To:	MODIFIED BY		New York State Department of Transportation ENGINEERING INSTRUCTION	EI 04-018
SUPERSEDED BY EB 06-057 EFFECTIVE 5/3/07	EI 06-028 EFFECTIVE 1/11/07			

Title: **REVISIONS TO STANDARD SPECIFICATIONS SECTIONS 401, 402, 403, AND 633 FOR HOT MIX ASPHALT (HMA) PLANT PRODUCTION, PAVEMENTS, AND PAVEMENT CONDITIONING**

Distribution:
- ☐ Manufacturers (18)
- ☑ Local Govt. (31)
- ☑ Agencies (32)
- ☐ Surveyors (33)
- ☑ Consultants (34)
- ☑ Contractors (39)
- ☐ _____( )

Approved: Robert L. Sack, Deputy Chief Engineer, Research — 7-APR-04 Date

ADMINISTRATIVE INFORMATION:

- This Engineering Instruction (EI) is effective beginning with projects scheduled for the letting of September 9, 2004.
- No issuances are superseded by this EI.
- The shelf notes transmitted by this EI will be incorporated into the next revision of the Standard Specifications.

PURPOSE: The purpose of this EI is to transmit shelf notes for revisions to Sections 401, 402, 403, and 633 of the Standard Specifications.

TECHNICAL INFORMATION:

Section 401: The acid-insoluble residue limits for dolomite under types F1 and F2 are changed to not less than 20.0%. Also for F1, F2, and F3, blending of limestone and dolomite is permitted providing the resulting blend has an acid-insoluble residue content of not less than 20.0%. The anticipated net effect of these changes is an increase in the use of local aggregate sources, which should in turn reduce the cost of aggregates used in HMA wearing surfaces. The actual effect on specific contracts will vary greatly; however, there should be no increase in costs due to the transmitted changes.

Section 402: Revisions to §402-3.07 allow the use of nonnuclear density gauges to monitor HMA pavement density on 60 and 70 series compaction method HMA items. No cost impact is expected from the allowance of nonnuclear gauges.

Section 403: Friction aggregate requirements are revised to match the revised requirements in Section 401. Section 403 is not used on Department projects; therefore no cost increase is expected.

Section 633: Changes include requirements that were specified in various special specifications for crack and joint repairs, and both portland cement concrete (PCC) and HMA pavement repairs prior to HMA overlay. These specifications included degrees of variation from the existing Section 633. Contract pay items for joint filling and sealing have been revised and are now measured on a length basis. Three additional items were added to pay for the repair of existing HMA pavements and PCC pavements prior to HMA overlay.

IMPLEMENTATION:

The Design Quality Assurance Bureau will insert the transmitted shelf notes into contract proposals beginning with projects scheduled for the letting of September 9, 2004.

The following specifications are disapproved by this EI.

04402.8801 M	Remove and Repair Defective HMA Pavement Overlay
04402.8802 M	Remove and Repair Defective HMA Pavement Overlay

04402.8901 M	Remove and Repair Defective HMA Overlay
04402.8902 M	Remove and Repair Defective PCC Beneath a HMA Overlay
01502.4467 M	Repair of Spalled Areas, Joints and/or Cracks in Portland Cement Concrete Pavement
08502.4468 M	Surface Preparation and Asphalt Concrete Pavement Repair in Existing Portland Cement Concrete Pavement
10502.4469 M	Repair of Spalled Areas in Portland Cement Concrete Pavement
18502.4467 M	Repair of Spalled Areas, Joints and/or Cracks in Portland Cement Concrete Pavement
04502.4597 M	Asphalt Concrete Joint in Existing Pavement
633.0202 M	Clean Existing Pavement and/or Shoulders
633.05 M	Cleaning Sealing and Filling Joints and Cracks
18633.06 M	Cleaning Existing Pavement and/or Shoulders
18633.07 M	Cleaning and Filling Joints and Cracks
18633.08 M	Cleaning and Filling Pavement/Shoulder Joints

The following new specifications are created by this EI

633.11 M	Cleaning Existing Pavement and/or Shoulders
633.12 M	Cleaning, Sealing and/or Filling Cracks
633.13 M	Cleaning, Sealing and/or Filling Joints
633.14 M	Removal and Repair of Deteriorated HMA Pavement
633.15 M	Removal and Repair of Loose, Broken, or Spalled PCC Pavement
633.16 M	Stress Relieving Pavement Repairs

TRANSMITTED MATERIALS: This EI transmits shelf notes for Sections 401, 402, 403 and 633.

