



NCDOT – Rideability and IRI Special Provision

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NCDOT - Ride Quality Background

- **Fall 1995 – Rideability addressed in Asphalt QA/QC Program**
- **National Highway User's survey in 1996 indicated that nationwide pavement conditions were the No. 1 concern of traveling public**
- **Rideability Specification developed for 5 projects let in Nov. 1996**
- **Full implementation considered for 1997**
- **Pavement Smoothness Task force was established**
- **June 2005 – Memo on Rideability (still an issue)**
- **Rideability Group was established with Industry Reps.**



NCDOT - Ride Quality Background

- **Final Surface Testing SP** (2 or more lifts of asphalt, 45 mph, 1000')
- **Hearne Straightedge – Asphalt Pavement**
- **Rainhart Profilograph – Concrete Pavement**



Hearne Straightedge – developed in NC by Tom Hearne





Hearne is a 10-ft rolling straightedge pushed at 2 mph



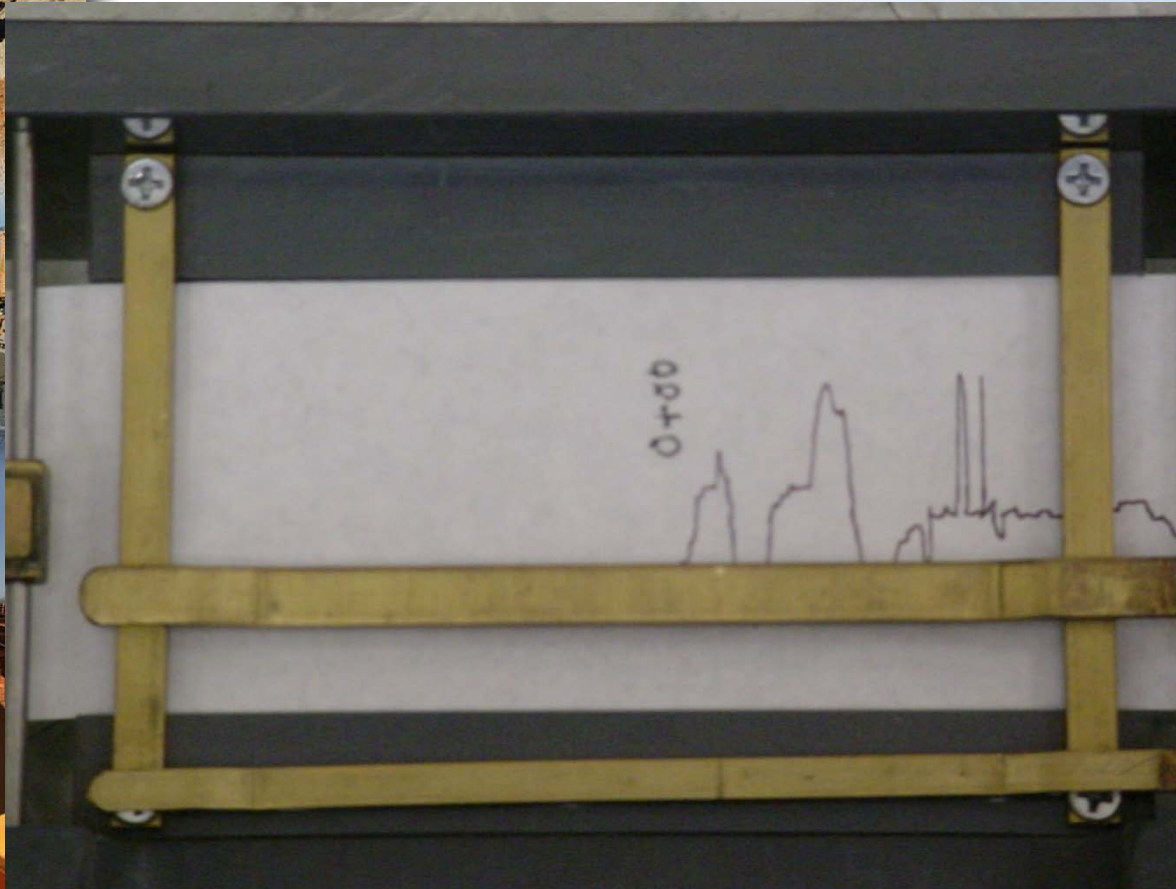


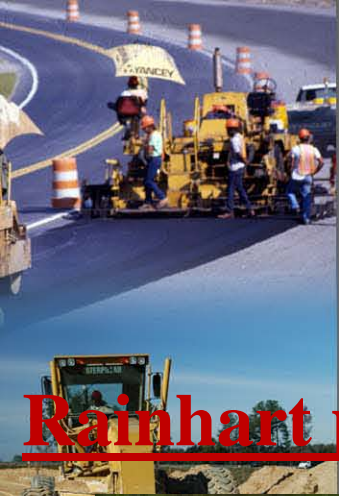
Graph produced by Hearne Straightedge





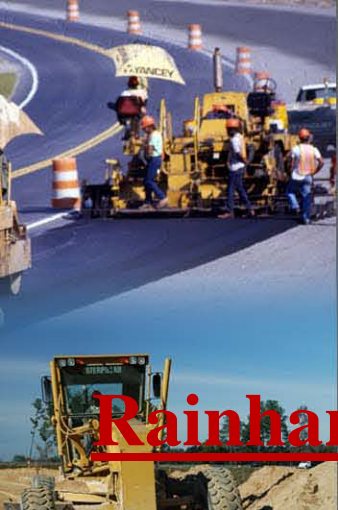
“Bump meter” taken in one wheel path





Rainhart profilograph for concrete pavements and bridges





Rainhart is 29-ft rolling profilograph pushed at 2 mph

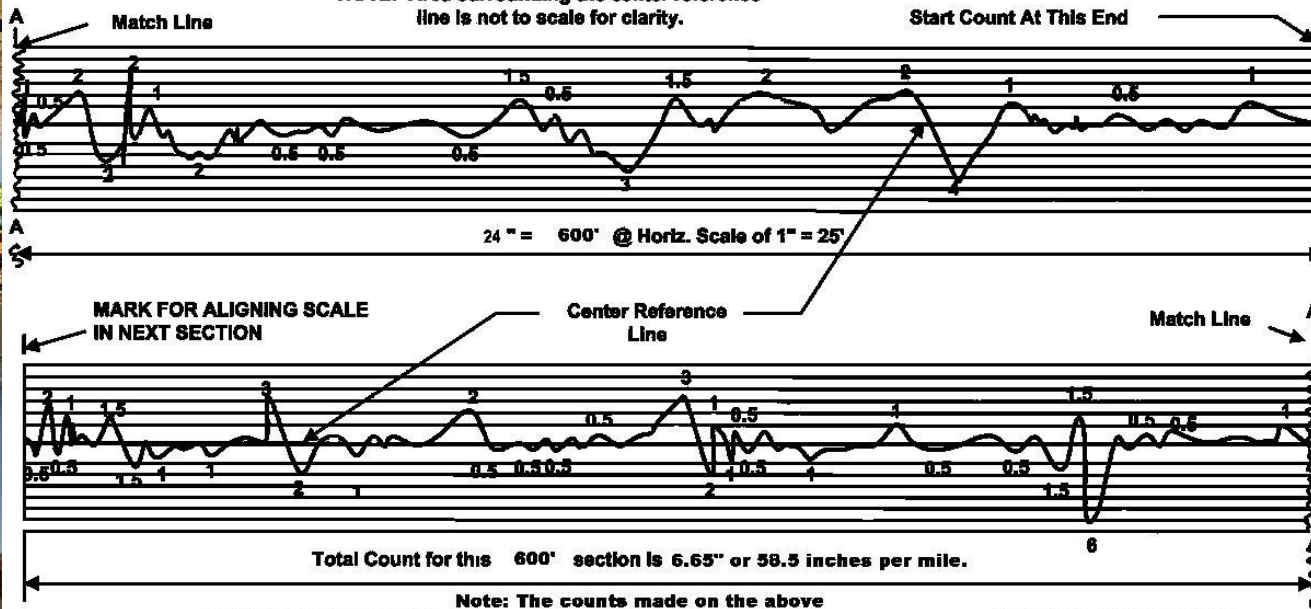




Measuring smoothness on graphical scale

EXAMPLE SHOWING METHOD OF DERIVING PROFILE INDEX FROM PROFILOGRAMS

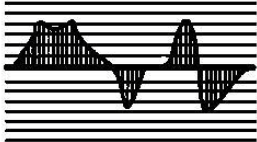
NOTE: Area surrounding the center reference line is not to scale for clarity.



