MODIFIED BY EB 00-031 EFFECTIVE 5/8/00 **SUPERSEDED BY EI 02-001 EFFECTIVE 7/11/02**		*New York State Department of Transportation* **ENGINEERING DIRECTIVE**	**ED** **99-001**

Title: **REVISED FRICTION AGGREGATE REQUIREMENTS IN HOT MIX ASPHALT SPECIFICATIONS**

Distribution:

- ☐ Manufacturers (18)
- ☒ Main Office (30)
- ☒ Local Govt. (31)
- ☒ Regions/Agencies (32)
- ☐ Surveyors (33)
- ☒ Consultants (34)
- ☒ Contractors (39)
- ☐ _____( )

Approved: F. P. Gerace, Deputy Commissioner and Chief Engineer — Date: 2/25/99

NOTICE

This Engineering Directive contains definitive material that is deemed critical to the continuation of essential engineering activities.

This Engineering Directive (ED) supplements EI 98-041.

EFFECTIVE DATE: *This Engineering Directive is effective immediately on all Department contracts . It expires on March 31, 2000.*

IMPLEMENTATION:

ON GOING CONTRACTS: Specification changes will be made by Order-on-Contract. Changes will only be made where required by EB 99-020 issued by the Construction Division.

ON CONTRACTS SCHEDULED FOR LETTING:

ON OR BEFORE MARCH 25, 1999 - Specification changes will be made by Order-on-Contract. Changes will only be made where required by EB 99-020 issued by the Construction Division.

AFTER MARCH 25, 1999 AND PRIOR TO AUGUST 12, 1999 - **Regional Designers** will include the appropriate pay item(s), issued with this Directive, by Amendment. The specification(s) will be inserted into proposals by Main Office Design Quality Assurance Bureau (DQAB).

ON OR AFTER AUGUST 12, 1999 - **Regional Designers** will include the appropriate pay item(s) issued with this Directive. The specification(s) will be inserted into proposals by DQAB.

PURPOSE: Revise the coarse friction aggregate requirements for hot mix asphalt surface courses and issue design guidance for selecting the appropriate specification. See "Design Guidance" for additional information.

TRANSMITTED MATERIALS:

- Proposal Insert Note (shelf note) revising §401 titled - Coarse Aggregate Requirement for Hot Mix Asphalt Surface Courses
- Revised Table 3-6 - Pavement Selection for Principal Arterials from Chapter 3 of the Highway Design Manual
- Revised Table 3-7 - Pavement Selection for General Highways from Chapter 3 of the Highway Design Manual
- Special Specifications for Superpave Hot Mix Asphalt and Asphalt Treated Permeable Base as listed under "New Item Specifications"

BACKGROUND: Recent studies on the performance of friction aggregates, in particular Wappinger Dolomite, have been completed. Based on these studies, revisions must be made to the friction aggregate requirements in the hot mix asphalt surface course specifications and related documents.

The studies have shown that the current DOT requirement for blending Wappinger Dolomite (a carbonate aggregate) with a minimum 20% non-carbonate aggregate will not result in a blend that meets the "Programmatic Design Target"(PDT) friction number in high traffic volume areas. Based on this information, the Department has made the decision to revise the coarse aggregate requirements for all hot mix asphalt (HMA) surface course mixes. The specifications have been divided into Upstate high volume, Downstate high volume and low volume statewide.

DESIGN GUIDANCE: We recommend that Superpave mix items be used rather than Marshall mix items. However, if a standard Marshall mix item is used, the attached shelf note will be inserted into proposals by Main Office DQAB to revise the coarse aggregate requirements in section §401-2.03A. If a Heavy Duty or Rut Avoidance mix item is required, contact Russell Thielke of the Materials Bureau at (518) 457-4582 to obtain specifications.

The specifications have been grouped into categories based on the project location and pavement design year two way traffic AADTs. The pavement design year is the estimated time of completion (ETC) plus 10 years for overlays and ETC plus 18 years for reconstruction. The specifications have been divided into the following categories: Upstate high volume, Downstate high volume and low volume statewide. Each category will have a distinct number associated to it within the item number. The fourth digit after the decimal point will identify the friction category. The categories and numbers are as follows:

1- Downstate High Volume - includes pavements in the area of the City of New York and the surrounding counties of Dutchess, Nassau, Orange, Putnam, Rockland, Suffolk, Sullivan and Westchester Counties with pavement design year two-way traffic AADTs that exceed 8,000 for 2 or 3 lanes, and 13,000 for more than three lanes.
2- Upstate High Volume - includes pavements in all other areas in New York State with pavement design year two-way traffic AADTs that exceed 8,000 for 2 or 3 lanes and 13,000 for more than three lanes.
3- Low Volume - includes all pavements in New York State with pavement design year two-way traffic AADTs less than 8,000 for 2 or 3 lanes and 13,000 for more than three lanes.
9- No friction requirements (all mixes other than top course mixes).

The designer will include the appropriate pay items selected from the attached revised Table 3-6 Pavement Selection for Principal Arterials and/or Table 3-7 Pavement Selection for General Highways from Chapter 3 of the Highway Design Manual in the PS&E package. The specifications will be inserted into proposals by Main Office DQAB.

EXAMPLES.

Example 1:
Functional Classification- Urban Interstate
Full/Partial Control of Access- Full Control
Location- Suffolk County
Pavement Design Year Two-way AADT- 4 lanes > 13,000

1. The function class will lead to Table 3-6.
2. Control of access - Full.
3. Location - Downstate.
4. The mix type to use will be 18403.XX51QR (Top), 18403XX59QR (Binder) and 18403.XX69QR (Base).

Example 2:
Functional Classification- Urban Minor Arterial
Location- Albany County
Pavement Design Year Two-way AADT- 2 lanes > 8,000
Quantity of HMA on Contract - < 2000 Mg but not vibratory sensitive

1. The function class will lead to Table 3-7.
2. Location - Upstate.
3. Volume - High.
4. No for over 2000 Mg.
5. The mix design to use will be 18403.XX72QR (Top) and 18403.XX79QR (Base and Binder).

DISAPPROVED SPECIAL SPECIFICATION ITEMS: All existing special specification items with "root" number 403 (XX403.XXXXXX M) and payment in metric tons or tons.

NEW ITEM SPECIFICATIONS:

18403.255902 M	SUPERPAVE HMA, 25.0 mm	Metric Ton
18403.255912 M	Plant Production Quality Adjustment to 18403.255902	Quality Unit
18403.255922 M	Pavement Density Quality Adjustment to 18403.255902	Quality Unit
18403.125102 M	SUPERPAVE HMA, DOWNSTATE HIGH VOLUME 12.5 mm F1	Metric Ton
18403.125112 M	Plant Production Quality Adjustment to 18403.125102	Quality Unit
18403.125122 M	Pavement Density Quality Adjustment to 18403.125102	Quality Unit
18403.095102 M	SUPERPAVE HMA, DOWNSTATE HIGH VOLUME 9.5 mm F1	Metric Ton
18403.095112 M	Plant Production Quality Adjustment to 18403.095102	Quality Unit
18403.095122 M	Pavement Density Quality Adjustment to 18403.095102	Quality Unit
18403.125202 M	SUPERPAVE HMA, UPSTATE HIGH VOLUME 12.5 mm F2	Metric Ton
18403.125212 M	Plant Production Quality Adjustment to 18403.125202	Quality Unit
18403.125222 M	Pavement Density Quality Adjustment to 18403.125202	Quality Unit

18403.095202 M	SUPERPAVE HMA, UPSTATE HIGH VOLUME 9.5 mm F2	Metric Ton
18403.095212 M	Plant Production Quality Adjustment to 18403.095202	Quality Unit
18403.095222 M	Pavement Density Quality Adjustment to 18403.095202	Quality Unit
18403.376902 M	SUPERPAVE HMA, 37.5 mm	Metric Ton
18403.376912 M	Plant Production Quality Adjustment to 18403.376902	Quality Unit
18403.256902 M	SUPERPAVE HMA, 25.0 mm	Metric Ton
18403.256912 M	Plant Production Quality Adjustment to 18403.256902	Quality Unit
18403.196902 M	SUPERPAVE HMA, 19.0 mm	Metric Ton
18403.196912 M	Plant Production Quality Adjustment to 18403.196902	Quality Unit
18403.126102 M	SUPERPAVE HMA, DOWNSTATE HIGH VOLUME 12.5 mm F1	Metric Ton
18403.126112 M	Plant Production Quality Adjustment to 18403.126102	Quality Unit
18403.096102 M	SUPERPAVE HMA, DOWNSTATE HIGH VOLUME 9.5 mm F1	Metric Ton
18403.096112 M	Plant Production Quality Adjustment to 18403.096102	Quality Unit
18403.126202 M	SUPERPAVE HMA, UPSTATE HIGH VOLUME 12.5 mm F2	Metric Ton
18403.126212 M	Plant Production Quality Adjustment to 18403.126202	Quality Unit
18403.096202 M	SUPERPAVE HMA, UPSTATE HIGH VOLUME 9.5 mm F2	Metric Ton
18403.096212 M	Plant Production Quality Adjustment to 18403.096202	Quality Unit
18403.126302 M	SUPERPAVE HMA, LOW VOLUME 12.5 mm F3	Metric Ton
18403.126312 M	Plant Production Quality Adjustment to 18403.126302	Quality Unit
18403.096302 M	SUPERPAVE HMA, LOW VOLUME 9.5 mm F3	Metric Ton
18403.096312 M	Plant Production Quality Adjustment to 18403.096302	Quality Unit
18403.377902 M	SUPERPAVE HMA, 37.5 mm	Metric Ton
18403.377912 M	Plant Production Quality Adjustment to 18403.377902	Quality Unit
18403.257902 M	SUPERPAVE HMA, 25.0 mm	Metric Ton
18403.257912 M	Plant Production Quality Adjustment to 18403.257902	Quality Unit
18403.197902 M	SUPERPAVE HMA, 19.0 mm	Metric Ton
18403.197912 M	Plant Production Quality Adjustment to 18403.197902	Quality Unit
18403.127102 M	SUPERPAVE HMA, DOWNSTATE HIGH VOLUME 12.5 mm F1	Metric Ton
18403.127112 M	Plant Production Quality Adjustment to 18403.127102	Quality Unit
18403.097102 M	SUPERPAVE HMA, DOWNSTATE HIGH VOLUME 9.5 mm F1	Metric Ton
18403.097112 M	Plant Production Quality Adjustment to 18403.097102	Quality Unit
18403.127202 M	SUPERPAVE HMA, UPSTATE HIGH VOLUME 12.5 mm F2	Metric Ton
18403.127212 M	Plant Production Quality Adjustment to 18403.127202	Quality Unit

18403.097202 M	SUPERPAVE HMA, UPSTATE HIGH VOLUME 9.5 mm F2	Metric Ton
18403.097212 M	Plant Production Quality Adjustment to 18403.097202	Quality Unit
18403.127302 M	SUPERPAVE HMA, LOW VOLUME 12.5 mm F3	Metric Ton
18403.127312 M	Plant Production Quality Adjustment to 18403.127302	Quality Unit
18403.097302 M	SUPERPAVE HMA, LOW VOLUME 9.5 mm F3	Metric Ton
18403.097312 M	Plant Production Quality Adjustment to 18403.097302	Quality Unit
18403.128902 M	SUPERPAVE HMA, SHOULDER COURSE 12.5 mm	Metric Ton
18403.128912 M	Plant Production Quality Adjustment to 18403.128902	Quality Unit
18403.098902 M	SUPERPAVE HMA, SHOULDER COURSE 9.5 mm	Metric Ton
18403.098912 M	Plant Production Quality Adjustment to 18403.098902	Quality Unit
18403.218902 M	SUPERPAVE HMA, TRUING AND LEVELING	Metric Ton
18403.218912 M	Plant Production Quality Adjustment to 18403.218902	Quality Unit
18403.100902 M	ASPHALT-TREATED PERMEABLE BASE COURSE	Metric Ton
18403.100912 M	Plant Production Quality Adjustment to 18403.100902	Quality Unit

REVISED SPECIFICATIONS: The following specification was revised to include the new friction aggregate requirements as shown in the attached shelf notes.

Section 401 - Plant Mix Pavements - General

ENGLISH ITEMS: Designers needing English unit specifications should contact Zoeb Zavery of the Materials Bureau at (518) 457-4582.

ACTIONS BY MAIN OFFICE DESIGN QUALITY ASSURANCE BUREAU: The revised specifications and/or ϕ401 shelf note will be inserted into proposals by Main Office DQAB.

COST IMPACT: The revision to the friction aggregate requirements may cause an increase in the cost of Hot Mix Asphalt surface courses. Contact the Regional Cost Estimating Engineer or Regional Materials Engineer for more information.

CONTACT PERSON: Direct questions regarding this ED to Zoeb Zavery of the Materials Bureau's Field Engineering II Section at (518) 457-4582.

COARSE AGGREGATE REQUIREMENT FOR HOT MIX ASPHALT SURFACE COURSES

Make the following changes to the Standard Specifications of January 2, 1995:

Page 4-4, line 15

Under ∮401-2.03A. Coarse Aggregates, **delete** the entire subsection and **replace** it with the following:

"**A. Coarse Aggregates.** Coarse aggregates used shall be from approved sources and shall meet one of the following requirements:

1. Limestone having an acid insoluble residue content of not less than 20.0%, excluding particles of chert and similar siliceous rocks.

2. Dolomite (excluding Wappinger dolomite, as defined by the Department).

3. Sandstone, granite, chert, traprock, ore tailings, slag or other similar non-carbonate materials. Non-carbonate particles are defined as having a minimum acid insoluble residue content of 80.0%.

4. Gravel, or a natural or manufactured blend of the following types of materials: limestone, dolomite (including Wappinger dolomite as defined by the Department), gravel, sandstone, granite, chert, traprock, ore tailings, slag or other similar materials, meeting the following requirements:

   For Type 6F mixes - Non-carbonate plus 3.2 mm particles must comprise a minimum of 10.0% of the total aggregate (by weight with adjustments to equivalent volumes for materials of different specific gravities). Additionally, a minimum of 20.0% of plus 6.3 mm particles must be non-carbonate.

   For Type 7F mixes - Non-carbonate plus 3.2 mm particles must comprise a minimum of 10.0% of the total aggregate (by weight with adjustments to equivalent volumes for materials of different specific gravities).

   Non-carbonate particles are defined as having a minimum acid insoluble residue content of 80.0%."

Table 3-6 Hot Mix Asphalt Pay Item Selection for Principal Arterials

Functional Classification	Control of Access	Traffic Volume[1]	Location[2]	Over 2000 Mg AND NOT Vibratory Sensitive	Hot Mix Asphalt Pay Item [3,4,5]
11 - Urban Principal Arterial Interstate 12 - Urban Principal Arterial Expressway 14 - Urban Principal Arterial Other 01 - Rural Principal Arterial Interstate 02 - Rural Principal Arterial Other	Full or Partial Control of Access	High or Low	Downstate		18403.ZZ51QR (Top) 18403.ZZ59QR (Binder) 18403.XX69QR (Base)
			Upstate		18403.ZZ52QR (Top) 18403.ZZ59QR (Binder) 18403.XX69QR (Base)
	No Control of Access	High	Downstate	Yes	18403.XX61QR (Top) 18403.XX69QR (Base and Binder)
				No	18403.XX71QR (Top) 18403.XX79QR (Base and Binder)
			Upstate	Yes	18403.XX62QR (Top) 18403.XX69QR (Base and Binder)
				No	18403.XX72QR (Top) 18403.XX79QR (Base and Binder)
		Low	Upstate or Downstate	Yes	18403.XX63QR (Top) 18403.XX69QR (Base and Binder)
				No	18403.XX73QR (Top) 18403.XX79QR (Base and Binder)

1. "High Volume" refers to 2 or 3 lane highways with design year two-way AADTs over 8,000, or for more than three lanes, with two-way AADTs over 13,000. "Low Volume" refers to highways with lower volumes for the specified number of lanes.

2. The City of New York, and the surrounding counties of Dutchess, Nassau, Orange, Sullivan, Putnam, Rockland, Suffolk, and Westchester are referred to as "downstate." All other areas are referred to as "upstate."

3. ZZ aggregate size may be 25.0 mm for binder, 12.5 mm or 9.5 mm for top. XX aggregate sizes may be 37.5 mm for base, 25.0 mm or 19.0 mm for binder, 12.5 mm or 9.5 mm for top. Note that 25.0 mm aggregate size for binder is required when 20 year ESAL projection is greater than 3×10^6. The 19.0 mm is preferred when the ESAL projection is less than 3×10^6. Also, 9.5 mm aggregate size for top requires concurrence of the Regional Materials Engineer.

4. Q has been reserved for Quality Payment Adjustments.

5. R has been reserved for Revision Number.

Table 3-7 Hot Mix Asphalt Pay Item Selection for General Highways

Functional Classification	Traffic Volume[1]	Location[2]	Over 2000 Mg AND NOT Vibratory Sensitive	Hot Mix Asphalt Pay Item [3,4,5]
16 - Urban Minor Arterial 17 - Urban Collector 19 - Urban Local 06 - Rural Minor Arterial 07 - Rural Major Collector 08 - Rural Minor Collector 09 - Rural Local	High	Downstate	Yes	18403.XX61QR (Top) 18403.XX69QR (Base and Binder)
			No	18403.XX71QR (Top) 18403.XX79QR (Base and Binder)
		Upstate	Yes	18403.XX62QR (Top) 18403.XX69QR (Base and Binder)
			No	18403.XX72QR (Top) 18403.XX79QR (Base and Binder)
	Low	Upstate or Downstate	Yes	18403.XX63QR (Top) 18403.XX69QR (Base and Binder)
			No	18403.XX73QR (Top) 18403.XX79QR (Base and Binder)

1. "High Volume" refers to 2 or 3 lane highways with design year two-way AADTs over 8,000, or for more than three lanes, with two-way AADTs over 13,000. "Low Volume" refers to highways with lower volumes for the specified number of lanes.

2. The City of New York, and the surrounding counties of Dutchess, Nassau, Orange, Sullivan, Putnam, Rockland, Suffolk, and Westchester are referred to as "downstate." All other areas are referred to as "upstate."

3. XX aggregate sizes may be 37.5 mm for base, 25.0 mm or 19.0 mm for binder, 12.5 mm or 9.5 mm for top. Note that 25.0 mm aggregate size for binder is required when 20 year ESAL projection is greater than 3×10^6. The 19.0 mm is preferred when the ESAL projection is less than 3×10^6. Also, 9.5 mm aggregate size for top requires concurrence of the Regional Materials Engineer.

4. Q has been reserved for Quality payment Adjustments.

5. R has been reserved for Revision Number.

ITEM 18403.095102 M	**SUPERPAVE HMA, DOWNSTATE HIGH VOLUME 9.5 mm F1**
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The requirements of Section 403 - Hot Mix Asphalt Concrete Pavement shall apply except as modified and/or revised below.

DESCRIPTION

This work shall consist of developing Hot Mix Asphalt pavement courses using the *SUPERPAVE* Mix Design procedure detailed in Materials Method 5.16, "*SUPERPAVE* Hot Mix Asphalt Mixture Design and Mixture Verification Procedures," in accordance with these specifications and in reasonable close conformity with the required lines, grades, thicknesses, and typical sections shown on the plans or established by the Engineer. This is a performance based specification in which the Contractor is responsible for compacting the pavement within a specified density range. Written instructions for determining pavement density and density Quality Adjustment Factors (QAFs) are available from the Regional Materials Engineer or the Director, Materials Bureau.

MATERIALS

The materials and composition for these mixtures shall meet the requirements specified in Subsection 403-2 Materials, except as noted herein. The specific Performance Graded Binder and the Design Estimated Traffic in 80 kN ESALs will be specified by a special note in the Contract Proposal.

Subsection 401-2.02 Composition of Mixtures shall be deleted and replaced with the following:

"Formulate and submit to the Regional Materials Engineer, a *SUPERPAVE* Mix Design that satisfies the design control points listed in Table 2 - Design Control Points and does not pass through the restricted zone listed in Table 3 - Restricted Zone of Materials Method 5.16, based on the specified nominal maximum aggregate size.

If for any reason, a change in gradation or materials occurs, prepare a separate job mix formula and *SUPERPAVE* mixture design to fit each change in material or gradation. Changes in Performance Graded Binder content can be made by the Regional Director or his representative providing the resultant mixture has properties within the specified mechanical and volumetric properties.

The mixtures shall be produced, delivered to the work site, and incorporated into the work within 10°C of the temperature specified by the Contractor but within the mixing and compaction range of 120°C and 165°C. Additionally, the Performance Graded Binder shall be introduced into the pugmill at a temperature compatible with that of the aggregate as determined by the Regional Director or his representative, between the limits of 110°C and 175°C.

The aggregates shall be those approved for use by the approved job mix formula and will be accepted at

ITEM 18403.095102 M	SUPERPAVE HMA, DOWNSTATE HIGH VOLUME 9.5 mm F1
ITEM 18403.095112 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.095102 M
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ITEM 18403.255912 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.255902 M
ITEM 18403.255922 M	PAVEMENT DENSITY QUALITY ADJUSTMENT to 18403.255902 M

the plant site. The Performance Graded Binder will be conditionally accepted at the supplier's source and at the plant on the basis of certification. Samples taken at the plant will be tested by the Department to determine specification compliance.

Subsection 401-2.03A. Coarse Aggregate and 401-2.03B. Blending shall be deleted and replaced with the following:

"***A.*** **Coarse Aggregates.** For 12.5 mm F1 and 9.5 mm F1 nominal maximum size top course mixtures use crushed aggregate from an approved source, meeting one of the following requirements:

1. Limestone having an acid insoluble residue content of not less than 20.0%, excluding particles of chert and similar siliceous rocks.

2. Dolomite having an acid insoluble residue content of not less than 17.0%, excluding particles of chert and similar siliceous rocks.

3. Sandstone, granite, chert, traprock, ore tailings, slag or other similar non-carbonate materials. Non-carbonate particles are defined as having a minimum acid insoluble residue content of 80.0%.

4. Gravel, or a natural or manufactured blend of the following types of materials: limestone, dolomite, gravel, sandstone, granite, chert, traprock, ore tailings, slag or other similar materials, meeting the following requirements:

   12.5 mm Nominal Maximum Size Aggregate Mixes - Non-carbonate plus 3.2 mm particles must comprise a minimum of 30.0% of the total aggregate (by weight with adjustments to equivalent volumes for materials of different specific gravities). Additionally, a minimum of 95.0% of plus 9.5 mm particles must be non-carbonate.

   9.5 mm Nominal Maximum Size Aggregate Mixes - Non-carbonate plus 3.2 mm particles must comprise a minimum of 30.0% of the total aggregate (by weight with adjustments to equivalent volumes for materials of different specific gravities). Additionally, a minimum of 95.0% of plus 4.75 mm particles must be non-carbonate.

   Non-carbonate particles are defined as having a minimum acid insoluble residue content of 80.0%.

B. ***Blending.*** Where coarse aggregates for these mixes are from more than one source or of more than one type of material, they shall be proportioned and blended to provide a uniform mixture."

ITEM 18403.095102 M	**SUPERPAVE HMA, DOWNSTATE HIGH VOLUME 9.5 mm F1**
ITEM 18403.095112 M	**PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.095102 M**
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Subsection 401-2.05 Bituminous Materials shall be deleted and replaced with the following:

"The Performance Graded Binder (PGB) used in the production of these mixes shall be defined by AASHTO Provisional Standard MP1 - Standard Specification for Performance Graded Asphalt Binder.

Acceptance of the PGB is based on the primary source appearing on the Department's Approved List for Bituminous Material Primary Sources, A. Performance Graded Binders for Paving. Acceptance of the PGB is contingent upon satisfactory test results from samples taken, as required by the Department's procedural directives, at the location where the material is incorporated into the work. A primary source is defined as a firm that samples, tests, and certifies by Production Lot that the PGB is in conformance with the specifications. The procedural directives for sampling, testing, and certifying the PGB, and for achieving and maintaining approved list status, are available from the Materials Bureau.

The PGB shall not be delivered to the HMA Production Facility at a temperature in excess of 175°C."

CONSTRUCTION DETAILS

The details of §401-3 Construction Details shall apply except as modified below:

Add the following to the end of Subsection 401-3.02 Bituminous Mixing Plant A. Requirements for All Plants No. 11:

"Y. Gyratory Compactor - A power driven gyratory compactor capable of maintaining an angle of gyration of 1.25° ± 0.02°, a speed of gyration of 30.0 rpm ± 0.5 rpm, and a consolidation pressure of 600 k Pa ± 10% for gyrations zero to five and ± 3% for gyrations six and greater. The make and model of the gyratory compactor supplied must be approved by the Director, Materials Bureau.

Z. Gyratory Specimen Mold Assembly - The specimen mold assembly consisting of the mold 150.00 mm + 0.00 mm and - 0.01 mm, base plate and top plate (if required). The minimum height of the mold is 250.00 mm. A minimum of 4 mold assemblies and an adequate supply of 150.00 mm paper discs shall be provided.

AA. Gyratory Specimen Extractor - A simple means of specimen extraction from the gyratory molds shall be supplied.

BB. Oven - A thermostatically controlled convection type oven having a minimum capacity of 0.15 cubic meters shall be supplied to preheat the *SUPERPAVE* Gyratory Compactor mold assemblies

ITEM 18403.095102 M	**SUPERPAVE HMA, DOWNSTATE HIGH VOLUME 9.5 mm F1**
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and asphalt mix samples. The oven shall have a controlled temperature range up to 190°C with a ± 3°C accuracy throughout the range.

CC. Kraft Paper - 23 kg medium weight, 915 mm width.

DD. Sheet Rock Taping Knives (min. 2) - 254 mm length.

EE. Aging Pans (minimum 4) - 457 mm x 457 mm x 38 mm H galvanized iron pans.

FF. Miscellaneous Pans (minimum 4) - 394 mm x 280 mm x 51 mm H aluminum pans.

GG. Screen trays (1 each) - 457 mm x 660 mm to include the following: 2.36 mm, 1.18 mm, 0.60 mm, 0.30 mm, 0.15 mm, 0.075 mm"

Add the following to the end of §401-3 Construction Details:

On the first day of mainline paving, select one of the following options:

OPTION A: **Test Section.** Prior to paving operations for this item, construct a test section on the project site at a location approved by the Engineer. The test section will be at least 50 m, the full width of the pavement, and the same depth specified for the construction of the course which it represents. The maximum test section length is 500 centerline-meters on the mainline. There is no maximum length if the test section is not on the mainline. Use equipment that is of the same type and weight to be used on the remainder of the course represented by the test section. The test section will be paid for at 1.5 times the actual quantity paved, up to 200 actual metric tons per test section. A maximum of two test sections per item will be paid at the 1.5 Test Section Adjustment and pavement density Quality Adjustment Factors (QAFs) will not apply to the first two test sections. If more than two test sections are required, the pavement density QAF will apply when the additional test sections are located on the mainline. Only one test section per item per day may be placed.

Paving operations for this item will not be permitted until a test section obtains a minimum pavement density QAF of 1.00. When the pavement density QAF is less than 1.00 construct another test section in accordance with Option A.

OPTION B: **Routine Paving.** Begin paving operations. The Test Section Adjustment will not apply. All material placed will be subject to a pavement density QAF in accordance with this specification. If the pavement density QAF on the first day of paving is less than 1.00, construct a test section in accordance with Option A.

ITEM 18403.095102 M	**SUPERPAVE HMA, DOWNSTATE HIGH VOLUME 9.5 mm F1**
ITEM 18403.095112 M	**PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.095102 M**
ITEM 18403.095122 M	**PAVEMENT DENSITY QUALITY ADJUSTMENT to 18403.095102 M**
ITEM 18403.125102 M	**SUPERPAVE HMA, DOWNSTATE HIGH VOLUME 12.5 mm F1**
ITEM 18403.125112 M	**PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.125102 M**
ITEM 18403.125122 M	**PAVEMENT DENSITY QUALITY ADJUSTMENT to 18403.125102 M**
ITEM 18403.255902 M	**SUPERPAVE HMA, 25.0 mm**
ITEM 18403.255912 M	**PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.255902 M**
ITEM 18403.255922 M	**PAVEMENT DENSITY QUALITY ADJUSTMENT to 18403.255902 M**

Loose Mix Samples. On each paving day, take four loose mix samples in accordance with AASHTO T168-91, Standard Test Method for Sampling Bituminous Paving Mixtures. Take these samples periodically throughout the day so as to represent the entire days production. When a low production day is anticipated it is recommended that a minimum of three loose mix samples be obtained before production is terminated. When operational conditions cause production to be terminated before the specified number of samples have been taken the following procedures will be used:

1) If only three samples are taken, the loose mix MADMTD will be based on the average of the three samples taken.

