Ohio DOT 448 Density

2008 Ohio Asphalt Paving Conference
Ohio DOT 448 Density

PRESENTATION GOALS

- Why the specification changed?
- What was the development process?
- What are the changes to and how does the specification work?
- What results has ODOT had?
- Recommendations and Conclusions
Why create the change

- 2006 Strategic Initiative for Pavements
- A streamlined method for ensuring proper contractor control of the paving operations and adequate mat density is achieved.
- A better method to assure the mat’s density than
  - the number of rollers
  - Loading of rollers
  - capacity of rollers
448 Density - Development

ODOT/Asphalt Industry Committee

Wanted User Friendly methods for ODOT and Contractor Personnel

Uniform thickness of Courses

Minimum thickness of surface and Intermediate Courses - 1 inch or greater

Projects Over 1 Lane Mile

Use nuclear or non-nuclear gauges

Minimum Level of acceptance/assurance
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STATE OF OHIO
DEPARTMENT OF TRANSPORTATION
SUPPLEMENT 1055
ASPHALT MAT DENSITY BY GAUGE TESTING
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Calibration

Nuclear and Non Nuclear

Testing Operations

Nuclear density gauge operation & calibration
Electronic density gauge operation & calibration

Reporting and Calibration Forms

TE – Min Density Target Nuclear
TE – Min Density Target Elec Gauge
TE – Mat Density QCQA
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Step One Gage Calibration

Nuclear

Electro-magnetic
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Step Two: At job start obtain gauge readings and actual core results at same reading location.

<table>
<thead>
<tr>
<th>Location</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>Average</th>
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<tbody>
<tr>
<td>PCF</td>
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<tbody>
<tr>
<td>% Density</td>
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Core Density Test Results (see TE-199 for detail)
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Step Three: Calculate a QC minimum density target (in PCF) using gauge and core results.

Apply the following to obtain the nuclear gauge Minimum Density Target:

Minimum Density Target (PCF) = 93 X Gauge Reading Average (a) / Average % Density of cores (b).

Minimum Density Target = 93 X (a) / (b) \text{ EQUALS } (c) \text{ PCF}

EXAMPLE - Gage Avg is 145 – Core avg % 92

Min Density for Gage = 93 (145/92) = 146.8 PCF
Step Four: For QC measure the actual mat with the gauge in PCF and record. Calculate % density and record.

### DAILY MAT DENSITY QCQA REPORT

<table>
<thead>
<tr>
<th>#</th>
<th>Longitudinal Location</th>
<th>Transverse Location (circle)</th>
<th>Actual Gauge Reading (d), pcf</th>
<th>% Density = ( \frac{d}{c} \times 93 )</th>
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Step Five: Take ODOT QA test readings at 2 locations per day chosen by the inspector. Calculate % density and record.

### DAILY MAT DENSITY QCQA REPORT

<table>
<thead>
<tr>
<th>ODOT QA TESTS</th>
<th>PCFs</th>
<th>L</th>
<th>C</th>
<th>R</th>
<th>AVE</th>
<th>% Density*</th>
<th>ODOT INITIALS</th>
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<tr>
<td></td>
<td>148/</td>
<td>147/</td>
<td>146/</td>
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* Ave Gauge PCF / Minimum Density Target PCF X 93 = % Density

Tests performed by: ____________________________ Date Submitted: ____________________________
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2007 448 Specification Results

No. of projects placed: 52

Typical project size: 2-6 production days

Mix Types: 16 Superpave, 36 Type I Medium

Thicknesses: 0.75 to 1.75 in.
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2007 448 Specification Results

Density results:

- 92% of projects achieved minimum density with no deduction
- 8% of projects received some type of deduction even if part of one day.
- 9 of 12 districts reported no deductions.
- 73% of projects achieved a density of 94% (above the minimum target of 93%) in general.
- Densities ranged as high as 96 to 97% on about 38% of the projects.
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Average 448 QA density readings
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Recommendations and conclusions

- Applying to lift thicknesses less than 1 inch can create compaction result issues
- Use on projects with uniform thickness courses
- Initial learning curve for all involved (forms, spec, understanding, test equipment on site)
- ODOT expects deductions numbers to decrease with continued use
- Will continue to watch 1 inch lifts for consistency in density
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Recommendations and conclusions

• While 8% of projects did have deductions only two projects had more than **one** ½ day’s production with a deduction

• Both gauge types proved applicable and reliable

• Using Gage without calibrated against actual core samples has little meaning. Using those results have little meaning.

• The new forms proved user friendly and usable with minimal coaching
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Recommendations and conclusions

- Owners should initially review forms to help inspectors understand how to completely fill out the forms.

- Development of and the rapid Implementation (no real test projects) was very successful and shows what an owner – contractor can successfully produce.

- The specification has done what it was targeted for achieving more consistent density and thus a more consistent level of durability across the state for 448 mixes.
Thank You!

Lloyd Welker, P.E.
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