

# FHWA-NJ-2015-1010: Performance Testing for HMA Quality Assurance

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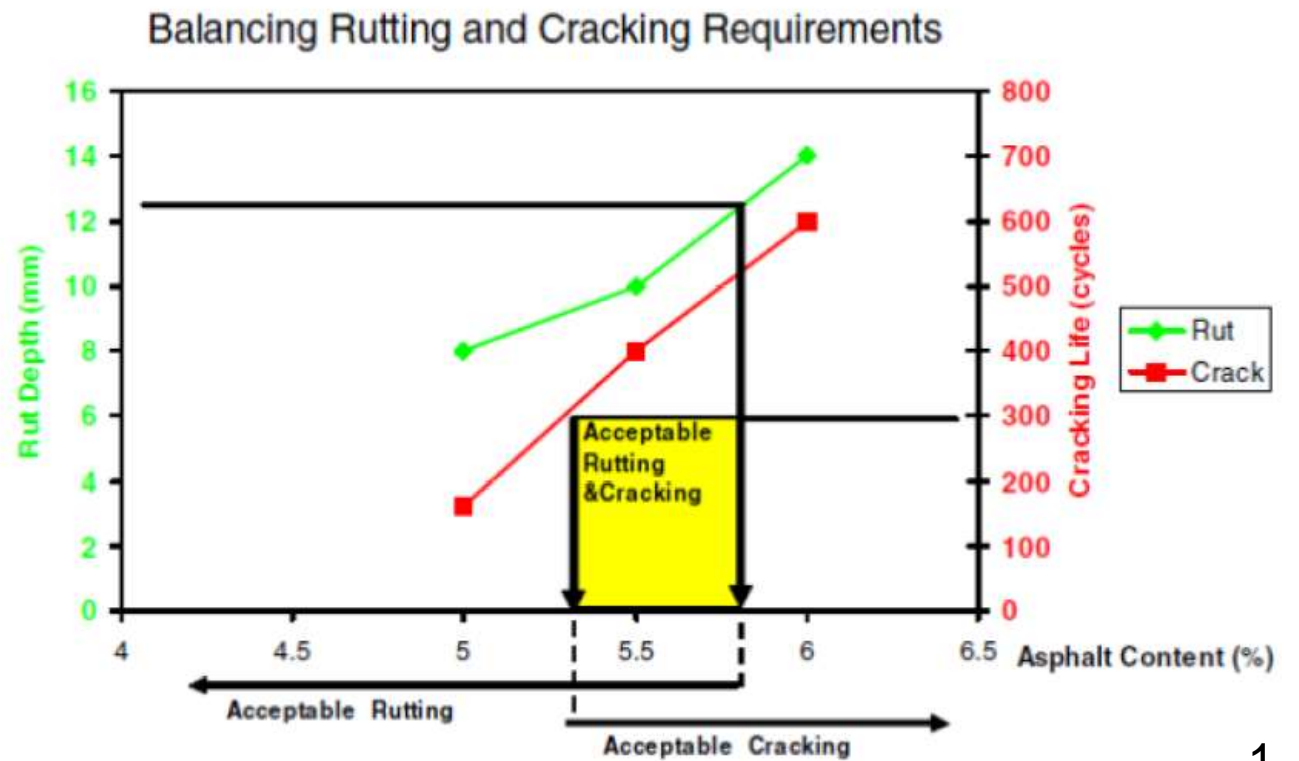
# New Jersey's Experience

- Longitudinal cracking primary distress
- First course of action was to lower gyrations
  - Increase AC content but use PMA to offset rutting concerns
- Pressure from contractors to increase RAP usage



# General Concepts

- Asphalt Cement content is a function of performance rather than air voids
- Evaluate cracking and rutting performance
- Correlation with field performance important



# Performance Based Acceptance Procedure

- NJDOT's FOUR STEP PROCESS:
  1. Volumetric Design
  2. Mixture Performance Tested
  3. Plant Produced Test Strip Paved and Tested
  4. Plant Produced Mix Evaluated During Paving
- Tests Used:
  - Asphalt Pavement Analyzer
  - Flexural Beam Fatigue (Four Point Bending)
  - Texas Overlay Tester

