FlexGard™

High Performance Thin Overlay System

Associated Asphalt®

FlexGard™ High Performance Thin Overlay (HPTO) System

SECTION 200 - CONTROL OF WORK

201 Authority of the Engineer

The Project Engineer or their designated representative will represent the owner / agency and decide all questions that may arise as to the quality and acceptability of the work and as to the rate of progress of the work, all questions that may arise as to the interpretation of the contract documents, all questions related to the acceptable fulfillment of the contract on the part of the contractor, and all questions related to compensation. All questions related to the interpretation of the contract documents shall be submitted to the owner / agency in writing.

The Project Engineer has the authority to suspend the work wholly or in part or to suspend partial payments due to the failure of the contractor to correct conditions unsafe for the workers or the general public, for failure to carry out provisions of the contract, or for failure to carry out orders. The Project Engineer may also suspend the work wholly or in part for such periods as deemed necessary due to unsuitable weather, for conditions considered unsuitable for the execution of the work, or for any other condition or reason deemed to be in the public interest.

202 Plans and Specifications.

Plans and specifications may be furnished by the Project Engineer or their designated representative.

203 Conformity with Contract Documents.

All work performed shall be in conformity with the lines, grades, cross-sections, dimensions, and material requirements, including tolerances shown in the contract documents. The purpose of tolerances is to accommodate occasional minor variations from the middle portion of the tolerance range that are unavoidable for practical reasons. When a maximum or minimum value is specified, the production and processing of the material and the performance of the work shall be so controlled that the work shall not be preponderantly of borderline quality or dimension. Although measurement, sampling, and testing may be considered evidence of conformity, the Engineer will determine whether the work deviates from the contract documents.

In the event the owner / agency finds the work not in conformance with the contract documents but that reasonably acceptable work has been produced, they will determine if the work is to be accepted and remain in place. In this event, the Project Engineer will document the basis of the acceptability of the work and provide for an appropriate adjustment in the contract price for such work as deemed necessary. If an appropriate adjustment cannot be negotiated, the work shall be removed and replaced or otherwise corrected at no cost to the owner / agency.

In the event the Project Engineer finds the work not in conformance with the contract documents, including tolerances resulting in an inferior or unsatisfactory product, the work shall be removed and replaced or otherwise corrected at no cost to the owner / agency.

Neither the observations of the Project Engineer in the administration of the contract, nor inspections, tests, or approvals by persons other than the contractor relieve the contractor from its obligation to perform the work according to the contract documents.

The contractor shall give the work the constant attention necessary to facilitate the progress thereof, and shall cooperate with the engineer and other contractors in every way possible.

When the contractor is comprised of two or more persons, firms, partnerships, or corporations functioning on a joint venture basis, said contractor shall designate in writing, before starting work, the name of one individual who shall have the authority to represent and act for the joint venture.

The contractor shall designate in writing before starting work, a competent, English-speaking superintendent capable of reading and thoroughly understanding the contract documents, and thoroughly experienced in the type of construction being performed. The superintendent shall have the authority to represent and act for the contractor. An alternate to the superintendent, with equal authority and qualifications, may also be designated.

The superintendent or the alternate shall be present at the site of the project at all times while work is actually in progress on the contract irrespective of the amount of Work subcontracted. The superintendent or the alternate shall have full authority to execute orders or direction from the Engineer, without delay, and to promptly supply such materials, equipment, tools, labor, and incidentals as may be required. When work is not in progress and during periods when work is suspended, arrangements acceptable to the Engineer shall be made for any emergency work that may be required.

Whenever the superintendent or the alternate is not present on the site or at the location of any particular part of the work where it may be desired to give direction, the engineer may suspend all of the work or the particular work in reference until the superintendent or the alternate is present. Such suspension shall not be the basis of any claim against the owner / agency.

SECTION 300 - CONTROL OF MATERIAL

301 Source of Supply and Quality Requirements.

All materials for the project shall be furnished by the contractor and shall be new, unless otherwise specifically prescribed in the contract documents. The materials shall conform to the requirements of the contract documents. Only materials that have been approved by the Engineer shall be used.

