MODIFIED BY EI 96-049 EFFECTIVE 1/2/97 SUPERSEDED BY EI 97-010 EFFECTIVE 4/4/97		*New York State Department of Transportation* **ENGINEERING INSTRUCTION**	**EI 96-025**

Title: **QUALITY CONTROL ASPHALT CONCRETE PRODUCTION - SPECIFICATION SECTION 402**

Distribution:

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

Approved:

D. J. Clark, Deputy Chief Engineer, Design Division — Date: 4/12/96

EFFECTIVE DATE: This Engineering Instruction affects contracts let on or after **May 23, 1996**.

PURPOSE: This Engineering Instruction issues a new section of the Standard Specifications of January 2, 1990 and January 2, 1995. The new section, titled "Section 402 - Quality Control Asphalt Concrete - General", is attached.

BACKGROUND: Historically, the Department controlled production of hot mix asphalt (HMA) using traditional, inspection-intensive method specifications. Many states, including New York, are moving away from this type of specification and toward performance-related Quality Control/Quality Assurance (QC/QA) specifications. The Department's first performance-related specification, for compaction of heavy-duty HMA pavements, was written in the early 1990's. Subsequently, the Materials Bureau was charged to develop and implement a performance-related specification for HMA production with the following aims:

- Maintain and/or improve HMA quality;
- Establish clear lines of responsibility between HMA producers and the Department; and,
- Transfer process control to HMA producers.

This performance-related specification describes materials properties which have been found to correlate well with pavement life and are easily tested by the producer during production. The Department continues to have the responsibility for monitoring those tests and performing routine inspections to assure compliance with the specification. Some of the major elements of the attached QC/QA specification are:

- Producers are responsible for all Quality Control testing during HMA production;
- Producers' Quality Control test results are used to determine HMA quality;
- Payment bonuses/penalties are used to encourage production of high quality HMA; and,
- Department's Quality Assurance procedures determine specification compliance.

COST IMPACT: The implementation of this specification should have little or no effect on the cost of hot mix asphalt production. Previous pilot projects using QC production resulted in no cost increase. An overall reduction of inspection cost is anticipated with cessation of the inspection-intensive method specification.

MAIN OFFICE ACTION: The Design Quality Assurance Bureau will insert these specifications into all contract proposals beginning with the May 23, 1996 letting.

CONTACT PERSON: Questions pertaining to this EI or the specification should be directed to Gary Frederick or Dave Whiteley of the Materials Bureau, Field Engineering II Section at (518) 457-4582.

QUALITY CONTROL ASPHALT CONCRETE PRODUCTION

On contracts **LET ON OR AFTER MAY 23, 1996,** Make the following changes to the Standard Specifications of January 2, 1995: Prior to that letting date the changes do not apply.

Page 4-1, line 5
Under §401-1, Description, add the following sentence to the beginning of the first paragraph:

"All hot mix asphalt concrete produced shall meet the requirements of §402-1 and the following."

Page 4-6, line 20

Under §401-3.02, Bituminous Mixing Plant., add the following as the first sentence of the first paragraph:
" All hot mix asphalt concrete produced shall meet the requirements of §402-3 and the following."

Page 4-25, line 27

Under §401-4, Method of Measurement, rewrite the first paragraph of this subsection to read as follows:
"All hot mix asphalt concrete produced will be measured and adjusted as indicated in §402-4 and the following."

Note. Section 402 is included in this proposal.

QUALITY CONTROL ASPHALT CONCRETE PRODUCTION

ATTENTION

The Contractor is advised that this Contract Proposal contains a specification, **Section 402 Quality Control Asphalt Concrete - General,** which is a Quality Control performance-related specification by which the contractor, through the hot mix asphalt manufacturer, is responsible for all Quality Control activities relating to the production of hot mix asphalt. The hot mix asphalt manufacturer is required to perform and document all Quality Control sampling and testing activities in accordance with procedures outlined by the Department. These procedures are available through the Regional Materials Section or the Central Office Materials Bureau.

The contractor shall also be aware this specification contains Quantity Adjustment Factors for all hot mix asphalt pay items. The Quantity Adjustment Factors in the **Quantity Adjustment Factor Conversion Table** below apply for the calendar year in which hot mix asphalt is produced and placed. In addition, the contractor has the option to select any later calendar year phase-in-rate shown below providing the contractor notifies the Department in writing of the selected phase-in-rate option intended for that calendar year. The contractor shall submit such written notice to the project Engineer-in-Charge at least one week prior to each calendar year's initial production. If the Contractor does not notify the Engineer-in-Charge, the phase-in-rate corresponding to the calendar year will be used. Changing phase-in-rate options during the calendar will not be permitted.

Calendar Year	Phase-in-Rate	Option
1996	0%	25%, 50% or 100%
1997	25%	50% or 100%
1998	50%	100%
1999	100%	None

The Quantity Adjustment Factors referenced in **Section 402, Quality Control Asphalt Concrete - General,** shall be changed accordingly depending on the option selected. However, the acceptance criteria referenced in section 402 is not affected by this phase-in-period.