2) If only one or two samples are taken, the days production will be added to the next days production and sublots determined based on the total quantity placed during the two days. Therefore a maximum of six loose mix samples will be used to determine the loose mix MADMTD.

Coring Locations. The Engineer will select one pavement core location for each sublot in accordance with Materials Procedure 96-4M, Asphalt Concrete Statistical Pavement Density Determination to represent each paving sublot. The Engineer will define a total of four 150 mm diameter coring locations using an appropriate method. The pavement core samples must come from within the 150 mm diameter circles outlined. Under no circumstances will the Engineer designate the coring locations before the rolling operation is complete. The rolling operation will be considered complete when all compaction equipment has moved off the lane to be cored. Obtain the 150 mm diameter pavement core samples no later than the day following the lot's placement. If coring is performed the same day as the placement, cool the pavement so that the core sample is not damaged during coring. Backfill the core holes, with a similar HMA material as soon as possible after coring, using a procedure approved by the Engineer.

Security Procedure. After procuring the pavement cores, secure them in accordance with Materials Procedure 96-4M, Asphalt Concrete Statistical Pavement Density Determination. Cores arriving at the Regional Laboratory for testing with a damaged or missing security seal will not be tested and new cores will be required from the same locations as the original cores. Take care to insure that the loose mix samples and cores are in acceptable test condition. Damaged cores will require resamplingg. The Engineer will select the core locations in the same general vicinity, ±0.3 meter of the damaged core. Do not intentionally separate the pavement core course from the underlying material if the course does not debond during coring. The Department will separate the pavement core course, required for testing from the remainder of the core by sawing if necessary. Deliver the pavement core samples and the loose mix samples to the Department Regional Laboratory no later than the end of the following day's placement. If, for any reason, a delay occurs in the delivery of the lot samples for three consecutive lots, paving operations for this item will not be permitted to continue until the samples are delivered and tested.

Core Testing Option. The Contractor may elect to test the cores procured under this specification. The testing will be performed under provisions of Materials Procedure NY 98-01M, "Procedure for Testing

ITEM 18403.095102 M	**SUPERPAVE HMA, DOWNSTATE HIGH VOLUME 9.5 mm F1**
ITEM 18403.095112 M	**PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.095102 M**
ITEM 18403.095122 M	**PAVEMENT DENSITY QUALITY ADJUSTMENT to 18403.095102 M**
ITEM 18403.125102 M	**SUPERPAVE HMA, DOWNSTATE HIGH VOLUME 12.5 mm F1**
ITEM 18403.125112 M	**PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.125102 M**
ITEM 18403.125122 M	**PAVEMENT DENSITY QUALITY ADJUSTMENT to 18403.125102 M**
ITEM 18403.255902 M	**SUPERPAVE HMA, 25.0 mm**
ITEM 18403.255912 M	**PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.255902 M**
ITEM 18403.255922 M	**PAVEMENT DENSITY QUALITY ADJUSTMENT to 18403.255902 M**

Cores Taken from All Hot Mix Asphalt (HMA) Performance-Related Specifications". If the Contractor elects to test the cores, the Engineer will define one additional core from two of the sublots within 0.3 m from the original core location, at the same offset, and secure them using the "Security Procedure".

Paving Lot. A paving lot is defined as a days production providing a minimum of 200 metric tons. When paving is continuous within a 24 hour period a new lot will result when a change occurs in the paving crew. If less than 200 metric tons is placed in any day no pavement cores will be taken and density QAFs will not apply. Each paving lot will be equally divided into four sublots in accordance with Materials Procedure 96-4M, Asphalt Concrete Statistical Pavement Density Determination."

Add the following to the end of Subsection 401-3.06 Rollers.

"The compaction equipment shall conform to the requirements of this Subsection. Control the operation of the rollers during the placement of these items including the speed, the amplitude settings, the vibration frequency, and the weight of the rollers."

Subsection 401-3.12 Compaction shall be deleted and replaced with the following:

"Immediately after the HMA mixture has been spread, struck off and surface irregularities adjusted, thoroughly and uniformly compact by rolling. Roll the surface when the mixture is in the proper condition and when the rolling does not cause undue displacement, cracking or shoving. Initially roll the pavement with the roller traveling parallel to the centerline of the pavement beginning at each edge and working toward the super-elevated edge.

Compact the pavement sufficiently to achieve densities, expressed as a percentage of the mixtures average daily maximum theoretical density (%MADMTD), in a range of 92% to 97%. Pavement cores and mix samples will be tested and analyzed by the Department in accordance with Materials Procedure 96-4M, Asphalt Concrete Statistical Pavement Density Determination to determine the loose mix sample MADMTD, pavement core bulk density, and the resultant pavement core percent of the MADMTD.

If consecutive lots are found to have a density QAF equal to or below 0.85, paving operations for this item will be stopped and a new test section constructed in accordance with Option A, described previously in this section.

The density QAF will not be applied to material placed on ramps with a uniform full width section of less than 400 m in length, shoulders, maintenance widenings and crossovers, and bridges. Payment for these areas will be based on satisfactory placement and compaction as determined by the Engineer. Placement and compaction procedures will be deemed satisfactory by the Engineer when the procedures used in these areas are the same or similarto those used on the main line pavement sections. If the shoulder shows signs of distress at this level of compaction decrease the compactive effort until no damage occurs to the shoulder or subbase. Also, if a nuclear gauge(s), or an equivalent density monitoring device

ITEM 18403.095102 M	**SUPERPAVE HMA, DOWNSTATE HIGH VOLUME 9.5 mm F1**
ITEM 18403.095112 M	**PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.095102 M**
ITEM 18403.095122 M	**PAVEMENT DENSITY QUALITY ADJUSTMENT to 18403.095102 M**
ITEM 18403.125102 M	**SUPERPAVE HMA, DOWNSTATE HIGH VOLUME 12.5 mm F1**
ITEM 18403.125112 M	**PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.125102 M**
ITEM 18403.125122 M	**PAVEMENT DENSITY QUALITY ADJUSTMENT to 18403.125102 M**
ITEM 18403.255902 M	**SUPERPAVE HMA, 25.0 mm**
ITEM 18403.255912 M	**PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.255902 M**
ITEM 18403.255922 M	**PAVEMENT DENSITY QUALITY ADJUSTMENT to 18403.255902 M**

subject to the approval of the Director, Materials Bureau, is used to monitor the main-line paving then the same gauge(s) should be used to monitor the above referenced areas to insure that the pavement density is between 92% to 97% of the MADMTD if the shoulder subbase is structurally sufficient to sustain this level of compaction.

When the rolling operation is complete there should be no visible shallow ruts, ridges, other irregularities, or roller marks in the pavement. If these imperfections are present, correct the imperfections or relay the pavement at no additional cost to the Department as ordered by the Engineer.

Correct at once any displacement occurring as a result of reversing the direction of the roller, or from other causes, by the use of rakes and addition of fresh mixture as required. Exercise care in rolling not to displace the line and grade of the edges of the bituminous mixture. To prevent adhesion of the mixture to the drum(s) of the roller, properly moisten the drum(s) with water, or water mixed with small quantities of detergent or other Department approved asphalt release compounds. If a pneumatic tire roller is used, the pneumatic drive wheels may be coated with a fine mist spray of fuel oil or other similar materials to prevent pneumatic tire pickup. In all instances, protect the surface of the pavement from drippings of fuel oil or any other solvents used in paving, compaction or cleaning operations.

Unless otherwise directed by the Engineer, compact the longitudinal joint by using one of the pneumatic drive wheels to overlap the joint in two (2) passes with the drum operating static, when vibratory rollers having pneumatic drive wheels are used. If dual vibrating drum rollers are used, compact the joint by overlapping the joints in two (2) passes with both drums operating static.

Along forms, curbs, headers, walls and other areas not accessible to the rollers, compact the mix thoroughly with mechanical tampers as directed by the Engineer. On depressed areas, a trench roller or small vibratory roller approved by the Engineer may be used. Cleated compression strips also may be used under the roller to transmit compression to the depressed area.

Remove any mixture that becomes loose and broken, mixed with dirt, or is in any way defective and replace with fresh hot mixture and compact to conform with the surrounding area. Correct any area showing an excess or deficiency of bituminous materials to the satisfaction of the Engineer.

If vibratory compaction equipment is used, the Contractor assumes full responsibility for the cost repairing all damage which may occur to highway components and adjacent property including buried utility and service facilities.

Multiple plant production shall not be allowed unless each plant supplies material to a separate paving operation. When multiple paving operations are utilized with material production from a single plant each paving operation will be evaluated as individual paving lots."

ITEM 18403.095102 M	SUPERPAVE HMA, DOWNSTATE HIGH VOLUME 9.5 mm F1
ITEM 18403.095112 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.095102 M
ITEM 18403.095122 M	PAVEMENT DENSITY QUALITY ADJUSTMENT to 18403.095102 M
ITEM 18403.125102 M	SUPERPAVE HMA, DOWNSTATE HIGH VOLUME 12.5 mm F1
ITEM 18403.125112 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.125102 M
ITEM 18403.125122 M	PAVEMENT DENSITY QUALITY ADJUSTMENT to 18403.125102 M
ITEM 18403.255902 M	SUPERPAVE HMA, 25.0 mm
ITEM 18403.255912 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.255902 M
ITEM 18403.255922 M	PAVEMENT DENSITY QUALITY ADJUSTMENT to 18403.255902 M

METHOD OF MEASUREMENT

The provisions of §401-4, §402-4 and §403-4, Method of Measurement shall apply including the following used to calculate the pavement density QAF:

"The Department will determine the paving lot's Percent Within Limits (PWL) in accordance with Materials Procedure 96-4, Asphalt Concrete Statistical Pavement Density Determination. This PWL will be used to determine the density QAF as shown in Table 1 - Quality Schedule. The quantity of the lot subject to possible adjustment will be determined based on an estimate of tonnage placed, determined from the typical sections shown in the plans.

Table 1 - Quality Schedule

Percent Within Limits (PWL)	Quality Adjustment Factor (QAF)
PWL > 93	1.05
5 ≤ PWL ≤ 93	0.60 < QAF ≤ 1.00 [1]
PWL < 5	0.60 [2]

1. The pavement density QAF will be calculated using the equation: (0.449(PWL) + 57.8)/100 = QAF where the PWL is generated for each paving lot.

2. The lot shall be evaluated by the Department to determine if it may remain in-place. The type of material produced (i.e. binder, top), the layer in which it was used, and the location of use (i.e., mainline or a non-critical area) will be primary considerations in the determination of whether the HMA can be left in-place. If the HMA cannot be left in-place it will be removed at no cost to the Department. However, if the Department determines that the HMA can be left in-place, the Quality Payment Adjustment will be calculated using a QAF of 0.60.

The pavement density QAF from Table 1 will be applied to each paving lot to determine the Quality Payment Adjustment. The pavement density QAF will not be applied to material placed on ramps with a uniform full width section of less than 400 meters in length, shoulders, maintenance widenings and crossovers, and bridges. Payment in these areas will be based on satisfactory placement and compaction as determined by the Engineer."

ITEM 18403.095102 M	**SUPERPAVE HMA, DOWNSTATE HIGH VOLUME 9.5 mm F1**
ITEM 18403.095112 M	**PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.095102 M**
ITEM 18403.095122 M	**PAVEMENT DENSITY QUALITY ADJUSTMENT to 18403.095102 M**
ITEM 18403.125102 M	**SUPERPAVE HMA, DOWNSTATE HIGH VOLUME 12.5 mm F1**
ITEM 18403.125112 M	**PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.125102 M**
ITEM 18403.125122 M	**PAVEMENT DENSITY QUALITY ADJUSTMENT to 18403.125102 M**
ITEM 18403.255902 M	**SUPERPAVE HMA, 25.0 mm**
ITEM 18403.255912 M	**PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.255902 M**
ITEM 18403.255922 M	**PAVEMENT DENSITY QUALITY ADJUSTMENT to 18403.255902 M**

BASIS OF PAYMENT

The provisions of subsection 403-5 Basis of Payment shall apply including the following:

"The unit bid price also includes the cost of all necessary equipment, labor and materials required in obtaining the pavement cores, filling all core holes with HMA and compacting these core holes to the satisfaction of the Engineer.

Payment will be made under:

ITEM NO.	ITEM	PAY UNIT
18403.095102 M	*SUPERPAVE* HMA, DOWNSTATE HIGH VOLUME 9.5 mm F1	Metric Ton
18403.095112 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.095102 M	Quality Unit
18403.095122 M	PAVEMENT DENSITY QUALITY ADJUSTMENT to 18403.095102 M	Quality Unit
18403.125102 M	*SUPERPAVE* HMA, DOWNSTATE HIGH VOLUME 12.5 mm F1	Metric Ton
18403.125112 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.125102 M	Quality Unit
18403.125122 M	PAVEMENT DENSITY QUALITY ADJUSTMENT to 18403.125102 M	Quality Unit
18403.255902 M	*SUPERPAVE* HMA, 25.0 mm	Metric Ton
18403.255912 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.255902 M	Quality Unit
18403.255922 M	PAVEMENT DENSITY QUALITY ADJUSTMENT to 18403.255902 M	Quality Unit"

ITEM 18403.095202 M	**SUPERPAVE HMA, UPSTATE HIGH VOLUME 9.5 mm F2**
ITEM 18403.095212 M	**PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.095202 M**
ITEM 18403.095222 M	**PAVEMENT DENSITY QUALITY ADJUSTMENT to 18403.095202 M**
ITEM 18403.125202 M	**SUPERPAVE HMA, UPSTATE HIGH VOLUME 12.5 mm F2**
ITEM 18403.125212 M	**PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.125202 M**
ITEM 18403.125222 M	**PAVEMENT DENSITY QUALITY ADJUSTMENT to 18403.125202 M**
ITEM 18403.255902 M	**SUPERPAVE HMA, 25.0 mm**
ITEM 18403.255912 M	**PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.255902 M**
ITEM 18403.255922 M	**PAVEMENT DENSITY QUALITY ADJUSTMENT to 18403.255902 M**

The requirements of Section 403 - Hot Mix Asphalt Concrete Pavement shall apply except as modified and/or revised below.

DESCRIPTION

This work shall consist of developing Hot Mix Asphalt pavement courses using the *SUPERPAVE* Mix Design procedure detailed in Materials Method 5.16, "*SUPERPAVE* Hot Mix Asphalt Mixture Design and Mixture Verification Procedures," in accordance with these specifications and in reasonable close conformity with the required lines, grades, thicknesses, and typical sections shown on the plans or established by the Engineer. This is a performance based specification in which the Contractor is responsible for compacting the pavement within a specified density range. Written instructions for determining pavement density and density Quality Adjustment Factors (QAFs) are available from the Regional Materials Engineer or the Director, Materials Bureau.

MATERIALS

The materials and composition for these mixtures shall meet the requirements specified in Subsection 403-2 Materials, except as noted herein. The specific Performance Graded Binder and the Design Estimated Traffic in 80 kN ESALs will be specified by a special note in the Contract Proposal.

Subsection 401-2.02 Composition of Mixtures shall be deleted and replaced with the following:

"Formulate and submit to the Regional Materials Engineer, a *SUPERPAVE* Mix Design that satisfies the design control points listed in Table 2 - Design Control Points and does not pass through the restricted zone listed in Table 3 - Restricted Zone of Materials Method 5.16, based on the specified nominal maximum aggregate size.

If for any reason, a change in gradation or materials occurs, prepare a separate job mix formula and *SUPERPAVE* mixture design to fit each change in material or gradation. Changes in Performance Graded Binder content can be made by the Regional Director or his representative providing the resultant mixture has properties within the specified mechanical and volumetric properties.

The mixtures shall be produced, delivered to the work site, and incorporated into the work within 10°C of the temperature specified by the Contractor but within the mixing and compaction range of 120°C and 165°C. Additionally, the Performance Graded Binder shall be introduced into the pugmill at a temperature compatible with that of the aggregate as determined by the Regional Director or his representative, between the limits of 110°C and 175°C.

The aggregates shall be those approved for use by the approved job mix formula and will be accepted at

ITEM 18403.095202 M	SUPERPAVE HMA, UPSTATE HIGH VOLUME 9.5 mm F2
ITEM 18403.095212 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.095202 M
ITEM 18403.095222 M	PAVEMENT DENSITY QUALITY ADJUSTMENT to 18403.095202 M
ITEM 18403.125202 M	SUPERPAVE HMA, UPSTATE HIGH VOLUME 12.5 mm F2
ITEM 18403.125212 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.125202 M
ITEM 18403.125222 M	PAVEMENT DENSITY QUALITY ADJUSTMENT to 18403.125202 M
ITEM 18403.255902 M	SUPERPAVE HMA, 25.0 mm
ITEM 18403.255912 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.255902 M
ITEM 18403.255922 M	PAVEMENT DENSITY QUALITY ADJUSTMENT to 18403.255902 M

the plant site. The Performance Graded Binder will be conditionally accepted at the supplier's source and at the plant on the basis of certification. Samples taken at the plant will be tested by the Department to determine specification compliance.

Subsection 401-2.03A. Coarse Aggregate and 401-2.03B. Blending shall be deleted and replaced with the following:

"*A.* **Coarse Aggregates.** For 12.5 mm F2 and 9.5 mm F2 top course HMA mixtures use crushed aggregate, from an approved source, meeting one of the following descriptions:

1. Limestone having an acid insoluble residue content of not less than 20.0%, excluding particles of chert and similar siliceous rocks.

2. Dolomite having an acid insoluble residue content of not less than 17.0%, excluding particles of chert and similar siliceous rocks.

3. Sandstone, granite, chert, traprock, ore tailings, slag or other similar non-carbonate materials. Non-carbonate particles are defined as having a minimum acid insoluble residue content of 80.0%.

4. Gravel, or a natural or manufactured blend of the following types of materials: limestone, dolomite (excluding Wappinger dolomite, as defined by the Department), gravel, sandstone, granite, chert, traprock, ore tailings, slag or other similar materials, meeting the following requirements:

   12.5 mm Nominal Maximum Size Aggregate Mixes - Non-carbonate plus 3.2 mm particles must comprise a minimum of 10.0% of the total aggregate (by weight with adjustments to equivalent volumes for materials of different specific gravities). Additionally, a minimum of 20.0% of plus 9.5 mm particles must be non-carbonate.

   9.5 mm Nominal Maximum Size Aggregate Mixes - Non-carbonate plus 3.2 mm particles must comprise a minimum of 10.0% of the total aggregate (by weight with adjustments to equivalent volumes for materials of different specific gravities). Additionally, a minimum of 20.0% of plus 4.75 mm particles must be non-carbonate.

   Non-carbonate particles are defined as having a minimum acid insoluble residue content of 80.0%.

5. Manufactured blend of Wappinger dolomite (as defined by the Department) and the following types of materials: gravel, sandstone, granite, chert, traprock, ore tailings, slag, or other similar materials meeting the following requirements:

ITEM 18403.095202 M	SUPERPAVE HMA, UPSTATE HIGH VOLUME 9.5 mm F2
ITEM 18403.095212 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.095202 M
ITEM 18403.095222 M	PAVEMENT DENSITY QUALITY ADJUSTMENT to 18403.095202 M
ITEM 18403.125202 M	SUPERPAVE HMA, UPSTATE HIGH VOLUME 12.5 mm F2
ITEM 18403.125212 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.125202 M
ITEM 18403.125222 M	PAVEMENT DENSITY QUALITY ADJUSTMENT to 18403.125202 M
ITEM 18403.255902 M	SUPERPAVE HMA, 25.0 mm
ITEM 18403.255912 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.255902 M
ITEM 18403.255922 M	PAVEMENT DENSITY QUALITY ADJUSTMENT to 18403.255902 M

12.5 mm Nominal Maximum Size Aggregate Mixes - Non-carbonate plus 3.2mm particles must comprise a minimum of 30.0% of the total aggregate (by weight with adjustments to equivalent volumes for materials of different specific gravities). Additionally, a minimum of 95.0% of plus 9.5mm particles must be non-carbonate.

9.5 mm Nominal Maximum Size Aggregate Mixes - Non-carbonate plus 3.2 mm particles must comprise a minimum of 30.0% of the total aggregate (by weight with adjustments to equivalent volumes for materials of different specific gravities). Additionally, a minimum of 95.0% of plus 4.75 mm particles must be non-carbonate.

Non-carbonate particles are defined as having a minimum acid insoluble residue content of 80.0%.

B. Blending. Where coarse aggregates for these mixes are from more than one source or of more than one type of material, they shall be proportioned and blended to provide a uniform mixture."

Subsection 401-2.05 Bituminous Materials shall be deleted and replaced with the following:

"The Performance Graded Binder (PGB) used in the production of these mixes shall be defined by AASHTO Provisional Standard MP1 - Standard Specification for Performance Graded Asphalt Binder.

Acceptance of the PGB is based on the primary source appearing on the Department's Approved List for Bituminous Material Primary Sources, A. Performance Graded Binders for Paving. Acceptance of the PGB is contingent upon satisfactory test results from samples taken, as required by the Department's procedural directives, at the location where the material is incorporated into the work. A primary source is defined as a firm that samples, tests, and certifies by Production Lot that the PGB is in conformance with the specifications. The procedural directives for sampling, testing, and certifying the PGB, and for achieving and maintaining approved list status, are available from the Materials Bureau.

The PGB shall not be delivered to the HMA Production Facility at a temperature in excess of 175°C."

CONSTRUCTION DETAILS

The details of §401-3 Construction Details shall apply except as modified below:

Add the following to the end of Subsection 401-3.02 Bituminous Mixing Plant A. Requirements for All Plants No. 11:

"Y. Gyratory Compactor - A power driven gyratory compactor capable of maintaining an angle of gyration of 1.25° ± 0.02°, a speed of gyration of 30.0 rpm ± 0.5 rpm, and a consolidation pressure

ITEM 18403.095202 M	**SUPERPAVE HMA, UPSTATE HIGH VOLUME 9.5 mm F2**
ITEM 18403.095212 M	**PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.095202 M**
ITEM 18403.095222 M	**PAVEMENT DENSITY QUALITY ADJUSTMENT to 18403.095202 M**
ITEM 18403.125202 M	**SUPERPAVE HMA, UPSTATE HIGH VOLUME 12.5 mm F2**
ITEM 18403.125212 M	**PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.125202 M**
ITEM 18403.125222 M	**PAVEMENT DENSITY QUALITY ADJUSTMENT to 18403.125202 M**
ITEM 18403.255902 M	**SUPERPAVE HMA, 25.0 mm**
ITEM 18403.255912 M	**PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.255902 M**
ITEM 18403.255922 M	**PAVEMENT DENSITY QUALITY ADJUSTMENT to 18403.255902 M**

of 600 k Pa ± 10% for gyrations zero to five and ± 3% for gyrations six and greater. The make and model of the gyratory compactor supplied must be approved by the Director, Materials Bureau.

Z. Gyratory Specimen Mold Assembly - The specimen mold assembly consisting of the mold 150.00 mm + 0.00 mm and - 0.01 mm, base plate and top plate (if required). The minimum height of the mold is 250.00 mm. A minimum of 4 mold assemblies and an adequate supply of 150.00 mm paper discs shall be provided.

AA. Gyratory Specimen Extractor - A simple means of specimen extraction from the gyratory molds shall be supplied.

BB. Oven - A thermostatically controlled convection type oven having a minimum capacity of 0.15 cubic meters shall be supplied to preheat the *SUPERPAVE* Gyratory Compactor mold assemblies and asphalt mix samples. The oven shall have a controlled temperature range up to 190°C with a ± 3°C accuracy throughout the range.

CC. Kraft Paper - 23 kg medium weight, 915 mm width.

DD. Sheet Rock Taping Knives (min. 2) - 254 mm length.

EE. Aging Pans (minimum 4) - 457 mm x 457 mm x 38 mm H galvanized iron pans.

FF. Miscellaneous Pans (minimum 4) - 394 mm x 280 mm x 51 mm H aluminum pans.

GG. Screen trays (1 each) - 457 mm x 660 mm to include the following: 2.36 mm, 1.18 mm, 0.60 mm, 0.30 mm, 0.15 mm, 0.075 mm"

Add the following to the end of §401-3 Construction Details:

On the first day of mainline paving, select one of the following options:

OPTION A: **Test Section.** Prior to paving operations for this item, construct a test section on the project site at a location approved by the Engineer. The test section will be at least 50 m, the full width of the pavement, and the same depth specified for the construction of the course which it represents. The maximum test section length is 500 centerline-meters on the mainline. There is no maximum length if the test section is not on the mainline. Use equipment that is of the same type and weight to be used on the remainder of the course represented by the test section. The test section will be paid for at 1.5 times the actual quantity paved, up to 200 actual metric tons per test section. A maximum of two test sections per item will be paid at the 1.5 Test Section Adjustment and pavement density Quality Adjustment Factors (QAFs) will not apply to the first two test sections. If more

ITEM 18403.095202 M	SUPERPAVE HMA, UPSTATE HIGH VOLUME 9.5 mm F2
ITEM 18403.095212 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.095202 M
ITEM 18403.095222 M	PAVEMENT DENSITY QUALITY ADJUSTMENT to 18403.095202 M
ITEM 18403.125202 M	SUPERPAVE HMA, UPSTATE HIGH VOLUME 12.5 mm F2
ITEM 18403.125212 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.125202 M
ITEM 18403.125222 M	PAVEMENT DENSITY QUALITY ADJUSTMENT to 18403.125202 M
ITEM 18403.255902 M	SUPERPAVE HMA, 25.0 mm
ITEM 18403.255912 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.255902 M
ITEM 18403.255922 M	PAVEMENT DENSITY QUALITY ADJUSTMENT to 18403.255902 M

than two test sections are required, the pavement density QAF will apply when the additional test sections are located on the mainline. Only one test section per item per day may be placed.

Paving operations for this item will not be permitted until a test section obtains a minimum pavement density QAF of 1.00. When the pavement density QAF is less than 1.00 construct another test section in accordance with Option A.

OPTION B: **Routine Paving.** Begin paving operations. The Test Section Adjustment will not apply. All material placed will be subject to a pavement density QAF in accordance with this specification. If the pavement density QAF on the first day of paving is less than 1.00, construct a test section in accordance with Option A.

Loose Mix Samples. On each paving day, take four loose mix samples in accordance with AASHTO T168-91, Standard Test Method for Sampling Bituminous Paving Mixtures. Take these samples periodically throughout the day so as to represent the entire days production. When a low production day is anticipated it is recommended that a minimum of three loose mix samples be obtained before production is terminated. When operational conditions cause production to be terminated before the specified number of samples have been taken the following procedures will be used:

1) If only three samples are taken, the loose mix MADMTD will be based on the average of the three samples taken.

2) If only one or two samples are taken, the days production will be added to the next days production and sublots determined based on the total quantity placed during the two days. Therefore a maximum of six loose mix samples will be used to determine the loose mix MADMTD.

Coring Locations. The Engineer will select one pavement core location for each sublot in accordance with Materials Procedure 96-4M, Asphalt Concrete Statistical Pavement Density Determination to represent each paving sublot. The Engineer will define a total of four 150 mm diameter coring locations using an appropriate method. The pavement core samples must come from within the 150 mm diameter circles outlined. Under no circumstances will the Engineer designate the coring locations before the rolling operation is complete. The rolling operation will be considered complete when all compaction equipment has moved off the lane to be cored. Obtain the 150 mm diameter pavement core samples no later than the day following the lot's placement. If coring is performed the same day as the placement, cool the pavement so that the core sample is not damaged during coring. Backfill the core holes, with a similar HMA material as soon as possible after coring, using a procedure approved by the Engineer.

