Specification/QMS Update
Breakout Session C
February 21-22, 2019

Review of Specifications and Best Practices for Successful Paving Seasons

- Mix Type Changes – Mix Consolidation Special Provision
  - Selecting the Appropriate Surface Mix for the Road
- Joint Construction Efforts
- Tack Coat
- Latest Special Provisions – January 15, 2019 letting

Mix Consolidation and 2018 Spec Changes What do you need to know?

- We are trying to allow for more durable mixes while still protecting against rutting
- Diminishing the Job Mix Formulas with poor rut performance
- Reducing the gyration level for S9.5C mixes to allow for more asphalt binder content
- Removing all S12.5X Mixes
- Consolidating to one Intermediate Mix Type (I19.0C) and one Base Mix Type (B25.0C)
- Decreasing the need for PG 70-22 binder
- Compaction requirements are the same, but look different due to naming of mix types.
- Basing the amount of recycled material based upon the percentage of asphalt binder rather than weight.
- Designers need to select the appropriate surface mix for the anticipated traffic demand
- Went into effect with the February 2018 letting

Side by Side Comparison

2018 Specification Book Asphalt Mixes

TABLE 610-3
SUPERPAVE MIX DESIGN CRITERIA

Mix Type	Design ESALs[A] millions	Binder PG Grade[B]	Compaction Levels G_{mm} @		Max. Rut Depth (mm)	Volumetric Properties			
			N_{ini}	N_{des}		VMA	VTM	VFA	$\%G_{mm}$
						% Min.	%	Min.-Max.	@ N_{ini}
SF9.5A	< 0.3	64 - 22	6	50	11.5	16.0	3.0 - 5.0	70 - 80	≤ 91.5
S9.5B	0.3 - 3	64 - 22	7	65	9.5	15.5	3.0 - 5.0	65 - 80	≤ 90.5
S9.5C	3 - 30	70 - 22	7	75	6.5	15.5	3.0 - 5.0	65 - 78	≤ 90.5
S9.5D	> 30	76 - 22	8	100	4.5	15.5	3.0 - 5.0	65 - 78	≤ 90.0
S12.5C	3 - 30	70 - 22	7	75	6.5	14.5	3.0 - 5.0	65 - 78	≤ 90.5
S12.5D	> 30	76 - 22	8	100	4.5	14.5	3.0 - 5.0	65 - 78	≤ 90.0
I19.0B	< 3	64 - 22	7	65	-	13.5	3.0 - 5.0	65 - 78	≤ 90.5
I19.0C	3 - 30	64 - 22	7	75	-	13.5	3.0 - 5.0	65 - 78	≤ 90.0
I19.0D	> 30	70 - 22	8	100	-	13.5	3.0 - 5.0	65 - 78	≤ 90.0
B25.0B	< 3	64 - 22	7	65	-	12.5	3.0 - 5.0	65 - 78	≤ 90.5
B25.0C	> 3	64 - 22	7	75	-	12.5	3.0 - 5.0	65 - 78	≤ 90.0
	Design Parameter					**Design Criteria**			
All Mix Types	Dust to Binder Ratio ($P_{0.075}$ / P_{be})					0.6 - 1.4			
	Tensile Strength Ratio (TSR)					85% Min.[C,D]			

A. Based on 20 year design traffic.
B. Volumetric Properties based on specimens compacted to Ndes as modified by the Department.
C. TSR for Type B 25.0 and Type B 25.0C mixes is 80% minimum.
D. AASHTO T 283 Modified (No Freeze-Thaw cycle required).

Special Provision - 2018 Consolidated Asphalt Mixes

TABLE 610-3
MIX DESIGN CRITERIA

Mix Type	Design ESALs millions [A]	Binder PG Grade [B]	Compaction Levels G_{mm} @		Max. Rut Depth (mm)	Volumetric Properties			
			N_{ini}	N_{des}		VMA	VTM	VFA	$\%G_{mm}$
						% Min.	%	Min.-Max.	@ N_{ini}
S4.75A	< 1	64 - 22	6	50	11.5	16.0	4.0 - 6.0	65 - 80	≤ 91.5
S9.5B	0 - 3	64 - 22	6	50	9.5	16.0	3.0 - 5.0	70 - 80	≤ 91.5
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B25.0C	ALL	64 - 22	7	65	-	12.5	3.0 - 5.0	65 - 78	≤ 90.5
	Design Parameter					**Design Criteria**			
All Mix Types	Dust to Binder Ratio ($P_{0.075}$ / P_{be})					0.6 - 1.4 [C]			
	Tensile Strength Ratio (TSR) [D]					85% Min. [E]			

A. Based on 20 year design traffic.
B. Volumetric Properties based on specimens compacted to N_{des} as modified by the Department.
C. Dust to Binder Ratio ($P_{0.075}$ / P_{be}) for Type S4.75A is 1.0 - 2.0.
D. NCDOT-T-283 (No Freeze-Thaw cycle required).
E. TSR for Type S4.75A & B25.0C mixes is 80% minimum.

