

OHIO DOT Bridge Rideability Investigations & Spec Development



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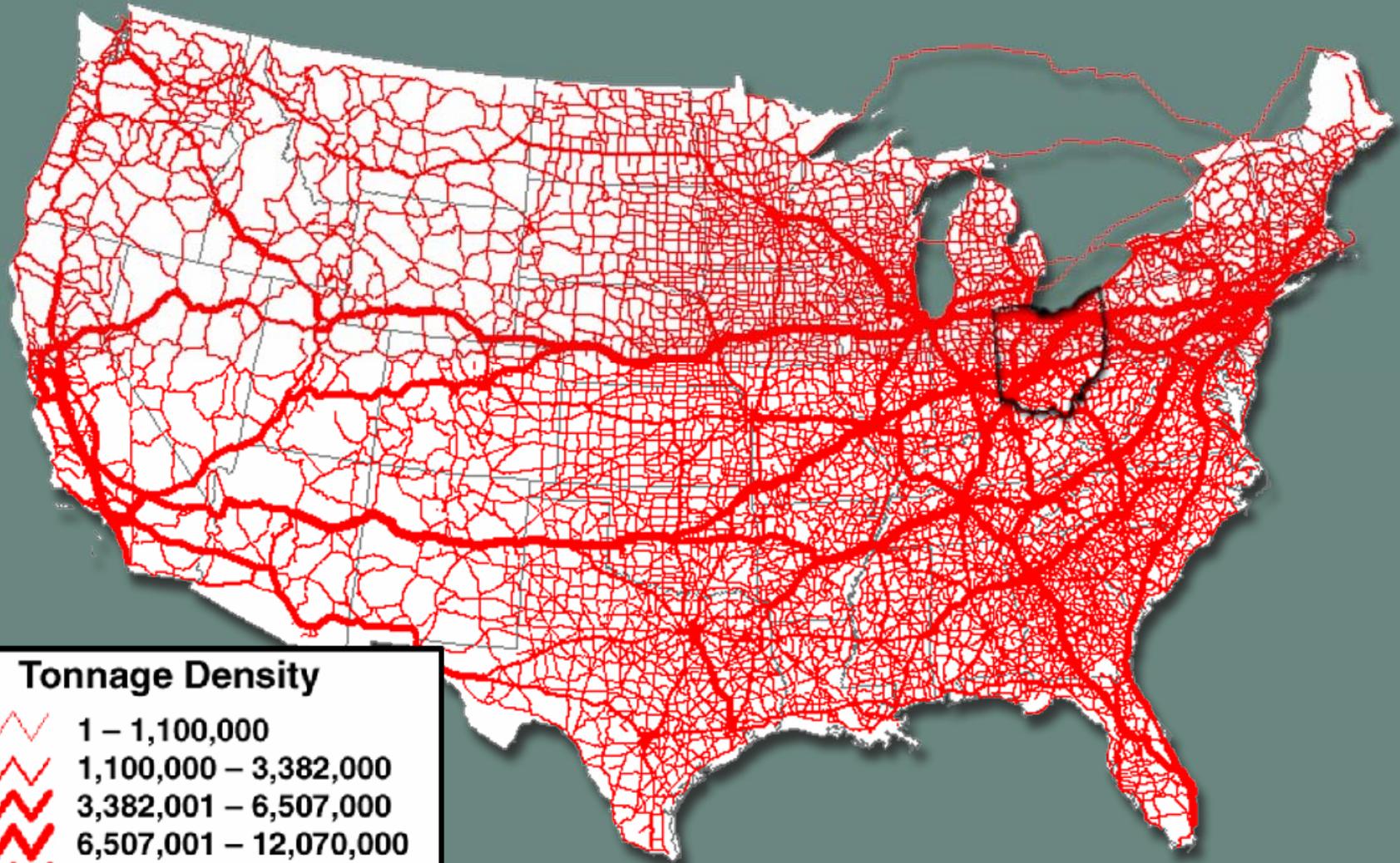
Overview

- Impacts of Poor Ride at Bridges
- How Bridges affect Network Rideability
- Causes of Poor Ride at Bridges
- Steps ODOT is taking to improve ride across Bridges
 - Other Policy/Design/Construction Issues
- Questions

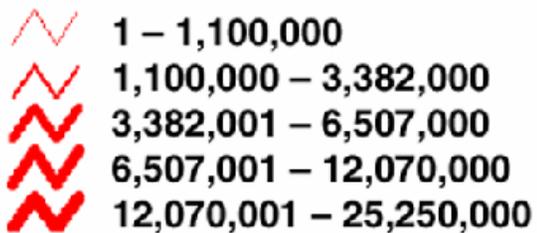
How does Ohio compare to other states?

