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Pavement Type Selection for Alternate Contracting

IAPA Annual Meeting

March 9, 2015

NATIONAL SECURITY ENERGY & ENVIRONMENT INFRASTRUCTURE HEALTH SOLUTIONS

Overview

Contracting Types

- D-B-B, D-B, CM/GC, DBOM, DBFOM, P3

Pavement Type Selection Basics

- Economic and non-economic factors

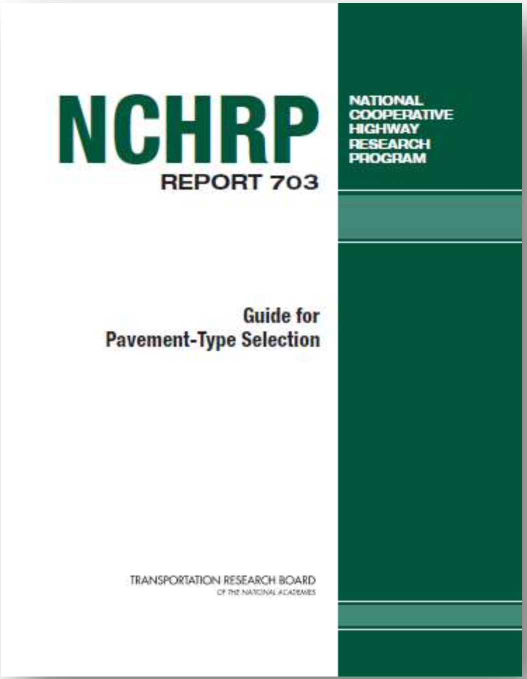
Flexible vs. Rigid

Design Features

Why is this Illinois guy qualified to talk about things that are not common to Illinois?

Pavement Design Specialist

- $4B+ P3 Projects
- $700M DBOM
- $4B+ D-B Projects



FHWA Innovation Deployment Contractor

- Design-Build
- CM/GC
- Alternate Technical Concepts (ATC)

AASHTOWare Pavement AASHTO

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Historical Background: FHWA Procurement Requirements

- Mid-1800's, many states adopt "low bid" requirements to protect taxpayers from extravagance, corruption and other improper practices by public officials
- 1938 Federal Highway Act required competitive bidding
- 1968 Federal Highway Act revised Title 23 USC to award construction contracts, "...only on the basis of the lowest responsive bid."
- February 2, 1990, FHWA establishes "Special Experimental Project No. 14 – Innovative Contacting"
- 1998 TEA-21 authorizes design-build

There are many project delivery methods

Design – Bid – Bid

Traditional Delivery

Design – Build

Construction Manager / General Contractor

SEP – 14 Cost Plus Time Bidding

SEP – 14 Lane Rental

Design – Build – Operate – Maintain

Design – Build – Finance – Operate – Maintain

Public Private Partnership (P3)

Alternate Delivery

Alternate delivery encourages innovation

Alternative Technical Concepts

- Confidential proposals for consideration
- Advances new technology, materials, construction
- Allows owners to receive full competitive value
  - (vs. 50% share through value engineering change proposal)

Use of best tools, materials, practices

NCHRP 10-75 Project Objective

Develop a Guide for Pavement-Type Selection.

Include processes for consideration in making decisions regarding pavement-type selection, using:

- Agency-based (decision is internal to the highway agency) processes.
- Contractor-based (selection is made by the contractor using criteria stipulated by the agency) processes.

Economic Pavement Type Selection Factors

- Initial Cost
- Rehabilitation Cost
- Maintenance Cost
- User Cost
- Life Cycle Cost

Non-Economic Pavement Type Selection Factors

- Roadway/lane geometrics
- Continuity of adjacent pavements
- Continuity of adjacent lanes
- Traffic during construction
- Availability of local materials
- Conservation of materials
- Local preference
- Stimulation of competition
- Noise
- Safety
- Subgrade soils
- Experimental features
- Future needs
- Maintenance Capability
- Sustainability

