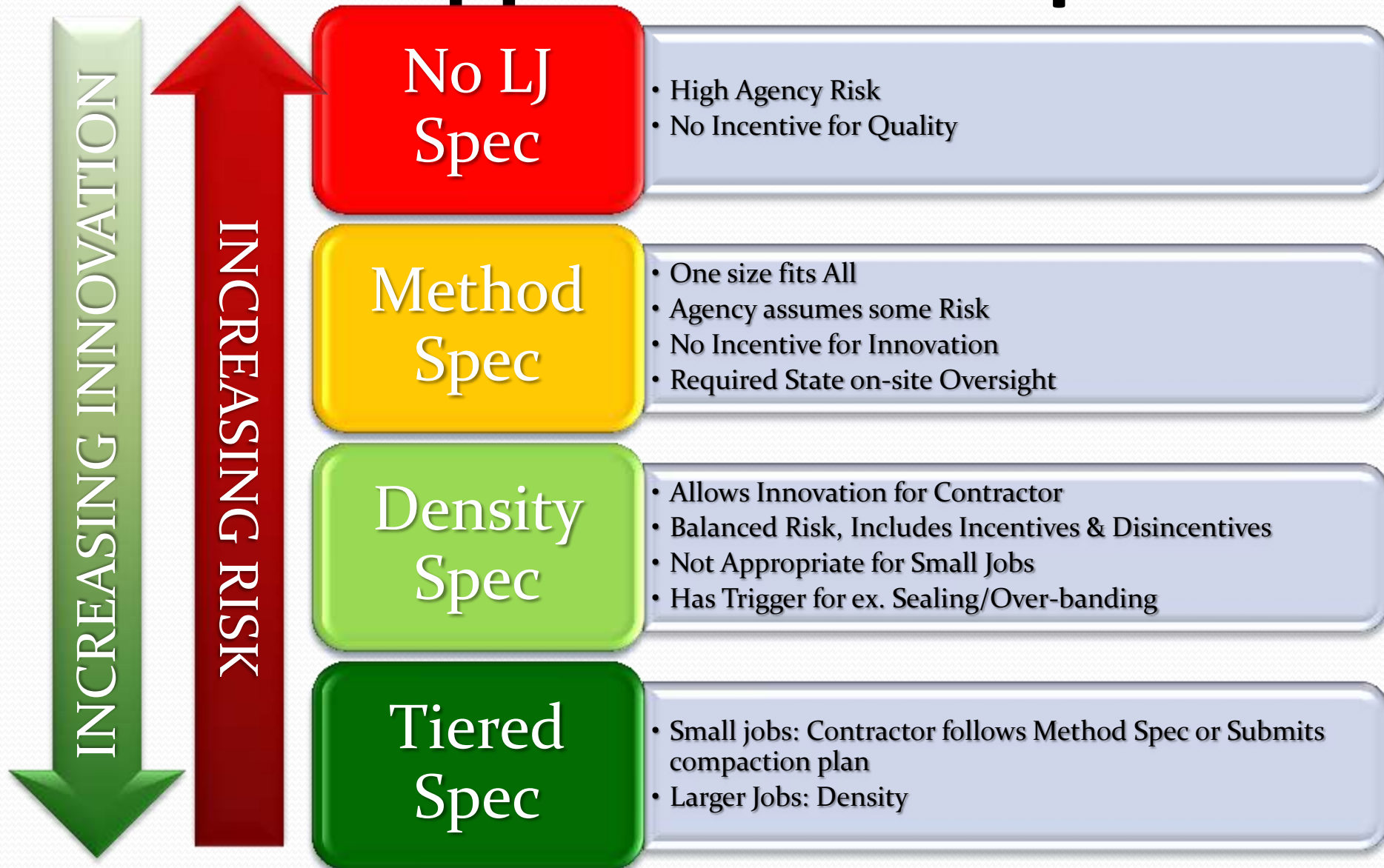
CT - RT 118
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Various Approaches to Specs:



INCREASING INNOVATION

INCREASING RISK

No LJ
Spec

- High Agency Risk
- No Incentive for Quality

Method
Spec

- One size fits All
- Agency assumes some Risk
- No Incentive for Innovation
- Required State on-site Oversight

Density
Spec

- Allows Innovation for Contractor
- Balanced Risk, Includes Incentives & Disincentives
- Not Appropriate for Small Jobs
- Has Trigger for ex. Sealing/Over-banding

Tiered
Spec

- Small jobs: Contractor follows Method Spec or Submits compaction plan
- Larger Jobs: Density

Proper Construction?



Photo by
James Scherocman, P.E

Rolling – Cold Side or Hot Side?



You Get What You Inspect, Not What You Expect!

Measured Density?



Using cores.....



Or a nuclear density gauge

The Weakest Link:



Poor Joint Performance is an Agency and Industry Concern

- LCCA**
- Alternate Bid Competitiveness**
- DOT Program Costs**
- HMA Industry's Livelihood**
- the Travelling Public**

Goal LJP = MP

**Longitudinal Joint Performance
equals
Mat Performance**





“We can't solve problems by using the same kind of thinking we used when we created them.”

30' Screed – No Longitudinal Joint!



A hand-drawn diagram illustrating aggregate particles in asphalt cement. A central globe shows three types of aggregate particles: a large angular particle with many sharp, fractured faces, a smaller angular particle with fewer sharp faces, and a smooth, rounded particle. Red arrows point from text labels on the right to these particles. Below the globe, two anthropomorphic aggregate particles are shown. The angular one is smiling and has a speech bubble, while the smooth one is frowning and has a sign. The background is a textured orange-brown, and the foreground is a purple surface with scattered aggregate outlines.

AGGREGATE

ASPHALT
CEMENT

AIR VOIDS

FRACTURED
OR CRUSHED
FACES ARE
BEST!