- 35th in geographical size
- 4th largest interstate mileage
- 2nd highest bridge inventory
- 4th largest freight volume
- 4th in truck VMT
- 5th in total VMT

Highway Freight Density



Tonnage Density



Impacts of Poor Bridge Ride

User Costs

- ↓ User Satisfaction
- ↑ Vehicle Wear/Damage
- ↑ Cargo Damage
- ↑ Freight Costs
- ↓ Safety
 - ↓ handling/grip

Agency Costs

- ↓ Pavement Life
- ↓ Bridge Life
- ↑ Maintenance Costs
- Snow/Ice Removal
 - ↓ efficiency
 - ↑ costs









Where do we start?

Understanding the problem

Support

Communicating

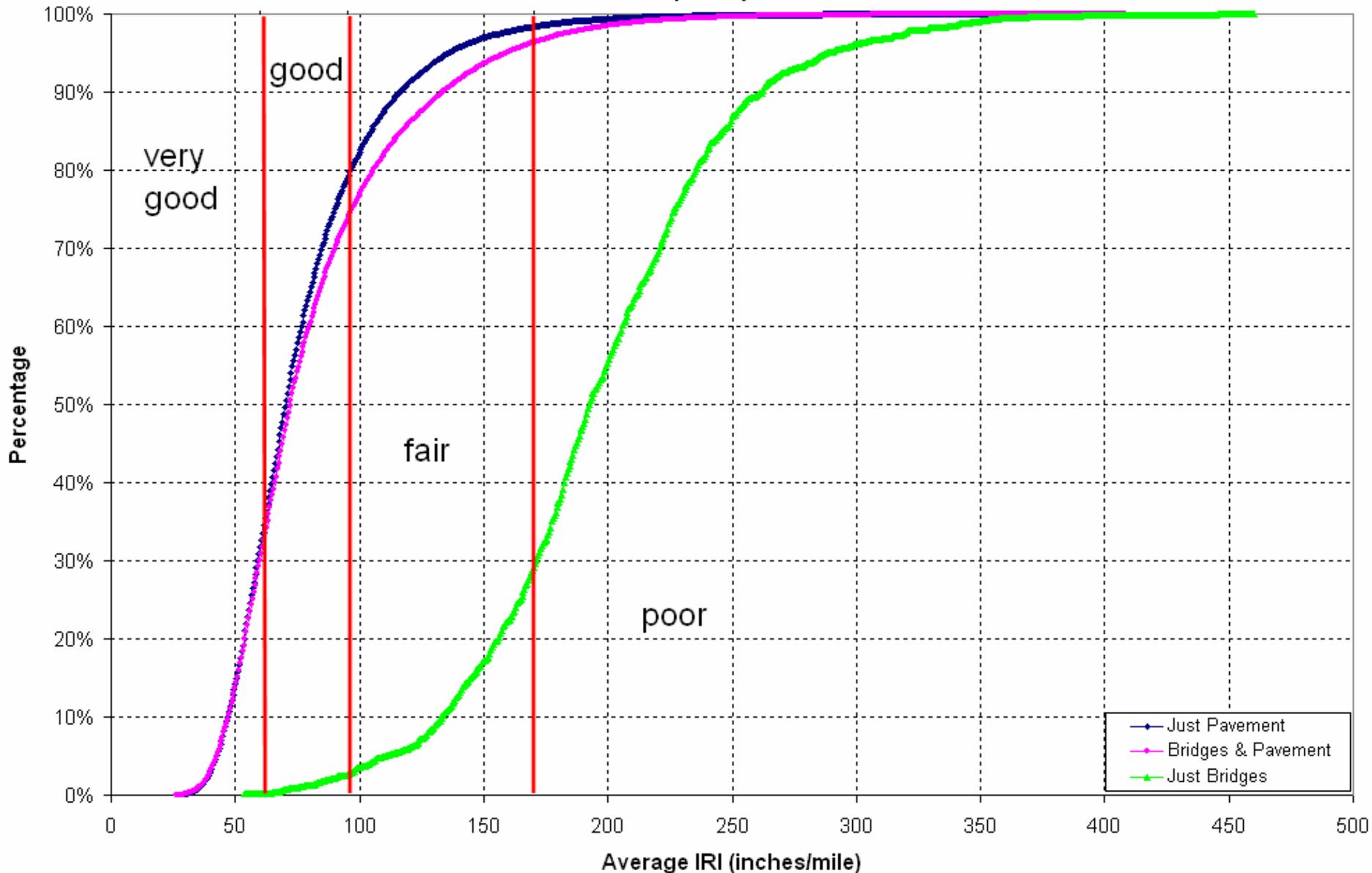
Old Dilemma: Bridge Ride

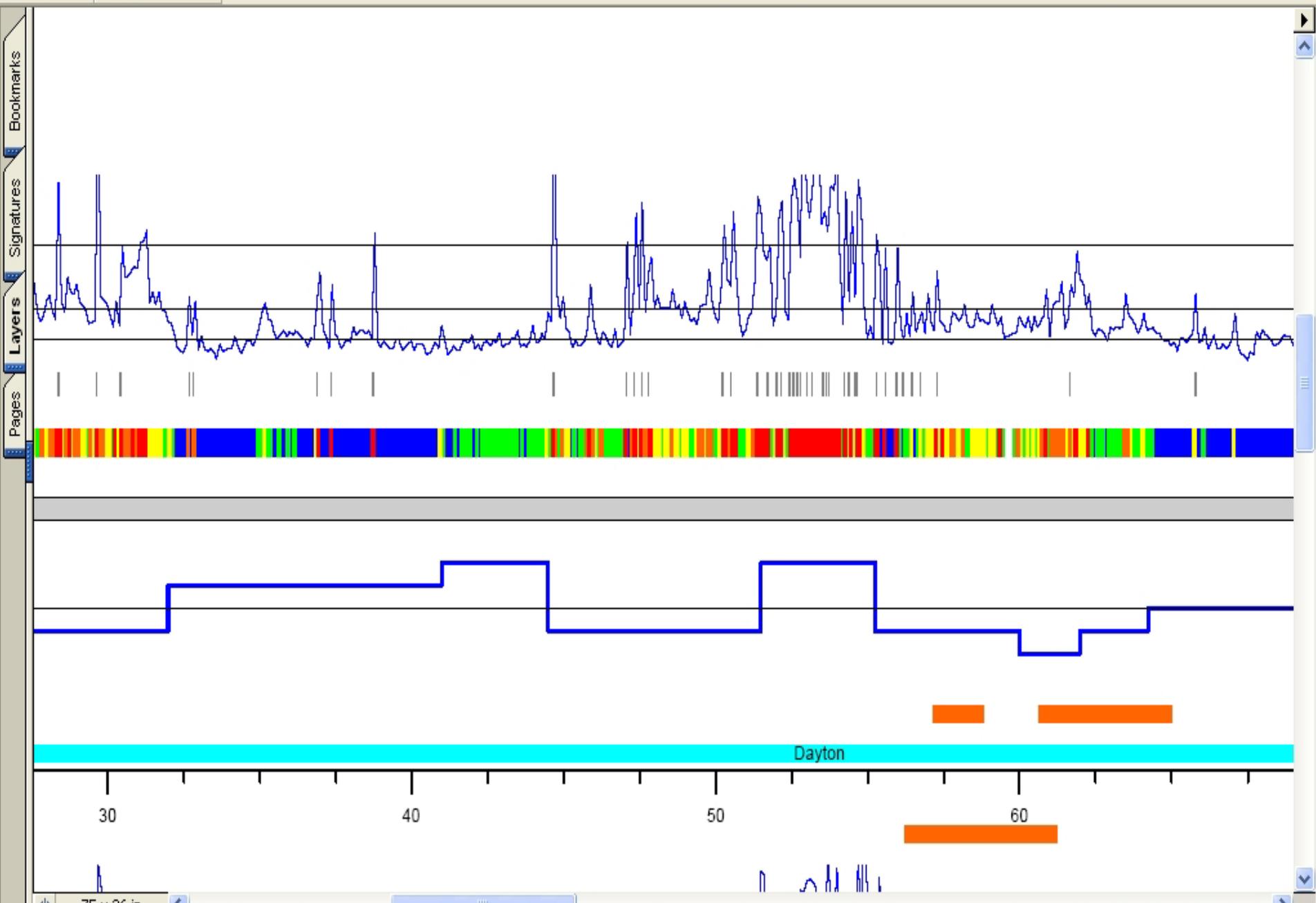
- We experience poor ride over most of our bridge encounters
- Bridges 2 ½ X rougher than pavements by IRI
- Bridges increase system IRI by 7.5%
 - Bridges are less than 4% of system by length
- Smoothness specs on decks & pavement
- No smoothness specs on transition