Security Procedure. After procuring the pavement cores, secure them in accordance with Materials Procedure 96-4M, Asphalt Concrete Statistical Pavement Density Determination. Cores arriving at the

ITEM 18403.095202 M	**SUPERPAVE HMA, UPSTATE HIGH VOLUME 9.5 mm F2**
ITEM 18403.095212 M	**PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.095202 M**
ITEM 18403.095222 M	**PAVEMENT DENSITY QUALITY ADJUSTMENT to 18403.095202 M**
ITEM 18403.125202 M	**SUPERPAVE HMA, UPSTATE HIGH VOLUME 12.5 mm F2**
ITEM 18403.125212 M	**PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.125202 M**
ITEM 18403.125222 M	**PAVEMENT DENSITY QUALITY ADJUSTMENT to 18403.125202 M**
ITEM 18403.255902 M	**SUPERPAVE HMA, 25.0 mm**
ITEM 18403.255912 M	**PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.255902 M**
ITEM 18403.255922 M	**PAVEMENT DENSITY QUALITY ADJUSTMENT to 18403.255902 M**

Regional Laboratory for testing with a damaged or missing security seal will not be tested and new cores will be required from the same locations as the original cores. Take care to insure that the loose mix samples and cores are in acceptable test condition. Damaged cores will require resamplingg. The Engineer will select the core locations in the same general vicinity, ±0.3 meter of the damaged core. Do not intentionally separate the pavement core course from the underlying material if the course does not debond during coring. The Department will separate the pavement core course, required for testing from the remainder of the core by sawing if necessary. Deliver the pavement core samples and the loose mix samples to the Department Regional Laboratory no later than the end of the following day's placement. If, for any reason, a delay occurs in the delivery of the lot samples for three consecutive lots, paving operations for this item will not be permitted to continue until the samples are delivered and tested.

Core Testing Option. The Contractor may elect to test the cores procured under this specification. The testing will be performed under provisions of Materials Procedure NY 98-01M, "Procedure for Testing Cores Taken from All Hot Mix Asphalt (HMA) Performance-Related Specifications". If the Contractor elects to test the cores, the Engineer will define one additional core from two of the sublots within 0.3 m from the original core location, at the same offset, and secure them using the "Security Procedure".

Paving Lot. A paving lot is defined as a days production providing a minimum of 200 metric tons. When paving is continuous within a 24 hour period a new lot will result when a change occurs in the paving crew. If less than 200 metric tons is placed in any day no pavement cores will be taken and density QAFs will not apply. Each paving lot will be equally divided into four sublots in accordance with Materials Procedure 96-4M, Asphalt Concrete Statistical Pavement Density Determination."

Add the following to the end of Subsection 401-3.06 Rollers.

"The compaction equipment shall conform to the requirements of this Subsection. Control the operation of the rollers during the placement of these items including the speed, the amplitude settings, the vibration frequency, and the weight of the rollers."

Subsection 401-3.12 Compaction shall be deleted and replaced with the following:

"Immediately after the HMA mixture has been spread, struck off and surface irregularities adjusted, thoroughly and uniformly compact by rolling. Roll the surface when the mixture is in the proper condition and when the rolling does not cause undue displacement, cracking or shoving. Initially roll the pavement with the roller traveling parallel to the centerline of the pavement beginning at each edge and working toward the super-elevated edge.

Compact the pavement sufficiently to achieve densities, expressed as a percentage of the mixtures average daily maximum theoretical density (%MADMTD), in a range of 92% to 97%. Pavement cores and mix samples will be tested and analyzed by the Department in accordance with Materials Procedure 96-4M, Asphalt Concrete Statistical Pavement Density Determination to determine the loose mix sample

ITEM 18403.095202 M	SUPERPAVE HMA, UPSTATE HIGH VOLUME 9.5 mm F2
ITEM 18403.095212 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.095202 M
ITEM 18403.095222 M	PAVEMENT DENSITY QUALITY ADJUSTMENT to 18403.095202 M
ITEM 18403.125202 M	SUPERPAVE HMA, UPSTATE HIGH VOLUME 12.5 mm F2
ITEM 18403.125212 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.125202 M
ITEM 18403.125222 M	PAVEMENT DENSITY QUALITY ADJUSTMENT to 18403.125202 M
ITEM 18403.255902 M	SUPERPAVE HMA, 25.0 mm
ITEM 18403.255912 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.255902 M
ITEM 18403.255922 M	PAVEMENT DENSITY QUALITY ADJUSTMENT to 18403.255902 M

MADMTD, pavement core bulk density, and the resultant pavement core percent of the MADMTD.

If consecutive lots are found to have a density QAF equal to or below 0.85, paving operations for this item will be stopped and a new test section constructed in accordance with Option A, described previously in this section.

The density QAF will not be applied to material placed on ramps with a uniform full width section of less than 400 m in length, shoulders, maintenance widenings and crossovers, and bridges. Payment for these areas will be based on satisfactory placement and compaction as determined by the Engineer. Placement and compaction procedures will be deemed satisfactory by the Engineer when the procedures used in these areas are the same or similarto those used on the main line pavement sections. If the shoulder shows signs of distress at this level of compaction decrease the compactive effort until no damage occurs to the shoulder or subbase. Also, if a nuclear gauge(s), or an equivalent density monitoring device subject to the approval of the Director, Materials Bureau, is used to monitor the main-line paving then the same gauge(s) should be used to monitor the above referenced areas to insure that the pavement density is between 92% to 97% of the MADMTD if the shoulder subbase is structurally sufficient to sustain this level of compaction.

When the rolling operation is complete there should be no visible shallow ruts, ridges, other irregularities, or roller marks in the pavement. If these imperfections are present, correct the imperfections or relay the pavement at no additional cost to the Department as ordered by the Engineer.

Correct at once any displacement occurring as a result of reversing the direction of the roller, or from other causes, by the use of rakes and addition of fresh mixture as required. Exercise care in rolling not to displace the line and grade of the edges of the bituminous mixture. To prevent adhesion of the mixture to the drum(s) of the roller, properly moisten the drum(s) with water, or water mixed with small quantities of detergent or other Department approved asphalt release compounds. If a pneumatic tire roller is used, the pneumatic drive wheels may be coated with a fine mist spray of fuel oil or other similar materials to prevent pneumatic tire pickup. In all instances, protect the surface of the pavement from drippings of fuel oil or any other solvents used in paving, compaction or cleaning operations.

Unless otherwise directed by the Engineer, compact the longitudinal joint by using one of the pneumatic drive wheels to overlap the joint in two (2) passes with the drum operating static, when vibratory rollers having pneumatic drive wheels are used. If dual vibrating drum rollers are used, compact the joint by overlapping the joints in two (2) passes with both drums operating static.

Along forms, curbs, headers, walls and other areas not accessible to the rollers, compact the mix thoroughly with mechanical tampers as directed by the Engineer. On depressed areas, a trench roller or small vibratory roller approved by the Engineer may be used. Cleated compression strips also may be used under the roller to transmit compression to the depressed area.

ITEM 18403.095202 M	SUPERPAVE HMA, UPSTATE HIGH VOLUME 9.5 mm F2
ITEM 18403.095212 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.095202 M
ITEM 18403.095222 M	PAVEMENT DENSITY QUALITY ADJUSTMENT to 18403.095202 M
ITEM 18403.125202 M	SUPERPAVE HMA, UPSTATE HIGH VOLUME 12.5 mm F2
ITEM 18403.125212 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.125202 M
ITEM 18403.125222 M	PAVEMENT DENSITY QUALITY ADJUSTMENT to 18403.125202 M
ITEM 18403.255902 M	SUPERPAVE HMA, 25.0 mm
ITEM 18403.255912 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.255902 M
ITEM 18403.255922 M	PAVEMENT DENSITY QUALITY ADJUSTMENT to 18403.255902 M

Remove any mixture that becomes loose and broken, mixed with dirt, or is in any way defective and replace with fresh hot mixture and compact to conform with the surrounding area. Correct any area showing an excess or deficiency of bituminous materials to the satisfaction of the Engineer.

If vibratory compaction equipment is used, the Contractor assumes full responsibility for the cost repairing all damage which may occur to highway components and adjacent property including buried utility and service facilities.

Multiple plant production shall not be allowed unless each plant supplies material to a separate paving operation. When multiple paving operations are utilized with material production from a single plant each paving operation will be evaluated as individual paving lots."

METHOD OF MEASUREMENT

The provisions of §401-4, §402-4 and §403-4, Method of Measurement shall apply including the following used to calculate the pavement density QAF:

"The Department will determine the paving lot's Percent Within Limits (PWL) in accordance with Materials Procedure 96-4, Asphalt Concrete Statistical Pavement Density Determination. This PWL will be used to determine the density QAF as shown in Table 1 - Quality Schedule. The quantity of the lot subject to possible adjustment will be determined based on an estimate of tonnage placed, determined from the typical sections shown in the plans.

Table 1 - Quality Schedule

Percent Within Limits (PWL)	Quality Adjustment Factor (QAF)
PWL > 93	1.05
5 ≤ PWL ≤ 93	0.60 < QAF ≤ 1.00 [1]
PWL < 5	0.60 [2]

1. The pavement density QAF will be calculated using the equation: (0.449(PWL) + 57.8)/100 = QAF where the PWL is generated for each paving lot.

2. The lot shall be evaluated by the Department to determine if it may remain in-place. The type of material produced (i.e. binder, top), the layer in which it was used, and the location of use (i.e., mainline or a non-critical area) will be primary considerations in the determination of whether the HMA can be left in-place. If the HMA cannot be left in-place it will be removed at no cost to the Department. However, if the Department determines that the HMA can be left in-place, the Quality

ITEM 18403.095202 M	**SUPERPAVE HMA, UPSTATE HIGH VOLUME 9.5 mm F2**
ITEM 18403.095212 M	**PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.095202 M**
ITEM 18403.095222 M	**PAVEMENT DENSITY QUALITY ADJUSTMENT to 18403.095202 M**
ITEM 18403.125202 M	**SUPERPAVE HMA, UPSTATE HIGH VOLUME 12.5 mm F2**
ITEM 18403.125212 M	**PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.125202 M**
ITEM 18403.125222 M	**PAVEMENT DENSITY QUALITY ADJUSTMENT to 18403.125202 M**
ITEM 18403.255902 M	**SUPERPAVE HMA, 25.0 mm**
ITEM 18403.255912 M	**PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.255902 M**
ITEM 18403.255922 M	**PAVEMENT DENSITY QUALITY ADJUSTMENT to 18403.255902 M**

Payment Adjustment will be calculated using a QAF of 0.60.

The pavement density QAF from Table 1 will be applied to each paving lot to determine the Quality Payment Adjustment. The pavement density QAF will not be applied to material placed on ramps with a uniform full width section of less than 400 meters in length, shoulders, maintenance widenings and crossovers, and bridges. Payment in these areas will be based on satisfactory placement and compaction as determined by the Engineer."

BASIS OF PAYMENT

The provisions of subsection 403-5 Basis of Payment shall apply including the following:

"The unit bid price also includes the cost of all necessary equipment, labor and materials required in obtaining the pavement cores, filling all core holes with HMA and compacting these core holes to the satisfaction of the Engineer.

Payment will be made under:

ITEM NO.	ITEM	PAY UNIT
18403.095202 M	*SUPERPAVE* HMA, UPSTATE HIGH VOLUME 9.5 mm F2	Metric Ton
18403.095212 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.095202 M	Quality Unit
18403.095222 M	PAVEMENT DENSITY QUALITY ADJUSTMENT to 18403.095202 M	Quality Unit
18403.125202 M	*SUPERPAVE* HMA, UPSTATE HIGH VOLUME 12.5 mm F2	Metric Ton
18403.125212 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.125202 M	Quality Unit
18403.125222 M	PAVEMENT DENSITY QUALITY ADJUSTMENT to 18403.125202 M	Quality Unit
18403.255902 M	*SUPERPAVE* HMA, 25.0 mm	Metric Ton
18403.255912 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.255902 M	Quality Unit
18403.255922 M	PAVEMENT DENSITY QUALITY ADJUSTMENT to 18403.255902 M	Quality Unit"

ITEM 18403.096102 M	SUPERPAVE HMA, DOWNSTATE HIGH VOLUME 9.5 mm F1
ITEM 18403.096112 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.096102 M
ITEM 18403.126102 M	SUPERPAVE HMA, DOWNSTATE HIGH VOLUME 12.5 mm F1
ITEM 18403.126112 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.126102 M
ITEM 18403.196902 M	SUPERPAVE HMA, 19.0 mm
ITEM 18403.196912 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.196902 M
ITEM 18403.256902 M	SUPERPAVE HMA, 25.0 mm
ITEM 18403.256912 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.256902 M
ITEM 18403.376902 M	SUPERPAVE HMA, 37.5 mm
ITEM 18403.376912 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.376902 M

The requirements of Section 403 - Hot Mix Asphalt Concrete Pavement shall apply except as modified and/or revised below.

DESCRIPTION

This work shall consist of developing Hot Mix Asphalt pavement courses using the *SUPERPAVE* Mix Design procedure detailed in Materials Method 5.16, "*SUPERPAVE* Hot Mix Asphalt Mixture Design and Mixture Verification Procedures," in accordance with these specifications and in reasonable close conformity with the required lines, grades, thicknesses, and typical sections shown on the plans or established by the Engineer. This is a performance based specification in which the Contractor is responsible for compacting the pavement within a specified density range. Written instructions for determining pavement density and quality adjustment factors are available from the Regional Materials Engineer or the Director, Materials Bureau.

MATERIALS

The materials and composition for these mixtures shall meet the requirements specified in Subsection 403-2 Materials, except as noted herein. The specific Performance Graded Binder and the Design Estimated Traffic in 80 kN ESALs will be specified by a special note in the Contract Proposal.

Subsection 401-2.02 Composition of Mixtures shall be deleted and replaced with the following:

"Formulate and submit to the Regional Materials Engineer, a *SUPERPAVE* Mix Design that satisfies the design control points listed in Table 2 - Design Control Points and does not pass through the restricted zone listed in Table 3 - Restricted Zone of Materials Method 5.16, based on the specified nominal maximum aggregate size.

If for any reason, a change in gradation or materials occurs, prepare a separate job mix formula and *SUPERPAVE* mixture design to fit each change in material or gradation. Changes in Performance Graded Binder content can be made by the Regional Director or his representative providing the resultant mixture has properties within the specified mechanical and volumetric properties.

The mixtures shall be produced, delivered to the work site, and incorporated into the work within 10°C of the temperature specified by the Contractor but within the mixing and compaction range of 120°C and 165°C. Additionally, the Performance Graded Binder shall be introduced into the pugmill at a temperature compatible with that of the aggregate as determined by the Regional Director or his representative, between the limits of 110°C and 175°C.

The aggregates shall be those approved for use by the approved job mix formula and will be accepted at the

ITEM 18403.096102 M	**SUPERPAVE HMA, DOWNSTATE HIGH VOLUME 9.5 mm F1**
ITEM 18403.096112 M	**PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.096102 M**
ITEM 18403.126102 M	**SUPERPAVE HMA, DOWNSTATE HIGH VOLUME 12.5 mm F1**
ITEM 18403.126112 M	**PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.126102 M**
ITEM 18403.196902 M	**SUPERPAVE HMA, 19.0 mm**
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ITEM 18403.256902 M	**SUPERPAVE HMA, 25.0 mm**
ITEM 18403.256912 M	**PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.256902 M**
ITEM 18403.376902 M	**SUPERPAVE HMA, 37.5 mm**
ITEM 18403.376912 M	**PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.376902 M**

plant site. The Performance Graded Binder will be conditionally accepted at the supplier's source and at the plant on the basis of certification. Samples taken at the plant will be tested by the Department to determine specification compliance.

Subsection 401-2.03A. Coarse Aggregate and 401-2.03B. Blending shall be deleted and replaced with the following:

"***A.*** **Coarse Aggregates.** For 12.5 mm F1 and 9.5 mm F1 nominal maximum size top course mixtures use crushed aggregate from an approved source, meeting one of the following requirements:

1. Limestone having an acid insoluble residue content of not less than 20.0%, excluding particles of chert and similar siliceous rocks.

2. Dolomite having an acid insoluble residue content of not less than 17.0%, excluding particles of chert and similar siliceous rocks.

3. Sandstone, granite, chert, traprock, ore tailings, slag or other similar non-carbonate materials. Non-carbonate particles are defined as having a minimum acid insoluble residue content of 80.0%.

4. Gravel, or a natural or manufactured blend of the following types of materials: limestone, dolomite, gravel, sandstone, granite, chert, traprock, ore tailings, slag or other similar materials, meeting the following requirements:

   12.5 mm Nominal Maximum Size Aggregate Mixes - Non-carbonate plus 3.2 mm particles must comprise a minimum of 30.0% of the total aggregate (by weight with adjustments to equivalent volumes for materials of different specific gravities). Additionally, a minimum of 95.0% of plus 9.5 mm particles must be non-carbonate.

   9.5 mm Nominal Maximum Size Aggregate Mixes - Non-carbonate plus 3.2 mm particles must comprise a minimum of 30.0% of the total aggregate (by weight with adjustments to equivalent volumes for materials of different specific gravities). Additionally, a minimum of 95.0% of plus 4.75 mm particles must be non-carbonate.

   Non-carbonate particles are defined as having a minimum acid insoluble residue content of 80.0%.

B. ***Blending.*** Where coarse aggregates for these mixes are from more than one source or of more than one type of material, they shall be proportioned and blended to provide a uniform mixture."

Subsection 401-2.05 Bituminous Materials shall be deleted and replaced with the following:

ITEM 18403.096102 M	SUPERPAVE HMA, DOWNSTATE HIGH VOLUME 9.5 mm F1
ITEM 18403.096112 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.096102 M
ITEM 18403.126102 M	SUPERPAVE HMA, DOWNSTATE HIGH VOLUME 12.5 mm F1
ITEM 18403.126112 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.126102 M
ITEM 18403.196902 M	SUPERPAVE HMA, 19.0 mm
ITEM 18403.196912 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.196902 M
ITEM 18403.256902 M	SUPERPAVE HMA, 25.0 mm
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ITEM 18403.376902 M	SUPERPAVE HMA, 37.5 mm
ITEM 18403.376912 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.376902 M

"The Performance Graded Binder (PGB) used in the production of these mixes shall be defined by AASHTO Provisional Standard MP1 - Standard Specification for Performance Graded Asphalt Binder.

Acceptance of the PGB is based on the primary source appearing on the Department's Approved List for Bituminous Material Primary Sources, A. Performance Graded Binders for Paving. Acceptance of the PGB is contingent upon satisfactory test results from samples taken, as required by the Department's procedural directives, at the location where the material is incorporated into the work. A primary source is defined as a firm that samples, tests, and certifies by Production Lot that the PGB is in conformance with the specifications. The procedural directives for sampling, testing, and certifying the PGB, and for achieving and maintaining approved list status, are available from the Materials Bureau.

The PGB shall not be delivered to the HMA Production Facility at a temperature in excess of 175°C."

CONSTRUCTION DETAILS

The details of §401-3 Construction Details shall apply except as modified below:

Add the following to the end of Subsection 401-3.02 Bituminous Mixing Plant A. Requirements for All Plants No. 11:

"Y. Gyratory Compactor - A power driven gyratory compactor capable of maintaining an angle of gyration of 1.25° ± 0.02°, a speed of gyration of 30.0 rpm ± 0.5 rpm, and a consolidation pressure of 600 k Pa ± 10% for gyrations zero to five and ± 3% for gyrations six and greater. The make and model of the gyratory compactor supplied must be approved by the Director, Materials Bureau.

Z. Gyratory Specimen Mold Assembly - The specimen mold assembly consisting of the mold 150.00 mm + 0.00 mm and - 0.01 mm, base plate and top plate (if required). The minimum height of the mold is 250.00 mm. A minimum of 4 mold assemblies and an adequate supply of 150.00 mm paper discs shall be provided.

AA. Gyratory Specimen Extractor - A simple means of specimen extraction from the gyratory molds shall be supplied.

BB. Oven - A thermostatically controlled convection type oven having a minimum capacity of 0.15 cubic meters shall be supplied to preheat the *SUPERPAVE* Gyratory Compactor mold assemblies and asphalt mix samples. The oven shall have a controlled temperature range up to 190°C with a ± 3°C accuracy throughout the range.

CC. Kraft Paper - 23 kg medium weight, 915 mm width.

ITEM 18403.096102 M	**SUPERPAVE HMA, DOWNSTATE HIGH VOLUME 9.5 mm F1**
ITEM 18403.096112 M	**PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.096102 M**
ITEM 18403.126102 M	**SUPERPAVE HMA, DOWNSTATE HIGH VOLUME 12.5 mm F1**
ITEM 18403.126112 M	**PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.126102 M**
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ITEM 18403.256902 M	**SUPERPAVE HMA, 25.0 mm**
ITEM 18403.256912 M	**PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.256902 M**
ITEM 18403.376902 M	**SUPERPAVE HMA, 37.5 mm**
ITEM 18403.376912 M	**PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.376902 M**

DD. Sheet Rock Taping Knives (minimum 2) - 254 mm length.

EE. Aging Pans (minimum 4) - 457 mm x 457 mm x 38 mm H galvanized iron pans.

FF. Miscellaneous Pans (minimum 4) - 394 mm x 280 mm x 51 mm H aluminum pans.

GG. Screen trays (1 each) - 457 mm x 660 mm to include the following: 2.36 mm, 1.18 mm, 0.60 mm, 0.30 mm, 0.15 mm, 0.075 mm"

Add the following to the end of §401-3 Construction Details:

"**Test Section.** Prior to paving operations for this item, construct a test section on the project site at a location approved by the Engineer, using the same equipment and procedures to be used in the construction of the remainder of the course being laid, and **stop paving** unless the Paving Option below is selected.

The amount of mixture prepared according to the job mix formula should be sufficient to construct a test section 500 centerline meters, the full width of pavement, and shall be of the same depth specified for the construction of the course which it represents. Routine paving will only begin after a Project Target Density (PTD) has been established by the Regional Materials Engineer based on testing of the pavement cores. The test section is for determining the PTD for this item and for calibration of the nuclear density gauge. The PTD will be established within one business day of the delivery of the four cores, the two loose mix samples, and the four nuclear density readings.

Note. Routine paving will only begin after a Project Target Density (PTD) has been established by the Regional Materials Engineer. Also, construction of a test section will not begin unless both a nuclear density gauge and an operator are present.

Use the first 150 linear meters of the test section to stabilize the paving operation. The remainder of the length will be used to determine the PTD. During construction of the test section, take two loose mix samples, in accordance with AASHTO T168-91. These samples will represent the material placed on this test section. At the conclusion of the test section, take four cores from the test section (exclude initial 150 meters) at locations randomly selected by the Engineer in accordance with Materials Procedure 96-01M. If coring is performed the same day as placement, cool the pavement so that the core sample is not damaged during coring. At each core location, take density readings with a nuclear density gauge(s). A nuclear density reading at each core location will be the average of the four measurements taken at 90°. Only gauge(s) calibrated during the construction of the test section will be allowed to be used during normal paving operations. Deliver the four cores, the two loose mix samples, and the four nuclear density readings to the Department Regional Laboratory. With the nuclear density readings, include gauge model number and serial number for each gauge calibrated on the test section. The Regional Materials Engineer will use the test section cores and nuclear gauge readings to establish the PTD.

ITEM 18403.096102 M	**SUPERPAVE HMA, DOWNSTATE HIGH VOLUME 9.5 mm F1**
ITEM 18403.096112 M	**PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.096102 M**
ITEM 18403.126102 M	**SUPERPAVE HMA, DOWNSTATE HIGH VOLUME 12.5 mm F1**
ITEM 18403.126112 M	**PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.126102 M**
ITEM 18403.196902 M	**SUPERPAVE HMA, 19.0 mm**
ITEM 18403.196912 M	**PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.196902 M**
ITEM 18403.256902 M	**SUPERPAVE HMA, 25.0 mm**
ITEM 18403.256912 M	**PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.256902 M**
ITEM 18403.376902 M	**SUPERPAVE HMA, 37.5 mm**
ITEM 18403.376912 M	**PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.376902 M**

Core Testing Option. The Contractor may elect to test the cores procured under this specification. The testing will be performed under provisions of Materials Procedure NY 98-01M, "Procedure for Testing Cores Taken from All Hot Mix Asphalt (HMA) Performance-Related Specifications". If the Contractor elects to test the cores, the Engineer will define one additional core from two of the sublots within 0.3 m from the original core location, at the same offset, and secure them using the "Security Procedure".

Paving Option. Paving may continue after completion of the test section using an interim PTD determined in accordance with Materials Procedure 96-01M, "Nuclear Gauge Density Data Collection and Determination of Pavement Core Locations for Rut Avoidance Asphalt Concrete". If the average density of the four cores taken on the test section is not between 92-97% of the mixture's maximum theoretical density, payment adjustments will be applied to any material placed after the test section and before the Project Target Density (PTD) has been determined by the Regional Materials Engineer. The payment adjustment will be made according to Table 1 - Density Quality Adjustment Factors."

Add the following to the end of Subsection 401-3.06 Rollers.

"The compaction equipment shall conform to the requirements of this Subsection. Control the operation of the rollers during the placement of these items including the speed, the amplitude settings, the vibration frequency, and the weight of the rollers."

Subsection 401-3.12 Compaction shall be deleted and replaced with the following:

"Immediately after the hot mix asphalt (HMA) has been spread, struck off and surface irregularities adjusted, compact the mix by rolling thoroughly and uniformly. Roll the surface when the mixture is in the proper condition and when the rolling does not cause undue displacement, cracking or shoving. Initially roll the pavement with the roller traveling parallel to the centerline of the pavement beginning at the low edge and working toward the super-elevated edge.

Use a nuclear density gauge to monitor and record the pavement density in accordance with this section and Materials Procedure 96-01M, "Nuclear Gauge Density Data Collection and Determination of Pavement Core Locations for Rut Avoidance Asphalt Concrete." The nuclear density gauge should consist of a radioactive source, scaler and other basic components housed in a single backscatter unit. The gauge must be operated by personnel trained in the principles of nuclear testing and safety practices. Only gauge(s) calibrated during the construction of the test section will be used during normal paving operation. If another nuclear gauge is to be used, a new test section must be constructed to calibrate it and to establish a new PTD.

Compact the pavement sufficiently to achieve a minimum density of 96% of the PTD in a single test location and 98% of the PTD calculated as a moving average of the last 10 test locations as determined by a

ITEM 18403.096102 M	SUPERPAVE HMA, DOWNSTATE HIGH VOLUME 9.5 mm F1
ITEM 18403.096112 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.096102 M
ITEM 18403.126102 M	SUPERPAVE HMA, DOWNSTATE HIGH VOLUME 12.5 mm F1
ITEM 18403.126112 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.126102 M
ITEM 18403.196902 M	SUPERPAVE HMA, 19.0 mm
ITEM 18403.196912 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.196902 M
ITEM 18403.256902 M	SUPERPAVE HMA, 25.0 mm
ITEM 18403.256912 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.256902 M
ITEM 18403.376902 M	SUPERPAVE HMA, 37.5 mm
ITEM 18403.376912 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.376902 M

nuclear density gauge. Take nuclear gauge readings at each site, randomly selected by the Engineer, approximately every 60 meters along the length of the pavement for each pass of the paver and record them on a BR340M.

If the average of 4 nuclear density gauge measurements taken at 90° angles over two consecutive locations falls below 96% of the PTD or if the moving average of the last 10 nuclear gauge test sites falls below 98% of the PTD, stop routine paving operations and construct a new test section. Normal production will only resume after establishing a new PTD.

Placement and compaction on shoulders, ramps, maintenance widenings, crossovers, and bridges will be deemed satisfactory by the Engineer when the procedures used in these areas are the same as those used on the mainline pavement sections. If shoulders show signs of distress at this level of compaction decrease the compactive effort until no damage occurs to the shoulder or subbase. Nuclear gauge(s) used to monitor the mainline paving should be used to monitor the above referenced areas to insure that the pavement density is between 92% to 97% of the mixture's average daily maximum theoretical density if the shoulder subbase is structurally sufficient to sustain this level of compaction.

The Engineer may require additional daily density verification consisting of four cores, nuclear density readings at each core location, and two loose mix samples on any day during routine production with adequate notice. Deliver the cores, nuclear density readings, and loose mix samples to the Department Regional Laboratory no later than the day following placement.

The following guidelines will be used by the EIC to determine when additional pavement cores should be required during routine paving.

1. **Material Subject to Payment Adjustment.**

   a. Pavement density monitoring was not performed in accordance with the specification requirements. This would include, but is not limited to: not taking the required number of density readings (either at a specific location or at the required frequency), beginning to pave without a nuclear density gauge on site, and continuing to pave after the only calibrated nuclear density gauge on site breaks down.

   b. There is a reason to believe that the nuclear density gauge readings do not accurately represent the actual in-place density of the pavement.

If the average density of the four cores is not between 92% and 97% of the mixture's average daily maximum theoretical density, a payment adjustment will be applied to the material placed on the day represented by the pavement cores. The payment adjustment will be made according to Table 1 - Density Quality Adjustment Factors.