Quantity Adjustment Factor Conversion Table

Quantity Adjustment Factors				
Specified in Section 402	Calendar Year			
	1996	1997	1998	1999
100%	0%	25%	50%	100%
1.04	1.00	1.01	1.02	1.04
1.02	1.00	1.005	1.01	1.02
1.00	1.00	1.00	1.00	1.00
0.98	1.00	0.995	0.99	0.98
0.96	1.00	0.99	0.98	0.96
0.94	1.00	0.985	0.97	0.94
0.92	1.00	0.98	0.96	0.92
0.90	1.00	0.975	0.95	0.90
0.85 [1]	1.00 [1]	0.96 [1]	0.925 [1]	0.85 [1]

Note : 1. Refer to §402-4, Method of Measurement.

QUALITY CONTROL ASPHALT CONCRETE PRODUCTION

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

Page 4-26, *Replace* **"SECTION 402 - VACANT"** with the following:

"SECTION 402 - QUALITY CONTROL ASPHALT CONCRETE - GENERAL

402-1 DESCRIPTION. This performance related specification applies to the manufacture of all hot mix asphalt utilizing a Quality Control/Quality Assurance system for governing production. Quality Control is defined as all activities required to produce hot mix asphalt that meets all specification requirements. The Contractor, through the hot mix asphalt Manufacturer, is ultimately responsible for all Quality Control activities relating to the production of hot mix asphalt.

The Manufacturer shall produce hot mix asphalt according to specification requirements and provide daily documentation on the quality of the hot mix asphalt. The hot mix asphalt payment quantity will be adjusted daily based on the quality of the hot mix asphalt produced. The Manufacturer shall certify daily that production meets the specification requirements.

The Department is responsible for Quality Assurance. Quality Assurance is defined as all activities performed by Department personnel to assure that the production of hot mix asphalt meets the specification requirements. The Department will determine the hot mix asphalt daily adjusted quantity using a Quantity Adjustment Factor. Quantity Adjustment Factors are determined from the materials variation from the mean of the specification limits using tables contained in this specification.

402-2 MATERIALS. The details of §401-2, Materials, shall apply unless otherwise specified in the contract plans or proposal.

402-3 CONSTRUCTION DETAILS. The details of §401-3, Construction Details, shall apply except as modified below:

402-3.01 Quality Control. The Contractor shall make arrangements with the Manufacturer to provide a production control system to produce hot mix asphalt for Department projects that conforms to all specification requirements.

The Manufacturer shall sample and test hot mix asphalt prior to acceptance on Department projects. The sampling and testing shall be performed in accordance with procedures approved by the Department. The Manufacturer shall maintain complete records of all Quality Control test results and actions taken. The records shall indicate the nature and type of deficiencies and corrective actions taken. All Quality Control test results shall be documented in a legible manner and provided to the Department. Hot mix asphalt produced without the required sampling, testing and documentation may be rejected.

A. Control Plan. The Manufacturer shall provide the Regional Materials Engineer with a Control Plan. The Control Plan shall outline all phases of the production process and actions necessary to ensure specification conformance. The Control Plan shall display in organizational form a chart listing all personnel titles associated with the production of the hot mix asphalt. This chart shall identify all personnel names and their functions necessary to implement all elements of the Quality Control program. The Plan Administrator, designated assistant, quality control personnel and phone numbers shall be included. The administration of the control plan shall be the sole responsibility of the Manufacturer.

As a minimum, the Control Plan shall contain the following:

1. Quality Control organizational chart.
2. Identification of the Plan Administrator, designated assistant and Quality Control personnel.
3. Qualifications and responsibilities of individuals.
4. Lines of communication to the Department.
5. Private testing organization representing the Manufacturer, including services provided.
6. Sampling and testing outline to ensure production process control.
7. List of sampling and testing equipment.
8. Actions and corrective actions that ensures Specification conformance.

The Control Plan shall be submitted annually to the Regional Materials Engineer for approval a minimum of fifteen working days prior to any hot mix asphalt production. Hot mix asphalt production without an approved Control Plan will not be allowed. Updates or changes to the Control Plan, or personnel, must receive prior approval by the Regional Materials Engineer.

The Control Plan may be operated by the Manufacturer or a private testing organization representing the Manufacturer. If a private testing organization is used to implement all or part of the control plan, the personnel assigned to the production facility site shall be identified on the organizational chart.

A separate Control Plan shall be submitted for each production facility site. When more than one plant is located at a production facility site, only one Control Plan is required. All plants located at the production facility site must be outlined in the Control Plan. All sampling and testing equipment used to implement the Control Plan shall meet the requirements pertaining to the testing procedure. The Department reserves the right to stop production for Department projects in the event the Control Plan is not followed.

B. Quality Control Organization. The quality control organization shall consist of the following:

1. Plan Administrator. The Plan Administrator shall be a representative of the Manufacturer and have full authority to institute all actions necessary for the operation of the Control Plan. The Plan Administrator is responsible to ensure all requirements of the specification are in conformance. The Plan Administrator's signature shall be legally binding for the Manufacturer. One Plan Administrator is allowed to be responsible for multiple production locations. An Assistant Plan Administrator may be designated in the absence of the Plan Administrator. The Plan Administrator or assistant must be available to communicate with the Department's representative at all times. The Department reserves the right to stop production for Department projects when the Plan Administrator or designee is not available.