Implementation Schedule (Projects Let before February 2018)

- Contractor can elect to continue placing 2017 or older JMFs to complete existing projects.
- Projects already under construction may use a 2018 JMF or newer, provided a no cost supplemental agreement is executed and the mix types are confirmed to be the types originally requested.
- Contract administration office will need to adjust the CBOM in HiCAMS to allow for the material to be included under the line item.

North Carolina Department of Transportation

Supplemental Agreement Documentation

Contract: **Supplemental Agreement Number:**

County/Counties: **Federal Aid Number:**

Contractor:

1. Description, location, and justification for change:

Asphalt Mix Consolidation- This Supplemental Agreement written in accordance with Articles 104-2 and 104-3 of the 2012 Standard Specifications allows for the substitution of Asphalt Mix designs designed in 2018 or later to be used on projects let prior to February 2018.

Where the "Pavement Schedule" in the plans calls for Asphalt Concrete Surface Course Type SF9.5A, a 2018 asphalt mix design or younger (i.e. 2019, 2020, etc.) for Asphalt Concrete Surface Course Type S9.5B may be substituted.

Where the "Pavement Schedule" in the plans calls for Asphalt Concrete Intermediate Course Type I19.0B, C or D, a 2018 asphalt mix design or younger (i.e. 2019, 2020, etc.) for Asphalt Concrete Intermediate Course Type I19.0C may be substituted.

Where the "Pavement Schedule" in the plans calls for Asphalt Concrete Base Course Type B25.0B, a 2018 asphalt mix design or younger (i.e. 2019, 2020, etc.) for Asphalt Concrete Base Course Type B25.0C may be substituted.

Where mix is substituted as allowed above, provide asphalt to meet the requirements of the 2018 Project Special Provision titled Asphalt Concrete Plant Mix Pavement SP6R65 dated 2-20-18; with the exception that references in the special provision to Article 610-16 MEASUREMENT AND PAYMENT will not be applicable. No additional compensation will be made for converting to the 2018 asphalt mix types. The asphalt mixes will be compensated at the original contract line items.

2. Estimate of quantities of work resulting from change and the basis for payment:

There are no changes in quantities.

3. Extension of contract time (if applicable):

No contract time extensions under Subarticle 108-10(B)(1) will be allowed for the work covered under this Supplemental Agreement.

North Carolina Department of Transportation

Documentation for Negotiated Prices and Contract Time Extensions

Contract:

Federal Aid Number:

Step-by-Step: No

Supplemental Agreement Number:

Verbal Approval: No

Supplemental Agreement Justification:

The Department has been working with our partners in the Asphalt Industry to adjust asphalt mixes to improve their performance and reduce the overall number of job mix formulas. These adjustments have resulted in a reclassification of some mixes and elimination of others. Table 610-3 of the 2018 QMS Manual illustrates the new asphalt mix types.

To reduce the impacts of the mix consolidation on the asphalt producers, previously approved job mix formulas which met all the criteria for the 2018 Asphalt mix types were reassigned with 2018 asphalt mix design numbers and job mix formulas. This supplemental agreement documents the ability to use the 2018 asphalt job mix formulas on projects let prior to February 2018.

Pricing Information

There are no changes in quantities.

FOR CONSTRUCTION AND MATERIALS BRANCH USE ONLY

FHWA NOTIFICATION

Discussed with: _____ Date: _____

Price: _____ Time Extension: _____

Beginning of Work: _____ Verbal Approval: ☐ Yes ☐ No

Signed: _____ Date: _____

2018 Asphalt Mix Consolidation Highlights

- Only one Asphalt Base Mix Type (B25.0C)
- Only one Intermediate Mix Type (I19.0C)
- SF9.5A JMFs designed before 2018 may have been converted to S9.5B JMFs
  - Can be used up to 3 million ESALs
- S9.5B JMFs designed before 2018 may have been converted to S9.5C,
  - Must have met tougher rut standard (max 6.5mm)
- No longer use the PG 70-22 binder
- Designers need to select surface mixes for designed ESALs
- Typical sections updated to new mix types in March 2018 letting

Updated Minimum Density Table

TABLE 610-7 DENSITY REQUIREMENTS	
Mix Type	**Minimum % G_{mm} (Maximum Specific Gravity)**
S4.75A	85.0 [A]
S9.5B	90.0
S9.5C, S9.5D, I19.0C, B25.0C	92.0

A. Compaction to the above specified density will be required when the S4.75A mix is applied at a rate of 100 lbs/sy or higher.