ITEM 18403.096102 M	SUPERPAVE HMA, DOWNSTATE HIGH VOLUME 9.5 mm F1
ITEM 18403.096112 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.096102 M
ITEM 18403.126102 M	SUPERPAVE HMA, DOWNSTATE HIGH VOLUME 12.5 mm F1
ITEM 18403.126112 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.126102 M
ITEM 18403.196902 M	SUPERPAVE HMA, 19.0 mm
ITEM 18403.196912 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.196902 M
ITEM 18403.256902 M	SUPERPAVE HMA, 25.0 mm
ITEM 18403.256912 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.256902 M
ITEM 18403.376902 M	SUPERPAVE HMA, 37.5 mm
ITEM 18403.376912 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.376902 M

2. **Material Not Subject to Payment Adjustment.**

   There are situations when the EIC should require pavement cores to monitor the Project Target Density (PTD) being used on the project. These situations include, but are not limited to the following: new mix design or supplier, change of existing pavement being overlaid, change of paving equipment (i.e., paver or rollers) being used, and excessive plant variation. In these situations the nuclear density gauge tests will be used for acceptance. However, a new PTD will be established if different from the original PTD.

When the rolling operation is complete there should be no visible shallow ruts, ridges, other roller marks, or irregularities in the pavement. If these imperfections are present, correct the imperfections or relay the pavement to the satisfaction of the Engineer. Perform all corrective work at no additional cost to the Department.

Correct at once any displacement occurring as a result of reversing the direction of the roller, or from other causes, by the use of rakes and addition of fresh mixture as required. Exercise care in rolling not to displace the line and grade of the edges of the bituminous mixture. To prevent adhesion of the mixture to the drum(s) of the roller, properly moisten the drum(s) with water, or water mixed with small quantities of detergent or other Department approved asphalt release compounds. If a pneumatic tire roller is used, the pneumatic drive wheels may be coated with a fine mist spray of fuel oil or other similar materials to prevent pneumatic tire pickup. In all instances, protect the surface of the pavement from drippings of fuel oil or any other solvents used in paving, compaction or cleaning operations.

Unless otherwise directed by the Engineer, compact the longitudinal joint by using one of the pneumatic drive wheels to overlap the joint in two (2) passes with the drum operating static where vibratory rollers having pneumatic drive wheels are used. If dual vibrating drum rollers are used compact the joint by overlapping the joints in two (2) passes with both drums operating static.

Along forms, curbs, headers, walls and other areas not accessible to the rollers, compact the mix thoroughly with mechanical tampers as directed by the Engineer. On depressed areas, a trench roller or small vibratory roller approved by the Engineer may be used. Cleated compression strips also may be used under the roller to transmit compression to the depressed area.

Remove any mixture that becomes loose and broken, mixed with dirt, or is in any way defective and replace with fresh hot mixture and compact to conform with the surrounding area. Correct any area showing an excess or deficiency of bituminous materials to the satisfaction of the Engineer.

If vibratory compaction equipment is used, the Contractor assumes full responsibility for the cost repairing all damage which may occur to highway components and adjacent property including buried utility and service facilities.

ITEM 18403.096102 M	SUPERPAVE HMA, DOWNSTATE HIGH VOLUME 9.5 mm F1
ITEM 18403.096112 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.096102 M
ITEM 18403.126102 M	SUPERPAVE HMA, DOWNSTATE HIGH VOLUME 12.5 mm F1
ITEM 18403.126112 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.126102 M
ITEM 18403.196902 M	SUPERPAVE HMA, 19.0 mm
ITEM 18403.196912 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.196902 M
ITEM 18403.256902 M	SUPERPAVE HMA, 25.0 mm
ITEM 18403.256912 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.256902 M
ITEM 18403.376902 M	SUPERPAVE HMA, 37.5 mm
ITEM 18403.376912 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.376902 M

When multiple paving operations are utilized with material production from a single plant each paving operation will be evaluated separately.

Routine paving operations will not begin unless both a project calibrated nuclear density gauge and an operator are present.

Backfill all core holes, with a similar HMA material as was cored, as soon as possible after coring, using a procedure approved by the Engineer."

METHOD OF MEASUREMENT

The provisions of §401-4, §402-4 and §403-4, Method of Measurement shall apply including the following:

"The Department will test the cores from a test section or from any day the Engineer requests cores. If paving is continued using an interim PTD immediately after the conclusion of a test section, or if the Engineer requests additional cores on any day after the first day, full payment will be made if the average density of the four cores is between 92% and 97% of the mixture's average daily maximum theoretical density. If the average density fails to meet this limit, **the quantity placed** will be adjusted according to Table 1 - Density Quality Adjustment Factors shown below:

Table 1 - Density Quality Adjustment Factors

Average Core Density	Quality Adjustment Factor
91.0 ≤ Density < 92.0	0.95
90.0 ≤ Density < 91.0	0.90
88.0 ≤ Density < 90.0	0.85
< 88.0	0.60*

* The lot shall be evaluated by the Department to determine if it may remain in-place. The type of material produced (i.e. binder, top), the layer in which it was used, and the location of use (i.e., mainline or a non-critical area) will be primary considerations in the determination of whether the HMA can be left in-place. If the HMA cannot be left in-place it will be removed at no cost to the Department. However, if the Department determines that the HMA can be left in-place, the Quality Payment Adjustment will be calculated using a QAF of 0.60.

The quantity of the material subject to payment adjustments will be determined from typical sections shown in the plans. The payment adjustments will be applied to material placed on mainline but not shoulders, ramps, maintenance widenings and crossovers, and bridges."

ITEM 18403.096102 M	**SUPERPAVE HMA, DOWNSTATE HIGH VOLUME 9.5 mm F1**
ITEM 18403.096112 M	**PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.096102 M**
ITEM 18403.126102 M	**SUPERPAVE HMA, DOWNSTATE HIGH VOLUME 12.5 mm F1**
ITEM 18403.126112 M	**PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.126102 M**
ITEM 18403.196902 M	**SUPERPAVE HMA, 19.0 mm**
ITEM 18403.196912 M	**PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.196902 M**
ITEM 18403.256902 M	**SUPERPAVE HMA, 25.0 mm**
ITEM 18403.256912 M	**PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.256902 M**
ITEM 18403.376902 M	**SUPERPAVE HMA, 37.5 mm**
ITEM 18403.376912 M	**PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.376902 M**

BASIS OF PAYMENT

The provisions of subsection 403-5 Basis of Payment shall apply including the following:

"The unit bid price also includes the cost of all necessary equipment, labor and materials required in construction of the test sections, nuclear density testing, obtaining the pavement cores, filling all core holes with asphalt concrete and compacting these core holes satisfactorily to the Engineer.

Payment will be made under:

ITEM NO.	ITEM	PAY UNIT
18403.096102 M	*SUPERPAVE* HMA, DOWNSTATE HIGH VOLUME 9.5 mm F1	Metric Ton
18403.096112 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.096102 M	Quality Unit
18403.126102 M	*SUPERPAVE* HMA, DOWNSTATE HIGH VOLUME 12.5 mm F1	Metric Ton
18403.126112 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.126102 M	Quality Unit
18403.196902 M	*SUPERPAVE* HMA, 19.0 mm	Metric Ton
18403.196912 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.196902 M	Quality Unit
18403.256902 M	*SUPERPAVE* HMA, 25.0 mm	Metric Ton
18403.256912 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.256902 M	Quality Unit
18403.376902 M	*SUPERPAVE* HMA, 37.5 mm	Metric Ton
18403.376912 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.376902 M	Quality Unit"

ITEM 18403.096202 M	SUPERPAVE HMA, UPSTATE HIGH VOLUME 9.5 mm F2
ITEM 18403.096212 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.096202 M
ITEM 18403.126202 M	SUPERPAVE HMA, UPSTATE HIGH VOLUME 12.5 mm F2
ITEM 18403.126212 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.126202 M
ITEM 18403.196902 M	SUPERPAVE HMA, 19.0 mm
ITEM 18403.196912 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.196902 M
ITEM 18403.256902 M	SUPERPAVE HMA, 25.0 mm
ITEM 18403.256912 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.256902 M
ITEM 18403.376902 M	SUPERPAVE HMA, 37.5 mm
ITEM 18403.376912 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.376902 M

The requirements of Section 403 - Hot Mix Asphalt Concrete Pavement shall apply except as modified and/or revised below.

DESCRIPTION

This work shall consist of developing Hot Mix Asphalt pavement courses using the *SUPERPAVE* Mix Design procedure detailed in Materials Method 5.16, "*SUPERPAVE* Hot Mix Asphalt Mixture Design and Mixture Verification Procedures," in accordance with these specifications and in reasonable close conformity with the required lines, grades, thicknesses, and typical sections shown on the plans or established by the Engineer. This is a performance based specification in which the Contractor is responsible for compacting the pavement within a specified density range. Written instructions for determining pavement density and quality adjustment factors are available from the Regional Materials Engineer or the Director, Materials Bureau.

MATERIALS

The materials and composition for these mixtures shall meet the requirements specified in Subsection 403-2 Materials, except as noted herein. The specific Performance Graded Binder and the Design Estimated Traffic in 80 kN ESALs will be specified by a special note in the Contract Proposal.

Subsection 401-2.02 Composition of Mixtures shall be deleted and replaced with the following:

"Formulate and submit to the Regional Materials Engineer, a *SUPERPAVE* Mix Design that satisfies the design control points listed in Table 2 - Design Control Points and does not pass through the restricted zone listed in Table 3 - Restricted Zone of Materials Method 5.16, based on the specified nominal maximum aggregate size.

If for any reason, a change in gradation or materials occurs, prepare a separate job mix formula and *SUPERPAVE* mixture design to fit each change in material or gradation. Changes in Performance Graded Binder content can be made by the Regional Director or his representative providing the resultant mixture has properties within the specified mechanical and volumetric properties.

The mixtures shall be produced, delivered to the work site, and incorporated into the work within 10°C of the temperature specified by the Contractor but within the mixing and compaction range of 120°C and 165°C. Additionally, the Performance Graded Binder shall be introduced into the pugmill at a temperature compatible with that of the aggregate as determined by the Regional Director or his representative, between the limits of 110°C and 175°C.

The aggregates shall be those approved for use by the approved job mix formula and will be accepted at

ITEM 18403.096202 M	**SUPERPAVE HMA, UPSTATE HIGH VOLUME 9.5 mm F2**
ITEM 18403.096212 M	**PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.096202 M**
ITEM 18403.126202 M	**SUPERPAVE HMA, UPSTATE HIGH VOLUME 12.5 mm F2**
ITEM 18403.126212 M	**PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.126202 M**
ITEM 18403.196902 M	**SUPERPAVE HMA, 19.0 mm**
ITEM 18403.196912 M	**PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.196902 M**
ITEM 18403.256902 M	**SUPERPAVE HMA, 25.0 mm**
ITEM 18403.256912 M	**PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.256902 M**
ITEM 18403.376902 M	**SUPERPAVE HMA, 37.5 mm**
ITEM 18403.376912 M	**PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.376902 M**

the plant site. The Performance Graded Binder will be conditionally accepted at the supplier's source and at the plant on the basis of certification. Samples taken at the plant will be tested by the Department to determine specification compliance.

Subsection 401-2.03A. Coarse Aggregate and 401-2.03B. Blending shall be deleted and replaced with the following:

"***A.* Coarse Aggregates.** For 12.5 mm F2 and 9.5 mm F2 top course HMA mixtures use crushed aggregate, from an approved source, meeting one of the following descriptions:

1. Limestone having an acid insoluble residue content of not less than 20.0%, excluding particles of chert and similar siliceous rocks.

2. Dolomite having an acid insoluble residue content of not less than 17.0%, excluding particles of chert and similar siliceous rocks.

3. Sandstone, granite, chert, traprock, ore tailings, slag or other similar non-carbonate materials. Non-carbonate particles are defined as having a minimum acid insoluble residue content of 80.0%.

4. Gravel, or a natural or manufactured blend of the following types of materials: limestone, dolomite (excluding Wappinger dolomite, as defined by the Department), gravel, sandstone, granite, chert, traprock, ore tailings, slag or other similar materials, meeting the following requirements:

   12.5 mm Nominal Maximum Size Aggregate Mixes - Non-carbonate plus 3.2 mm particles must comprise a minimum of 10.0% of the total aggregate (by weight with adjustments to equivalent volumes for materials of different specific gravities). Additionally, a minimum of 20.0% of plus 9.5 mm particles must be non-carbonate.

   9.5 mm Nominal Maximum Size Aggregate Mixes - Non-carbonate plus 3.2 mm particles must comprise a minimum of 10.0% of the total aggregate (by weight with adjustments to equivalent volumes for materials of different specific gravities). Additionally, a minimum of 20.0% of plus 4.75 mm particles must be non-carbonate.

   Non-carbonate particles are defined as having a minimum acid insoluble residue content of 80.0%.

5. Manufactured blend of Wappinger dolomite (as defined by the Department) and the following types of materials: gravel, sandstone, granite, chert, traprock, ore tailings, slag, or other similar materials meeting the following requirements:

ITEM 18403.096202 M	SUPERPAVE HMA, UPSTATE HIGH VOLUME 9.5 mm F2
ITEM 18403.096212 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.096202 M
ITEM 18403.126202 M	SUPERPAVE HMA, UPSTATE HIGH VOLUME 12.5 mm F2
ITEM 18403.126212 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.126202 M
ITEM 18403.196902 M	SUPERPAVE HMA, 19.0 mm
ITEM 18403.196912 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.196902 M
ITEM 18403.256902 M	SUPERPAVE HMA, 25.0 mm
ITEM 18403.256912 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.256902 M
ITEM 18403.376902 M	SUPERPAVE HMA, 37.5 mm
ITEM 18403.376912 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.376902 M

12.5 mm Nominal Maximum Size Aggregate Mixes - Non-carbonate plus 3.2mm particles must comprise a minimum of 30.0% of the total aggregate (by weight with adjustments to equivalent volumes for materials of different specific gravities). Additionally, a minimum of 95.0% of plus 9.5mm particles must be non-carbonate.

9.5 mm Nominal Maximum Size Aggregate Mixes - Non-carbonate plus 3.2 mm particles must comprise a minimum of 30.0% of the total aggregate (by weight with adjustments to equivalent volumes for materials of different specific gravities). Additionally, a minimum of 95.0% of plus 4.75 mm particles must be non-carbonate.

Non-carbonate particles are defined as having a minimum acid insoluble residue content of 80.0%.

B. Blending. Where coarse aggregates for these mixes are from more than one source or of more than one type of material, they shall be proportioned and blended to provide a uniform mixture."

Subsection 401-2.05 Bituminous Materials shall be deleted and replaced with the following:

"The Performance Graded Binder (PGB) used in the production of these mixes shall be defined by AASHTO Provisional Standard MP1 - Standard Specification for Performance Graded Asphalt Binder.

Acceptance of the PGB is based on the primary source appearing on the Department's Approved List for Bituminous Material Primary Sources, A. Performance Graded Binders for Paving. Acceptance of the PGB is contingent upon satisfactory test results from samples taken, as required by the Department's procedural directives, at the location where the material is incorporated into the work. A primary source is defined as a firm that samples, tests, and certifies by Production Lot that the PGB is in conformance with the specifications. The procedural directives for sampling, testing, and certifying the PGB, and for achieving and maintaining approved list status, are available from the Materials Bureau.

The PGB shall not be delivered to the HMA Production Facility at a temperature in excess of 175°C."

CONSTRUCTION DETAILS

The details of §401-3 Construction Details shall apply except as modified below:

Add the following to the end of Subsection 401-3.02 Bituminous Mixing Plant A. Requirements for All Plants No. 11:

"Y. Gyratory Compactor - A power driven gyratory compactor capable of maintaining an angle of

ITEM 18403.096202 M	**SUPERPAVE HMA, UPSTATE HIGH VOLUME 9.5 mm F2**
ITEM 18403.096212 M	**PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.096202 M**
ITEM 18403.126202 M	**SUPERPAVE HMA, UPSTATE HIGH VOLUME 12.5 mm F2**
ITEM 18403.126212 M	**PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.126202 M**
ITEM 18403.196902 M	**SUPERPAVE HMA, 19.0 mm**
ITEM 18403.196912 M	**PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.196902 M**
ITEM 18403.256902 M	**SUPERPAVE HMA, 25.0 mm**
ITEM 18403.256912 M	**PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.256902 M**
ITEM 18403.376902 M	**SUPERPAVE HMA, 37.5 mm**
ITEM 18403.376912 M	**PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.376902 M**

gyration of 1.25° ± 0.02°, a speed of gyration of 30.0 rpm ± 0.5 rpm, and a consolidation pressure of 600 k Pa ± 10% for gyrations zero to five and ± 3% for gyrations six and greater. The make and model of the gyratory compactor supplied must be approved by the Director, Materials Bureau.

Z. Gyratory Specimen Mold Assembly - The specimen mold assembly consisting of the mold 150.00 mm + 0.00 mm and - 0.01 mm, base plate and top plate (if required). The minimum height of the mold is 250.00 mm. A minimum of 4 mold assemblies and an adequate supply of 150.00 mm paper discs shall be provided.

AA. Gyratory Specimen Extractor - A simple means of specimen extraction from the gyratory molds shall be supplied.

BB. Oven - A thermostatically controlled convection type oven having a minimum capacity of 0.15 cubic meters shall be supplied to preheat the *SUPERPAVE* Gyratory Compactor mold assemblies and asphalt mix samples. The oven shall have a controlled temperature range up to 190°C with a ± 3°C accuracy throughout the range.

CC. Kraft Paper - 23 kg medium weight, 915 mm width.

DD. Sheet Rock Taping Knives (minimum 2) - 254 mm length.

EE. Aging Pans (minimum 4) - 457 mm x 457 mm x 38 mm H galvanized iron pans.

FF. Miscellaneous Pans (minimum 4) - 394 mm x 280 mm x 51 mm H aluminum pans.

GG. Screen trays (1 each) - 457 mm x 660 mm to include the following: 2.36 mm, 1.18 mm, 0.60 mm, 0.30 mm, 0.15 mm, 0.075 mm"

Add the following to the end of §401-3 Construction Details:

"**Test Section.** Prior to paving operations for this item, construct a test section on the project site at a location approved by the Engineer, using the same equipment and procedures to be used in the construction of the remainder of the course being laid, and **stop paving** unless the Paving Option below is selected.

The amount of mixture prepared according to the job mix formula should be sufficient to construct a test section 500 centerline meters, the full width of pavement, and shall be of the same depth specified for the construction of the course which it represents. Routine paving will only begin after a Project Target Density (PTD) has been established by the Regional Materials Engineer based on testing of the pavement cores. The test section is for determining the PTD for this item and for calibration of the nuclear density

ITEM 18403.096202 M	SUPERPAVE HMA, UPSTATE HIGH VOLUME 9.5 mm F2
ITEM 18403.096212 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.096202 M
ITEM 18403.126202 M	SUPERPAVE HMA, UPSTATE HIGH VOLUME 12.5 mm F2
ITEM 18403.126212 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.126202 M
ITEM 18403.196902 M	SUPERPAVE HMA, 19.0 mm
ITEM 18403.196912 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.196902 M
ITEM 18403.256902 M	SUPERPAVE HMA, 25.0 mm
ITEM 18403.256912 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.256902 M
ITEM 18403.376902 M	SUPERPAVE HMA, 37.5 mm
ITEM 18403.376912 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.376902 M

gauge. The PTD will be established within one business day of the delivery of the four cores, the two loose mix samples, and the four nuclear density readings.

Note. Routine paving will only begin after a Project Target Density (PTD) has been established by the Regional Materials Engineer. Also, construction of a test section will not begin unless both a nuclear density gauge and an operator are present.

Use the first 150 linear meters of the test section to stabilize the paving operation. The remainder of the length will be used to determine the PTD. During construction of the test section, take two loose mix samples, in accordance with AASHTO T168-91. These samples will represent the material placed on this test section. At the conclusion of the test section, take four cores from the test section (exclude initial 150 meters) at locations randomly selected by the Engineer in accordance with Materials Procedure 96-01M. If coring is performed the same day as placement, cool the pavement so that the core sample is not damaged during coring. At each core location, take density readings with a nuclear density gauge(s). A nuclear density reading at each core location will be the average of the four measurements taken at 90°. Only gauge(s) calibrated during the construction of the test section will be allowed to be used during normal paving operations. Deliver the four cores, the two loose mix samples, and the four nuclear density readings to the Department Regional Laboratory. With the nuclear density readings, include gauge model number and serial number for each gauge calibrated on the test section. The Regional Materials Engineer will use the test section cores and nuclear gauge readings to establish the PTD.

Core Testing Option. The Contractor may elect to test the cores procured under this specification. The testing will be performed under provisions of Materials Procedure NY 98-01M, "Procedure for Testing Cores Taken from All Hot Mix Asphalt (HMA) Performance-Related Specifications". If the Contractor elects to test the cores, the Engineer will define one additional core from two of the sublots within 0.3 m from the original core location, at the same offset, and secure them using the "Security Procedure".

Paving Option. Paving may continue after completion of the test section using an interim PTD determined in accordance with Materials Procedure 96-01M, "Nuclear Gauge Density Data Collection and Determination of Pavement Core Locations for Rut Avoidance Asphalt Concrete". If the average density of the four cores taken on the test section is not between 92-97% of the mixture's maximum theoretical density, payment adjustments will be applied to any material placed after the test section and before the Project Target Density (PTD) has been determined by the Regional Materials Engineer. The payment adjustment will be made according to Table 1 - Density Quality Adjustment Factors."

Add the following to the end of Subsection 401-3.06 Rollers.

"The compaction equipment shall conform to the requirements of this Subsection. Control the operation of the rollers during the placement of these items including the speed, the amplitude settings, the vibration frequency, and the weight of the rollers."

ITEM 18403.096202 M	**SUPERPAVE HMA, UPSTATE HIGH VOLUME 9.5 mm F2**
ITEM 18403.096212 M	**PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.096202 M**
ITEM 18403.126202 M	**SUPERPAVE HMA, UPSTATE HIGH VOLUME 12.5 mm F2**
ITEM 18403.126212 M	**PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.126202 M**
ITEM 18403.196902 M	**SUPERPAVE HMA, 19.0 mm**
ITEM 18403.196912 M	**PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.196902 M**
ITEM 18403.256902 M	**SUPERPAVE HMA, 25.0 mm**
ITEM 18403.256912 M	**PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.256902 M**
ITEM 18403.376902 M	**SUPERPAVE HMA, 37.5 mm**
ITEM 18403.376912 M	**PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.376902 M**

Subsection 401-3.12 Compaction shall be deleted and replaced with the following:

"Immediately after the hot mix asphalt (HMA) has been spread, struck off and surface irregularities adjusted, compact the mix by rolling thoroughly and uniformly. Roll the surface when the mixture is in the proper condition and when the rolling does not cause undue displacement, cracking or shoving. Initially roll the pavement with the roller traveling parallel to the centerline of the pavement beginning at the low edge and working toward the super-elevated edge.

Use a nuclear density gauge to monitor and record the pavement density in accordance with this section and Materials Procedure 96-01M, "Nuclear Gauge Density Data Collection and Determination of Pavement Core Locations for Rut Avoidance Asphalt Concrete." The nuclear density gauge should consist of a radioactive source, scaler and other basic components housed in a single backscatter unit. The gauge must be operated by personnel trained in the principles of nuclear testing and safety practices. Only gauge(s) calibrated during the construction of the test section will be used during normal paving operation. If another nuclear gauge is to be used, a new test section must be constructed to calibrate it and to establish a new PTD.

Compact the pavement sufficiently to achieve a minimum density of 96% of the PTD in a single test location and 98% of the PTD calculated as a moving average of the last 10 test locations as determined by a nuclear density gauge. Take nuclear gauge readings at each site, randomly selected by the Engineer, approximately every 60 meters along the length of the pavement for each pass of the paver and record them on a BR340M.

If the average of 4 nuclear density gauge measurements taken at 90° angles over two consecutive locations falls below 96% of the PTD or if the moving average of the last 10 nuclear gauge test sites falls below 98% of the PTD, stop routine paving operations and construct a new test section. Normal production will only resume after establishing a new PTD.

Placement and compaction on shoulders, ramps, maintenance widenings, crossovers, and bridges will be deemed satisfactory by the Engineer when the procedures used in these areas are the same as those used on the mainline pavement sections. If shoulders show signs of distress at this level of compaction decrease the compactive effort until no damage occurs to the shoulder or subbase. Nuclear gauge(s) used to monitor the mainline paving should be used to monitor the above referenced areas to insure that the pavement density is between 92% to 97% of the mixture's average daily maximum theoretical density if the shoulder subbase is structurally sufficient to sustain this level of compaction.

The Engineer may require additional daily density verification consisting of four cores, nuclear density readings at each core location, and two loose mix samples on any day during routine production with adequate notice. Deliver the cores, nuclear density readings, and loose mix samples to the Department Regional Laboratory no later than the day following placement.

ITEM 18403.096202 M	SUPERPAVE HMA, UPSTATE HIGH VOLUME 9.5 mm F2
ITEM 18403.096212 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.096202 M
ITEM 18403.126202 M	SUPERPAVE HMA, UPSTATE HIGH VOLUME 12.5 mm F2
ITEM 18403.126212 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.126202 M
ITEM 18403.196902 M	SUPERPAVE HMA, 19.0 mm
ITEM 18403.196912 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.196902 M
ITEM 18403.256902 M	SUPERPAVE HMA, 25.0 mm
ITEM 18403.256912 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.256902 M
ITEM 18403.376902 M	SUPERPAVE HMA, 37.5 mm
ITEM 18403.376912 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.376902 M

The following guidelines will be used by the EIC to determine when additional pavement cores should be required during routine paving.

1. **Material Subject to Payment Adjustment.**

   a. Pavement density monitoring was not performed in accordance with the specification requirements. This would include, but is not limited to: not taking the required number of density readings (either at a specific location or at the required frequency), beginning to pave without a nuclear density gauge on site, and continuing to pave after the only calibrated nuclear density gauge on site breaks down.

   b. There is a reason to believe that the nuclear density gauge readings do not accurately represent the actual in-place density of the pavement.

If the average density of the four cores is not between 92% and 97% of the mixture's average daily maximum theoretical density, a payment adjustment will be applied to the material placed on the day represented by the pavement cores. The payment adjustment will be made according to Table 1 - Density Quality Adjustment Factors.

2. **Material Not Subject to Payment Adjustment.**

   There are situations when the EIC should require pavement cores to monitor the Project Target Density (PTD) being used on the project. These situations include, but are not limited to the following: new mix design or supplier, change of existing pavement being overlaid, change of paving equipment (i.e., paver or rollers) being used, and excessive plant variation. In these situations the nuclear density gauge tests will be used for acceptance. However, a new PTD will be established if different from the original PTD.

When the rolling operation is complete there should be no visible shallow ruts, ridges, other roller marks, or irregularities in the pavement. If these imperfections are present, correct the imperfections or relay the pavement to the satisfaction of the Engineer. Perform all corrective work at no additional cost to the Department.

Correct at once any displacement occurring as a result of reversing the direction of the roller, or from other causes, by the use of rakes and addition of fresh mixture as required. Exercise care in rolling not to displace the line and grade of the edges of the bituminous mixture. To prevent adhesion of the mixture to the drum(s) of the roller, properly moisten the drum(s) with water, or water mixed with small quantities of detergent or other Department approved asphalt release compounds. If a pneumatic tire roller is used, the pneumatic drive wheels may be coated with a fine mist spray of fuel oil or other similar materials to prevent pneumatic tire pickup. In all instances, protect the surface of the pavement from drippings of fuel

ITEM 18403.096202 M	SUPERPAVE HMA, UPSTATE HIGH VOLUME 9.5 mm F2
ITEM 18403.096212 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.096202 M
ITEM 18403.126202 M	SUPERPAVE HMA, UPSTATE HIGH VOLUME 12.5 mm F2
ITEM 18403.126212 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.126202 M
ITEM 18403.196902 M	SUPERPAVE HMA, 19.0 mm
ITEM 18403.196912 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.196902 M
ITEM 18403.256902 M	SUPERPAVE HMA, 25.0 mm
ITEM 18403.256912 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.256902 M
ITEM 18403.376902 M	SUPERPAVE HMA, 37.5 mm
ITEM 18403.376912 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.376902 M

oil or any other solvents used in paving, compaction or cleaning operations.

Unless otherwise directed by the Engineer, compact the longitudinal joint by using one of the pneumatic drive wheels to overlap the joint in two (2) passes with the drum operating static where vibratory rollers having pneumatic drive wheels are used. If dual vibrating drum rollers are used compact the joint by overlapping the joints in two (2) passes with both drums operating static.

Along forms, curbs, headers, walls and other areas not accessible to the rollers, compact the mix thoroughly with mechanical tampers as directed by the Engineer. On depressed areas, a trench roller or small vibratory roller approved by the Engineer may be used. Cleated compression strips also may be used under the roller to transmit compression to the depressed area.

