

# Intelligent Compaction



## Introduction to Intelligent Compaction

Annual Project Manager Meeting  
January 14, 2015



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## Proper Compaction is Key to Roadway Longevity

*“The importance of compaction in highway construction has long been recognized. Recent laboratory and field investigation have repeatedly emphasized the value of thorough consolidation in both the base and surfacing courses.”*

*-“Public Roads”, J.T. Pauls and J.F. Goode, May 1939*

**“In the last 75 years, except for the addition of vibratory rollers and nuclear densometers, what else has changed?”**



## Traditional Methods Leave a Lot to be Desired

- Compaction relies on roller operator's experience
  - ✓ "Where did I stop on previous pass?"
  - ✓ "Did I go back far enough on the return pass?"
  - ✓ "Is the mat temperature correct?"
- Some areas under compacted; some areas over compacted
- No record of compactive efforts – spot checked by nuclear densometer
- Mat temperature - spot checked

# INTELLIGENT COMPACTION



## Intelligent Compaction is the Solution!

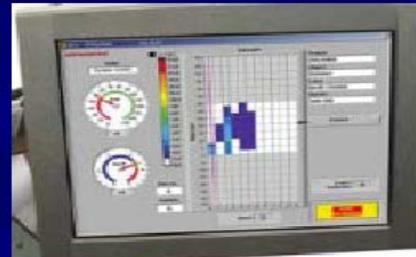
- GPS based system
- Real-time coverage information displayed to operator
- Monitors , displays and records mat temperature at rollers and paver on the entire project
- Automatic collect and record data for later analysis
- Verification of pass count, mat temperature and roller speed

# INTELLIGENT COMPACTION

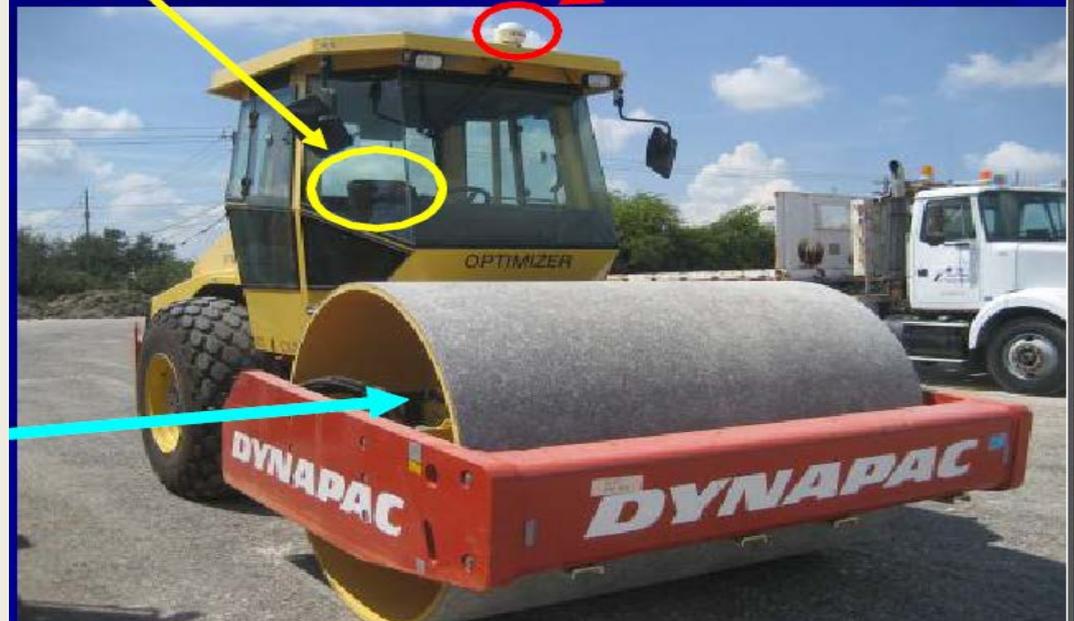


How Intelligent  
Compaction (IC)  
Works on a Roller

## Display Panel



GPS Receiver



# IC Equipment and Current IC Practices

Photos courtesy of each company



**Control Panel**



**Temperature Sensor**



**Accelerometer – not in ODOT Spec**

**GPS  
Radio/Receiver**



**Display Panel**

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## In-Cab Display

- Color coded
- Real time information
- Operator “paints” the pavement

## Results

- Accurate real-time view of number of passes
- Data stored internally; transfer to USB drive for analysis