BACKGROUND:

Sections 401 and 403: Based on recent Department investigations, it has been determined that the test procedure to measure acid-insoluble residue (AIR) in carbonate aggregates (limestone and dolomite) requires revision. The revision, being made in Materials Method 28, stops the removal of chert and similar noncarbonate particles from the test sample, prior to emersion in acid. This change necessitates a change in the acceptance limit for dolomite in F1 and F2 applications from not less than 17.0% to not less than 20.0% AIR to account for the chert particles. The change in the acceptance limit to 20.0% makes the acceptance limit for dolomite the same as for limestone. With equal acceptance limits, and additional knowledge gained through related research, blending carbonates of different types and residues is now allowable under the specifications, provided any resulting blend has a composite AIR content of at least 20.0%.

Section 402: The existing Section 402 requires the use of nuclear gauges to measure pavement densities for HMA when either 60 or 70 series compaction specification is used. A few years ago, the Department participated in a pooled-fund study with 5 other states to study the use of nonnuclear gauges as an alternative to the nuclear gauges to measure the densities of HMA pavements. Based on the results of this study, the Department will allow the use of the nonnuclear gauges for 60 and 70 series compaction specifications to measure HMA pavement density.

Section 633: The existing Section 633 did not include repair methods for either HMA or PCC pavements prior to HMA overlays. As a result, several special specifications were developed by the Main Office and the Regions to address the need for these pavement repair methods. Also, there is general consensus that the pay unit for sealing and filling of joints should be per linear meter rather than a lump sum. Therefore, Section 633 is revised to include some of the requirements of these special specifications.

CONTACT: For additional information regarding the changes to Section 401 or 403 friction aggregate requirements, contact Brad Allen of the Materials Bureau at ballen@dot.state.ny.us. For additional information regarding the inclusion of nonnuclear gauges in Section 402 or the revision of Section 633, contact Chris Euler of the Materials Bureau at ceuler@dot.state.ny.us. Both contacts can also be reached by telephone at (518) 457-3240.

Make the following changes to the Standard Specifications of January 2, 2002.

Page 4-2

Line 30 to Page 4-3 line 41, under §401-2.02 Aggregates ***delete*** paragraphs: "A. Coarse Aggregate Type F1 Conditions," B. Coarse Aggregate Type F2 Conditions" and "C. Coarse Aggregates Type F3 Conditions" and ***replace*** them with the following.

"***A. Coarse Aggregate Type F1 Conditions***

1. Limestone, dolomite or a blend of the two having an acid-insoluble residue content of not less than 20.0%.

2. Sandstone, granite, chert, traprock, ore tailings, slag or other similar noncarbonate materials.

3. 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:

a. 12.5 mm Nominal Maximum Size Aggregate Mixes. Noncarbonate 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.

b. 9.5 mm Nominal Maximum Size Aggregate Mixes. Noncarbonate 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.

B. Coarse Aggregate Type F2 Conditions

1. Limestone, dolomite, or a blend of the two having an acid-insoluble residue content of not less than 20.0%.

2. Sandstone, granite, chert, traprock, ore tailings, slag or other similar noncarbonate materials.

3. 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:

a. 12.5 mm Nominal Maximum Size Aggregate Mixes. Noncarbonate 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 noncarbonate.

b. 9.5 mm Nominal Maximum Size Aggregate Mixes. Noncarbonate 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 noncarbonate.

C. Coarse Aggregate Type F3 Conditions

1. Limestone or a blend of limestone and dolomite having an acid-insoluble residue content of not less than 20.0%.

2. Dolomite.

3. Sandstone, granite, chert, traprock, ore tailings, slag or other similar noncarbonate materials.

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:

a. 12.5 mm Nominal Maximum Size Aggregate Mixes. Noncarbonate 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 noncarbonate.

b. 9.5 mm Nominal Maximum Size Aggregate Mixes. Noncarbonate 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 noncarbonate."

Page 4-46

Lines 25 to 42, under §403-2.02 Aggregates ***delete*** paragraph "A. Coarse Aggregate Type F2 Conditions," and ***replace*** it with the following.

"A. Coarse Aggregate Type F2 Conditions

1. Limestone, dolomite, or a blend of the two having an acid-insoluble residue content of not less than 20.0%.

2. Sandstone, granite, chert, traprock, ore tailings, slag or other similar noncarbonate materials.

3. 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:

a. Type 6F2 Mixes. Noncarbonate 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 noncarbonate.

b. Type 7F2 Mixes. Noncarbonate 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 3.2 mm particles must be noncarbonate."

Page 4-48

Lines 1 to 17, under §403-2.02 Aggregates ***delete*** paragraph "B. Coarse Aggregate Type F3 Conditions," and ***replace*** it with the following.

"B. Coarse Aggregate Type F3 Conditions

1. Limestone or a blend of limestone and dolomite having an acid-insoluble residue content of not less than 20.0%.

2. Dolomite

3. Sandstone, granite, chert, traprock, ore tailings, slag or other similar noncarbonate materials.

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:

a. Type 6F3 Mixes. Noncarbonate 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 noncarbonate.

b. Type 7F3 Mixes. Noncarbonate 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 3.2 mm particles must be noncarbonate."