The Operations and Maintenance Type in Alternate Delivery Drives Bidder Strategy

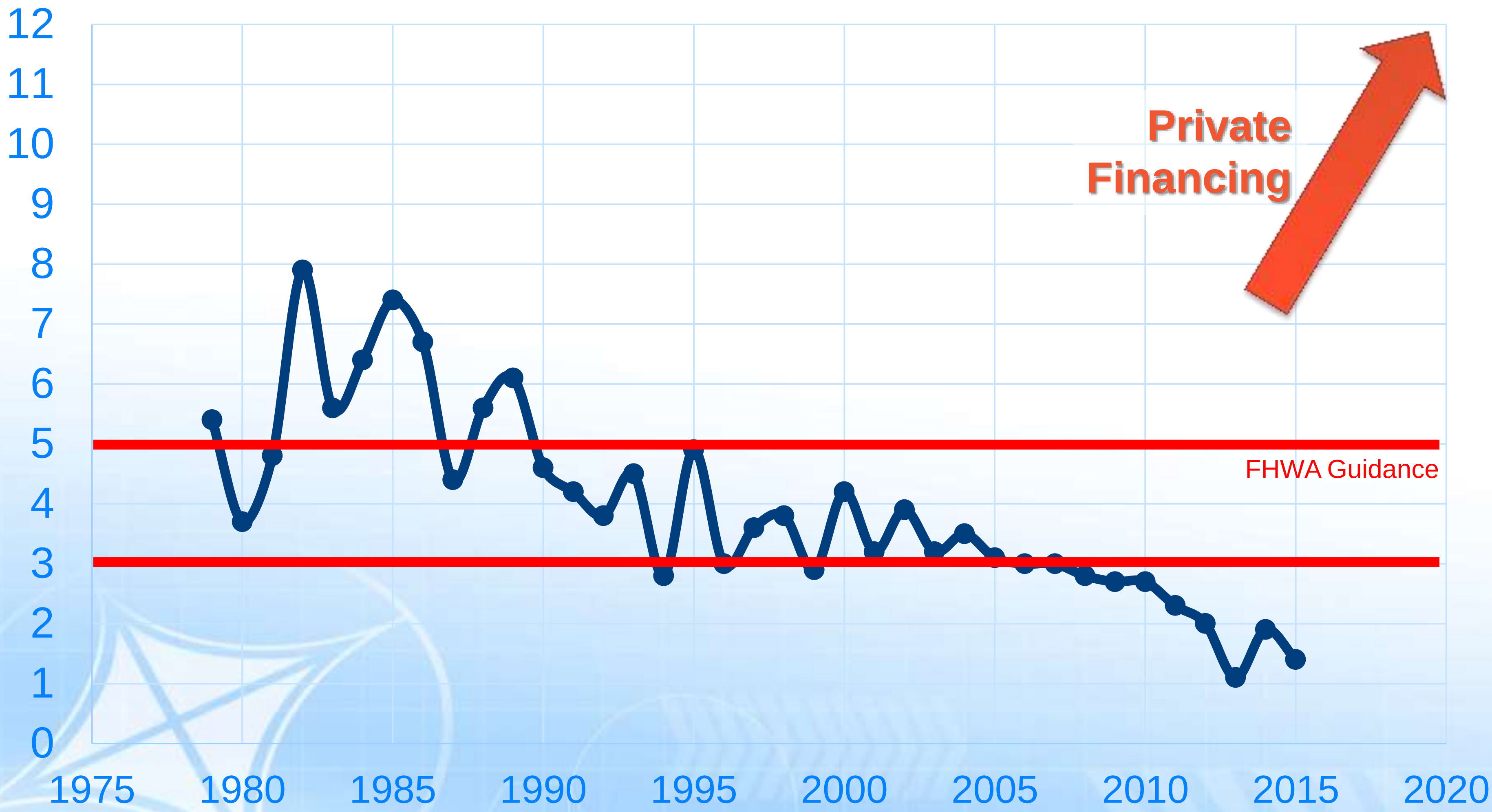
No Operations – Maintenance Component

- Be low responsive bidder
- Eliminate work items with high cost or long time

With O&M LCCA & Risk Management Key

- LCCA over period of O&M (considering turn back)
- Pavement performance risk
- Price risk
- O&M strategies

Discount rate drives decisions



*OMB Circular No. A-94

Pavement Design Considerations

Some Limit Pavement Alternatives

- Prescriptive designs
- Prescriptive typical sections
- Little room for innovation

