



Department of
Transportation

Assuring Quality in a Fast-Paced World

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NYSDOT – Materials Bureau

New York State's Transportation System is a vast and expansive network



Need for rapid repairs / replacement

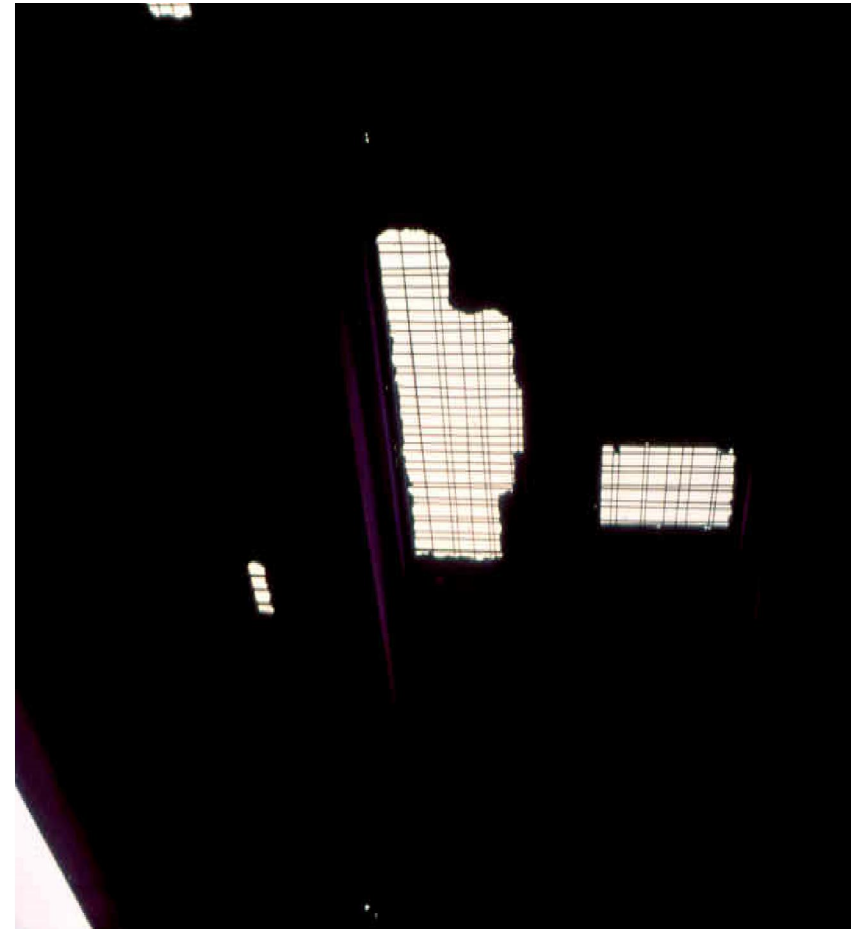


▣ Drivers First



Need for rapid repairs / replacement

➔ Emergency response



Our “Fast Paced” World

- ➔ R u Imp8ent ???
 - ❑ Trained for Instant Gratification
 - ❑ “Faster is better” mentality



Is “faster” really better?

Minimizing Risk – Maximizing reward

Managing a Balancing Act between:

- ➔ Reasonable quality for service
 - ❑ What is reasonable – 25 yrs, 50 yrs, more?
 - ❑ Quality Assurance – adherence to specs?
- ➔ Drivers First
 - ❑ Minimize impact on traveling public
- ➔ Cost
 - ❑ Completing work within or below budget

FHWA's ABC EDC Initiative

Accelerated Bridge Construction:

- ➔ Precast construction
 - Accelerated PCC mixtures
 - UHPC
- ➔ Slide-in technology
- ➔ SPMT



“Faster” and “Sustainable”

Keys:

- ➔ Do it right the first time
- ➔ Don't rush faster than you need to
- ➔ Don't push materials beyond their capabilities
 - ❑ Use the right materials for the job
- ➔ Use responsible engineering judgment
 - ❑ Consider alternatives
- ➔ Don't use “Super, High, or Ultra” in the name

Goals:

