The FHWA Mobile Concrete Trailer (MCT)

*Bringing New Technologies to Your Doorstep*

Jagan Gudimettla, P.E.
ATI Inc (Consultant to FHWA)
Program Goals

- Implement new and proven concrete technologies
- Evaluate new tests and equipment
- Demonstrate the benefits of statistical materials acceptance in both agency acceptance programs and industry quality control applications
- Assist states with concrete issues
  - Specification review and development
  - Technical assistance
  - Forensics
FHWA Mobile Concrete Trailer (MCT)

- Nondestructive/In-situ Tests
- Sustainability
- AASHTOWare Pavement ME Design
- Quality Assurance
- Performance Engineered Mixtures
- Performance Related Specifications
MCT Activities

- Field visits to active construction projects
- Quality in the Concrete Paving Process Workshop
- Assist with (PEM) implementation
- Equipment Loan Program, One-on-one Training
- Conferences, papers, and other activities
MCT Field Visits

- Active field project for a two week period
- Traditional and Innovative testing
- Data in control chart format

Kick-Off Meeting | Testing | Testing

Week 1
MCT Field Visits

- Active field project for a two week period
- Traditional and Innovative testing
- Data in control chart format
MCT Field Visits

- Close out meeting with the state DOT, FHWA division office and contractor
- Summary report
- A free QA workshop using the field visit data

Close Out

QA Workshop
Quality in the Concrete Paving Process (QA Workshop)

➢ Two-day workshop on the benefits of a Quality Assurance Program
  – Increase concrete pavements life at reduced cost
  – Contactor benefits of improved Quality Control
  – New technologies and tools for testing and inspection

➢ Agency and Contractor Participation
  – Class size 30 to encourage discussion
  – DOT (QA/QC, Materials, Construction Staff etc.)
  – Contractor staff (Superintends, QC Managers etc.)
  – FHWA Division Office Staff
PEM Implementation

- Assisting PEM Team and TFHRC with ongoing PEM-related research
- Continuing to assist with Super Air Meter
- Parallel PEM and state testing during field visits
- Demonstrating PEM equipment and testing
- Conferences and other venues
- Investment through Equipment Loan Program
Equipment Loan Program

- States or industry can borrow MCT equipment
- MCT staff will provide training, if desired
- PEM focus
- Anticipate substantial new equipment purchase for Spring 2018
- Currently enhancing information on our website
Training

- One on one training to DOT engineers and technicians
- Side by side comparison of new technologies
Other Activities

- **Conferences (5-6 a year)**
  - National Conferences (ACI, TRB, ISCP, etc)
  - State DOT / Industry conferences
  - Provide speakers
  - Specialized Workshops
  - Technical Assistance

- **Papers**
  - Practical papers based on data collected at field projects
One Pagers

- New effort to use MCT data
- Narrowly focused
- Meant to stir interest and point reader to resources
  - 1st: Cement Content
  - 2nd: Optimized Mix Design
  - 3rd: Cores vs. Cylinders
New Tests

- Box Test
  - Workability

- Super Air Meter
  - Freeze-Thaw Durability

- MIT Scan T2
  - Pavement Thickness
The Box Test

- A simple test that examines:
  - Response to vibration
  - Filling ability of the grout (avoid internal voids)
  - Ability of the slip formed concrete to hold a sharp edge
The Box Test
Air Content

- Total air (4.0% - 8.0%)
- Pressure air meter
  - Measure total air in the field
  - But, the air void system is what counts

Which is freeze / thaw durable?
Current Test Methods

- Hover photo
  ASTM C 457
  Spacing factor

- Humboldt photo
  ASTM C 666
  AASHTO T 161
  durability factor

- MCT photo
  AASHTO TP-08
  Spacing factor
Super Air Meter (SAM)

- Measures the Air Void System
- Modification of existing air test
- Measures air system quality
- Small bubbles implode
- Test
  - Test three times at different pressures
  - Repeat
  - Field friendly
  - 8-12 Minutes
  - Measures total air content
SAM Principle

- Provisional Test Method
  - AASHTO TP 118

![Diagram of SAM Principle]

- 1st Pressure curve
- 2nd Pressure curve
- 14.5 psi
- 30 psi
- 45 psi
- Standard air pot total air value
- Time
- Resultant Pressure
- Pressure Introduced
- SAM Number
SAM Principle

Super Air Meter (SAM)
SAM vs. ASTM C457

This test takes 7 – 14 days

92% Agreement

Yes!