Most allow approved methods/technologies

- Local design method
- AASHTO Pavement ME Design
- Other design methods

With O&M, more innovation allowed

Pavement Type

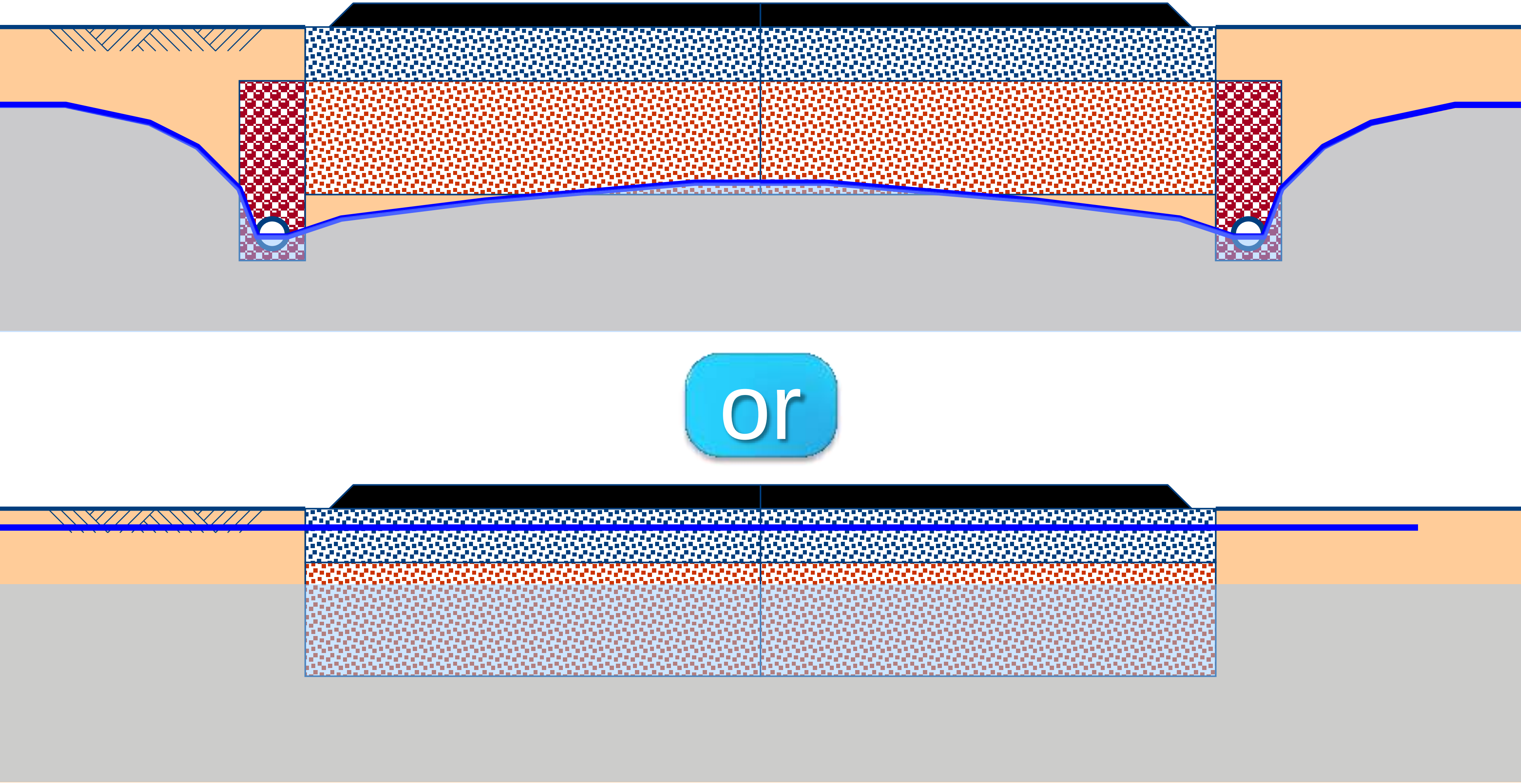
Rigid Pavement vs. Flexible Pavement

- Team preference
- CRCP rarely selected

Most factors of safety are out

- D-B – Do what you can get approved through ATC
- Finance – Risk assessment
  - What will the failure mechanism be?
  - What are the maintenance requriements?

Pavement drainage – Yes or No?



