Asphalt Quality Assurance Program & Construction Inspection

2015 Asphalt Regional Seminars

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QUALITY CONTROL ALWAYS
COSTS LESS THAN "REMOVE & REPLACE"

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QUALITY ASSURANCE

QUALITY CONTROL (QC) and ACCEPTANCE

INDEPENDENT ASSURANCE (IA)

VERIFICATION SAMPLING AND TESTING (VST)
Are these Actually Different?

**QA or Quality Assurance** is the *overall program* required by the *owner*.

1. **QC or Quality Control** is the processes*/procedures used by the *contractor*.

* These processes are beyond the minimum requirements of acceptance testing - such as additional sampling

**Acceptance** is the procedure for which a product is measured for adherence to specification such as mat density. In Virginia, this procedure is performed by the *contractor* for asphalt
2. **Independent Assurance** is a procedure/process used by the owner.

The purpose is to ensure the people, equipment, and procedures used by the Contractor are compliant to specification.

3. **Verification, Sampling and Testing** is a procedure/process used by the owner.

The purpose is to check the acceptance decision by the Contractor such as verification cores.
VDOT Uses System & Project Approach to QA

System Approach at the Plant (Contractor)

- Certified technicians
- QC on mixes during production
- Sampling for acceptance on AC Content and Gradation; Pass/Fail on Volumetrics
- All mixes going to VDOT projects tested, but not specific to a project
- Test data entered into PLAID
VDOT Uses System & Project Approach to QA

**System Approach at the Plant (VDOT)**

- Certified technicians
- Mix samples collected for statistical comparisons on AC Content and Gradation
- Mix samples collected with contractor acceptance samples for IA (matched samples)
- VDOT samples compared to other contractor acceptance samples for VST (unmatched samples)
- VDOT volumetric samples collected for Pass/Fail only and compared to contractor results
Asphalt Plant
Quality Control
VDOT Uses System & Project Approach to QA

Project Approach in the Field (Contractor)

- Asphalt Field Level 2 Technician
- Certified density technicians
- Establish roller pattern and control strip
- QC on density during compaction of Lots
- Acceptance on Lot mat density
- Monitoring of longitudinal joint density
- All data recorded on TL forms and provided to VDOT
VDOT Uses System & Project Approach to QA

**Project Approach in the Field (VDOT)**

- Asphalt Field Level 2 technicians
- Monitor construction of roller pattern
- Monitor compacting, nuclear density testing, coring/plug and calculation of average control strip density
- Randomly tests cores from control strip (IA)
- Provides random numbers to contractor
- Monitors nuclear density testing in Lot
- Identifies and retrieves cores for VDOT acceptance testing (VST)
• Verifies paving equipment meets specifications

• Verifies materials being used are from approved sources

• Take temperature measurements of AC at least every hour

• Verifies that contractor personnel are performing QC operations correctly

• Verifies density testing being performed
  • Joint Density
VDOT/Materials VST and IA

- Perform VST testing on plugs

- IA testing
  - Verify method of random selection
  - Marking of test locations
  - Observe QC testing at control strip
  - Observe test sections.
  - Obtain samples of cores from control strip to reweigh in laboratory.

- Depth Control tests
So where does construction inspection fit into VDOT’s QA Program?
Construction Inspection

VDOT Representatives (consultant or VDOT employee) provides the construction oversight & inspection

Representatives must be familiar with the VDOT Road and Bridge Specifications as well as Special Provisions that are found in the contract.
General notes and other written information not in a SP or SPCN in No Plan and Minimum Plan Concept contracts carry the same weight as plans
Key Inspection Points

**Prior to Density Acceptance**
- Site preparation
- Milling
- Tacking
- Equipment
- Placement
- Compaction

**Density Acceptance**
- General requirements
- Small quantity applications
- VTM-76
- QC test sections
- Independent assurance
- Verification testing and sampling
- Referee procedure
Site Preparation

Areas of particular concern/focus:

• Repairing failed areas
• Cleaning the surface
• Tack-achieve bonding of layers
Not addressing failed areas leads to premature failure of our overlays & resurfacing

Approaches to correct failures can include:

• **Milling**

• **Patching prior to the contract for resurfacing**

• **Specify patching type, material and locations in the contract**
  • Use Special Provision (SP) for Surface Preparation and Restoration Prior to Plant Mix Overlay (Volume 2)
Milling

Why mill a road?
- Remove material distress
- Maintain surface elevation
- Improve cross-section

What things must be inspected?
- Presence of scabbing
- Positive drainage
- Cleanliness
- Performance milling
- Time frames
- Run-on conditions
What Happens with No Bonding
Bonded Demonstration

½” Deflection, 60# Load

¼” Deflection, 160# Load

Unbonded

Fully Bonded
Cores Showing Debonding

Bonding Failures
Days later!