2. Quality Control Technician. The Manufacturer shall provide a sufficient number of hot mix asphalt Quality Control Technicians to perform Quality Control sampling and testing. The Quality Control Technician must possess a current New York State Asphalt Pavement Association Certification for Hot Mix Asphalt Sampling and Testing or its equivalent, as determined by the Director, Materials Bureau. A minimum of one Certified Quality Control Technician shall be present at each production facility site. Production facility sites having multiple plants may utilize Non-Certified Technicians to augment the Certified Technician. Hot mix asphalt production is not acceptable unless the Certified Quality Control Technician is present during production. Technicians associated with private testing organizations shall meet the requirements for a Quality Control Technician.

The Department reserves the right to stop plant production for Department projects in the event unacceptable Technician performance is noted. The Regional Materials Engineer or representative will immediately inform the Plan Administrator regarding the reasons for stopping plant operations.

The Department may require the Manufacturer to replace unacceptable technician(s) before plant production is allowed to continue.

As a minimum, the Certified Quality Control Technician shall be responsible for the following:

a. Have knowledge about all plant equipment used for hot mix asphalt production.
b. Perform all Quality Control sampling and testing as required.
c. Document all Quality Control test results and actions necessary to ensure process control.
d. Maintain a separate Quality Control book for each plant.
e. Document all Quality Control test results in a legible manner.
f. Keep Quality Control test results updated on a daily basis.

402-3.02 Production Facility Laboratory. The Manufacturer shall maintain an approved production facility site laboratory equipped with necessary equipment to perform all required hot mix asphalt sampling and testing. Testing equipment requiring calibration shall be calibrated annually and certified by the Manufacturer that all testing equipment meets the required operational tolerances. Verification of the production facility site laboratory and testing equipment will be performed annually by the Department and whenever deemed necessary. Laboratory sampling and testing equipment shall be made available to the Department's Quality Assurance personnel. The requirements under §401-3.02 A.-ll, Inspection Facilities shall apply. In addition, the following equipment shall be required.

A. Maximum Specific Gravity Equipment. Equipment necessary to determine the Maximum Specific Gravity of bituminous paving mixtures. All sampling and testing equipment shall meet the requirements outlined in AASHTO T209, Standard Test Method for Maximum Specific Gravity of Bituminous Paving Mixtures.

B. Bulk Specific Gravity Equipment. Equipment necessary to determine the Bulk Specific Gravity of bituminous paving mixtures. All sampling and testing equipment shall meet the requirements outlined in AASHTO T166, Bulk Specific Gravity and Density of Compacted Bituminous Mixtures using Standard Surface Dry Specimens.

402-3.03 Plant Lot(s) and Sublot(s). Plant lot(s) and sublot(s) shall be determined on a daily basis using NYSDOT Materials Procedure 94-04, Testing Frequencies using Random Sampling at a Hot Mix Asphalt Plant.

A plant lot is defined as the quantity in metric tons of hot mix asphalt produced per plant for each mix design in one day. When more than one mix design is produced at a plant on the same day, then each mix design produced shall represent a separate plant lot. Plant lot numbers are consecutive throughout the production season and start at the beginning of each calendar year's production. Plant lot numbers (i.e. 1-200) shall be assigned for each mix design produced and increased by one for each production day. Sublots will be assigned a consecutive letter (A-F) and shall begin with "A" each production day. When hot mix asphalt is manufactured and stored on a day prior to delivery, the quantity and plant lot number will be associated with the date of delivery.

Plant lots are subdivided into sublots and are based on the anticipated daily production. A sublot is defined as a portion of a plant lot having a quantity not to exceed 700 metric tons. When production exceeds a 700 metric ton sublot, and the excess is not greater than 140 metric tons, the excess shall be incorporated into the previous sublot.

Quality Control sampling and testing shall not be performed on the first or last 70 metric ton portion of a sublot, providing the sublot quantity is greater than 140 metric tons. If a plant lot consists of one sublot and the quantity is not greater than 140 metric tons, the Quality Control sample shall be obtained from the sublot portion greater than 70 metric tons.

When production stops before a sublot sample is obtained, the untested sublot quantity will be incorporated into the next sublot. If there is no subsequent sublot, the quantity shall be incorporated into the previous sublot.

If there is no subsequent or previous sublot to incorporate into, the untested sublot quantity shall be considered a plant lot and the final Quantity Adjustment Factor for that amount shall be 1.00. Untested sublot quantities shall not be incorporated into any subsequent or previous days plant lot production.

When production stops after a sublot sample is obtained and the quantity is less than 700 metric tons, the amount will be considered a sublot.

Hot mix asphalt production without the required Quality Control testing will be allowed to be certified for daily plant lot quantities of 70 metric tons or less. Certified plant lot quantities without the required Quality Control testing shall have a final Quantity Adjustment Factor of 1.00.

The Manufacturer has the option to produce hot mix asphalt mixes at a final Quantity Adjustment Factor of 1.00 for anticipated daily plant lot quantities of 180 metric tons or less, providing the required Quality Control sample yields a Quantity Adjustment Factor of 0.90 or greater. When the Quality Control sample yields a Quantity Adjustment Factor less than 0.90, the Department will determine if the plant lot material will remain in place or be removed and replaced at no cost to the Department. Under this option, any additional sampling and testing will not be considered in the final Quantity Adjustment Factor. The manufacturer shall notify the Regional Materials Office prior to any scheduled option production.

402-3.04 Quality Control Sampling and Testing. Quality Control samples shall be obtained as outlined in NYSDOT Materials Procedure 94-04, Testing Frequencies using Random Sampling at a Hot Mix Asphalt Plant. Only Quality Control samples obtained using Materials Procedure 94-04 will be considered acceptable for determining the final Quantity Adjustment Factor.