# New Jersey Process

1. Volumetric Design:
  - Using proposed materials, contractor performed, DOT verified
2. Contractor submits materials to DOT approved laboratory
  - Lab prepares mixture test specimens
  - If successful, move to Step 3
3. Hot Mix plant produces a test strip
  - Loose mix is sampled and supplied for testing
  - Repeated until the material passes
4. Contractor samples mix during production for continued evaluation

# Specialty Mixes with Performance Specifications

- High Performance Thin Overlays
- Binder Rich Intermediate Course
- Bridge Deck Waterproofing Surface Course
- Bottom Rich Base Course
- High RAP Mix (Surface and Base Course)
- Limits produced with database of mix performance data

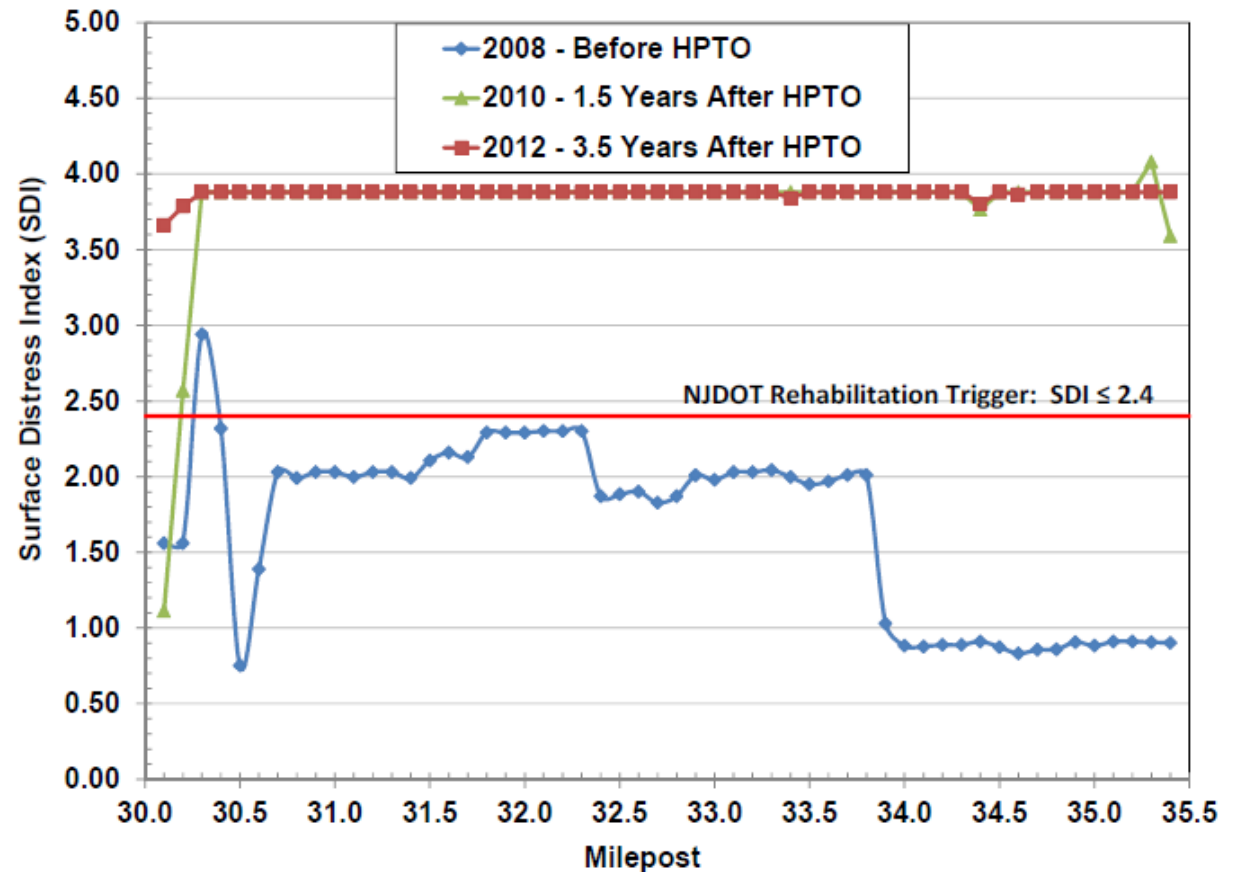
# High Performance Thin Overlay

- Fine graded mixtures with maximum nominal aggregate size of 9.5mm
- Use polymer modified PG 76-22
- No natural sand or recycled materials
- As of report, only had rut requirement (Max. 4mm)
- Current specifications also include overlay tester specification

Volumetric Requirements for Design and Control of HPTO					
	Required Density (% of Gmm)		Voids in Mineral Aggregate (VMA)	Dust to Binder Ratio	Draindown AASHTO T 305
	N <sub>des</sub> (50 Gyr)	N <sub>max</sub> (100 Gyr)			
Design Requirements	96.5	≤ 99.0	≥ 18.0 %	0.6-1.2	≤ 0.1 %
Control Requirements	95.5 - 97.5	≤ 99.0	≥ 18.0 %	0.6-1.3	≤ 0.1 %

# High Performance Thin Overlay

- Trial on Interstate 287 Southbound
- Primary distress was top-down, longitudinal cracking
- 1 inch (25mm) thick lift applied after milling
- “Performing exceptionally well”





# Bridge Deck Waterproofing Surface Course

- Produce rut and fatigue resistant impermeable bridge deck layer which can be placed with static, rolling compaction
- 9.5mm NMAAS
- Polymer modified or thermoplastic polymer modified asphalt suggested
- Rutting and Cracking requirements

BDWSC Grading of Total Aggregate	
Sieve Size	Percent Passing by Mass