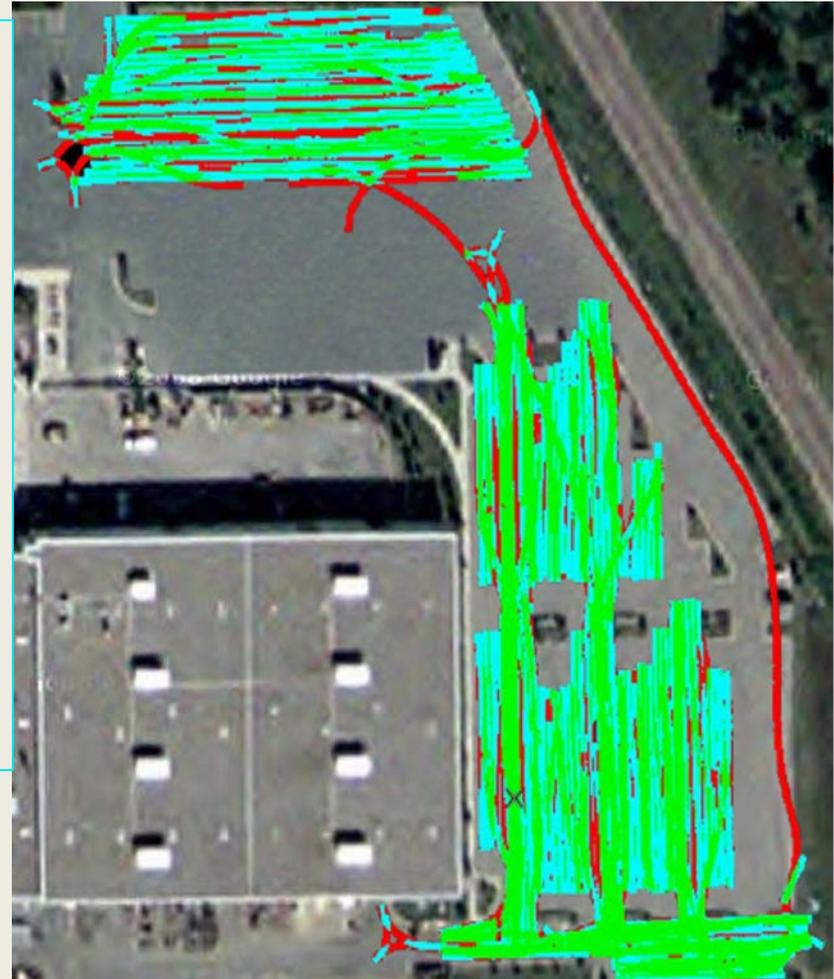




## Example of Pass-Count Mapping on a Parking Lot

- Green – 3 Pass – pass count met
- Blue – 2 passes - 1 pass needed
- Red – 1 pass - 2 passes needed