Tack Coat Basics

- To promote the bond between pavement layers
  - Prevent slippage between pavement layers
  - Vital for structural performance of the pavement
  - All layers working together

Tack Coats for Resurfacing Projects

Four essential requirements for satisfactory tack coat application:

1. Existing pavement surface must be thoroughly cleaned.

2. Proper rate of application must be assured. Use Best Practices Field Guide 2012

3. Uniform coverage over the entire area to be paved must be assured.

4. Allow the tack to thoroughly break and set before paving
   - ✓ Color change
   - ✓ Rice Krispy Test (Snap, Crackle, and Pop)
   - ✓ Heel Test

Tack

Pavement Clean

Proper rate

Uniform Application

Ensure tack breaks before paving

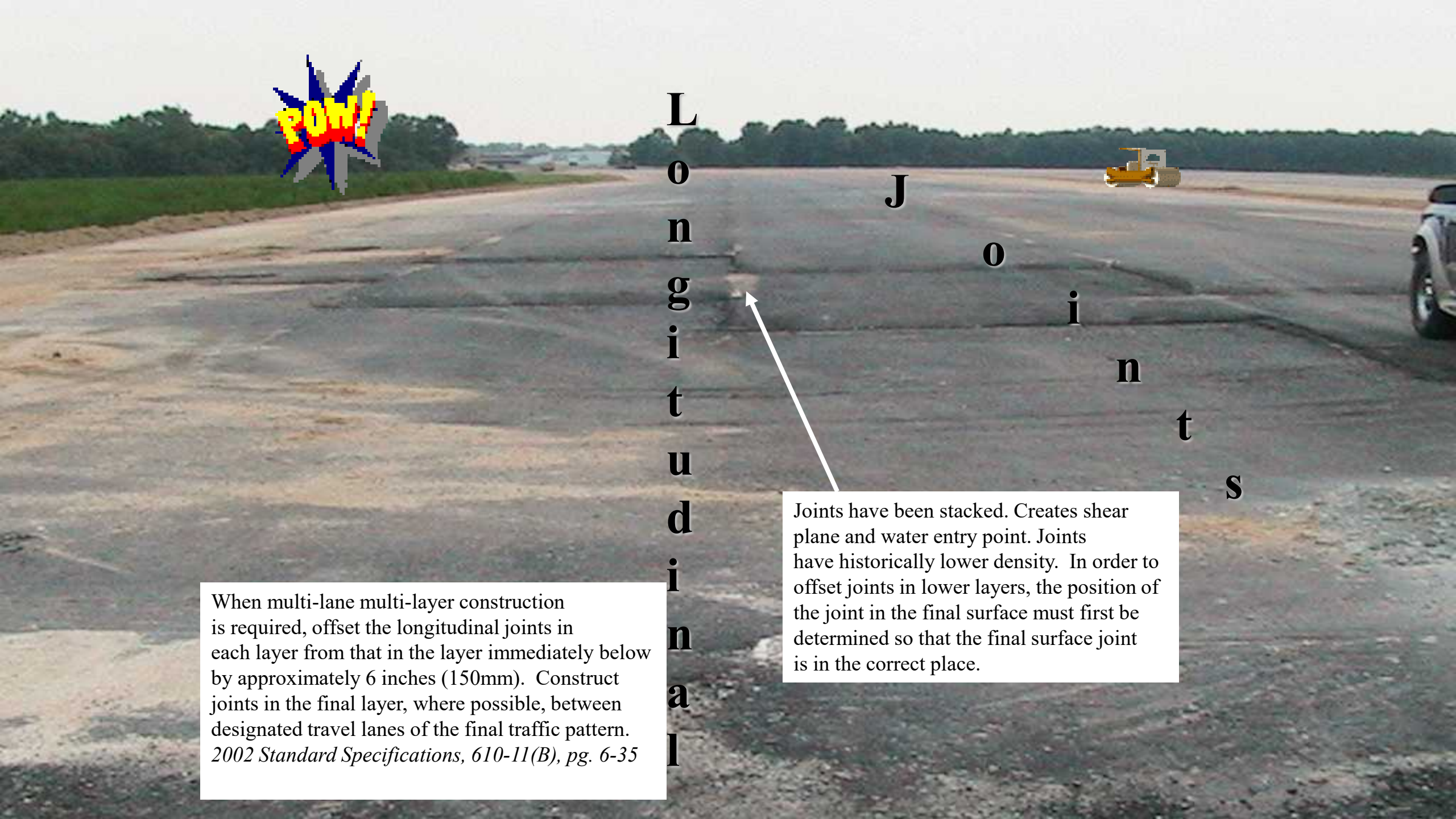
Work Zone Traffic Control Special Provisions