Make the following changes to the Standard Specifications of January 2, 2002.

Page 4-26

Delete Table 402-1 in its entirety and ***replace*** it with the following table.

"

Table 402-1 General Description

Specification Types		50 Series	60 Series	70 Series	80 series
Coarse Agg. Type = F1 & Coarse Agg. Type = F2	Use	Mainline paving for controlled access highways, i.e., interstate, parkways.	Mainline paving other than 50 or 70 Series.	Mainline paving on low volume roadways.	Miscellaneous repairs, bridge approaches, trenches, etc.
	Compaction Monitoring	Compaction monitoring using 4 cores every day.	Compaction monitoring using PTD based on average of 4 cores.	Compaction monitoring using a density gauge.	Compaction based on number of passes.
Coarse Agg. Type = F3	Use		Mainline paving other than 70 Series.	Mainline paving on low volume roadways.	Miscellaneous repairs, bridge approaches, trenches, etc.
	Compaction Monitoring		Compaction monitoring using PTD based on average of 4 cores.	Compaction monitoring using a density gauge.	Compaction based on number of passes.
Coarse Agg. Type = F9	Use	Mainline paving for controlled access highways, i.e., interstate, parkways.	Mainline paving other than 50 or 70 Series.	T&L, mainline paving on low volume roadways.	T&L, shoulders, miscellaneous repairs, bridge approaches, trenches, etc.
	Compaction Monitoring	Compaction monitoring using 4 cores every day.	Compaction monitoring using PTD based on average of 4 cores.	Compaction monitoring using a density gauge.	Compaction based on number of passes.

Notes: 402.XXYZQR

XX = Mixture's nominal maximum aggregate size (37, 25, 19, 12, 09, 05, 01)

Y = Compaction requirements (50, 60, 70, 80)

Z = Friction requirement (1, 2, 3, 9)

Q = Quality item number

R = Revision number"

Pages 4-31 to 4-37

Under §402-3.07 Compaction, ***delete*** §402-3.07 in its entirety, and ***replace*** it with the following.

"402-3.07 Compaction. Compact the HMA mixture using the appropriate compaction method specified in Table 402-4, Compaction Methods, associated to specific items being placed.

TABLE 402-4 Compaction Methods

Compaction Methods	Item Number
A=50 series	402.XX5ZQR
B=60 series	402.XX6ZQR
C=70 series	402.XX7ZQR
D=80 series	402.XX8ZQR & other

Notes: XX = 37, 25, 19, 12, 09, 05, 01
Z = Friction requirement (1, 2, 3, 9)
Q = Quality item number
R = Revision number

Immediately after the HMA mixture has been spread, struck off, and surface irregularities adjusted to uniformity, compact it using rollers meeting the requirements of §402-3.04, Rollers. Roll the surface when the mixture is in the proper condition and when the rolling does not cause displacement, cracking, or shoving. Initially roll all courses with the roller traveling parallel to the centerline of the pavement, beginning at each edge and working toward the center. Roll banked curves starting at the low-side edge and working toward the superelevated edge.

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 HMA mixture as required. Exercise care in rolling so as not to displace the line and grade of the edges of the HMA mixture. To prevent adhesion of the mixture to the rollers, keep the wheels properly moistened with water, water mixed with small quantities of detergent or other approved material. Petroleum products or solvents having an adverse effect upon the HMA pavement will not be permitted.

When the rolling operation is complete, defects, such as shallow ruts, ridges, roller marks, cracking, tearing, segregation, or any other irregularities, as determined by the Engineer, shall not be visible in the pavement. If these defects are present, correct these defects to the satisfaction of the Engineer or replace the pavement at no additional cost to the State.

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

Remove and replace any mixture that becomes loose and broken, mixed with dirt, or is in any way defective, with fresh HMA mixture. Compact the mixture to conform with the surrounding area. Correct any area showing an excess or deficiency of HMA material.

When Shim Course is used for filling wheel ruts, compact with a minimum of three passes of a pneumatic rubber tire roller. When Shim Course is used as a skim coat, use pneumatic rubber tire rollers unless other rollers are approved by the Engineer.

Vibratory compaction is not permitted when compacting HMA mixtures on structural bridge decks, or other structures with less than 0.6 meters of cover. When using vibratory compaction, repair all

damages which may occur to the highway components and adjacent property, including buried utility and service facilities, at no cost to the State.

When placing HMA mixture using either 50, 60, or 70 series compaction methods, control the operation of the rollers including the speed, the amplitude settings, the vibration frequency, and the weight of the rollers.

For 60 and 70 series compaction methods, use at least one of the density gauges specified in §402-3.07 E of this section.

Use the following compaction methods based on the item numbers for HMA placements on all Department contracts.