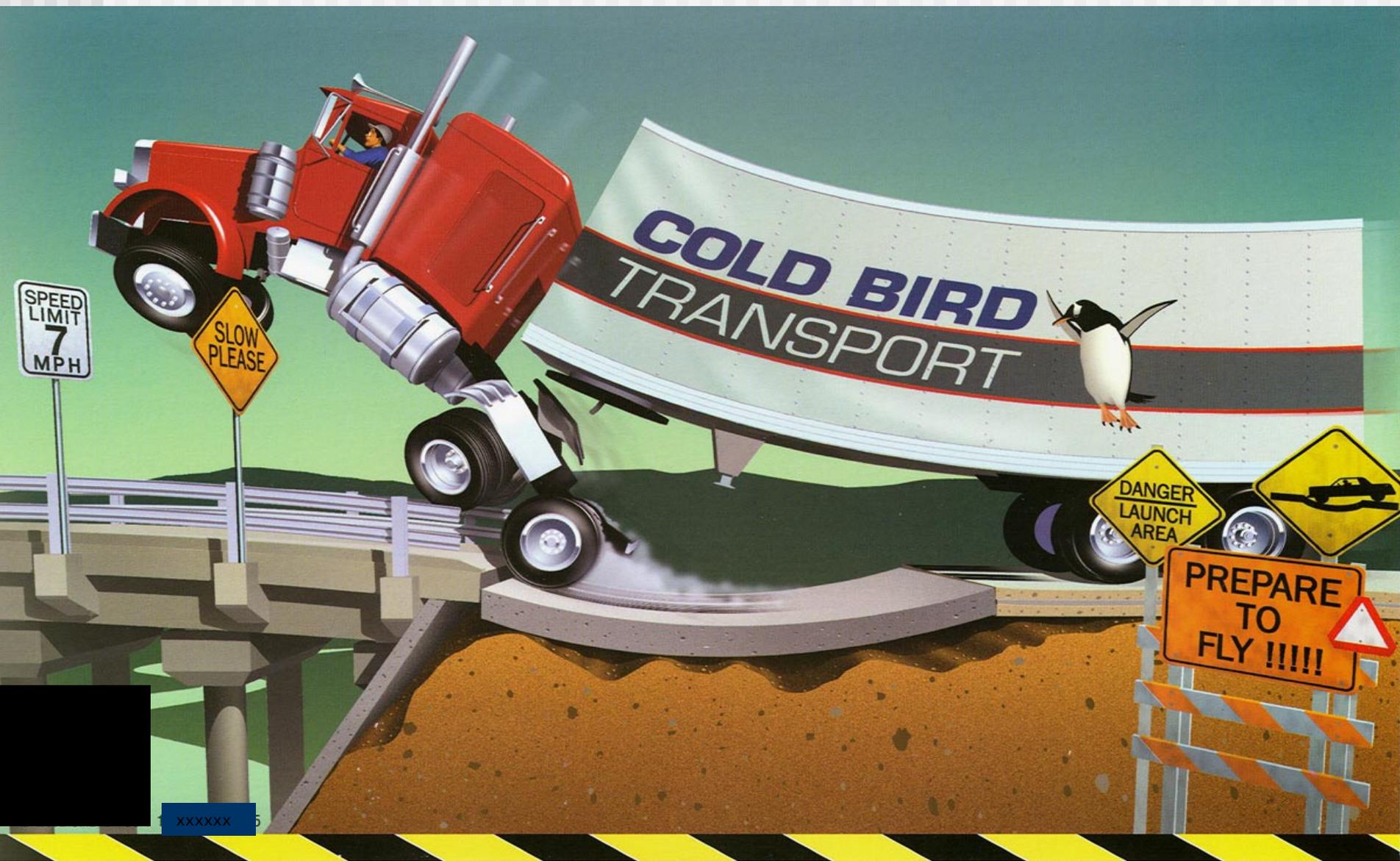
2001 Ohio Interstate System

Bridge Roughness Study

Cumulative Frequency Distribution





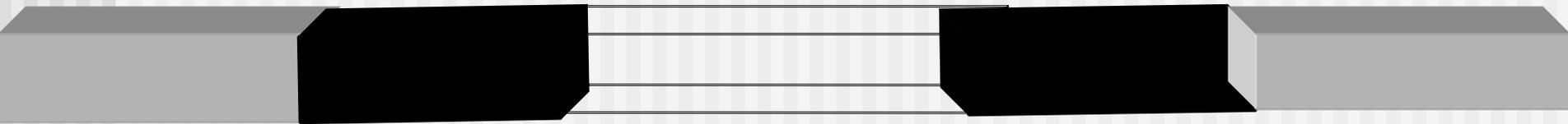


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Desired State after Construction