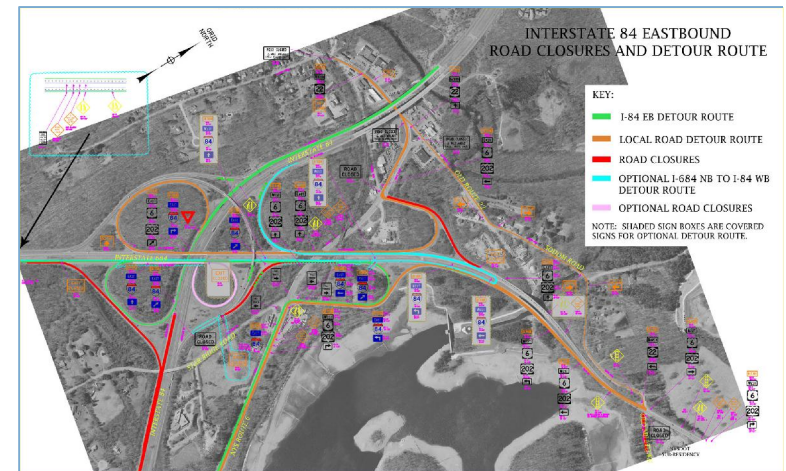
- ➔ Achieve Sustainability
- ➔ Provide Quality Assurance

Design

- ➔ Select the right acceleration means
 - ❑ Is “acceleration” even necessary?
 - ❑ Nights and weekend closures / temporary detours

VS.

- ❑ Alternate traffic patterns w/ long term detours
- ➔ Consider alternatives and cost



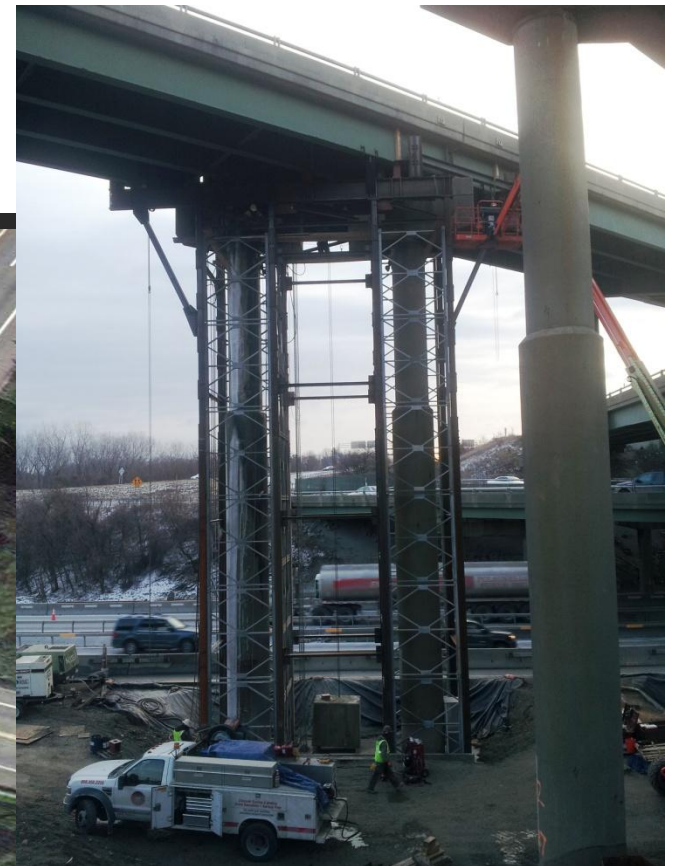
Faster Materials / Methods

- ➔ Precast Components systems w/
 - ❑ Traditional PCC closures
 - ❑ Accelerated PCC closures
 - ❑ UHPC closures