A. 50 Series Compaction Method. On the first day of mainline paving, select one of the following options:

1. Option 1: Test Section. Prior to routine paving of this item, construct a test section on the project site at a location approved by the Engineer. The test section will be a maximum of 500 lane meters on the mainline. Construct the full width of the pavement if necessary. The test section will be the same depth specified for the construction of the course which it represents. Use the first 100 linear meters of the test section to stabilize the paving operation. There is no maximum length if the test section is not on the mainline. The first 200 metric tons of quantity placed on a test section will be paid at a factor of 1.5 times the bid price. The remaining quantity will be paid at the bid price. A maximum of two test sections per item will be paid at the 1.5 adjustment. 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 will be placed. Subsequent test sections after the initial passing test section will be subject to approval by the Engineer. Once the test section is completed, the Engineer will select core locations and have cores taken in accordance with §402-3.08, Pavement Density Samples. When the average density of the cores is less than 88% of the maximum theoretical density, the Engineer will evaluate the test section to determine its acceptability. If found acceptable, payment will be adjusted by a factor of 0.60. If found unacceptable remove and replace at no additional cost to the State and the 1.5 factor will not apply.

Routine paving operations for this item will not be permitted until the results of the cores from the test section has a minimum pavement density QAF of 1.00. If the pavement density QAF is less than 1.00, construct another test section in accordance with Option 1.

2. Option 2: Routine Paving. Begin paving operations. Test Section Adjustment of 1.5 for the first 200 metric tons will not apply. All material placed will be subject to a pavement density QAF. If the pavement density QAF on the first day of paving is less than 1.00, construct a test section in accordance with Option 1.

During the placement of HMA mixture under this method, including the test section, take cores and loose mix samples in accordance with §402-3.08, Pavement Density Samples.

A paving lot is defined as a day's production which must be a minimum of 200 metric tons. Each paving lot will be equally divided into four sublots in accordance with Materials Procedure (MP) 96-04, Asphalt Concrete Statistical Pavement Density Determination. When paving is continuous within a 24-hour period, a new lot will result when a change occurs in the paving crew. When a single plant is supplying to multiple paving operations or multiple plants are supplying to multiple paving operations, each paving operation will be evaluated separately. Multiple plants will not be allowed to supply HMA mixture to a single paver. If less than 200 metric tons are placed on any day, pavement cores will not be

required and the density QAF will be reported as 1.00 for that day, provided that the Engineer is satisfied that the procedures used in these areas obtain pavement densities similar to previously placed pavement sections.

Compact the pavement sufficiently to achieve densities, expressed as a percentage of the mixture's average daily maximum theoretical density (%MADMTD), in a range of 92% to 97%. Pavement cores and loose mix samples will be tested and analyzed by the Department in accordance with MP 96-04 to determine the pavement density QAF.

When consecutive lots are found to have a density QAF equal to or less than 0.85, stop paving operations and immediately construct a new test section in accordance with Option 1, 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. Placement and compaction procedures will be satisfactory when the procedures used in these areas obtain pavement density similar to that obtained on the mainline pavement sections. If the shoulder shows signs of distress at this level of compaction, decrease the compaction effort until no further damage occurs to the shoulder or subbase. If a density gauge(s) is used to monitor mainline paving, use the same gauge(s) to monitor density of the above referenced areas.

B. 60 Series Compaction Method. On the first day of paving, select one of the options specified below:

1. Option 1 - Test Section Only. The test section is constructed to determine a Project Target Density (PTD) for this item and correlation of a density gauge. Prior to routine paving operations for this item, construct a test section at a location approved by the Engineer. Construction of the test section will not be allowed unless both a density gauge and the operator are present. The test section will be a maximum of 500 lane meters on the mainline. The Contractor will construct the full width of the pavement if necessary. The test section will be the same depth specified for the construction of the course which it represents. Use the first 100 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 samples in accordance with §402-3.08, Pavement Density Samples. These samples should represent the material placed on the test section. At the conclusion of the test section, the Engineer will randomly select four 150 mm core locations on the test section (excluding the initial 100 linear meters) in accordance with §402-3.08, Pavement Density Samples. Take density readings with a density gauge(s) at each core location prior to drilling the cores. A density gauge reading is the average of multiple density gauge measurements taken in accordance with the appropriate Materials Procedure. Deliver the samples and the four density gauge readings with the gauge type, model, and serial number for each gauge to be correlated to the Regional Laboratory in accordance with §402-3.08, Pavement Density Samples. The Regional Materials Engineer will use the test section cores and density gauge readings to establish a PTD for each density gauge within one business day of the delivery of the samples and density gauge readings. When the average of the cores is less than 88% of the maximum theoretical density, the Engineer will evaluate the test section to determine its acceptability. If found acceptable, payment will be adjusted by a factor of 0.60. If found unacceptable remove and replace at no additional cost to the State and the 1.5 factor will not apply.

The first 200 metric tons of quantity placed on a test section will be paid at a factor of 1.5 times the bid price. The remaining quantity will be paid at bid price. A maximum of two test sections per

item will be paid at the 1.5 adjustment. Place only one test section per item per day. Subsequent test sections after the initial test section will be subject to approval by the Engineer.