Paving Operations

- Paving Lift Requirements and Time Limitations
  - For lifts =<2”, bring all newly resurfaced lanes to the same station and elevation within 72 hours.
  - For lifts > 2”, bring all newly resurfaced lanes to the same station and elevation by the end of each work day unless the contractor utilizes the notched wedge paving method.
- Shoulder Drop-off Requirements
  - Whenever paving operations create an edge of pavement drop-off >2”, within 72 hours, the contractor shall backfill at a 6:1 slope from the edge and finished elevation… This work is not considered part of shoulder reconstruction.

Joint Construction Efforts

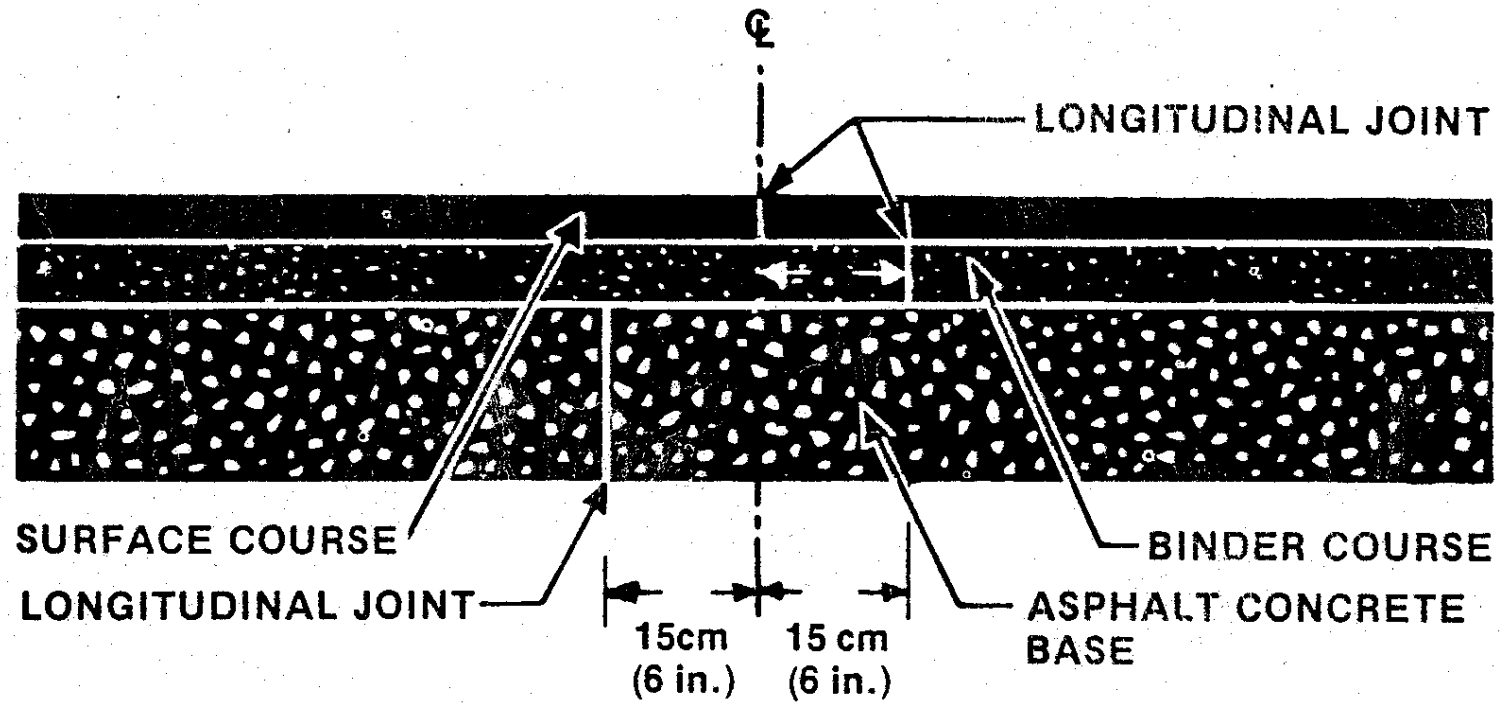
- Longitudinal Joints
  - Straight
  - Offset from layer below
  - Lower density due to unconfined edge on one side.
  - Plan pavement marking requirement
- Transverse Joints
  - More required due to Work Zone Traffic Control Special Provisions
  - Good construction practices include
    - Heated screed for surface texture
    - Use of Start up Blocks (1/4” for each 1” of compacted thickness)
    - Check for > 1/8” deviation with 10’ straightedge