"RIVER
RUN"
GRAVEL

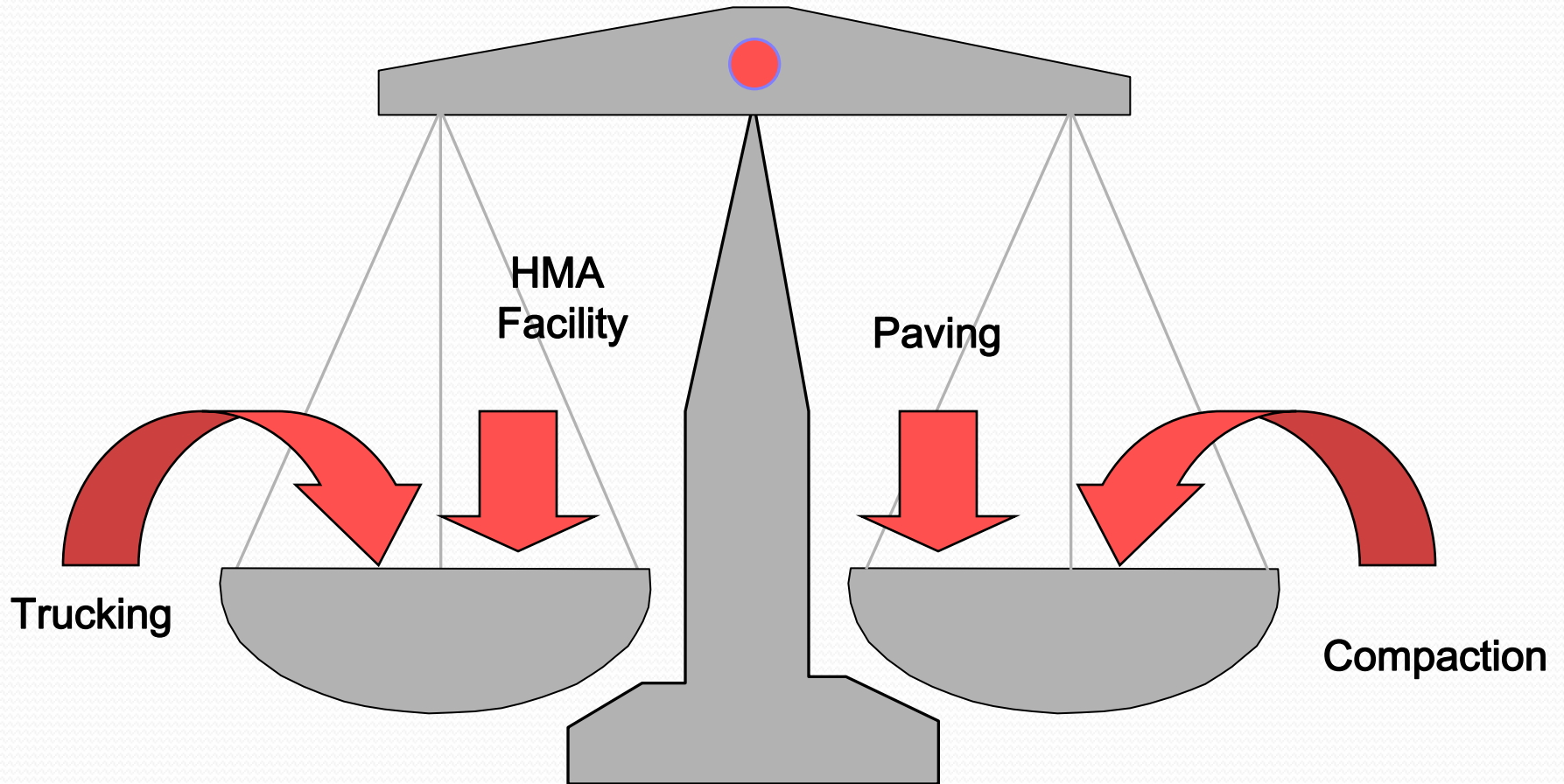
ASPHALT

CEMENT

AT PAVING
TEMPERATURES
ASPHALT
CEMENT IS A
**LUBRICATING
FLUID!**

AS IT COOLS,
ASPHALT
CEMENT
BECOMES A
**GLUE-LIKE
BINDER!**

Balancing Production





Safety - First, Last and Always...
Don't depend on drivers to avoid you. Play it safe.
Watch your back and your buddies.

HMA Temperature / Segregation



Checking Temperatures

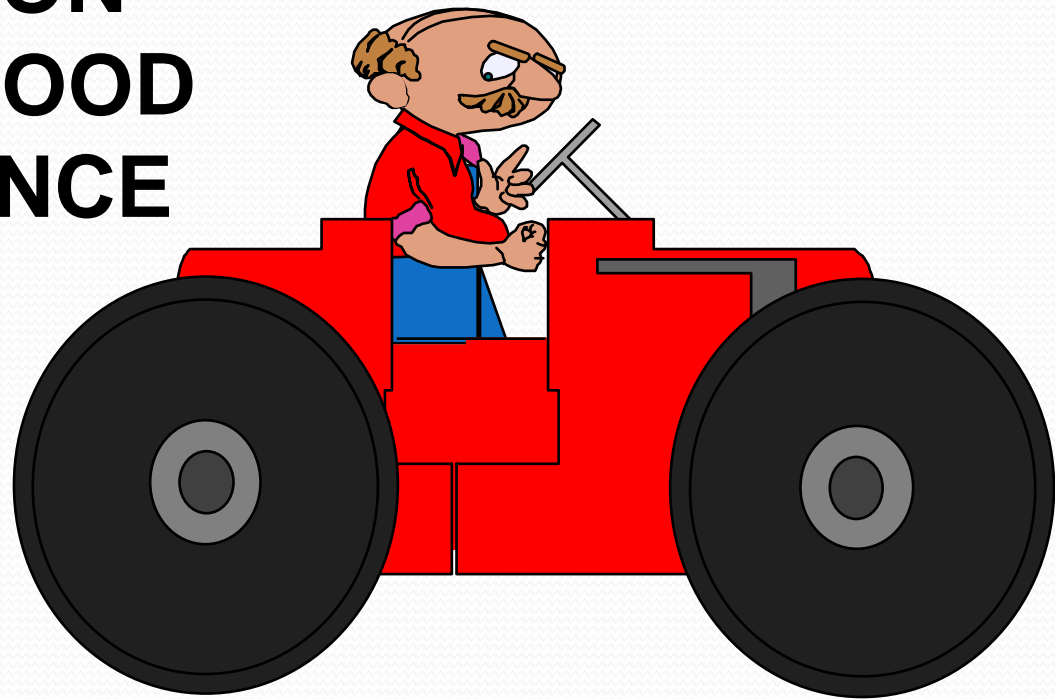


Tarping Loads



COMPACTION

**GOOD
COMPACTION
LEADS TO GOOD
PERFORMANCE**



Compaction

The process of compressing a material into a smaller volume while maintaining the same mass.

Roll - Down

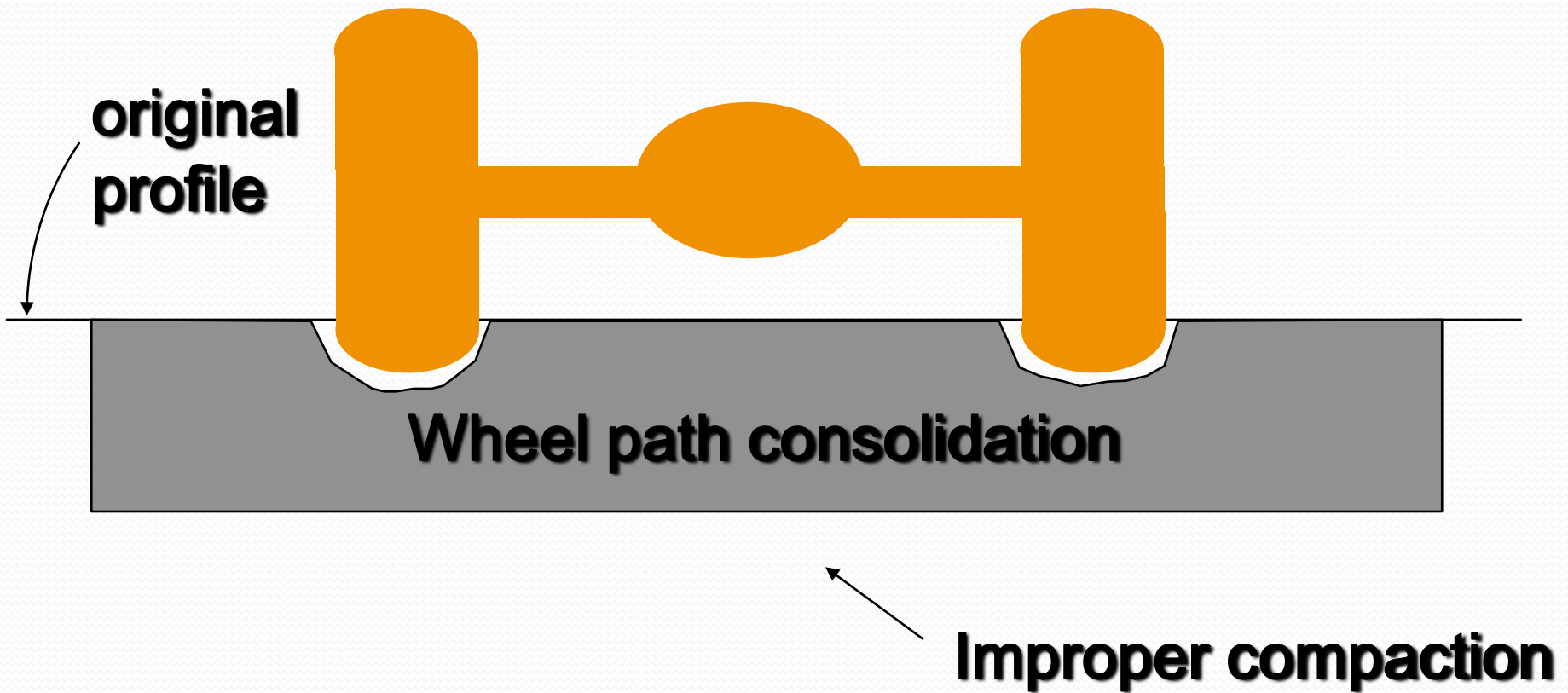
25 %?