Quality Control sampling and testing shall be performed by Quality Control Technicians meeting the requirements outlined in §402-3.01 B. 2, Quality Control Technician.

Quality Control testing procedures will be verified by the Department on a random basis by split sample testing as outlined in NYSDOT Materials Procedure 96-02, Quality Assurance Procedure for Quality Control Hot Mix Asphalt Production. The Manufacturer's Quality Control samples from each mix design produced shall be split into two representative samples and individually tested by the Manufacturer and the Department. The Department's split sample test results will be compared to the Manufacturer's sample test results.

When the split sample test results are within the allowable tolerances as outlined in Table 402-1, Allowable Testing Tolerances, the Manufacturer's Quality Control test results representing the daily plant lot quantity will be used to determine the final Quantity Adjustment Factor.

When the test results of the split sample exceeds the allowable tolerances outlined in Table 402-1, retesting of the subject material shall be performed. When the test results of the retest split sample are within the allowable tolerances, the Manufacturer's Quality Control test results representing the plant lot will be used to determine the final Quantity Adjustment Factor.

When the test results of the retest split sample exceeds the allowable tolerances, an independent verification sample shall be obtained and tested by Department. If the Department's independent verification sample yields a Quantity Adjustment Factor of 1.00 or greater, production will be allowed to continue and all the Manufacturer's Quality Control test results representing the plant lot will be used to determine the final Quantity Adjustment Factor.

TABLE 402-1
ALLOWABLE TESTING TOLERANCES

Test Property	Tolerance	
	Within Lab	Lab to Lab
Gradation ≥ 425 μm	± 5.0 %	± 7.0 %
Gradation < 425 μm	± 2.0 %	± 3.0 %
Bulk Specific Gravity	± 0.020	± 0.028
Maximum Specific Gravity	± 0.011	± 0.019

When the Department's independent verification sample yields a Quantity Adjustment Factor less than 1.00, production for Department projects shall stop and all the Manufacturer's Quality Control test results representing the plant lot up to this point will be used to determine the final Quantity Adjustment Factor. In order for production to continue for Department projects, the Manufacturer must demonstrate by trial production that a trial test sample yields a final Quantity Adjustment Factor of 1.00 or greater. Trial production quantities will not be allowed for Department projects.

Retesting of Split samples shall be performed on the day the plant lot material was produced or delivered. If production has been terminated for any reason, the retesting shall be performed during initial production of the next plant lot. When there is no future production, the subject material shall be considered a plant lot and the final Quantity Adjustment Factor shall be 1.00.

During the required Quality Control sampling and testing, the Manufacturer shall obtain a hot bin or composite aggregate split sample which represents the Quality Control sample. One aggregate split sample shall be obtained per day for each mix type produced. The aggregate split sample shall be reduced to testing size, identified and retained at the production site for a minimum of ten production days. The retained aggregate split samples shall be identified as to plant lot, sublot, and mix type. Hot bin aggregate samples shall be packaged separately by hot bin and retained together. Composite aggregate samples shall be dried before packaging.

All required compacted air void specimens, including the maximum specific gravity samples shall be retained at the production site for a minimum of ten production days. The specimens and samples shall be identified as to the plant lot, sublot, and mix type. The compacted air void specimens and the maximum specific gravity samples shall be air dried and packaged. All retained aggregate and air void samples may be discarded at the end of the specified time period.

The Department reserves the right to witness any or all quality control sampling and testing, and test any or all retained samples for Specification Conformance.

Sampling and testing shall be performed using test procedures and frequencies outlined in the following Table 402- 2, Quality Control Sampling and Testing.

TABLE 402-2
QUALITY CONTROL SAMPLING AND TESTING

Test Property	Sample Location	Test Method	Quality Control Frequency
Aggregate Gradation	NYSDOT MM 5.0	AASHTO T27 MM 5.0	Note (1)
Aggregate Moisture (2)	MM 5.0	MM 5.0	1 Every Other Sublot Minimum 2 Per Day
Air Voids Plant Mixture (3)	MM 5.0	AASHTO T166 & T209 MM 5.13 (M)	1 Per Sublot
Wet Analysis Minus 75μm sieve	Note (4)	AASHTO T11	1 Per Week
Plant Mixture Moisture (2), (5)	MM 5.0	MM 5.0	As Required
Plant Mixture Temperature	Plant and Haul Vehicle	N/A	Routinely, Minimum 4 Times Per Day
Plant Mixture Asphalt Content	MM 5.0	MM 5.0	Routinely, Minimum 4 Times Per Day/Mix
RAP Moisture	MM 5.0	MM 5.0	2 Per Week
RAP Extraction	MM 5.0	MM 5.0	2 Per Week
Asphalt Cement Sampling (6)	MM 5.0	N/A	2 Per Day
High Friction Aggregate Sampling	MM 5.0	NYSDOT 703-14G(M)	As Noted On JMF

NOTES:
(1) Volumetric design mixes - one test every other sublot, minimum one per day.
Non - Volumetric design mixes - one test every sublot.
(2) Required for drum mix plant only.
(3) Required for Volumetric design mixes.
(4) Batch plant hot bin(s) and Drum mix plant composite sample.
(5) Required for Batch and Drum mix plants when producing recycled mixes.
(6) Department will be responsible for sample submission.

