334 SUPERPAVE ASPHALT CONCRETE – ACCEPTANCE OPTIONS. (REV 2-23-07) (FA 3-15-07) (7-07)

SECTION 334 (Pages 258–279) is deleted and the following substituted:

SECTION 334
SUPERPAVE ASPHALT CONCRETE

334-1 Description.

334-1.1 General: Construct a Superpave Asphalt Concrete pavement with the type of mixture specified in the Contract, or when offered as alternates, as selected. Superpave mixes are identified as Type SP-9.5, Type SP-12.5 or Type SP-19.0.

Meet the requirements of Section 320 for plant and equipment. Meet the general construction requirements of Section 330, except as modified herein, including the provision for Quality Control Plans and Quality Control Systems as specified in 6-8.

On projects with only Traffic Level A and/or B asphalt mixtures, select Option 1 or Option 2 Mixture Acceptance as specified in 334-5. The selection shall be made at the preconstruction conference and shall apply to all mixes, including base, structural and friction courses, on the entire project. Traffic Level C, D and E mixtures will be accepted under Option 1 Mixture Acceptance only. On Contracts having both Traffic Level A or B and Traffic Level C, D or E asphalt mixtures, material will be accepted only under Option 1 Material Acceptance.

When Option 2 Mixture Acceptance is selected, the requirements of 330-2 will not apply.

For Option 1 Mixture Acceptance, the Engineer will accept the work on a LOT to LOT basis in accordance with 334-5.1. The size of the LOT will be as specified in 334-5.1.2.

For Option 2 Mixture Acceptance, the Engineer will accept the work in accordance with 334-5.2.

334-1.2 Traffic Levels: The requirements for Type SP Asphalt Concrete mixtures are based on the design traffic level of the project, expressed in 18,000 pound Equivalent Single Axle Loads (ESAL's). The five traffic levels are as shown in Table 334-1.

Table 334-1
Superpave Traffic Levels

Traffic Level	Traffic Level ($1x10^6$ ESAL's)
A	<0.3
B	0.3 to <3
C	3 to <10
D	10 to <30
E	≥30

The traffic level(s) for the project are as specified in the Contract. A Type SP mix one traffic level higher than the traffic level specified in the Contract may be substituted, at no cost to the Department (i.e. Traffic Level B may be substituted for Traffic Level A, etc.).

334-1.3 Gradation Classification: The Superpave mixes are classified as either coarse or fine, depending on the overall gradation of the mixture. Coarse and fine mixes are defined in 334-3.2.2.

The equivalent AASHTO nominal maximum aggregate size Superpave mixes are as follows:

Type SP-9.5..... 9.5 mm
Type SP-12.5..... 12.5 mm
Type SP-19.0..... 19.0 mm

334-1.4 Thickness: The total thickness of the Type SP asphalt layer(s) will be the plan thickness as shown in the Contract documents. Before paving, propose a thickness for each individual layer meeting the requirements of this specification, which when combined with other layers (as applicable) will equal the plan thickness. For construction purposes, the plan thickness and individual layer thickness will be converted to spread rate based on the maximum specific gravity of the asphalt mix being used, as well as the minimum density level, as shown in the following equation:

Spread rate (lbs/yd^2) = t x G_{mm} x 43.3

Where: t = Thickness (in.) (Plan thickness or individual layer thickness)

G_{mm} = Maximum specific gravity from the verified mix design

The weight of the mixture shall be determined as provided in 320-2.2. For target purposes only, spread rate calculations should be rounded to the nearest whole number.

Note: Plan quantities are based on a G_{mm} of 2.540, corresponding to a spread rate of 110 lbs/yd^2-in. Pay quantities will be based on the actual maximum specific gravity of the mix being used.

334-1.4.1 Layer Thicknesses - Fine Mixes: The allowable layer thicknesses for fine Type SP Asphalt Concrete mixtures are as follows:

Type SP-9.5.....1 - 1 1/2 inches
Type SP-12.5.....1 1/2 - 2 1/2 inches
Type SP-19.0.....2 - 3 inches

In addition to the minimum and maximum thickness requirements, the following restrictions are placed on fine mixes when used as a structural course:

Type SP-9.5 - Limited to the top two structural layers, two layers maximum.

Type SP-9.5 – May not be used on Traffic Level D and E applications.

Type SP-19.0 - May not be used in the final (top) structural layer.

334-1.4.2 Layer Thicknesses - Coarse Mixes: The allowable layer thicknesses for coarse Type SP Asphalt Concrete mixtures are as follows:

Type SP-9.5.....1 1/2 - 2 inches
Type SP-12.5.....2 - 3 inches
Type SP-19.0.....3 - 3 1/2 inches

In addition to the minimum and maximum thickness requirements, the following restrictions are placed on coarse mixes when used as a structural course:

Type SP-19.0 - May not be used in the final (top) structural layer.

334-1.4.3 Additional Requirements: The following requirements also apply to coarse and fine Type SP Asphalt Concrete mixtures:

1. A minimum 1 1/2 inch initial lift is required over an Asphalt Rubber Membrane Interlayer (ARMI).

2. When construction includes the paving of adjacent shoulders (≤5 feet wide), the layer thickness for the upper pavement layer and shoulder must be the same and paved in a single pass, unless called for differently in the Contract documents.

3. All overbuild layers must be fine Type SP Asphalt Concrete designed at the traffic level as stated in the Contract. Use the minimum and maximum layer thicknesses as specified above unless called for differently in the Contract documents. On variable thickness overbuild layers, the minimum allowable thickness may be reduced by 1/2 inch, and the maximum allowable thickness may be increased 1/2 inch, unless called for differently in the Contract documents.

334-2 Materials.

334-2.1 General Requirements: Meet the material requirements specified in Division III. Specific references are as follows:

Superpave PG Asphalt Binder or Recycling Agent 916-1, 916-2
Coarse Aggregate.....Section 901
Fine Aggregate.....Section 902

334-2.2 Superpave Asphalt Binder: Unless specified otherwise in the Contract, use a PG 67-22 asphalt binder. In addition, meet the requirements of 334-2.3.

334-2.3 Reclaimed Asphalt Pavement (RAP) Material:

334-2.3.1 General requirements: RAP may be used as a component of the asphalt mixture subject to the following requirements:

1. For Traffic Levels A, B and C mixtures, limit the amount of RAP material used in the mix to a maximum of 50 percent by weight of total aggregate. For Traffic Levels D and E mixtures, limit the amount of RAP material used in the mix to a maximum of 30 percent by weight of total aggregate.

2. When using a PG 76-22 Asphalt Binder, limit the amount of RAP material used in the mix to a maximum of 15 percent by weight of total aggregate. As an exception, amounts greater than 15 percent RAP by weight of total aggregate can be used if no more than 15% by weight of the total asphalt binder comes from the RAP material.

3. Assume full responsibility for the design, production and construction of asphalt mixes which incorporate RAP as a component material.

4. Use RAP from an FDOT approved stockpile or RAP that has an FDOT furnished Pavement Composition Data Sheet.

5. Do not use RAP material in any friction course mixes.

6. Provide stockpiled RAP material that is reasonably consistent in characteristics and contains no aggregate particles which are soft or conglomerates of fines.

7. Provide RAP material having a minimum average asphalt content of 4.0 percent by weight of total mix. As an exception, when using fractionated RAP, the minimum average asphalt content for the coarse portion of the RAP shall be 2.5 percent by weight of the coarse portion of the RAP. The coarse portion of the RAP shall be the portion of the RAP

retained on the No. 4 sieve. The Engineer may sample the stockpile(s) to verify that this requirement is met.