Longitudinal Joints

When multi-lane multi-layer construction is required, offset the longitudinal joints in each layer from that in the layer immediately below by approximately 6 inches (150mm). Construct joints in the final layer, where possible, between designated travel lanes of the final traffic pattern.
2002 Standard Specifications, 610-11(B), pg. 6-35

Joints have been stacked. Creates shear plane and water entry point. Joints have historically lower density. In order to offset joints in lower layers, the position of the joint in the final surface must first be determined so that the final surface joint is in the correct place.


℄
LONGITUDINAL JOINT
SURFACE COURSE
LONGITUDINAL JOINT
15cm
(6 in.)
15 cm
(6 in.)
BINDER COURSE
ASPHALT CONCRETE
BASE


GMC
2012


Longitudinal Joints


UNEVEN
PAVEMENT
S
1031


SPEED
LIMIT
35

Transverse Joint Construction

If the take off or landing weren't important, then they would let the kid in the window seat fly the plane.

If we just set down and pull off without any prep, then we will go down.

Jeff Richmond – Roadtec

Pavement Professionals Workshop

Transverse Joints

Successful takeoffs involve:

- Allow for Roll Down
- Execute Proper Material Control
- Check the Joint with a Straight Edge While Mix is Still Hot

Start up on a transverse joint

- Start up block should be used to provide a slight difference in the unrolled pavement and the existing pavement (1/4” for each 1” of compacted thickness)


2011

Asphalt Special Provision Updates
SP6R65 (Revised 1-15-19)

- Mix consolidation changes
- Spreading and Finishing – MTV Usage
- Final Surface Testing – consistency with Options 1 and 2

Spreading and Finishing

- Use an MTV for all surface mix regardless of binder grade on Interstate, US Routes, and NC Routes (primary routes) that have 4 or more lanes and median divided.
- Use MTV for all ramps, loops, Y-lines that have 4 or more lanes and are median divided, full width acceleration lanes, full width deceleration lanes, and full width turn lanes that are greater than 1000 feet in length.

610-13 Final Surface Testing

- Final surface testing is not required on ramps, loops and turn lanes.
  - Requirements are now the same for Option 1 -Inertial Profiler and Option 2 -North Carolina Hearne Straightedge

- Areas excluded from testing by the profiler may be tested using a 10-foot straightedge in accordance with Article 610-12.

Article 610-12

- Using a 10-foot stationary straightedge furnished by the Contractor…
- Do not exceed 1/8” variation of the surface being tested from the edge of the straightedge between two contact points.

Asphalt Special Provision Updates
SP6R63 (Revised 1-15-19)

- Tack Coat Materials
  - PG 58 -28, PG 64 -22, or an approved non-tracking hot-applied (NTHA) asphalt tack coat material
  - Apply the asphalt binder tack coat material at a rate of 0.06 to 0.08 gal/SY or as directed. Uniformly apply the NTHA tack coat material at a rate of 0.10 to 0.14 gal/SY or as directed.

Milling Asphalt Pavement
SP6 R59 (1-15-19) &
Ultra-Thin Bonded Wearing Course
SP6 R64 (1-15-19)

- Use either a non-contacting laser or sonar ski system with a minimum of three referencing stations at a length of at least 24 feet.