All HMA facilities manufacturing HMA for these projects shall have an approved Quality Control Program Plan and be approved by the owner / agency to supply materials.

302 Certification of Compliance.

Binder, emulsion, and aggregate materials will be accepted on the basis of Certificates of Compliance stating that such materials fully comply with the requirements of the contract. The Engineer must approve the form of Certificates of Compliance.

Materials used on the basis of Certificates of Compliance, may be sampled and tested at any time. If found not to be in conformance with the contract requirements, materials will be rejected whether in place or not. The contractor shall require the manufacturer or supplier to furnish copies of Certificates of Compliance with each delivery of materials that are acceptable by certification.

SECTION 400 – DESCRIPTION OF FLEXGARD^{TM} HPTO

401 Definition

This item shall consist of a Hot Mixed Asphalt (HMA) or approved Warm Mix Asphalt (WMA) surface course composed of mineral aggregate and polymer modified asphalt (PMA) binder which will be mixed in a central mixing plant and placed in accordance with these specifications.

402 Materials

402.1 Aggregate

Aggregates shall consist of crushed stone, with stone sand/screenings, and mineral filler, if necessary. Some natural sand, crushed gravel, or other aggregates may be used, but only with the prior approval of the Engineer. The portion of materials retained on the No. 8 sieve is coarse aggregate. The portion passing the No. 8 sieve and retained on the No. 200 sieve is fine aggregate, and the portion passing the No. 200 sieve is mineral filler.

402.1.1 Coarse Aggregate.

Coarse aggregate shall consist of sound, tough, durable particles, free from adherent films of matter that would prevent thorough coating and bonding with the bituminous binder and be free from organic matter and other deleterious substances. The aggregate shall be from a source approved by the state DOT or owner / agency and have a friction rating designated in the plan. The percentage of wear shall not be greater than 40 percent when tested in accordance with ASTM C131. The sodium sulfate soundness loss shall not exceed 10 percent, or the magnesium sulfate soundness loss shall not exceed 13 percent, after five cycles, when tested in accordance with ASTM C88.

402.1.2 Fine Aggregate

Fine aggregate shall consist of clean, sound, durable, angular shaped particles produced by crushing stone, that meets the requirements for wear and soundness specified for coarse aggregate. The aggregate particles shall be free from coatings of clay, silt, or other objectionable matter and shall contain no clay balls. The fine aggregate, including any blended material for the fine aggregate, shall be non-plastic when tested in accordance with ASTM D4318. Natural (non-manufactured) sand may not be used, unless approved by the Engineer. The un-compacted void content of the aggregate shall have a minimum FAA of 45, when tested according to AASHTO T304 – Method A.

The aggregate shall have sand equivalent values of 50 or greater when tested in accordance with ASTM D 2419.

402.1.3 Sampling

ASTM D 75 shall be used in sampling coarse and fine aggregate, and ASTM C 183 shall be used in sampling mineral filler.

402.2 Mineral Filler

If filler, in addition to that naturally present in the aggregate, is necessary, it shall meet the requirements of ASTM D242.

402.3 Asphalt Binder

Contract documents will specify the type of FlexGard™ binder to be used, as listed in Table 1. Use polymer modified asphalt binder that is specially formulated for meeting the mix performance criteria listed in Table 2 of this specification corresponding to the binder type. Consult with the asphalt binder supplier to obtain the appropriate material for the specific mix design. Submit a certificate of analysis (COA) showing the PG continuous grading (AASHTO R 29) for the asphalt binder used in the mix design. For quality assurance testing during production, the Project Engineer will consider the asphalt binder acceptable if the binder compares favorably with the COA submitted at the time of mix design. To analyze the binder, the Project Engineer will test the binder at the nearest standard PG temperature then compare the results with the COA. If the high and low temperature test results are within 5% of the results from the same temperature on the COA, then the Project Engineer will consider the asphalt binder comparable to the binder used during mix design.