QUALITY CONTROL ASPHALT CONCRETE PRODUCTION

A. Sampling. Quality Control samples for aggregate and hot mix asphalt shall be obtained randomly using the procedures outlined in NYSDOT Materials Procedure 94-04, Testing Frequencies using Random Sampling at a Hot Mix Asphalt Plant. Other required Quality Control samples shall be obtained as outlined below in B., Testing, and Table 402-2, Quality Control Sampling and Testing.

B. Testing. The Manufacturer shall perform all Quality Control testing as outlined below:

1. Aggregate Gradation. The aggregate gradation analysis shall be determined using the procedures outlined in NYSDOT Materials Method 5.0, Plant Inspector's Manual for Bituminous Concrete Mix Production. Aggregate gradations for any type mix design produced will be considered in control when all Quality Control sieve test values are within the Job Mix Formula tolerances.

a. Volumetric Design Mixes. An aggregate gradation analysis shall be performed every other sublot of hot mix asphalt produced. A minimum of one analysis per day shall be performed for each mix design produced.

b. Non-Volumetric Design Mixes. An aggregate gradation analysis shall be performed every sublot for each hot mix asphalt mix design produced.

2. Determination of Material Finer than the 75μm Sieve. Material finer than the 75μm sieve shall be determined in accordance with the procedures outlined in AASHTO T11, Standard Test Method for Materials Finer than 75μm Sieve in Mineral Aggregates by Washing. The material finer than the 75μm sieve shall be determined for each production plant a minimum of one per week for monitoring purposes. The analysis shall be performed on the batch plant fine hot bin and the drum mix plant composite sample. Sampling of batch plant coarse aggregate hot bins will be required and/or the testing frequency modified for the fine hot bin if deemed necessary by the Regional Materials Engineer.

3. Air Void Analysis - Volumetric Design Mixes. Air Void analysis shall be performed for each sublot of volumetric design hot mix asphalt produced. The Air Void analysis shall be determined on the hot mix asphalt obtained from the haul vehicle. When hot mix asphalt holding bins are used for standard storage times as outlined in §401-3.03, Hot Bituminous Mixture Holding Bins, the air void analysis shall be determined after the storage time. Air Void analysis shall be determined using the following procedure.

a. The hot mix asphalt shall be tested to determine the Maximum Specific Gravity in accordance with the procedure outlined in NYSDOT Materials Method 5.13(M), Marshall Method Mix Design for Asphalt Concrete Mixtures and AASHTO T209, Standard Test Method for Maximum Specifics Gravity of Bituminous Paving Mixtures. Two Maximum Specific Gravity tests shall be performed per sample and the results averaged to a single value. The maximum allowable difference between the two test results is 0.011.

b. Three hot mix asphalt specimens (one set) shall be compacted and tested to determine the Bulk Specific Gravity in accordance with the procedures outlined in NYSDOT Materials Method 5.13(M), and AASHTO T166, Bulk Specific Gravity and Density of Compacted Bituminous Mixtures Using Standard Surface Dry Specimens. The maximum allowable range for the three specimens shall be 0.020.

c. The air void analysis shall be determined by comparing the average Bulk Specific Gravity of the compacted specimens to the average Maximum Specific Gravity. The value for the Bulk Specific Gravity is determined by averaging three individual specimen values to a single value. The value for the Maximum Specific Gravity is determined by averaging two individual values to a single value.

d. In conjunction with the air void analysis, the Voids in Mineral Aggregate (VMA) and Voids Filled with Asphalt (VFA) shall be calculated and reported.

4. Determination of Asphalt Content. The asphalt content shall be determined using the procedures outlined in NYSDOT Materials Method 5.0, Plant Inspector's Manual for Bituminous Concrete Mix Production. The asphalt content shall be calculated during initial production and then routinely throughout production a minimum of four times per day per mix type.

5. Mixture Temperature. The mix temperature shall be determined at the beginning of production with the first or second haul vehicle and then routinely throughout the production day. A minimum of four temperatures shall be determined per day independent of mix type. The temperature shall be transmitted to the project paving site with the haul vehicle delivery ticket. When hot mix asphalt holding bins are loaded for storage, the mix temperature shall be determined routinely throughout the loading time.

6. Aggregate and Mix Moisture Content (Drum Mix Plant). The aggregate and hot mix asphalt moisture shall be determined using the procedures outlined in NYSDOT Materials Method 5.0. The composite aggregate moisture content shall be determined during initial daily production and then mid-way throughout the production day. A minimum of two aggregate moisture contents shall be determined per day. The hot mix asphalt moisture content shall be determined as deemed necessary by Regional Materials Engineer.

7. Asphalt Cement Sampling. The Manufacturer shall obtain samples of the asphalt cement in accordance with the procedures outlined in NYSDOT Materials Method 5.0. A minimum of two samples shall be obtained each production day. All samples shall be appropriately identified and stored at the facility site. Sample containers, documentation and submission of the samples will be the Department's responsibility.

8. High Friction Aggregate. The high friction coarse aggregate must meet the requirements outlined in §401-2.03 A., Coarse Aggregates. The Manufacturer shall perform high friction coarse aggregate sampling and testing using procedures outlined in NYSDOT Materials Method 5.0 and NYSDOT Test Method 703-14G(M), Percentage of Non-Carbonate Particles in a Coarse Aggregate Mixture. The high friction coarse aggregate test procedure shall be performed at the production facility at frequencies noted on the job mix formula.