Longitudinal Joints Handled Different Based on Alternate Contracting Type

No O&M

- Follow the specification

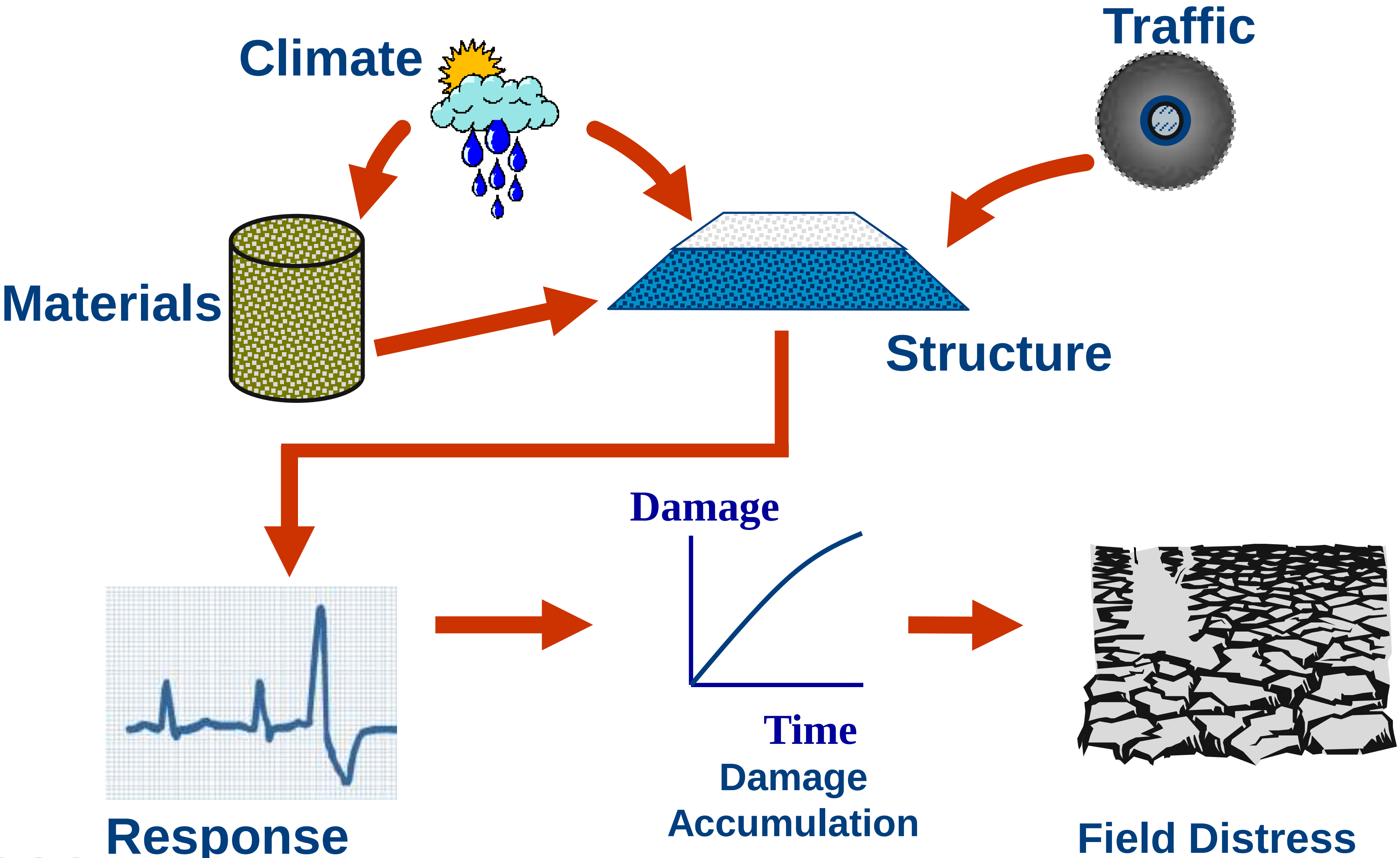
O&M

- Evaluate risk, cost, schedule
- Often increased attention to longitudinal joints
- Often consideration for echelon paving, cut back, etc.

Pavement ME Used to Evaluate Impact of Many Pavement Design Inputs

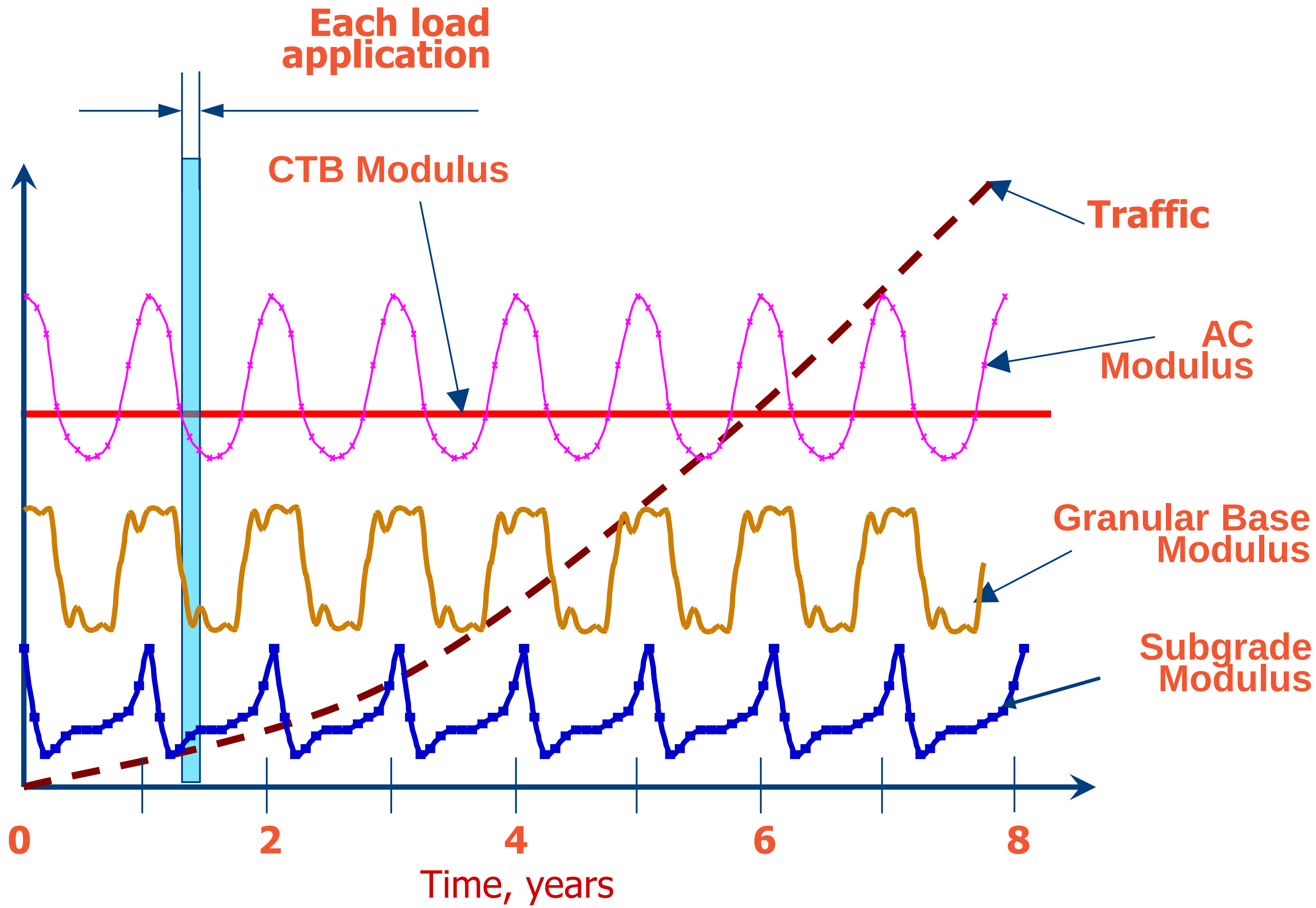
- Pavement ME is an analysis tool
- Designer/contractor evaluates “what-if”
- Results allow the evaluation of risk