Table 1 – FlexGard Binder Types *
Binder Designation
FlexGard™ S (Standard Grade)
FlexGard™ E (Extreme Performance)

*Use a PG asphalt binder that is storage-stable, pre-blended, homogeneous, polymer modified, using styrene-butadiene or styrene-butadiene-styrene formulations. The binder shall be tested according to ASTM D5976 Separation Test the maximum difference (original DSR) shall be 5%.

403 Preliminary Material Acceptance

Prior to delivery of materials to the job site, the contractor shall submit certified test reports to the Engineer indicating compliance with the following:

403.1.1 Aggregate

Aggregate shall meet all the applicable sections of AASHTO (M323, T312, and R35).

403.1.2 Asphalt binder

The certification(s) shall show the appropriate AASHTO/ ASTM test(s) run for Compliance with ASTM D 7643 Continuous PG, and a statement that the material meets the specification requirement.
The Engineer may request samples for testing, prior to and during production, to verify the quality of the materials and to ensure conformance with the applicable specifications.

404 Composition

404.1 Composition of Mixture

The bituminous plant mix shall be composed of a mixture of well-graded aggregate, filler if required, and bituminous binder. The several aggregate fractions shall be sized, handled in separate size groups, and combined in such proportions that the resulting mixture meets the grading requirements of the job mix formula (JMF).

404.2 Job Mix Formula

No bituminous mixture for payment shall be produced until a job mix formula has been approved by the Engineer. The bituminous mixture shall be designed to meet the requirements of Table 2, using procedures contained in the Asphalt Institute's Asphalt Mix Design Methods – MS 2 (7th Edition) as modified and amended below.

If the Tensile Strength Ratio (TSR) of the composite mixture, as determined by AASHTO T-283, is less than 85%, the aggregates shall be rejected or an approved anti-stripping agent added. The amount of anti-stripping agent added shall be sufficient to produce a TSR of not less than 85%, and shall not alter the Performance Grade of the asphalt binder. If an anti-strip agent is required, it will be provided by the contractor at no additional cost.

The job mix formula (JMF) shall be submitted in writing by the contractor to the Engineer at least 14 days prior to the start of paving operations, it shall meet all the requirements of Table 2, and shall include as a minimum:

a. The percent passing each sieve size for each aggregate used in the mix and the percentage of each aggregate used in the mix.

b. Optimum percent of asphalt binder for the mix.

c. The asphalt binder Continuous grade.

d. The percent air voids at N_{des}.

e. The Lab Mixing temperature range.

f. The Lab Compaction temperature range.

g. The recommended range of temperatures for field mixing and compaction.

h. The combined gradation as well as the specification limits plotted on a 45 power gradation chart.

i. Complete volumetric worksheets, including SGC specimen height @ N_{des} and N_{max}, G_{mm}, G_{mb}, % air voids, % VMA, G_{sb}, G_{se}, calculations.

j. The graphical plots of the volumetric properties - air voids, voids in the mineral aggregate, and unit weight - versus asphalt content.

k. The complete Tensile Strength Ratio (TSR) work sheet.

l. The amount and type of anti-strip agent (if required).

m. APA Rut Test results, mm

n. IDEAL CT Index Test results, cycles

Performance testing shall be performed by an AASHTO Resources approved facility.

The Contractor shall submit samples to the Engineer, upon request, for job mix formula verification testing.

The job mix formula for each mixture shall be in effect until modified in writing by the Engineer. Should a change in sources of materials be made, a new job mix formula must be approved by the Engineer before the new material is used.

Table 2 – Mix Properties

Binder Type	**FlexGard™ S**	**FlexGard™ E**
SGC Design Criteria	**N_{des}**	**N_{des}**
Number of gyrations	50	50
% Air Voids	3.2% - 3.8% [1]	
% VMA [2]	18 % minimum	18 % minimum
AASHTO T 340 [3] - APA Rut Test [4]	Max. 5 mm	Max. 4 mm
ASTM 8225 – IDEAL CT Index	Min. 500	Min. 1200

[1] – For Volumetric mix design – target 3.5% AV, however, % air voids may be adjusted within these limits, provided the performance test requirements are meet.

