

QUALITY MANAGEMENT SYSTEM FOR ASPHALT PAVEMENTS (Maintenance Version – July 2006)

F.O.B. Annual Needs Asphalt, Subdivision and Encroachment Agreement Asphalt Pavements

1. DESCRIPTION.

Produce and supply asphalt mixtures and pavements in accordance with a quality management system as described in these provisions. Perform all quality control activities in accordance with applicable procedures detailed in the Department's Hot Mix Asphalt Quality Management System (HMA/QMS) Manual in effect on the date of contract advertisement, except as modified herein or unless otherwise approved.

In lieu of providing quality control in accordance with these provisions, the supplier may provide quality control for the applicable mix type as described in Section 609 of the July 2006 Standard Specifications with revisions in effect on the date of contract advertisement. In addition, Certification of Pavement Conformance, as detailed in Item 2B below, is a requirement.

The producer will be permitted to operate under any of the Quality Management Systems detailed above and may switch from one system to another provided the minimum sampling frequency is maintained and the appropriate Division Quality Assurance Supervisor is notified in advance.

2. DESCRIPTION OF RESPONSIBILITIES.

(A) Quality Control:

Provide and conduct a quality control program in accordance with Item 5 "Contractor's Quality Control System". A quality control program is defined as all activities, including mix design, process control inspection, plant and equipment calibration, sampling and testing, and necessary adjustments in the process that are related to production, transportation and placement of a pavement to meet all requirements of the specifications. Complete and provide to the Project Engineer Form QMS-MV1 detailing the companies and/or individuals responsible for each component of the quality control program.

(B) Quality Control Certification of Pavement Conformance:

Prior to project acceptance onto the State Maintenance System, provide to the Project Engineer certification that Hot Mix Asphalt was constructed in accordance with this Provision, Article 610 of the July 2006 Standard Specifications for Roads and Structures as revised by the Maintenance Provision, dated January 2008, and in accordance with the Approved Plans. Utilize Form QMS-MV2 for this certification process. Certification of pavement conformance is project specific and may be performed by either a North Carolina licensed Professional Engineer with expertise in asphalt testing and placement procedures or a NCDOT certified QMS Level II Plant Technician.

Include all quality control test reports associated with the production, placement and compaction of the asphalt with the certification document. Compile the test results for each day's production to a project separately. QC laboratory test data may be representative of asphalt produced to multiple projects provided the minimum testing frequency is maintained. Provide measurements and documentation to substantiate the constructed pavement width, thickness and cross-section is that detailed in the Approved Plans.

Asphalt which does not conform to the Approved Plans and/or Specifications should be presented to the Project Engineer for evaluation prior to certification of pavement conformance. Additional testing to determine suitability of this asphalt may be required. Note in a summary

and attach to the certification all asphalt test results that do not meet Specifications. Include Project Engineers directives; additional test results, if applicable; corrective measures; and final action.

Certification of Pavement Conformance does not relieve the appropriate company/ies from the responsibility of performing any pavement maintenance or corrective measures necessary prior to acceptance of the project.

Certification of Pavement Conformance is not required for F.O.B. Annual Needs Asphalt.

(C) Quality Assurance:

The Department will conduct a quality assurance program in accordance with Item 6 "Quality Assurance". A quality assurance program is defined as all activities, including inspection, sampling, and testing related to determining that the quality of the mixture components and completed pavement conforms to specification requirements.

3. MIX DESIGN/JOB MIX FORMULA REQUIREMENTS.

Apply all requirements of Article 610-3 of the July 2006 Standard Specifications for Roads and Structures as revised by the Maintenance Provision, dated January 2008.

4. FIELD VERIFICATION OF MIXTURE AND JOB MIX FORMULA ADJUSTMENTS.

Conduct field verification of the mix at each plant within 30 calendar days prior to initial production of each mix design, when required by the Allowable Mix Adjustment Policy and when directed as deemed necessary. Provide mix verification results to Division QA lab and to individual certifying mix conformance.