1/2"	100
3/8"	80-100
#4	55-85
#8	32-42
#16	20-30
#30	12-20
#50	7-16
#100	3-12
#200	2.0-6.0
Minimum Percent Asphalt by Mass of Total Mix	7.0

# Bridge Deck Waterproofing Surface Course

- Use on ACROW Bridge, Route 80
  - Temporary bridge
- Mix was pre-approved and exceeded minimum requirements
- Original pavements were removed after 6 weeks of use
- Deck appearance did not change over lifespan



# High RAP Mixes

- Surface: 20% Minimum
- Base/Intermediate: 30% Minimum
- Lead to 1% VMA increase in specification
- Air Voids Controlled between 95 and 98.5% during production
- Specification based on virgin mixes

Test	Requirement			
	Surface Course		Intermediate Course	
	PG 64-22	PG 76-22	PG 64-22	PG 76-22
APA @ 8,000 loading cycles (AASHTO T 340)	< 7 mm	< 4 mm	< 7 mm	< 4 mm
Overlay Tester (NJDOT B-10)	> 150 cycles	> 175 cycles	> 100 cycles	> 125 cycles

# High RAP Mixes

- First trial: 2012 on Interstate 295
- Final mix had 25% in surface, 35% in intermediate
- Binder selection left to whatever was most appropriate for performance
- No issues with compaction, IRI and density measurements confirmed this

Property	I295 Final HRAP Mixtures	
	9.5M76 (Surface Course)	12.5M64 (Intermed. Course)
RAP % Used	25%	35%
JMF Asphalt Content (%)	6.0%	5.8%
% Binder Replacement	27.4%	29.7%
PG Grade of Virgin Binder (Continuous Grade)	PG70-22 (74.6-26.99)	PG64-28 (64.8-28.29)
Fractionated RAP Portion Used	100% Fine RAP Fraction	50% Fine RAP Fraction 50% Coarse RAP Fraction

# High RAP Mixes



# Lessons Learned

- RAP mixes were under asphalted by 0.6% on average
- Lower NMAS for specialty mixes
- Increase in design VMA for incorporation of RAP
- Database of already approved mixes tested alongside construction of specialty mix trials
  - Database of virgin mixes used to generate specification for High RAP mixes
- Binder selection based on performance of the mix for some specialty mixes

Thank you!

Questions?

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