Mechanistic-Empirical Design

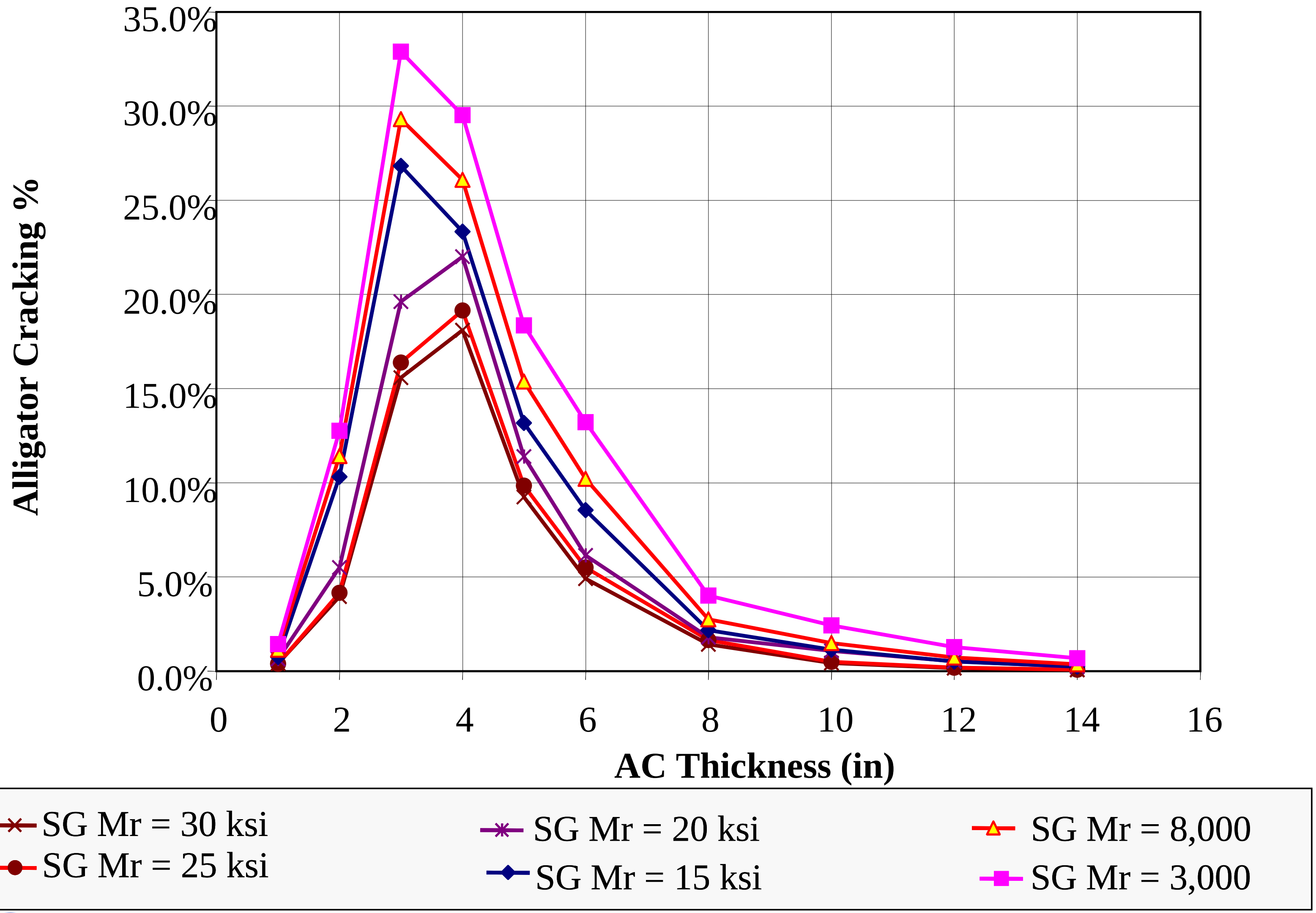


Predicting Distress

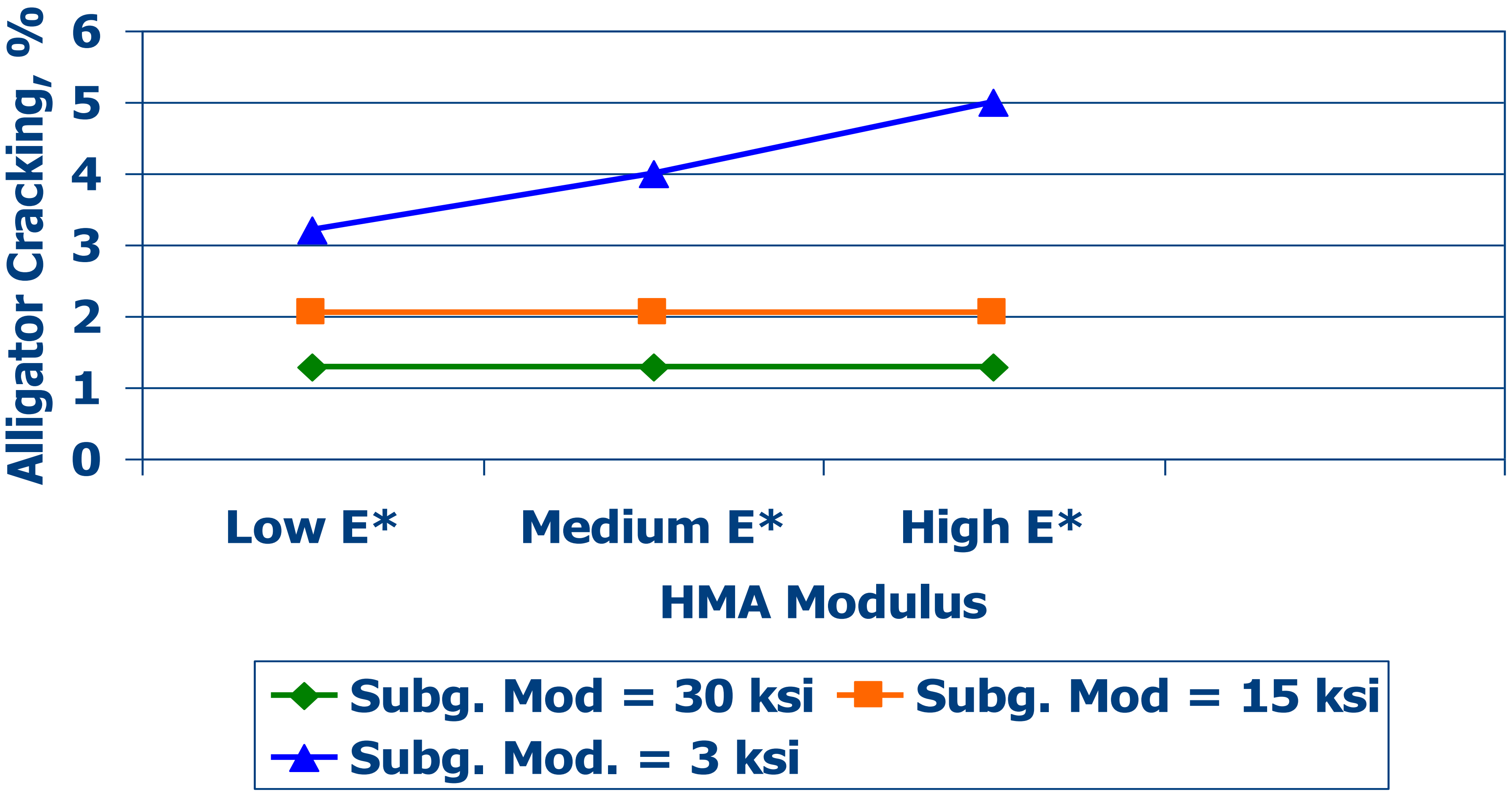