Field verification testing consists of performing a minimum of one full test series on mix sampled and tested in accordance with Item 5(C)2, "Required Sampling and Testing Frequencies". Obtain the mix verification sample and split in accordance with current procedures in the Department's HMA/QMS Manual. Do not begin normal plant production until all field verification test results have been completed and the mix has been satisfactorily verified by a QMS Level II Quality Control Plant Technician or Division Quality Assurance Supervisor. Verification is considered satisfactory when all volumetric properties except %Gmm@Nini are within the applicable mix design criteria and the gradation, binder content, and %Gmm@Nini are within the individual control limits for the mix type being produced as specified in Article 609 of the July 2006 Standard Specifications for Roads and Structures with revisions in effect on the date of contract advertisement.

In addition to the required sampling and testing for field verification, perform all preliminary inspections and plant calibrations as outlined in the HMA/QMS Manual.

Retain records of these calibrations and mix verification tests, including Superpave Gyratory Compactor (SGC) printouts, at the QC laboratory. In addition, furnish copies of the mix verification tests, including SGC printouts, to the Division Quality Assurance Lab and individual certifying pavement conformance.

Conduct the initial mix verification of all new mix designs with the plant set up to produce the aggregate blend and binder content in accordance with the initially approved JMF. If the Contractor and/or the Engineer determines from quality control test results conducted during mix verification that adjustments to the JMF are necessary to achieve specified mix properties, adjustments to the JMF may be made within tolerances permitted by specifications for the mix type being produced, subject to approval. No reduction of asphalt binder content will be made

when the average production VMA computes below the minimum specification requirement. All JMF adjustments will be approved by the Engineer and documented in writing.

Failure by the Contractor to fully comply with the above mix verification requirements will result in immediate production stoppage by the Engineer. Do not resume normal production until all mix verification sampling and testing, calibrations, and plant inspections have been performed and approved. Any mix produced that is not verified may be assessed a price reduction at the Engineer's discretion in addition to any reduction in pay due to mix and/or density deficiencies.

5. CONTRACTOR'S QUALITY CONTROL SYSTEM.

(A) Personnel Requirements:

Obtain all certifications in accordance with the Department's QMS Asphalt Technician Certification Program as outlined in the HMA/QMS Manual. Provide a certified QMS Asphalt Plant Technician or QMS Asphalt Mix Sampling Technician at each plant site at all times during production of material for the project. Perform all quality control operations and activities, testing, and data analysis by or under the direct supervision of a certified QMS Asphalt Plant Technician. Sampling and data posting may be performed by or under the direct supervision of a certified QMS Asphalt Mix Sampling Technician or QMS Asphalt Plant Technician.

Absences of the QMS Asphalt Plant Technician or QMS Asphalt Mix Sampling Technician, other than those for normal breaks and emergencies, must be pre-approved by the appropriate QA Supervisor or his designated representative. Any extended absence of the Technician that has not been approved will result in immediate suspension of production by the Engineer. All mix produced during this absence will be accepted in accordance with Article 105-3 of the Standard Specifications.

Have readily available a certified QMS Asphalt Plant Technician Level II to consult for any necessary adjustments in the mix quality control process. The Level II Technician may serve in a dual capacity and fulfill the Level I Technician or Asphalt Mix Sampling Technician requirements specified above.

Provide a certified QMS Roadway Technician with each paving operation at all times during placement of asphalt, F.O.B. Annual Needs asphalt excluded. This person is responsible for monitoring all roadway paving operations and directly supervising all quality control processes and activities, to include stopping production or implementing corrective measures when warranted. The Roadway Technician is also responsible for monitoring density test results and proceeding on limited production if required. Provide a certified QMS Nuclear Gauge Operator when nuclear density control is being used.

Post in the quality control laboratory an organizational chart, including names, telephone numbers and current certification numbers of all personnel responsible for the quality control program while asphalt paving work is in progress.

(B) Field Laboratory Requirements:

Perform all quality control testing at a Department certified laboratory, unless otherwise approved. The laboratory may be located either at the plant facility or off-site. A minimum of 320 square feet (30 square meters) of floor space (exclusive of toilet facilities), equipment, and supplies necessary for performing quality control testing is required. Provide convenient telephone and fax machine access for QMS personnel at the plant site.

Provide testing equipment meeting the requirements of the test methods herein identified in Item 5(C)2, "Required Sampling and Testing Frequencies". Provide equipment that is properly

calibrated and maintained. Allow all measuring and testing devices to be inspected to confirm both calibration and condition. If at any time the Engineer determines that the equipment is not operating properly or is not within the dimensions or calibration described in the applicable test method, the Engineer may stop production until corrective action is taken. Maintain and have available a record of all calibration results at the laboratory.