CONTINUITY

Lack of Height Deviations through
bridge encounter



Pavement

Approach Slab

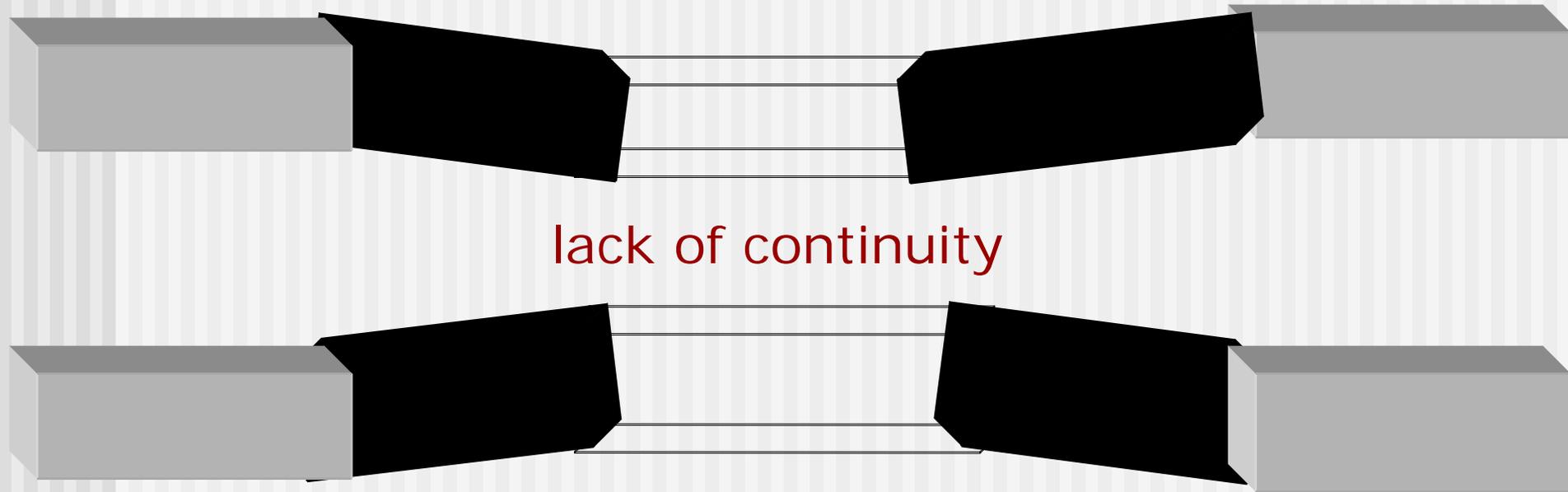
Bridge Deck

Approach Slab

Pavement

Causes of Poor Ride Across Bridges

Decks are higher/lower than pavement



lack of continuity

Pavement

Approach Slab

Bridge Deck

Approach Slab

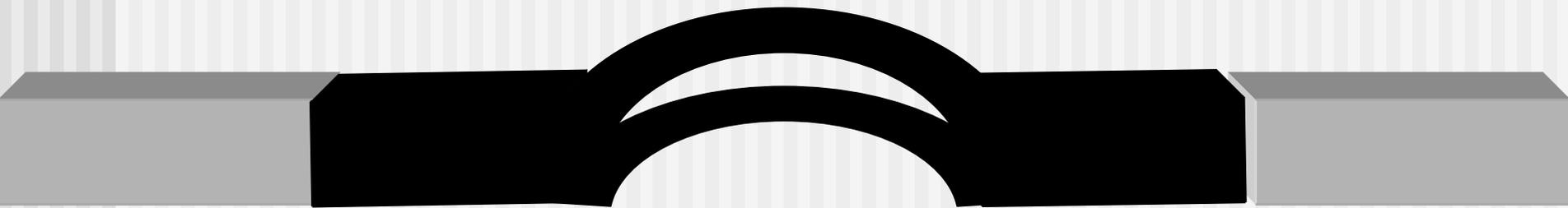
Pavement



Causes of Poor Ride Across Bridges

Residual Camber in structure

lack of continuity



Pavement

Approach Slab

Bridge Deck

Approach Slab

Pavement

EXIT 49

Alum Creek Dr
Obetz
1/2 MILE

ROAD CLOSED
BY MAINTENANCE
REMOVED & RELOADED



Obetz
1/2 MILE

ROAD AHEAD IS
CLOSED
TO ALL ROAD
TRAVEL - 200
& 200 WEST

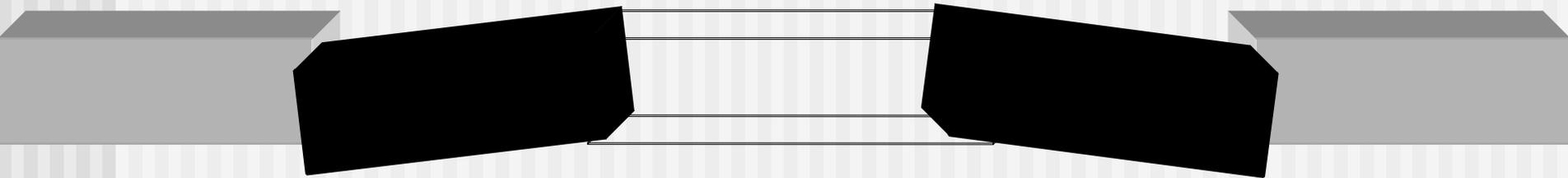




Causes of Poor Ride Across Bridges

Approach slab settlement
Deep fill settlement

lack of continuity



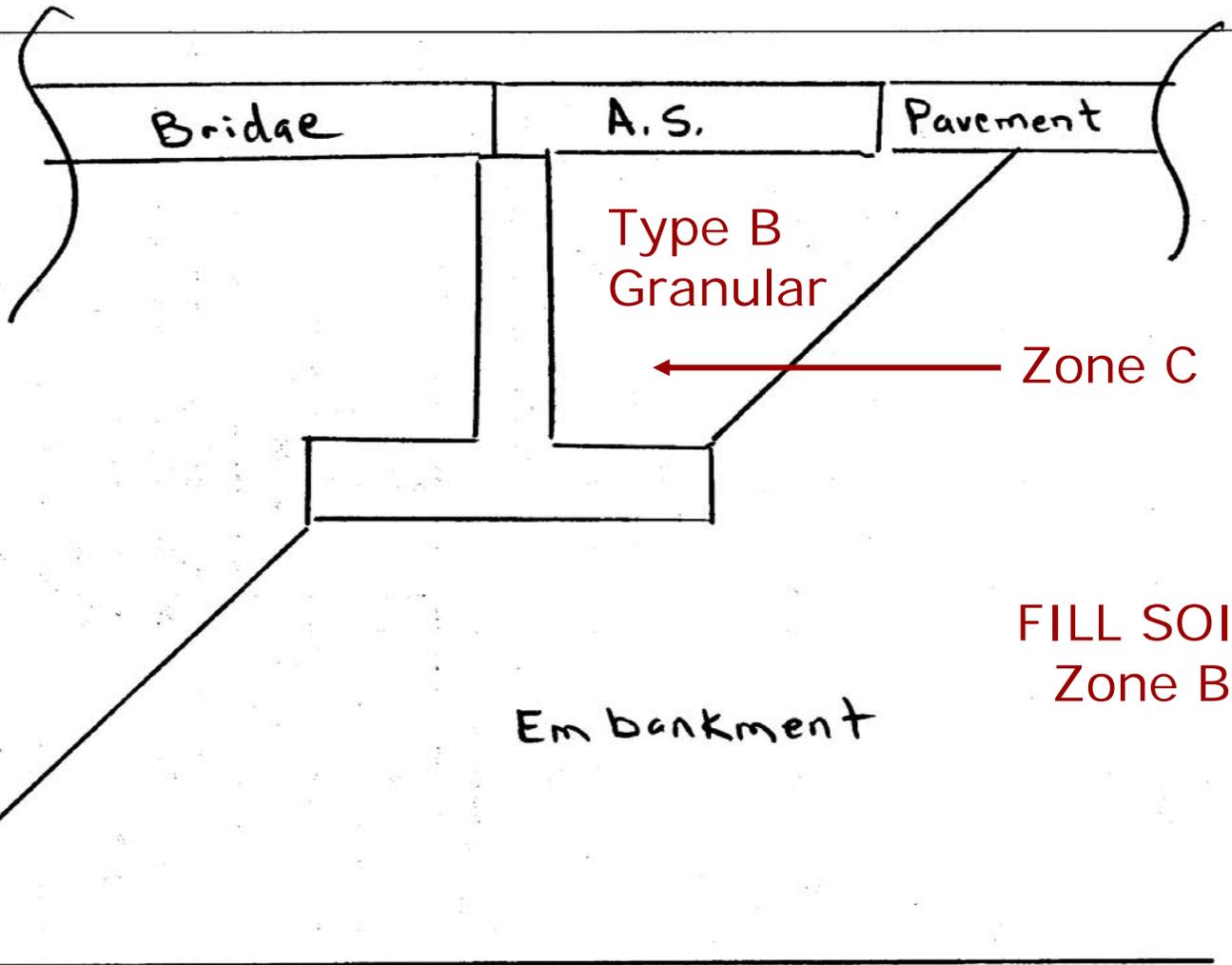
Pavement

Approach Slab

Bridge Deck

Approach Slab

Pavement



Bridge

A.S.

Pavement

Type B
Granular

Zone C

FILL SOIL
Zone B

Em bankment

Foundation

IN SITU SOIL
Zone A







Leading Causes of Poor Ride Across Bridges

Discontinuity

- Decks higher/lower than surrounding pavement
- Settlement
 - Approach Slabs
 - Deep Fills
- Residual Camber in Spans

Where do we start?

SUPPORT (it's the right thing to do!)

- Internal
 - Public expects/accepts rough ride at bridges?
 - Big concern w/ bridges is safety/carrying the load not rideability
 - Responsibility/Ownership: structures, construction, pavements, districts, etc?
 - Everybody's plate is already full

Where do we start?

SUPPORT (it's the right thing to do!)

- External
 - Construction Industry: AC, PCC, Bridge construction industry
 - Understanding down to the construction crew level
 - Responsibility/Ownership: primes vs. subs; pavement vs. bridge
 - Pride in final product

Where do we start?