Remove any mixture that becomes loose and broken, mixed with dirt, or is in any way defective and replace with fresh hot mixture and compact to conform with the surrounding area. Correct any area showing an excess or deficiency of bituminous materials to the satisfaction of the Engineer.

If vibratory compaction equipment is used, the Contractor assumes full responsibility for the cost repairing all damage which may occur to highway components and adjacent property including buried utility and service facilities.

When multiple paving operations are utilized with material production from a single plant each paving operation will be evaluated separately.

Routine paving operations will not begin unless both a project calibrated nuclear density gauge and an operator are present.

Backfill all core holes, with a similar HMA material as was cored, as soon as possible after coring, using a procedure approved by the Engineer."

METHOD OF MEASUREMENT

The provisions of §401-4, §402-4 and §403-4, Method of Measurement shall apply including the following:

"The Department will test the cores from a test section or from any day the Engineer requests cores. If paving is continued using an interim PTD immediately after the conclusion of a test section, or if the Engineer requests additional cores on any day after the first day, full payment will be made if the average density of the four cores is between 92% and 97% of the mixture's average daily maximum theoretical density. If the average density fails to meet this limit, **the quantity placed** will be adjusted according to Table 1 - Density Quality Adjustment Factors shown below:

ITEM 18403.096202 M	SUPERPAVE HMA, UPSTATE HIGH VOLUME 9.5 mm F2
ITEM 18403.096212 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.096202 M
ITEM 18403.126202 M	SUPERPAVE HMA, UPSTATE HIGH VOLUME 12.5 mm F2
ITEM 18403.126212 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.126202 M
ITEM 18403.196902 M	SUPERPAVE HMA, 19.0 mm
ITEM 18403.196912 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.196902 M
ITEM 18403.256902 M	SUPERPAVE HMA, 25.0 mm
ITEM 18403.256912 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.256902 M
ITEM 18403.376902 M	SUPERPAVE HMA, 37.5 mm
ITEM 18403.376912 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.376902 M

Table 1 - Density Quality Adjustment Factors

Average Core Density	Quality Adjustment Factor
91.0 ≤ Density < 92.0	0.95
90.0 ≤ Density < 91.0	0.90
88.0 ≤ Density < 90.0	0.85
< 88.0	0.60*

* The lot shall be evaluated by the Department to determine if it may remain in-place. The type of material produced (i.e. binder, top), the layer in which it was used, and the location of use (i.e., mainline or a non-critical area) will be primary considerations in the determination of whether the HMA can be left in-place. If the HMA cannot be left in-place it will be removed at no cost to the Department. However, if the Department determines that the HMA can be left in-place, the Quality Payment Adjustment will be calculated using a QAF of 0.60.

The quantity of the material subject to payment adjustments will be determined from typical sections shown in the plans. The payment adjustments will be applied to material placed on mainline but not shoulders, ramps, maintenance widenings and crossovers, and bridges."

BASIS OF PAYMENT

The provisions of subsection 403-5 Basis of Payment shall apply including the following:

"The unit bid price also includes the cost of all necessary equipment, labor and materials required in construction of the test sections, nuclear density testing, obtaining the pavement cores, filling all core holes with asphalt concrete and compacting these core holes satisfactorily to the Engineer.

Payment will be made under:

ITEM NO.	ITEM	PAY UNIT
18403.096202 M	*SUPERPAVE* HMA, UPSTATE HIGH VOLUME 9.5 mm F2	Metric Ton
18403.096212 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.096202 M	Quality Unit
18403.126202 M	*SUPERPAVE* HMA, UPSTATE HIGH VOLUME 12.5 mm F2	Metric Ton
18403.126212 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.126202 M	Quality Unit

ITEM 18403.096202 M	**SUPERPAVE HMA, UPSTATE HIGH VOLUME 9.5 mm F2**
ITEM 18403.096212 M	**PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.096202 M**
ITEM 18403.126202 M	**SUPERPAVE HMA, UPSTATE HIGH VOLUME 12.5 mm F2**
ITEM 18403.126212 M	**PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.126202 M**
ITEM 18403.196902 M	**SUPERPAVE HMA, 19.0 mm**
ITEM 18403.196912 M	**PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.196902 M**
ITEM 18403.256902 M	**SUPERPAVE HMA, 25.0 mm**
ITEM 18403.256912 M	**PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.256902 M**
ITEM 18403.376902 M	**SUPERPAVE HMA, 37.5 mm**
ITEM 18403.376912 M	**PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.376902 M**

18403.196902 M	*SUPERPAVE* HMA, 19.0 mm	Metric Ton
18403.196912 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.196902 M	Quality Unit
18403.256902 M	*SUPERPAVE* HMA, 25.0 mm	Metric Ton
18403.256912 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.256902 M	Quality Unit
18403.376902 M	*SUPERPAVE* HMA, 37.5 mm	Metric Ton
18403.376912 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.376902 M	Quality Unit"

ITEM 18403.096302 M	SUPERPAVE HMA, LOW VOLUME 9.5 mm F3
ITEM 18403.096312 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.096302 M
ITEM 18403.126302 M	SUPERPAVE HMA, LOW VOLUME 12.5 mm F3
ITEM 18403.126312 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.126302 M
ITEM 18403.196902 M	SUPERPAVE HMA, 19.0 mm
ITEM 18403.196912 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.196902 M
ITEM 18403.256902 M	SUPERPAVE HMA, 25.0 mm
ITEM 18403.256912 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.256902 M
ITEM 18403.376902 M	SUPERPAVE HMA, 37.5 mm
ITEM 18403.376912 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.376902 M

The requirements of Section 403 - Hot Mix Asphalt Concrete Pavement shall apply except as modified and/or revised below.

DESCRIPTION

This work shall consist of developing Hot Mix Asphalt pavement courses using the *SUPERPAVE* Mix Design procedure detailed in Materials Method 5.16, "*SUPERPAVE* Hot Mix Asphalt Mixture Design and Mixture Verification Procedures," in accordance with these specifications and in reasonable close conformity with the required lines, grades, thicknesses, and typical sections shown on the plans or established by the Engineer. This is a performance based specification in which the Contractor is responsible for compacting the pavement within a specified density range. Written instructions for determining pavement density and quality adjustment factors are available from the Regional Materials Engineer or the Director, Materials Bureau.

MATERIALS

The materials and composition for these mixtures shall meet the requirements specified in Subsection 403-2 Materials, except as noted herein. The specific Performance Graded Binder and the Design Estimated Traffic in 80 kN ESALs will be specified by a special note in the Contract Proposal.

Subsection 401-2.02 Composition of Mixtures shall be deleted and replaced with the following:

"Formulate and submit to the Regional Materials Engineer, a *SUPERPAVE* Mix Design that satisfies the design control points listed in Table 2 - Design Control Points and does not pass through the restricted zone listed in Table 3 - Restricted Zone of Materials Method 5.16, based on the specified nominal maximum aggregate size.

If for any reason, a change in gradation or materials occurs, prepare a separate job mix formula and *SUPERPAVE* mixture design to fit each change in material or gradation. Changes in Performance Graded Binder content can be made by the Regional Director or his representative providing the resultant mixture has properties within the specified mechanical and volumetric properties.

The mixtures shall be produced, delivered to the work site, and incorporated into the work within 10°C of the temperature specified by the Contractor but within the mixing and compaction range of 120°C and 165°C. Additionally, the Performance Graded Binder shall be introduced into the pugmill at a temperature compatible with that of the aggregate as determined by the Regional Director or his representative, between the limits of 110°C and 175°C.

The aggregates shall be those approved for use by the approved job mix formula and will be accepted at

ITEM 18403.096302 M	**SUPERPAVE HMA, LOW VOLUME 9.5 mm F3**
ITEM 18403.096312 M	**PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.096302 M**
ITEM 18403.126302 M	**SUPERPAVE HMA, LOW VOLUME 12.5 mm F3**
ITEM 18403.126312 M	**PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.126302 M**
ITEM 18403.196902 M	**SUPERPAVE HMA, 19.0 mm**
ITEM 18403.196912 M	**PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.196902 M**
ITEM 18403.256902 M	**SUPERPAVE HMA, 25.0 mm**
ITEM 18403.256912 M	**PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.256902 M**
ITEM 18403.376902 M	**SUPERPAVE HMA, 37.5 mm**
ITEM 18403.376912 M	**PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.376902 M**

the plant site. The Performance Graded Binder will be conditionally accepted at the supplier's source and at the plant on the basis of certification. Samples taken at the plant will be tested by the Department to determine specification compliance.

Subsection 401-2.03A. Coarse Aggregate and 401-2.03B. Blending shall be deleted and replaced with the following:

"***A.*** **Coarse Aggregates.** For 12.5 mm F3 and 9.5 mm F3 top course HMA mixtures use crushed aggregate, from an approved source, meeting one of the following descriptions:

1. Limestone having an acid insoluble residue content of not less than 20.0%, excluding particles of chert and similar siliceous rocks.

2. Dolomite (excluding Wappinger dolomite, as defined by the Department).

3. Sandstone, granite, chert, traprock, ore tailings, slag or other similar non-carbonate materials. Non-carbonate particles are defined as having a minimum acid insoluble residue content of 80.0%.

4. Gravel, or a natural or manufactured blend of the following types of materials: limestone, dolomite (including Wappinger dolomite, as defined by the Department), gravel, sandstone, granite, chert, traprock, ore tailings, slag or other similar materials, meeting the following requirements:

   12.5 mm Nominal Maximum Size Aggregate Mixes - Non-carbonate plus 3.2 mm particles must comprise a minimum of 10.0% of the total aggregate (by weight with adjustments to equivalent volumes for materials of different specific gravities). Additionally, a minimum of 20.0% of plus 9.5 mm particles must be non-carbonate.

   9.5 mm Nominal Maximum Size Aggregate Mixes - Non-carbonate plus 3.2 mm particles must comprise a minimum of 10.0% of the total aggregate (by weight with adjustments to equivalent volumes for materials of different specific gravities). Additionally, a minimum of 20.0% of plus 4.75 mm particles must be non-carbonate.

   Non-carbonate particles are defined as having a minimum acid insoluble residue content of 80.0%.

B. ***Blending.*** Where coarse aggregates for these mixes are from more than one source or of more than one type of material, they shall be proportioned and blended to provide a uniform mixture."

ITEM 18403.096302 M	SUPERPAVE HMA, LOW VOLUME 9.5 mm F3
ITEM 18403.096312 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.096302 M
ITEM 18403.126302 M	SUPERPAVE HMA, LOW VOLUME 12.5 mm F3
ITEM 18403.126312 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.126302 M
ITEM 18403.196902 M	SUPERPAVE HMA, 19.0 mm
ITEM 18403.196912 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.196902 M
ITEM 18403.256902 M	SUPERPAVE HMA, 25.0 mm
ITEM 18403.256912 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.256902 M
ITEM 18403.376902 M	SUPERPAVE HMA, 37.5 mm
ITEM 18403.376912 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.376902 M

Subsection 401-2.05 Bituminous Materials shall be deleted and replaced with the following:

"The Performance Graded Binder (PGB) used in the production of these mixes shall be defined by AASHTO Provisional Standard MP1 - Standard Specification for Performance Graded Asphalt Binder.

Acceptance of the PGB is based on the primary source appearing on the Department's Approved List for Bituminous Material Primary Sources, A. Performance Graded Binders for Paving. Acceptance of the PGB is contingent upon satisfactory test results from samples taken, as required by the Department's procedural directives, at the location where the material is incorporated into the work. A primary source is defined as a firm that samples, tests, and certifies by Production Lot that the PGB is in conformance with the specifications. The procedural directives for sampling, testing, and certifying the PGB, and for achieving and maintaining approved list status, are available from the Materials Bureau.

The PGB shall not be delivered to the HMA Production Facility at a temperature in excess of 175°C."

CONSTRUCTION DETAILS

The details of §401-3 Construction Details shall apply except as modified below:

Add the following to the end of Subsection 401-3.02 Bituminous Mixing Plant A. Requirements for All Plants No. 11:

"Y. Gyratory Compactor - A power driven gyratory compactor capable of maintaining an angle of gyration of 1.25° ± 0.02°, a speed of gyration of 30.0 rpm ± 0.5 rpm, and a consolidation pressure of 600 k Pa ± 10% for gyrations zero to five and ± 3% for gyrations six and greater. The make and model of the gyratory compactor supplied must be approved by the Director, Materials Bureau.

Z. Gyratory Specimen Mold Assembly - The specimen mold assembly consisting of the mold 150.00 mm + 0.00 mm and - 0.01 mm, base plate and top plate (if required). The minimum height of the mold is 250.00 mm. A minimum of 4 mold assemblies and an adequate supply of 150.00 mm paper discs shall be provided.

AA. Gyratory Specimen Extractor - A simple means of specimen extraction from the gyratory molds shall be supplied.

BB. Oven - A thermostatically controlled convection type oven having a minimum capacity of 0.15 cubic meters shall be supplied to preheat the *SUPERPAVE* Gyratory Compactor mold assemblies and asphalt mix samples. The oven shall have a controlled temperature range up to 190°C with a ± 3°C accuracy throughout the range.

ITEM 18403.096302 M	**SUPERPAVE HMA, LOW VOLUME 9.5 mm F3**
ITEM 18403.096312 M	**PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.096302 M**
ITEM 18403.126302 M	**SUPERPAVE HMA, LOW VOLUME 12.5 mm F3**
ITEM 18403.126312 M	**PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.126302 M**
ITEM 18403.196902 M	**SUPERPAVE HMA, 19.0 mm**
ITEM 18403.196912 M	**PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.196902 M**
ITEM 18403.256902 M	**SUPERPAVE HMA, 25.0 mm**
ITEM 18403.256912 M	**PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.256902 M**
ITEM 18403.376902 M	**SUPERPAVE HMA, 37.5 mm**
ITEM 18403.376912 M	**PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.376902 M**

CC. Kraft Paper - 23 kg medium weight, 915 mm width.

DD. Sheet Rock Taping Knives (minimum 2) - 254 mm length.

EE. Aging Pans (minimum 4) - 457 mm x 457 mm x 38 mm H galvanized iron pans.

FF. Miscellaneous Pans (minimum 4) - 394 mm x 280 mm x 51 mm H aluminum pans.

GG. Screen trays (1 each) - 457 mm x 660 mm to include the following: 2.36 mm, 1.18 mm, 0.60 mm, 0.30 mm, 0.15 mm, 0.075 mm"

Add the following to the end of §401-3 Construction Details:

"**Test Section.** Prior to paving operations for this item, construct a test section on the project site at a location approved by the Engineer, using the same equipment and procedures to be used in the construction of the remainder of the course being laid, and **stop paving** unless the Paving Option below is selected.

The amount of mixture prepared according to the job mix formula should be sufficient to construct a test section 500 centerline meters, the full width of pavement, and shall be of the same depth specified for the construction of the course which it represents. Routine paving will only begin after a Project Target Density (PTD) has been established by the Regional Materials Engineer based on testing of the pavement cores. The test section is for determining the PTD for this item and for calibration of the nuclear density gauge. The PTD will be established within one business day of the delivery of the four cores, the two loose mix samples, and the four nuclear density readings.

Note. Routine paving will only begin after a Project Target Density (PTD) has been established by the Regional Materials Engineer. Also, construction of a test section will not begin unless both a nuclear density gauge and an operator are present.

Use the first 150 linear meters of the test section to stabilize the paving operation. The remainder of the length will be used to determine the PTD. During construction of the test section, take two loose mix samples, in accordance with AASHTO T168-91. These samples will represent the material placed on this test section. At the conclusion of the test section, take four cores from the test section (exclude initial 150 meters) at locations randomly selected by the Engineer in accordance with Materials Procedure 96-01M. If coring is performed the same day as placement, cool the pavement so that the core sample is not damaged during coring. At each core location, take density readings with a nuclear density gauge(s). A nuclear density reading at each core location will be the average of the four measurements taken at 90°. Only gauge(s) calibrated during the construction of the test section will be allowed to be used during normal paving operations. Deliver the four cores, the two loose mix samples, and the four nuclear

ITEM 18403.096302 M	SUPERPAVE HMA, LOW VOLUME 9.5 mm F3
ITEM 18403.096312 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.096302 M
ITEM 18403.126302 M	SUPERPAVE HMA, LOW VOLUME 12.5 mm F3
ITEM 18403.126312 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.126302 M
ITEM 18403.196902 M	SUPERPAVE HMA, 19.0 mm
ITEM 18403.196912 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.196902 M
ITEM 18403.256902 M	SUPERPAVE HMA, 25.0 mm
ITEM 18403.256912 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.256902 M
ITEM 18403.376902 M	SUPERPAVE HMA, 37.5 mm
ITEM 18403.376912 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.376902 M

density readings to the Department Regional Laboratory. With the nuclear density readings, include gauge model number and serial number for each gauge calibrated on the test section. The Regional Materials Engineer will use the test section cores and nuclear gauge readings to establish the PTD.

Core Testing Option. The Contractor may elect to test the cores procured under this specification. The testing will be performed under provisions of Materials Procedure NY 98-01M, "Procedure for Testing Cores Taken from All Hot Mix Asphalt (HMA) Performance-Related Specifications". If the Contractor elects to test the cores, the Engineer will define one additional core from two of the sublots within 0.3 m from the original core location, at the same offset, and secure them using the "Security Procedure".

Paving Option. Paving may continue after completion of the test section using an interim PTD determined in accordance with Materials Procedure 96-01M, "Nuclear Gauge Density Data Collection and Determination of Pavement Core Locations for Rut Avoidance Asphalt Concrete". If the average density of the four cores taken on the test section is not between 92-97% of the mixture's maximum theoretical density, payment adjustments will be applied to any material placed after the test section and before the Project Target Density (PTD) has been determined by the Regional Materials Engineer. The payment adjustment will be made according to Table 1 - Density Quality Adjustment Factors."

Add the following to the end of Subsection 401-3.06 Rollers.

"The compaction equipment shall conform to the requirements of this Subsection. Control the operation of the rollers during the placement of these items including the speed, the amplitude settings, the vibration frequency, and the weight of the rollers."
Subsection 401-3.12 Compaction shall be deleted and replaced with the following:

"Immediately after the hot mix asphalt (HMA) has been spread, struck off and surface irregularities adjusted, compact the mix by rolling thoroughly and uniformly. Roll the surface when the mixture is in the proper condition and when the rolling does not cause undue displacement, cracking or shoving. Initially roll the pavement with the roller traveling parallel to the centerline of the pavement beginning at the low edge and working toward the super-elevated edge.

Use a nuclear density gauge to monitor and record the pavement density in accordance with this section and Materials Procedure 96-01M, "Nuclear Gauge Density Data Collection and Determination of Pavement Core Locations for Rut Avoidance Asphalt Concrete." The nuclear density gauge should consist of a radioactive source, scaler and other basic components housed in a single backscatter unit. The gauge must be operated by personnel trained in the principles of nuclear testing and safety practices. Only gauge(s) calibrated during the construction of the test section will be used during normal paving operation. If another nuclear gauge is to be used, a new test section must be constructed to calibrate it and to establish a new PTD.

ITEM 18403.096302 M	**SUPERPAVE HMA, LOW VOLUME 9.5 mm F3**
ITEM 18403.096312 M	**PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.096302 M**
ITEM 18403.126302 M	**SUPERPAVE HMA, LOW VOLUME 12.5 mm F3**
ITEM 18403.126312 M	**PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.126302 M**
ITEM 18403.196902 M	**SUPERPAVE HMA, 19.0 mm**
ITEM 18403.196912 M	**PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.196902 M**
ITEM 18403.256902 M	**SUPERPAVE HMA, 25.0 mm**
ITEM 18403.256912 M	**PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.256902 M**
ITEM 18403.376902 M	**SUPERPAVE HMA, 37.5 mm**
ITEM 18403.376912 M	**PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.376902 M**

Compact the pavement sufficiently to achieve a minimum density of 96% of the PTD in a single test location and 98% of the PTD calculated as a moving average of the last 10 test locations as determined by a nuclear density gauge. Take nuclear gauge readings at each site, randomly selected by the Engineer, approximately every 60 meters along the length of the pavement for each pass of the paver and record them on a BR340M.

If the average of 4 nuclear density gauge measurements taken at 90° angles over two consecutive locations falls below 96% of the PTD or if the moving average of the last 10 nuclear gauge test sites falls below 98% of the PTD, stop routine paving operations and construct a new test section. Normal production will only resume after establishing a new PTD.

Placement and compaction on shoulders, ramps, maintenance widenings, crossovers, and bridges will be deemed satisfactory by the Engineer when the procedures used in these areas are the same as those used on the mainline pavement sections. If shoulders show signs of distress at this level of compaction decrease the compactive effort until no damage occurs to the shoulder or subbase. Nuclear gauge(s) used to monitor the mainline paving should be used to monitor the above referenced areas to insure that the pavement density is between 92% to 97% of the mixture's average daily maximum theoretical density if the shoulder subbase is structurally sufficient to sustain this level of compaction.

The Engineer may require additional daily density verification consisting of four cores, nuclear density readings at each core location, and two loose mix samples on any day during routine production with adequate notice. Deliver the cores, nuclear density readings, and loose mix samples to the Department Regional Laboratory no later than the day following placement.

The following guidelines will be used by the EIC to determine when additional pavement cores should be required during routine paving.

1. **Material Subject to Payment Adjustment.**

   a. Pavement density monitoring was not performed in accordance with the specification requirements. This would include, but is not limited to: not taking the required number of density readings (either at a specific location or at the required frequency), beginning to pave without a nuclear density gauge on site, and continuing to pave after the only calibrated nuclear density gauge on site breaks down.

   b. There is a reason to believe that the nuclear density gauge readings do not accurately represent the actual in-place density of the pavement.

If the average density of the four cores is not between 92% and 97% of the mixture's average daily maximum theoretical density, a payment adjustment will be applied to the material placed on the day represented by the pavement cores. The payment adjustment will be made according to Table 1 - Density Quality Adjustment Factors.

ITEM 18403.096302 M	SUPERPAVE HMA, LOW VOLUME 9.5 mm F3
ITEM 18403.096312 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.096302 M
ITEM 18403.126302 M	SUPERPAVE HMA, LOW VOLUME 12.5 mm F3
ITEM 18403.126312 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.126302 M
ITEM 18403.196902 M	SUPERPAVE HMA, 19.0 mm
ITEM 18403.196912 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.196902 M
ITEM 18403.256902 M	SUPERPAVE HMA, 25.0 mm
ITEM 18403.256912 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.256902 M
ITEM 18403.376902 M	SUPERPAVE HMA, 37.5 mm
ITEM 18403.376912 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.376902 M

2. Material Not Subject to Payment Adjustment.

There are situations when the EIC should require pavement cores to monitor the Project Target Density (PTD) being used on the project. These situations include, but are not limited to the following: new mix design or supplier, change of existing pavement being overlaid, change of paving equipment (i.e., paver or rollers) being used, and excessive plant variation. In these situations the nuclear density gauge tests will be used for acceptance. However, a new PTD will be established if different from the original PTD.

When the rolling operation is complete there should be no visible shallow ruts, ridges, other roller marks, or irregularities in the pavement. If these imperfections are present, correct the imperfections or relay the pavement to the satisfaction of the Engineer. Perform all corrective work at no additional cost to the Department.

Correct at once any displacement occurring as a result of reversing the direction of the roller, or from other causes, by the use of rakes and addition of fresh mixture as required. Exercise care in rolling not to displace the line and grade of the edges of the bituminous mixture. To prevent adhesion of the mixture to the drum(s) of the roller, properly moisten the drum(s) with water, or water mixed with small quantities of detergent or other Department approved asphalt release compounds. If a pneumatic tire roller is used, the pneumatic drive wheels may be coated with a fine mist spray of fuel oil or other similar materials to prevent pneumatic tire pickup. In all instances, protect the surface of the pavement from drippings of fuel oil or any other solvents used in paving, compaction or cleaning operations.

Unless otherwise directed by the Engineer, compact the longitudinal joint by using one of the pneumatic drive wheels to overlap the joint in two (2) passes with the drum operating static where vibratory rollers having pneumatic drive wheels are used. If dual vibrating drum rollers are used compact the joint by overlapping the joints in two (2) passes with both drums operating static.

Along forms, curbs, headers, walls and other areas not accessible to the rollers, compact the mix thoroughly with mechanical tampers as directed by the Engineer. On depressed areas, a trench roller or small vibratory roller approved by the Engineer may be used. Cleated compression strips also may be used under the roller to transmit compression to the depressed area.

Remove any mixture that becomes loose and broken, mixed with dirt, or is in any way defective and replace with fresh hot mixture and compact to conform with the surrounding area. Correct any area showing an excess or deficiency of bituminous materials to the satisfaction of the Engineer.

If vibratory compaction equipment is used, the Contractor assumes full responsibility for the cost repairing all damage which may occur to highway components and adjacent property including buried

ITEM 18403.096302 M	SUPERPAVE HMA, LOW VOLUME 9.5 mm F3
ITEM 18403.096312 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.096302 M
ITEM 18403.126302 M	SUPERPAVE HMA, LOW VOLUME 12.5 mm F3
ITEM 18403.126312 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.126302 M
ITEM 18403.196902 M	SUPERPAVE HMA, 19.0 mm
ITEM 18403.196912 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.196902 M
ITEM 18403.256902 M	SUPERPAVE HMA, 25.0 mm
ITEM 18403.256912 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.256902 M
ITEM 18403.376902 M	SUPERPAVE HMA, 37.5 mm
ITEM 18403.376912 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.376902 M

utility and service facilities.

When multiple paving operations are utilized with material production from a single plant each paving operation will be evaluated separately.

Routine paving operations will not begin unless both a project calibrated nuclear density gauge and an operator are present.

Backfill all core holes, with a similar HMA material as was cored, as soon as possible after coring, using a procedure approved by the Engineer."

METHOD OF MEASUREMENT

The provisions of §401-4, §402-4 and §403-4, Method of Measurement shall apply including the following:

"The Department will test the cores from a test section or from any day the Engineer requests cores. If paving is continued using an interim PTD immediately after the conclusion of a test section, or if the Engineer requests additional cores on any day after the first day, full payment will be made if the average density of the four cores is between 92% and 97% of the mixture's average daily maximum theoretical density. If the average density fails to meet this limit, **the quantity placed** will be adjusted according to Table 1 - Density Quality Adjustment Factors shown below:

Table 1 - Density Quality Adjustment Factors

Average Core Density	Quality Adjustment Factor
91.0 ≤ Density < 92.0	0.95
90.0 ≤ Density < 91.0	0.90
88.0 ≤ Density < 90.0	0.85
< 88.0	0.60*

* The lot shall be evaluated by the Department to determine if it may remain in-place. The type of material produced (i.e. binder, top), the layer in which it was used, and the location of use (i.e., mainline or a non-critical area) will be primary considerations in the determination of whether the HMA can be left in-place. If the HMA cannot be left in-place it will be removed at no cost to the Department. However, if the Department determines that the HMA can be left in-place, the Quality Payment Adjustment will be calculated using a QAF of 0.60.

ITEM 18403.096302 M	**SUPERPAVE HMA, LOW VOLUME 9.5 mm F3**
ITEM 18403.096312 M	**PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.096302 M**
ITEM 18403.126302 M	**SUPERPAVE HMA, LOW VOLUME 12.5 mm F3**
ITEM 18403.126312 M	**PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.126302 M**
ITEM 18403.196902 M	**SUPERPAVE HMA, 19.0 mm**
ITEM 18403.196912 M	**PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.196902 M**
ITEM 18403.256902 M	**SUPERPAVE HMA, 25.0 mm**
ITEM 18403.256912 M	**PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.256902 M**
ITEM 18403.376902 M	**SUPERPAVE HMA, 37.5 mm**
ITEM 18403.376912 M	**PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.376902 M**

The quantity of the material subject to payment adjustments will be determined from typical sections shown in the plans. The payment adjustments will be applied to material placed on mainline but not shoulders, ramps, maintenance widenings and crossovers, and bridges."

BASIS OF PAYMENT

The provisions of subsection 403-5 Basis of Payment shall apply including the following:

"The unit bid price also includes the cost of all necessary equipment, labor and materials required in construction of the test sections, nuclear density testing, obtaining the pavement cores, filling all core holes with asphalt concrete and compacting these core holes satisfactorily to the Engineer.