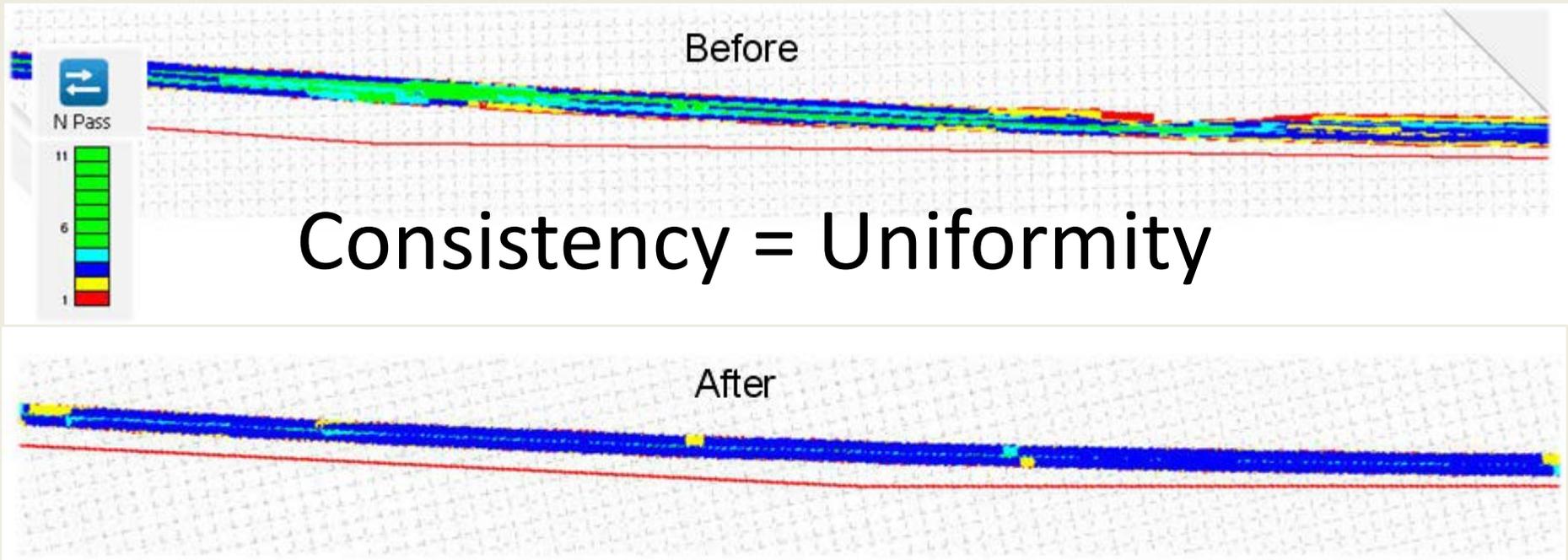
Note: Red slivers indicate gap between necessary multiple roller passes.



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## Intelligent Compaction Technology and Current Implementation Practices