334-2.3.2 Material Characterization: Assume responsibility for establishing the asphalt binder content, gradation, viscosity and bulk specific gravity (G_{sb}) of the RAP material based on a representative sampling of the material. Obtain the samples by one of the following methods:

1. Roadway cores: Cut a minimum number of cores to be representative of the pavement prior to milling. Fill the core holes prior to opening to traffic. Assume responsibility for accounting for the degradation that will occur during the milling operation.

2. Milling: Obtain representative samples by milling the existing pavement to the full depth shown on the plans for a minimum length of approximately 200 feet. If required to maintain traffic, immediately replace the pavement removed with the mix specified in the Contract. This mix will be paid for at the Contract unit price.

3. Stockpile sampling: Obtain samples from a stockpile of either milled or processed RAP. Take representative samples at random locations around the stockpile. Request the Engineer to make a visual inspection of the stockpiled RAP material. Based on visual inspection and a review of the test data, the Engineer will determine the suitability of the stockpiled materials. Once the RAP stockpile has been approved, do not add additional material without prior approval of the Engineer.

Determine the binder content and gradation of the RAP material in accordance with FM 5-563 and FM 1-T 030, respectively. Extract and recover the asphalt binder from the RAP in accordance with FM 5-524 and FM 3-D 5404, respectively. Determine the viscosity of the recovered asphalt binder in accordance with ASTM D2171. Establish the G_{sb} of the RAP material by using one of the following methods:

a) Calculate the G_{sb} value based upon the effective specific gravity (G_{se}) of the RAP material, determined on the basis of the asphalt binder content and maximum specific gravity (G_{mm}) of the RAP material. The Engineer will approve the estimated asphalt binder absorption value used in the calculation.

b) Measure the G_{sb} of the RAP aggregate, in accordance with FM 1-T 084 and FM 1-T 085. Obtain the aggregate by using either a solvent or ignition oven extraction method.

334-2.3.3 Pavement Composition: When the Contract includes milling of the existing asphalt pavement, the Pavement Composition Data Sheet may be available on the Department's website. The URL for obtaining this information, if available, is: www.dot.state.fl.us/statematerialsoffice/laboratory/asphalt/centrallaboratory/compositions/index.htm .

334-2.3.4 Asphalt Binder for Mixes with RAP: Select the appropriate asphalt binder grade based on Table 334-2. The Engineer reserves the right to change the asphalt binder type and grade at design based on the characteristics of the RAP asphalt binder, and reserves the right to make changes during production. Maintain the viscosity of the recycled mixture within the range of 4,000 to 12,000 poises. Obtain a sample of the mixture for the Engineer within the first 1,000 tons of production and at a continuing frequency of one sample per 4,000 tons of mix.

Table 334-2
Asphalt Binder Grade for Mixes Containing RAP

Percent RAP	Asphalt Binder Grade

Table 334-2 Asphalt Binder Grade for Mixes Containing RAP	
Percent RAP	Asphalt Binder Grade
<20	PG 67-22
20 – 29	PG 64-22
≥ 30	Recycling Agent

334-2.4 Recycled Crushed Glass: Recycled crushed glass may be used as a component of the asphalt mixture subject to the following requirements:

1. Consider the recycled crushed glass a local material and meet all requirements specified in 902-6.
2. Limit the amount of recycled crushed glass to a maximum of 15 percent by weight of total aggregate.
3. Use an asphalt binder that contains a minimum of 0.5 percent anti-stripping agent by weight of binder. The antistrip additive shall be one of the products included on the Qualified Products List specified in 6-1 of the Specifications. The antistrip additive shall be introduced into the asphalt binder by the supplier during loading.
4. Do not use recycled crushed glass in friction course mixtures or in structural course mixtures which are to be used as the final wearing surface.

334-3 General Composition of Mixture.

334-3.1 General: Compose the asphalt mixture using a combination of aggregate (coarse, fine or mixtures thereof), mineral filler, if required, and asphalt binder material. Size, grade and combine the aggregate fractions to meet the grading and physical properties of the mix design. Aggregates from various sources may be combined.

334-3.2 Mix Design:

334-3.2.1 General: Design the asphalt mixture in accordance with AASHTO R35-04, except as noted herein. Prior to the production of any asphalt mixture, submit the proposed mix design with supporting test data indicating compliance with all mix design criteria to the Engineer. For Traffic Level B through E mix designs, include representative samples of all component materials, including asphalt binder. Allow the State Materials Engineer a maximum of four weeks to either conditionally verify or reject the mix as designed.

For Traffic Level C through E mix designs, final verification of the mix design will occur when the requirements of 334-5.1.2.1 have been met. Do not use more than three mix designs per nominal maximum aggregate size per traffic level per binder grade per contract year. Exceeding this limitation will result in a maximum Composite Pay Factor of 1.00 as defined in 334-8.2 for all designs used beyond this limit.

The Engineer will consider any marked variations from original test data for a mix design or any evidence of inadequate field performance of a mix design as sufficient evidence that the properties of the mix design have changed, and the Engineer will no longer allow the use of the mix design.

334-3.2.2 Mixture Gradation Requirements: Combine the coarse and fine aggregate in proportions that will produce an asphalt mixture meeting all of the requirements defined in this specification and conform to the gradation requirements at design as defined in AASHTO M323-04, Table 3. Aggregates from various sources may be combined.

334-3.2.2.1 Mixture Gradation Classification: Plot the combined mixture gradation on an FHWA 0.45 Power Gradation Chart. Include the Control Points from AASHTO M323-04, Table-3, as well as the Primary Control Sieve (PCS) Control Point from AASHTO M323-04, Table 4. Coarse mixes are defined as having a combined aggregate gradation that passes below the primary control sieve control point and below the maximum density line for all sieve sizes smaller than the primary control sieve. Fine mixes are defined as having a gradation that passes above the primary control sieve control point and above the maximum density line for all sieve sizes smaller than the primary control sieve and larger than the #100 sieve. Use a fine mix for Traffic Levels A through C; use either a coarse mix or fine mix for Traffic Levels D and E.

334-3.2.3 Aggregate Consensus Properties: For Traffic Level C through E mixtures, meet the following consensus properties at design for the aggregate blend. Aggregate consensus properties do not apply to Traffic Level A and B mixtures.

334-3.2.3.1 Coarse Aggregate Angularity: When tested in accordance with ASTM D 5821, meet the percentage of fractured faces requirements specified in AASHTO M323-04, Table 5.

334-3.2.3.2 Fine Aggregate Angularity: When tested in accordance with AASHTO T-304, Method A, meet the uncompacted void content of fine aggregate specified in AASHTO M323-04, Table 5.

334-3.2.3.3 Flat and Elongated Particles: When tested in accordance with ASTM D 4791, (with the exception that the material passing the 3/8 inch sieve and retained on the No. 4 sieve shall be included), meet the requirements specified in AASHTO M323-04, Table 5. Measure the aggregate using the ratio of 5:1, comparing the length (longest dimension) to the thickness (shortest dimension) of the aggregate particles.

334-3.2.3.4 Sand Equivalent: When tested in accordance with AASHTO T 176, meet the sand equivalent requirements specified in AASHTO M323-04, Table 5.

334-3.2.4 Gyratory Compaction: Compact the design mixture in accordance with AASHTO T312-04, with the following exception: use the number of gyrations at N_{design} as defined in Table 334-3.

Table 334-3
Gyratory Compaction Requirements

Traffic Level	N_{design} Number of Gyrations
A	50
B	65
C	75
D	100
E	100

334-3.2.5 Design Criteria: Meet the requirements for nominal maximum aggregate size as defined in AASHTO M323-04, as well as for relative density, VMA, VFA, and dust-to-binder ratio as specified in AASHTO M323-04, Table 6. Use a dust-to-binder ratio of 0.8 to 1.6 for coarse mixes. $N_{maximum}$ requirements are not applicable for Traffic Level A and B mixtures.