No
Pavement Thickness

- Pavement life is influenced by thickness
- Important QA activity
- Probing (QC)/ Coring (QA)
MIT Scan T2

- A faster, cheaper and non-destructive method to measure pavement thickness
Easy to use
Non-destructive
Rapid measurement
Independent of the base material
Independent of the maturity of concrete
Significant cost savings compared to taking cores
High accuracy (within ± 0.1 inch of core thickness)
Many Other Technologies

Surface Resistivity Test (Indirectly)

Capillary Sensors

Come see us in the Gammage Parking Lot
Benefit - Equipment Loan Program

Example - Iowa Specification (thickness)

- MIT Scan T2 (non-destructive pavement thickness)
  - Introduced the technology to Iowa DOT (2008)
  - Equipment loan to Iowa DOT (2008)
  - Iowa DOT evaluated the technology - two projects (2009)
  - Trial Specification – four projects (2010)
  - Full Specification (2011)
  - Iowa DOT purchased devices for each of their 6 districts

AASHTO Test Method

- Iowa DOT and MCT Joint Effort (2014-2016)
Benefit- Technical Assistance

Example- West Virginia Specification (Strength)

- West Virginia specifications (through 2016) required cores to be taken for acceptance

- MCT made a field visit to WV in Fall 2015
  - Cast cylinders from actual paving project
  - Compressive strength testing performed at various ages

- QA workshop in 2016
  - In-depth discussion on the compressive strength data
  - Emphasized the advantages of using cylinders versus cores for acceptance

- West Virginia DOT revised 2017 specifications to use cylinders for strength acceptance.
Technical Assistance

Review of Specifications
- Pennsylvania Division Office/PennDOT
- Oklahoma Division Office/OKDOT
- New Mexico DOT
- Montana DOT
- NYSDOT
- North Dakota DOT
- South Dakota Division Office/SD DOT
- Virginia DOT

Forensic Investigations
- Premature Pavement Cracking in North Dakota
- Premature median barrier failure in Idaho
Impact – Some Recent Examples

Specification changes

- Nondestructive Pavement Thickness
  - Iowa DOT
  - West Virginia DOT
  - Penn DOT
  - North Dakota DOT
  - Illinois Tollway
  - Wisconsin DOT
  - Ohio DOT (considering change)
  - Washington DOT (considering change)
  - Delaware DOT (considering change)
  - Nevada (considering change)
  - Alabama (considering change)

- Acceptance Testing (cores to cylinders)
  - Alabama DOT
  - West Virginia DOT

- Box Test (considering changes)
  - Idaho DOT
  - Ohio DOT
Impact – Some Recent Examples

**Specification changes**

- Optimized Aggregate Gradation
  - Ohio DOT
  - West Virginia DOT
  - Idaho DOT
  - Maine DOT
  - Massachusetts DOT

- Nondestructive Dowel Bar Alignment
  - Caltrans
  - Idaho DOT
  - IL Tollway
  - North Carolina
  - Ohio DOT
  - New York State Thruway
  - Nevada
Contact:

Office of Preconstruction, Construction, and Pavements
HIPT-20, E73-105C
1200 New Jersey Avenue, S.E.
Washington D.C.
Phone: 202 366 1335
Mobile: 703 963 4939
jagan.m.Gudimettla.CTR@dot.gov
https://www.fhwa.dot.gov/Pavement/concrete/mclfly.cfm
Directions to the Mobile Concrete Trailer