Note: The counts made on the above profilogram are counted in 10ths of an inch.

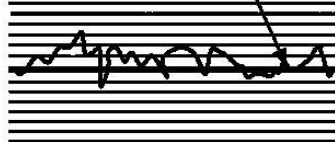
TYPICAL CONDITIONS

Scallops are areas enclosed by profile line and center reference line.



A

Small projections which are not included in the count.



B

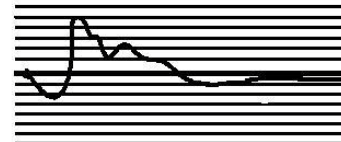
Rock or dirt on the pavement (Not counted)



C

SPECIAL CONDITIONS

Double peaked scallop. (Only highest part counted)



D



Rainhart profilograph for concrete pavements and bridges

- Profile Index (PI) averaged over 29-foot length and across a 44-inch wide path
- Every wheel path is measured
- No incentives / disincentives
- Corrective action usually diamond grinding



Feedback and issues with profilographs

- These “contraptions” are slow (2 mph)
- Can take multiple runs to complete
- Traffic control issues (lane closures)
- Results are subjective (graphs on paper)
- Not a true profile of roadway



Fast forward to 2011...

- What is IRI? International Roughness Index
- Pavement smoothness measured with Laser Profiler mounted on a vehicle (Units = in/mile)

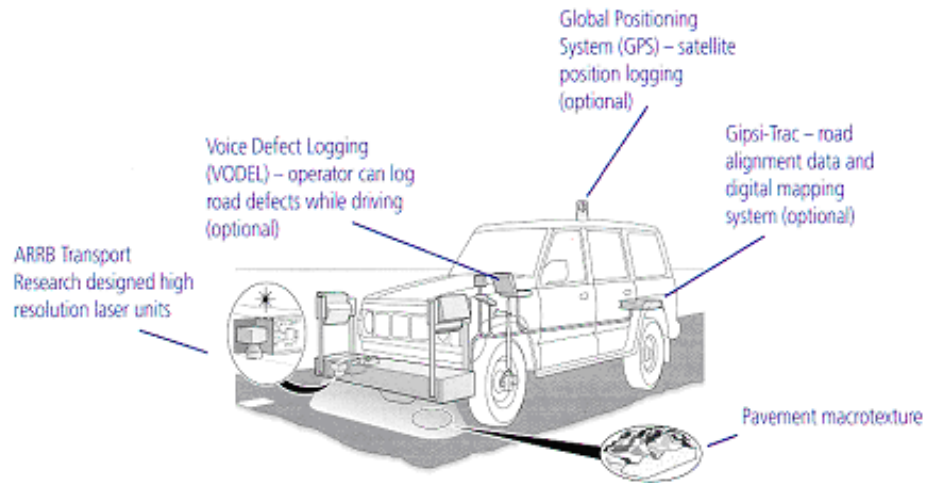
Golf carts...
Vehicles < 30 mph



SUVs and vans...
Vehicles up to 70 mph



Laser Profiler Set Up



- **NCDOT – Pavement Management Unit has profiler equipment and has been measuring IRI for years on our Interstates**
- **PMU has 4 profilers (Single 5-Pt lasers – can go to 7)**
- **2 DynaTest and 2 ICC**



Liner laser technology



RoLine and TriODS sensors mounted on lightweight profiler.



NC Turnpike Authority - IRI Special Provision

- **NCTA had an IRI spec on WWF and Monroe projects**
- **NCTA used 65 in/mile on asphalt and 75 in/mile on concrete**



- **NCTA has hired Consultant to perform IRI testing**



NCDOT - IRI Special Provision

- **2008** - NCDOT had pilot project w/ Percent Improvement SP
- **2011** - NCDOT developed draft IRI Spec
- **Reconvened Rideability group for asphalt**
- **Formed Rigid Pavement Committee for concrete**
- **Received Industry input on draft IRI spec**
- **Intent - Use IRI spec for new location construction (Bypass projects are ideal)**

