Surface Characteristics

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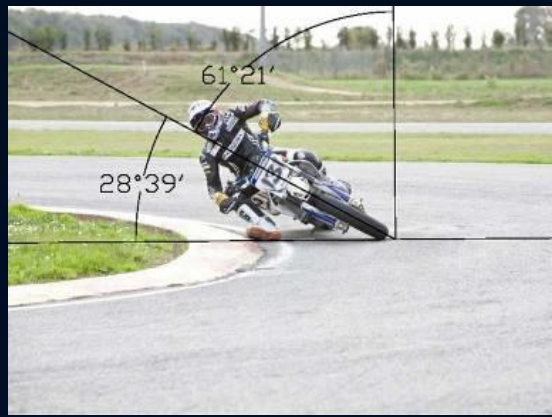
Key Areas

- Friction / Texture
- Splash / Spray
- Noise
- Smoothness / Ride Quality

Pavement Friction

- Investigating most suitable equipment
- Working with States on data collection
- Develop Pavement Friction Management Programs with States
- High Friction Surface Treatments



FHWA Toolkit – Friction/Texture

- Equipment loan program
  - GripTester (2)
  - Circular Texture Meter – CTM (3)
  - Dynamic Friction Tester – DFT (3)

FHWA Toolkit – Friction/Texture

- Equipment demonstration program
  - Dynatest Highway Friction Tester: Continuous Friction Measurement Equipment (CFME)
- High Friction Surface Treatments
  - 11 State Study
  - EDC2 Deliverable

