The FHWA Mobile Concrete Trailer (MCT) Bringing New Technologies to Your Doorstep

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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



Performance Engineered Mixtures

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



MCT Field Visits

Active field project for a two week period
 Traditional and Innovative testing
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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 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 <u>or industry</u> 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



while also lowering the cost of production and at the same time reducing CO₂ emissions.

1: <u>http://www.fhwa.dot.gov/pavement/concrete/pubs/hif15019.pdf</u> (Optimizing Aggregate Gradations) 2: https://www.fhwa.dot.gov/pavement/pccp/pubs/06004/06004.pdf (Concept of Maturity)

References

MCT Staff



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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



Consolidation Issues

Edge Slump Issues

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

ASTM C 666 AASHTO T 161 durability factor

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



Pressure Introduced

SAM Principle



Super Air Meter (SAM)

SAM vs. ASTM C457



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







MIT Scan T2



MIT Scan T2 Advantages

- 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



HIPERPAV



MIT Scan 2

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:

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Directions to the Mobile Concrete Trailer

