Accelerated Concrete Pavement
Rubbilization and HMA Overlay

Joyce Taylor
MaineDOT

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Existing Pavement

- Constructed in 1970’s
  - 9” Jointed Plain Concrete Pavement
  - Individual slabs 12’ wide, 20’ long
  - Slabs placed over 29” of good quality gravel day-lighted to inslope
- Visible signs of distress, blow-ups and structural issues associated with Alkali-Silica Reactivity
- Positive test results for ASR (done by UNH)
Repairs

- Many repair methods were used to address the deteriorating conditions of the pavement:
  - Thin overlay (NovaChip)
  - Slab replacement
  - Expansion Joints
  - Joint seal
  - Patching
  - Partial Depth Crack Repair

- These repairs were done in preparation for a 4” overlay
Repairs

- Concrete was deteriorating at quicker rate than anticipated due to ASR
- Repairs not lasting
Repairs

- Funds for rehabilitation became available in November 2007
- A multi-disciplined VE team was assigned to analyze alternatives and make recommendations
Repairs

- Cores cut on longitudinal cracks
- Found that the cracks seen on the surface went through the entire depth of the slab
- Broken slabs → structural failure
Repairs

- Overlay was not a good option since 11,220 slabs would need to be replaced prior to overlay ($$$)
  - Overlay also did not address ASR
  - Pavement functional/service life unknown
Repairs

- Consideration of a full closure of southbound began in February 2008
- Although the deterioration on northbound was more severe, southbound was selected to be rehabilitated first
- Final pavement design and construction method considered the possibility of a full closure
Why a full closure?

- Safety of public and work crews
- Minimizes time – 3 months versus 3 years
- Rubblizing of concrete with one lane open might cause deterioration in the adjacent lane
- The Turnpike and Route 201 are available as alternate routes
Why not have I-295 northbound serve as both northbound and southbound?

- **Safety** the northbound lanes are not designed for vehicles to travel safely in the southbound direction
  - The existing 8’ shoulder is not sufficient for a breakdown lane
  - Guardrail end-treatments are not designed to handle head-on impacts from vehicles heading south
  - Accelerated concrete deterioration may result in increased safety risks and unplanned closure of the northbound lanes.
  - May cause difficulties for “first responders” at crash sites
  - Increased number of vehicles in one lane increases the risk of crashes
Why not have I-295 northbound serve as both northbound and southbound?

- **Time and Money** - *necessary road improvements add time and money to build the crossovers, improve guardrails and reconstruct shoulders*
  - New on and off ramps need to be constructed
  - Shoulders would need to be reconstructed
  - Funneling the current volume of traffic from two lanes into one lane would create back-ups in both directions

- **Predictability**
  - Motorists will seek alternate routes causing a “free-for-all” on 201 & other local roads
I-295 Southbound Rehabilitation Project
2008

Maine Turnpike Detour
Preferred commercial route and thru route to Portland and points south

Rte. 201 Detour
Preferred route to Brunswick and Freeport

Southbound I-295 closure - Exits 31 to 49

Temporary entrance ramp from US 201 onto I-295 southbound

Repairs to 3 bridges, plus guardrail, drainage & safety improvements and paving
(Done prior to full closure)

Paving and guardrail improvements
(Done prior to full closure)
Can the Turnpike and 201 handle the increase in traffic?

- I-295 southbound used by 13,500 vehicles daily during the peak of summer
- Try to push 50% onto Turnpike including commercial trucks
- Motorists headed to Portland and south will use Turnpike
- Traffic plan modified as needed
Route 201 Traffic Plan

- MaineDOT “patrol” will assist motorists with vehicle problems and report “hot spots”
- Make Route 201 look and feel like a work zone
  - Improvements made to Route 197 Intersection
  - Installing flashing lights at the intersections of Route 125 and at Route 138
  - Street lighting at major intersections
  - Work zone speed limits – fines doubled
  - Install radar speed signs
  - Temporary ramp constructed in Topsham
How can we make this work?

- **Aggressive Communications Campaign**
  - Communication Advisory Panel – Reps from tourism, Freeport Merchants, truckers, Maine Turnpike Authority
  - Work with major employers, news media, paid media

- **Ongoing Dialogue**
  - Route 201 residents
  - Municipalities
  - First Responders Group

- **Flexibility**
  - Adjust traffic plan as necessary
  - Plentiful signage and message boards
  - 24/7 On-Site Availability
  - “Roving” MaineDOT vehicle with water/gasoline/roadside assistance
  - E-mail alerts
Pavement Design - Southbound

- Design had to meet or exceed performance criteria for 20+ years (Garvee funding requirement)
- MEPDG used for structural design
  - Performance based design method
- The final approved pavement design:
  - 8” HMA
  - 3” milled off existing concrete pavement
  - 6” Rubblized concrete
  - 29” existing gravel
- Includes 1” additional HMA
  - Factor of Safety for unknowns
  - Reduced risk for Garvee Bond funding
Pavement Design - Southbound

- 1 ½ " - 12.5 mm Surface Course (PG 70-28)
- 1 ½ " - 12.5 mm Intermediate Course (PG 70-28)
- 2 ½ " - 19.0 mm Base Course (PG 64-28)
- 2 ½ " - 19.0 mm HMA - Asphalt Rich Base (PG 64-28)
- 6 " Rubblized Concrete
- 29 " existing Base Gravel
Pavement Design - Southbound