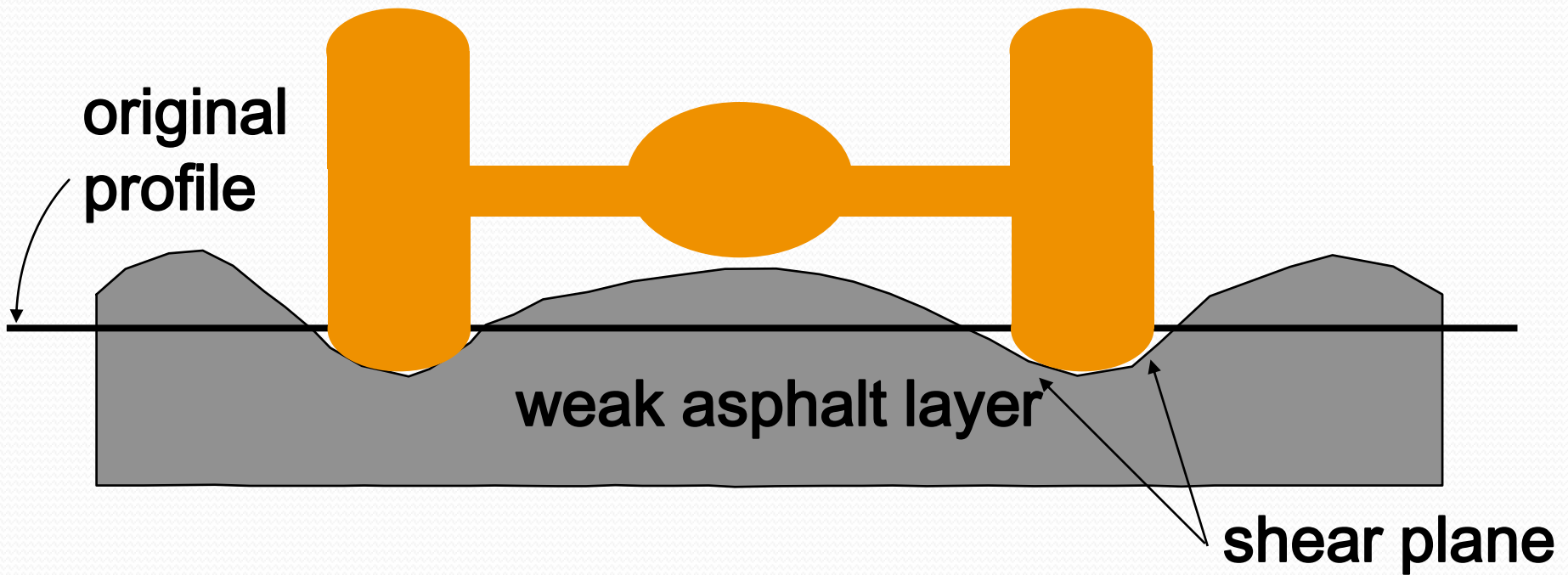
Reasons For Compaction

- **To prevent further consolidation**
- **To provide shear strength and resistance to rutting**
- **To ensure the mixture is waterproof (impermeable)**
- **To prevent excessive oxidation of the asphalt binder.**