334-3.2.6 Moisture Susceptibility:

1. For Traffic Level A and B mixtures, use a liquid anti-strip additive, which is on the Department's Qualified Products List, at a rate of 0.5% by weight of the asphalt binder.

2. For Traffic Level C through E mixtures, test 4 inch specimens in accordance with FM 1-T 283. Provide a mixture having a retained tensile strength ratio of at least 0.80 and a minimum tensile strength (unconditioned) of 100 psi. If necessary, add a liquid anti-stripping agent, which is on the Department's Qualified Products List or hydrated lime (meeting the requirements of 337-10.2) in order to meet these criteria.

334-3.2.7 Additional Information: In addition to the requirements listed above, provide the following information with each proposed mix design submitted for verification:

1. The design traffic level and the design number of gyrations (N_{design}).
2. The source and description of the materials to be used.
3. The DOT source number and the DOT product code of the aggregate components furnished from a DOT approved source.
4. The gradation and proportions of the raw materials as intended to be combined in the paving mixture. The gradation of the component materials shall be representative of the material at the time of use. Compensate for any change in aggregate gradation caused by handling and processing as necessary.
5. A single percentage of the combined mineral aggregate passing each specified sieve. Degradation of the aggregate due to processing (particularly material passing the No. 200 sieve) should be accounted for and identified.
6. The bulk specific gravity (G_{sb}) value for each individual aggregate and RAP component, as identified in the Department's aggregate control program.
7. A single percentage of asphalt binder by weight of total mix intended to be incorporated in the completed mixture, shown to the nearest 0.1 percent.
8. A target temperature at which the mixture is to be discharged from the plant and a target roadway temperature (per 330-6.3). Do not exceed a target temperature of 330°F for modified asphalts and 315°F for unmodified asphalts.
9. Provide the physical properties achieved at four different asphalt binder contents. One of which shall be at the optimum asphalt content, and must conform to all specified physical requirements.
10. The name of the CTQP Qualified Mix Designer.
11. The ignition oven calibration factor.

334-3.3 Mix Design Revisions: During production, the Contractor may request a target value revision to a mix design, subject to meeting the following requirements: (1) the target change falls within the limits defined in Table 334-4, (2) appropriate data exists demonstrating that the mix complies with production air voids specification criteria, and (3) the mixture gradation meets the basic gradation requirements defined in 334-3.2.2.

Table 334-4 Limits for Potential Adjustments to Mix Design Target Values	
Characteristic	Limit from Original Mix Design
No. 8 sieve and Coarser	± 5.0 percent
No. 16 sieve	± 4.0 percent
No. 30 sieve	± 4.0 percent
No. 50 sieve	± 3.0 percent
No. 100 sieve	± 3.0 percent
No. 200 sieve	± 1.0 percent
Asphalt Binder Content (1)	± 0.3 percent
(1) Reductions to the asphalt binder content will not be permitted if the VMA during production is lower than 1.0 percent below the design criteria.	

Submit all requests for revisions to mix designs, along with supporting documentation, to the Engineer. In order to expedite the revision process, the request for revision or discussions on the possibility of a revision may be made verbally, but must be followed up by a written request. The verified mix design will remain in effect until the Engineer authorizes a change. In no case will the effective date of the revision be established earlier than the date of the first communication between the Contractor and the Engineer regarding the revision.

A new design mix will be required if aggregate sources change, or for any substitution of an aggregate product with a different aggregate code, unless approved by the Engineer.

334-4 Contractor Process Control (for Option 1 Mixture Acceptance).

Assume full responsibility for controlling all operations and processes such that the requirements of these Specifications are met at all times. Perform any tests necessary at the plant and roadway for process control purposes. The Engineer will not use these test results in the acceptance payment decision.

Address in the Quality Control Plan how Process Control failures will be handled. When a Process Control failure occurs, investigate, at a minimum, the production process, testing equipment and/or sampling methods to determine the cause of the failure, and make any necessary changes to assure compliance with these Specifications. Obtain a follow up sample immediately after corrective actions are taken to assess the adequacy of the corrections. In the event the follow-up Process Control sample also fails to meet Specification requirements, cease production of the asphalt mixture until the problem is adequately resolved to the satisfaction of the Quality Control Manager.

334-5 Acceptance of the Mixture.

334-5.1 Option 1 Mixture Acceptance.

334-5.1.1 General: The mixture will be accepted at the plant with respect to gradation (P_{-8} and P_{-200}), asphalt content (P_b), and volumetrics (volumetrics is defined as air voids at N_{design}). The mixture will be accepted on the roadway with respect to density of roadway cores. Acceptance will be on a LOT-by-LOT basis (for each mix design) based on tests of random samples obtained within each sublot taken at a frequency of one set of samples per sublot. A roadway LOT and a plant production LOT shall be the same. Acceptance of the

mixture will be based on Contractor Quality Control test results that have been verified by the Department.

334-5.1.1.1 Sampling and Testing Requirements: Obtain the samples in accordance with FM 1-T 168. Obtain samples at the plant of a sufficient quantity to be split into three smaller samples; one for Quality Control, one for Verification and one for Resolution testing; each sample at approximately 35 pounds. The split samples for Verification testing and Resolution testing shall be reduced in size and stored in three boxes each. The approximate size of each box must be 12” x 8” x 4”. Label and safely store these boxes in a manner agreed upon by the Engineer for future testing. The Contractor can retain additional split samples at their option.

The asphalt content of the mixture will be determined in accordance with FM 5-563. In the event the FM 5-563 ignition oven goes out of service during production, the Contractor may elect to use a replacement oven at another location for no more than 72 hours while the oven is being repaired. The gradation of the recovered aggregate will be determined in accordance with FM 1-T 030. Volumetric testing will be in accordance with AASHTO T312-04 and FM 1-T 209. Prior to testing volumetric samples, condition the test-sized sample for one hour ± five minutes at the target roadway compaction temperature in a covered, shallow, flat pan, such that the mixture temperature at the end of the one hour conditioning period is within ± 20° F of the roadway compaction temperature. Test for roadway density in accordance with FM 1-T 166.

334-5.1.1.2 Acceptance Testing Exceptions: When the total combined quantity of hot mix asphalt for the project, as indicated in the plans for Type SP and Type FC mixtures only, is less than 2000 tons, the Engineer will accept the mix on the basis of visual inspection. The Engineer may require the Contractor to run process control tests for informational purposes, as defined in 334-4, or may run independent verification tests to determine the acceptability of the material.

Density testing for acceptance will not be performed on widening strips or shoulders with a width of 5 feet or less, open-graded friction courses, variable thickness overbuild courses, leveling courses, first lift of asphalt base course placed on subgrade, miscellaneous asphalt pavement, or any course with a specified thickness less than 1 inch or a specified spread rate that converts to less than 1 inch as described in 334-1.4. In addition, density testing for acceptance will not be performed on the following areas when they are less than 1,000 feet in length: crossovers, intersections, turning lanes, acceleration lanes, deceleration lanes, shoulders, or ramps. Compact these courses (with the exception of open-graded friction courses) in accordance with the rolling procedure (equipment and pattern) as approved by the Engineer. In the event that the rolling procedure deviates from the approved procedure, placement of the mix shall be stopped.

The density pay factor (as defined in 334-8.2) for LOTs where there are areas not requiring density testing for acceptance will be prorated based on a pay factor of 1.00 for the quantity (tonnage) of material in areas not requiring density testing for acceptance and the actual pay factor for the tonnage of material in areas requiring density testing.