(C) Plant Mix Quality Control:

(1) General:

Include in the quality control process the preliminary inspections, plant calibrations and field verification of the mix and JMF as described in Item 4, "Field Verification of Mixture and Job Mix Formula Adjustments". In addition, conduct at a minimum, but not limited to, the sampling, testing, and determination of all parameters outlined in these provisions using test methods and minimum frequencies specified herein. Perform additional sampling and testing when conditions dictate. Log all samples taken on forms provided by the Department. Split and retain all samples taken in accordance with prescribed procedures in the HMA/QMS Manual. Provide documentation as required in Item 5(E), "Documentation (Records)".

Retain the untested split portion of quality control aggregate and mix samples for 5 calendar days at the quality control laboratory site, commencing the day the samples are tested. Permission for disposal may be given by Quality Assurance personnel prior to these minimum storage periods. Retain the split portion of the quality control mix verification and referee mix samples until either procured by or permission for disposal is given by Quality Assurance personnel. Store all retained samples in a dry and protected location.

(2) Required Sampling and Testing Frequencies:

For projects or contracts where the specified quantity of an asphalt concrete mix type is 100 tons or more, maintain minimum test frequencies as established in the schedule below. Complete all tests within 4 calendar days of the time the sample is taken. Should the specified tests not be completed within the required time frame, cease production at that point until such time the tests are completed. Provide all test data to the appropriate Division Quality Assurance Lab and individual certifying pavement conformance within one calendar day of the results being known.

Should the Contractor's testing frequency fail to meet the minimum frequency requirements as specified, all mix without the specified test representation will be considered unacceptable until samples are recovered from the constructed pavement and the appropriate testing is performed. Upon evaluation of the test results, the pavement will be accepted in accordance with Article 105-3 of the Standard Specifications.

If desired, innovative equipment or techniques not addressed by these specifications to produce or monitor the production of mix may be utilized, subject to approval.

QUALITY CONTROL MINIMUM SAMPLING AND TESTING SCHEDULE

Sample and test the completed mixture from each mix design at the minimum frequency detailed below. Include in the production increment all mix being produced under this Provision, excluding F. O. B. Annual Needs asphalt. If the daily production quantity is less than 100 tons (metric tons) a sample is not required.

<u>Daily Production – Tons (Metric Tons)</u>	<u>Number of Samples per day</u>
100 – 750 (100-750)	1
750- 1500+	1 per each additional 750 tons (metric tons)

Sample and test the completed F.O.B. Annual Needs asphalt mixture at a minimum frequency of 1 Partial Test Series per quarter for each mix design produced during that quarter, beginning January of each year, and/or when directed by Quality Assurance personnel. Obtain the sample from the actual asphalt being supplied for F.O.B. Annual Needs Asphalt.

Utilizing the QMS Form QC-1, fax all tonnage information to the appropriate Division Quality Assurance Lab by the beginning of the next work day, not to exceed one (1) calendar days.

Obtain a sample, within the increment specified above, at a location determined by the QMS Asphalt Plant Technician or QMS Asphalt Mix Sampling Technician. Acquire the sample in accordance with the procedures detailed in the current edition of the Department's HMA/QMS Manual, excluding the random sampling procedures. Sample the asphalt mixture from the truck at the plant in accordance with AASHTO T 168 Modified. A split sample is required.

Perform a Partial Test Series on each sample within the specified increment. Utilizing the QMS Form QC-1, provide test results to the Quality Assurance Lab and the individual certifying pavement conformance within one calendar day after the test results are known.

Partial Test Series will consist of Items A. and B. detailed directly below.

- A. Binder Content, % (Contractor may select either option below):
 - 1. Ignition Furnace (AASHTO T 308 Modified)
 - 2. Other (Contractor may request and use other means of determining percent asphalt binder, subject to approval).
- B. Gradation on Recovered Blended Aggregate from Mix Sample
(AASHTO T 30 Modified) Grade on all sieves specified on JMF

In addition to Items A& B above, perform the following additional tests, Items C through J, during mix verification (Full Test Series).