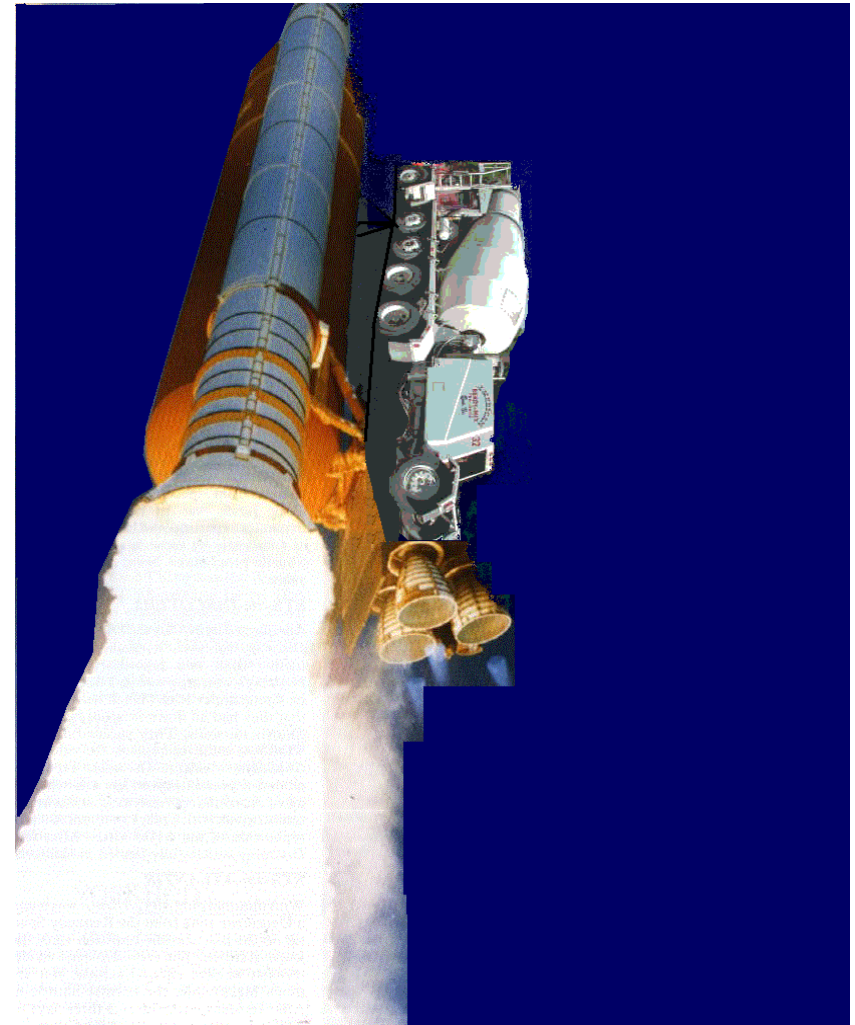
Fastest Materials / Methods

- ➔ Pre-constructed components
 - ❑ Slide in units
 - ❑ Temporary structures



➔ Rocket Science

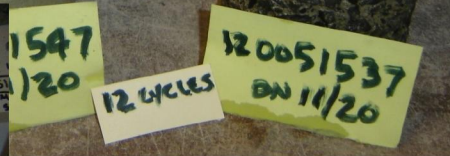
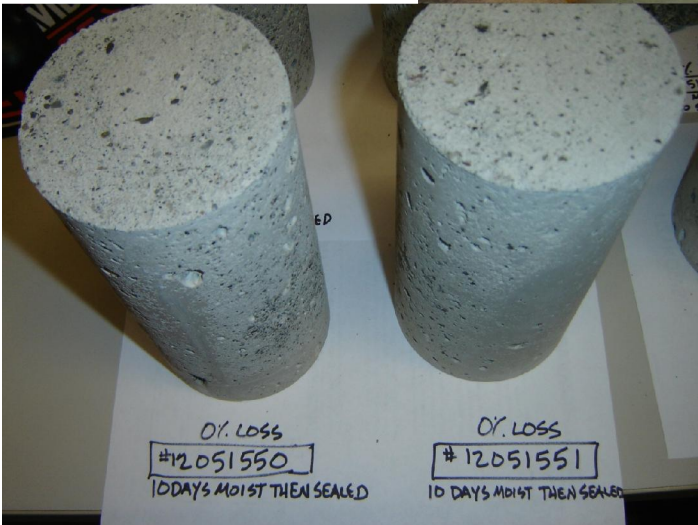
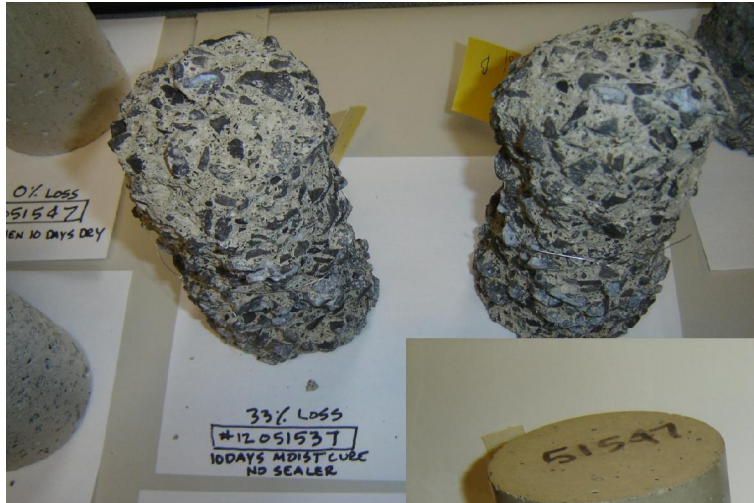
- ❑ Requires attention to details
- ❑ Back-up systems
- ❑ Extra oversight



