

**New Jersey Department of Transportation**  
1035 Parkway Avenue, PO Box 600, Trenton, New Jersey 08625-0600



## ***Baseline Document Change Announcement***

**ANNOUNCEMENT: BDC15S-07**

**DATE: June 30, 2015**

**SUBJECT: Air Void Requirements**  
- Revision to Subparts 401.03.03, 404.03.01 and 406.03.01 of the 2007 Standard Specifications for Road and Bridge Construction.

Subparts 401.03.03 & 404.03.01 of 2007 Standard Specifications and 406.03.01 as it appears in the Standard Input (SI 2007) have been revised to improve the statistical basis for the HMA air voids specifications. The HMA air voids testing has been changed and an outlier provision for the air void  $N = 10$  has been added.

**The following revisions have been incorporated into the Standard Input SI2007 as of June 30, 2015.**

### **SECTION 401 – HOT MIX ASPHALT (HMA) COURSES**

#### **401.03.03 HMA Courses**

##### **H. Air Void Requirements.**

THE SEVENTH PARAGRAPH, SUBPART 5 & 7 ARE CHANGED TO:

- 5 Outlier Detection.** If  $PD < 10$ , the ME will not screen for outliers. If  $PD \geq 10$ , the ME will screen acceptance cores for outliers using a statistically valid procedure. The following procedure applies only for a sample size of 5 or 10.
1. The ME will arrange the core results in ascending order, in which  $X_1$  represents the smallest value and  $X_N$  represents the largest value.
  2. If  $X_N$  is suspected of being an outlier, the ME will calculate:
 
$$R = \frac{X_N - X_{(N-1)}}{X_N - X_1}$$
  3. If  $X_1$  is suspected of being an outlier, the ME will calculate:
 
$$R = \frac{X_2 - X_1}{X_N - X_1}$$
  4. For  $N=5$  if  $R > 0.642$ , the value is judged to be statistically significant and the core is excluded. For  $N = 10$  if  $R > 0.412$ , the value is judged to be statistically significant and the core is excluded.

If an outlier is detected and no retest is warranted, the Contractor may replace that core by taking an additional core at the same offset and within 5 feet of the original station. If an outlier is detected and a retest is justified, take a replacement core for the outlier at the same time as the 5 additional retest cores are taken. If the outlier replacement core is not taken within 15 days, the ME will use the initial core results to determine PPA.

If an outlier is detected for  $N = 10$ , the Contractor may replace that core by taking an additional core at the same offset and within 5 feet of the original station. If the outlier replacement core is not taken within 15 days, the ME will use the initial core results to determine PPA.

- 7 Removal and Replacement.** If the final lot  $PD \geq 75$  (based on the combined set of 10 cores or 5 cores if the Contractor does not take additional cores), remove and replace the lot and all overlying work. The replacement work is subject to the same requirements as the initial work.

For shoulder lots, instead of removal and replacement, the Department will assess the calculated PPA, and the Contractor shall perform a fog seal of the lot as specified in 422.03.01.

## SECTION 404 – STONE MATRIX ASPHALT (SMA)

### 404.03.01 SMA

#### H. Air Void Requirements.

THE ENTIRE PART IS CHANGED TO:

Drill cores as specified in 401.03.05.

Mainline lots are defined as the area covered by a day's paving production of the same job mix formula for the traveled way and auxiliary lanes. The RE may combine daily production areas less than 1000 tons with previous or subsequent production areas. If a day's production is greater than 4000 tons, the RE may divide the area of HMA placed into 2 lots with approximately equal areas.

Ramp pavement lots are defined as approximately 10,000 square yards of pavement in ramps. The RE may combine ramps with less than the minimum area into a single lot. If 2 or more ramps are included in a single lot, the RE will require additional cores to ensure that at least 1 core is taken from each ramp.

Other pavement lots are defined as approximately 10,000 square yards of pavement in shoulders and other undefined areas.

The ME will calculate the percent defective (PD) as the percentage of the lot outside the acceptable range of 1 percent air voids to 7 percent air voids. The acceptable quality limit is 10 percent defective. For lots in which  $PD < 10$ , the Department will award a positive pay adjustment. For lots in which  $PD > 10$ , the Department will assess a negative pay adjustment.

The ME will determine air voids from 5 cores taken from each lot in random locations. The ME will determine air voids of cores from the values for the maximum specific gravity of the mix and the bulk specific gravity of the core. The ME will determine the maximum specific gravity of the mix according to NJDOT B-3 and AASHTO T 209, except that minimum sample size may be waived in order to use a 6-inch diameter core sample. The ME will determine the bulk specific gravity of the compacted mixture by testing each core according to AASHTO T 166.