Payment will be made under:

ITEM NO.	ITEM	PAY UNIT
18403.096302 M	*SUPERPAVE* HMA, LOW VOLUME 9.5 mm F3	Metric Ton
18403.096312 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.096302 M	Quality Unit
18403.126302 M	*SUPERPAVE* HMA, LOW VOLUME 12.5 mm F3	Metric Ton
18403.126312 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.126302 M	Quality Unit
18403.196902 M	*SUPERPAVE* HMA, 19.0 mm	Metric Ton
18403.196912 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.196902 M	Quality Unit
18403.256902 M	*SUPERPAVE* HMA, 25.0 mm	Metric Ton
18403.256912 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.256902 M	Quality Unit
18403.376902 M	*SUPERPAVE* HMA, 37.5 mm	Metric Ton
18403.376912 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.376902 M	Quality Unit"

ITEM 18403.097102 M	SUPERPAVE HMA, DOWNSTATE HIGH VOLUME 9.5 mm F1
ITEM 18403.097112 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.097102 M
ITEM 18403.127102 M	SUPERPAVE HMA, DOWNSTATE HIGH VOLUME 12.5 mm F1
ITEM 18403.127112 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.127102 M
ITEM 18403.197902 M	SUPERPAVE HMA, 19.0 mm
ITEM 18403.197912 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.197902 M
ITEM 18403.257902 M	SUPERPAVE HMA, 25.0 mm
ITEM 18403.257912 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.257902 M
ITEM 18403.377902 M	SUPERPAVE HMA, 37.5 mm
ITEM 18403.377912 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.377902 M

The requirements of Section 403 - Hot Mix Asphalt Concrete Pavement shall apply except as modified and/or revised below.

DESCRIPTION

This work shall consist of developing Hot Mix Asphalt pavement courses using the *SUPERPAVE* Mix Design procedure detailed in Materials Method 5.16, "*SUPERPAVE* Hot Mix Asphalt Mixture Design and Mixture Verification Procedures," in accordance with these specifications and in reasonable close conformity with the required lines, grades, thicknesses, and typical sections shown on the plans or established by the Engineer. This is a performance based specification in which the Contractor is responsible for compacting the pavement within a specified density range. Written instructions for determining pavement density are available from the Regional Materials Engineer or the Director, Materials Bureau.

MATERIALS

The materials and composition for these mixtures shall meet the requirements specified in Subsection 403-2 Materials, except as noted herein. The specific Performance Graded Binder and the Design Estimated Traffic in 80 kN ESALs will be specified by a special note in the Contract Proposal.

Subsection 401-2.02 Composition of Mixtures shall be deleted and replaced with the following:

"Formulate and submit to the Regional Materials Engineer, a *SUPERPAVE* Mix Design that satisfies the design control points listed in Table 2 - Design Control Points and does not pass through the restricted zone listed in Table 3 - Restricted Zone of Materials Method 5.16, based on the specified nominal maximum aggregate size.

If for any reason, a change in gradation or materials occurs, prepare a separate job mix formula and *SUPERPAVE* mixture design to fit each change in material or gradation. Changes in Performance Graded Binder content can be made by the Regional Director or his representative providing the resultant mixture has properties within the specified mechanical and volumetric properties.

The mixtures shall be produced, delivered to the work site, and incorporated into the work within 10°C of the temperature specified by the Contractor but within the mixing and compaction range of 120°C and 165°C. Additionally, the Performance Graded Binder shall be introduced into the pugmill at a temperature compatible with that of the aggregate as determined by the Regional Director or his representative, between the limits of 110°C and 175°C.

The aggregates shall be those approved for use by the approved job mix formula and will be accepted at the

ITEM 18403.097102 M	SUPERPAVE HMA, DOWNSTATE HIGH VOLUME 9.5 mm F1
ITEM 18403.097112 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.097102 M
ITEM 18403.127102 M	SUPERPAVE HMA, DOWNSTATE HIGH VOLUME 12.5 mm F1
ITEM 18403.127112 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.127102 M
ITEM 18403.197902 M	SUPERPAVE HMA, 19.0 mm
ITEM 18403.197912 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.197902 M
ITEM 18403.257902 M	SUPERPAVE HMA, 25.0 mm
ITEM 18403.257912 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.257902 M
ITEM 18403.377902 M	SUPERPAVE HMA, 37.5 mm
ITEM 18403.377912 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.377902 M

plant site. The Performance Graded Binder will be conditionally accepted at the supplier's source and at the plant on the basis of certification. Samples taken at the plant will be tested by the Department to determine specification compliance.

Subsection 401-2.03A. Coarse Aggregate and 401-2.03B. Blending shall be deleted and replaced with the following:

"***A.*** **Coarse Aggregates.** For 12.5 mm F1 and 9.5 mm F1 nominal maximum size top course mixtures use crushed aggregate from an approved source, meeting one of the following requirements:

1. Limestone having an acid insoluble residue content of not less than 20.0%, excluding particles of chert and similar siliceous rocks.

2. Dolomite having an acid insoluble residue content of not less than 17.0%, excluding particles of chert and similar siliceous rocks.

3. Sandstone, granite, chert, traprock, ore tailings, slag or other similar non-carbonate materials. Non-carbonate particles are defined as having a minimum acid insoluble residue content of 80.0%.

4. Gravel, or a natural or manufactured blend of the following types of materials: limestone, dolomite, gravel, sandstone, granite, chert, traprock, ore tailings, slag or other similar materials, meeting the following requirements:

   12.5 mm Nominal Maximum Size Aggregate Mixes - Non-carbonate plus 3.2 mm particles must comprise a minimum of 30.0% of the total aggregate (by weight with adjustments to equivalent volumes for materials of different specific gravities). Additionally, a minimum of 95.0% of plus 9.5 mm particles must be non-carbonate.

   9.5 mm Nominal Maximum Size Aggregate Mixes - Non-carbonate plus 3.2 mm particles must comprise a minimum of 30.0% of the total aggregate (by weight with adjustments to equivalent volumes for materials of different specific gravities). Additionally, a minimum of 95.0% of plus 4.75 mm particles must be non-carbonate.

   Non-carbonate particles are defined as having a minimum acid insoluble residue content of 80.0%.

B. ***Blending.*** Where coarse aggregates for these mixes are from more than one source or of more than one type of material, they shall be proportioned and blended to provide a uniform mixture."

Subsection 401-2.05 Bituminous Materials shall be deleted and replaced with the following:

ITEM 18403.097102 M	SUPERPAVE HMA, DOWNSTATE HIGH VOLUME 9.5 mm F1
ITEM 18403.097112 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.097102 M
ITEM 18403.127102 M	SUPERPAVE HMA, DOWNSTATE HIGH VOLUME 12.5 mm F1
ITEM 18403.127112 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.127102 M
ITEM 18403.197902 M	SUPERPAVE HMA, 19.0 mm
ITEM 18403.197912 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.197902 M
ITEM 18403.257902 M	SUPERPAVE HMA, 25.0 mm
ITEM 18403.257912 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.257902 M
ITEM 18403.377902 M	SUPERPAVE HMA, 37.5 mm
ITEM 18403.377912 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.377902 M

"The Performance Graded Binder (PGB) used in the production of these mixes shall be defined by AASHTO Provisional Standard MP1 - Standard Specification for Performance Graded Asphalt Binder.

Acceptance of the PGB is based on the primary source appearing on the Department's Approved List for Bituminous Material Primary Sources, A. Performance Graded Binder for Paving. Acceptance of the PGB is contingent upon satisfactory test results from samples taken, as required by the Department's procedural directives, at the location where the material is incorporated into the work. A primary source is defined as a firm that samples, tests, and certifies by Production Lot that the PGB is in conformance with the specifications. The procedural directives for sampling, testing, and certifying the PGB, and for achieving and maintaining approved list status, are available from the Materials Bureau.

The PGB shall not be delivered to the HMA Production Facility at a temperature in excess of 175°C."

CONSTRUCTION DETAILS

The details of §401-3 Construction Details shall apply except as modified below:

Add the following to the end of Subsection 401-3.02 Bituminous Mixing Plant A. Requirements for All Plants No. 11:

"Y. Gyratory Compactor - A power driven gyratory compactor capable of maintaining an angle of gyration of 1.25° ± 0.02°, a speed of gyration of 30.0 rpm ± 0.5 rpm, and a consolidation pressure of 600 k Pa ± 10% for gyrations zero to five and ± 3% for gyrations six and greater. The make and model of the gyratory compactor supplied must be approved by the Director, Materials Bureau.

Z. Gyratory Specimen Mold Assembly - The specimen mold assembly consisting of the mold 150.00 mm + 0.00 mm and - 0.01 mm, base plate and top plate (if required). The minimum height of the mold is 250.00 mm. A minimum of 4 mold assemblies and an adequate supply of 150.00 mm paper discs shall be provided.

AA. Gyratory Specimen Extractor - A simple means of specimen extraction from the gyratory molds shall be supplied.

BB. Oven - A thermostatically controlled convection type oven having a minimum capacity of 0.15 cubic meters shall be supplied to preheat the *SUPERPAVE* Gyratory Compactor mold assemblies and asphalt mix samples. The oven shall have a controlled temperature range up to 190°C with a ± 3°C accuracy throughout the range.

CC. Kraft Paper - 23 kg medium weight, 915 mm width.

ITEM 18403.097102 M	**SUPERPAVE HMA, DOWNSTATE HIGH VOLUME 9.5 mm F1**
ITEM 18403.097112 M	**PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.097102 M**
ITEM 18403.127102 M	**SUPERPAVE HMA, DOWNSTATE HIGH VOLUME 12.5 mm F1**
ITEM 18403.127112 M	**PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.127102 M**
ITEM 18403.197902 M	**SUPERPAVE HMA, 19.0 mm**
ITEM 18403.197912 M	**PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.197902 M**
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ITEM 18403.257912 M	**PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.257902 M**
ITEM 18403.377902 M	**SUPERPAVE HMA, 37.5 mm**
ITEM 18403.377912 M	**PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.377902 M**

DD. Sheet Rock Taping Knives (min. 2) - 254 mm length.

EE. Aging Pans (minimum 4) - 457 mm x 457 mm x 38 mm H galvanized iron pans.

FF. Miscellaneous Pans (minimum 4) - 394 mm x 280 mm x 51 mm H aluminum pans.

GG. Screen trays (1 each) - 457 mm x 660 mm to include the following: 2.36 mm, 1.18 mm, 0.60 mm, 0.30 mm, 0.15 mm, 0.075 mm"

Add the following to the end of §401-3 Construction Details:

"**Test Section.** Prior to paving operations for this item, construct a test section on the project site at a location approved by the Engineer, using the same equipment and procedures to be used in the construction of the remainder of the course being laid.

The amount of mixture prepared according to the job mix formula should be sufficient to construct a test section 500 meters long on the mainline and shall be the same depth specified for the construction of the course which it represents. Routine paving operations may begin immediately following the construction of the test section once a PTD has been determined to the satisfaction of the Engineer based the evaluation of density readings. The test section is for the purpose of determining the PTD for this item. Construction of the test section will not begin unless both an operator and a nuclear density gauge are present.

Use the first 150 linear meters of the test section to stabilize the paving operation. The remainder of the length will be used to determine the PTD. Once a sufficient amount of material has been placed in the remaining 350 linear meters of the test section compact the pavement with 2 machine passes of the breakdown roller. Perform density readings at three sites, randomly selected by the Engineer in accordance with Materials Procedure 96-01M, "Nuclear Gauge Density Data Collection and Determination of Pavement Core Locations for Rut Avoidance Asphalt Concrete." A nuclear density reading at each location will be the average of the four measurements taken at 90°. Mark these sites so that subsequent density readings can be performed at the same locations. Make additional machine passes using either the intermediate or finish roller and perform additional density readings at the three previously selected sites until the increase in density is less than 32.0 kg/m^3, or until the Engineer stops further compaction because the pavement shows signs of distress.

The Engineer will immediately determine the average of the final density measurements at the three test locations. This average density will be the PTD. Once a PTD has been established routine paving operations may begin.

Only gauge(s) calibrated during the construction of the test section will be allowed to be used during normal paving operations."

ITEM 18403.097102 M	**SUPERPAVE HMA, DOWNSTATE HIGH VOLUME 9.5 mm F1**
ITEM 18403.097112 M	**PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.097102 M**
ITEM 18403.127102 M	**SUPERPAVE HMA, DOWNSTATE HIGH VOLUME 12.5 mm F1**
ITEM 18403.127112 M	**PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.127102 M**
ITEM 18403.197902 M	**SUPERPAVE HMA, 19.0 mm**
ITEM 18403.197912 M	**PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.197902 M**
ITEM 18403.257902 M	**SUPERPAVE HMA, 25.0 mm**
ITEM 18403.257912 M	**PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.257902 M**
ITEM 18403.377902 M	**SUPERPAVE HMA, 37.5 mm**
ITEM 18403.377912 M	**PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.377902 M**

Add the following to the end of Subsection 401-3.06 Rollers.

"The compaction equipment shall conform to the requirements of this Subsection. Control the operation of the rollers during the placement of these items including the speed, the amplitude settings, the vibration frequency, and the weight of the rollers."

Subsection 401-3.12 Compaction shall be deleted and replaced with the following:

"Immediately after the hot mix asphalt (HMA) has been spread, struck off and surface irregularities adjusted, compact the mix by rolling thoroughly and uniformly. Roll the surface when the mixture is in the proper condition and when the rolling does not cause undue displacement, cracking or shoving. Initially roll the pavement with the roller traveling parallel to the centerline of the pavement beginning at the low edge and working toward the super-elevated edge.

Use a nuclear density gauge to monitor and record the pavement density in accordance with this section and Materials Procedure 96-01M, "Nuclear Gauge Density Data Collection and Determination of Pavement Core Locations for Rut Avoidance Asphalt Concrete." The nuclear density gauge should consist of a radioactive source, scaler and other basic components housed in a single backscatter unit. The gauge must be operated by personnel trained in the principles of nuclear testing and safety practices. Only gauge(s) calibrated during the construction of the test section will be used during normal paving operation. If another nuclear gauge is to be used, a new test section must be constructed to calibrate that gauge and to establish a new PTD.

Compact the pavement sufficiently to achieve a minimum density of 96% of the PTD in a single test location and 98% of the PTD calculated as a moving average of the last 10 test locations as determined by a nuclear density gauge. Take nuclear gauge readings at each site, randomly selected by the Engineer, approximately every 60 meters along the length of the pavement for each pass of the paver and record them on a BR340M.

If the average of 4 nuclear density gauge measurements taken at 90° angles over two consecutive locations falls below 96% of the PTD or if the moving average of the last 10 nuclear gauge test sites falls below 98% of the PTD, stop routine paving operations and construct a new test section. Normal production will only resume after establishing a new PTD.

Placement and compaction on shoulders, ramps, maintenance widenings, crossovers, and bridges will be deemed satisfactory by the Engineer when the procedures used in these areas are the same as those used on the mainline pavement sections. If shoulders show signs of distress at this level of compaction decrease the compactive effort until no damage occurs to the shoulder or subbase. Nuclear gauge(s) used to monitor the mainline paving should be used to monitor the above referenced areas.

ITEM 18403.097102 M	SUPERPAVE HMA, DOWNSTATE HIGH VOLUME 9.5 mm F1
ITEM 18403.097112 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.097102 M
ITEM 18403.127102 M	SUPERPAVE HMA, DOWNSTATE HIGH VOLUME 12.5 mm F1
ITEM 18403.127112 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.127102 M
ITEM 18403.197902 M	SUPERPAVE HMA, 19.0 mm
ITEM 18403.197912 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.197902 M
ITEM 18403.257902 M	SUPERPAVE HMA, 25.0 mm
ITEM 18403.257912 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.257902 M
ITEM 18403.377902 M	SUPERPAVE HMA, 37.5 mm
ITEM 18403.377912 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.377902 M

When the rolling operation is complete there should be no visible shallow ruts, ridges, other roller marks, or irregularities in the pavement. If these imperfections are present, correct the imperfections or relay the pavement to the satisfaction of the Engineer. Perform all corrective work at no additional cost to the Department.

Correct at once any displacement occurring as a result of reversing the direction of the roller, or from other causes, by the use of rakes and addition of fresh mixture as required. Exercise care in rolling not to displace the line and grade of the edges of the bituminous mixture. To prevent adhesion of the mixture to the drum(s) of the roller, properly moisten the drum(s) with water, or water mixed with small quantities of detergent or other Department approved asphalt release compounds. If a pneumatic tire roller is used, the pneumatic drive wheels may be coated with a fine mist spray of fuel oil or other similar materials to prevent pneumatic tire pickup. In all instances, protect the surface of the pavement from drippings of fuel oil or any other solvents used in paving, compaction or cleaning operations.

Unless otherwise directed by the Engineer, compact the longitudinal joint by using one of the pneumatic drive wheels to overlap the joint in two (2) passes with the drum operating static where vibratory rollers having pneumatic drive wheels are used. If dual vibrating drum rollers are used compact the joint by overlapping the joints in two (2) passes with both drums operating static.

Along forms, curbs, headers, walls and other areas not accessible to the rollers, compact the mix thoroughly with mechanical tampers as directed by the Engineer. On depressed areas, a trench roller or small vibratory roller approved by the Engineer may be used. Cleated compression strips also may be used under the roller to transmit compression to the depressed area.

Remove any mixture that becomes loose and broken, mixed with dirt, or is in any way defective and replace with fresh hot mixture and compact to conform with the surrounding area. Correct any area showing an excess or deficiency of bituminous materials to the satisfaction of the Engineer.

If vibratory compaction equipment is used, the Contractor assumes full responsibility for the cost repairing all damage which may occur to highway components and adjacent property including buried utility and service facilities.

When multiple paving operations are utilized with material production from a single plant each paving operation will be evaluated separately.

Routine paving operations will not begin unless both a project calibrated nuclear density gauge and an operator are present."

ITEM 18403.097102 M	SUPERPAVE HMA, DOWNSTATE HIGH VOLUME 9.5 mm F1
ITEM 18403.097112 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.097102 M
ITEM 18403.127102 M	SUPERPAVE HMA, DOWNSTATE HIGH VOLUME 12.5 mm F1
ITEM 18403.127112 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.127102 M
ITEM 18403.197902 M	SUPERPAVE HMA, 19.0 mm
ITEM 18403.197912 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.197902 M
ITEM 18403.257902 M	SUPERPAVE HMA, 25.0 mm
ITEM 18403.257912 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.257902 M
ITEM 18403.377902 M	SUPERPAVE HMA, 37.5 mm
ITEM 18403.377912 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.377902 M

METHOD OF MEASUREMENT

The provisions of §401-4, §402-4 and §403-4, Method of Measurement shall apply.

BASIS OF PAYMENT

The provisions of subsection 403-5 Basis of Payment shall apply including the following:

"The unit bid price also includes the cost of all necessary equipment, labor and materials required in construction of the test sections, and routine nuclear density testing.

Payment will be made under:

ITEM NO.	ITEM	PAY UNIT
18403.097102 M	*SUPERPAVE* HMA, DOWNSTATE HIGH VOLUME 9.5 mm F1	Metric Ton
18403.097112 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.097102 M	Quality Unit
18403.127102 M	*SUPERPAVE* HMA, DOWNSTATE HIGH VOLUME 12.5 mm F1	Metric Ton
18403.127112 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.127102 M	Quality Unit
18403.197902 M	*SUPERPAVE* HMA, 19.0 mm	Metric Ton
18403.197912 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.197902 M	Quality Unit
18403.257902 M	*SUPERPAVE* HMA, 25.0 mm	Metric Ton
18403.257912 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.257902 M	Quality Unit
18403.377902 M	*SUPERPAVE* HMA, 37.5 mm	Metric Ton
18403.377912 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.377902 M	Quality Unit"

ITEM 18403.097202 M	**SUPERPAVE HMA, UPSTATE HIGH VOLUME 9.5 mm F2**
ITEM 18403.097212 M	**PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.097202 M**
ITEM 18403.127202 M	**SUPERPAVE HMA, UPSTATE HIGH VOLUME 12.5 mm F2**
ITEM 18403.127212 M	**PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.127202 M**
ITEM 18403.197902 M	**SUPERPAVE HMA, 19.0 mm**
ITEM 18403.197912 M	**PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.197902 M**
ITEM 18403.257902 M	**SUPERPAVE HMA, 25.0 mm**
ITEM 18403.257912 M	**PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.257902 M**
ITEM 18403.377902 M	**SUPERPAVE HMA, 37.5 mm**
ITEM 18403.377912 M	**PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.377902 M**

The requirements of Section 403 - Hot Mix Asphalt Concrete Pavement shall apply except as modified and/or revised below.

DESCRIPTION

This work shall consist of developing Hot Mix Asphalt pavement courses using the *SUPERPAVE* Mix Design procedure detailed in Materials Method 5.16, "*SUPERPAVE* Hot Mix Asphalt Mixture Design and Mixture Verification Procedures," in accordance with these specifications and in reasonable close conformity with the required lines, grades, thicknesses, and typical sections shown on the plans or established by the Engineer. This is a performance based specification in which the Contractor is responsible for compacting the pavement within a specified density range. Written instructions for determining pavement density are available from the Regional Materials Engineer or the Director, Materials Bureau.

MATERIALS

The materials and composition for these mixtures shall meet the requirements specified in Subsection 403-2 Materials, except as noted herein. The specific Performance Graded Binder and the Design Estimated Traffic in 80 kN ESALs will be specified by a special note in the Contract Proposal.

Subsection 401-2.02 Composition of Mixtures shall be deleted and replaced with the following:

"Formulate and submit to the Regional Materials Engineer, a *SUPERPAVE* Mix Design that satisfies the design control points listed in Table 2 - Design Control Points and does not pass through the restricted zone listed in Table 3 - Restricted Zone of Materials Method 5.16, based on the specified nominal maximum aggregate size.

If for any reason, a change in gradation or materials occurs, prepare a separate job mix formula and *SUPERPAVE* mixture design to fit each change in material or gradation. Changes in Performance Graded Binder content can be made by the Regional Director or his representative providing the resultant mixture has properties within the specified mechanical and volumetric properties.

The mixtures shall be produced, delivered to the work site, and incorporated into the work within 10°C of the temperature specified by the Contractor but within the mixing and compaction range of 120°C and 165°C. Additionally, the Performance Graded Binder shall be introduced into the pugmill at a temperature compatible with that of the aggregate as determined by the Regional Director or his representative, between the limits of 110°C and 175°C.

ITEM 18403.097202 M	SUPERPAVE HMA, UPSTATE HIGH VOLUME 9.5 mm F2
ITEM 18403.097212 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.097202 M
ITEM 18403.127202 M	SUPERPAVE HMA, UPSTATE HIGH VOLUME 12.5 mm F2
ITEM 18403.127212 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.127202 M
ITEM 18403.197902 M	SUPERPAVE HMA, 19.0 mm
ITEM 18403.197912 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.197902 M
ITEM 18403.257902 M	SUPERPAVE HMA, 25.0 mm
ITEM 18403.257912 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.257902 M
ITEM 18403.377902 M	SUPERPAVE HMA, 37.5 mm
ITEM 18403.377912 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.377902 M

The aggregates shall be those approved for use by the approved job mix formula and will be accepted at the plant site. The Performance Graded Binder will be conditionally accepted at the supplier's source and at the plant on the basis of certification. Samples taken at the plant will be tested by the Department to determine specification compliance.

Subsection 401-2.03A. Coarse Aggregate and 401-2.03B. Blending shall be deleted and replaced with the following:

"***A.*** **Coarse Aggregates.** For 12.5 mm F2 and 9.5 mm F2 top course HMA mixtures use crushed aggregate, from an approved source, meeting one of the following descriptions:

1. Limestone having an acid insoluble residue content of not less than 20.0%, excluding particles of chert and similar siliceous rocks.

2. Dolomite having an acid insoluble residue content of not less than 17.0%, excluding particles of chert and similar siliceous rocks.

3. Sandstone, granite, chert, traprock, ore tailings, slag or other similar non-carbonate materials. Non-carbonate particles are defined as having a minimum acid insoluble residue content of 80.0%.

4. Gravel, or a natural or manufactured blend of the following types of materials: limestone, dolomite (excluding Wappinger dolomite, as defined by the Department), gravel, sandstone, granite, chert, traprock, ore tailings, slag or other similar materials, meeting the following requirements:

   12.5 mm Nominal Maximum Size Aggregate Mixes - Non-carbonate plus 3.2 mm particles must comprise a minimum of 10.0% of the total aggregate (by weight with adjustments to equivalent volumes for materials of different specific gravities). Additionally, a minimum of 20.0% of plus 9.5 mm particles must be non-carbonate.

   9.5 mm Nominal Maximum Size Aggregate Mixes - Non-carbonate plus 3.2 mm particles must comprise a minimum of 10.0% of the total aggregate (by weight with adjustments to equivalent volumes for materials of different specific gravities). Additionally, a minimum of 20.0% of plus 4.75 mm particles must be non-carbonate.

   Non-carbonate particles are defined as having a minimum acid insoluble residue content of 80.0%.

5. Manufactured blend of Wappinger dolomite (as defined by the Department) and the following types of materials: gravel, sandstone, granite, chert, traprock, ore tailings, slag, or other similar

ITEM 18403.097202 M	SUPERPAVE HMA, UPSTATE HIGH VOLUME 9.5 mm F2
ITEM 18403.097212 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.097202 M
ITEM 18403.127202 M	SUPERPAVE HMA, UPSTATE HIGH VOLUME 12.5 mm F2
ITEM 18403.127212 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.127202 M
ITEM 18403.197902 M	SUPERPAVE HMA, 19.0 mm
ITEM 18403.197912 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.197902 M
ITEM 18403.257902 M	SUPERPAVE HMA, 25.0 mm
ITEM 18403.257912 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.257902 M
ITEM 18403.377902 M	SUPERPAVE HMA, 37.5 mm
ITEM 18403.377912 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.377902 M

materials meeting the following requirements:

12.5 mm Nominal Maximum Size Aggregate Mixes - Non-carbonate plus 3.2mm particles must comprise a minimum of 30.0% of the total aggregate (by weight with adjustments to equivalent volumes for materials of different specific gravities). Additionally, a minimum of 95.0% of plus 9.5mm particles must be non-carbonate.

9.5 mm Nominal Maximum Size Aggregate Mixes - Non-carbonate plus 3.2 mm particles must comprise a minimum of 30.0% of the total aggregate (by weight with adjustments to equivalent volumes for materials of different specific gravities). Additionally, a minimum of 95.0% of plus 4.75 mm particles must be non-carbonate.

Non-carbonate particles are defined as having a minimum acid insoluble residue content of 80.0%.

B. *Blending.* Where coarse aggregates for these mixes are from more than one source or of more than one type of material, they shall be proportioned and blended to provide a uniform mixture."

Subsection 401-2.05 Bituminous Materials shall be deleted and replaced with the following:

"The Performance Graded Binder (PGB) used in the production of these mixes shall be defined by AASHTO Provisional Standard MP1 - Standard Specification for Performance Graded Asphalt Binder.

Acceptance of the PGB is based on the primary source appearing on the Department's Approved List for Bituminous Material Primary Sources, A. Performance Graded Binder for Paving. Acceptance of the PGB is contingent upon satisfactory test results from samples taken, as required by the Department's procedural directives, at the location where the material is incorporated into the work. A primary source is defined as a firm that samples, tests, and certifies by Production Lot that the PGB is in conformance with the specifications. The procedural directives for sampling, testing, and certifying the PGB, and for achieving and maintaining approved list status, are available from the Materials Bureau.

The PGB shall not be delivered to the HMA Production Facility at a temperature in excess of 175°C."

CONSTRUCTION DETAILS

The details of §401-3 Construction Details shall apply except as modified below:

Add the following to the end of Subsection 401-3.02 Bituminous Mixing Plant A. Requirements for All Plants
No. 11:

ITEM 18403.097202 M	SUPERPAVE HMA, UPSTATE HIGH VOLUME 9.5 mm F2
ITEM 18403.097212 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.097202 M
ITEM 18403.127202 M	SUPERPAVE HMA, UPSTATE HIGH VOLUME 12.5 mm F2
ITEM 18403.127212 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.127202 M
ITEM 18403.197902 M	SUPERPAVE HMA, 19.0 mm
ITEM 18403.197912 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.197902 M
ITEM 18403.257902 M	SUPERPAVE HMA, 25.0 mm
ITEM 18403.257912 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.257902 M
ITEM 18403.377902 M	SUPERPAVE HMA, 37.5 mm
ITEM 18403.377912 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.377902 M

"Y. Gyratory Compactor - A power driven gyratory compactor capable of maintaining an angle of gyration of 1.25° ± 0.02°, a speed of gyration of 30.0 rpm ± 0.5 rpm, and a consolidation pressure of 600 k Pa ± 10% for gyrations zero to five and ± 3% for gyrations six and greater. The make and model of the gyratory compactor supplied must be approved by the Director, Materials Bureau.