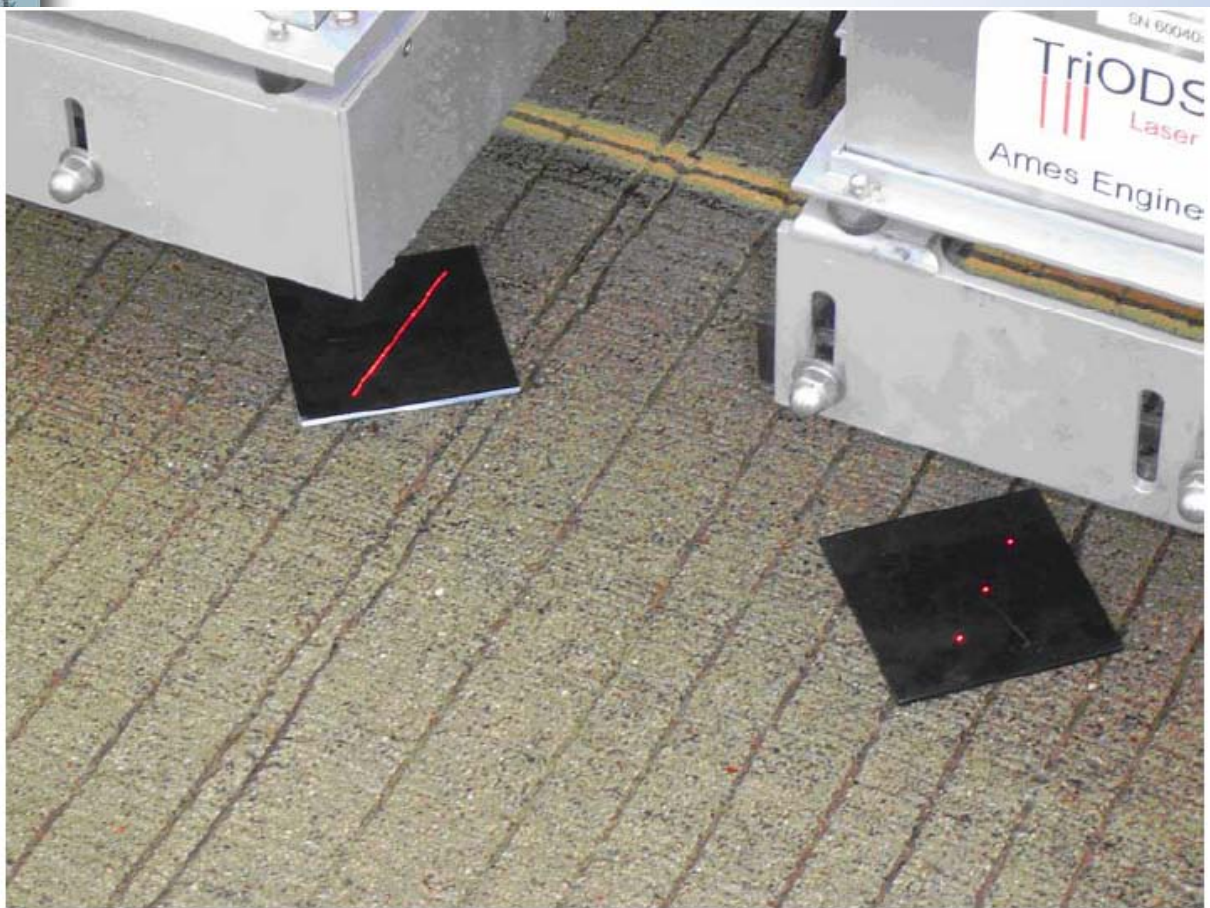


NCDOT – IRI Special Provisions details

- For asphalt, still include Hearne as an option
- For concrete, convert to IRI in 2012 Spec Book
- Contractor performs smoothness testing or hires a firm
- In 2010, AASHTO documents on Inertial profilers and systems were updated and finalized
- Need calibrated profiler and trained, competent personnel using the system
- Use low-speed or high-speed profiler
- Run profiler on both wheel paths at same time
- Will allow separate runs...one per each wheel path