Design Parameters Over Pavement Life



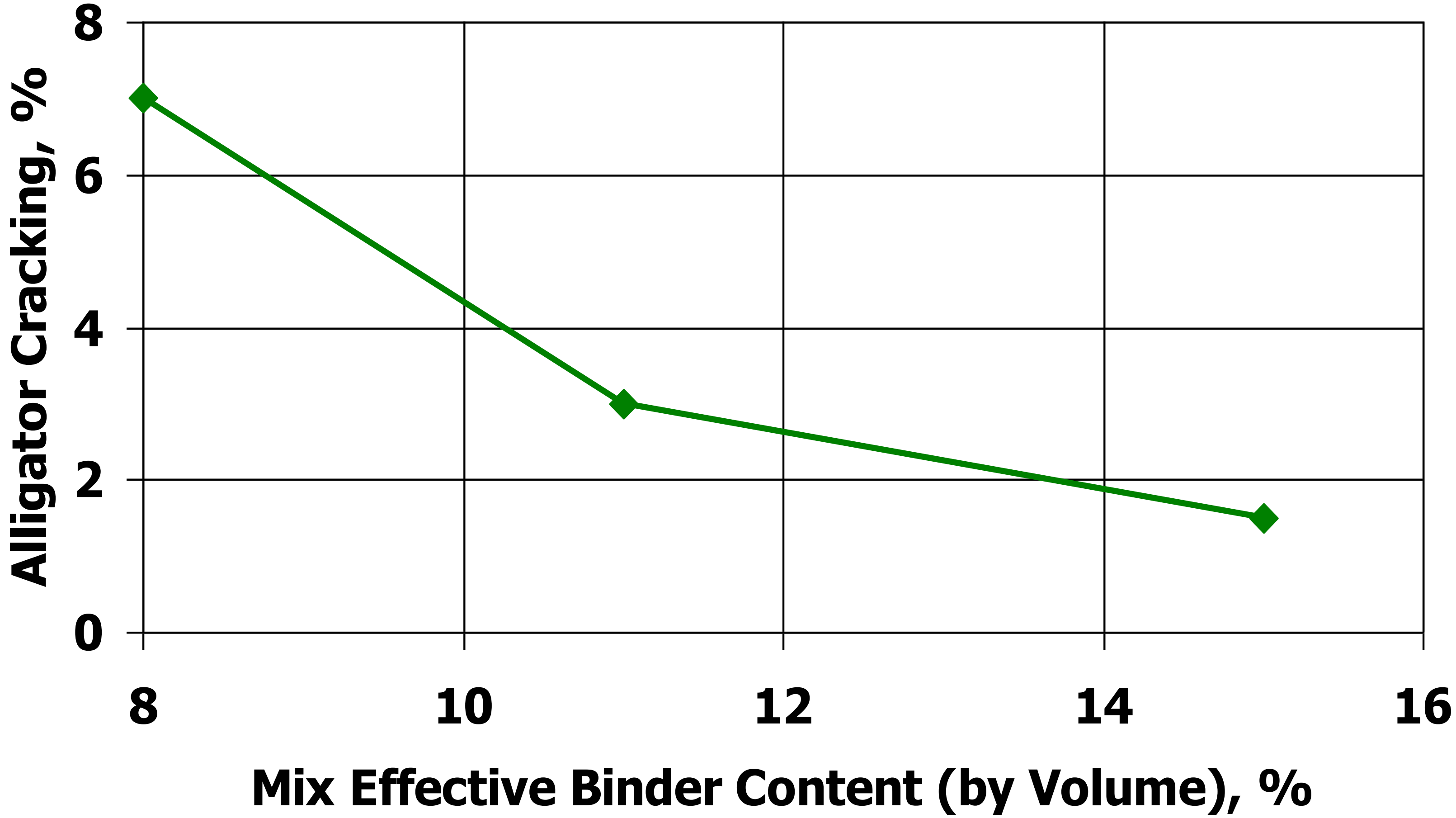
Base Stiffness Impacts Needed Thickness



Effect of HMA Modulus (E*) on