- Design team recommended rubblization of concrete pavement - rubblization would destroy the pavement and stop ASR
- New process for MaineDOT
- Information from other State DOT’s with experience in rubblization used to develop the specification:
  - NYSDOT
  - IDOT
  - PennDOT
  - WisDOT
Bidding and Award — I-295 S

- Project out to bid April 2, 2008
- Bid opening April 23, 2008
- Awarded to Pike Industries April 24, 2008
- Construction began May 2008
- Full Closure began June 16, 2008
- Opened to traffic by August 31, 2008
  deadline
Construction - I 295 Southbound

- Prior to full closure:
  - Overlay of section between Brunswick and Topsham
  - Rehabilitated 2 bridges
  - Construct a temporary on-ramp
  - Completion deadline - June 15, 2008
Construction - Topsham On-Ramp
Construction-I 295 Southbound

- Full Closure – began June 16, 2008
- 18 mile section between Topsham and Gardiner
- Scope included:
  - Milling
  - Slab removal
  - Weep drain installation
  - Rubblization
  - HMA paving
  - Fill a “dip” area
  - In-slope work
  - 5 bridge deck rehabs
  - Guardrail installation
  - Rumble strips
  - Striping
Construction - Weep Drains

- Constructed “weepers” for assurance that no water would be trapped under pavement during rubblization process.
Construction - Rubblization

- First milled 3” off existing pavement and placed on shoulders as new recycled aggregate
- By milling, we were able to:
  - Eliminate hauling in new material to build up shoulder to new elevation
  - Reduce impacts to the slopes
  - Avoid environmental impacts at the toe of slope
Construction - Rubblization

- Resonant Breaker Rubblizer specified
- Specification included criteria for
  - Particle size
    - 6” minus for bottom layer
    - 2” minus at surface
  - Grading
  - Compaction
  - Surface tolerance
    - Steel – must be debonded, exposed removed
    - Crack sealant removal
    - Patch removal
Construction - Rubblization

- **Test pits**
  - Gradation check
  - De-bonding check
  - Every 2500’ per lane

17/06/2009
Construction - Slab Removal

- Some slabs were removed because of:
  - Pavement deterioration
  - Clearance requirements under overpasses
  - Used 9” HMA in these areas
Construction - Filling settlement in Richmond
Construction – HMA – Asphalt Rich Base

- Used to reduce reflective cracking potential from stiff rubblized concrete
  - 19.0 mm mix
  - 2 ½ " thick
  - PGAB 64-28
  - PGAB target - 5.5%
  - Air Void target - 2.5%
  - 50 gyrations
Construction – HMA Base Course

- 19.0 mm mix
- 2 ½ " thick
- PGAB 64-28
- 75 gyrations
Construction - HMA Surface and Intermediate Course

- Polymer Modified
  - 1 ½ " lift - surface
  - 1 ½ " lift - intermediate
  - 12.5 mm mix
  - PGAB 70-28
  - 75 gyrations
- RAP not permitted in mix
- Material transfer vehicle specified
I-295 Southbound opens on schedule!!!
I-295 Northbound
I-295 Northbound

- Same pavement structure design, construction method, materials as southbound
- Design phase focused on the best possible closure options including:
  - Use Rte. 201 for the northbound detour
  - Use Rte. 201 for southbound traffic, run northbound traffic on I-129 southbound
Closure options - NB on Rte. 201

- Close Northbound
- Using the Rte. 201 detour for northbound traffic required building a new off-ramp onto Rte. 201
  - Location not good because of:
    - Environmental impacts
    - Grade changes between I-295 and Rte. 201 requiring lots of fill and real estate
    - Left turn movement from ramp onto Rte. 201 conflicted with local traffic
    - Backups on I-295 probable due to traffic volumes
Closure options - SB on Rte. 201, NB on I-295 S

- Close Northbound
- Detour used for I-295 S project (Rte. 201) would be used for southbound traffic
- Northbound traffic routed to I-295 S
  - I-295 S would need guardrail and sign changes
  - Ramps would be modified to allow traffic off – no on traffic
  - Crossovers would need to be constructed in Topsham and Gardiner
- This closure option was considered the safest and therefore selected for this project
Bidding and Award

- Project out to bid - Feb. 4, 2009
- Bid opening - Feb. 25, 2009
- Awarded to Pike Industries - March 3, 2009
- Construction began - April 2, 2009
- Full Closure began - June 16, 2009
Construction - Northbound

- Prior to full closure:
  - Overlay of section between Brunswick and Topsham
  - 2 bridges rehabs
  - Construct 2 temporary crossovers
  - Modifications to 2 ramps
  - Completion deadline - June 15, 2008
Construction - Northbound

- Full Closure – began June 16, 2009
- 17 mile section between Topsham and Gardiner
- Scope includes:
  - Milling
  - Slab removal (under overpasses)
  - Rubblization
  - HMA paving
  - Fill a “Richmond settlement” area
  - In-slope work
  - 5 bridge deck rehabs
  - Guardrail installation
  - Rumble strips
  - Striping
Construction - Crossovers

Topsham

Gardiner
Construction

- Portable Plant
  - Significantly reduced hauling
Construction - Record rainfall
20”+ of rain in June, July, August 2009
Construction - Longitudinal Joint

- Asphalt rubber joint sealer specified to adhere adjoining HMA materials together
- Used in the 12.5 mm polymer modified intermediate and surface course if not paved in echelon
- Infrared technology used to heat previously placed HMA prior to placement of adjoining HMA
I-295 Northbound opens ahead of schedule!!!
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Thanks!!

Questions ?????