NORTH CAROLINA
Department of Transportation

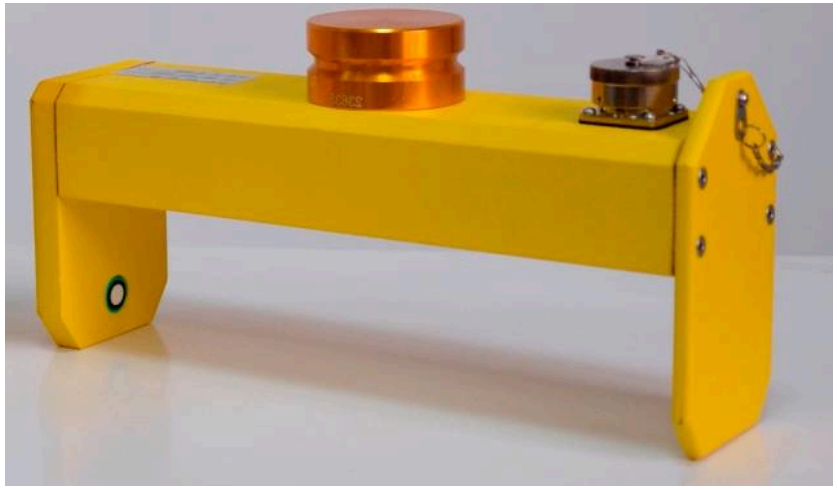
2019 CAPA/NCDOT Asphalt Pavement Workshop

Todd W. Whittington, PE – State Field Operations Manager

Materials and Tests Unit

Paver Referencing Sensors

- Minimum of 3 Sensors Mounted on the Paver
  - Minimum Length = 24 feet



QMS Forms

- Electronic Submission of Files = OK
  - Email electronic or scanned attachments
  - Have to remain mindful of CFR (FHWA) requirements on "Source Documentation"
- NCDOT Continues Expanding Use of SharePoint
  - QMS Forms slated for move to SharePoint
    - M&T 605 – on SP now; Density forms next; QC-5 & QA-5 – soon?
- M&T Putting Mix Test Data on HiCAMS
  - Automatic Download of Test Results to QAP

Checking Truck Temperatures

- Digital Thermometer - ***Required***
  - Probe Length = 10” or greater
  - ***“Note: Dial Stem thermometers are not to be used.”***