9. Recycle Mixes. The Manufacturer shall perform all sampling and testing of recycle design hot mix asphalt using procedures outlined in NYSDOT Materials Method 5.0. Quality Control testing frequencies for recycle mix production shall be followed as outlined in §402-3.04, Quality Control Sampling and Testing, except the following tests shall be performed at frequencies outlined in NYSDOT Materials Method 5.0 and Table 402-2, Quality Control Sampling and Testing.

a. RAP Moisture Test
b. RAP Extraction Test
c. Recycle Mix Moisture Test

C. Air void and Gradation Reporting. Air void control test values shall be calculated to the nearest 0.001 of a percent and reported to the nearest 0.01 of a percent. Aggregate gradation control test values shall be calculated to the nearest 0.01 of a percent and reported to the nearest 0.1 of a percent. When determining test result acceptability, the air void test value shall be referenced to the mix design median of 4.00 percent and the gradation test value referenced to the Job Mix Formula target value.

D. Sampling and Testing Disputes. When sampling and testing disputes occur, the Department will perform referee sampling and testing. Referee samples will be obtained randomly and independently from the Quality Control samples and tested at the Regional or Central Laboratory. For non-volumetric design mixes one independent sample per plant lot shall be obtained and tested. For volumetric design mixes one sample per sublot shall be obtained and tested. If production has been terminated, the Manufacturer's retained sample(s) representing the disputed plant lot will be tested. The Department's independent referee sample(s) test results are final and will be used to determine the final Quantity Adjustment Factor for the disputed quantity and the acceptance of the in place production material.

402-3.05 Production Control. Hot mix asphalt production will be considered in control when all required testing indicates conformance with the requirements outlined in this specification and all Quality Control calculations yields a final Quantity Adjustment Factor of 0.90 or greater.

Hot mix asphalt production will be considered out of control when any required testing is not in conformance with the specification requirements and any Quality Control calculation yields a final Quantity Adjustment Factor of 0.85. When production is out of control, the Manufacturer has the option to:

A. Perform addtional Quality Control sampling and testing.
B. Make adjustments to the production process.
C. Terminate Department production.

When additional Quality Control sampling and testing is performed, the additional test value(s) will be included with the required Quality Control test value(s) to calculate the final Quantity Adjustment Factor. For example, if two required Quality Control tests and two additional Quality Control tests are performed, the final Quantity Adjustment Factor shall be determined using the test value range from the four test column.

During the production process, all target values for mix design parameters must be strived for. When test values consistently fall outside the allowable production tolerances, immediate corrective action shall be taken. Target value adjustments will be allowed for aggregate gradation and asphalt content. Adjustments to any target value must be documented and receive approval by the Regional Materials Engineer prior to any change.

Target value adjustments must begin with the aggregate gradation. Any target value change for the aggregate gradation shall not exceed one half the Job Mix Formula production tolerance and the Specification General Limits. The aggregate gradation production tolerance will be allowed to exceed the Specification General Limits. When the aggregate gradation target value change fails to yield the desired results, then the asphalt content target value may be adjusted. The asphalt content target value can be adjusted up to ± 0.2 percent from the original target value. The adjusted asphalt content target value is not allowed to exceed the Specification General Limit.

Changes to any volumetric design will only be allowed providing all specified volumetric mix properties remain within the specification production limits.

When production is terminated for Department projects, the hot mix asphalt quantity produced up to that point will be considered a plant lot. The final Quantity Adjustment Factor for the terminated plant lot shall be determined by using the required Quality Control test value(s) and all additional test values obtained from the terminated plant lot.

When the daily final Quantity Adjustment Factor of any mix type is 0.85 for two consecutive production days, corrective actions must be taken to bring the production process back into control. If by the end of the third production day, corrective actions did not yield a daily final Quantity Adjustment Factor greater than 0.85, Department production shall be terminated.

When production is terminated for any reason, the Manufacturer shall then demonstrate by trial production that the production process is back in control. Trial production mix properties shall meet all specification requirements and be within production tolerances. The trial production Quality Control test value(s) must yield a Quantity Adjustment Factor of 1.00 or greater. Trial production quantities shall not be supplied to Department projects.

Hot mix asphalt contained in storage that represents any terminated plant lot shall be considered unacceptable and not be shipped to any Department project.

When any production is terminated, the Manufacturer shall immediately notify the Department's Engineer-in-Charge and the Regional Materials Engineer.

402-3.06 Production Quantities. The Manufacturer is required to notify the Regional Materials office of scheduled production by 3:00 PM the day before the production.

Production quantities will be adjusted (if necessary) based on the quality of the hot mix asphalt produced. Production quantity will be adjusted by obtaining the Quantity Adjustment Factor from either Table 402-3 or Tables 402-4 thru 402-6 and applying the final Quantity Adjustment Factor to the daily production quantity. Production quantities shall be determined as outlined in §402-4, Method Of Measurement.

The Manufacturer is required to document daily production quantities of each hot mix asphalt mix produced and transmit daily the quantities to each project, using NYSDOT Form BR-307. Materials Certification form BR-307 acknowledges that the Manufacturer supplied each Department project with Specification Conformance material. The Plan Administrator or authorized representative as outlined in the Control Plan is required to sign the Certification form. An original shall be sent to the project and a copy retained at the production facility. All production quantities shall be transmitted to Department Projects no later than one day following the corresponding delivery.