Communication

- Winter Construction conferences
- Industry meetings
- Smooth Paving Workshop (March 2006)

"Rideability"

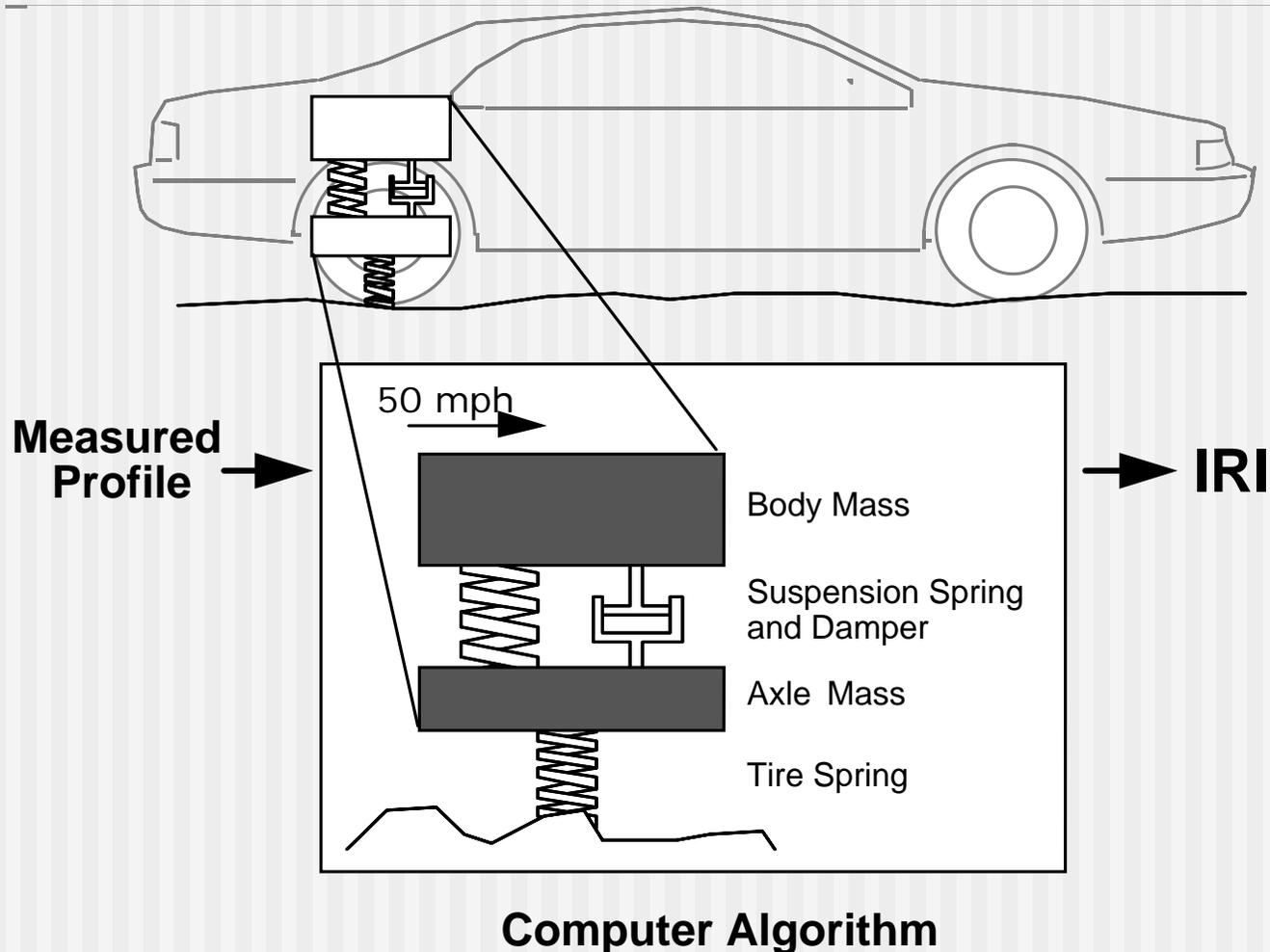
Seeing the surface of a highway
the way motor vehicles do.

that means:

Collecting and interpreting road
profiles.

International Roughness Index (IRI)

Using profiles to simulate vehicle response (What the public "feels")



10 ft Rolling Straightedge



02/17/2004



Current Situation/Specs

- Smoothness specs (*where's rideability?*)
 1. 10' Rolling Straightedge – bridge decks
 2. CA Profilograph - pavement
 3. No specification at transitions
- Need to consider Ride Quality in design, construction, maintenance processes
- DOT

Exp Spec for New Projects or Major Rehabs (pave & bridge)

Can we build them smooth to begin with?