334-5.1.2 LOT Sizes: LOT sizes will be either 2,000 tons or 4,000 tons. The Initial Production LOT of all mix designs used on a project shall consist of 2,000 tons, subdivided into four equal sublots of 500 tons each. Following the Initial Production LOT, each remaining LOT will be defined (as selected by the Contractor prior to the start of the LOT) as either (1) 2,000 tons, with each LOT subdivided into four equal sublots of 500 tons each, or (2)

4,000 tons (as authorized by the Engineer per 334-5.1.2.1), with each LOT subdivided into four equal sublots of 1,000 tons each. Before the beginning of a LOT, the Engineer will develop a random sampling plan for each sublot and direct the Contractor on sample points, based on tonnage, for each sublot during construction.

In the event a LOT is terminated per 334-5.1.4.4, the LOT size upon resuming production of the mixture will be 2000 tons until the requirements of 334-5.1.2.1 are met.

334-5.1.2.1 Criteria for 4,000 ton LOTs: At the completion of the Initial Production LOT, the quality of the as-produced material will be evaluated by the Engineer. Begin the option of 4,000 ton LOT sizes only when authorized by the Engineer based upon the Quality Control test results for the Initial Production LOT meeting the following:

1. A minimum Pay Factor of 0.90 for each asphalt quality characteristic as defined in 334-8.2.

2. A favorable comparison with the Verification test results. Comparisons between the Quality Control and Verification test results will be based on between-laboratory precision values shown in Table 334-6.

3. A coefficient of permeability of less than 125 x 10^{-5}cm/s on each roadway core as determined in accordance with FM 5-565. Permeability criteria apply only to coarse mixes when the average density for the sublot is less than 93.00 percent of G_{mm}, or when an individual density value is less than 91.00 percent of G_{mm}.

In the event that the Initial Production LOT does not meet these criteria, limit production LOT sizes to 2,000 tons with 500 ton sublots until these criteria are met.

334-5.1.2.2 Partial LOTs: A partial LOT is defined as a LOT size that is less than a full LOT. A partial LOT may occur due to the following:

l. The completion of a given mix type or mix design on a project.

2. LOTs will be terminated 20 calendar days after the start of the LOT. (Time periods other than 20 days may be used if agreed to by both the Engineer and the Contractor.)

3. A LOT is terminated per 334-5.1.4.4.

All partial LOTs will be evaluated based on the number of tests available, and will not be redefined.

334-5.1.3 Initial Production Requirements: The Initial Production LOT of all mix designs shall be established at 2,000 tons. During this period demonstrate the capability to produce and place the mixture as specified unless waived by the Engineer in 334-3.2.1. If necessary, during this time, make adjustments to the mix design, as defined in 334-3.3. Any target value adjustments to the mix design will result in the LOT being terminated and evaluated for payment purposes per 334-8. Do not begin 4,000 ton LOT sizes until a 2,000 ton initial production LOT (for each mix design) has been successfully completed, or is waived by the Engineer.

At the sole option of the Engineer, the requirement for an Initial Production LOT may be waived based on evidence of satisfactory production, placement and performance on previous projects for that particular mix.

334-5.1.3.1 Plant Sampling and Testing Requirements: Obtain one random sample of mix per sublot in accordance with 334-5.1.1.1 as directed by the Engineer. Test the Quality Control split sample for gradation, asphalt binder content and volumetrics in

accordance with 334-5.1.1.1. Complete all Quality Control testing within one working day from the time the samples were obtained.

334-5.1.3.2 Roadway Sampling and Testing Requirements: Obtain five 6 inch diameter roadway cores within 24 hours of placement at random locations as directed by the Engineer within each sublot. Test these Quality Control samples for density in accordance with 334-5.1.1.1. The G_{mm} used for the density evaluation will be based on the Quality Control test result for the corresponding sublot.

On coarse mixes when the average density for an Initial Production sublot is less than 93.00 percent of G_{mm}, or an individual core density is less than 91.00 percent of G_{mm}, cut five 6 inch diameter roadway cores (at locations determined by the Engineer) and have them evaluated for permeability in accordance with FM 5-565 by a laboratory as approved by the Engineer. If approved by the Engineer, the original cores cut for density testing purposes may be used to evaluate permeability.

334-5.1.3.3 Verification of Initial Production LOT: For Verification purposes the Engineer will test a minimum of one split sample as described in 334-5.1.1.1 from the Initial Production LOT at the completion of the LOT. Results of the testing and analysis for the LOT will be made available to the Contractor within one working day from when the LOT is completed.

The Verification test results will be compared with the corresponding Quality Control test results based on the between-laboratory precision values shown in Table 334-6.

If all of the specified mix characteristics compare favorably, then the LOT will be accepted, with payment based on the Quality Control results for the LOT.

If any of the results do not compare favorably, then the split Resolution samples from the LOT will be sent to the Resolution laboratory for testing, as described in 334-5.1.6.

334-5.1.3.4 Acceptance of Initial Production LOT: The Initial Production LOT shall be considered a single LOT and will receive a Composite Pay Factor as determined in 334-8, based on results of the verified Quality Control tests, or as determined by the Resolution System.

334-5.1.4 Quality Control Sampling and Testing: Obtain all samples randomly as directed by the Engineer.

Should the Engineer determine that the Quality Control requirements are not being met or that unsatisfactory results are being obtained, or should any instances of falsification of test data occur, approval of the Contractor's Quality Control Plan will be suspended and production will be stopped.

334-5.1.4.1 Lost or Missing Verification/Resolution Samples: In the event that any of the Verification and/or Resolution samples that are in the custody of the Contractor are lost, damaged, destroyed, or are otherwise unavailable for testing, the minimum possible pay factor for each quality characteristic as described in 334-8.2 will be applied to the entire LOT in question, unless called for otherwise by the Engineer. Specifically, if the LOT in question has more than two sublots, the pay factor for each quality characteristic will be 0.55. If the LOT has two or less sublots, the pay factor for each quality characteristic will be 0.80. In either event, the material in question will also be evaluated in accordance with 334-5.1.9.5.

If any of the Verification and/or Resolution samples that are in the custody of the Department are lost, damaged, destroyed or are otherwise unavailable for testing,

the corresponding Quality Control test result will be considered verified, and payment will be based upon the Contractor's data.

334-5.1.4.2 Plant Sampling and Testing Requirements: Obtain one random sample of mix per sublot in accordance with 334-5.1.1.1 as directed by the Engineer. Test the Quality Control split sample for gradation, asphalt binder content and volumetrics in accordance with 334-5.1.1.1. Complete all Quality Control testing within one working day from the time the samples were obtained.

334-5.1.4.3 Roadway Sampling and Testing Requirements: Obtain five 6 inch diameter roadway cores within 24 hours of placement at random locations as directed by the Engineer within each sublot. Test these Quality Control samples for density (G_{mb}) in accordance with 334-5.1.1.1. In situations where it is impractical to cut five cores per sublot, obtain a minimum of three cores per sublot at random locations as identified by the Engineer. Do not obtain cores any closer than 12 inches from an unsupported edge. Maintain traffic during the coring operation; core the roadway, patch the core holes (within three days of coring); and trim the cores to the proper thickness prior to density testing.

Density for the sublot shall be based on the average value for the cores cut from the sublot with the target density being the maximum specific gravity (G_{mm}) of the sublot. Once the average density of a sublot has been determined, do not retest the samples unless approved by the Engineer. Ensure proper handling and storage of all cores until the LOT in question has been accepted.