- C. Maximum Specific Gravity (AASHTO T 209 or ASTM D 2041), optional (ASTM D 6857)
- D. Bulk Specific Gravity of Compacted Specimens (AASHTO T 166), optional (ASTM D 6752), Average of 3 specimens at N_{des} gyrations (AASHTO T 312)
- E. Air Voids (VTM)(AASHTO T 269), Average of 3 specimens at N_{des} gyrations
- F. Voids in Mineral Aggregate (VMA) (calculation)
- G. Voids Filled with Asphalt (VFA) (calculation)

H. $P_{0.075}/P_{bc}$ Ratio

I. % Maximum Specific Gravity at N_{ini} (calculation)

J. % Maximum Specific Gravity at N_{max} . (Split Sample Required)

1. Sampled from plant produced mix
2. 3 specimens compacted at N_{max} gyrations
3. %Gmm@Nmax calculated from average of 3 specimens.

As part of the Quality Control Process and in addition to the above Full and Partial Test Series, periodically or when directed conduct the following sampling and testing:

A. Aggregate Stockpile Gradations (AASHTO T 27 and T 11)

(Sampled from stockpiles or cold feed system as follows; split samples not required)

1. Coarse Aggregates (Approved Standard Sizes)
2. Fine Aggregates (Stone Screenings, Natural Sands, Etc.)

In lieu of the aggregate stockpile gradations performed by QC, gradation quality control data conducted by the aggregate producer, which is representative of the Contractor's current stockpiles, may be furnished.

B. Reclaimed Asphalt Pavement (RAP) Binder Content and Gradation (AASHTO T 308 Modified or T 164 and AASHTO T 30) (sampled from stockpiles or cold feed system). Have RAP approved for use in accordance with Article 1012-1(G). (Split Sample Required)

C. Combined Aggregate Moisture Content (AASHTO T 255) Drum Plant Only (sampled from stockpiles or cold feed system).

D. Uncompacted Void Content of Fine Aggregate, AASHTO T 304, Method A (natural sand only).

E. Reclaimed Asphalt Shingle Material (RAS) Binder Content and Gradation (AASHTO T 308 Modified or T 164 and AASHTO T 30 Modified) (sampled from stockpiles or cold feed system at beginning of production and weekly thereafter). Have RAS approved for use in accordance with Article 1012-1(F). (Split Sample Required)

Sampling and Testing of the asphalt mixture may be performed after pavement construction is complete, however, this process is highly discouraged. When electing to test the asphalt mixture after the pavement construction is complete, adhere to the sampling and testing frequency detailed below. Perform all sampling and testing in the presence of an appropriately QMS certified technician.

- A. The mixture tonnage without test representation will be divided into approximate equal sub-lots not to exceed 250 tons.
- B. Increment tonnage of 375 tons or more will be divided into a minimum of 3 sub-lots.
- C. Increment tonnage of less than 375 tons will be divided into a minimum of 2 sub-lots.

- D. Each sub-lot shall be sufficiently cored at one random location to yield enough mix to perform a Partial Test Series. Only one set of samples will be allowed in each sub-lot.
- E. Core samples from the same sub-lot will be combined for testing, samples from different sub-lots shall not be combined for testing.
- F. Full depth cores must be satisfactorily separated by mix layer prior to testing.
- G. Saw the area from which the cores were taken to create a rectangular area. Remove all excess material and immediately clean, tack, fill with hot asphalt mix of the same type and compact the asphalt to conform to the surrounding area.

(3) Control Limits:

The following are established as control limits for mix production.

Control Limits

Mix Control Criteria	Target Source	Individual Limit
2.36mm Sieve	JMF	±8.0 %
0.075mm Sieve	JMF	±2.5 %
Binder Content	JMF	±0.7 %

(4) Corrective Actions:

All required corrective actions are based upon initial test results and must be taken immediately upon obtaining those results. In the event situations occur which warrant more than one corrective action and/or adjustment, give precedence to the more severe of these actions. Stopping production when required takes precedence over all other corrective actions. Document all corrective actions.

Immediately cease production of a mix when an individual test result for a mix control criteria exceeds both the individual test control limits and the applicable specification design limits detailed in Table 610-1 of the July 2006 Standard Specifications for Roads and Structures as revised by the Maintenance Provision, dated January 2008, or when two consecutive binder content test results exceed the individual limits. Do not resume normal production of the mix in question until approval is given.