- Within ± 25° F of the Temperature Specified on JMF

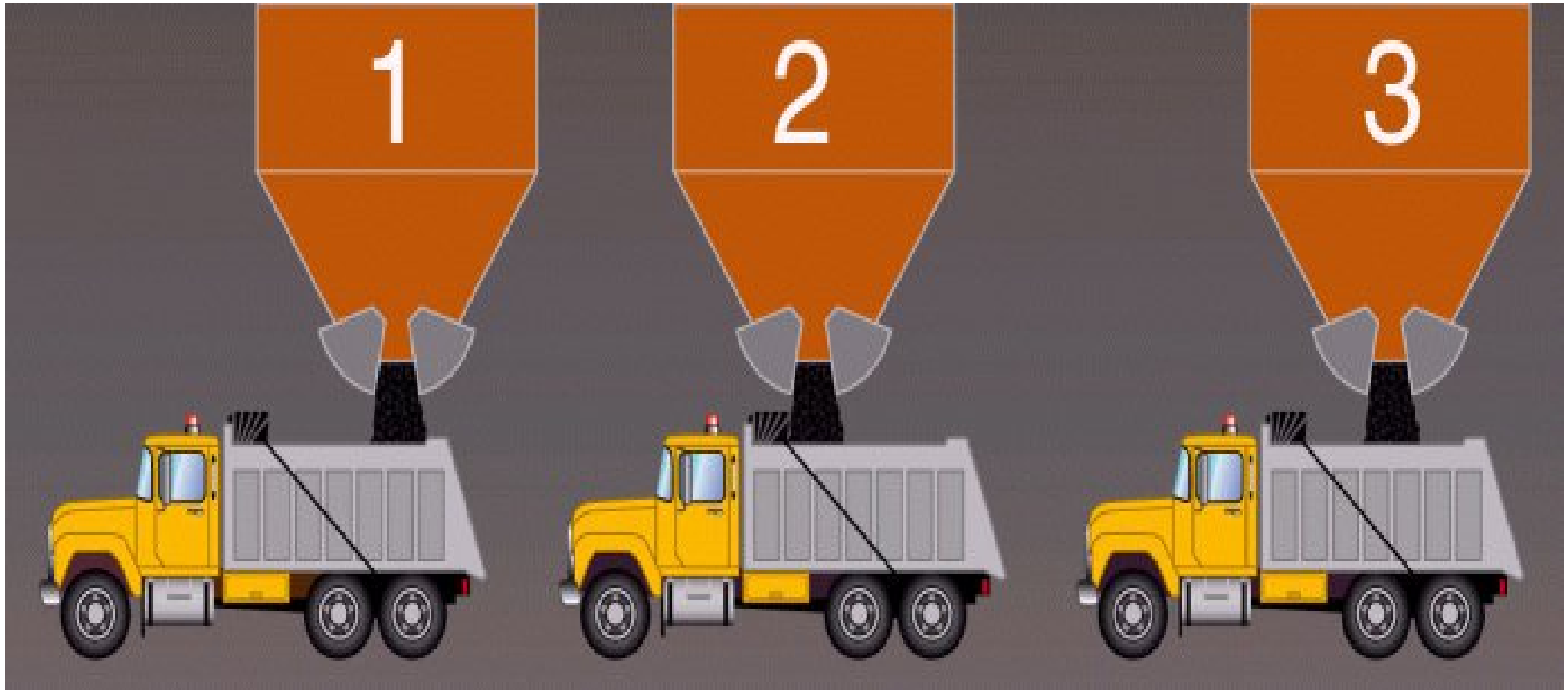
Checking Truck Temperatures

Checking Truck Temperatures

TABLE 610-1 MIXING TEMPERATURE AT THE ASPHALT PLANT	
Binder Grade	**JMF Mix Temperature**
PG 58-28; PG 64-22	250 - 290° F
PG 76-22	300 - 325° F

- JMF Mix Temperature is chosen by the contractor.
- Set when the JMF is approved or modified.

Proper Truck Loading



WHY?? Mix Consolidation

- Reduce the Number of Mix Types
  - Removed S9.5C – harsh, dry, hard-to-compact mix.
    - "Old" B & C mixes designed using identical gradations.
    - Only difference = "old S9.5B" contained +0.2% more binder.
  - Removed PG70-22 – a stiffer, non-modified binder.
- New Mix Types Improve Rut Resistance
  - New mixes use lower rut maximum specifications.
  - Same rut resistance – potentially improving cracking resistance.
    - With the +0.2% more binder

Table 610-3: Mix Types

2012 Specifications			2018 Specifications (via Special Provisions)		
Mix Type Designation	***ESALs***	***Maximum Rut Depth (mm)***	***Mix Type Designation***	***ESALs***	***Maximum Rut Depth (mm)***
S4.75A	0 – 1	11.5	S4.75A	0 – 1	11.5
SF9.5A	< 0.3	11.5			
S9.5B	0.3 - 3	9.5	S9.5B	0 – 3	9.5
S9.5C	3 - 30	6.5	S9.5C	3 – 30	6.5
S9.5D	> 30	4.5	S9.5D	> 30	4.5
I19.0 B, C, D	< 3, 3 – 30, > 30	-	I19.0C	ALL	-
B25.0 B, C	< 3, > 3	-	B25.0C	ALL	-

Table 610-3: Mix Types

TABLE 610-3 SUPERPAVE MIX DESIGN CRITERIA									
Mix Type	Design ESALs[A] millions	Binder PG Grade[B]	Compaction Levels		Max. Rut Depth (mm)	Volumetric Properties			
			G_{mm} @			VMA	VTM	VFA	$\%G_{mm}$ @ N_{ini}
			N_{ini}	N_{des}		% Min.	%	Min.-Max.	
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Current Table 610-3: "Consolidated"

TABLE 610-3 MIX DESIGN CRITERIA									
Mix Type	Design ESALs millions [A]	Binder PG Grade [B]	Compaction Levels		Max. Rut Depth (mm)	Volumetric Properties			
			G_{mm} @			VMA	VTM	VFA	$\%G_{mm}$ @ N_{ini}
			N_{ini}	N_{des}		% Min.	%	Min.-Max.	
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Recycled Content

- New Way of Determining Recycled % in 2018 Specs.
  - Recycled Binder Ratio - %RBR
  - Looks at contribution from Shingles and RAP separately.
    - RAS has more effect on Mix Binder.

$$\%RBR\ from\ RAS = \frac{(\%RAS\ in\ Mix) \times (\%AC\ in\ RAS)}{(Total\ \%AC\ in\ Mix)}$$

$$Total\ \%RBR = \frac{\big((\%RAP\ in\ Mix) \times (\%AC\ in\ RAP)\big) + \big((\%RAS\ in\ Mix) \times (\%AC\ in\ RAS)\big)}{(Total\ \%AC\ in\ Mix)}$$