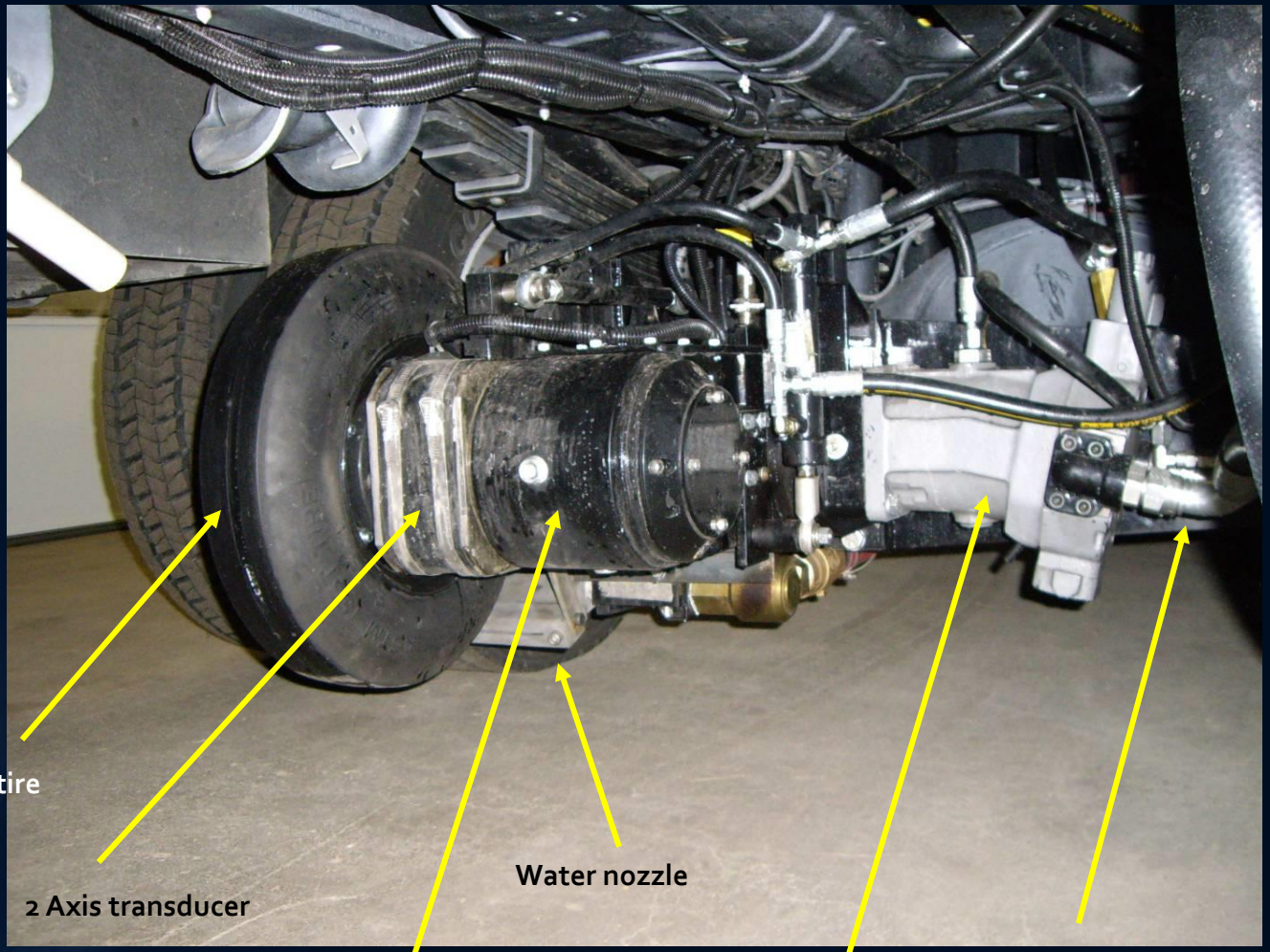
CFMEs

- CFME – Continuous Friction Measuring Equipment
- Benefits
  - Continuous measurement and reporting of friction values rather than spot measurement
  - Measurement around curves and through intersections
  - Fixed-slip devices better measure available friction, which better correlates to anti-lock braking
  - Network-level and Project-level testing

Dynatest 6875H HFT

- Fixed Slip Friction Testing
  - 14% slip (can be varied)
  - Hydraulically Controlled
- Continuous Friction Testing
  - Reports friction at 1 ft intervals
  - Test left wheel path only (can be built for RWP)
- Texture Measurement
  - Texture laser in-line with test wheel
  - Reports MPD every 0.01 miles
- Water System
  - 500 gal water tank (6875H); also available with 200 gal water tank on standard truck chassis
  - Testing range ~27 miles (0.5 mm water film thickness)

Dynatest 6875H

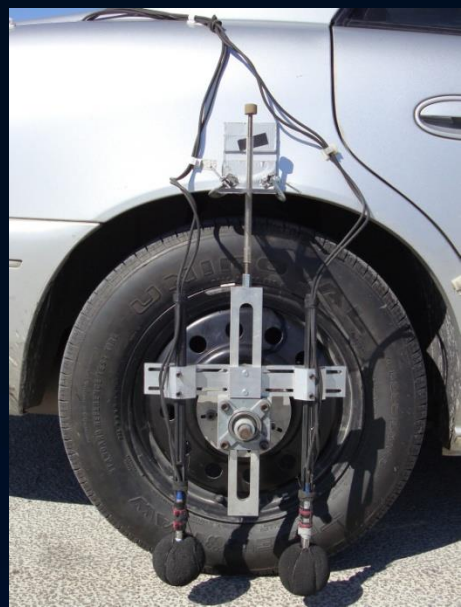


Splash / Spray

- Splash – spray assessment tool development study - VTTI
  - Development of a model to predict water film thickness and splash and spray occurrence on pavement surfaces
  - Develop recommendations for threshold criteria to classify the impact of splash and spray on highway users .

FHWA Toolkit - Noise

- AASHTO Provisional Standard on Tire/Pavement Noise Measurement PP-76 using On Board Sound Intensity (OBSI)
- Developing two additional AAHSTO standards on pavement noise measurement
- TPF 5(135) "Tire/Pavement Noise Research Consortium"
  - Develop lower cost OBSI system
  - Conduct equipment demonstration rodeos



Performance Measure Defined - FHWA

- Performance measurement is the use of statistical evidence to determine progress toward specific defined organizational objectives. This includes both evidence of actual fact, such as measurement of *pavement surface smoothness*, and measurement of customer perception such as would be accomplished through a *customer satisfaction survey*.
- http://www.ops.fhwa.dot.gov/perf_measurement/fundamentals/index.htm
  - Last updated February 26, 2013

Measurement of customer satisfaction

- FHWA conducted User Survey: 2002
  - Road condition cited as the public's number one criteria for satisfaction – smoothness.
- Because of the public's focus on smoothness, any improvements made in both the initial and long term-term smoothness of a roadway should lead directly to greater customer satisfaction.

Pavement Smoothness

- Pavement smoothness is probably the single most important indicator of performance from the standpoint of the traveling public (CLIENTS).
- Goal(s): Develop and deploy standards to provide consistent, quality data.
- Collaboration: HQ, RC, HRDI, AASHTO SOM, ASTM, SHAs, Industry and Academia.
- Used Technical Working Groups for Ride Quality and started a Pooled Fund Study.

