



# **Workshop 2: Use of HVS to Assess and Select Treatments for Pavement Preservation**

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HVSIA Annual Meeting  
FAA Technical Center, Atlantic City, New Jersey,  
August, 31<sup>th</sup>, - September 2<sup>nd</sup> 2015

# Agenda

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- **Background**
- **Review Previous Consensus**
- **Summary**



# Background

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## ■ **Transportation Research E-Circular C139**

- Published in September 2009
- Sponsored by AFD40 on Accelerated Pavement testing
- Summary of Session 594 in TRB 2007
- Edited by Moderator John Harvey
- Four papers and discussions and post TRB reviews

## ■ **Renewed interest?**

# Review E-Circular C139

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- **Planning**
- **Performance and Failure Measures**
- **Conditions of Existing Pavements**
- **Pre-Loading Conditioning**
- **Loading**
- **Instrumentation**
- **Comparison of Results and Extrapolation**





# Planning for Preservation Tests

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- **Need to determine questions to be answered**
- **Question need to be answerable**
  - Effect of ride quality can not be quantified accurately
  - HVS testing speed is lower than typically relevant to preservation treatment effectiveness
  - Short section->amplified effect of construction deficiencies
  - Cornering, acceleration and deceleration can not be assessed

# Performance and Failure Measures

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- **Depends on treatment type**

- Rutting

- Cracking

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# Conditions of Existing Pavements

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- **Structural Capacity**
- **Previous exposure to environmental and traffic loading**
- **Existing relevant surface distresses**



# Conditioning of Existing Pavements

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## ■ Equal conditioning

- Exposure to environment after treatment
- Artificial conditioning
  - Water,
  - Temperature,
  - Exposure to sunlight,
  - Air,
  - Dust,
  - Trafficking
  - Aging







# Loading

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- **Standard Loads**

- i.e., no overload
- Don't want to change the failure mechanism
- Don't want overload to introduce extra factor

- **Need to have a bedding-in phase**

# Instrumentation

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- **Similar to regular instrumentations**
- **Extra**
  - Noise measurements using on-board sound intensity before and after
  - Surface texture and friction
  - Longitudinal surface profile
  - Transverse surface profile (rutting–shoving)
  - Observation of stripping; and
  - Splash and spray



# Comparison of Results and Extrapolation

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- **Need to have well understood control**
- **Difficult to directly extrapolate to field conditions**
- **Typical practice:**
  - Build LTPP sections along with APT sections
  - APT results provide relative ranking
  - LTPP sections provide absolute performance



# Experiences

Treatment	Distress Mechanisms	APT Can Evaluate?		Concerns or Effects That Should Be Considered	Controls Needed if APT Machine Used	Where Has It Been Done Before?
		Test Track	APT Machine			
Thin dense and gap-graded overlays	Cracking	Yes	Yes	Aging, extent of underlying cracking (if reflection cracking), wheel speed	Temperature, water	South Africa, California, Australia, NCAT
	Rutting	Yes	Yes	Wheel speed	Temperature, no water	South Africa, California, Australia, NCAT
	Shoving	No	No	Torsion from drive wheels	N/A	
	Ravelling	Yes	No	Aging, torsion from drive wheels, wheel speed	N/A	
	Moisture damage	Yes	Yes		Temperature, water	South Africa
Thin open-graded overlays	Cracking	Yes	Yes	Aging, extent of underlying cracking (if reflection cracking), wheel speed	Temperature, water	South Africa, New Zealand
	Rutting	Yes	Yes	Wheel speed	Temperature, no water	South Africa, NCAT
	Shoving	No	No	Torsion from drive wheels	N/A	
	Ravelling	Yes	No	Aging, torsion from drive wheels, wheel speed	N/A New	Zealand
	Moisture damage	Yes	Yes	Wheel speed	Temperature, water	South Africa
	Closing of voids	Yes	Yes	Effects of waterborne and airborne debris	Temperature, grit, water	

# Experiences - continued

Treatment	Distresses Mechanisms	APT Can Evaluate?		Concerns or Effects That Should Be Considered	Controls Needed if APT Machine Used	Where Has It Been Done Before?
		Test Track	APT Machine			
High-friction epoxy surface treatment	Surface friction	Yes	No	Torsion from drive wheels, wheel speed	NA NCAT	
	Debonding Yes		No?	Wheel speed	NA NCAT	
Aggregate seal coats	Ravelling	Yes	No	Aging, torsion from drive wheels, wheel speed	NA South	Africa MnROAD
	Cracking	Yes	Yes	Aging, extent of underlying cracking (if reflection cracking), wheel speed	Temperature, water	Australia, South Africa
	Embedment, bleeding	Yes	Yes	Existing surface condition	Temperature, no water	
	Rutting	Yes	Yes	Wheel speed	Temperature, water	Australia, South Africa MnROAD
Aggregate stabilization	Raveling and Potholes	Yes	No	Construction for short test cells, Wheel speed	Stabilization amounts, water	MnROAD
Slurry seals	Ravelling	Yes	No	Aging, torsion from drive wheels, wheel speed	N/A MnROAD	
	Cracking	Yes	Yes	Aging, extent of underlying cracking (if reflection cracking), wheel speed	Temperature, water	MnROAD

# Experiences - continued

Treatment	Distress Mechanisms	APT Can Evaluate?		Concerns or Effects That Should Be Considered	Controls Needed if APT Machine Used	Where Has It Been Done Before?
		Test Track	APT Machine			
Micro-surfacing	Ravelling	Yes	No	Aging, torsion from drive wheels, wheel speed	NA MnROAD	
	Cracking	Yes	Yes	Aging, extent of underlying cracking (if reflection cracking), wheel speed	Temperature, water	MnROAD
	Rutting (when filling ruts)	Yes	Yes	Depth of existing rut, wheel speed	Temperature, water	MnROAD
Patching	Rutting	Yes	Yes	Wheel speed	Temperature, no water	South Africa, NCAT
Crack sealants	Crack reappearance	Yes	Yes	Aging, extent of underlying cracking (if reflection cracking), wheel speed	Temperature MnROAD,	NCAT
Fog seals	Rutting	Yes	Yes	Wheel speed	Temperature, no water	
	Top-down cracking	Yes	No?	Wheel speed	N/A	
Ultra thin white-topping	Cracking Yes		Yes		Water, temperature	MnROAD, Indiana, FHWA, Florida (in progress)
	Faulting	Yes	No?	Unidirectional traffic, wheel speed	Water, temperature	Indiana, FHWA, Florida
	Debonding Yes		Yes		Temperature	
	Roughness Yes		Yes		Temperature	

# Experiences - continued

Treatment	Distress Mechanisms	APT Can Evaluate?		Concerns or Effects That Should Be Considered	Controls Needed if APT Machine Used	Where Has It Been Done Before?
		Test Track	APT Machine			
Jointed plain concrete pavement load transfer restoration	Load transfer efficiency (LTE)	Yes	Yes	Measure slab temperature when LTE is measured	Water California	
	Faulting Yes		No	Unidirectional traffic, wheel speed	Water	
	Cracking Yes		Yes		Water	California
	Debonding (backfill)	Yes	Yes		Water?	
Ultra-thin reinforced portland cement concrete	Cracking Yes		Yes		Water	South Africa
	Pumping Yes		Yes	Wheel speed	Water	
	Debonding Yes		Yes		Temperature, water	
All treatments	Longitudinal profile*	Yes	No?	Wheel speed	Temperature, water	Australia, MnROAD, NCAT

# Summary

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- **Yes you can!**
- **Be aware of limitations**
- **And...**