[2] - If the water absorption of the combined aggregates in the mix exceeds 1.5 % (ASTM D127 & D128) then the mix must be short term aged in accordance with AASHTO R30 – Sec. 7.2. The short term aged material will then be used for the SGC specimens and the maximum specific gravity test (ASTM D 2041)

[3] – Lab age condition all performance test samples in accordance with AASHTO R-30 sec. 7.2. After conditioning, immediately bring the material to compaction temperature and compact.

[4] – APA Test Conditions - 8000 cycles @ 64ºC/100psi hose pressure/100 lbs. load run on SGC specimens compacted @ 5% air voids ± 0.5%

The gradations in Table 3 represent the limits which shall determine the suitability of aggregate for use from the sources of supply. The aggregate, as selected (and used in the JMF), shall have a gradation within the limits designated in Table 3 and shall not vary from the low limit on one sieve to the high limit on the adjacent sieve, or vice versa, but shall be well graded from coarse to fine. Deviations from the final approved mix design for bitumen content and gradation of aggregates shall be within the action limits for individual measurements as specified in the approved quality control plan.

The maximum size aggregate used shall not be more than one-half of the thickness of the course being constructed.

Table 3 – FlexGard™ Mix Gradation

Sieve Size	FlexGard™ - Mix % passing by weight
12.5 mm	100
9.5 mm	98-100
4.75 mm	65 - 85
2.36 mm	35 - 55
1.18 mm	20 - 40
0.60 mm	15 - 30
0.30 mm	10 - 20
0.15 mm	5 - 15
0.075 mm	5 - 8
Min. Asphalt Content	7%**
	**Asphalt content may be lower than 7% provided the rutting and cracking requirements are met.

The aggregate gradations shown are based on aggregates of uniform specific gravity. The percentages passing the various sieves shall be corrected when aggregates of varying specific gravities are used, as indicated in the Asphalt Institute Manual Series No. 2 (MS-2), Appendix A.

404.3 RECYCLED ASPHALT CONCRETE

No RAP shall be permitted in this mix.

404.4 TESTING LABORATORY

The laboratory used to develop the job mix formula and perform quality control testing must be approved by the contracting agency.

404.5 TEST SECTION

Prior to full production, the owner / agency may require the contractor to prepare and place a quantity of bituminous mixture according to the job mix formula. The amount of mixture should be sufficient to construct a test section consisting of a minimum of 75 tons, and shall be of the same depth specified for the construction of the course which it represents. The underlying grade or pavement structure upon which the test section is to be constructed shall be the same as the remainder of the course represented by the test section. The equipment used in construction of the test section shall be the same type and weight to be used on the remainder of the course represented by the test section.

Two samples (minimum 2 SGC cycles each) shall be taken at the plant and tested for volumetric properties in accordance with section 403.2 and 405.5. Two samples of mixture shall be taken at the same time and tested for aggregate gradation and asphalt content in accordance with section 403.2 and 405.7. Four cores shall be taken from the finished pavement mat, and tested in accordance with section 400.5.8.4.

. In addition, prepare nine gyratory specimens of the plant mix for testing by the Engineer. The Engineer will use these additional samples for performance testing of the HPTO mix. The Engineer reserves the right to be present at the time of molding the gyratory specimens. Ensure that the additional gyratory specimens are compacted according to AASHTO T 312, are 77 mm high, and have an air void content of 5.0 ± 0.5 percent. The Engineer will test six (6) specimens using an Asphalt Pavement Analyzer (APA) according to AASHTO TP 63 at 64ºC, 100 psi hose pressure, and 100 lb. wheel load. The Engineer will use the remaining three (3) specimens to test using an Overlay Tester at 25°C and a joint opening of 0.025 inch.

Mat density and air voids shall be evaluated in accordance with section 405.8.4. Voids in the mineral aggregate (VMA), for the plant samples, shall be computed in accordance with ASTM D6995.

The test section shall be considered acceptable if:

- The mat air voids meet the criteria in Table 4
- Gradation and asphalt content, and % air voids and VMA of the plant mix are within the criteria of Tables 2 & 3.

