





# The Smooth,

# **Durable Pavement**

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# 51% of drivers want a smoother ride



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### **Kentucky Interstate Smoothness Comparison**



### **Texas Interstate Smoothness Comparison**



Percent Lane Miles in Very Good Category

# **Webster Defines**

Smooth as: Having a surface free from irregularities or roughness



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### The FHWA Coins the Term Acceptable Ride Quality



1998 National Strategic Highway Plan introduced a new term,

# "Acceptable Ride Quality "

and stated, 93%<sup>\*</sup> of the National Highway System would have an "acceptable ride quality" by the year 2008

\*Amended to 95% in Fiscal Year 2003 Strategic Plan

# to the FHWA



# Acceptable Ride Quality = International Roughness Index < 170 inches/mile



IRI provides a response similar to a passenger car

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% of National Highway System Miles with Acceptable Ride Quality



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# Overdrive Magazine's Annual Survey Rates Pennsylvania Roads the "MOST IMPROVED"!

How did Pennsylvania do it?

Penn DOT made a serious commitment to improve the ride quality of their roads and the implementation of a ride quality incentive specification

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# **Pennsylvania's Incentive Specification**





Definition	IRI	Payment/Lot
Excellent 7	<u>&lt;</u> 35	+ \$300
Very Good (Bonus)	35.1 - 45	+ \$150
Good	45.1 - 55	+ \$ 75
Acceptable	55.1 - 70	
Unacceptable (Penalty)	70.1 - 95	- \$150
Must Correct	>95	FIX

# Has had positive results

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# Statewide Average on Ride Spec Projects: IRI- 45.3

# Quoting one Pa DOT engineer, "The results are OUTSTANDING, no they are better than OUTSTANDING"

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### Has the Overall Ride Quality Improved in Pennsylvania ?



### You Bet It Has



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Responding to their customers, the Arizona DOT implemented a smoothness specification in 1995 and hosted an, Asphalt Pavement Smoothness Seminar in December of 1998

Since implementing the smoothness specification the Arizona DOT had registered significant benefits in:

- satisfied motorist
- satisfied contractors
- lower bids

- Iower maintenance costs
- quality of construction





# **Richard Petty describes the Arizona smoothness**

# story as <u>"Highways Fit for a King!"</u>

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# March 7, 2000

**Kansas City** 

# **FHWA**

# Sponsored a National Conference Promoting Smooth Pavements

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# **Kansas Smoothes Way**

**KDOT** has included smoothness specifications for asphalt and concrete pavements since 1990.

Smoother pavements in Kansas are expected to require less maintenance due to less dynamic loading from truck traffic, with an estimated maintenance cost savings of \$10,000 per mile the first year and an increase in savings for the life of the pavement.



# Asphalt Spells Highway Comfort In Georgia

# Georgia developed and enforced strict ride quality specifications The Result

Georgia's highway system is one of the best in the nation. Georgia's highways are 95% asphalt.



You don't have to be "King of the Highway" or a DOT official to <u>recognize</u> the smoothest highway...

Meet Taylor Johnson, St. Agnes School Charleston, West Virginia 5<sup>th</sup> Grade Science Project

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- -Glass filled with water in wagon
- -A lesser amount was displaced on hot mix asphalt roads than concrete roads
- -"Asphalt roads are seamless; concrete pavements have seams."

# Hats off to Taylor!





Hot-mix asphalt's ability to pave uninterrupted and the absence of joints results in

# **SMOOTH PAVEMENTS**

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# The motorist benefit is more than just a SMOOTH, QUIET ride. It also increases the fuel efficiency and reduces vehicle wear and tear!

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# FHWA Tech Brief on WesTrack



"when the average IRI number decreased by 10%, it resulted in a 4<sup>.5</sup>% increase in miles / gallon"



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# FHWA Tech Brief on WesTrack





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# Smooth Pavements mean more than just HAPPY CUSTOMERS



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# **Smooth Roads**



# **S-T-R-E-T-C-H** Agency Roadway \$\$\$ by:

Less Dynamic Loadings
Reducing Pavement Distress
Resulting in Less Maintenance \$\$\$\$
and Ultimately Lower Life Cycle Costs



#### The Long-Term Effects of Initial **Pavement Smoothness**

#### Introduction

In a recent independent survey1, pavement smoothness was rated the leading concern of the traveling public. Smooth-riding pavements provide a high level of comfort to users and allow for more efficient movement of vehicles over the roadway. Rough pavement not only generate complaints highway users, but they creat hazards, cause vehicle damag may increase fuel consumpt

Although the benefits of smooth pavements to the traveling public are widely acknowledged, the effect of initial smoothness on the long-term future smoothness and life of the payement has never been fully established. Although the AASHTO pavement design equations imply that a higher level of initial smoo leads to a longer pavement supposition has never been config It may be argued that rougher pave ments increase the dynamic loading effects of truck traffic on the pavement that, in turn, induce more deterioration; but again, such a theory has never been validated

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### Initial pavement smoothness has:

Research Program (NCHRP) Project

pavement smoothness on the future

1-31 examined the effect of initial

construction, new portland cement

#### Effect of Initial **Smoothness on Future** Smoothness

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# A significant effect on future smoothness

# significant effect on actual pavement life

### **ERES Newsletter on Results of NCHRP 1-31**

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NCHRP 1-31 estimated 15% increase in pavement life for 50% increase in smoothness



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# Pavement Smoothness



Publication of the National Asphalt Pavement Association Information Series III By Michael S. Janoff

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# Long Term (10 year) Cracking



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# **Major Conclusions**

- 1. Pavement Serviceability Index (PSI) is directly related to roughness (in/mi).
- 2. Initial smoothness is directly related to long term roughness.
- 3. Initial smoothness is directly related to average annual road maintenance costs.
- 4. Roughness has a direct relationship to vehicle operating costs.



## What has the Wisconsin DOT learned from their

# **Hot-Mix Asphalt Warranty Pavements?**



Warranty pavements have been smoother initially and stay smooth longer than conventionally constructed projects.

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# **Wisconsin Warranty Pavements**





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# "Smoothness is specified by the owner, but it is achieved by the contractor"



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### **Getting Smoother Pavements**

The Arizona, Pennsylvania and Georgia success stories are adaptable nationwide

Set a standard for smoothness on new highways and then make it worth the extra care and effort for contractors to reach that standard.

# **Building Smooth Roads**

# **Starts with design**

- Consider milling/profiling
- Use multiple lifts
  - Each lift is an opportunity to improve smoothness



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# **Building Smooth Roads**

Properly Trained and Conscientious Employees **Road Institute** 

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# **Building Smooth Roads**





# **A Continuous Paving Operation**





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# **Smooth Roads Require**



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# **Smooth Roads Require**



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Byron Lord Deputy Director, FHWA Office of Pavement Technology

# "Building smoother roads leads to longer life and improved service.."

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# Put It All Together





# And you get

- A Smooth, Safe, Durable Roadway
- Happy Motorist

# Optimum Economics for the Owner

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