Acceptance of all mix failing to meet the individual test control limits will be determined in accordance with Article 105-3. In addition, any mix which is obviously unacceptable will be rejected for use in the work.

Failure to stop production when required due to an individual mix test not meeting the specified requirements will subject all mix from the stop point tonnage to the point when the next individual test is back within the control limits, or to the tonnage point when production is actually stopped, whichever occurs first, to being considered unacceptable. Acceptance of this mix will be determined in accordance with Article 105-3 of the Standard Specifications. Additional sampling and testing of the mix from the constructed pavement may be required for evaluation.

(5) Allowable Retesting for Mix Deficiencies:

The Contractor may elect to resample and retest for plant mix deficiencies when individual QC test(s) exceed one or more mix property target(s) by more than the tolerances indicated below. Perform the retesting within 10 days after initial test results are determined. Retesting must be approved prior to being performed and in accordance with the Department's "GUIDELINES FOR RETESTS OF PLANT MIX DEFICIENCIES" outlined in the HMA/QMS Manual. These retests will be performed by the Contractor under the supervision of the Department's QA Personnel. Retests for any mix deficiency other than as listed below will not be allowed unless otherwise permitted. Acceptance of the mix in question will be based on the retest data in accordance with Article 105-3.

The Department reserves the right to require the Contractor to resample and retest at any time or location as directed.

- % Binder Content -- by more than +/- 1.0%
- 0.075 mm sieve -- by more than +/- 3.0%
- 2.36 mm sieve -- exceeds both the Specification mix design limits and one or more of the above tolerances

(D) Field Compaction Quality Control (F.O.B. Annual Needs Asphalt excluded):

(1) General:

Perform quality control of the compaction process in accordance with these provisions and applicable requirements of Article 610-9 of the July 2006 Standard Specifications for Roads and Structures as revised by the Maintenance Provision, dated January 2008. The Contractor may elect to use either cored sample density procedures or nuclear gauge density procedures. Utilizing QMS Form MV-1, provide to the Department and the individual certifying pavement conformance the method of density quality control which will be used on the project.

Establish acceptable control strips when required at locations approved by the Engineer. Construct control strips which are 300 feet (91.4 m) in length at the paver laydown width being placed. When utilizing core sample control, place control strips anytime placement is proceeding on limited production due to failing densities. When utilizing nuclear density control, place control strips at the minimum frequencies specified in the Department's current Nuclear Gauge Operator's Manual. In addition, place control strips anytime deemed necessary by the Engineer.

Perform density sampling and testing within each test section, which is defined as 2000 linear feet (600 linear meters) or fraction thereof per day of pavement placed at the paver laydown width. Perform density sampling and testing on all pavement widening 4.0 feet (1.2 m) or greater, on uniform width paved shoulders 2.0 feet (0.6 m) or greater, and on all full width travel lane pavements, including normal travel lanes, turn lanes, collector lanes, ramps, loops, temporary pavements, and wedging as outlined in the HMA/QMS Manual, unless otherwise approved.

Base and intermediate mix types (surface mixes not included) utilized for pavement widening of less than 4.0 feet (1.2 meters) and all mix types used in tapers, irregular areas and intersections (excluding full width travel lanes of uniform thickness), will not be subject to the sampling and testing frequency specified above provided the pavement is compacted using approved equipment and procedures. However, the Engineer may require occasional

density sampling and testing to evaluate the compaction process. Irregular areas are defined as areas which have irregular shapes which make them difficult to compact with conventional asphalt rollers to include cul-de-sacs.

Perform the sampling and testing at the minimum test frequencies as specified above. Should the density testing frequency fail to meet the minimum frequency as specified above, all mix without the required density test representation will be considered unsatisfactory until samples are recovered from the constructed pavement and the appropriate testing is performed. Upon evaluation of the test results, the pavement will be accepted in accordance with Article 105-3 of the Standard Specifications.

Conduct all QC nuclear density testing the same day that the mix being tested is placed and compacted. Obtain all core samples no later than the beginning of the next production day, not to exceed three (3) calendar days. Test QC core samples and submit test results to the Quality Assurance Lab and to the individual certifying pavement conformance within one calendar day of the results being known. Should the specified density tests not be completed within the allowable time cease production at that point until such time the required tests are completed. Failure to provide samples may result in suspension of all project operations.