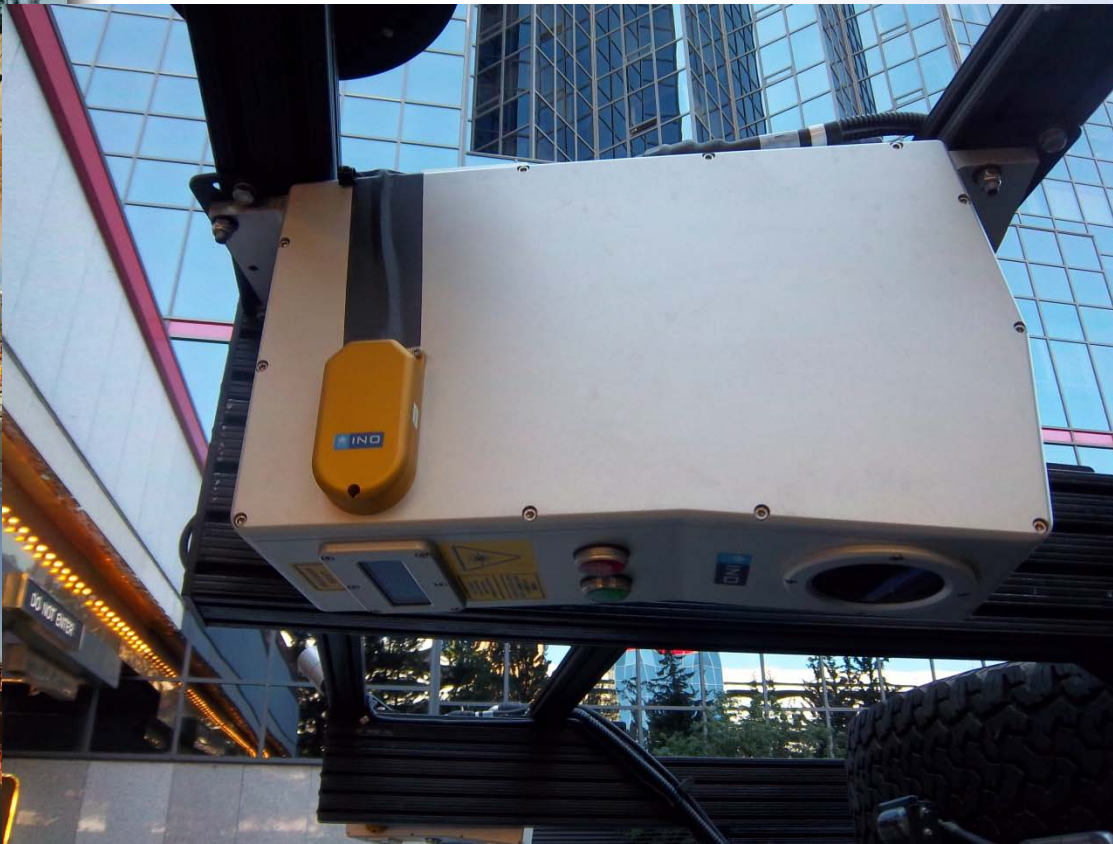
NCDOT SP requires use of line laser technology



Sensor footprint of the RoLine and TriOD sensors.



Liner laser technology



PaveMetrics LCMS with Accelerometer to collect IRI values



NCDOT – More details on IRI Special Provision

- Data provided to RE after each run on approved media (CD, DVD, flash drive)
- DOT will analyze raw data on FHWA ProVAL software
- DOT can do QA to verify data with PMU profilers
- Contractor provides results report - 10 days after completion of smoothness testing
- IRI numbers for 0.10-mile sections (MRI is average of IRI numbers from both wheel paths)
- NCDOT – Same numbers for both pavement types w/ acceptance range from 55-70
- Pay Adjustment “continuous” formulas



NCDOT – Pay Adjustment Chart

- Price adjusted based on MRI numbers per lane

- 45.0 or under

PA = \$200 per 0.10 mile

- 45.1 to 55.0

PA = 600 – (10*MRI)

- 55.1 to 70.0

Acceptable (No PA)

- 70.1 to 90.0

PA = 650 – (10*MRI)

- Over 90.1

Corrective Action Required

- **Corrective action must be approved by RE**

- **Areas of Localized roughness (>125.0 in 25')**



What's next???

- **Implementation on projects in 2012**
- **Bumps in the road as we learn and use laser profilers**
- **Resurfacing projects – Different Specification (Future)**
 - **Goal will be to develop a Percent Improvement SP (Similar to chart such as SCDOT)**
- **Bridge IRI Special Provision**
- **Oregon Inlet bridge = 3 miles in length**



GO WOLFPACK!!! & BLACKJACK!!!

??? Any QUESTIONS ???

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RPUG 2011

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