Routine paving will only begin after a PTD has been established by the Regional Materials Engineer based on testing of the pavement cores.

2. Option 2 - Test Section immediately followed by Routine Paving. Inform the Engineer when this option is selected. Construct a test section as described in Option 1 and continue paving. Take additional loose-mix samples in accordance with §402-3.08. Store these samples at the plant. The 1.5 adjustment for the test section does not apply when this option is selected. Determine an Interim PTD to monitor pavement density as described in the appropriate Materials Procedure. If nuclear density readings over two consecutive locations fall below 96% or above 103% of the PTD or if the moving average of the last 10 nuclear density readings falls below 98% of the PTD, stop routine paving operations and immediately construct a new test section in accordance with requirements of Option 1 - Test Section Only.

At the end of the first day's paving, submit a copy of the appropriate BR form, as described in MP 96-01 or MP 03-001, to the Engineer. The Engineer will determine whether the density readings taken using the Interim PTD are acceptable based on the Actual PTD in accordance with MP 96-01 or MP 03-001. If not, the Engineer will select core locations randomly over the entire first day's production excluding the test section. Prior to drilling these cores, take density readings at each core location. Deliver the core samples, density gauge readings, and the loose mix samples to the Regional Laboratory in accordance with §402-3.08, Pavement Density Samples.

If the average density of the pavement cores is not between 92% and 97% of the mixture's maximum theoretical density, the Engineer will make a payment adjustment in accordance with Table 402-9, Density Quality Adjustment Factors, to the material placed on that day excluding the material placed on the test section.

Use only the gauge(s) correlated during the construction of the test section for monitoring pavement density during routine paving operations.

Compact the pavement sufficiently to achieve the PTD value. The minimum acceptable density reading is 96% and no greater than 103% of the PTD at a single test location and 98% of the PTD calculated as a moving average of the last 10 test locations as determined by a density gauge. Take density gauge readings at each location, randomly selected by the Engineer in accordance with the appropriate Materials Procedure, every 60 meters along the length of the pavement for each pass of the paver. Record these density values on the appropriate BR form.

If density gauge readings over two consecutive locations fall below 96% or above 103% of the PTD or if the moving average of the last 10 density gauge readings falls below 98% of the PTD, stop routine paving operations and immediately construct a new test section in accordance with requirements of Option 1 - Test Section Only.

Placement and compaction on shoulders, ramps, maintenance widenings and crossovers, and bridges will be deemed satisfactory by the Engineer when the procedures used in these areas obtain pavement density similar to that obtained on the mainline pavement sections. Monitor and record the density of the above-referenced areas with the same density gauge to insure the PTD is achieved. If the shoulder subbase is structurally insufficient to sustain the level of compaction such that the shoulder shows signs of distress, decrease the compaction effort until no damage occurs to the shoulder or subbase.

Additional pavement core samples may be required for daily density verification from the previously placed HMA. The requirement of these samples shall be based on the following situations:

- Insufficient number of density readings recorded, either at a specific location or at the required frequency.
- Paving without a density gauge on site.
- Paving completed after the only calibrated density gauge on site breaks down.
- Gauge readings do not seem to accurately represent the HMA density.

When pavement samples are required, take cores and density gauge readings at each core location in accordance with §402-3.08, Pavement Density Samples, and deliver them to the Regional Laboratory. The Regional Materials Engineer may establish a new PTD based on these cores. The material placed under the above situations will be subject to a payment adjustment.

Pavement samples may be required to verify PTD used on the contract for the following situations:

- When the contract includes multiple paving locations.
- Changes in existing pavement condition being overlaid.
- Excessive plant mix variations.
- Using a Job Mix Formula different from the mix produced for the Test Section or producing the mix in a plant different from the plant used during the Test Section.

When pavement samples are required, take cores, density gauge readings at each core location, and loose-mix samples in accordance with §402-3.08, Pavement Density Samples, and deliver them to the Regional Laboratory. The material placed under these situations will not be subject to payment adjustment. The Regional Materials Engineer will establish a new PTD if different from the original PTD.

C. 70 Series Compaction Method. On the first day of paving, 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 test section is constructed to determine the Project Target Density (PTD). Routine paving operations may begin immediately following the construction of the test section once a PTD has been established based on the evaluation of density readings. Paving operations will not be allowed unless both a density gauge and an operator are present.