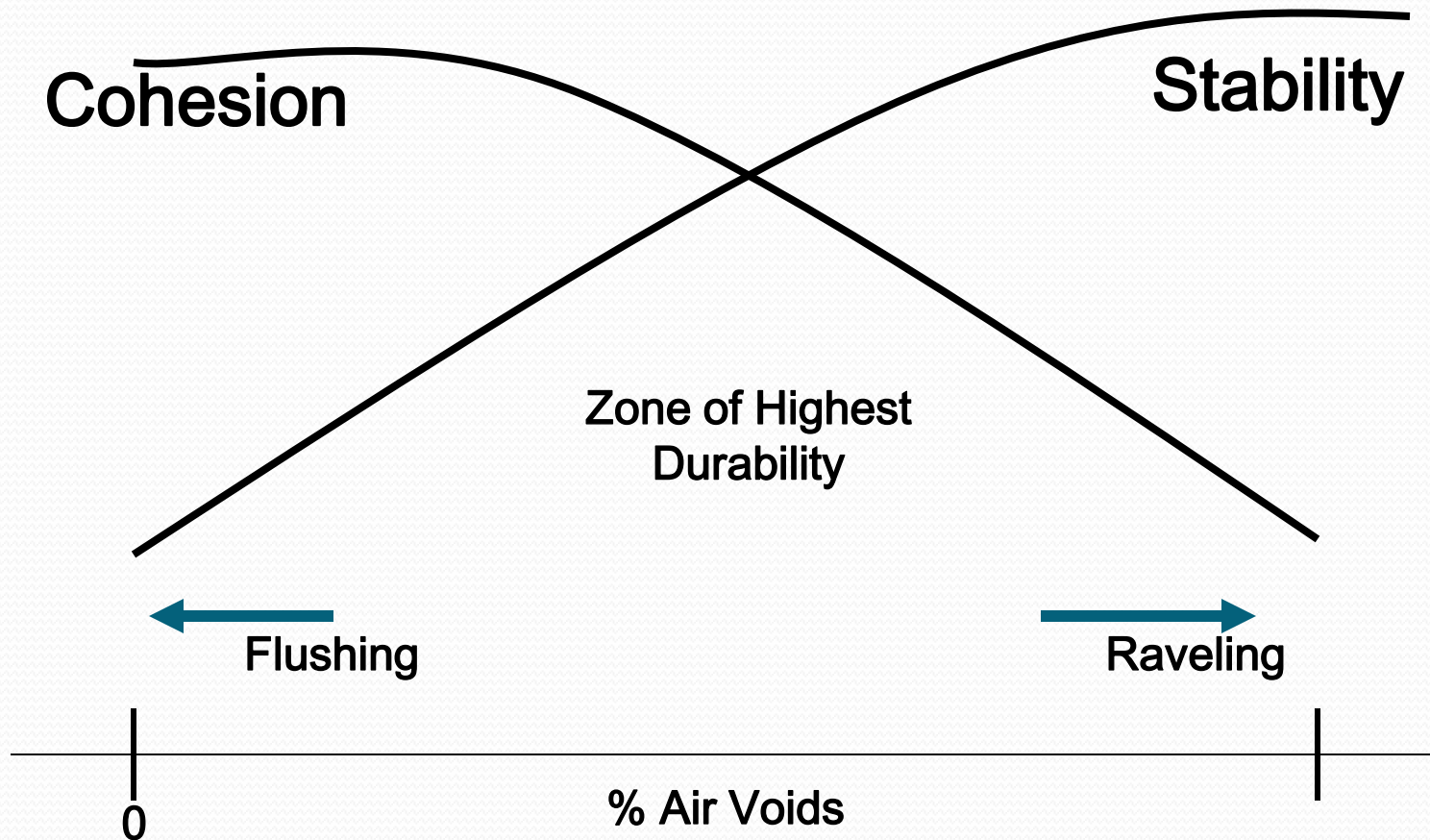
Rutting in Asphalt Layer



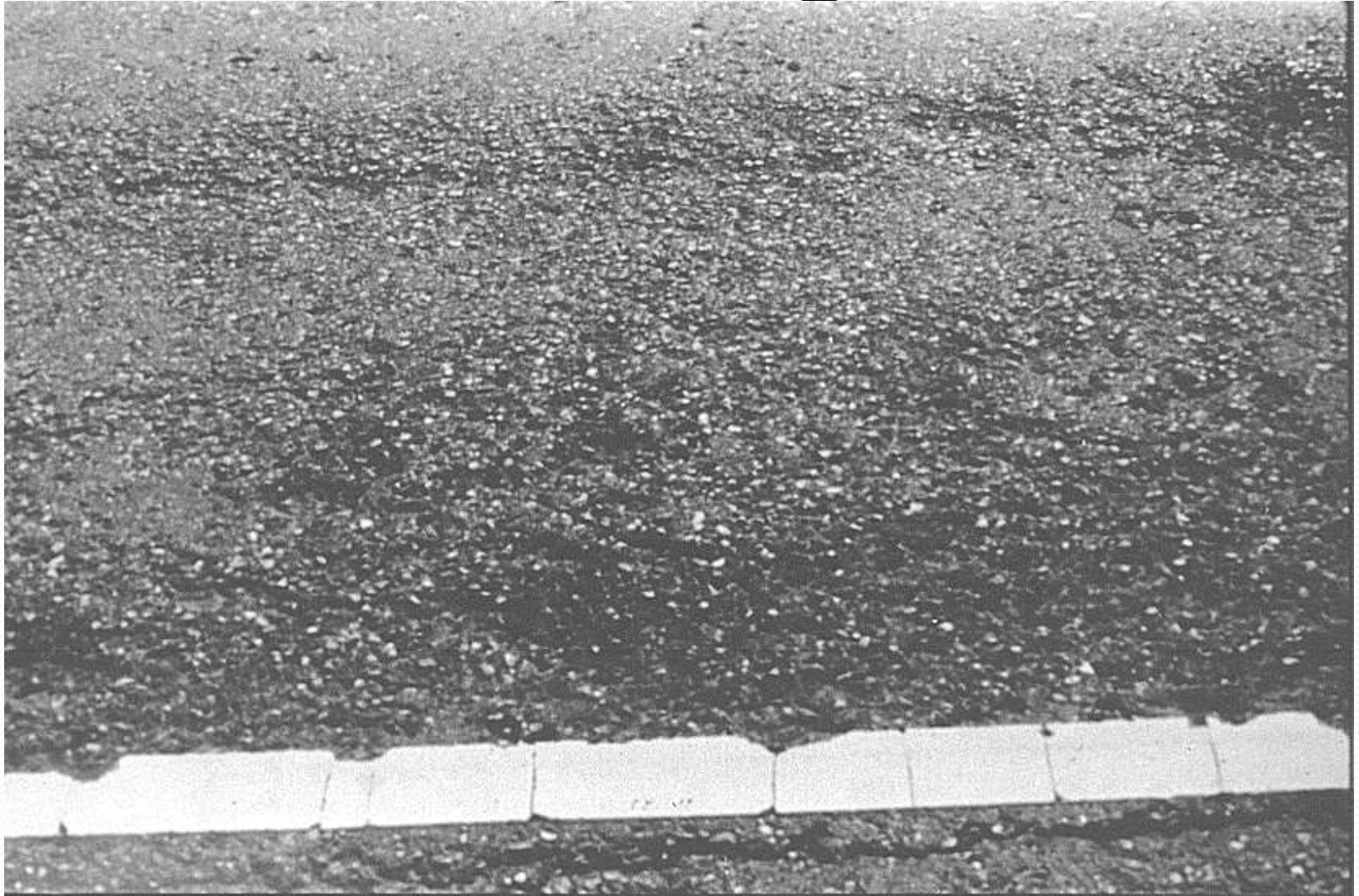
Rutting in Asphalt Layer



Durability vs Air Voids



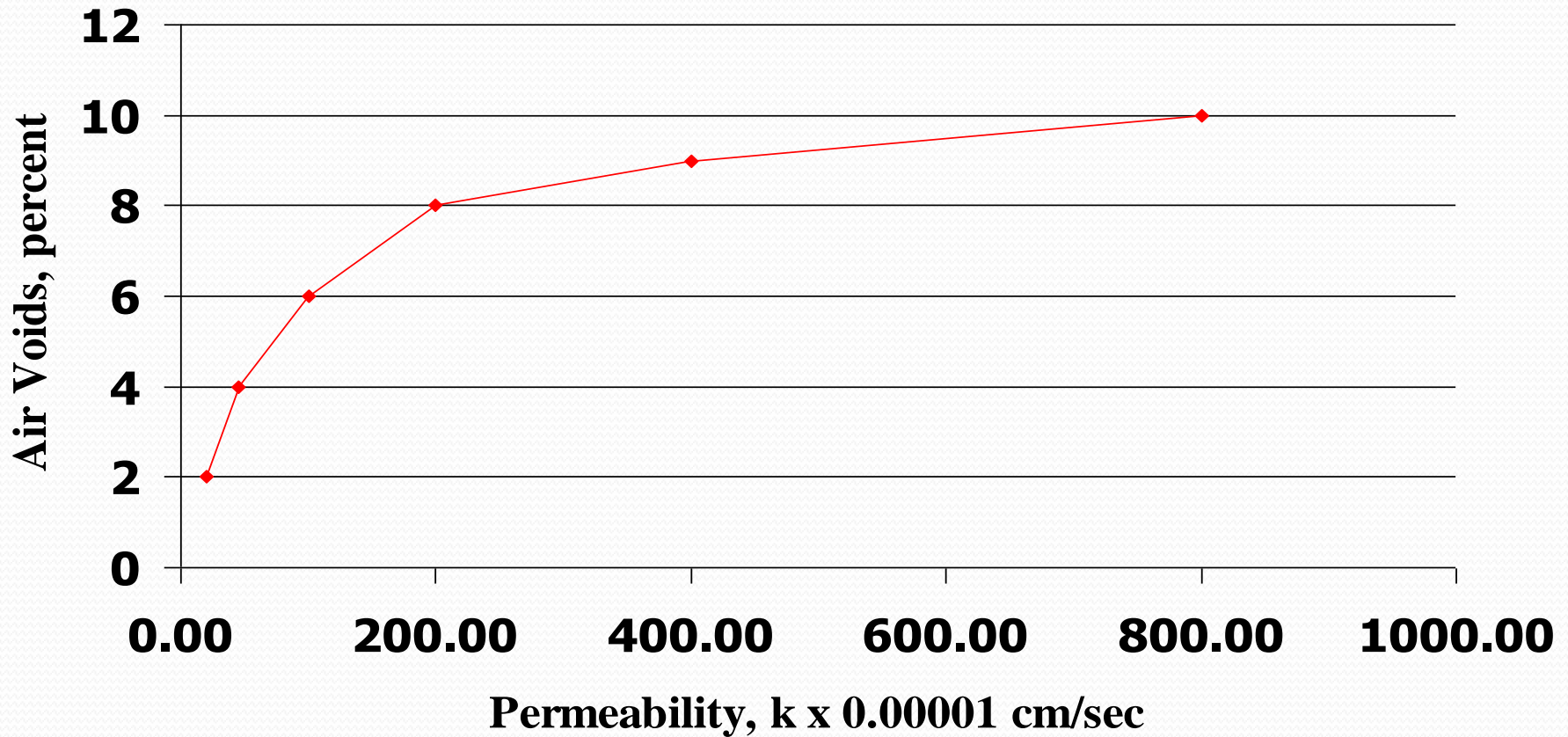
Raveling