402-3.07 Documentation. The manufacturer shall maintain at each plant facility all process control test data. The test data shall be kept in a ringed type book which shall be stored in the production facility laboratory. Test data shall be updated in this book within a 24 hour period following each lots production. As a minimum, the book shall contain the control plan, job mix formulas, volumetric design target values, test data summaries, and daily production quantities. All forms, except control charts will be supplied by the Department. Test data shall be documented on NYSDOT Form BR-331(m), Production Summary Sheet. A separate test data production summary sheet is required for each mix design produced.

A copy of the plant automation printout for all hot mix asphalt produced shall be kept at the plant facility site and must be available for review at all times.

Control charts are required for hot mix asphalt air voids and shall be plotted and posted in the laboratory or kept in a separate book. All control charts must be updated within a 24 hour period. Air void control charts are required for each volumetric mix design produced.

The Manufacturer should use the recorded test data from the summary sheets and control charts as part of the process control system to identify potential problems before they occur.

A summary of all test data shall be transmitted weekly to the Regional Materials Engineer. As a minimum, the following shall be documented:

- **A.** Date and time of test sample
- **B.** Gradation Analysis
- **C.** Wet analysis of material finer than 75μm sieve
- **D.** Air Void Analysis
- **E.** Aggregate and hot mix asphalt moisture content
- **F.** Asphalt Content
- **G.** Production mix temperature
- **H.** Lot and sublot identification
- **I.** Random Sample test location
- **J.** Production Quantities (BR-307)
- **K.** High Friction Aggregate results
- **L.** Voids in Mineral Aggregate (VMA) and Voids Filled with Asphalt (VFA)

402-4 METHOD OF MEASUREMENT. The provisions of §401-4, Method of Measurement shall apply except as modified below:

The Manufacturer shall determine on a daily basis the quantity of each plant lot produced. The quantity shall be measured by the number of actual metric tons produced at the plant facility. The quantity shall be determined from the automated proportioning system or the delivery vehicle weigh system. The quantity shall be measured or calculated based on the measured amount and reported to the nearest metric ton.

The Department will determine the final daily Quantity Adjustment Factor for each mix design produced from either Table 402-3 (Volumetric design mixes) or Tables 402-4 thru 402-6 (Non-Volumetric design mixes). The final Quantity Adjustment Factor will be used to adjust the daily production payment quantity.

Plant production payment quantities for Volumetric design mixtures will be adjusted based on plant mixture air voids. Plant production payment quantities for Non-Volumetric design mixtures will be adjusted based on plant mixture aggregate gradation.

The final Quantity Adjustment Factor for Volumetric design mixtures shall be obtained from Table 402-3, Air Voids in Plant Mixture. When hot mix asphalt holding bins are used for Volumetric design mixtures, the final Quantity Adjustment Factor for the stored mixture shall be determined on the day of delivery.

The final Quantity Adjustment Factor for Non-Volumetric design mixtures will be calculated for all Job Mix Formula sieves having design target values less than ninety percent passing. The final Quantity Adjustment Factor for Non-Volumetric design mixtures shall be the lowest factor obtained from Tables 402-4 thru 402-6, Percent Passing Sieves, unless each of the individual Quantity Adjustment Factor is 1.00 or greater. If each individual Quantity Adjustment Factor is equal to or greater than 1.00, the highest Quantity Adjustment Factor shall be used.

When the final Quantity Adjustment Factor for any plant production lot is less than 1.00 and greater than 0.85, the Contractor has the option to remove and replace the subject lot or agree to accept the resulting reduction in payment quantity.

When the final Quantity Adjustment Factor for any plant production lot yields a 0.85, the Department will determine if that plant lot material is acceptable and will remain in place at the calculated Quantity Adjustment Factor or be removed and replaced at no cost to the Department.

The daily final Quantity Adjustment Factor will be transmitted by the Department to the Engineer-in-Charge on NYSDOT Form BR-343, Daily Hot Mix Asphalt Plant Report. The following formula will be used to determine the daily final adjusted payment quantity for each mix type produced and delivered to the project:

Adjusted Payment Quantity = Accepted Plant Quantity x Final Quantity Adjustment Factor

The daily final Quantity Adjustment Factor will be calculated for all hot mix asphalt items specified in the contract documents regardless of pay unit.

Asphalt cement price adjustments will be based upon the adjusted payment quantity and not the actual quantity produced.

402-5 BASIS OF PAYMENT. The provisions of §403-5, Basis of Payment shall apply, except that the daily project quantity shall be adjusted based on the final Quantity Adjustment Factor obtained from the procedures outlined in §402-4, Method of Measurement.