Test Section. Construct a test section maximum of 500 linear meters on the mainline which has the same depth specified for the construction of the course it represents. Use the first 100 meters of the test section to stabilize the paving operation. The remainder of the length will be used to determine the Project Target Density (PTD). Once a sufficient amount of material has been placed in the remaining test section, compact the pavement initially with a breakdown roller making four vibratory passes or as recommended by the Engineer. The Engineer will select three random locations in accordance with the appropriate Materials Procedure, and mark these sites so that subsequent density testing can be performed at the same locations. Take density readings at the three selected sites. A density gauge reading is defined as the average of multiple density gauge measurements taken in accordance with the appropriate Materials Procedure. Make additional machine passes using either the intermediate or the finish roller and take additional density readings at the three previously selected sites after each pass 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 calculate the average of the highest density reading from each of the random locations. The resulting average will be set as the PTD.

Compact the pavement sufficiently to achieve the PTD value. The minimum acceptable density reading will be 96% or maximum of 103% 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 density gauge. Take density gauge readings at each location, randomly selected by the Engineer in accordance with the appropriate Materials Procedure, approximately every 60 meters along the length of the pavement for each pass of the paver. Record these values on the appropriate BR form.

If density gauge readings over two consecutive locations fall below 96% or above 103% of the PTD or if the moving average of the last 10 density gauge readings falls below 98% of the PTD, stop routine paving operations and immediately construct a new test section in accordance with requirements of the Test Section.

Placement and compaction on shoulders, ramps, maintenance widenings and crossovers, and bridges will be satisfactory when the procedures used in these areas obtain pavement density similar to that obtained on the mainline pavement sections. Monitor the density of areas with the same density gauge to insure the PTD is achieved. If the shoulder subbase is structurally insufficient to sustain the level of compaction such that they show signs of distress, decrease the compaction effort until no damage occurs to the shoulder or subbase.

D. 80 Series Compaction Method. For this compaction method, use either of the compaction options listed below:

1. Option 1 - Static Compaction. Use this option only when the compacted thickness of the finished mat is 100 mm or less. The roller speeds shall not exceed 5 km/hr and will move at a slow and uniform speed. The roller drive wheel or drum will be nearest to the paver. When paving multiple lanes simultaneously, increase the required number of rollers proportionately for each additional full lane width unless otherwise approved by the Engineer. Under this option, initially roll all HMA mixtures with an approved steel-wheel roller operating in a static mode. Overlap the previous roller pass by one-half the width of the roller.

Immediately following the initial rolling, roll the mat with an approved pneumatic rubber-tired roller. A minimum of 3 passes of the rubber-tired roller will be required. One pass is defined as one movement of the roller over any point of the pavement in either direction.

Immediately following the pneumatic rubber-tired rolling, finish rolling the mat with a steel-wheel roller to remove all shallow ruts, ridges, roller marks, and other irregularities from the surface.

To prevent adhesion of the mixture to the drum(s) and pneumatic tires, keep the drum(s) and the pneumatic tires properly moistened with water, or water mixed with small quantities of detergent or other approved materials.

When the compaction procedure fails to produce acceptable results, adjust the procedure to obtain the desired results.

2. Option 2 - Vibratory Compaction. Under this option, furnish a vibrating-reed tachometer for the exclusive use of the Engineer. The vibrating-reed tachometer must have a frequency range of 17 Hz to 67 Hz with a minimum reed interval of 1 Hz between 17 Hz and 33 Hz and a minimum reed interval of 2 Hz between 33 Hz and 67 Hz.

Operate vibratory rollers at a uniform speed not exceeding 4 km/hr (67 m/min.) on all pavement courses. Complete all turning of the compaction equipment on material which has had a minimum of one roller pass.

The number of passes listed in Table 402-5, Number of Passes, are recommended and may be increased or decreased to obtain adequate density. Complete all breakdown roller passes before the mat temperature falls below 120° C. One vibratory pass is defined as one movement of one drum of

the roller over the pavement in either direction. One static pass is defined as one movement of the roller over the pavement in either direction. Remove all ruts, ridges, roller marks, or other irregularities from the surface using static rolling. The Engineer may approve alternate compaction procedures for areas where the specified procedures are not practical.

If satisfactory compaction is not obtained, or damage to highway components and/or adjacent property occurs using vibratory compaction equipment, immediately cease using this equipment and proceed with the work in accordance with the conventional compaction procedures stipulated under Option A at no additional cost to the State.

TABLE 402-5 NUMBER OF PASSES

Pavement Courses	Option 1 Three Roller Train (Static)		Option 2 Vibratory Rollers	
	Steel Wheel Rollers	Pneumatic Roller	Vibratory Passes	Static Passes
37.5 mm Base (Each Lift)	8	3	6	4
25.0 mm Binder	8	3	6	4
19.0 mm Binder	6	3	4	2
12.5 mm Top	6	3	4	2
9.5 mm Top	4	3	4	2

For the permeable base course, compact the mixture between the temperatures of 60° C and 110° C by applying two static roller passes. Up to 2 additional passes may be required to obtain adequate density.

E. Density Gauges

1. Nuclear Density Gauge. Use a nuclear density gauge to monitor the pavement density in accordance with this subsection and Materials Procedure (MP) 96-01, Nuclear Gauge Density Data Collection for Hot Mix Asphalt. A nuclear density gauge shall 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.