If the initial test section should prove to be unacceptable, the necessary adjustments to the job mix formula, plant operation, placing procedures, and/or rolling procedures shall be made.

A second test section shall then be placed. If the second test section also does not meet specification requirements, both sections shall be removed at the contractor's expense. Additional test sections, as required, shall be constructed and evaluated for conformance to the specifications. Any additional sections that are not acceptable shall be removed at the contractor's expense. Full production shall not begin until a satisfactory section has been constructed and accepted by the engineer. The initial test section, whether acceptable or unacceptable, and any subsequent section that meets specification requirements shall be paid for in accordance with the bid document.

Job mix control testing shall be performed by the contractor at the start of plant production and in conjunction with the calibration of the plant for the job mix formula. It should be recognized that the aggregates produced by the plant may not satisfy the gradation requirements or produce a mix that exactly meets the JMF. In those instances, it will be necessary to reevaluate and redesign the mix using plant-produced aggregates. Specimens should be prepared and the optimum binder content determined in the same manner as for the original design tests.

405 Construction Methods

405.1 Weather Limitations

The bituminous mixture shall not be placed upon a wet surface or when the surface temperature of the underlying course is less than 50ºF (10ºC). The temperature requirements may be waived by the engineer if requested, however, all other requirements including compaction shall be met.

405.2 Bituminous Mixing Plant

Plants used for the preparation of bituminous mixtures shall conform to the requirements of and be approved by the state DOT.

405.3 Hauling Equipment

Trucks used for hauling bituminous mixtures shall have tight, clean, and smooth metal beds. To prevent the mixture from adhering to them, the truck beds shall be lightly coated with a State DOT approved release agent material. Each truck shall have a suitable cover to protect the mixture from cooling during transport. If crusting of the mix occurs during transport, appropriate corrective action must be taken or the hauling unit must be taken out of service. When necessary, to ensure that the mixture will be delivered to the site at the specified temperature, truck beds shall be insulated or heated and covers shall be securely fastened.

405.4 Bituminous Pavers

Bituminous pavers shall be self-propelled, with an activated screed, heated as necessary, and shall be capable spreading and finishing courses of bituminous plant mix material which will meet the specified thickness, smoothness, and grade. The paver shall have sufficient power to propel itself and the hauling equipment without adversely affecting the finished surface.

The paver shall have a receiving hopper of sufficient capacity to permit a uniform spreading operation. The hopper shall be equipped with a distribution system to place the mixture uniformly in front of the screed without segregation. The screed shall effectively produce a finished surface of the required evenness and texture without tearing, shoving, or gouging the mixture.

405.5 Rollers

Rollers of the vibratory and steel wheel type shall be used. They shall be in good condition, capable of operating at slow speeds to avoid displacement of the bituminous mixture. The number, type, and weight of rollers shall be sufficient to compact the mixture to the required density while it is still in a workable condition.
The use of equipment which causes excessive crushing of the aggregate will not be permitted.

405.6 Storage and Handling of Asphalt Binders

The bituminous binder shall be heated in a manner that will avoid local overheating and provide a continuous supply of the bituminous binder to the mixer at a uniform temperature. The temperature of the bituminous binder delivered to the mixer shall be sufficient to provide a suitable viscosity for adequate coating of the aggregate particles, but shall not exceed 340^{o}F.

405.7 Preparation of Mineral Aggregate

The aggregate for the mixture shall be heated and dried prior to introduction into the mixer. The maximum temperature and rate of heating shall be such that no damage occurs to the aggregates. The temperature of the aggregate and mineral filler shall not exceed 335^{o}F when the asphalt is added. The temperature shall not be lower than is required to obtain complete coating and uniform distribution on the aggregate particles and to provide a mixture of satisfactory workability.

405.8 Preparation of Asphalt Mixture

The aggregates and the bituminous binder shall be weighed or metered and introduced into the mixer in the amount specified by the job mix formula.
The combined materials shall be mixed until the aggregate obtains a uniform coating of bitumen and is thoroughly distributed throughout the mixture. The moisture content of all bituminous mix upon discharge shall not exceed 0.1 percent.