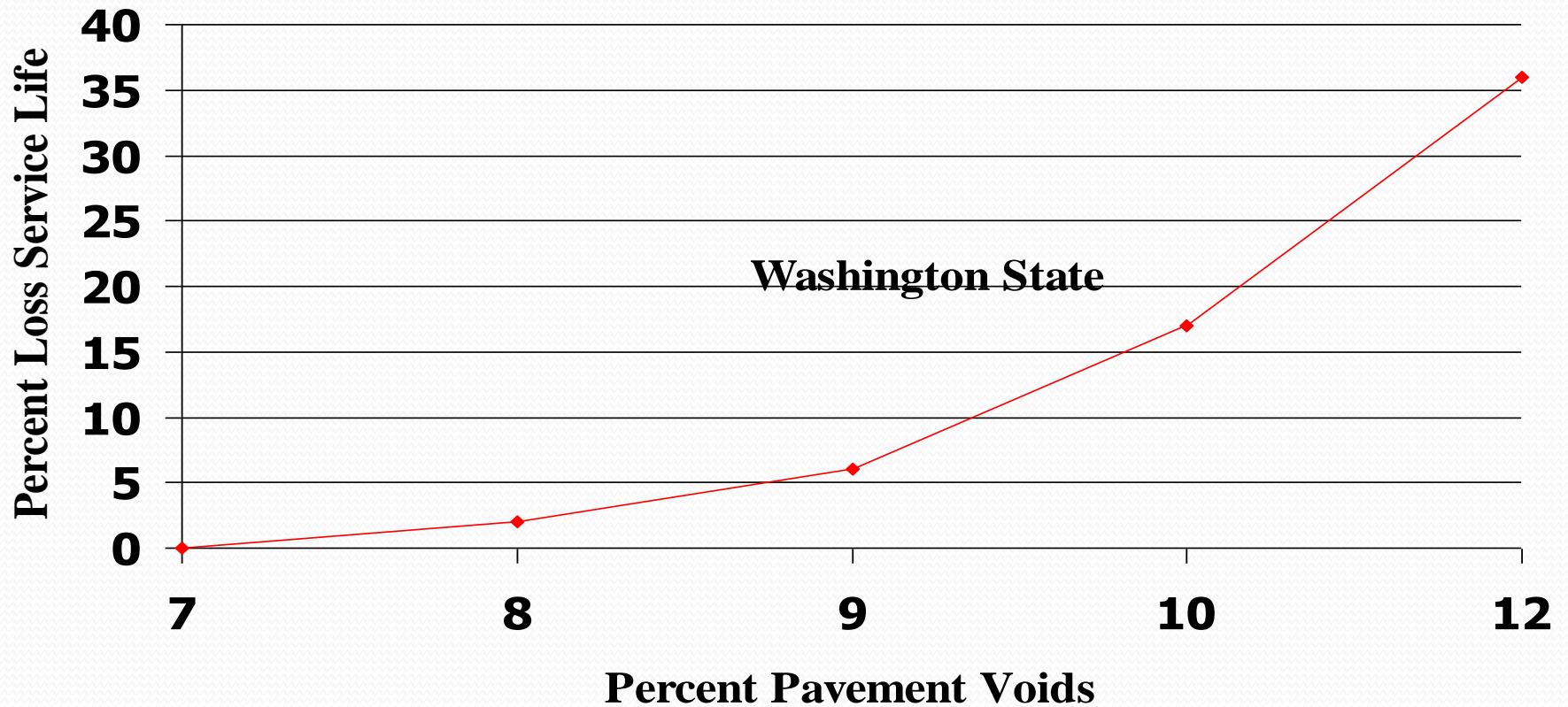
Causes of Raveling

- **Lack of Compaction**
- **Constructed in cold or wet weather**
- **Dirty aggregate - poor adhesion between the asphalt and the aggregate.**
- **Too little asphalt**
- **Overheating of mix**