2. Nonnuclear Density Gauge. Use a nonnuclear density gauge to monitor the pavement density in accordance with this subsection and Materials Procedure (MP) 03-001, Nonnuclear Density Gauge Data Collection for Hot Mix Asphalt. The nonnuclear density gauge shall function in the temperature and moisture levels experienced during HMA paving. The nonnuclear density gauge shall contain the internal circuitry to determine the density of HMA pavements by measuring changes in the electromagnetic field resulting from the HMA compaction process."

Make the following changes to the Standard Specifications of January 2, 2002.

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Delete Section 633, Conditioning Existing Pavement in its entirety and ***replace*** it with the following.

"SECTION 633 - CONDITIONING EXISTING PAVEMENT PRIOR TO HOT MIX ASPHALT (HMA) OVERLAY

633-1 DESCRIPTION. Cleaning, sealing, and filling joints and cracks in the existing pavement, removal and repair of deteriorated pavement sections, stress-relieving pavement repairs, and cleaning the existing pavement and shoulders prior to the application of a new HMA course.

633-2 MATERIALS. Use materials conforming to the requirements of the specifications listed below:

Hot Mix Asphalt True & Leveling	401 and 402
Hot Mix Asphalt Shim	401
Asphalt Filler	702-0700 (Table702-2, Miscellaneous Asphalt Cements)
Asphalt Emulsions	Tables 702-5 and 702-6
Fine Aggregate	703-01

633-3 CONSTRUCTION DETAILS

633-3.01 Cleaning Existing Pavement and/or Shoulders. Clean existing pavement and shoulder surfaces to be overlaid, including ruts and depressions, by the use of mechanical sweepers, hand brooms, or other means until the surfaces are free of all material which might interfere with the bond between the overlay material and the existing surfaces. All cleaning equipment shall be approved by the Engineer prior to use.

Remove all debris from the pavement and shoulders surfaces and dispose of in an appropriate manner. Keep the pavement and shoulders clean until the overlay operations are completed. Cleaning of shoulders is required only when the shoulder surface is constructed of Portland Cement Concrete (PCC), Hot Mix Asphalt (HMA) or a surface treatment thereon.

633-3.02 Cleaning, Sealing and/or Filling Joints and Cracks. If the existing pavement requires stress relieving repairs, complete these repairs in accordance with §633-3.05, *Stress Relieving Pavement Repairs,* prior to joint and crack repair work.

Use a compressed air stream of at least 550 kPa measured at the source, to clean all unsealed and inadequately sealed joints and cracks. Clean all joints and cracks in the pavement of all dirt and loose material to a depth equal to a minimum of twice the crack or joint width, by holding the cleaning jet 25 mm above the pavement surface. Old joint and crack sealer remaining after such cleaning operation need not be removed. Keep the joint and cracks clean until the sealing, filling, and paving operations are completed.

Joints and cracks less than 6 mm are not required to be cleaned or sealed. Seal joints and cracks in the existing pavement from 6 mm to 25 mm wide with an asphalt filler. To ensure that space will be available for expansion of the asphalt filler when the HMA is paved over the joint or crack, do not fill the joint or crack completely to the surface. Blot with fine aggregate, if required, to prevent tracking the bituminous material over the pavement surface.

Fill joints and cracks greater than 25 mm wide with HMA Shim or an approved cold, plant-mixed stockpile patching material.

633-3.03 Removal and Repair of Deteriorated HMA Pavement Sections. Remove and dispose of deteriorated HMA pavements to sound material, such that all excavated sides are vertical. Use a chipping hammer meeting the requirements of §580-3.02, *Removal of Structural Concrete*, a milling machine equipped with a means to suppress airborne particles, or by other appropriate means. If a chipping hammer is used, first sawcut the pavement around the perimeter of the designated repair area to the anticipated repair depth.

Clean and dry all surfaces exposed from removal operation such that they are clean and free of dust and debris. Uniformly apply asphalt emulsion to these surfaces and place the HMA in the repair areas only when the ambient temperature is 7°C or greater. The minimum HMA placement temperature shall be 120°C.

If the total depth of the patch is greater than 75 mm, compact the HMA in multiple lifts of approximately equal thickness with a maximum lift of 75 mm. When placing HMA in multiple lifts, thoroughly compact the lower lifts with a mechanical tamper. For the top lift, thoroughly compact with a roller meeting the requirements of §402-3.04, *Rollers*, or a small vibratory roller approved by the Engineer. Slightly overfill the patch with HMA such that the resulting patch is dense, smooth, and no more than 6 mm above the existing surface.