International Roughness Index (IRI)

Advantages of IRI

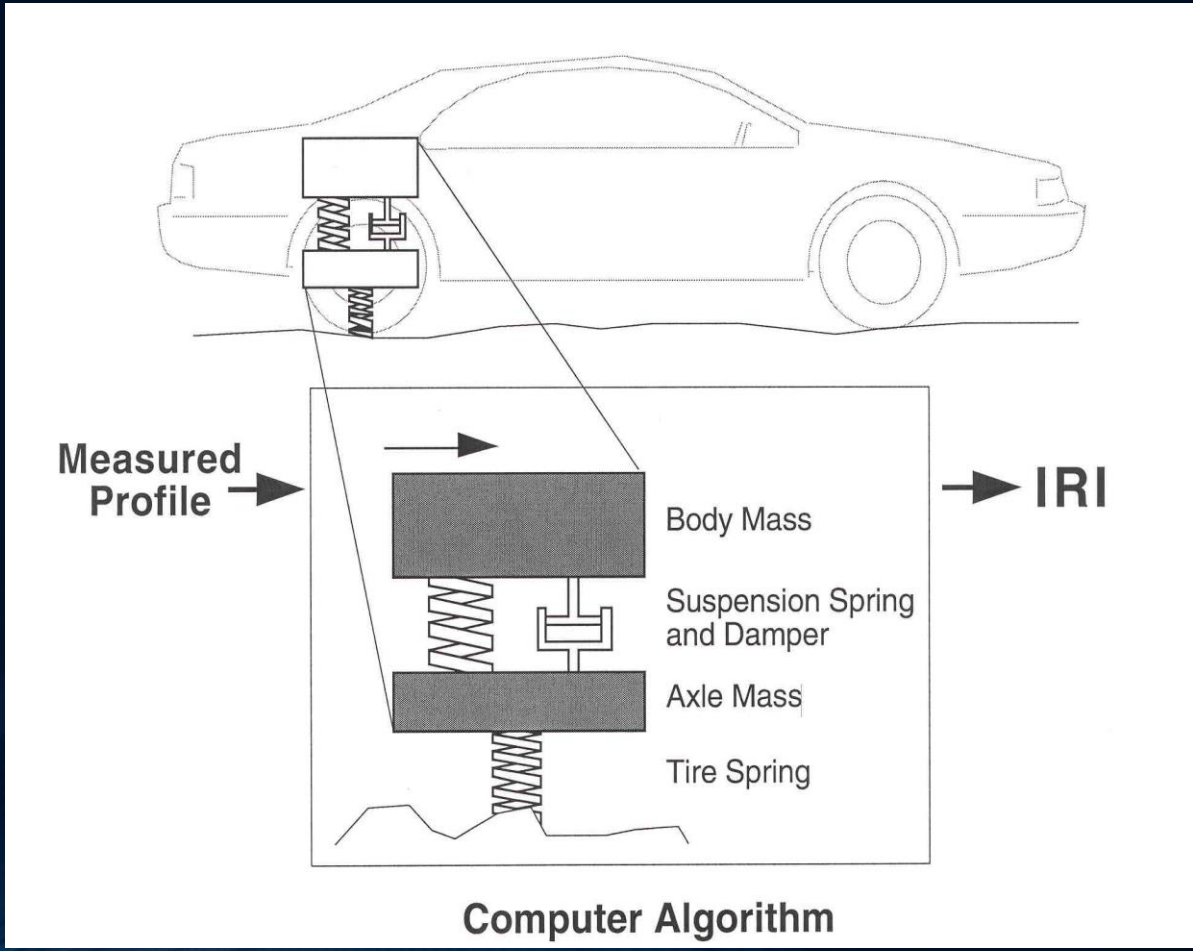
- Reproducible, portable and stable with time
- General pavement condition indicator
- Describes roughness that causes vehicle vibrations

IRI is highly correlated to:

- Vertical passenger acceleration (Ride Quality)
- Tire Contact (vehicle control and safety)
- Output from Response Type Roughness Measuring Systems