334-5.1.4.4 Individual Test Tolerances for Quality Control Testing: In the event that an individual Quality Control test result of a sublot for air voids, or the average sublot density for coarse graded mixes does not meet the requirements of Table 334-5, terminate the LOT and stop production of the mixture until the problem is adequately resolved (to the satisfaction of the Engineer), unless it can be demonstrated to the satisfaction of the Engineer that the problem can immediately be (or already has been) resolved. Address any material represented by the failing test result in accordance with 334-5.1.9.5.

In the event that an individual Quality Control test result of a sublot for gradation (P_{-8} or P_{-200}), asphalt binder content, or the average sublot density for fine graded mixes does not meet the requirements of Table 334-5, or an individual core density is less than 91.00 percent of G_{mm} (for coarse mixes), take steps to correct the situation and report the actions to the Engineer.

In the event that two consecutive individual Quality Control test results (for the same material characteristic) for gradation (P_{-200} only), asphalt binder content, or the average sublot density (for two consecutive sublots) for fine graded mixes do not meet the requirements of Table 334-5, or two individual core densities within a sublot are less than 91.00 percent of G_{mm} (for coarse mixes), terminate the LOT and stop production of the mixture. Address any material represented by the failing test result in accordance with 334-5.1.9.5.

When a LOT is terminated and production is stopped due to a QC failure, prior to resuming production, assess the problem and make all necessary changes to correct the problem to the satisfaction of the Quality Control Manager. Do not resume production until appropriate corrections have been made. Inform the Engineer of the problem and corrections made to correct the problem. After resuming production, sample and test the material to verify that the changes have adequately addressed the problem. This information must then be summarized and provided to the Engineer prior to the end of the work shift when production resumes.

The Engineer may require the Contractor to stop production following a QC failure and obtain the Engineer's approval prior to resuming production. The Engineer may require the Contractor to revise the Quality Control Plan accordingly.

Any LOT terminated under this subarticle will be limited to a maximum Pay Factor of 1.00 (as defined in 334-8.2) for each quality characteristic.

Table 334-5 Master Production Range	
Characteristic	Tolerance (1)
Asphalt Binder Content (percent)	Target ±0.55
Passing No. 8 Sieve (percent)	Target ±5.50
Passing No. 200 Sieve (percent)	Target ±1.50
Air Voids (percent) Coarse Graded	2.00 - 6.00
Air Voids (percent) Fine Graded	2.30 – 6.00
Density, percent G_{mm} (2)	
Coarse Graded (minimum)	93.00
Fine Graded (minimum)	90.00
(1) Tolerances for sample size of n = 1 from the verified mix design (2) Based on an average of 5 randomly located cores	

334-5.1.5 Verification Testing: In order to determine the validity of the Contractor's Quality Control test results prior to their use in the Acceptance decision, the Engineer will run verification tests.

334-5.1.5.1 Plant Testing: At the completion of each LOT, the Engineer will test a minimum of one Verification split sample randomly selected from the LOT. Results of the testing and analysis for the LOT will be made available to the Contractor within one working day from the time the LOT is completed. Verification samples shall be reheated at the target roadway compaction temperature for 1 1/2 hours ± 5 minutes, reduced to the appropriate testing size, and conditioned and tested as described in 334-5.1.1.1.

The Verification test results will be compared with the Quality Control test results based on the between-laboratory precision values shown in Table 334-6.

Table 334-6 Between-Laboratory Precision Values	
Property	Maximum Difference
G_{mm}	0.016
G_{mb}	0.022
P_b	0.44 percent
P_{-200}	FM 1-T 030 (Figure 2)
P_{-8}	FM 1-T 030 (Figure 2)

If all of the specified mix characteristics compare favorably, then the LOT will be accepted, with payment based on the Contractor's Quality Control test data for the LOT.

If any of the results do not compare favorably, then the Resolution samples from the LOT will be sent to the Resolution laboratory for testing, as described in

334-5.1.6.

334-5.1.5.2 Roadway Testing: At the completion of each LOT, the Engineer will determine the density (G_{mb}) of each core (previously tested by Quality Control) as described in 334-5.1.1.1 from one randomly selected sublot from the LOT. Results of the testing and analysis for the LOT will be made available to the Contractor within one working day from the time the LOT is completed.

The individual Verification test results will be compared with individual Quality Control test results by the Engineer based on the between-laboratory precision values given in Table 334-6 for G_{mb}.

If each of the core test results compare favorably, then the LOT will be accepted with respect to density, with payment based on the Contractor's Quality Control test data for the LOT.

If any of the results do not compare favorably, then the core samples from the LOT will be sent to the Resolution laboratory for testing as specified in 334-5.1.6.

334-5.1.6 Resolution System:

334-5.1.6.1 Plant Samples: In the event of an unfavorable comparison between the Contractor's Quality Control test results and the Engineer's Verification test results on any of the properties identified in Table 334-6, the Resolution laboratory will test all of the split samples from the LOT for only the property (or properties) in question. Resolution samples shall be reheated at the target roadway compaction temperature for 1 1/2 hours ± 5 minutes, reduced to the appropriate testing size, and conditioned and tested as described in 334-5.1.1.1.

334-5.1.6.2 Roadway Samples: In the event of an unfavorable comparison between the Contractor's Quality Control test data and the Engineer's Verification test data on the density results, the Resolution laboratory will test all of the cores from the LOT. Testing will be as described in 334-5.1.1.1. Any damaged roadway cores will not be included in the evaluation; replace damaged cores with additional cores at the direction of the Engineer.

334-5.1.6.3 Resolution Determination: If the Resolution laboratory results compare favorably (for the property or properties in question) with all of the Quality Control results, then acceptance and payment for the LOT will be based on the Quality Control results, and the Department will bear the costs associated with Resolution testing. No additional compensation, either monetary or time, will be made for the impacts of any such testing.

If the Resolution laboratory results do not compare favorably (for the property or properties in question) with all of the Quality Control results, then acceptance and payment for the LOT will be based on the Resolution test data for the LOT, and the costs of the Resolution testing will be deducted from monthly estimates. No additional time will be granted for the impacts of any such testing.

In the event of an unfavorable comparison between the Resolution test results and Quality Control test results, make the necessary adjustments to assure that future comparisons are favorable.

334-5.1.7 Independent Verification Testing:

334-5.1.7.1 Plant: Take samples as directed by the Engineer for Independent Verification testing. Obtain enough material for three complete sets of tests (two samples for Independent Verification testing by the Engineer and one sample for testing by the Contractor). If agreed upon by both the Engineer and the Contractor, only one sample for Independent Verification testing by the Engineer may be obtained. Independent Verification

samples will be reheated at the target roadway compaction temperature for 1 1/2 hours +/- 5 minutes, reduced to the appropriate testing size, and conditioned and tested as described in 334-5.1.1.1. The Contractor's split sample, if tested immediately after sampling, shall be reduced to the appropriate testing size, and conditioned and tested as described in 334-5.1.1.1. If the Contractor's sample is not tested immediately after sampling, then the sample shall be reheated at the target roadway compaction temperature for 1 1/2 hours +/- 5 minutes, reduced to the appropriate testing size, and conditioned and tested as described in 334-5.1.1.1. The Contractor's test results shall be provided to the Engineer within one working day from the time the sample was obtained.

If any of the Independent Verification test results, excluding the percent passing the No. 8 sieve, do not meet the requirements of Table 334-5, then a comparison of the Independent Verification test results and the Contractor's test results, if available, will be made. If a comparison of the Independent Verification test results and the Contractor's test results meets the precision values of Table 334-6 for the material properties in question, or if the Contractor's test results are not available, then the Independent Verification test results are considered verified and the Contractor shall cease production of the asphalt mixture until the problem is adequately resolved (to the satisfaction of the Engineer), unless it can be demonstrated to the satisfaction of the Engineer that the problem can immediately be (or already has been) resolved. Address any material represented by the failing test results in accordance with 334-5.1.9.5.