Z. Gyratory Specimen Mold Assembly - The specimen mold assembly consisting of the mold 150.00 mm + 0.00 mm and - 0.01 mm, base plate and top plate (if required). The minimum height of the mold is 250.00 mm. A minimum of 4 mold assemblies and an adequate supply of 150.00 mm paper discs shall be provided.

AA. Gyratory Specimen Extractor - A simple means of specimen extraction from the gyratory molds shall be supplied.

BB. Oven - A thermostatically controlled convection type oven having a minimum capacity of 0.15 cubic meters shall be supplied to preheat the *SUPERPAVE* Gyratory Compactor mold assemblies and asphalt mix samples. The oven shall have a controlled temperature range up to 190°C with a ± 3°C accuracy throughout the range.

CC. Kraft Paper - 23 kg medium weight, 915 mm width.

DD. Sheet Rock Taping Knives (min. 2) - 254 mm length.

EE. Aging Pans (minimum 4) - 457 mm x 457 mm x 38 mm H galvanized iron pans.

FF. Miscellaneous Pans (minimum 4) - 394 mm x 280 mm x 51 mm H aluminum pans.

GG. Screen trays (1 each) - 457 mm x 660 mm to include the following: 2.36 mm, 1.18 mm, 0.60 mm, 0.30 mm, 0.15 mm, 0.075 mm"

Add the following to the end of §401-3 Construction Details:

"**Test Section.** Prior to paving operations for this item, construct a test section on the project site at a location approved by the Engineer, using the same equipment and procedures to be used in the construction of the remainder of the course being laid.

The amount of mixture prepared according to the job mix formula should be sufficient to construct a test section 500 meters long on the mainline and shall be the same depth specified for the construction of the course which it represents. Routine paving operations may begin immediately following the construction of the test section once a PTD has been determined to the satisfaction of the Engineer based the

ITEM 18403.097202 M	**SUPERPAVE HMA, UPSTATE HIGH VOLUME 9.5 mm F2**
ITEM 18403.097212 M	**PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.097202 M**
ITEM 18403.127202 M	**SUPERPAVE HMA, UPSTATE HIGH VOLUME 12.5 mm F2**
ITEM 18403.127212 M	**PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.127202 M**
ITEM 18403.197902 M	**SUPERPAVE HMA, 19.0 mm**
ITEM 18403.197912 M	**PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.197902 M**
ITEM 18403.257902 M	**SUPERPAVE HMA, 25.0 mm**
ITEM 18403.257912 M	**PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.257902 M**
ITEM 18403.377902 M	**SUPERPAVE HMA, 37.5 mm**
ITEM 18403.377912 M	**PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.377902 M**

evaluation of density readings. The test section is for the purpose of determining the PTD for this item. Construction of the test section will not begin unless both an operator and a nuclear density gauge are present.

Use the first 150 linear meters of the test section to stabilize the paving operation. The remainder of the length will be used to determine the PTD. Once a sufficient amount of material has been placed in the remaining 350 linear meters of the test section compact the pavement with 2 machine passes of the breakdown roller. Perform density readings at three sites, randomly selected by the Engineer in accordance with Materials Procedure 96-01M, "Nuclear Gauge Density Data Collection and Determination of Pavement Core Locations for Rut Avoidance Asphalt Concrete." A nuclear density reading at each location will be the average of the four measurements taken at 90°. Mark these sites so that subsequent density readings can be performed at the same locations. Make additional machine passes using either the intermediate or finish roller and perform additional density readings at the three previously selected sites until the increase in density is less than 32.0 kg/m^3, or until the Engineer stops further compaction because the pavement shows signs of distress.

The Engineer will immediately determine the average of the final density measurements at the three test locations. This average density will be the PTD. Once a PTD has been established routine paving operations may begin.

Only gauge(s) calibrated during the construction of the test section will be allowed to be used during normal paving operations."

Add the following to the end of Subsection 401-3.06 Rollers.

"The compaction equipment shall conform to the requirements of this Subsection. Control the operation of the rollers during the placement of these items including the speed, the amplitude settings, the vibration frequency, and the weight of the rollers."

Subsection 401-3.12 Compaction shall be deleted and replaced with the following:

"Immediately after the hot mix asphalt (HMA) has been spread, struck off and surface irregularities adjusted, compact the mix by rolling thoroughly and uniformly. Roll the surface when the mixture is in the proper condition and when the rolling does not cause undue displacement, cracking or shoving. Initially roll the pavement with the roller traveling parallel to the centerline of the pavement beginning at the low edge and working toward the super-elevated edge.

Use a nuclear density gauge to monitor and record the pavement density in accordance with this section and Materials Procedure 96-01M, "Nuclear Gauge Density Data Collection and Determination of Pavement Core Locations for Rut Avoidance Asphalt Concrete." The nuclear density gauge should

consist of a radioactive source, scaler and other basic components housed in a single backscatter unit. The gauge must be operated by personnel trained in the principles of nuclear testing and safety practices. Only gauge(s) calibrated during the construction of the test section will be used during normal paving operation. If another nuclear gauge is to be used, a new test section must be constructed to calibrate that gauge and to establish a new PTD.

Compact the pavement sufficiently to achieve a minimum density of 96% of the PTD in a single test location and 98% of the PTD calculated as a moving average of the last 10 test locations as determined by a nuclear density gauge. Take nuclear gauge readings at each site, randomly selected by the Engineer, approximately every 60 meters along the length of the pavement for each pass of the paver and record them on a BR340M.

If the average of 4 nuclear density gauge measurements taken at 90° angles over two consecutive locations falls below 96% of the PTD or if the moving average of the last 10 nuclear gauge test sites falls below 98% of the PTD, stop routine paving operations and construct a new test section. Normal production will only resume after establishing a new PTD.

Placement and compaction on shoulders, ramps, maintenance widenings, crossovers, and bridges will be deemed satisfactory by the Engineer when the procedures used in these areas are the same as those used on the mainline pavement sections. If shoulders show signs of distress at this level of compaction decrease the compactive effort until no damage occurs to the shoulder or subbase. Nuclear gauge(s) used to monitor the mainline paving should be used to monitor the above referenced areas.

When the rolling operation is complete there should be no visible shallow ruts, ridges, other roller marks, or irregularities in the pavement. If these imperfections are present, correct the imperfections or relay the pavement to the satisfaction of the Engineer. Perform all corrective work at no additional cost to the Department.

Correct at once any displacement occurring as a result of reversing the direction of the roller, or from other causes, by the use of rakes and addition of fresh mixture as required. Exercise care in rolling not to displace the line and grade of the edges of the bituminous mixture. To prevent adhesion of the mixture to the drum(s) of the roller, properly moisten the drum(s) with water, or water mixed with small quantities of detergent or other Department approved asphalt release compounds. If a pneumatic tire roller is used, the pneumatic drive wheels may be coated with a fine mist spray of fuel oil or other similar materials to prevent pneumatic tire pickup. In all instances, protect the surface of the pavement from drippings of fuel oil or any other solvents used in paving, compaction or cleaning operations.

Unless otherwise directed by the Engineer, compact the longitudinal joint by using one of the pneumatic drive wheels to overlap the joint in two (2) passes with the drum operating static where vibratory rollers having pneumatic drive wheels are used. If dual vibrating drum rollers are used compact the joint by overlapping the joints in two (2) passes with both drums operating static.

Along forms, curbs, headers, walls and other areas not accessible to the rollers, compact the mix thoroughly with mechanical tampers as directed by the Engineer. On depressed areas, a trench roller or

ITEM 18403.097202 M	SUPERPAVE HMA, UPSTATE HIGH VOLUME 9.5 mm F2
ITEM 18403.097212 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.097202 M
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ITEM 18403.127212 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.127202 M
ITEM 18403.197902 M	SUPERPAVE HMA, 19.0 mm
ITEM 18403.197912 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.197902 M
ITEM 18403.257902 M	SUPERPAVE HMA, 25.0 mm
ITEM 18403.257912 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.257902 M
ITEM 18403.377902 M	SUPERPAVE HMA, 37.5 mm
ITEM 18403.377912 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.377902 M

small vibratory roller approved by the Engineer may be used. Cleated compression strips also may be used under the roller to transmit compression to the depressed area.

Remove any mixture that becomes loose and broken, mixed with dirt, or is in any way defective and replace with fresh hot mixture and compact to conform with the surrounding area. Correct any area showing an excess or deficiency of bituminous materials to the satisfaction of the Engineer.

If vibratory compaction equipment is used, the Contractor assumes full responsibility for the cost repairing all damage which may occur to highway components and adjacent property including buried utility and service facilities.

When multiple paving operations are utilized with material production from a single plant each paving operation will be evaluated separately.

Routine paving operations will not begin unless both a project calibrated nuclear density gauge and an operator are present."

METHOD OF MEASUREMENT

The provisions of §401-4, §402-4 and §403-4, Method of Measurement shall apply.

BASIS OF PAYMENT

The provisions of subsection 403-5 Basis of Payment shall apply including the following:

"The unit bid price also includes the cost of all necessary equipment, labor and materials required in construction of the test sections, and routine nuclear density testing.

Payment will be made under:

ITEM NO.	ITEM	PAY UNIT
18403.097202 M	*SUPERPAVE* HMA, UPSTATE HIGH VOLUME 9.5 mm F2	Metric Ton
18403.097212 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.097202 M	Quality Unit
18403.127202 M	*SUPERPAVE* HMA, UPSTATE HIGH VOLUME 12.5 mm F2	Metric Ton
18403.127212 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.127202 M	Quality Unit
18403.197902 M	*SUPERPAVE* HMA, 19.0 mm	Metric Ton
18403.197912 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.197902 M	Quality Unit

ITEM 18403.097202 M	**SUPERPAVE HMA, UPSTATE HIGH VOLUME 9.5 mm F2**
ITEM 18403.097212 M	**PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.097202 M**
ITEM 18403.127202 M	**SUPERPAVE HMA, UPSTATE HIGH VOLUME 12.5 mm F2**
ITEM 18403.127212 M	**PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.127202 M**
ITEM 18403.197902 M	**SUPERPAVE HMA, 19.0 mm**
ITEM 18403.197912 M	**PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.197902 M**
ITEM 18403.257902 M	**SUPERPAVE HMA, 25.0 mm**
ITEM 18403.257912 M	**PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.257902 M**
ITEM 18403.377902 M	**SUPERPAVE HMA, 37.5 mm**
ITEM 18403.377912 M	**PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.377902 M**

18403.257902 M	*SUPERPAVE* HMA, 25.0 mm	Metric Ton
18403.257912 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.257902 M	Quality Unit
18403.377902 M	*SUPERPAVE* HMA, 37.5 mm	Metric Ton
18403.377912 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.377902 M	Quality Unit"

ITEM 18403.097302 M	SUPERPAVE HMA, LOW VOLUME 9.5 mm F3
ITEM 18403.097312 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.097302 M
ITEM 18403.127302 M	SUPERPAVE HMA, LOW VOLUME 12.5 mm F3
ITEM 18403.127312 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.127302 M
ITEM 18403.197902 M	SUPERPAVE HMA, 19.0 mm
ITEM 18403.197912 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.197902 M
ITEM 18403.257902 M	SUPERPAVE HMA, 25.0 mm
ITEM 18403.257912 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.257902 M
ITEM 18403.377902 M	SUPERPAVE HMA, 37.5 mm
ITEM 18403.377912 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.377902 M

The requirements of Section 403 - Hot Mix Asphalt Concrete Pavement shall apply except as modified and/or revised below.

DESCRIPTION

This work shall consist of developing Hot Mix Asphalt pavement courses using the *SUPERPAVE* Mix Design procedure detailed in Materials Method 5.16, "*SUPERPAVE* Hot Mix Asphalt Mixture Design and Mixture Verification Procedures," in accordance with these specifications and in reasonable close conformity with the required lines, grades, thicknesses, and typical sections shown on the plans or established by the Engineer. This is a performance based specification in which the Contractor is responsible for compacting the pavement within a specified density range. Written instructions for determining pavement density are available from the Regional Materials Engineer or the Director, Materials Bureau.

MATERIALS

The materials and composition for these mixtures shall meet the requirements specified in Subsection 403-2 Materials, except as noted herein. The specific Performance Graded Binder and the Design Estimated Traffic in 80 kN ESALs will be specified by a special note in the Contract Proposal.

Subsection 401-2.02 Composition of Mixtures shall be deleted and replaced with the following:

"Formulate and submit to the Regional Materials Engineer, a *SUPERPAVE* Mix Design that satisfies the design control points listed in Table 2 - Design Control Points and does not pass through the restricted zone listed in Table 3 - Restricted Zone of Materials Method 5.16, based on the specified nominal maximum aggregate size.

If for any reason, a change in gradation or materials occurs, prepare a separate job mix formula and *SUPERPAVE* mixture design to fit each change in material or gradation. Changes in Performance Graded Binder content can be made by the Regional Director or his representative providing the resultant mixture has properties within the specified mechanical and volumetric properties.

The mixtures shall be produced, delivered to the work site, and incorporated into the work within 10°C of the temperature specified by the Contractor but within the mixing and compaction range of 120°C and 165°C. Additionally, the Performance Graded Binder shall be introduced into the pugmill at a temperature compatible with that of the aggregate as determined by the Regional Director or his representative, between the limits of 110°C and 175°C.

ITEM 18403.097302 M	**SUPERPAVE HMA, LOW VOLUME 9.5 mm F3**
ITEM 18403.097312 M	**PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.097302 M**
ITEM 18403.127302 M	**SUPERPAVE HMA, LOW VOLUME 12.5 mm F3**
ITEM 18403.127312 M	**PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.127302 M**
ITEM 18403.197902 M	**SUPERPAVE HMA, 19.0 mm**
ITEM 18403.197912 M	**PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.197902 M**
ITEM 18403.257902 M	**SUPERPAVE HMA, 25.0 mm**
ITEM 18403.257912 M	**PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.257902 M**
ITEM 18403.377902 M	**SUPERPAVE HMA, 37.5 mm**
ITEM 18403.377912 M	**PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.377902 M**

The aggregates shall be those approved for use by the approved job mix formula and will be accepted at the plant site. The Performance Graded Binder will be conditionally accepted at the supplier's source and at the plant on the basis of certification. Samples taken at the plant will be tested by the Department to determine specification compliance.

Subsection 401-2.03A. Coarse Aggregate and 401-2.03B. Blending shall be deleted and replaced with the following:

"***A.* Coarse Aggregates.** For 12.5 mm F3 and 9.5 mm F3 top course HMA mixtures use crushed aggregate, from an approved source, meeting one of the following descriptions:

1. Limestone having an acid insoluble residue content of not less than 20.0%, excluding particles of chert and similar siliceous rocks.

2. Dolomite (excluding Wappinger dolomite, as defined by the Department).

3. Sandstone, granite, chert, traprock, ore tailings, slag or other similar non-carbonate materials. Non-carbonate particles are defined as having a minimum acid insoluble residue content of 80.0%.

4. Gravel, or a natural or manufactured blend of the following types of materials: limestone, dolomite (including Wappinger dolomite, as defined by the Department), gravel, sandstone, granite, chert, traprock, ore tailings, slag or other similar materials, meeting the following requirements:

   12.5 mm Nominal Maximum Size Aggregate Mixes - Non-carbonate plus 3.2 mm particles must comprise a minimum of 10.0% of the total aggregate (by weight with adjustments to equivalent volumes for materials of different specific gravities). Additionally, a minimum of 20.0% of plus 9.5 mm particles must be non-carbonate.

   9.5 mm Nominal Maximum Size Aggregate Mixes - Non-carbonate plus 3.2 mm particles must comprise a minimum of 10.0% of the total aggregate (by weight with adjustments to equivalent volumes for materials of different specific gravities). Additionally, a minimum of 20.0% of plus 4.75 mm particles must be non-carbonate.

   Non-carbonate particles are defined as having a minimum acid insoluble residue content of 80.0%.

***B.* Blending.** Where coarse aggregates for these mixes are from more than one source or of more than one type of material, they shall be proportioned and blended to provide a uniform mixture."

ITEM 18403.097302 M	SUPERPAVE HMA, LOW VOLUME 9.5 mm F3
ITEM 18403.097312 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.097302 M
ITEM 18403.127302 M	SUPERPAVE HMA, LOW VOLUME 12.5 mm F3
ITEM 18403.127312 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.127302 M
ITEM 18403.197902 M	SUPERPAVE HMA, 19.0 mm
ITEM 18403.197912 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.197902 M
ITEM 18403.257902 M	SUPERPAVE HMA, 25.0 mm
ITEM 18403.257912 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.257902 M
ITEM 18403.377902 M	SUPERPAVE HMA, 37.5 mm
ITEM 18403.377912 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.377902 M

Subsection 401-2.05 Bituminous Materials shall be deleted and replaced with the following:

"The Performance Graded Binder (PGB) used in the production of these mixes shall be defined by AASHTO Provisional Standard MP1 - Standard Specification for Performance Graded Asphalt Binder.

Acceptance of the PGB is based on the primary source appearing on the Department's Approved List for Bituminous Material Primary Sources, A. Performance Graded Binder for Paving. Acceptance of the PGB is contingent upon satisfactory test results from samples taken, as required by the Department's procedural directives, at the location where the material is incorporated into the work. A primary source is defined as a firm that samples, tests, and certifies by Production Lot that the PGB is in conformance with the specifications. The procedural directives for sampling, testing, and certifying the PGB, and for achieving and maintaining approved list status, are available from the Materials Bureau.

The PGB shall not be delivered to the HMA Production Facility at a temperature in excess of 175°C."

CONSTRUCTION DETAILS

The details of §401-3 Construction Details shall apply except as modified below:

Add the following to the end of Subsection 401-3.02 Bituminous Mixing Plant A. Requirements for All Plants No. 11:

"Y. Gyratory Compactor - A power driven gyratory compactor capable of maintaining an angle of gyration of 1.25° ± 0.02°, a speed of gyration of 30.0 rpm ± 0.5 rpm, and a consolidation pressure of 600 k Pa ± 10% for gyrations zero to five and ± 3% for gyrations six and greater. The make and model of the gyratory compactor supplied must be approved by the Director, Materials Bureau.

Z. Gyratory Specimen Mold Assembly - The specimen mold assembly consisting of the mold 150.00 mm + 0.00 mm and - 0.01 mm, base plate and top plate (if required). The minimum height of the mold is 250.00 mm. A minimum of 4 mold assemblies and an adequate supply of 150.00 mm paper discs shall be provided.

AA. Gyratory Specimen Extractor - A simple means of specimen extraction from the gyratory molds shall be supplied.

BB. Oven - A thermostatically controlled convection type oven having a minimum capacity of 0.15 cubic meters shall be supplied to preheat the *SUPERPAVE* Gyratory Compactor mold assemblies and asphalt mix samples. The oven shall have a controlled temperature range up to 190°C with a ± 3°C accuracy throughout the range.

ITEM 18403.097302 M	**SUPERPAVE HMA, LOW VOLUME 9.5 mm F3**
ITEM 18403.097312 M	**PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.097302 M**
ITEM 18403.127302 M	**SUPERPAVE HMA, LOW VOLUME 12.5 mm F3**
ITEM 18403.127312 M	**PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.127302 M**
ITEM 18403.197902 M	**SUPERPAVE HMA, 19.0 mm**
ITEM 18403.197912 M	**PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.197902 M**
ITEM 18403.257902 M	**SUPERPAVE HMA, 25.0 mm**
ITEM 18403.257912 M	**PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.257902 M**
ITEM 18403.377902 M	**SUPERPAVE HMA, 37.5 mm**
ITEM 18403.377912 M	**PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.377902 M**

CC. Kraft Paper - 23 kg medium weight, 915 mm width.

DD. Sheet Rock Taping Knives (min. 2) - 254 mm length.

EE. Aging Pans (minimum 4) - 457 mm x 457 mm x 38 mm H galvanized iron pans.

FF. Miscellaneous Pans (minimum 4) - 394 mm x 280 mm x 51 mm H aluminum pans.

GG. Screen trays (1 each) - 457 mm x 660 mm to include the following: 2.36 mm, 1.18 mm, 0.60 mm, 0.30 mm, 0.15 mm, 0.075 mm"

Add the following to the end of §401-3 Construction Details:

"**Test Section.** Prior to paving operations for this item, construct a test section on the project site at a location approved by the Engineer, using the same equipment and procedures to be used in the construction of the remainder of the course being laid.

The amount of mixture prepared according to the job mix formula should be sufficient to construct a test section 500 meters long on the mainline and shall be the same depth specified for the construction of the course which it represents. Routine paving operations may begin immediately following the construction of the test section once a PTD has been determined to the satisfaction of the Engineer based the evaluation of density readings. The test section is for the purpose of determining the PTD for this item. Construction of the test section will not begin unless both an operator and a nuclear density gauge are present.

Use the first 150 linear meters of the test section to stabilize the paving operation. The remainder of the length will be used to determine the PTD. Once a sufficient amount of material has been placed in the remaining 350 linear meters of the test section compact the pavement with 2 machine passes of the breakdown roller. Perform density readings at three sites, randomly selected by the Engineer in accordance with Materials Procedure 96-01M, "Nuclear Gauge Density Data Collection and Determination of Pavement Core Locations for Rut Avoidance Asphalt Concrete." A nuclear density reading at each location will be the average of the four measurements taken at 90°. Mark these sites so that subsequent density readings can be performed at the same locations. Make additional machine passes using either the intermediate or finish roller and perform additional density readings at the three previously selected sites until the increase in density is less than 32.0 kg/m^3, or until the Engineer stops further compaction because the pavement shows signs of distress.

The Engineer will immediately determine the average of the final density measurements at the three test locations. This average density will be the PTD. Once a PTD has been established routine paving

ITEM 18403.097302 M	SUPERPAVE HMA, LOW VOLUME 9.5 mm F3
ITEM 18403.097312 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.097302 M
ITEM 18403.127302 M	SUPERPAVE HMA, LOW VOLUME 12.5 mm F3
ITEM 18403.127312 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.127302 M
ITEM 18403.197902 M	SUPERPAVE HMA, 19.0 mm
ITEM 18403.197912 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.197902 M
ITEM 18403.257902 M	SUPERPAVE HMA, 25.0 mm
ITEM 18403.257912 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.257902 M
ITEM 18403.377902 M	SUPERPAVE HMA, 37.5 mm
ITEM 18403.377912 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.377902 M

operations may begin.

Only gauge(s) calibrated during the construction of the test section will be allowed to be used during normal paving operations."

Add the following to the end of Subsection 401-3.06 Rollers.

"The compaction equipment shall conform to the requirements of this Subsection. Control the operation of the rollers during the placement of these items including the speed, the amplitude settings, the vibration frequency, and the weight of the rollers."

Subsection 401-3.12 Compaction shall be deleted and replaced with the following:

"Immediately after the hot mix asphalt (HMA) has been spread, struck off and surface irregularities adjusted, compact the mix by rolling thoroughly and uniformly. Roll the surface when the mixture is in the proper condition and when the rolling does not cause undue displacement, cracking or shoving. Initially roll the pavement with the roller traveling parallel to the centerline of the pavement beginning at the low edge and working toward the super-elevated edge.

Use a nuclear density gauge to monitor and record the pavement density in accordance with this section and Materials Procedure 96-01M, "Nuclear Gauge Density Data Collection and Determination of Pavement Core Locations for Rut Avoidance Asphalt Concrete." The nuclear density gauge should consist of a radioactive source, scaler and other basic components housed in a single backscatter unit. The gauge must be operated by personnel trained in the principles of nuclear testing and safety practices. Only gauge(s) calibrated during the construction of the test section will be used during normal paving operation. If another nuclear gauge is to be used, a new test section must be constructed to calibrate that gauge and to establish a new PTD.

Compact the pavement sufficiently to achieve a minimum density of 96% of the PTD in a single test location and 98% of the PTD calculated as a moving average of the last 10 test locations as determined by a nuclear density gauge. Take nuclear gauge readings at each site, randomly selected by the Engineer, approximately every 60 meters along the length of the pavement for each pass of the paver and record them on a BR340M.

If the average of 4 nuclear density gauge measurements taken at 90° angles over two consecutive locations falls below 96% of the PTD or if the moving average of the last 10 nuclear gauge test sites falls below 98% of the PTD, stop routine paving operations and construct a new test section. Normal production will only resume after establishing a new PTD.

Placement and compaction on shoulders, ramps, maintenance widenings, crossovers, and bridges will be deemed satisfactory by the Engineer when the procedures used in these areas are the same as those used on the mainline pavement sections. If shoulders show signs of distress at this level of compaction

ITEM 18403.097302 M	**SUPERPAVE HMA, LOW VOLUME 9.5 mm F3**
ITEM 18403.097312 M	**PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.097302 M**
ITEM 18403.127302 M	**SUPERPAVE HMA, LOW VOLUME 12.5 mm F3**
ITEM 18403.127312 M	**PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.127302 M**
ITEM 18403.197902 M	**SUPERPAVE HMA, 19.0 mm**
ITEM 18403.197912 M	**PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.197902 M**
ITEM 18403.257902 M	**SUPERPAVE HMA, 25.0 mm**
ITEM 18403.257912 M	**PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.257902 M**
ITEM 18403.377902 M	**SUPERPAVE HMA, 37.5 mm**
ITEM 18403.377912 M	**PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.377902 M**

decrease the compactive effort until no damage occurs to the shoulder or subbase. Nuclear gauge(s) used to monitor the mainline paving should be used to monitor the above referenced areas.

When the rolling operation is complete there should be no visible shallow ruts, ridges, other roller marks, or irregularities in the pavement. If these imperfections are present, correct the imperfections or relay the pavement to the satisfaction of the Engineer. Perform all corrective work at no additional cost to the Department.

Correct at once any displacement occurring as a result of reversing the direction of the roller, or from other causes, by the use of rakes and addition of fresh mixture as required. Exercise care in rolling not to displace the line and grade of the edges of the bituminous mixture. To prevent adhesion of the mixture to the drum(s) of the roller, properly moisten the drum(s) with water, or water mixed with small quantities of detergent or other Department approved asphalt release compounds. If a pneumatic tire roller is used, the pneumatic drive wheels may be coated with a fine mist spray of fuel oil or other similar materials to prevent pneumatic tire pickup. In all instances, protect the surface of the pavement from drippings of fuel oil or any other solvents used in paving, compaction or cleaning operations.

Unless otherwise directed by the Engineer, compact the longitudinal joint by using one of the pneumatic drive wheels to overlap the joint in two (2) passes with the drum operating static where vibratory rollers having pneumatic drive wheels are used. If dual vibrating drum rollers are used compact the joint by overlapping the joints in two (2) passes with both drums operating static.

Along forms, curbs, headers, walls and other areas not accessible to the rollers, compact the mix thoroughly with mechanical tampers as directed by the Engineer. On depressed areas, a trench roller or small vibratory roller approved by the Engineer may be used. Cleated compression strips also may be used under the roller to transmit compression to the depressed area.

Remove any mixture that becomes loose and broken, mixed with dirt, or is in any way defective and replace with fresh hot mixture and compact to conform with the surrounding area. Correct any area showing an excess or deficiency of bituminous materials to the satisfaction of the Engineer.

If vibratory compaction equipment is used, the Contractor assumes full responsibility for the cost repairing all damage which may occur to highway components and adjacent property including buried utility and service facilities.

When multiple paving operations are utilized with material production from a single plant each paving operation will be evaluated separately.

Routine paving operations will not begin unless both a project calibrated nuclear density gauge and an operator are present."

ITEM 18403.097302 M	SUPERPAVE HMA, LOW VOLUME 9.5 mm F3
ITEM 18403.097312 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.097302 M
ITEM 18403.127302 M	SUPERPAVE HMA, LOW VOLUME 12.5 mm F3
ITEM 18403.127312 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.127302 M
ITEM 18403.197902 M	SUPERPAVE HMA, 19.0 mm
ITEM 18403.197912 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.197902 M
ITEM 18403.257902 M	SUPERPAVE HMA, 25.0 mm
ITEM 18403.257912 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.257902 M
ITEM 18403.377902 M	SUPERPAVE HMA, 37.5 mm
ITEM 18403.377912 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.377902 M

METHOD OF MEASUREMENT

The provisions of §401-4, §402-4 and §403-4, Method of Measurement shall apply.

BASIS OF PAYMENT

The provisions of subsection 403-5 Basis of Payment shall apply including the following:

"The unit bid price also includes the cost of all necessary equipment, labor and materials required in construction of the test sections, and routine nuclear density testing.