Typical Permeability vs. Voids

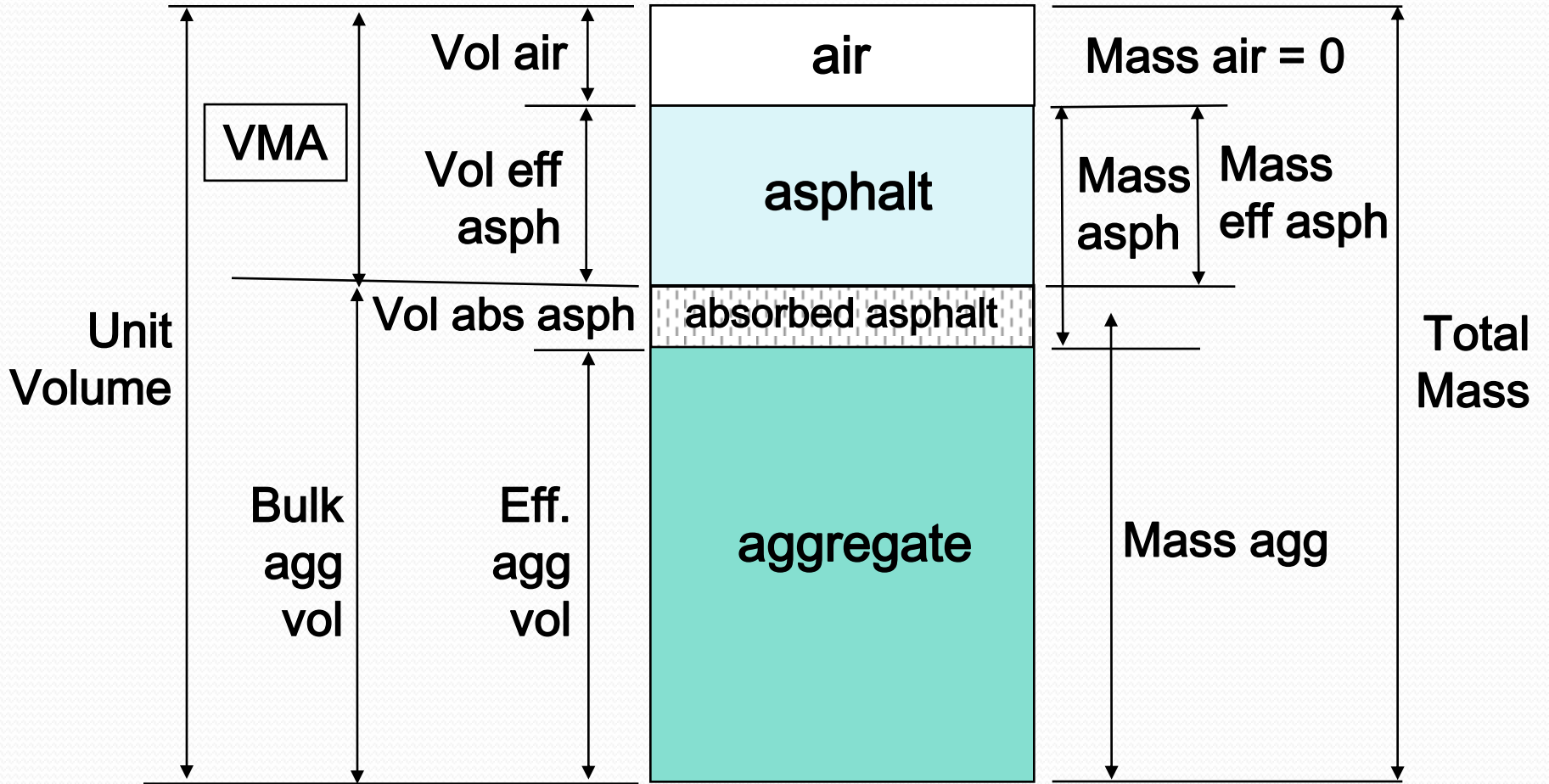


Effect of Voids on Life

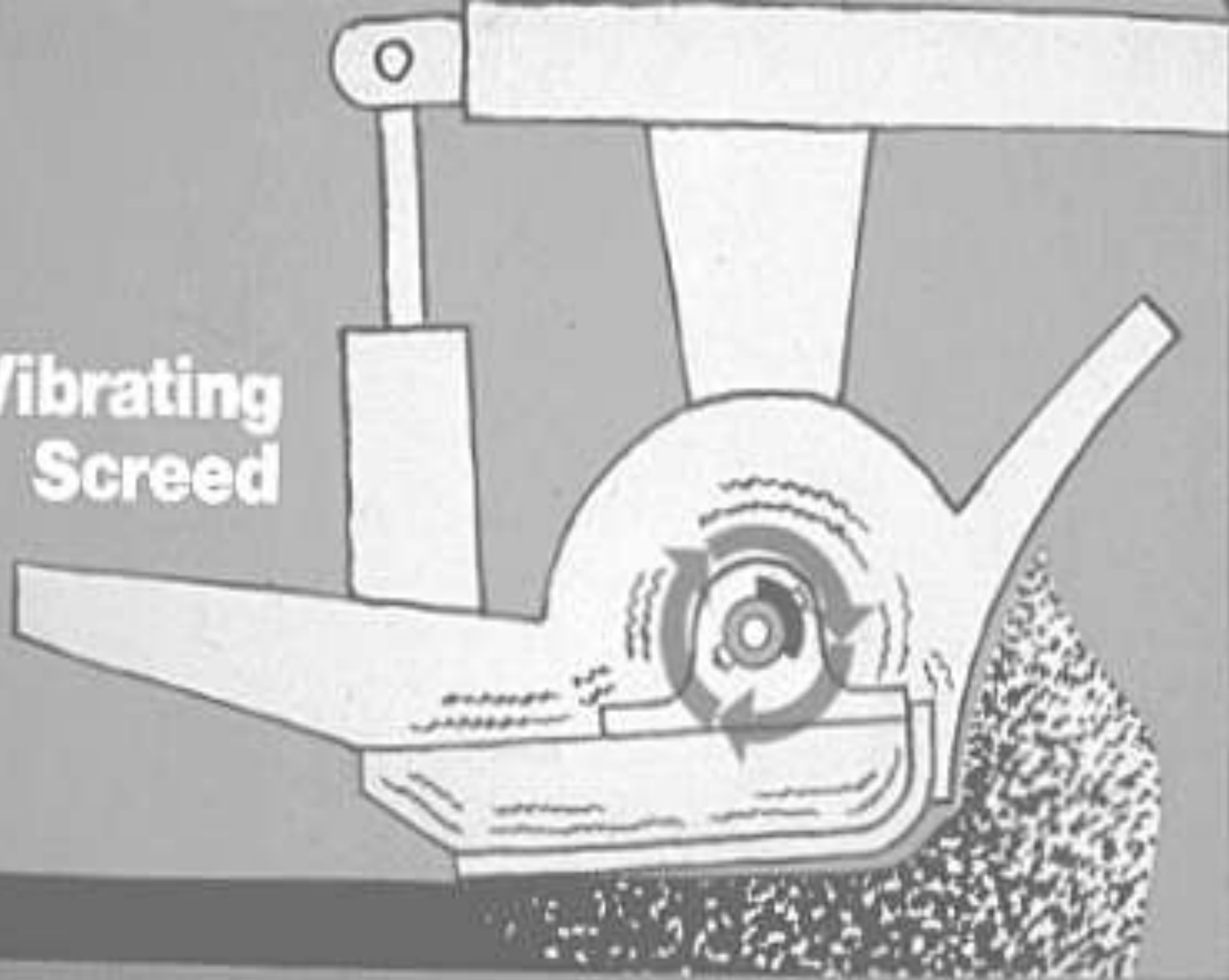


VOLUME

MASS



Vibrating Screed



Static Steel Wheel Roller

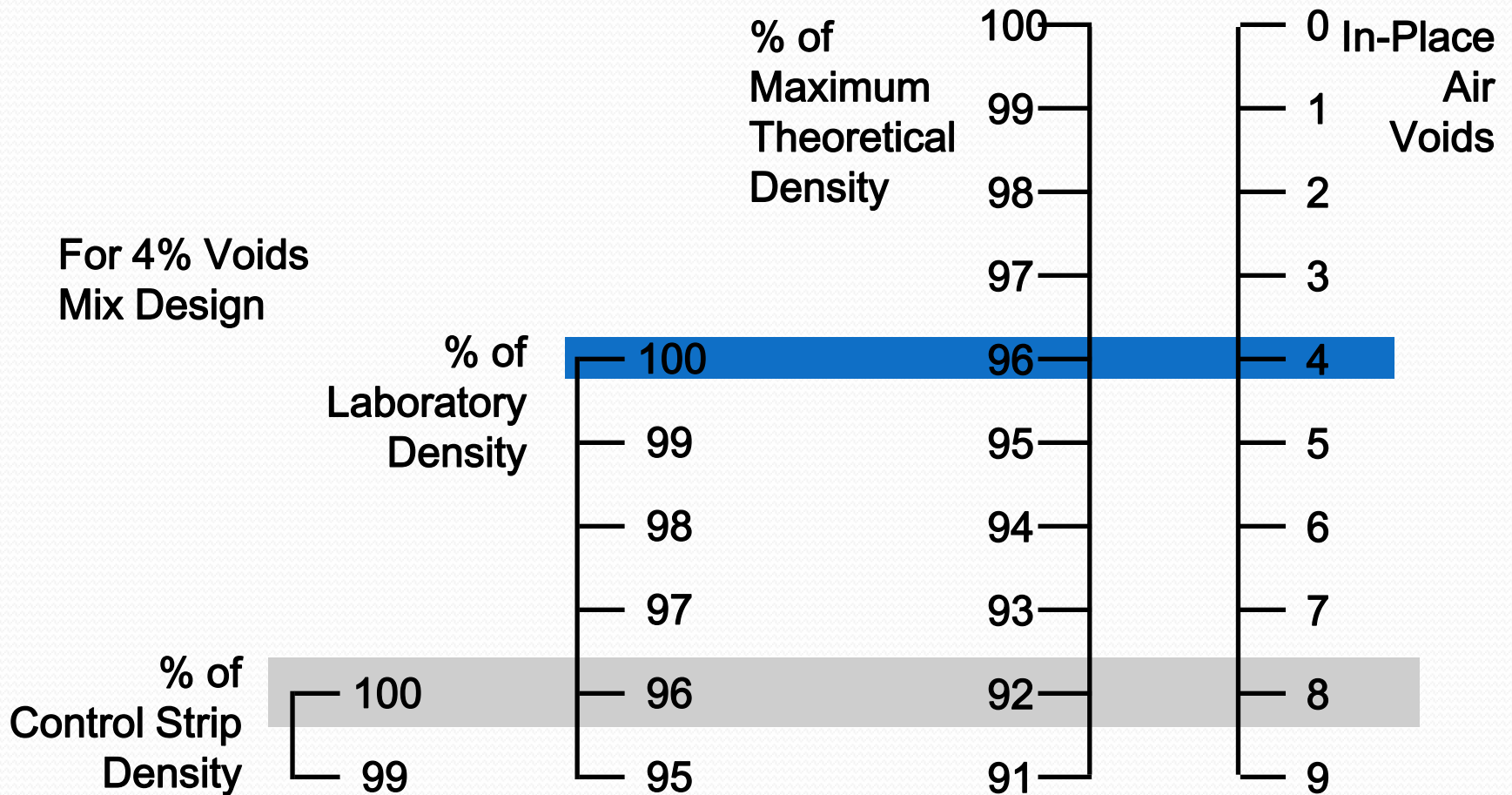


Vibratory Roller





Reference Density Comparison



Holistic View of Compaction



IC Technologies



SafetyEDGE



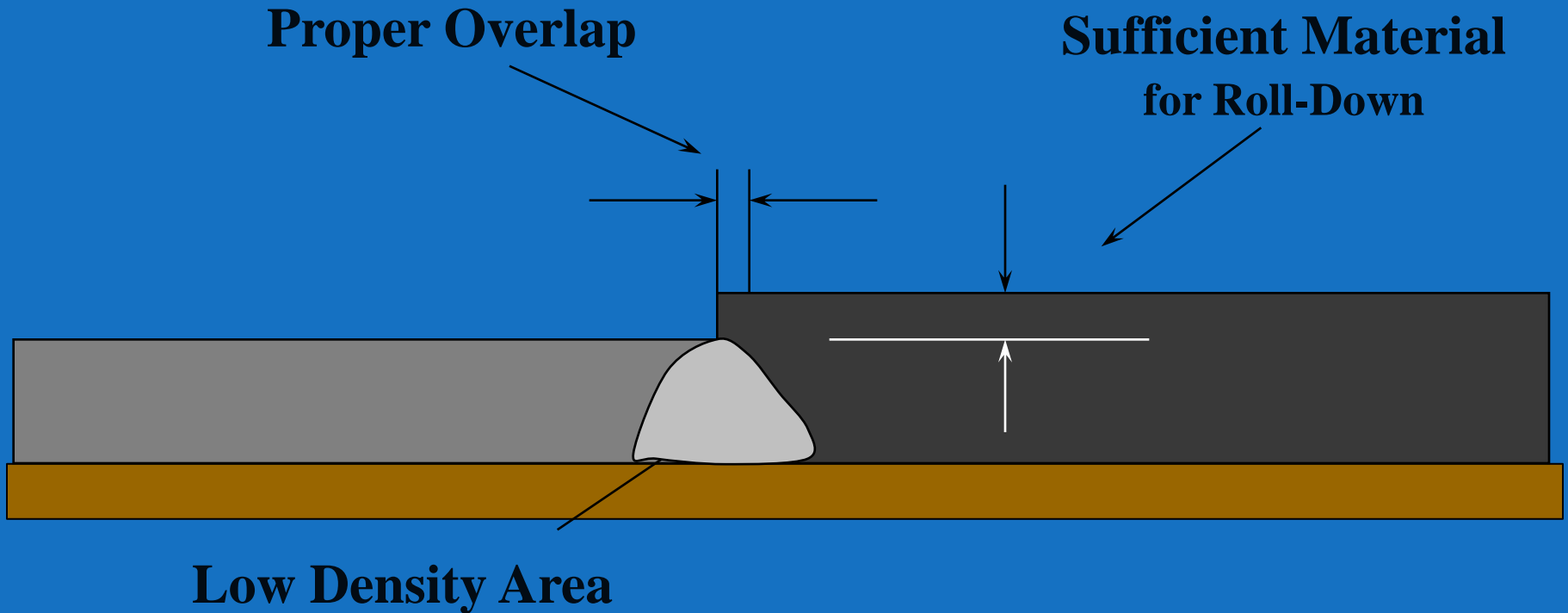
Long Joint