If a comparison of the Independent Verification test results and the Contractor's test results does not meet the precision values of Table 334-6 for the material properties in question, then the second Independent Verification sample shall be tested by the Engineer for the material properties in question. If a comparison between the first and second Independent Verification test results does not meet the precision values of Table 334-6 for the material properties in question, then the first Independent Verification test results are considered unverified for the material properties in question and no action shall be taken.

If a comparison between the first and second Independent Verification test results meets the precision values of Table 334-6 for the material properties in question, then the first Independent Verification sample is considered verified and the Contractor shall cease production of the asphalt mixture until the problem is adequately resolved (to the satisfaction of the Engineer), unless it can be demonstrated to the satisfaction of the Engineer that the problem can immediately be (or already has been) resolved. Address any material represented by the failing test results in accordance with 334-5.1.9.5.

The Engineer has the option to use the Independent Verification sample for comparison testing as specified in 334-6.

334-5.1.7.2 Roadway: Obtain five roadway cores as directed by the Engineer for Independent Verification testing. These independent cores will be obtained from the same LOTs and sublots as the Independent Verification Plant samples, or as directed by the Engineer. The density of these cores will be obtained as described in 334-5.1.1.1. If the average of the results for the sublot does not meet the requirements of Table 334-5 for density, cease production of the asphalt mixture until the problem is adequately resolved (to the satisfaction of the Engineer), unless it can be demonstrated to the satisfaction of the Engineer that the problem can immediately be (or already has been) resolved. Address any material represented by the failing test results in accordance with 334-5.1.9.5.

334-5.1.8 Surface Tolerance: The asphalt mixture will be accepted on the roadway with respect to surface tolerance in accordance with the applicable requirements of 330-12.

334-5.1.9 Minimum Acceptable Quality Levels:

334-5.1.9.1 Pay Factors Below 0.90: In the event that an individual pay factor for any quality characteristic of a LOT falls below 0.90, take steps to correct the situation and report the actions to the Engineer. In the event that the pay factor for the same quality characteristic for two consecutive LOTs is below 0.90, cease production of the asphalt mixture until the problem is adequately resolved (to the satisfaction of the Engineer), unless it can be demonstrated to the satisfaction of the Engineer that the problem can immediately be (or already has been) resolved. Actions taken must be approved by the Engineer before production resumes.

334-5.1.9.2 Composite Pay Factors Less Than 0.90 and Greater Than or Equal to 0.80: If the composite pay factor for the LOT is less than 0.90 and greater than or equal to 0.80, cease production of the asphalt mixture until the problem is adequately resolved (to the satisfaction of the Engineer), unless it can be demonstrated to the satisfaction of the Engineer that the problem can immediately be (or already has been) resolved. Actions taken must be approved by the Engineer before production resumes.

334-5.1.9.3 Composite Pay Factors Less Than 0.80 and Greater Than or Equal to 0.75: If the composite pay factor for the LOT is less than 0.80 and greater than or equal to 0.75, address the defective material in accordance with 334-5.1.9.5.

334-5.1.9.4 Composite Pay Factors Less Than 0.75: If the composite pay factor for the LOT is less than 0.75, remove and replace the defective LOT at no cost to the Department, or as approved by the Engineer.

334-5.1.9.5 Defective Material: Assume responsibility for removing and replacing all defective material placed on the project, at no cost to the Department.

As an exception to the above and upon approval of the Engineer, obtain an engineering analysis by an independent laboratory (as approved by the Engineer) to determine the disposition of the material. The engineering analysis must be signed and sealed by a Professional Engineer licensed in the State of Florida.

The Engineer may determine that an engineering analysis is not necessary or may perform an engineering analysis to determine the disposition of the material.

Any material that remains in place will be accepted with a composite pay factor as determined by 334-8, or as determined by the Engineer.

If the defective material is due to a gradation, asphalt binder content or density failure, upon approval of the Engineer the Contractor may perform delineation tests on roadway cores in lieu of an engineering analysis to determine the limits of the defective material that requires removal and replacement. Prior to any delineation testing, all sampling locations shall be approved by the Engineer. All delineation sampling and testing shall be monitored and verified by the Engineer. The minimum limit of removal of defective material is fifty-feet either side of the failed sample. For materials that are defective due to air voids, an engineering analysis is required.

334-5.2 Option 2 Mixture Acceptance.

334-5.2.1 General: The mixture will be accepted with respect to gradation (P_{-8} and P_{-200}), asphalt content (P_b) and density of roadway cores. Acceptance of the mixture will be based on the Engineer's test results. Acceptance will be on a LOT-by-LOT basis (for each mix design) based on tests of random samples obtained within each sublot taken at a frequency of one

set of samples per sublot. A roadway LOT and a plant production LOT shall be the same. A LOT shall consist of a maximum of four sublots, where a sublot is defined as one day's production. A day's production is defined as a period of time no longer than 24 hours where a minimum of 100 tons of hot mix asphalt for the project (including Type B, Type SP and Type FC) is produced. When less than 100 tons of hot mix asphalt for the project (including Type B, Type SP and Type FC) is produced in a day, no acceptance testing will be required. A LOT shall not extend past seven calendar days from the start of the LOT. A LOT shall be complete after four sublots have been produced or seven calendar days have transpired (whichever comes first).

If a Traffic Level C mixture is substituted for a Traffic Level B mixture per 334-1.2 and Option 2 was selected, the mixture will be accepted under Option 2.

334-5.2.2 Gradation and Asphalt Content Testing: The Engineer (or Contractor, if directed by the Engineer) will randomly obtain a minimum of one sample per sublot. The samples shall be obtained in accordance with FM 1-T 168. At the completion of the LOT or seven calendar days (whichever comes first), the Engineer will randomly test one sample for gradation per FM 1-T 030, asphalt content per FM 5-563 and maximum specific gravity per FM 1-T 209.

334-5.2.3 Roadway Density Testing: Obtain five 6 inch diameter roadway cores within 24 hours of placement at random locations as directed by the Engineer within each sublot. In situations where it is impractical to cut five cores per sublot, obtain a minimum of three cores per sublot at random locations as identified by the Engineer. Do not obtain cores any closer than 12 inches from an unsupported edge. Maintain traffic during the coring operation, core the roadway and patch the core holes (within three days of coring).The Engineer will determine density of the cores from the same sublot as the sample for gradation and asphalt content tested in 334-5.2.2.

334-5.2.4 Acceptance Criteria: Acceptance will be on a pass/fail basis. Engineer's test results that meet the criteria shown in Table 334-7, Column A, will be accepted at full pay.

Table 334-7
Acceptance Criteria for Traffic Level A and B Mixtures

Characteristic	Tolerance (1)	
	Column A	Column B
Asphalt Binder Content (percent)	Target ± 0.55	Target ± 0.75
Passing No. 8 Sieve (percent)	Target ± 5.50	Target ± 10.00
Passing No. 200 Sieve (percent)	Target ± 1.50	Target ± 3.50
Density, minimum percent G_{mm} (2) (3)	92.00	90.00

(1) Tolerances for sample size of n = 1 from the verified mix design.
(2) Based on the average value of the roadway cores and Gmm for the sample.
(3) If the Engineer (or Contract Documents) limits compaction to the static mode only, the tolerance for Column A shall be 91.00 and the tolerance for Column B shall be 90.00.