Payment will be made under:

ITEM NO.	ITEM	PAY UNIT
18403.097302 M	*SUPERPAVE* HMA, LOW VOLUME 9.5 mm F3	Metric Ton
18403.097312 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.097302 M	Quality Unit
18403.127302 M	*SUPERPAVE* HMA, LOW VOLUME 12.5 mm F3	Metric Ton
18403.127312 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.127302 M	Quality Unit
18403.197902 M	*SUPERPAVE* HMA, 19.0 mm	Metric Ton
18403.197912 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.197902 M	Quality Unit
18403.257902 M	*SUPERPAVE* HMA, 25.0 mm	Metric Ton
18403.257912 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.257902 M	Quality Unit
18403.377902 M	*SUPERPAVE* HMA, 37.5 mm	Metric Ton
18403.377912 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.377902 M	Quality Unit"

ITEM 18403.098902 M	**SUPERPAVE HMA, SHOULDER COURSE 9.5 mm**
ITEM 18403.098912 M	**PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.098902 M**
ITEM 18403.128902 M	**SUPERPAVE HMA, SHOULDER COURSE 12.5 mm**
ITEM 18403.128912 M	**PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.128902 M**

The requirements of Section 403 - Hot Mix Asphalt Concrete Pavement shall apply except as modified and/or revised below.

DESCRIPTION

This work shall consist of developing Hot Mix Asphalt pavement courses using the *SUPERPAVE* Mix Design procedure detailed in Materials Method 5.16, "*SUPERPAVE* Hot Mix Asphalt Mixture Design and Mixture Verification Procedures," in accordance with these specifications and in reasonable close conformity with the required lines, grades, thicknesses, and typical sections shown on the plans or established by the Engineer. This is a performance based specification in which the Contractor is responsible for compacting the pavement within a specified density range. Written instructions for determining pavement density are available from the Regional Materials Engineer or the Director, Materials Bureau.

MATERIALS

The materials and composition for these mixtures shall meet the requirements specified in Subsection 403-2 Materials, except as noted herein. The specific Performance Graded Binder and the Design Estimated Traffic in 80 kN ESALs will be specified by a special note in the Contract Proposal.

Subsection 401-2.02 Composition of Mixtures shall be deleted and replaced with the following:

"Formulate and submit to the Regional Materials Engineer, a *SUPERPAVE* Mix Design that satisfies the design control points listed in Table 2 - Design Control Points and does not pass through the restricted zone listed in Table 3 - Restricted Zone of Materials Method 5.16, based on the specified nominal maximum aggregate size.

If for any reason, a change in gradation or materials occurs, prepare a separate job mix formula and *SUPERPAVE* mixture design to fit each change in material or gradation. Changes in Performance Graded Binder content can be made by the Regional Director or his representative providing the resultant mixture has properties within the specified mechanical and volumetric properties.

The mixtures shall be produced, delivered to the work site, and incorporated into the work within 10°C of the temperature specified by the Contractor but within the mixing and compaction range of 120°C and 175°C. Additionally, the Performance Graded Binder shall be introduced into the pugmill at a temperature compatible with that of the aggregate as determined by the Regional Director or his representative, between the limits of 110°C and 175°C.

The aggregates shall be those approved for use by the approved job mix formula and will be accepted at the plant site. The Performance Graded Binder will be conditionally accepted at the supplier's source and at the plant on the basis of certification. Samples taken at the plant will be tested by the Department to determine specification compliance. The gradation of the plant mixed material will be tested to determine compliance with the job mix formula during the production of the material. The plant mixed material will be accepted after blending and mixing at the plant. The pavement courses will be accepted after all paving operations are completed.

ITEM 18403.098902 M	**SUPERPAVE HMA, SHOULDER COURSE 9.5 mm**
ITEM 18403.098912 M	**PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.098902 M**
ITEM 18403.128902 M	**SUPERPAVE HMA, SHOULDER COURSE 12.5 mm**
ITEM 18403.128912 M	**PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.128902 M**

Subsection 401-2.05 Bituminous Materials shall be deleted and replaced with the following:

"The Performance Graded Binder (PGB) used in the production of these mixes shall be defined by AASHTO Provisional Standard MP1 - Standard Specification for Performance Graded Asphalt Binder.

Acceptance of the PGB is based on the primary source appearing on the Department's Approved List for Bituminous Material Primary Sources, A. Asphalt Cements for Paving. Acceptance of the PGB is contingent upon satisfactory test results from samples taken, as required by the Department's procedural directives, at the location where the material is incorporated into the work. A primary source is defined as a firm that samples, tests, and certifies by Production Lot that the PGB is in conformance with the specifications. The procedural directives for sampling, testing, and certifying the PGB, and for achieving and maintaining approved list status, are available from the Materials Bureau.

The PGB shall not be delivered to the HMA Production Facility at a temperature in excess of 175°C."

CONSTRUCTION DETAILS

The details of §401-3 Construction Details shall apply except as modified below:

Add the following to the end of Subsection 401-3.02 Bituminous Mixing Plant A. Requirements for All Plants No. 11:

"Y. Gyratory Compactor - A power driven gyratory compactor capable of maintaining an angle of gyration of 1.25° ± 0.02°, a speed of gyration of 30.0 rpm ± 0.5 rpm, and a consolidation pressure of 600 k Pa ± 10% for gyrations zero to five and ± 3% for gyrations six and greater. The make and model of the gyratory compactor supplied must be approved by the Director, Materials Bureau.

Z. Gyratory Specimen Mold Assembly - The specimen mold assembly consisting of the mold 150.00 mm + 0.00 mm and - 0.01 mm, base plate and top plate (if required). The minimum height of the mold is 250.00 mm. A minimum of 4 mold assemblies and an adequate supply of 150.00 mm paper discs shall be provided.

AA. Gyratory Specimen Extractor - A simple means of specimen extraction from the gyratory molds shall be supplied.

BB. Oven - A thermostatically controlled convection type oven having a minimum capacity of 0.15 cubic meters shall be supplied to preheat the *SUPERPAVE* Gyratory Compactor mold assemblies and asphalt mix samples. The oven shall have a controlled temperature range up to 190°C with a ± 3°C accuracy throughout the range.

CC. Kraft Paper - 23 kg medium weight, 915 mm width.

DD. Sheet Rock Taping Knives (minimum 2) - 254 mm length.

EE. Aging Pans (minimum 4) - 457 mm x 457 mm x 38 mm H galvanized iron pans.

FF. Miscellaneous Pans (minimum 4) - 394 mm x 280 mm x 51 mm H aluminum pans.

GG. Screen trays (1 each) - 457 mm x 660 mm to include the following: 2.36 mm, 1.18 mm, 0.60 mm, 0.30 mm, 0.15 mm, 0.075 mm."

Add the following to the end of §401-3:

"**Test Section**. Prior to paving operations for this item, construct a test section on the project site at a location approved by the Engineer, using the same equipment and procedures to be used in the construction of the remainder of the course being laid.

The amount of mixture prepared according to the job mix formula should be sufficient to construct a test section 500 meters long on the mainline and shall be the same depth specified for the construction of the course which it represents. Routine paving operations may begin immediately following the construction of the test section once a PTD has been determined to the satisfaction of the Engineer based the evaluation of density readings. The test section is for the purpose of determining the PTD for this item. Construction of the test section will not begin unless both an operator and a nuclear density gauge are present.

Use the first 150 linear meters of the test section to stabilize the paving operation. The remainder of the length will be used to determine the PTD. Once a sufficient amount of material has been placed in the remaining 350 linear meters of the test section compact the pavement with 2 machine passes of the breakdown roller. Perform density readings at three sites, randomly selected by the Engineer in accordance with Materials Procedure 96-01M, "Nuclear Gauge Density Data Collection and Determination of Pavement Core Locations for Rut Avoidance Asphalt Concrete." A nuclear density reading at each location will be the average of the four measurements taken at 90°. Mark these sites so that subsequent density readings can be performed at the same locations. Make additional machine passes using either the intermediate or finish roller and perform additional density readings at the three previously selected sites until the increase in density is less than 32.0 kg/m^3, or until the Engineer stops further compaction because the pavement shows signs of distress.

The Engineer will immediately determine the average of the final density measurements at the three test locations. This average density will be the PTD. Once a PTD has been established routine paving operations may begin.

Only gauge(s) calibrated during the construction of the test section will be allowed to be used during normal paving operations."

Add the following to the end of Subsection 401-3.06 Rollers.

"The compaction equipment shall conform to the requirements of this Subsection. Control the operation of the rollers during the placement of these items including the speed, the amplitude settings, the vibration frequency, and the weight of the rollers."

Subsection 401-3.12 Compaction shall be deleted and replaced with the following:

"Immediately after the hot mix asphalt (HMA) has been spread, struck off and surface irregularities adjusted, compact the mix by rolling thoroughly and uniformly. Roll the surface when the mixture is in the

proper condition and when the rolling does not cause undue displacement, cracking or shoving. Initially roll the pavement with the roller traveling parallel to the centerline of the pavement beginning at the low edge and working toward the super-elevated edge. The types of rollers used, the number of rollers used, and the number of roller passes made will be at your discretion.

Use a nuclear density gauge to monitor and record the pavement density in accordance with this section and Materials Procedure 96-01M, Nuclear Gauge Density Data Collection and Determination of Pavement Core Locations for Rut Avoidance Asphalt Concrete." The nuclear density gauge should consist of a radioactive source, scaler and other basic components housed in a single backscatter unit. The gauge must be operated by personnel trained in the principles of nuclear testing and safety practices. Only gauge(s) calibrated during the construction of the test section will be used during normal paving operation. If another nuclear gauge is to be used, a new test section must be constructed to calibrate that gauge and to establish a new PTD.

Compact the pavement sufficiently to achieve a minimum density of 96% of the PTD in a single test location and 98% of the PTD calculated as a moving average of the last 10 test locations as determined by a nuclear density gauge. Take nuclear gauge readings at each site, randomly selected by the Engineer, approximately every 60 meters along the length of the pavement for each pass of the paver and record them on a BR340M.

If the average of 4 nuclear density gauge measurements taken at 90° angles over two consecutive locations falls below 96% of the PTD or if the moving average of the last 10 nuclear gauge test sites falls below 98% of the PTD, stop routine paving operations and construct a new test section. Normal production will only resume after establishing a new PTD.

Placement and compaction on shoulders, ramps, maintenance widenings, crossovers, and bridges will be deemed satisfactory by the Engineer when the procedures used in these areas are the same as those used on the mainline pavement sections. If shoulders show signs of distress at this level of compaction decrease the compactive effort until no damage occurs to the shoulder or subbase. Nuclear gauge(s) used to monitor the mainline paving should be used to monitor the above referenced areas.

When the rolling operation is complete there should be no visible shallow ruts, ridges, other roller marks, or irregularities in the pavement. If these imperfections are present, correct the imperfections or relay the pavement to the satisfaction of the Engineer. Perform all corrective work at no additional cost to the Department.

Correct at once any displacement occurring as a result of reversing the direction of the roller, or from other causes, by the use of rakes and addition of fresh mixture as required. Exercise care in rolling not to displace the line and grade of the edges of the bituminous mixture. To prevent adhesion of the mixture to the drum(s) of the roller, properly moisten the drum(s) with water, or water mixed with small quantities of detergent or other Department approved asphalt release compounds. If a pneumatic tire roller is used, the pneumatic drive wheels may be coated with a fine mist spray of fuel oil or other similar materials to prevent pneumatic tire pickup. In all instances, protect the surface of the pavement from drippings of fuel oil or any other solvents used in paving, compaction or cleaning operations.

Unless otherwise directed by the Engineer, compact the longitudinal joint by using one of the pneumatic

drive wheels to overlap the joint in two (2) passes with the drum operating static where vibratory rollers having pneumatic drive wheels are used. If dual vibrating drum rollers are used compact the joint by overlapping the joints in two (2) passes with both drums operating static.

Along forms, curbs, headers, walls and other areas not accessible to the rollers, compact the mix thoroughly with mechanical tampers as directed by the Engineer. On depressed areas, a trench roller or small vibratory roller approved by the Engineer may be used. Cleated compression strips also may be used under the roller to transmit compression to the depressed area.

Remove any mixture that becomes loose and broken, mixed with dirt, or is in any way defective and replace with fresh hot mixture and compact to conform with the surrounding area. Correct any area showing an excess or deficiency of bituminous materials to the satisfaction of the Engineer.

If vibratory compaction equipment is used, the Contractor assumes full responsibility for the cost repairing all damage which may occur to highway components and adjacent property including buried utility and service facilities.

When multiple paving operations are utilized with material production from a single plant each paving operation will be evaluated separately.

Routine paving operations will not begin unless both a project calibrated nuclear density gauge and an operator are present."

METHOD OF MEASUREMENT

The provisions of §401-4, §402-4 and §403-4, Method of Measurement shall apply.

BASIS OF PAYMENT

The provisions of subsection 403-5 Basis of Payment shall apply including the following::

"The unit bid price also includes the cost of all necessary equipment, labor and materials required in construction of the test sections, and routine nuclear density testing.

Payment will be made under:

ITEM NO.	ITEM	PAY UNIT
18403.098902 M	*SUPERPAVE* HMA, Shoulder Course 9.5 mm	Metric Ton
18403.098912 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.098902 M	Quality Unit
18403.128902 M	*SUPERPAVE* HMA, Shoulder Course 12.5 mm	Metric Ton
18403.128912 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.128902 M	Quality Unit"

ITEM 18403.218902 M **SUPERPAVE HMA, TRUING AND LEVELING**
ITEM 18403.218912 M **PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.218902 M**

The requirements of Section 403 - Hot Mix Asphalt Concrete Pavement shall apply except as modified and/or revised below.

DESCRIPTION

This work shall consist of developing Hot Mix Asphalt pavement courses using the *SUPERPAVE* Mix Design procedure in accordance with these specifications and in reasonable close conformity with the required lines, grades, thicknesses, and typical sections shown on the plans or established by the Engineer. This is a performance based specification in which the Contractor is responsible for compacting the pavement within a specified density range. Written instructions for determining pavement density are available from the Regional Materials Engineer or the Director, Materials Bureau.

MATERIALS

The materials and composition for these mixtures shall meet the requirements specified in Subsection 403-2 Materials, except as noted herein. The specific Performance Graded Binder and the Design Estimated Traffic in 80 kN ESALs will be specified by a special note in the Contract Proposal.

Subsection 401-2.02 Composition of Mixtures shall be deleted and replaced with the following:

"Formulate and submit to the Regional Materials Engineer, a *SUPERPAVE* Mix Design that satisfies the design control points listed in Table 2 - Design Control Points and does not pass through the restricted zone listed in Table 3 - Restricted Zone of Materials Method 5.16, based on the specified nominal maximum aggregate size.

If for any reason, a change in gradation or materials occurs, prepare a separate job mix formula and *SUPERPAVE* mixture design to fit each change in material or gradation. Changes in Performance Graded Binder content can be made by the Regional Director or his representative providing the resultant mixture has properties within the specified mechanical and volumetric properties.

The mixtures shall be produced, delivered to the work site, and incorporated into the work within 10°C of the temperature specified by the Engineer but within the mixing and compaction range of 120°C and 165°C. Additionally, the Performance Graded Binder shall be introduced into the pugmill at a temperature compatible with that of the aggregate as determined by the Regional Director or his representative, between the limits of 110°C and 175°C.

The aggregates shall be those approved for use by the approved job mix formula and will be accepted at the plant site. The Performance Graded Binder will be conditionally accepted at the supplier's source and at the plant on the basis of certification. Samples taken at the plant will be tested by the Department to determine specification compliance. The gradation of the plant mixed material will be tested to determine compliance with the job mix formula during the production of the material. The plant mixed material will be accepted after blending and mixing at the plant. The pavement courses will be accepted after all paving operations are completed.

Subsection 401-2.05 Bituminous Materials shall be deleted and replaced with the following:

"The Performance Graded Binder (PGB) used in the production of these mixes shall be defined by AASHTO Provisional Standard MP1 - Standard Specification for Performance Graded Asphalt Binder.

Acceptance of the PGB is based on the primary source appearing on the Department's Approved List for Bituminous Material Primary Sources, A. Asphalt Cements for Paving. Acceptance of the PGB is contingent upon satisfactory test results from samples taken, as required by the Department's procedural directives, at the location where the material is incorporated into the work. A primary source is defined as a firm that samples, tests, and certifies by Production Lot that the PGB is in conformance with the specifications. The procedural directives for sampling, testing, and certifying the PGB, and for achieving and maintaining approved list status, are available from the Materials Bureau."

CONSTRUCTION DETAILS

The details of §401-3 Construction Details shall apply except as modified below:

Prior to paving operations for this item, construct a test section, as detailed in "Test Section" in this specification, on the project site at a location approved by the Engineer, using the same equipment and procedures to be used in the construction of the remainder of the course being laid. Routine paving operations may begin immediately following the construction of the test section once a Project Target Density (PTD) has been determined by the Engineer.

Add the following to the end of Subsection 401-3.02 Bituminous Mixing Plant A. Requirements for All Plants No. 11:

"Y. Gyratory Compactor - A power driven gyratory compactor capable of maintaining an angle of gyration of 1.25° ± 0.02°, a speed of gyration of 30.0 rpm ± 0.5 rpm, and a consolidation pressure of 600 k Pa ± 10% for gyrations zero to five and ± 3% for gyrations six and greater. The make and model of the gyratory compactor supplied must be approved by the Director, Materials Bureau.

Z. Gyratory Specimen Mold Assembly - The specimen mold assembly consisting of the mold 150.00 mm + 0.00 mm and - 0.01 mm, base plate and top plate (if required). The minimum height of the mold is 250.00 mm. A minimum of 4 mold assemblies and an adequate supply of 150.00 mm paper discs shall be provided.

AA. Gyratory Specimen Extractor - A simple means of specimen extraction from the gyratory molds shall be supplied.

BB. Oven - A thermostatically controlled convection type oven having a minimum capacity of 0.15 cubic meters shall be supplied to preheat the *SUPERPAVE* Gyratory Compactor mold assemblies and asphalt mix samples. The oven shall have a controlled temperature range up to 190°C with a ± 3°C accuracy throughout the range.

CC. Kraft Paper - 23 kg medium weight, 915 mm width.

DD. Sheet Rock Taping Knives (minimum 2) - 254 mm length.

EE. Aging Pans (minimum 4) - 457 mm x 457 mm x 38 mm H galvanized iron pans.

FF. Miscellaneous Pans (minimum 4) - 394 mm x 280 mm x 51 mm H aluminum pans.

GG. Screen trays (1 each) - 457 mm x 660 mm to include the following: 2.36 mm, 1.18 mm, 0.60 mm, 0.30 mm, 0.15 mm, 0.075 mm."

Add the following to the end of Subsection 401-3.06 Rollers.

"The compaction equipment shall conform to the requirements of this Subsection. Control the operation of the rollers during the placement of these items including the speed, the amplitude settings, the vibration frequency, and the weight of the rollers."

Subsection 401-3.12 Compaction shall be deleted and replaced with the following:

"Immediately after the hot mix asphalt (HMA) has been spread, struck off and surface irregularities adjusted, compact the mix by rolling thoroughly and uniformly. Roll the surface when the mixture is in the proper condition and when the rolling does not cause undue displacement, cracking or shoving. Initially roll the pavement with the roller traveling parallel to the centerline of the pavement beginning at the low edge and working toward the super-elevated edge. The types of rollers used, the number of rollers used, and the number of roller passes made will be at your discretion.

Use a nuclear density gauge to monitor and record the pavement density in accordance with this section and Materials Procedure 96-01M, "Pavement Density Monitoring with a Nuclear Gauge." The nuclear density gauge should consist of a radioactive source, scaler and other basic components housed in a single backscatter unit. The gauge must be operated by personnel trained in the principles of nuclear testing and safety practices. Only gauge(s) calibrated during the construction of the test section will be used during normal paving operation. If another nuclear gauge is to be used, a new test section must be constructed to calibrate that gauge and to establish a new PTD.

Compact the pavement sufficiently to achieve a minimum density of 96% of the PTD in a single test location and 98% of the PTD calculated as a moving average of the last 10 test locations as determined by a nuclear density gauge. Take nuclear gauge readings at each site, randomly selected by the Engineer, approximately every 60 meters along the length of the pavement for each pass of the paver and record them on a BR340M.

If the average of 4 nuclear density gauge measurements taken at 90° angles over two consecutive locations falls below 96% of the PTD or if the moving average of the last 10 nuclear gauge test sites falls below 98% of the PTD, stop routine paving operations and construct a new test section. Normal production will only resume after establishing a new PTD.

When the rolling operation is complete there should be no visible shallow ruts, ridges, other roller marks, or irregularities in the pavement. If these imperfections are present, correct the imperfections or relay the pavement to the satisfaction of the Engineer. Perform all corrective work at no additional cost to the Department.

Correct at once any displacement occurring as a result of reversing the direction of the roller, or from other causes, by the use of rakes and addition of fresh mixture as required. Exercise care in rolling not to displace the line and grade of the edges of the bituminous mixture. To prevent adhesion of the mixture to the drum(s) of the roller, properly moisten the drum(s) with water, or water mixed with small quantities of detergent or other Department approved asphalt release compounds. If a pneumatic tire roller is used, the pneumatic drive wheels may be coated with a fine mist spray of fuel oil or other similar materials to prevent pneumatic tire pickup. In all instances, protect the surface of the pavement from drippings of fuel oil or any other solvents used in paving, compaction or cleaning operations.

Unless otherwise directed by the Engineer, compact the longitudinal joint by using one of the pneumatic drive wheels to overlap the joint in two (2) passes with the drum operating static where vibratory rollers having pneumatic drive wheels are used. If dual vibrating drum rollers are used compact the joint by overlapping the joints in two (2) passes with both drums operating static.

Along forms, curbs, headers, walls and other areas not accessible to the rollers, compact the mix thoroughly with mechanical tampers as directed by the Engineer. On depressed areas, a trench roller or small vibratory roller approved by the Engineer may be used. Cleated compression strips also may be used under the roller to transmit compression to the depressed area.

Remove any mixture that becomes loose and broken, mixed with dirt, or is in any way defective and replace with fresh hot mixture and compact to conform with the surrounding area. Correct any area showing an excess or deficiency of bituminous materials to the satisfaction of the Engineer.

If vibratory compaction equipment is used, the Contractor assumes full responsibility for the cost repairing all damage which may occur to highway components and adjacent property including buried utility and service facilities.

When multiple paving operations are utilized with material production from a single plant each paving operation will be evaluated separately.

Routine paving operations will not begin unless both a project calibrated nuclear density gauge and an operator are present."

Add the following to the end of §401-3:

"**Test Section.** Prior to paving operations for this item, construct a test section on the project site at a location approved by the Engineer, using the same equipment and procedures to be used in the construction of the remainder of the course being laid. The amount of mixture prepared according to the job mix formula should be sufficient to construct a test section 500 linear meters long, on the mainline, and shall be of the same depth specified for the construction of the course which it represents. Routine paving operations may begin immediately following the construction of the test section once a PTD has been determined to the satisfaction of the Engineer based the evaluation of nuclear density readings. The test section is for determining the PTD for this item and for calibration of the nuclear density gauge.

Use the first 150 linear meters of the test section to stabilize the paving operation. The remainder of the length will be used to determine the PTD. Once a sufficient amount of material has been placed in the remaining 350 linear meters of the test section compact the pavement with 2 machine passes of the breakdown roller. Perform density readings at three sites, randomly selected by the Engineer in accordance with Materials Procedure 96-01M, "Nuclear Gauge Density Data Collection and Determination of Pavement Core Locations for Rut Avoidance Asphalt Concrete." A nuclear density reading at each location will be the average of the four measurements taken at 90°. Mark these sites so that subsequent density readings can be performed at the same locations. Make additional machine passes using either the intermediate or finish roller and perform additional density readings at the three previously selected sites until the increase in density is less than 32.0 kg/m^3, or until the Engineer stops further compaction because the pavement shows signs of distress.

The Engineer will immediately determine the average of the final density measurements at the three test locations. This average density will be the PTD. Once a PTD has been established routine paving operations may begin.

Only gauge(s) calibrated during the construction of the test section will be allowed to be used during normal paving operations."

METHOD OF MEASUREMENT

The provisions of §401-4, §402-4 and §403-4, Method of Measurement shall apply.

BASIS OF PAYMENT

The provisions of subsection 403-5 Basis of Payment shall apply including the following:

"The unit bid price also includes the cost of all necessary equipment, labor and materials required in construction of the test sections, and routine nuclear density testing.

Payment will be made under:

ITEM NO.	ITEM	PAY UNIT
18403.218902 M	*SUPERPAVE* HMA, Truing and Leveling	Metric Ton
18403.218912 M	PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.218902 M	Quality Unit"

18403.100902 M **ASPHALT-TREATED PERMEABLE BASE COURSE**
18403.100912 M **PLANT PRODUCTION QUALITY ADJUSTMENT to 18403.100902**

The requirements of Section 402, Hot Mix Asphalt Concrete Pavement, shall apply except as modified below:

DESCRIPTION

This work shall consist of constructing a hot mix asphalt-treated permeable base course on a prepared base in accordance with these specifications and in reasonably close conformity with the required lines, grades, thickness and typical sections shown on the plans or established by the engineer.

MATERIALS

The Details of §402-2, shall apply except that the mix composition shall meet the requirements outlined in the following table, Mix Composition:

MIX COMPOSITION

Sieve Size	General Limits % Passing	Job Mix Tolerance %
50.0 mm	100	---
37.5 mm	95 - 100	---
25.0 mm	80 - 95	± 6
12.5 mm	30 - 60	± 6
6.3 mm	10 - 25	± 6
3.2 mm	3 - 15	± 6
75 μm	0 - 4	± 2
Asphalt[1] Content, %	2.0 - 4.0	± 0.4
Plant Mixing Temperature, °C		95 - 135

Note:
1. **The asphalt cement grade and number shall meet the requirements for Base Mixture outlined in Table 401-1, Composition of Bituminous Plant Mixtures.**

CONSTRUCTION DETAILS

The details of §402-3 shall apply except as modified below:

The hot mix asphalt treated permeable base course shall be placed on a prepared surface having a minimum surface temperature of 5 °C. The permeable base course mixture shall be compacted between the temperatures of 60 °C and 107 °C with a dual steel wheel roller having a minimum nominal weight of 7 metric tons. The permeable base course shall be compacted by applying two roller passes operating in the static mode, unless otherwise directed by the Engineer-in-Charge. Additional passes will be allowed to eliminate any surface irregularities, ridges or creases. Caution shall be taken to prevent contamination and/or damage during placement and compaction. Areas found contaminated and/or damaged shall be removed and replaced at no cost to the Department.

After compaction, the Contractor shall protect the surface from any damage or debris that will affect the

permeability of the mixture. The Contractor is placed on notice that this material may be susceptible to damage from traffic placed directly on the permeable base course. Damage may consist of rutting, raveling, shoving, contamination by dirt and debris, and other deterioration of the compacted base. The type and method of surface protection shall be to the satisfaction of the Engineer-in-Charge. The Contractor shall be responsible for the repair of damage caused by the placement of traffic or construction vehicles on the compacted permeable base at the option of the Contractor, at no cost to the State. The Engineer-in-Charge shall be the sole judge of the extent of damage that is unacceptable.

METHOD OF MEASUREMENT

The provisions of §401-4, §402-4 and §403-4, Method of Measurement, shall apply.

BASIS OF PAYMENT

The Provisions of §403-5, Basis of Payment, shall apply.

Payment will be made under:

Item Number	Item	Pay Unit
18403.100902 M	Asphalt-Treated Permeable Base Course	Metric Ton
18403.100912 M	Plant Production Quality Adjustment to 18403.100902	Quality Unit

From: Russell Thielke
To: GWBLDG5.BLDG5.KHAHN
Date: 2/3/00 1:59pm
Subject: ED 99-001 (Reminder as requested)

Ken,

As discussed this morning, we are looking for your input regarding the expiration of ED 99-001. The shelf note was included in Addendum 2 and the designers have HDM Chapter 3 Tables 3-6 and 7, as well as all of the specs. Is there a problem with just letting the ED expire without doing anything? We do not believe there is any information within the ED that needs to be reissued.

If an EI is required we will **not** attach the specifications, but simply state that the items issued with the ED are the current items. (Re-issuing the specs will create more confusion than anything else.) Also, would a quick review by MO Design Div, DQAB, Construction and Materials be sufficient?

I hope you're feeling better and look forward to your response (especially if we don't have to do anything)!

Thanks ... Russ

CC: ZZavery, DBernard