Hot-Mix Asphalt Compaction

SUMMARY

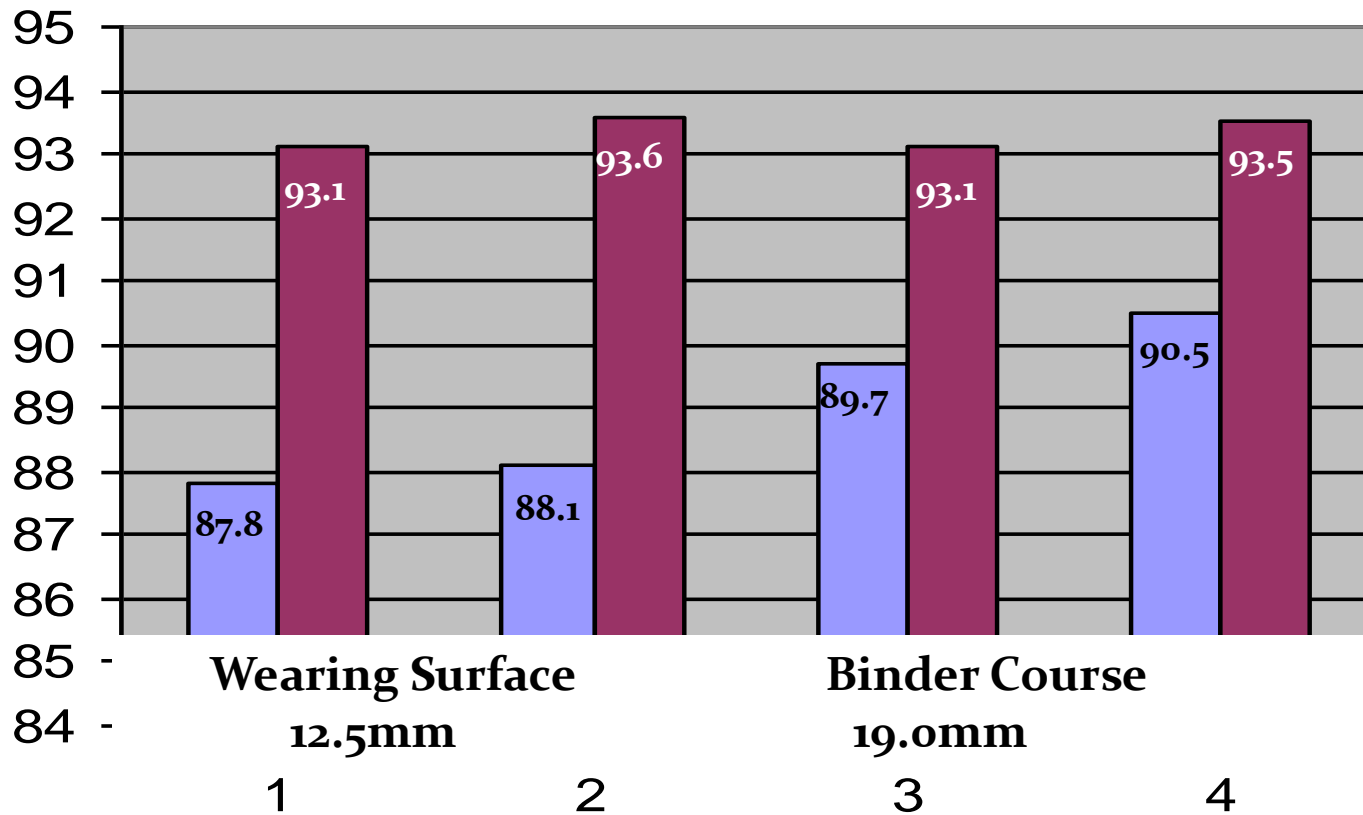
- YOU MUST ADEQUATELY COMPACT HMA
- Get the Proper Air Voids in the Mix
(4%-8% air voids = 92%-96% MTD)
- KEEP THE MIX HOT!!!
- Understand the factors that affect compaction!
- ROLL THE MIX QUICKLY AND THOROUGHLY WITH GOOD EQUIPMENT!
- TEST FOR DENSITY!!!

We Know Unsupported Edge Will Have Lower Density



Joint vs. Mat Density

(Representative of Other Studies)



