

# New Jersey Department of Transportation

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## Baseline Document Change Announcement

Compaction Testing, Air Voids

**BDC99S-002**

December 8, 1999

**Subject: Revision to the 1998 Supplemental Specifications to the 1996 Standard Specifications, Subsections 404.16, 404.18, 404.20, 404.21, 404.24 and 903.05 (Compaction Testing, Air Voids).**

Subsections 404.16, 404.18, 404.20, 404.21, 404.24, and 903.05 are revised to require the Contractor to construct mandatory test strips and to establish a quality control plan to ensure proper compaction of bituminous pavement **for all projects containing a combination of more than 5000 megagrams of Bituminous Stabilized Base Course or Bituminous Concrete Surface Course**. Subsection 404.24 is modified to clarify that separate payment will not be made for mandatory test strips and quality control for compaction, including the comparison cores and the nuclear density testing.

Additionally, Subsections 404.18, 404.20 and 404.21 are revised to require the Contractor to provide core samples for acceptance testing within 5 days of placement for all projects with Bituminous Concrete Surface Course or Bituminous Stabilized Base Course. The definition of an air voids lot is changed to a day's production for mainline pavement and also the size of the core sample is changed to 150 millimeters.

The revisions to the Specifications will provide improved compaction, thickness, and air voids content as a result of enhanced quality control checks and testing throughout the project. Furthermore, the revisions will improve the quality of the finished bituminous pavement providing longer pavement life and in so doing, reducing maintenance costs due to premature pavement failures.

To incorporate these changes, the Standard Input (SI98DOT1) is revised as follows:

### **SECTION 404 - BITUMINOUS CONCRETE SURFACE COURSE**

#### **404.16 Compaction.**

THE FOLLOWING IS ADDED:

A mandatory test strip shall be constructed for projects with a combination of more than 5000 megagrams of bituminous concrete surface course and bituminous stabilized base course. The test strip shall be constructed for the first 600 to 1000 square meters placed for each job mix formula. Prior to paving, a detailed plan of the test strip shall be submitted to the Engineer for review and approval. During paving of the test strip, the Contractor shall record and submit the following information to the Engineer:

1. Ambient temperature.
2. Base temperature.
3. Nuclear density readings
4. Core density readings.

When the temperature of the bituminous pavement permits, five cores, 150 millimeters in nominal diameter, shall be removed and tested in accordance with Subsection 404.21, in order to correlate the nuclear density gauge testing with the core results. The core and nuclear density gauge testing results shall be submitted to the Engineer prior to the next day's paving. Failure to submit the reports will result in suspended paving operations. The core results shall include the bulk specific gravity and maximum specific gravity determined from testing, and the calculated percent air voids. The nuclear density gauge testing results shall include the bulk density as measured by the gauge, the maximum density based on the maximum specific gravity determined at the plant, and the calculated percent air voids.

Upon completion of the test strip, the Contractor shall determine the appropriate method to proceed. If the Contractor elects to continue production, the day's production including the test strip will be subject to the regular acceptance procedure. If the Contractor elects to discontinue production, the Contractor shall notify the Engineer indicating that a second test strip is necessary due to unsatisfactory results. The paving placed up to that point will be treated as a separate lot, and will not be subject to the lot size requirements stated herein. The test strip lot will be evaluated in accordance with the acceptance plan and pay adjustment provisions of these specifications. If more than two test strips are required, the Contractor shall obtain written approval from the Engineer.

A quality control plan outlining the use of the nuclear density gauge, cores, and the control of the compaction process shall be submitted for approval by the Engineer. Paving operations shall not begin prior to approval of the quality control plan. The Contractor shall perform quality control testing of compaction by use of a thin lift nuclear density gauge in accordance with ASTM D2950. Cores shall be taken for correlation with the nuclear gauge at a frequency of not less than one core per week and not more than two cores per 1000 megagrams. A higher frequency of coring may be approved by the Engineer with valid cause presented by the Contractor. Cores for correlation with the nuclear density gauge shall be tested by the Contractor. Results of both the nuclear density and core testing shall be furnished on a weekly basis to the Engineer. Core and nuclear density results shall include the bulk specific gravity, the maximum specific gravity in accordance with AASHTO T209, and the calculated air voids. Failure to submit the core and nuclear density test results from the previous weeks paving, will result in suspended paving operations.

#### **404.18 Air Voids Acceptance Plan.**

THE TEXT PRECEDING SUBPART 1. OF THE FIRST PARAGRAPH IS CHANGED TO:

Mainline lots are defined as the area covered by a day's paving production of the same lift of placed material consisting of a minimum of 450 megagrams and a maximum of 2700 megagrams. Unless directed otherwise, mainline pavement lots will be calculated as areas within a single lane on the project. Except for test strip lots, daily production areas less than 450 megagrams, will be combined with previous or subsequent production areas to meet the minimum requirements. When the maximum requirement is exceeded in a day's production, the area of material placed will be divided into two lots with approximately equal areas.