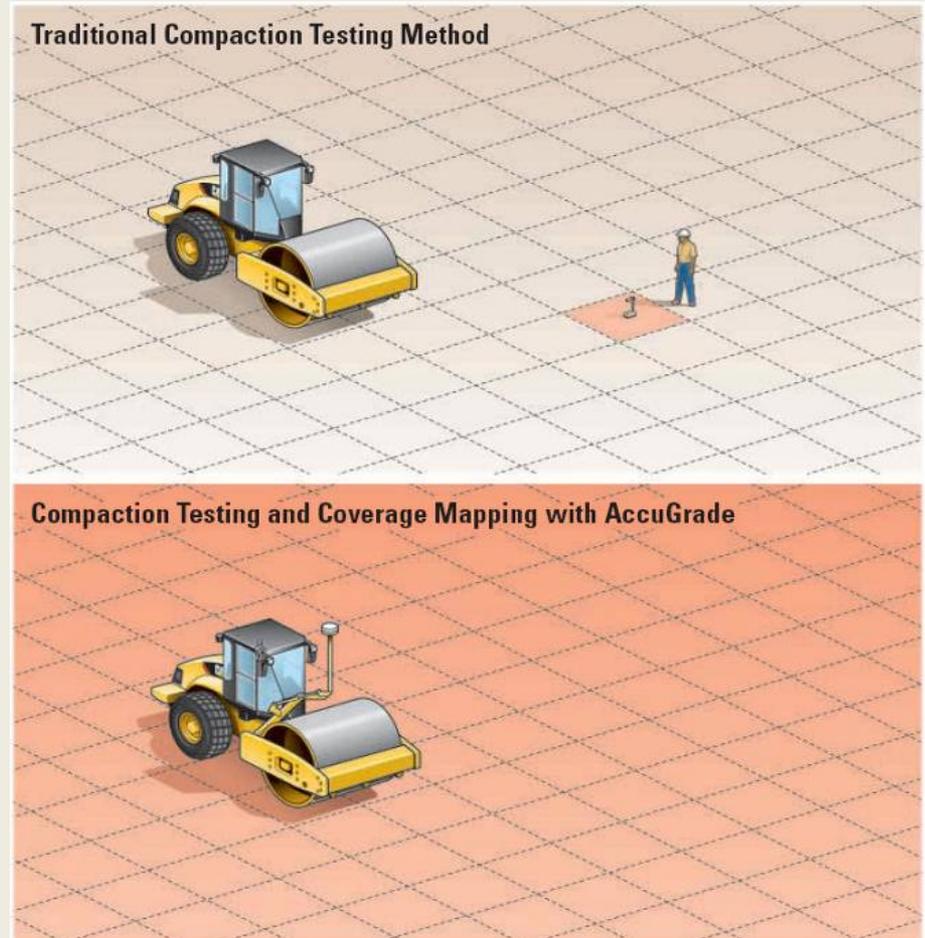
# INTELLIGENT COMPACTION



Current IC  
Implementation  
Practices

1 / 100,000  
without IC

100 %  
Coverage and  
Documented  
with IC



# INTELLIGENT COMPACTION



## Current IC Implementation Practices - GPS

Photos Courtesy of Trimble



**Base Stations**



**Rover**

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## Pave-IR

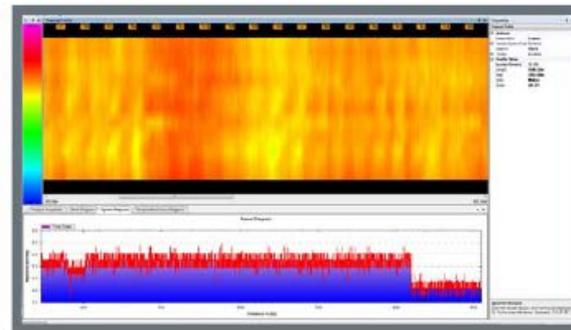
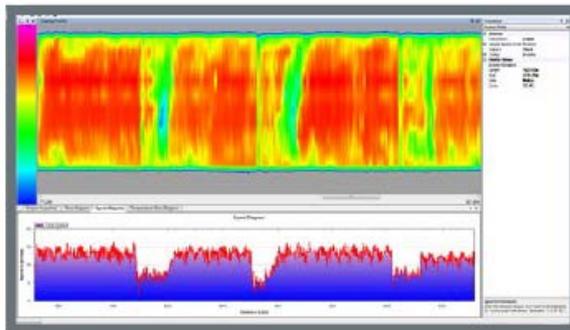
- Infrared sensor above back of paver, display for paving crew
- GPS receiver for distance and position data
- Weather sensor for ambient conditions
- Real-time temperature profile of full mat on entire project
- Allows cold spots to be repaired before compaction.



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## Pave-IR





## IC Implementation - what is needed?

- GPS receiver and IR temperature sensor on roller and paver (available on monthly rental basis)
- In-cab display panel and software (available on monthly rental basis)
- GPS subscription (available on monthly rental basis)
- Minimal training – Plug and Play!
- VEDA software – Public domain software for analysis of IC data



## IC Specification Development

- FHWA generic specification “Intelligent Compaction Technology for Asphalt Applications”
- 18 states have created their own specifications

State DOT	Pilot Study	Implemented Projects
California	2010	14
Georgia	2009	4
Minnesota	2008	39
Texas	2008	17
Indiana	2010	4
Oregon	2014	1 (by CCO)



## Oregon IC Experience

- I-84: Arlington – Tower Road
- 25 miles in length, Award 12/31/13
- ODOT Contact: Bob Townsend (The Dalles)
- Kerr Contractors
- Implemented by Contract Change Order – IC Roller only

Remarks from roller operator on I-84, with 20+ years of experience:  
*“When the IC equipment stopped working briefly, **I had to retrain myself to keep track of my passes in the old-fashioned way.**”*



## IC Spec Highlights (work in progress)

- Contact ODOT Pavements to include IC into your project by CCO.
- Draft specification – a work in progress: *No deduction for lack of roller coverage (some states require 90% coverage...with deduction for less than 90% coverage)*
- Equipment is paid for with lump-sum bid item
- IC supplier is paid in bid item to provide training for operators, supervisors and ODOT staff
- Daily download of data for analysis
- More to come! . . . *as there is much more for ODOT to learn*



## Additional References

- [www.intelligentcompaction.com](http://www.intelligentcompaction.com)
- AASHTO –SHRP2 program
  - ✓ <http://shrp2.transportation.org/Pages/Default.aspx>
- FHWA IC Technical Support Service Center (TSSC)
  - ✓ [www.fhwa.dot.gov/construction/ictssc](http://www.fhwa.dot.gov/construction/ictssc)

*Special thanks and credit to FHWA for subject matter in this presentation*

# **INTELLIGENT COMPACTION**



## **Questions?**