Quality Assurance - Materials

- ➔ Approved / Qualified Products list
- ➔ Trial batches for design mixtures
 - ❑ Strength – ultimate and rate
 - ❑ F/T durability
 - ❑ Permeability / resistivity
 - ❑ Placement characteristics





Quality Assurance - Materials

- ➔ Pre-evaluation
 - ❑ Time consuming
 - ❑ Requires lead time
 - ❑ Doesn't assure quality
 - Minimizes risks



Quality assurance - Construction

- ➔ Trial placements
- Use mock-ups



Construction

- ➔ Once started... have to complete
 - ❑ May need temporary placements / conditions to open back to traffic



Remember Murphy's Law



Murphy...

- ➔ Weekend – 8pm Friday to noon Sunday
- ➔ Saturday 5 PM, On Schedule
- ➔ Started Pouring Joints Sat @ 10 PM on Schedule, Scheduled to Finish Midnight
- ➔ **Concrete Flash Setting Problems in the Next 5 Hours.....5 Rejected Concrete Loads**
- ➔ Finished Pouring at 7 AM!!!!
- ➔ Left 9 hours - Curing, Temp. Barriers, Paving, Striping and taking down TCP

Minimizing Risk – Maximizing reward

The Balancing Act between:

- ➔ Reasonable quality for service
- ➔ Drivers First
- ➔ Completing work within or below budget

Assuring Performance and Quality?

Performance / Quality

Current prescriptive process:

- ➔ Automation / recordation
- ➔ Scale check / lab
- ➔ Mix designs
- ➔ Inspection – production
 - ❑ Gradation / moisture / friction
- ➔ Project sampling
 - ❑ Air / slump / cylinders



All DOT actions ergo all DOT Risk

Performance / Quality

Prescriptive Risks:

- ➔ Automation failure / tampering
- ➔ Scale inaccuracy / tampering
- ➔ Mix / materials variability
- ➔ Inspection – Expertise of TCI's
 - ❑ Testing proficiency
 - ❑ Awareness of plant operations
- ➔ Project sampling
 - ❑ Testing proficiency / Sample handling

End performance remains DOT's Risk

Performance based specs

For PCC production:

- ➔ Delegate responsibility
- ➔ Re-assign risk
- ➔ Improved economics
- ➔ Improved product
- ➔ Evaluation tools
 - ➔ New and existing tools – verify quality

Performance process

- ⇒ Automation / recordation required
 - ⇒ Current system requirements remain
 - ⇒ certified by producer
- ⇒ Scale Checks / Lab facilities
 - ⇒ Current system requirements remain
 - ⇒ certified by producer
 - ⇒ Verified by DOT – payment measure
- ⇒ Truck inspection
 - ⇒ Current system requirements remain
 - ⇒ certified by producer

Performance process

➔ QC Plan

- ❑ Producers to define QC process

➔ DOT audits – assure effort / compliance

❑ Review of:

- ❑ Agg gradation / moisture / friction
- ❑ Cement / pozzolan sampling
- ❑ Scale accuracy
- ❑ Batch records
- ❑ Truck conditions
- ❑ Etc...