633-3.04 Removal and Repair of Loose, Broken, or Spalled PCC Pavement Sections. Remove loose, broken, or spalled PCC pavements to sound material, but not exceeding a depth of 75 mm. Use a chipping hammer meeting the requirements of §580-3.02, *Removal of Structural Concrete*, a milling machine equipped with a means to suppress airborne particles, or by other appropriate means. If a chipping hammer is used, first sawcut the pavement around the perimeter of the designated repair area to the anticipated repair depth not to exceed 75 mm. Dispose of all the removed PCC material in an appropriate manner.

Clean and dry all surfaces exposed from removal operation such that they are clean and free of dust and debris. Uniformly apply asphalt emulsion to these surfaces and place the HMA in the repair areas only when the ambient temperature is 7°C or greater. The minimum HMA placement temperature shall be 120°C.

If the total depth of the patch is greater than 75 mm, compact the HMA in multiple lifts of approximately equal thickness with a maximum lift of 75 mm. When placing HMA in multiple lifts, thoroughly compact the lower lifts with a mechanical tamper. For the top lift, thoroughly compact with a roller meeting the requirements of §402-3.04, *Rollers*, or a small vibratory roller approved by the Engineer. Slightly overfill the patch with HMA such that the resulting patch is dense, smooth, and no more than 6 mm above the existing surface.

633-3.05 Stress Relieving Pavement Repairs. Unless indicated otherwise in the contract documents, the pressure relief joint shall be a minimum of 5.0 meters longitudinally and the full width of the pavement, including the curb, and gutter, if any. If an existing transverse joint is within the pressure relief joint repair, remove the existing transverse joint by a minimum of 300 mm. Saw cut the transverse lines of the designated repair area full depth to produce a neat cut. Remove the PCC pavements with minimum disturbance to the subbase. Dispose of all the removed PCC material in an appropriate manner.

Level and recompact the subbase, prior to the placement of the HMA.

Clean and dry all surfaces exposed from removal operation such that they are clean and free of dust and debris. Uniformly apply asphalt emulsion to these surfaces and place the HMA in the repair areas

only when the ambient temperature is 7°C or greater. The minimum HMA placement temperature shall be 120°C.

Compact the HMA in multiple lifts of approximately equal thickness with a maximum lift of 75 mm. Thoroughly compact each lift with a roller meeting the requirements of §402-3.04, *Rollers*, or a small vibratory roller approved by the Engineer. Slightly overfill the patch with HMA such that the resulting patch is dense, smooth, and no more than 6 mm above the existing surface.

633-4 METHOD OF MEASUREMENT

633-4.01 Cleaning Existing Pavement and/or Shoulders. The quantity measured will be the number of square meters of existing pavement and/or shoulder surfaces cleaned.

633-4.02 Cleaning, Sealing, and/or Filling Cracks. The quantity measured will be on a lump-sum basis for work satisfactorily completed.

633- 4.03 Cleaning, Sealing, and/or Filling Joints. The quantity measured will be on a linear meter basis for work satisfactorily completed.

633-4.04 Removal and Repair of Deteriorated HMA Pavement Sections. The quantity measured will be the number of square meters of existing pavement surface removed and repaired.

633-4.05 Removal and Repair of Loose, Broken, or Spalled PCC Pavement Sections. The quantity measured will be the number of square meters of existing pavement surface removed and repaired.

633-4.06 Stress Relieving Pavement Repairs. The quantity measured will be the number of square meters of existing pavement surface removed and repaired.

633-5 BASIS OF PAYMENT

633-5.01 Cleaning Existing Pavement and/or Shoulders. The unit price bid for this work shall include the cost of all labor, materials, and equipment necessary to complete the work.

633-5.02 Cleaning, Sealing, and/or Filling Cracks. The lump sum price bid for this item shall include the cost of all labor, materials, and equipment necessary to complete the work.

633-5.03 Cleaning, Sealing and/or Filling Joints. The unit price bid for this item shall include the cost of all labor, materials, and equipment necessary to complete the work.

633-5.04 Removal and Repair of Deteriorated HMA Pavement Sections. The unit price bid for this work shall include the cost of all labor, materials, and equipment necessary to complete the work.

633-5.05 Removal and Repair of Loose, Broken, or Spalled PCC Pavement Sections. The unit price bid for this work shall include the cost of all labor, materials, and equipment necessary to complete the work.

633-5.06 Stress Relieving Pavement Repairs. The unit price bid for this work shall include the cost of all labor, materials, and equipment necessary to complete the work.

Payment will be made under:

Item No.	Item	Pay Unit
633.11 M	Cleaning Existing Pavement and/or Shoulders	Square Meter
633.12 M	Cleaning, Sealing and/or Filling Cracks	Lump Sum
633.13 M	Cleaning, Sealing and/or Filling Joints	Linear Meter
633.14 M	Removal and Repair of Deteriorated HMA Pavement	Square Meter
633.15 M	Removal and Repair of Loose, Broken, or Spalled PCC Pavement	Square Meter
633.16 M	Stress Relieving Pavement Repairs	Square Meter