Courtesy of Road Science
Tacking – Proper Mainline
What two categories of tack coat materials are approved by VDOT?

- Conventional Tack – Section 310
- Non-Tracking Tack Coat – Volume 2
What is the specified application rate for conventional tack on mainline? Where is it found?

- 0.05 – 0.10 gal/sy for undiluted
  Section 310.03

What is the specified application rate for non-tracking tack coat on mainline?

- Rate recommended by the manufacturer
Proper application to result in joint density

Width of application for first paving pass?

- 2 feet – 18 to 20 inches under first pass, 4 to 6 inches protruding beyond first pass

- For second pass, vertical face of first pass and approximately 1 foot into lane to be paved
Equipment

Material Transfer Vehicle

• Required for interstate surface paving in 2015
• Required for SMA and other specialty mixes
• Minimum 15 ton combined capacity between device and paver
Placement

Temperatures

Base
- WMA: 40F minimum
- HMA: 40F for “A” mixes and less 25% RAP; 50F for “A” mixes and 25% or more RAP, “D” and “E”

Mix
- Maximum is 350F or specified by liquid supplier
- New for 2015: WMA minimum is 200F
Placement

Paver Items

Longitudinal joints must be offset 6” from underlying joint

Surface longitudinal joint must be 6” – 12” from centerline marking; 6” offset from between lane markings

Continuous line for steering the paver

Grade control with ski, joint shoe
Density (Compaction)

CRITICAL to pavement durability & performance!

No significant changes to procedures from 2014

SMA changes:

Allow more than 3 vibratory passes, caution not to crush the stone
Roller pattern

MARK TEST LOCATIONS

ORIENT GAUGE IN SAME DIRECTION
Thin Lift Roller Pattern Graph TL-57

- Maximum Density = 142.5 lb/ft³
- Roller Pattern = 5 passes
  - 3 Vibratory
  - 2 Static

Density lbs/ft³

Roller Passes
Control Strip Construction

- Establishes an average nuclear density reading (10 locations)
- Verifies nuclear density reading using asphalt cores
- Determines the Target Density Value for subsequent acceptance testing
When do you have to construct a Control Strip?

**VDOT specifications require that one control strip be constructed at the beginning of work on each roadway and shoulder course and on each lift of each course.**
Locations of nuclear readings are marked by contractor.
Core locations are marked for cutting.
Verification of Target Density

Table III-3

<table>
<thead>
<tr>
<th>Mix Type</th>
<th>Min. Control Strip Density%</th>
</tr>
</thead>
<tbody>
<tr>
<td>SM-9.5A, SM-12.5A</td>
<td>92.5</td>
</tr>
<tr>
<td>SM-9.5D SM-12.5D</td>
<td>92.2</td>
</tr>
<tr>
<td>SM-9.5E, SM-12.5E</td>
<td>92.2</td>
</tr>
<tr>
<td>IM-19.0A, IM-19.0D, IM-19.0E</td>
<td>92.2</td>
</tr>
<tr>
<td>BM-25.0A, BM-25.0D</td>
<td>92.2</td>
</tr>
</tbody>
</table>
Control Strip Construction

An additional control strip is required when:

- There is a change in type or source of materials.

- There is a significant change in the composition of the material being placed from the same source.

- There is a control strip failure (consecutive failures?)

*Construction must cease if new control strip is required*
## Table III-4
Payment Schedule for Lot Densities

<table>
<thead>
<tr>
<th>% of Target Control Strip Density</th>
<th>Percent of Payment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Greater than 102.0%</td>
<td>95</td>
</tr>
<tr>
<td>98.0 to 102%</td>
<td>100</td>
</tr>
<tr>
<td>97.0 to less than 98.0%</td>
<td>95</td>
</tr>
<tr>
<td>96.0 to less than 97.0</td>
<td>90</td>
</tr>
<tr>
<td>Less than 96.0%</td>
<td>75</td>
</tr>
</tbody>
</table>
SM-4.75 is Slightly Different

Mix monitored at plant through permeability testing as well as standard tests

In the field:

- Roller pattern established (same as other dense graded mixes)
- Control strip constructed
  - BUT NO CORES
  - Average nuclear density from 10 readings is target

Lot testing and payment follows Table III-4
SUCCESS COMES IN A CAN; NOT A CAN'T
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