Recycled Content

TABLE 610-4 MAXIMUM RECYCLED BINDER REPLACEMENT PERCENTAGE (RBR%)			
Recycled Material	**Intermediate & Base Mixes**	**Surface Mixes**	**Mixes Using PG 76-22**
RAS	23%	20%	18%
RAP or RAP/RAS Combination	45%	40%	18%

M&T Personnel Updates

Division(s)	Pavement Specialist	Office Location
1 & 2	Donnie Best	Kinston
3 & 4	Junior Thornton	Burgaw
5 & 6	Tommy Bowen	Fayetteville
7 & 8	Norm Abrams	McLeansville
9 & 10	Randall Ashmore	Lexington
11 & 12	Jeff Canter	Wilkesboro
13 & 14	Dan Hunter	Franklin
Statewide	John Flowers	Wilson
	Jim Sawyer	Raleigh

M&T Personnel Updates

Lab Location	Lab Supervisor
Williamston	Lee Madison
Burgaw	Adam Pearsall
Raleigh - Central	Charles Colgate
Fayetteville	Johnny Hammonds
Lexington	Rebecca Harris
Matthews	Ryan Richardson
Statesville	Powell Simpson
Asheville	Cathy McAbee
Statewide	David Dunn

Construction Unit Region
And
Area Engineers

B. C. Skeens, PE (Brian)
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A. C. Cochran, PE (Cameron)
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W. W. Jones III, PE (Wiley)
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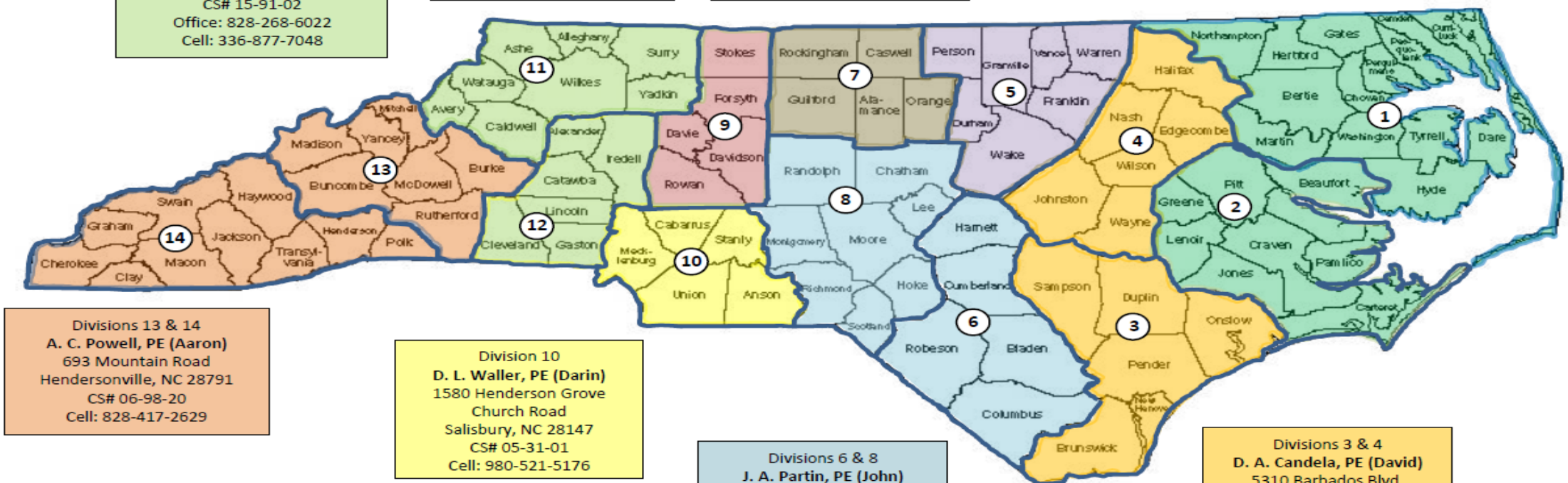

Divisions 13 & 14
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Division 10
D. L. Waller, PE (Darin)
1580 Henderson Grove
Church Road
Salisbury, NC 28147
CS# 05-31-01
Cell: 980-521-5176

Divisions 6 & 8
J. A. Partin, PE (John)
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Divisions 3 & 4
D. A. Candela, PE (David)
5310 Barbados Blvd.
Suite 102
Castle Hayne, NC 28429
CS# 04-08-04
Cell: 910-524-4931


JEOPARDY!


DOUBLE
JEOPARDY!


FINAL
JEOPARDY!