The ME will calculate pay adjustments based on the following:

- Sample Mean ( $\bar{X}$ ) and Standard Deviation (S) of the N Test Results ( $X_1, X_2, \dots, X_N$ ).**

$$\bar{X} = \frac{(X_1 + X_2 + \dots + X_N)}{N}$$

$$S = \sqrt{\frac{(X_1 - \bar{X})^2 + (X_2 - \bar{X})^2 + \dots + (X_N - \bar{X})^2}{N - 1}}$$

- Quality Index (Q).**

$$Q_L = \frac{(\bar{X} - 1.0)}{S}$$

$$Q_U = \frac{(7.0 - \bar{X})}{S}$$

3. **Percent Defective (PD).** Using NJDOT ST for the appropriate sample size, the Department will determine PD<sub>L</sub> and PD<sub>U</sub> associated with Q<sub>L</sub> and Q<sub>U</sub>, respectively. PD = PD<sub>L</sub> + PD<sub>U</sub>
4. **Percent Pay Adjustment (PPA).** Calculate the PPA for traveled way and ramp lots as specified in Table 401.03.03-3.

Table 404.03.01-1 PPA for Mainline Lots and Ramp Lots		
	Quality	PPA
Surface	PD < 10	PPA = 4 - (0.4 PD)
	10 ≤ PD < 30	PPA = 1 - (0.1 PD)
	PD ≥ 30	PPA = 40 - (1.4 PD)
Intermediate and Base	PD < 30	PPA = 1 - (0.1 PD)
	PD ≥ 30	PPA = 40 - (1.4 PD)

Calculate the PPA for other pavement lots as specified in Table 401.03.03-4.

Table 404.03.01-2 PPA for Other Pavement Lots		
	Quality	PPA
All Courses	PD < 50	PPA = 1 - (0.1 PD)
	PD ≥ 50	PPA = 92 - (1.92 PD)

5. **Outlier Detection.** If PD < 10, the ME will not screen for outliers. If PD ≥ 10, the ME will screen all acceptance cores for outliers using a statistically valid procedure. The following procedure applies only for a sample size of 5 or 10.

1. The ME will arrange the core results in ascending order, in which X<sub>1</sub> represents the smallest value and X<sub>N</sub> represents the largest value.

2. If X<sub>N</sub> is suspected of being an outlier, the ME will calculate:

$$R = \frac{X_N - X_{(N-1)}}{X_N - X_1}$$

3. If X<sub>1</sub> is suspected of being an outlier, the ME will calculate:

$$R = \frac{X_2 - X_1}{X_N - X_1}$$

4. For N=5 if R > 0.642, the value is judged to be statistically significant and the core is excluded. For N = 10 if R > 0.412, the value is judged to be statistically significant and the core is excluded.

If an outlier is detected and no retest is warranted, the Contractor may replace that core by taking an additional core at the same offset and within 5 feet of the original station. If an outlier is detected and a retest is justified, take a replacement core for the outlier at the same time as the 5 additional retest cores are taken. If the outlier replacement core is not taken within 15 days, the ME will use the initial core results to determine PPA

If an outlier is detected for  $N = 10$ , the Contractor may replace that core by taking an additional core at the same offset and within 5 feet of the original station. If the outlier replacement core is not taken within 15 days, the ME will use the initial core results to determine PPA.

6. **Retest.** If the initial series of 5 cores produces a percent defective value of  $PD \geq 30$  for mainline or ramp lots, or  $PD \geq 50$  for other pavement lots, the Contractor may elect to take an additional set of 5 cores at random locations chosen by the ME. Take the additional cores within 15 days of receipt of the initial core results. If the additional cores are not taken within the 15 days, the ME will use the initial core results to determine the PPA. If the additional cores are taken, the ME will recalculate the PPA using the combined results from the 10 cores.
7. **Removal and Replacement.** If the final lot  $PD \geq 75$  (based on the combined set of 10 cores or 5 cores if the Contractor does not take additional cores), remove and replace the lot and all overlying work. The replacement work is subject to the same requirements as the initial work.

For shoulder lots, instead of removal and replacement, the Department will assess the calculated PPA, and the Contractor shall perform a fog seal of the lot as specified in 422.03.01.

## SECTION 406 – HIGH PERFORMANCE THIN OVERLAY (HPTO)

### 406.03.01 High Performance Thin Overlay (HPTO)

#### H. Air Void Requirements on Roadway.

THE ENTIRE PART IS CHANGED TO:

Drill cores as specified in 401.03.05. Mainline lots are defined as the area covered by a day's paving production of the same job mix formula for the traveled way and auxiliary lanes. The RE may combine daily production areas less than 500 tons with previous or subsequent production areas. If a day's production is greater than 2000 tons, the RE may divide the area of HMA placed into 2 lots with approximately equal areas.

Ramp pavement lots are defined as approximately 10,000 square yards of pavement in ramps. The RE may combine ramps with less than the minimum area into a single lot. If 2 or more ramps are included in a single lot, the RE will require additional cores to ensure that at least 1 core is taken from each ramp.

Other pavement lots are defined as approximately 10,000 square yards of pavement in shoulders and other undefined areas.

The ME will calculate the percent defective (PD) as the percentage of the lot outside the acceptable range of 1 percent air voids to 7 percent air voids. The acceptable quality limit is 10 percent defective. For lots in which  $PD < 10$ , the Department will award a positive pay adjustment. For lots in which  $PD > 10$ , the Department will assess a negative pay adjustment.