Retain quality control density core samples at the plant site for 5 calendar days, commencing the day the samples are tested, or until permission for disposal is granted by the quality assurance personnel, whichever occurs first. Retain the Department's quality assurance comparison and verification core samples in a sealed container at the plant site until obtained by quality assurance personnel. Store all retained density samples on a smooth, flat surface in a cool, dry, and protected location.

Check core samples may be taken by the Contractor for any of the following reasons:

1. When core sample control is being used and a test section core sample(s) is more than 2.0 percent below the average of all core samples from the same lot, that core(s) samples may be checked,
2. When a control strip fails and a core sample(s) is more than 2.0 percent below the average of the control strip, that core(s) may be checked.

For each core sample that is to be checked, take 3 check samples as follows: one adjacent to the initial sample and one ten feet (3 meters) in each direction, longitudinally, of the initial sample. The results of these 3 check samples will be averaged and this average will be used in lieu of the initial core results in question. The initial core sample results will not be used if check samples are taken.

Check samples must be taken within 2 calendar days of the date when the initial sample results are obtained. Only one set of check samples per sample location will be allowed. If full depth cores are necessary at these check sample locations, separation of the layer to be tested will be the responsibility of the Contractor. Notify the Project Engineer if check samples are to be obtained.

(2) Pavement Samples (Cores):

When cored samples are required by either density method, obtain cores from the full layer depth of the compacted pavement at random locations determined in accordance with procedures in the Department's HMA/QMS Manual. Full depth cores may be taken in lieu of placing a separator medium beneath the layer to be tested. If full depth cores are taken, the Contractor is responsible for separating the layer of mix to be tested in a manner such that it is not damaged. The use of a separator medium beneath the layer to be tested is prohibited.

Pavement layers may be cooled by approved artificial methods to allow cutting the core samples as quickly as possible. No additional compensation will be made for the costs of artificial cooling.

Take pavement specimens for density testing purposes utilizing a 6 inch (152.4 mm) core drill. Use approved coring equipment that is capable of taking a representative sample of the compacted pavement.

Where samples have been taken, clean the inside surfaces of the sample hole, dry, lightly coat with tack coat, and immediately place and compact new mix of the same type to conform with the surrounding area. Use a circular tamp or other approved device to achieve compaction.

(3) Cored Sample Density Procedures:

In addition to the above requirements, perform core sample density control procedures as noted herein. When cored sample control is being utilized, the testing frequency will be a minimum of one random 6 inch (152 mm) core sample taken from each test section, except take a minimum of at least three core samples from each mix type and/or lot placed on a given day.

An initial control strip is not required at the beginning of placement of each job mix formula but may be performed by the Contractor for use in determining the necessary compactive effort and roller patterns. Cored sample control strips will be required if production and placement is being performed under limited production procedures due to failing densities.

(4) Nuclear Gauge Density Procedures:

In addition to the requirements in Item 5(D)1, perform nuclear density control procedures in accordance with the Department's most current Nuclear Gauge Operator's Manual. This manual may be obtained through the Department's M & T Soils Section. Determine density by the backscatter method of testing using a thin-lift nuclear gauge, with printer, which has been approved by the Department. Furnish, maintain, and operate the nuclear gauge. Perform testing by a certified QMS Nuclear Gauge Operator.

Provide a gauge that has been calibrated within the previous 12 months by an approved calibration service. Maintain documentation of such calibration service for a 12-month period. Provide record of gauge calibration to the individual certifying mix conformance.

Conduct all QC nuclear density tests the same day the mix being tested is placed and compacted. Furnish summary of density results, along with the nuclear gauge printout(s), to the individual certifying mix conformance.

Determine target density for testing by constructing control strip(s) in accordance with and at the frequencies prescribed in the Nuclear Gauge Operator's Manual. Core samples from the control strips may be checked in accordance with the criteria established in Item 5(D)1.