Properties of IRI Analysis

- IRI computed using quarter car model



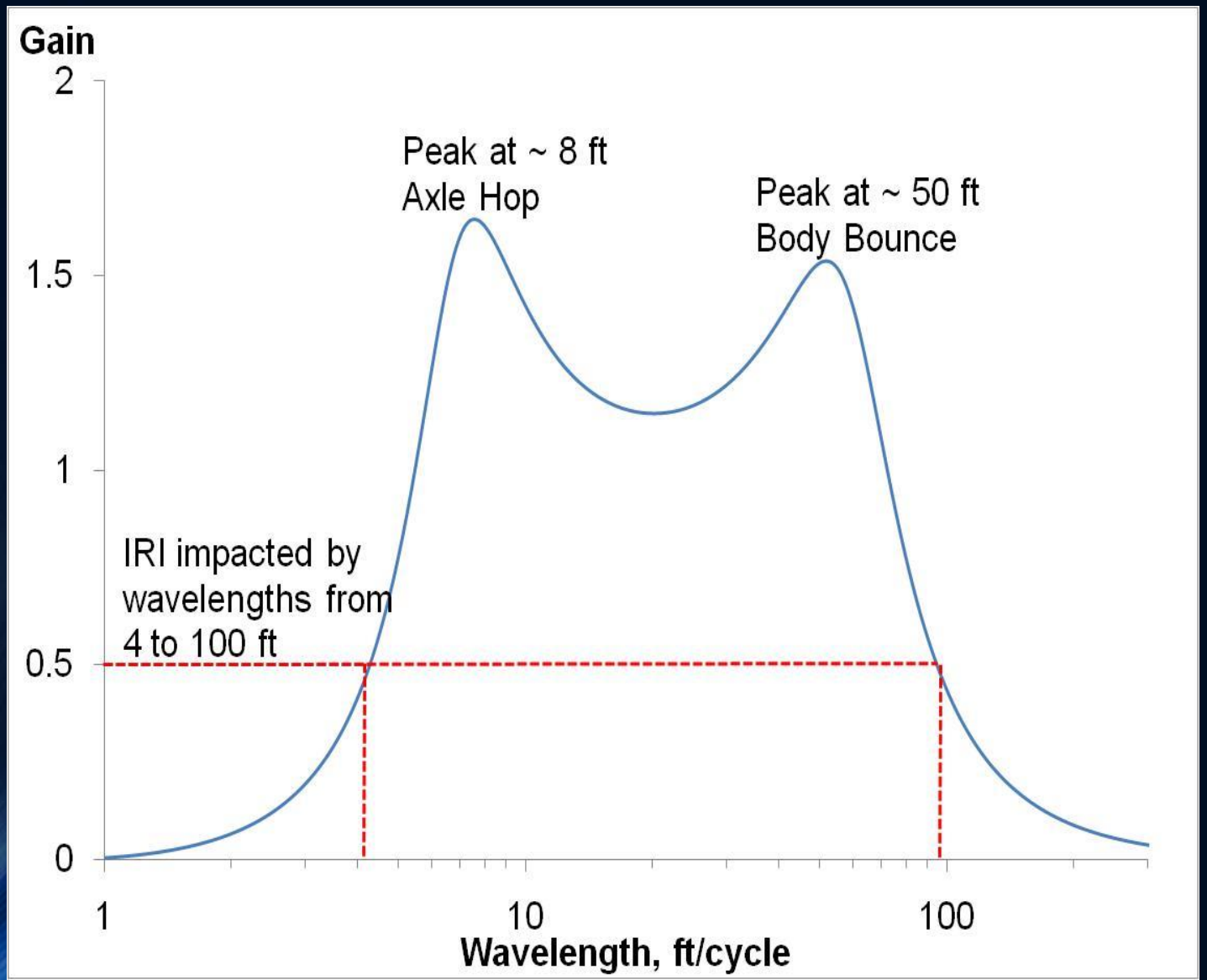
Computation of IRI

- Need longitudinal profile containing information relevant to ride

- Computation of IRI performed by a computer program as specified in ASTM Standard E1926

- Parameters of quarter car (e.g., spring stiffness, etc.) referred to as "Golden Car" parameters