The ME will determine air voids from 5 cores taken from each lot in random locations. The ME will determine air voids of cores from the values for the maximum specific gravity of the mix and the bulk specific gravity of the core. The ME will determine the maximum specific gravity of the mix according to NJDOT B-3 and AASHTO T 209, except that minimum sample size may be waived in order to use a 6-inch diameter core sample. The ME will determine the bulk specific gravity of the compacted mixture by testing each core according to AASHTO T 166.

The ME will calculate pay adjustments based on the following:

1. **Sample Mean ( $\bar{X}$ ) and Standard Deviation (S) of the N Test Results ( $X_1, X_2, \dots, X_N$ ).**

$$\bar{X} = \frac{(X_1 + X_2 + \dots + X_N)}{N}$$

$$S = \sqrt{\frac{(X_1 - \bar{X})^2 + (X_2 - \bar{X})^2 + \dots + (X_N - \bar{X})^2}{N - 1}}$$

2. **Quality Index (Q).**

$$Q_L = \frac{(\bar{X} - 1.0)}{S}$$

$$Q_U = \frac{(7.0 - \bar{X})}{S}$$

3. **Percent Defective (PD).** Using NJDOT ST for the appropriate sample size, the Department will determine PD<sub>L</sub> and PD<sub>U</sub> associated with Q<sub>L</sub> and Q<sub>U</sub>, respectively. PD = PD<sub>L</sub> + PD<sub>U</sub>
4. **Percent Pay Adjustment (PPA).** Calculate the PPA for traveled way and ramp lots as specified in Table 401.03.03-3.

Table 406.03.01-1 PPA for Mainline Lots and Ramp Lots		
	Quality	PPA
Surface	PD < 10	PPA = 4 - (0.4 PD)
	10 ≤ PD < 30	PPA = 1 - (0.1 PD)
	PD ≥ 30	PPA = 40 - (1.4 PD)
Intermediate and Base	PD < 30	PPA = 1 - (0.1 PD)
	PD ≥ 30	PPA = 40 - (1.4 PD)

Calculate the PPA for other pavement lots as specified in Table 401.03.03-4.

Table 406.03.01-2 PPA for Other Pavement Lots		
	Quality	PPA
All Courses	PD < 50	PPA = 1 - (0.1 PD)
	PD ≥ 50	PPA = 92 - (1.92 PD)

5. **Outlier Detection.** If PD < 10, the ME will not screen for outliers. If PD ≥ 10, the ME will screen all acceptance cores for outliers using a statistically valid procedure. The following procedure applies only for a sample size of 5 or 10.
- The ME will arrange the core results in ascending order, in which X<sub>1</sub> represents the smallest value and X<sub>N</sub> represents the largest value.
  - If X<sub>N</sub> is suspected of being an outlier, the ME will calculate:

$$R = \frac{X_N - X_{(N-1)}}{X_N - X_1}$$

3. If  $X_1$  is suspected of being an outlier, the ME will calculate:

$$R = \frac{X_2 - X_1}{X_N - X_1}$$

4. For  $N = 5$  if  $R > 0.642$ , the value is judged to be statistically significant and the core is excluded. For  $N = 10$  if  $R > 0.412$ , the value is judged to be statistically significant and the core is excluded.

If an outlier is detected and no retest is warranted, the Contractor may replace that core by taking an additional core at the same offset and within 5 feet of the original station. If an outlier is detected and a retest is justified, take a replacement core for the outlier at the same time as the 5 additional retest cores are taken. If the outlier replacement core is not taken within 15 days, the ME will use the initial core results to determine PPA.

If an outlier is detected for  $N = 10$ , the Contractor may replace that core by taking an additional core at the same offset and within 5 feet of the original station. If the outlier replacement core is not taken within 15 days, the ME will use the initial core results to determine PPA.

6. **Retest.** If the initial series of 5 cores produces a percent defective value of  $PD \geq 30$  for mainline or ramp lots, or  $PD \geq 50$  for other pavement lots, the Contractor may elect to take an additional set of 5 cores at random locations chosen by the ME. Take the additional cores within 15 days of receipt of the initial core results. If the additional cores are not taken within the 15 days, the ME will use the initial core results to determine the PPA. If the additional cores are taken, the ME will recalculate the PPA using the combined results from the 10 cores.
7. **Removal and Replacement.** If the final lot  $PD \geq 75$  (based on the combined set of 10 cores or 5 cores if the Contractor does not take additional cores), remove and replace the lot and all overlying work. The replacement work is subject to the same requirements as the initial work.

For shoulder lots, instead of removal and replacement, the Department will assess the calculated PPA, and the Contractor shall perform a fog seal of the lot as specified in 422.03.01.

**Implementation Code R (ROUTINE)**

Changes must be implemented in all applicable Department projects scheduled for Final Design Submission at least one month after the date of the BDC announcement. This will allow designers to make necessary plan, specifications, and estimate/proposal changes without requiring the need for an addenda or postponement of advertisement or receipt of bids.

**Recommended By:**

**Approved By:**

ORIGINAL SIGNED

ORIGINAL SIGNED

---

Richard Jaffe, P.E.  
 Director  
 Capital Program Support

---

Richard T. Hammer  
 Assistant Commissioner  
 Capital Program Management