Two Goals

*Best way
To Build it.*

*Best way
To Spec it.*

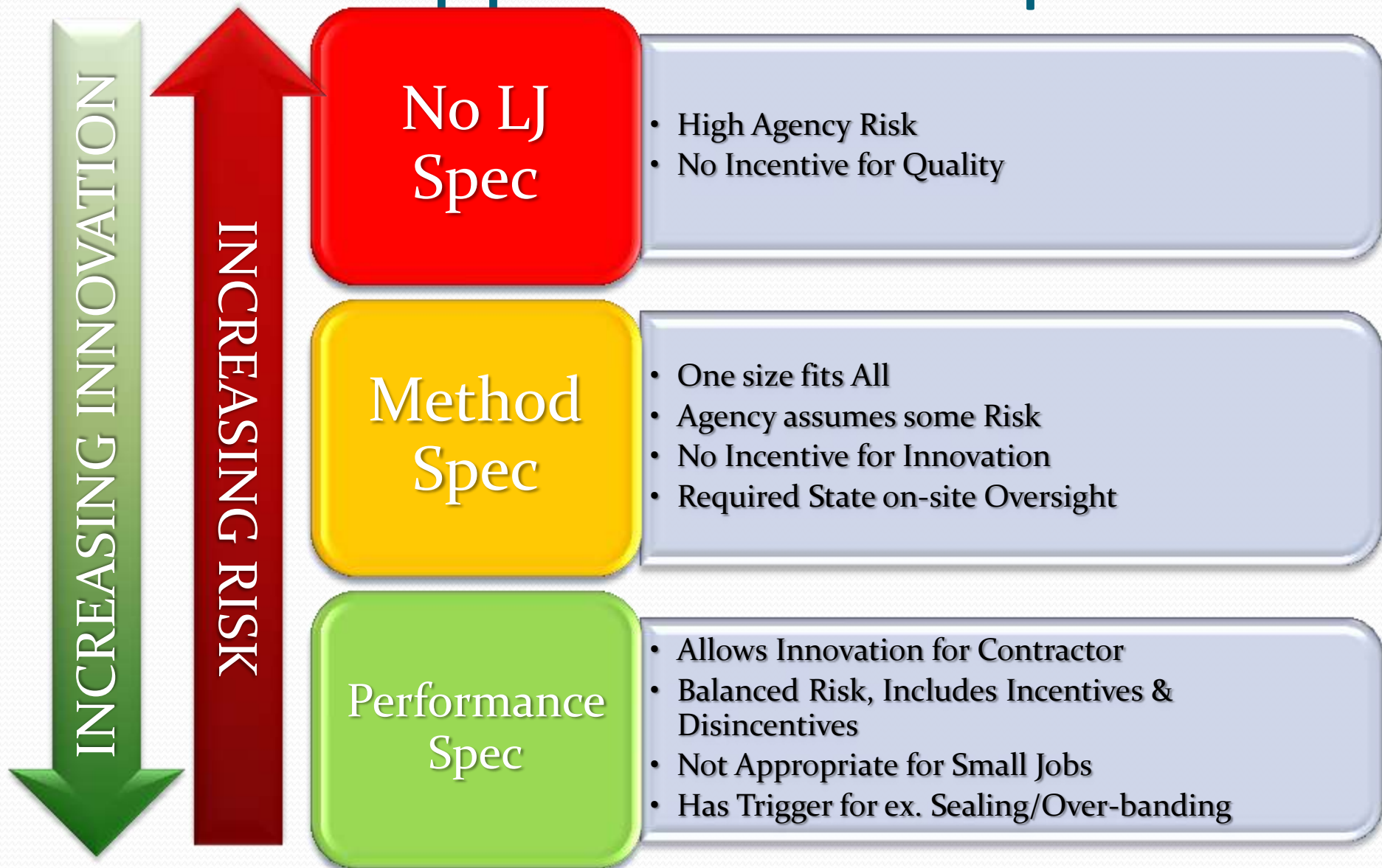


Destined for Failure

Permeability can be Catastrophic



Various Approaches to Specs:



Quality Control and Acceptance of Joint Density



Density Gauge



6-inch Core



Proposed QA Criteria for LJ Density Spec

Six-inch Cores: Located over center of butt joint,
or middle of wedge on wedge joint

- $\geq 92\%$ of G_{mm} : maximum bonus
- Between 92% and 90% of G_{mm} : 100% pay, pro-rated bonus, and overband joint
- $< 90\%$ of G_{mm} : reduced payment, and overband joint

Key Steps in Implementing New LJ Spec

- Agency and Industry Work Together
- Offer training (Best Practices, Alternatives)
- Try new technologies, products and methods. Measure effectiveness
- Establish baseline of existing joint densities by randomly selecting projects
- Implement min. density spec, but 1st year only show bonus/penalty without adding/subtracting dollars
- Incrementally increase min. density requirement to reach 90%, or possibly higher as it can be shown to be accomplished on regular basis

Construction Recommendations

- Echelon Paving
- Notched Wedge vs. Butt Joint
- **BALANCED OPERATION**
 - **Must Take Care of the Basics!**
- Tack Coat!
- Dump Person is a Key Person

Construction Recommendations

- **Straight First Pass**
- **Use Automated Control Systems**
- **VIBRATORY SCREED – ALWAYS ON!!!!**
- **ROLLERS CLOSE TO THE PAVER**
- **DON'T BROADCAST HMA ACROSS MAT**
- **DON'T LUTE THE LONGITUDINAL JOINT**

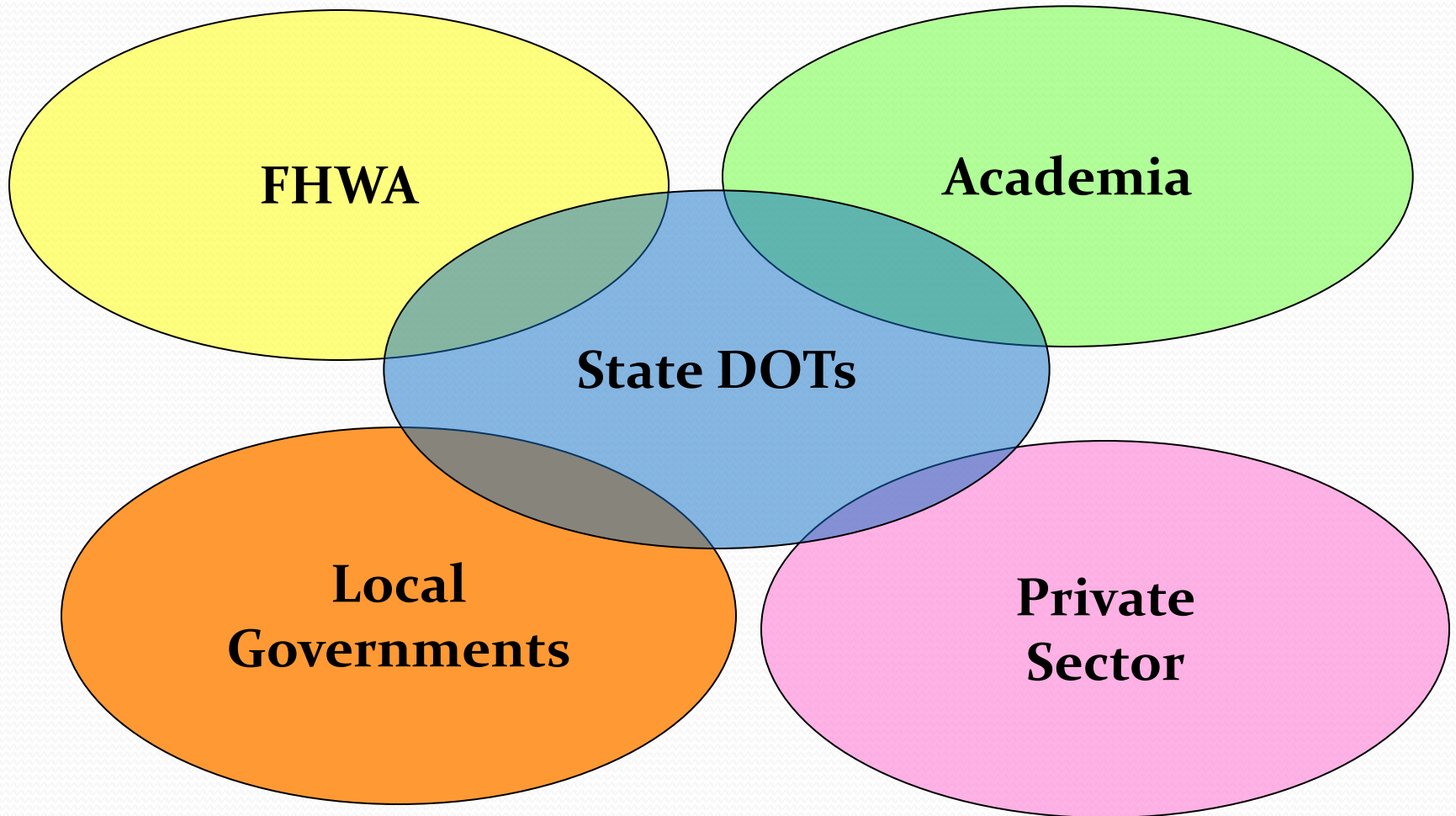
**PLEASE REQUEST AND ATTEND THE
4 HOUR WORKSHOP !!!**

**“Best Practices for Specifying
and Constructing
HMA Longitudinal Joints”**

**A Cooperative Effort between
Asphalt Institute & FHWA**



Partnerships Are Required



Partnerships are Required

- **1 FHWA**
- **52 State DOTs (including DC and PR)**
- **3,034 County governments;**
- **35,933 Municipal, Town and Township governments.**
- **4,140 Colleges and Universities**
- **_____ contractors/industry reps.**

UNITED WE STAND....

THANK YOU!

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