TABLE 402-3
AIR VOIDS IN PLANT MIXTURE (Volumetric Design mixes)

Quantity Adjustment Factor	Average Absolute Value of (Test Value - 4.0 %)			
	1 Test	2 Tests	3 Tests	4 or More Tests
1.04	0.00 - 0.38	0.00 - 0.27	0.00 - 0.22	0.00 - 0.19
1.02	0.39 - 0.75	0.28 - 0.53	0.23 - 0.44	0.20 - 0.38
1.00	0.76 - 1.50	0.54 - 1.06	0.45 - 0.87	0.39 - 0.75
0.98	1.51 - 1.65	1.07 - 1.17	0.88 - 0.95	0.76 - 0.83
0.96	1.66 - 1.80	1.18 - 1.27	0.96 - 1.04	0.84 - 0.90
0.94	1.81 - 1.95	1.28 - 1.38	1.05 - 1.13	0.91 - 0.98
0.92	1.96 - 2.10	1.39 - 1.48	1.14 - 1.21	0.99 - 1.05
0.90	2.11 - 2.25	1.49 - 1.59	1.22 - 1.30	1.06 - 1.13
0.85*	over 2.25	over 1.59	over 1.30	over 1.13

TABLE 402-4
PERCENT PASSING 425μm and LARGER SIEVES (Non - Volumetric Design mixes)

Quantity Adjustment Factor	Average Absolute Value of (Test Value - JMF Target Value)			
	1 Test	2 Tests	3 Tests	4 or More Tests
1.04	0.0 - 1.5	0.0 - 1.1	0.0 - 0.9	0.0 - 0.8
1.02	1.6 - 3.0	1.2 - 2.1	1.0 - 1.8	0.9 - 1.5
1.00	3.1 - 6.0	2.2 - 4.2	1.9 - 3.5	1.6 - 3.0
0.98	6.1 - 6.6	4.3 - 4.7	3.6 - 3.8	3.1 - 3.3
0.96	6.7 - 7.2	4.8 - 5.1	3.9 - 4.2	3.4 - 3.6
0.94	7.3 - 7.8	5.2 - 5.5	4.3 - 4.5	3.7 - 3.9
0.92	7.9 - 8.4	5.6 - 5.9	4.6 - 4.8	4.0 - 4.2
0.90	8.5 - 9.0	6.0 - 6.4	4.9 - 5.2	4.3 - 4.5
0.85*	over 9.0	over 6.4	over 5.2	over 4.5

Note: * Refer to §402-4, Method of Measurement.

TABLE 402-5
PERCENT PASSING 180μm SIEVE (Non - Volumetric Design mixes)

Quantity Adjustment Factor	Average Absolute Value of (Test Value - JMF Target Value)			
	1 Test	2 Tests	3 Tests	4 or More Tests
1.04	0.0 - 1.0	0.0 - 0.7	0.0 - 0.6	0.0 - 0.5
1.02	1.1 - 2.0	0.8 - 1.4	0.7 - 1.2	0.6 - 1.0
1.00	2.1 - 4.0	1.5 - 2.8	1.3 - 2.3	1.1 - 2.0
0.98	4.1 - 4.4	2.9 - 3.1	2.4 - 2.5	2.1 - 2.2
0.96	4.5 - 4.8	3.2 - 3.4	2.6 - 2.8	2.3 - 2.4
0.94	4.9 - 5.2	3.5 - 3.7	2.9 - 3.0	2.5 - 2.6
0.92	5.3 - 5.6	3.8 - 4.0	3.1 - 3.2	2.7 - 2.8
0.90	5.7 - 6.0	4.1 - 4.3	3.3 - 3.5	2.9 - 3.0
0.85*	over 6.0	over 4.3	over 3.5	over 3.0

TABLE 402-6
PERCENT PASSING 75μm SIEVE (Non - Volumetric Design mixes)

Quantity Adjustment Factor	Average Absolute Value of (Test Value - JMF Target Value)			
	1 Test	2 Tests	3 Tests	4 or More Tests
1.04	0.0 - 0.5	0.0 - 0.4	0.0 - 0.3	0.0 - 0.2
1.02	0.6 - 1.0	0.5 - 0.7	0.4 - 0.6	0.3 - 0.5
1.00	1.1 - 2.0	0.8 - 1.4	0.7 - 1.2	0.6 - 1.0
0.98	2.1 - 2.2	1.5 - 1.6	1.3 - 1.4	1.1 - 1.2
0.96	2.3 - 2.4	1.7 - 1.8	1.5 - 1.6	1.3 - 1.4
0.94	2.5 - 2.6	1.9 - 2.0	1.7 - 1.8	1.5 - 1.6
0.92	2.7 - 2.8	2.1 - 2.2	1.9 - 2.0	1.7 - 1.8
0.90	2.9 - 3.0	2.3 - 2.4	2.1 - 2.2	1.9 - 2.0
0.85*	over 3.0	over 2.4	over 2.2	over 2.0

Note: * Refer to §402-4, Method of Measurement."

QUALITY CONTROL ASPHALT CONCRETE PRODUCTION

On contracts **LET ON OR AFTER MAY 23, 1996,** Make the following changes to the Standard Specifications of January 2, 1990: Prior to that letting date the changes do not apply.

Page 4-1
Under §401-1, Description, add the following sentence to the beginning of the first paragraph:

"All hot mix asphalt concrete produced shall meet the requirements of §402-1 and the following."

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Under §401-3.02, Bituminous Mixing Plant., add the following as the first sentence of the material in quotes " All hot mix asphalt concrete produced shall meet the requirements of §402-3 and the following."

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Under §401-4, Method of Measurement, rewrite the first paragraph of this subsection to read as follows: "All hot mix asphalt concrete produced will be measured and adjusted as indicated in §402-4 and the following."

Note. Section 402 is included in this proposal.