Alligator Cracking



Mix Properties Matter



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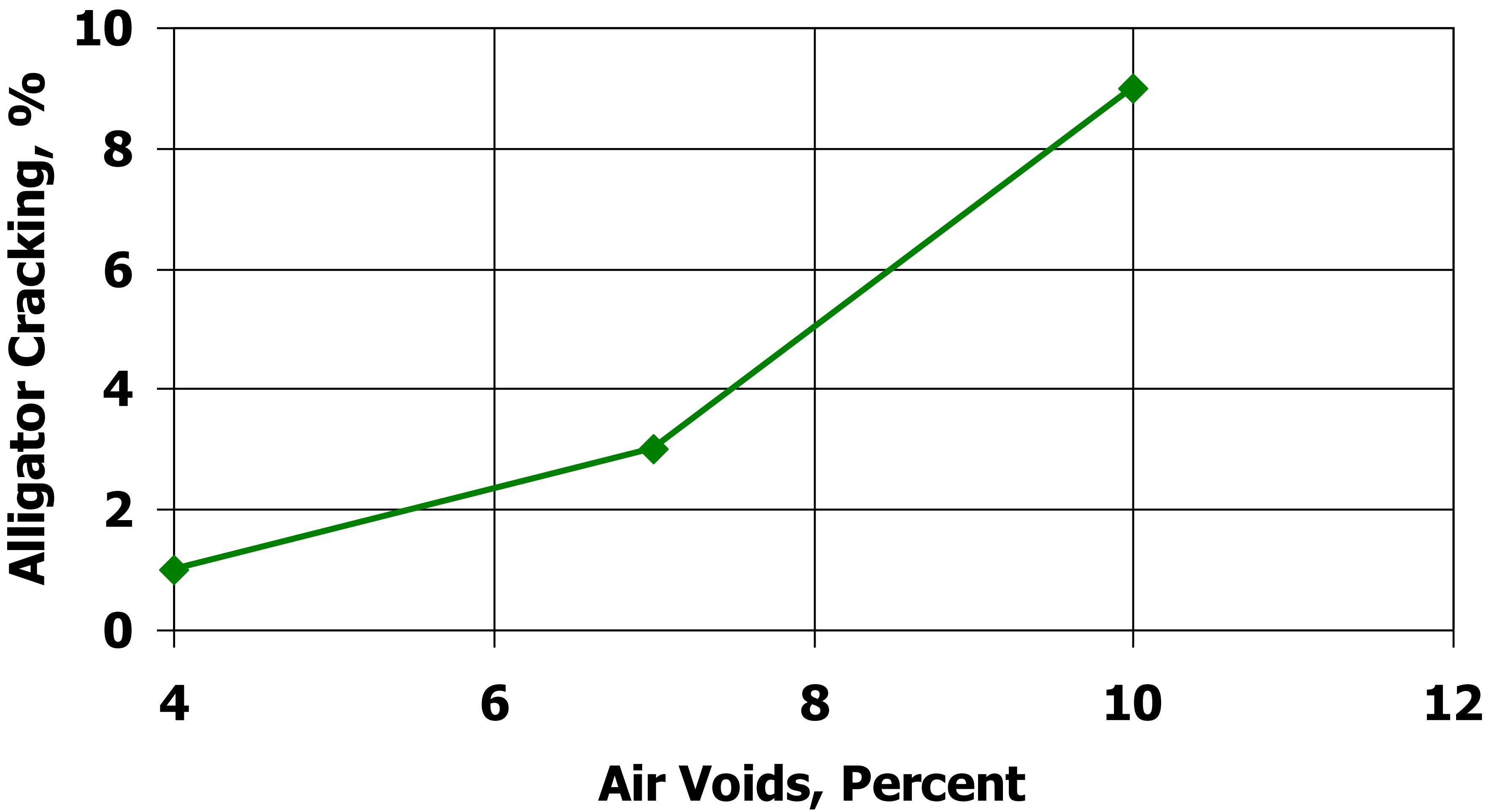