Conduct sampling and testing as specified based on test sections consisting of not more than 2000 linear feet (600 linear meters) or fraction thereof per day on pavement placed at the paver laydown width. The nuclear density testing frequency will consist of five random gauge readings (one random reading from each of five equally spaced increments) from each test section. In addition, take at least five gauge readings during any day's production of a given mix type. Random locations for gauge readings will be determined in accordance with the procedures in the Department's most current Nuclear Gauge Operator's Manual. Test

section pavement must be of the same mix design as the pavement utilized in the applicable control strip.

(5) Density Acceptance:

As detailed in Article 610-13 of the July 2006 Standard Specifications for Roads and Structures as revised by the Maintenance Provision, dated January 2008, asphalt pavement will be accepted for density on a lot by lot basis. A lot will consist of one day's production of a given job mix formula on a contract. As an exception, separate lots will be established for pavement placed simultaneously by multiple paving crews. A separate lot will be established for the pavement placed by each paving crew.

(6) Limited Production Procedure:

Proceed on limited production when, for the same mix type, one of the following items occur:

- Three consecutive failing lots
- Two consecutive failing nuclear control strips.

Limited production is defined as being restricted to the production, placement, and compaction of a sufficient quantity of mix necessary to construct only a 300 foot (100 meter) control strip plus 100 feet (30 meters) of pavement adjacent to each end of the control strip.

Remain on limited production until such time as satisfactory density results are achieved or until two control strips have been attempted without achieving acceptable density test results. If the Contractor fails to achieve satisfactory density after two control strips have been attempted, cease production of that mix type until such time as the cause of the failing density test results can be determined. As an exception, the Project Engineer may grant approval to produce a different mix design of the same mix type if the cause is related to mix problem(s) rather than compaction related problems.

If the Contractor does not operate by the limited production procedures as specified above, three consecutive failing lots or two consecutive failing nuclear control strips, whichever is applicable, and all mix produced thereafter will be considered unacceptable. Acceptance of this mix will be determined in accordance with Article 105-3 of the Standard Specifications. Additional sampling and testing from the constructed pavement may be required for evaluation of this pavement.

(E) Documentation (Records):

Document all quality control observations, records of inspection, samples taken, adjustments to the mix, and test results on a daily basis. Note the results of observations and records of inspection as they occur in a permanent field record. Record adjustment to mix production and test results on forms provided. Provide all such records to the Engineer, upon request, at any time during project construction.

Complete all QC records and forms in accordance with the most current edition of the Department's HMA/QMS Manual and provide to the individual certifying mix conformance. Maintain the QC testing forms and records for one calendar year after the project is accepted onto the state maintenance system. Failure to maintain QC records and forms as required, or to provide these records and forms to the Engineer upon request, may result in production and/or placement stoppage until the problem is resolved.

Falsification of test results, documentation of observations, records of inspection, adjustments to the process, discarding of samples and/or test results, or any other

deliberate misrepresentation of the facts will result in the revocation of the applicable person's QMS certification and possible prosecution under State and/or Federal Law. The Engineer will determine acceptability of the mix and/or pavement represented by the falsified results or documentation. If the mix and/or pavement in question is determined to be acceptable, the Engineer may allow the mix to remain in place at no pay for the mix, asphalt binder and other mix components. If the mix and/or pavement represented by the falsified results is determined not to be acceptable, remove and replace with mix which complies with the Specifications. Payment will be made for the actual quantities of materials required to replace the falsified quantities, not to exceed the original amounts.

6. QUALITY ASSURANCE.

The Department's quality assurance program will be conducted by a certified QMS technician(s) and will be accomplished in the following ways:

Plant Mix Quality Assurance:

1. By conducting assurance testing of split samples obtained by the Contractor;
2. By periodically observing sampling and testing procedures performed by the Contractor;
3. By directing the Contractor to take additional samples at any time and any location during production (in lieu of the next scheduled random sample for that increment);
4. By conducting verification sampling and testing on samples taken independently of the Contractor's quality control samples; or
5. By any combination of the above

The Engineer will conduct assurance tests on both split QC mix samples taken by the Contractor and verification samples taken by the Department. These samples may be the regular quality control samples or a sample selected by the Engineer from any location in the process or verification samples taken at random by the Department. The Engineer may select any or all split samples for assurance testing.