Response of IRI to Wavelengths

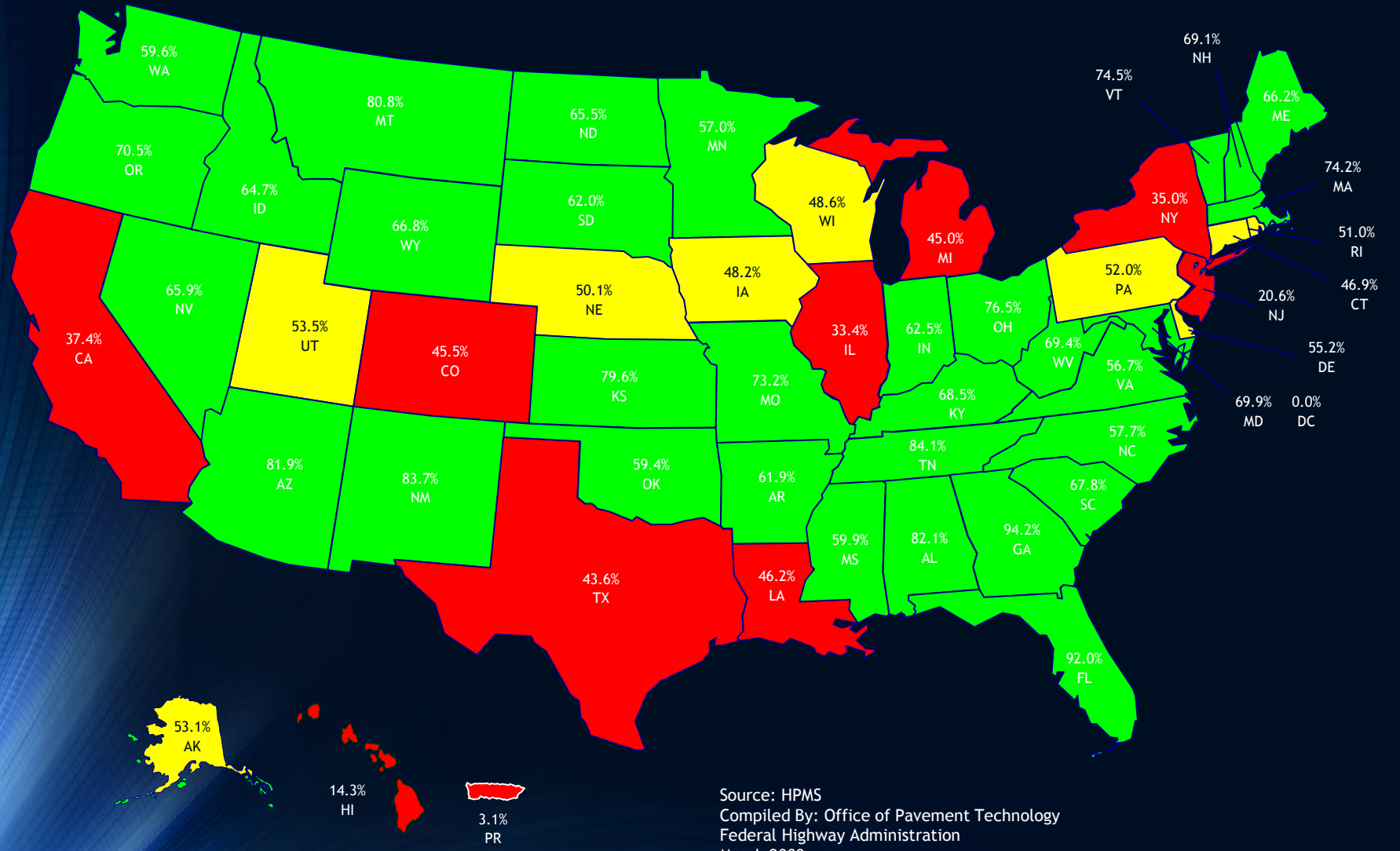


Equipment Requirements for IRI

- Resolution of height sensor 0.001 inch or less
- Sample interval must be less than 2 inches

Inertial Profiler – Measuring Ride Quality

2007 Pavement Condition on the National Highway System (NHS)
National Average = 56.7%, Target 57% in 2009
Good/Very Good (IRI of <95"/mile)



Source: HPMS
Compiled By: Office of Pavement Technology
Federal Highway Administration
March 2008

Developing new standards

- Used Expert Task Group (ETG) – started 2000: consisted of industry, academia, SHA's & FHWA.
- Provisional Standards on ride quality by 2003 – coordinated with AASHTO SOM – Andy Mergenmeier (P&M TST).
- Full AASHTO Standards on ride quality by 2010 with focus on project level data collection.
- Revised ride standards in 2013 to include network level data collection: AASHTO R43, M328, R54, R56, R57; ASTM E2560.

Pooled Fund Study – TPF 5(063) "Improving the Quality of Pavement Profiler Measurement" – kick off meeting 2003

Goal: To assemble states and the FHWA to:

(1) identify data integrity and quality issues with inertial profilers;

(2) suggest approaches to addressing identified problems;

(3) initiate and monitor projects intended to address identified problems;

(4) disseminate results; and

(5) assist in solution deployment.

FHWA Toolkit

- Smoothness
  - Profile Viewer and Analysis (ProVAL) software (www.roadprofile.com) – 10 workshops per year
  - ASTM E2560-07: Standard Specification for Data Format for Pavement Profile
  - NHI 131100 "Pavement Smoothness"
  - AASHTO Ride Quality Standards Implementation Contract
    - M328 Equipment Specification
    - R54 Accepting Ride Quality using an inertial profiler
    - R56 Certification of Inertial Profilers
    - R57 Operating Inertial Profiler

Questions?

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