- Pilot Bridge Ride Specification
 - ODOT Structures
 - ODOT Construction
 - ODOT Pavement Engineering
 - Industry
- (25' pavement, approach slab, deck, approach slab, 25' pavement) = ??? IRI

Exp Spec for New Projects or Major Rehabs (pave & bridge)

- Each lane of encounter must have an IRI below 150 in/mile (*proper threshold?*)
(25' pavement, approach slab, deck, approach slab, 25' pavement) $IRI \leq 150''/mi$
- Achievable – communication
 - IRI from recent bridge projects
 - pre construction meetings
- Incentive – max of 20% with $IRI \leq 80''/mi$
paid on price concrete in deck
(*carrot the right size?*)

Exp Spec for New Projects or Major Rehabs (pave & bridge)

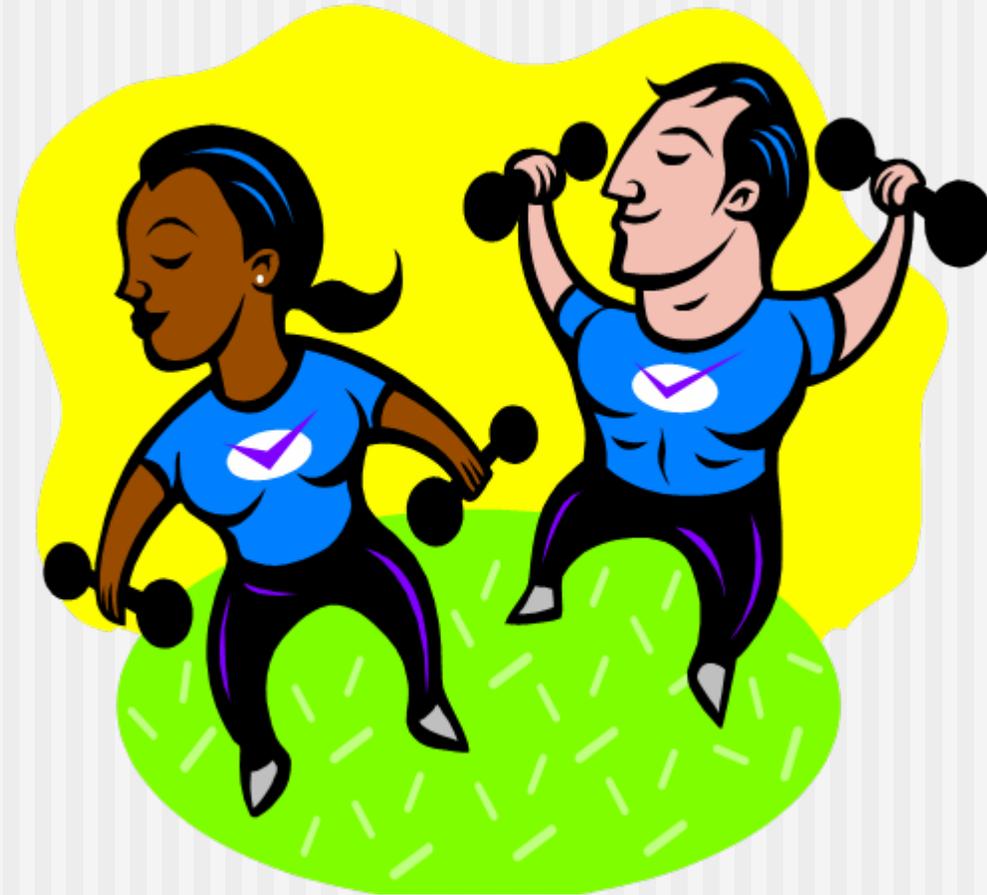
Considerations

- Length of bridge, (decks & approaches)
- What if bridge encounter isn't below 150 inches/mile?
- Incentive increments

Bridge spec link

Bridge Rideability

**It's not
hopeless!**







Policy/Design/Construction

*"Ability to safely carry loads
and
good rideability
are NOT
mutually exclusive goals
for our structures!"*

Policy/Design/Construction ideas

- Future Maintenance
- Maximum allowable skew angles
- Closure pours
- Approach Slab Design
 - Integral/Semi-integral approach slabs
 - Lowering approach slabs 3-4"
 - Trapezoidal – perpendicular to pavement
- Reconsider Taboos
 1. AC overlays
 2. Diamond grinding decks





Future Considerations

- Evaluate initial pilot projects
 - Baselength/continuous reporting methodology?
- Additional specs
 1. Just replacing decks/approach slabs
 2. Just resurfacing but not touching bridges
 - Problem with multiple overlays
- Can IRI specs improve bridge rideability? If so, do we gain anything else?



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Any questions?

RO gun

unBEARable
bridge roughness



Questions ????????

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THANK YOU