Performance process

- ➔ Mix designs
 - ➔ Performance criteria for mixtures
 - ➔ Strength
 - ➔ Resistivity (assures low permeability)
 - ➔ Indirectly controls w/c, pozzolan use, aggregate gradation
 - ➔ Air content
 - ➔ Friction
 - ➔ ASR resistance
 - ➔ F/T resistance (flatwork)
- ➔ JMF's established



Performance process

- ⇒ Mix designs
 - ⇒ We don't care about:
 - ⇒ Min / max cement content
 - ⇒ w/c ratio
 - ⇒ Aggregate gradation
 - ⇒ Slump

Performance process

- ⇒ Mix designs – benefits:
 - ⇒ Mix economy
 - ⇒ Improved gradations
 - ⇒ Strength w/ less cement
 - ⇒ Improved mix characteristics
 - ⇒ Resistivity (assures low permeability)
 - ⇒ Indirectly controls w/c, pozzolan use, aggregate gradation
 - ⇒ Varied strength designs

Performance process

- ⇒ Mix designs – issues:
 - ⇒ Some prescriptive req
 - ⇒ Internal curing
 - ⇒ DOT approved materials
 - ⇒ Pay factors
 - ⇒ Strength / Air / Resistivity
 - ⇒ Pass / fail vs pay factors?
 - ⇒ Friction / safety

Performance process

- ➔ Project sampling – Quality Control
 - ❑ Air
 - ❑ F/T durability control
 - ❑ Every 50 CY minimum
 - ❑ Slump
 - ❑ Verify consistency
 - ❑ Every 50 CY minimum
 - ❑ Cylinders (producers actions)
 - ❑ As desired for own records
 - ❑ Contractor data / statistical analysis?

Performance based specs

Quality Achieved / Acceptance

- ➔ Air meter / Super Air Meter (SAM)
- ➔ Surface resistivity Meter
- ➔ Wash samples
- ➔ Compressive strength



Performance based specs

Quality Achieved / Acceptance

➔ Air meter / Super Air Meter (SAM)

➔ Measures:

➔ air content

➔ quality of bubble structure

➔ Repeated pressure test

➔ 15 minute test

➔ Verify convenience equip



Performance based specs

Quality Achieved / Acceptance

- ➔ Surface Resistivity Meter
 - ➔ Measures resistivity
(inverse of permeability)

Indirectly controls:

- Water content
- Pozzolan use in mixtures
- Mixture design
 - Cement content
 - Aggregate gradation



Performance based specs

Quality Achieved / Acceptance

- ➔ Wash samples
 - ➔ Friction
 - ➔ ASR (?)
- ➔ Compressive strength



Performance process

- ⇒ Field testing – risks:
 - ⇒ Acceptance verification day of placement
 - ⇒ Correct materials used
 - ⇒ Proper air content
 - ⇒ Acceptance determined later date
 - ⇒ Strength
 - ⇒ Resistivity
 - ⇒ Results subject to proper QA
 - ⇒ Good sampling / testing
 - ⇒ Cylinders handled properly



No impact on placement operations



Q1: What types of closure materials are currently used with precast concrete components?

- Traditional PCC closures
- Accelerated PCC closures
- UHPC closures



Q2: What are some of FHWA's ABC initiatives?

- Precast construction
- Slide-in technology
- SPMT



Q3: What are some of the potential benefits when using performance based PCC specifications?

- Delegated responsibility / authority
- Improved economics
- Improved product performance



Q4: What are some of the performance criteria that determine quality of PCC mixtures?

- Strength
- Resistivity (assures low permeability)
- Air content
- Friction
- ASR resistance
- F/T resistance (flatwork)



Q5: What is SAM and what does it do?

- Super Air Meter
- Measure air content and air bubble quality (determines spacing factor, size, and specific surface of air in concrete)



Q5: What does a Surface Resistivity Meter measure?

- Resistivity (permeability of concrete)
- Indirectly controls quality of mixture including
 - Water content
 - Pozzolan use in mixtures
 - Mixture design
 - Cement content
 - Aggregate gradation



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Transportation**

Thank you