Ramp Pavement Lots are defined as the area of highway access ramps consisting of approximately 4000 square meters of full depth uniform thickness pavement or 8000 square meters of full depth variable thickness pavement. Ramp pavement lot will be calculated from the pavement structures within the traveled roadway of access ramps only. Ramps with less than the minimum area may be combined into a single lot. Where two or more non-adjacent ramps are included in a single lot, additional cores may be required to insure that at least one core is taken from each ramp.

Other Pavement Lots are defined as approximately 4000 square meters of bituminous concrete of full depth, uniform thickness or 8000 square meters of full depth, variable thickness material in shoulders and other incidental pavement construction. Shoulders less than 1.5 meters in width are excluded from these requirements.

Each mixture in a given lot shall be compacted so that the combined percentage of material below 2.0 percent voids or above 8.0 percent voids shall be no more than ten percent. Air voids will be determined from five drilled cores taken from each lot in random locations as directed by the Engineer. All core drilling will be witnessed by the Engineer. The drilled cores will be tested in accordance with Table 903-5 to determine the air voids content.

Conformance with these requirements will be determined on the basis of the amount of material estimated to fall outside of the specification limits as follows:

#### **404.20 Thickness Requirements.**

THE FOLLOWING IS ADDED AFTER THE SECOND SENTENCE OF THE FIRST PARAGRAPH:

Compliance will be determined based on cores drilled through the entire pavement structure after the final course has been placed

THE SECOND PARAGRAPH IS CHANGED TO:

Conformance to thickness requirements for shoulders and ramps, will be determined in lots consisting of approximately 12 000 square meters or less. Conformance to thickness requirements for mainline pavements, will normally be determined in lots consisting of three contiguous air voids lots; when necessary, four or five air voids lots may be combined to form a thickness lot. Areas consisting of different combinations of bituminous mixtures or thickness will not be included in the same lot.

THE SECOND SENTENCE OF THE FOURTH PARAGRAPH IS CHANGED TO:

Each lot will be divided into three sections of approximate equal area and five cores will be removed from random locations within each section and tested for compliance with thickness requirements.

#### **404.21 Core Samples.**

THE ENTIRE SUBSECTION IS CHANGED TO:

Upon completion of a lot of bituminous concrete paving, the Contractor shall obtain acceptance cores from the finished pavement at random locations as directed, in accordance with this Section and Sections 903 and 990. For all lots containing a test strip, and the first mainline pavement lot, cores shall be taken no sooner than 12 hours after paving and delivered no later than 48 hours after completion of the lot. All other acceptance cores shall be taken no sooner than twenty-four hours after completion of the lot and delivered no later than six working days after completion of the lot. All cores shall be taken in the presence of the Engineer at random locations as directed by the Engineer.

The cores shall be 150 millimeters in nominal diameter and shall contain the full depth of the lift to be tested. Cores to be submitted for air voids acceptance of the surface course and for total pavement thickness shall be full depth of the entire thickness of the pavement and shall be taken after all lifts have been placed. The drilling equipment shall be of sufficient size and power to drill through the entire thickness of the pavement. The drill bit shall consist of a water-cooled diamond-tipped masonry type capable of obtaining a valid test sample through the entire pavement thickness.

The core shall be removed from the pavement without damage to the core. Damaged cores shall not be submitted for testing. After the core has been removed from the pavement, the excess cooling water shall be pumped from the hole, and the hole shall be filled and compacted with hot mix asphalt or high performance cold patching material approved by the Engineer. The finished patch shall be at least 6 millimeters above the surrounding pavement surface to allow for additional compaction by traffic. Cores received at the Laboratory in a damaged condition will not be accepted for testing and shall be re-drilled within 300 millimeters of the original core location, and delivered to the laboratory within 48 hours after the notification by the Department. Each core shall be identified by number, painted on the side of the sample and accompanied by the appropriate laboratory form, supplied and signed by the Engineer. The cores shall be placed in a ventilated box with a lid capable of being locked and sealed by the Engineer. The boxes shall provide adequate protection to prevent damage during transit. The seal number will be recorded by the Engineer on the laboratory form. The sealed boxes shall be transported by the Contractor to the Department Laboratory.

#### **404.24 Basis of Payment.**

THE FOLLOWING IS ADDED:

Separate payment will not be made for any test strips and quality control for compaction, including comparison cores, and nuclear density testing. All costs thereof shall be included in the prices bid for Bituminous Concrete Surface Course and Bituminous Stabilized Base Course.

#### **903.05 Tables.**

NOTES 1 and 2 OF TABLE 903-5 ARE CHANGED TO:

Note 1: THE LAST SENTENCE IS CHANGED TO:

Bulk specific gravity of the compacted mixture will be determined in accordance with AASHTO T 166.

Note 2: As determined by the Engineer from drilled pavement cores. The air voids will be determined based on the maximum specific gravity and bulk specific gravity tests performed on each core individually.

#### **Instructions to Designers**

These revisions shall be included in all Department projects, *with a combination of more than 5000 megagrams of Bituminous Stabilized Base Course or Bituminous Concrete Surface Course*, which are scheduled for Final Design submission after December 27, 1999. The revisions will be incorporated by Department Specification Engineers responsible for preparing the Special Provisions, therefore, designers need not insert these changes.

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