405.9 Preparation of Underlying Surface

A hot applied or emulsified tack coat of the grade specified in the plans shall be applied in accordance the contract specifications. When emulsified tack is used there shall be no dilution allowed and the application rates shall be based on residual asphalt content of the tack materials. The surface upon which the tack is to be applied shall be free from moisture and cleaned of all dirt and other foreign or loose matter. When precipitation has occurred during the previous 24 hours, the engineer will determine if the tack coat may be applied or if the work will be delayed until the surface is completely dry. No more tack coat shall be applied than can be covered in the same day. Traffic control shall be provided to prevent vehicles from riding on surfaces upon which tack coat has been applied. The Tack coat shall be applied at a rate of 0.06 – 0.14 gallon per square yard based on residual asphalt content of the tack material The material should be applied at a spraying temperature recommended by the supplier of the tack materials. A technical data sheet shall be supplied for all tack materials stating materials type, target residual asphalt content, handling properties, and application information. The spraying temperature and application rate will be adjusted by the engineer as required to produce a uniform coating so that every part of the surface is covered, with no excess material. When emulsified tack coats are used each load of tack material shall be accompanied with a Residual Asphalt Content value for use in calculating proper shot rates.

All uncoated or lightly coated areas shall be corrected. All areas showing an excess of tack coat material shall be corrected by removing the excess material. The application is not acceptable if the material is streaked or ribboned.

405.10 Transporting, Placing and Finishing

The bituminous mixture shall be transported from the mixing plant to the site in vehicles conforming to the requirements of section 400.4.3. Deliveries shall be scheduled so that placing and compacting of mixture is uniform with minimum stopping and starting of the paver. Adequate artificial lighting shall be provided during night placements. Hauling over freshly placed material shall not be permitted until the material has been compacted, as specified, and allowed to cool to atmospheric temperature.
The mix shall be placed and compacted at a temperature suitable for obtaining density, surface smoothness, and other specified requirements but not less than 265ºF.
Upon arrival, the mixture shall be placed to the full width by a bituminous paver. It shall be struck off in a uniform layer of such depth that, when the work is completed, it shall have the required thickness and conform to the grade and contour indicated.

The speed of the paver shall be regulated to eliminate pulling and tearing of the bituminous mat. Transverse joints in adjacent lanes shall be offset a minimum of 10 feet. On areas where irregularities or unavoidable obstacles make the use of mechanical spreading and finishing equipment impractical, the mixture may be spread and luted by hand tools.

405.11 Compaction of Mixture

After placing, the mixture shall be thoroughly and uniformly compacted by rolling. The surface shall be compacted as soon as possible when the mixture has attained sufficient stability so that the rolling does not cause undue displacement, cracking or shoving. The sequence of rolling operations and the type of rollers used shall be at the discretion of the contractor. The speed of the roller shall, at all times, be sufficiently slow to avoid displacement of the hot mixture and be effective in compaction. Any displacement occurring as a result of reversing the direction of the roller, or from any other cause, shall be corrected at once. Sufficient rollers shall be furnished to handle the output of the plant. Rolling shall continue until the surface is of uniform texture, true to grade and cross section, and the required field density is obtained. To prevent adhesion of the mixture to the roller, the wheels shall be kept properly moistened (and scrapers used), but excessive water will not be permitted. The addition of one capful of TIDE® liquid detergent or other proven material to each roller water tank may be required to prevent pickup. In areas not accessible to the roller, the mixture shall be thoroughly compacted with hand tampers. Any mixture that becomes loose and broken, mixed with dirt, contains check-cracking, or in any way defective shall be removed and replaced with fresh hot mixture and immediately compacted to conform to the surrounding area. This work shall be done at the Contractor's expense. Skin patching is not allowed.