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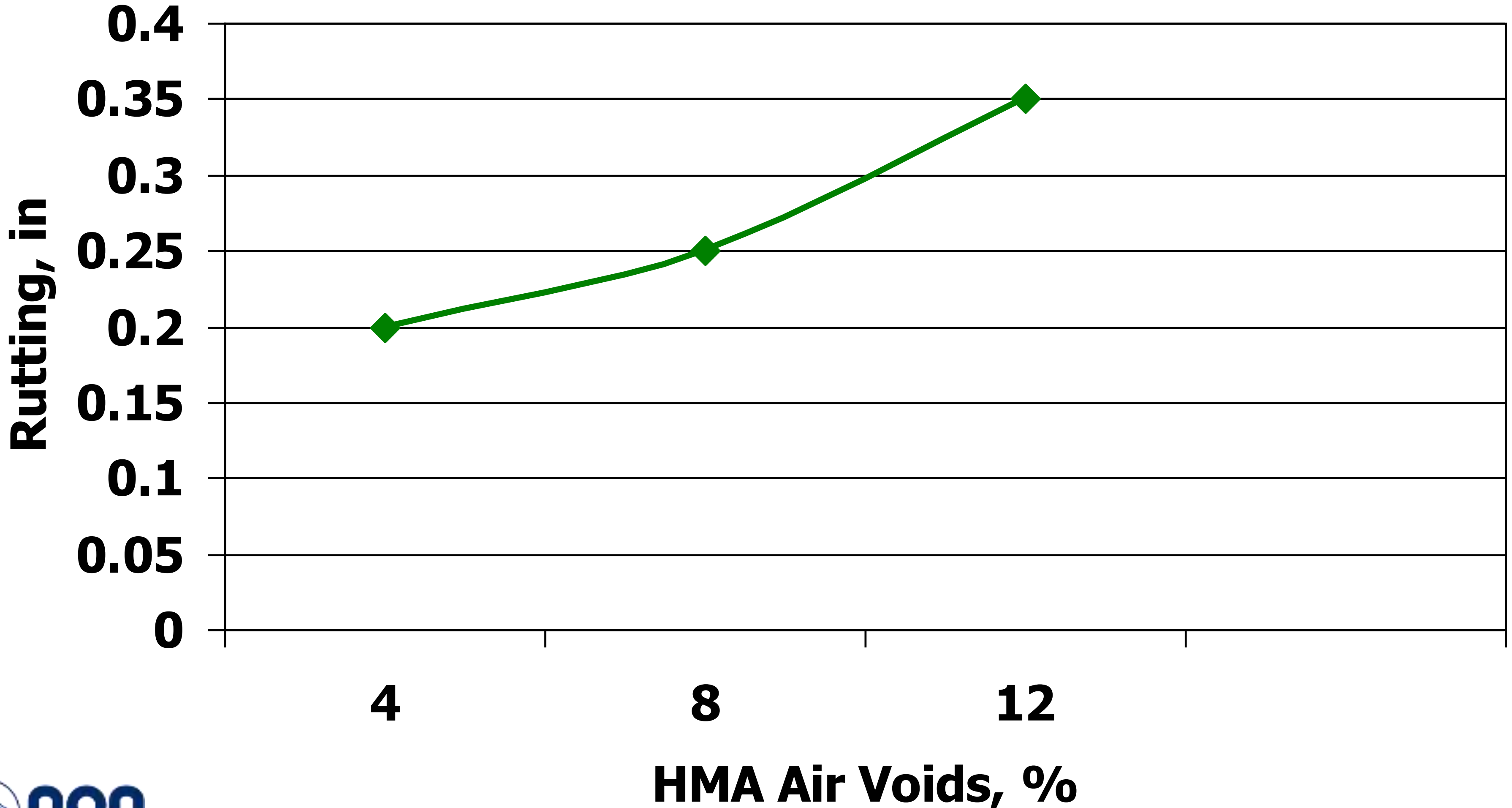

Mix Properties & Construction Practices Can Reduce Thickness at the Same Performance

10” Full-Depth HMA Section

- 6% in-place Voids in all mixes

Similar Performance

9” Full-Depth HMA Section

- 5% in-place voids in all mixes

Parting Thoughts

Pavement type selection is more complex under alternate contracting

Economic and non-economic factors are still part of the evaluation

Tools not same as Illinois standards

Designers/contractors can innovate

- Leads to lower cost solutions
- Equivalent or better performance

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Thank You!