Density Quality Assurance:

1. By retesting randomly selected quality control test sections (either cores or nuclear)
2. By periodically observing tests performed by the Contractor;
3. By testing randomly selected comparison core samples taken adjacent to the Contractor's quality control core samples (8 inches center-to-center); and
4. By conducting verification sampling and testing on test sections (either core or nuclear) independently of the Contractor's quality control test sections
5. By periodically directing the recalculation of random numbers for the Quality Control core or nuclear density test locations. The original QC test locations may be tested by QA and evaluated as verification tests.

Comparison and verification core samples will be taken in the presence of a QA technician, and either delivered directly to the appropriate Division Quality Assurance Lab by a QA technician or placed in a sealed container and delivered to the Quality Control Lab to be acquired for Quality Assurance testing.

Quality assurance and verification samples will periodically be obtained for testing independently of the Contractor's quality control process. These samples will be split for testing by Quality Assurance and Quality Control personnel.

Results of quality assurance tests will be provided to the Contractor within 4 working days after the sample has been obtained.

Limits of Precision:

Differences between the Contractor's and the Department's split sample test results will be considered acceptable if within the following limits of precision:

<u>Mix Property</u>	<u>Limits of Precision</u>
25.0mm sieve(Base Mix)	± 10.0%
19.0mm sieve(Base Mix)	± 10.0%
12.5mm sieve(Intermediate Mix)	± 6.0%
9.5mm sieve(Surface Mix)	± 5.0%
4.75mm sieve(Surface Mix)	± 5.0%
2.36mm sieve(All Mixes)	± 5.0%
0.075mm sieve(All Mixes)	± 2.0%
Asphalt Binder Content	± 0.5%
Maximum Specific Gravity(G_{mm})	± 0.020
Bulk Specific Gravity (G_{mb})	± 0.030
Retest of QC Core Sample	± 1.2% (% Compaction)
Comparison QA Core Sample	± 2.0% (% Compaction)
QA Verification Core Sample	± 2.0% (% Compaction)
Nuclear Comparison of QC Test	± 2.0% (% Compaction)
QA Nuclear Verification Test	± 2.0% (% Compaction)

The Engineer will immediately investigate the reason for differences if any of the following occur:

1. QA test results of QC split sample does not meet above limits of precision, or
2. QA test results of QC split sample does not meet the individual test control limits or the specification requirements, or
3. QA verification sample test results exceed the allowable retesting tolerances.

If the potential for a pavement failure exist, the Engineer may suspend production, wholly or in part, in accordance with Article 108-7 of the Standard Specifications while the investigation is in progress. The Engineer's investigation may include, but not be limited to the following:

1. Joint testing of any remaining split samples,
2. Review and observation of the QC technician's sampling and testing procedures,
3. Evaluation and calibration of QC testing equipment, and/or
4. Comparison testing of other retained quality control samples, and/or additional density core samples.

If additional mix samples or core samples are necessary to resolve the difference, these samples will be taken as directed and tested jointly by the Quality Control and Quality Assurance personnel. If reasons for the difference cannot be determined, payment for the mix in question

will be determined in accordance with Article 105-3 of the Standard Specifications. If the reason for the difference is determined to be an error or other discrepancy in the quality control test results, the applicable quality assurance test results or applicable verification test results will be used to determine compliance with the applicable mix or density specification requirements.

Quality Assurance personnel will periodically witness the sampling and testing being performed by the Quality Control technician. If the Engineer observes that the sampling and quality control tests are not being performed in accordance with the applicable test procedures, the Engineer may stop production until corrective action is taken. The Engineer will promptly notify the Contractor of observed deficiencies, both verbally and in writing. The Engineer will document all witnessed samples and tests.

7. ACCEPTANCE.

Final acceptance of the asphalt pavement will be made by the Department in accordance with the following:

Mix Acceptance:

The Engineer will base final acceptance of the mix on the results of random testing made on split samples during the assurance process and validation of the Contractor's quality control process as outlined in Items 6 and 5(C), respectively.

Density Acceptance (F.O.B Annual Needs asphalt excluded):

The Department will evaluate the asphalt pavement for density compliance after the asphalt mix has been placed and compacted using the Contractor's quality control test results, the Department's quality assurance test results, and by observation of the Contractor's density quality control process as outlined in Items 5(D) and 6 of this provision and in Article 610-13 of the July 2006 Standard Specifications for Roads and Structures as revised by the Maintenance Provision, dated January 2008.