334-5.2.5 Failing Test Results: Should the test result(s) for the sample not meet the criteria given in Table 334-7, Column A, then the material for that sublot is considered defective. The Engineer will then test the remaining samples for all of the characteristics in Table 334-7 to determine the extent of the defective material. The additional samples to be tested are those from the remaining sublots of the LOT. The Contractor has the following options with respect to defective material:

1. Remove and replace the defective material at no cost to the Department.

2. Leave the defective material in place with no pay, if approved by the Engineer.

3. Perform delineation testing using a testing plan and a qualified laboratory approved by the Engineer to determine the limits of the defective material. The Engineer reserves the right to witness delineation testing conducted by the approved laboratory. Delineated material not meeting the criteria given in Table 334-7, Column A, shall be removed and replaced at no cost to the Department or left in place with no pay, if approved by the Engineer.

Should the test result(s) for the sample not meet the criteria given in Table 334-7, Column B, the Contractor has the following options with respect to the defective material:

1. Remove and replace the defective material at no cost to the Department.

2. Perform delineation testing using a testing plan and a qualified laboratory approved by the Engineer to determine the limits of the defective material. The Engineer reserves the right to witness delineation testing conducted by the approved laboratory. Delineated material not meeting the criteria given in Table 334-7, Column A, but meeting the criteria given in Table 334-7, Column B shall be removed and replaced at no cost to the Department or left in place with no pay, if approved by the Engineer. Delineated material not meeting the criteria given in Table 334-7, Column B shall be removed and replaced at no cost to the Department.

334-5.2.6 Acceptance Testing Exceptions: When the total quantity of hot mix asphalt for the project, as indicated on the plans for Type SP and Type FC mixtures only, is less than 2000 tons, the Engineer will accept the mix on the basis of visual inspection, the Engineer may run acceptance tests to determine the acceptability of the material.

Density testing for acceptance will not be performed on widening strips or shoulders with a width of 5 feet. or less, variable thickness overbuild courses, leveling courses, first lift of asphalt base course placed on subgrade, miscellaneous asphalt pavement, or any course with a specified thickness less than 1 inch or a specified spread rate that converts to less than 1 inch as described in 334-1.4. In addition, density testing for acceptance will not be performed on the following areas when they are less than 1,000 feet in length: crossovers, intersections, turning lanes, acceleration lanes, deceleration lanes, shoulders or ramps. Compact these courses (with the exception of open-graded friction courses) in accordance with the rolling procedure (equipment and pattern) approved by the Engineer. In the event that the rolling procedure deviates from the approved procedure, placement of the mix shall be stopped.

334-5.2.7 Surface Tolerance: The asphalt mixture will be accepted on the roadway with respect to surface tolerance in accordance with the applicable requirements of 330-12.

334-6 Comparison Testing.

For materials accepted under Option 1, at the start of the project (unless waived by the Engineer) and at other times as determined necessary by the Engineer, provide split samples for comparison testing with the Engineer. The purpose of these tests is to verify that the testing equipment is functioning properly and that the testing procedures are being performed correctly. In the event that the Engineer determines that there is a problem with the Contractor's testing equipment and/or testing procedures, immediately correct the problem to the Engineer's

satisfaction. In the event that the problem is not immediately corrected, cease production of the asphalt mixture until the problem is adequately resolved to the satisfaction of the Engineer.

If so agreed to by both the Contractor and the Engineer, the split sample used for comparison testing may also be used for the Quality Control sample. The split sample used for comparison testing will also meet the requirements for Independent Verification Testing described in 334-5.1.7.

For materials accepted under Option 2, the requirements of this Article do not apply.

334-7 Method of Measurement.

For the work specified under this Section (including the pertinent provisions of Sections 320 and 330), the quantity to be paid for will be the weight of the mixture, in tons.

The bid price for the asphalt mix will include the cost of the liquid asphalt or the asphalt recycling agent and the tack coat application as directed in 300-8. There will be no separate payment or unit price adjustment for the asphalt binder material in the asphalt mix. For the calculation of unit price adjustments of bituminous material, the average asphalt content will be based on the percentage specified in 9-2.1.2. The weight will be determined as provided in 320-2 (including the provisions for the automatic recordation system).

Prepare a Certification of Quantities, using the Department's current approved form, for the certified Superpave asphalt concrete pay item. Submit this certification to the Engineer no later than Twelve O'clock noon Monday after the estimate cut-off or as directed by the Engineer, based on the quantity of asphalt produced and accepted on the Contract. The certification must include the Contract Number, FPID Number, Certification Number, Certification Date, period represented by Certification and the tons produced for each asphalt pay item.

334-8 Basis of Payment.

334-8.1 General: Price and payment will be full compensation for all the work specified under this Section (including the applicable requirements of Sections 320 and 330). There will be no pay adjustments for materials accepted in accordance with 334-5.2.

For materials accepted in accordance with 334-5.1, based upon the quality of the material, a pay adjustment will be applied to the bid price of the material as determined on a LOT by LOT basis. The pay adjustment will be assessed by calculating a Pay Factor for the following individual quality characteristics: pavement density, air voids, asphalt binder content, and the percentage passing the No. 200 and No. 8 sieves. The pay adjustment will be computed by multiplying a Composite Pay Factor for the LOT by the bid price per ton. Perform all calculations with the Department's Asphalt Plant - Pay Factor Worksheets (Form No. 675-030-22).

334-8.2 Pay Factors:

334-8.2.1 Two or Less Sublot Test Results: In the event that two or less sublot test results are available for a LOT, Pay Factors will be determined based on Table 334-8, using the average of the accumulated deviations from the target value. (Deviations are absolute values with no plus or minus signs.) Use the 1-Test column when there is only one sublot test result and use the 2-Tests column when there are two sublots.

Table 334-8 Small Quantity Pay Table		
Pay Factor	1 Sublot Test Deviation	2 Sublot Test Average Deviation
Asphalt Binder Content		

Table 334-8 Small Quantity Pay Table		
Pay Factor	1 Sublot Test Deviation	2 Sublot Test Average Deviation
1.05	0.00-0.23	0.00-0.16
1.00	0.24-0.45	0.17-0.32
0.90	0.46-0.55	0.33-0.39
0.80	>0.55	>0.39
No. 8 Sieve		
1.05	0.00-2.25	0.00-1.59
1.00	2.26-4.50	1.60-3.18
0.90	4.51-5.50	3.19-3.89
0.80	>5.50	>3.89
No. 200 Sieve		
1.05	0.00-0.55	0.00-0.39
1.00	0.56-1.10	0.40-0.78
0.90	1.11-1.50	0.79-1.06
0.80	>1.50	>1.06
Air Voids (Coarse Mixes)		
1.05	0.00-0.55	0.00-0.39
1.00	0.56-1.10	0.40-0.78
0.90	1.11-2.00	0.79-1.41
0.80	2.01-2.25	1.42-1.59
0.70	2.26-2.50	1.60-1.77
0.55	>2.50	>1.77
Air Voids (Fine Mixes)		
1.05	0.00-0.50	0.00-0.35
1.00	0.51-1.00	0.36-0.71
0.90	1.01-1.70	0.72-1.20
0.80	1.71-2.00	1.21-1.41
0.70	2.01-2.50	1.42-1.77
0.55	>2.50	>1.77
Density (Coarse Mixes) Note (1)		
1.05	0.00-0.50	0.00-0.35
1.00	0.51-1.00	0.36-0.71
0.95	1.01-1.50	0.72-1.06
0.90	>1.50	>1.06
Density (Fine Graded Mixtures) Note (1)		
1.05	0.00-0.50	0.00-0.35
1.00	0.51-1.00	0.36-0.71
0.95	1.01-2.00	0.72-1.41
0.90	2.01-3.00	1.42-2.12
0.80	>3.00	>2.12

Notes:
(1) Each density test result is the average of five cores. The target density for coarse mixes is 94.50 percent of G_{mm}. The target density for fine mixes is 93.00 percent of G_{mm} (92.00 percent when compaction is limited to the static mode as defined in Note 1 of Table 334-9)

334-8.2.2 Three or More Sublot Test Results: When three or more sublot test results are available for a LOT, the variability-unknown, standard deviation method will be used to determine the estimated percentage of the LOT that is within specification limits. The number of significant figures used in the calculations will be in accordance with requirements of AASHTO R 11-82 (2002), Absolute Method.

334-8.2.2.1 Percent Within Limits: The percent within limits (PWL) and Pay Factors for the LOT will be calculated as described below. Variables used in the calculations are as follows:

x = individual test value (sublot)
n = number of tests (sublots)
s = sample standard deviation
$\Sigma(x^2)$ = summation of squares of individual test values
$(\Sigma x)^2$ = summation of individual test values squared
Q_U = upper quality index
USL = upper specification limit (target value plus upper specification limit from Table 334-9)
Q_L = lower quality index
LSL = lower specification limit (target value minus lower specification limit from Table 334-9)
P_U = estimated percentage below the USL
P_L = estimated percentage above the LSL

(1) Calculate the arithmetic mean $(\overline{X})$ of the test values:

$$\overline{X} = \frac{\sum x}{n}$$

(2) Calculate the sample standard deviation (s):

$$s = \sqrt{\frac{n\sum\left(x^2\right) - \left(\sum x\right)^2}{n(n-1)}}$$

(3) Calculate the upper quality index (Q_U):

$$Q_U = \frac{\text{USL} - \overline{\text{X}}}{\text{s}}$$

(4) Calculate the lower quality index (Q_L):

$$Q_L = \frac{\overline{X} - LSL}{s}$$

(5) From Table 334-10, determine the percentage of work below the USL (P_U).

(6) From Table 334-10, determine percentage of work above the LSL (P_L) Note: If USL or LSL is not specified; percentages within (USL or LSL) will be 100.

(7) If Q_U or Q_L is a negative number, then calculate the percent within limits for Q_U or Q_L as follows: enter Table 334-10 with the positive value of Q_U or Q_L and obtain the corresponding percent within limits for the proper sample size. Subtract this number from 100.00. The resulting number is the value to be used in the next step (Step 8) for the calculation of quality level.

(8) Calculate the percent within limits (PWL) = $(P_U + P_L) - 100$

(9) Calculate the Pay Factor (PF) for each quality characteristic using the equation given in 334-8.2.2.2.

Table 334-9
Specification Limits

Quality Characteristic	Specification Limits
Passing No. 8 sieve (percent)	Target ± 3.1
Passing No. 200 sieve (percent)	Target ± 1.0
Asphalt Content (percent)	Target ± 0.40
Air Voids - Coarse Mixes (percent)	4.00 ± 1.40
Air Voids - Fine Mixes (percent)	4.00 ± 1.20
Density - Coarse Mixes (percent of G_{mm}):	94.50 ± 1.30
Density - Fine Mixes (percent of G_{mm}):	93.00 + 2.00, - 1.20 (1)

Note (1): If the Engineer (or Contract Documents) limits compaction to the static mode only, the specification limits are as follows: 92.00 + 3.00, -1.20. No additional compensation, cost or time, shall be made.

Table 334-10
Percent Within Limits

Quality Index	Percent within Limits for Selected Sample Size			
	n = 3	n = 4	n = 5	n = 6
0.00	50.00	50.00	50.00	50.00
0.05	51.38	51.67	51.78	51.84
0.10	52.76	53.33	53.56	53.67
0.15	54.15	55.00	55.33	55.50
0.20	55.54	56.67	57.10	57.32
0.25	56.95	58.33	58.87	59.14
0.30	58.37	60.00	60.63	60.94
0.35	59.80	61.67	62.38	62.73
0.40	61.26	63.33	64.12	64.51
0.45	62.74	65.00	65.84	66.27
0.50	64.25	66.67	67.56	68.00
0.55	65.80	68.33	69.26	69.72
0.60	67.39	70.00	70.95	71.41
0.65	69.03	71.67	72.61	73.08
0.70	70.73	73.33	74.26	74.71

Table 334-10 Percent Within Limits				
Quality Index	Percent within Limits for Selected Sample Size			
	n = 3	n = 4	n = 5	n = 6
0.75	72.50	75.00	75.89	76.32
0.80	74.36	76.67	77.49	77.89
0.85	76.33	78.33	79.07	79.43
0.90	78.45	80.00	80.62	80.93
0.95	80.75	81.67	82.14	82.39
1.00	83.33	83.33	83.64	83.80
1.05	86.34	85.00	85.09	85.18
1.10	90.16	86.67	86.52	86.50
1.15	97.13	88.33	87.90	87.78
1.20	100.00	90.00	89.24	89.01
1.25	100.00	91.67	90.54	90.19
1.30	100.00	93.33	91.79	91.31
1.35	100.00	95.00	92.98	92.37
1.40	100.00	96.67	94.12	93.37
1.45	100.00	98.33	95.19	94.32
1.50	100.00	100.00	96.20	95.19
1.55	100.00	100.00	97.13	96.00
1.60	100.00	100.00	97.97	96.75
1.65	100.00	100.00	98.72	97.42
1.70	100.00	100.00	99.34	98.02
1.75	100.00	100.00	99.81	98.55
1.80	100.00	100.00	100.00	98.99
1.85	100.00	100.00	100.00	99.36
1.90	100.00	100.00	100.00	99.65
1.95	100.00	100.00	100.00	99.85
2.00	100.00	100.00	100.00	99.97
2.05	100.00	100.00	100.00	100.00
2.10	100.00	100.00	100.00	100.00
2.15	100.00	100.00	100.00	100.00
2.20	100.00	100.00	100.00	100.00
2.25	100.00	100.00	100.00	100.00
2.30	100.00	100.00	100.00	100.00
2.35	100.00	100.00	100.00	100.00
2.40	100.00	100.00	100.00	100.00

Table 334-10 Percent Within Limits				
Quality Index	Percent within Limits for Selected Sample Size			
	n = 3	n = 4	n = 5	n = 6
2.45	100.00	100.00	100.00	100.00
2.50	100.00	100.00	100.00	100.00
2.55	100.00	100.00	100.00	100.00
2.60	100.00	100.00	100.00	100.00
2.65	100.00	100.00	100.00	100.00

334-8.2.2.2 Pay Factors (PF): Pay Factors will be calculated by using the following equation:

$$\text{Pay Factor} = (55 + 0.5 \times \text{PWL}) / 100$$

The PWL is determined from Step (8) of 334-8.2.2.1.

334-8.3 Composite Pay Factor (CPF): A Composite Pay Factor for the LOT will be calculated based on the individual Pay Factors (PF) with the following weighting applied: 35 percent Density (D), 25 percent Air Voids (V_a), 25 percent asphalt binder content (P_b), 10 percent Passing No. 200 (P_{-200}) and 5 percent Passing No. 8 (P_{-8}). Calculate the CPF by using the following formula:

$$\text{CPF} = [(0.350 \times \text{PF D}) + (0.250 \times \text{PF } V_a) + (0.250 \times \text{PF } P_b) + (0.100 \times \text{PF } P_{-200}) + (0.050 \times \text{PF } P_{-8})]$$

Where the Pay Factor (PF) for each quality characteristic is determined in either 334-8.2.1 or 334-8.2.2, depending on the number of sublot tests. Note that the number after each multiplication will be rounded to the nearest 0.01.

The pay adjustment shall be computed by multiplying the Composite Pay Factor for the LOT by the bid price per ton.

334-8.4 Payment: Payment will be made under:

Item No. 334- 1- Superpave Asphaltic Concrete - per ton.