405.12 Joints

The formation of all joints shall be made in such a manner as to ensure a continuous bond between the courses and obtain the required density. All joints shall have the same texture as other sections of the course and meet the requirements for smoothness and grade. Longitudinal joints which are irregular, damaged, un-compacted, or otherwise defective shall be cut back to expose a clean, sound surface for the full depth of the course. All contact surfaces shall be given a tack coat of bituminous binder prior to placing any fresh mixture against the joint.

406 Material Acceptance

406.1 Acceptance Sampling and Testing

All acceptance sampling and testing necessary to determine conformance with the requirements specified in this section will be performed by the Project Engineer or his designated representative at no cost to the contractor. Testing organizations performing these tests must be approved by the contracting agency.

406.2 Plant-Produced Material

Plant-produced material shall be tested for percent binder content, mix gradation, air voids and VMA on a lot basis. Sampling shall be from material deposited into trucks at the plant or from trucks at the job site. A lot shall not exceed 1200 tons. A sub-lot shall not exceed 300 tons. Four consecutive sub-lots shall equal one lot. If a day's production is less than 300 tons, a sub-lot shall be generated for that day and included in the average of the next lot. Where more than one plant is simultaneously producing material for the job, the lot sizes shall apply separately for each plant.

406.3 Sampling – Volumetric properties

Each lot will normally consist of four sub-lots. Sufficient material for preparation of test specimens will be sampled by the engineer on a random basis, in accordance with the procedures contained in ASTM D3665. One set of laboratory compacted specimens (minimum two SCG specimens) will be prepared for each sub-lot in accordance to section 406.2. The compaction temperature of the specimens should be as specified in the job mix formula.

406.4 Sampling – Binder Content and Mix Gradation Test

Two of the four sub lot samples shall be used to determine the binder content and gradation of the extracted aggregate. A minimum of one test per day shall be required.

406.5 Testing - Plant Mix Lab Compacted Density

Samples shall be compacted with a SGC in accordance with ASTM D6925 to the N_{des} specified in Table 2. Prior to testing, the bulk specific gravity of each test specimen shall be measured by the Engineer in accordance with ASTM D2726 for use in computing air voids and pavement density.

For air voids determination, the theoretical maximum specific gravity of the mixture shall be measured for each sub lot in accordance with ASTM D2041. The average used for the % voids for each sub-lot shall be averaged to compute the average % air voids for each lot.

406.6 Testing – Plant VMA

Determine the VMA of the plant lab compacted mix in accordance with ASTM D6995.

406.7 Testing – Binder Content and Mix Gradation

Determine the % AC content in accordance with either ASTM D6307 (burn test) or ASTM D2172 (solvent extraction). Determine the extracted mix gradation in accordance with ASTM D5444.

406.8 Acceptance Criteria – Mix Density

Acceptance of plant produced material for air voids shall be determined by the Engineer in accordance with the requirements of Table 4.

406.8.1 Field Placed Material

Material placed in the field shall be tested for mat density on a lot basis.

406.8.2 Mat Density

The lot and sub-lot size shall be the same as that indicated in paragraph 406.2. One core of finished, compacted materials shall be taken by the contractor from each sub-lot. Core locations will be determined by the engineer on a random basis in accordance with procedures contained in ASTM D3665. Cores shall not be taken closer than one foot from a transverse or longitudinal joint. One core of finished, compacted materials shall be taken by the contractor from each sub-lot.

406.8.3 Sampling- Field Cores

Samples shall be neatly cut with a core drill or other approved equipment in accordance with ASTM D5361. The minimum diameter of the sample shall be 6 inches (mm). Samples that are clearly defective, as a result of sampling, shall be discarded and another sample taken. The contractor shall furnish all tools, labor, and materials for cutting samples and filling the cored pavement. Cored holes shall be filled in a manner acceptable to the engineer and within one day after sampling.

406.8.4 Testing- Field cores

The bulk specific gravity of each cored sample will be measured by the engineer in accordance with ASTM D2726. The in-place air voids will be determined by ASTM D3203.

406.8.5 Acceptance – Field cores

Acceptance of field placed material for mat density will be determined by the Engineer in accordance with the requirements of Table 5.

406.8.6 Partial Lots

Field Placed Material. The lot size for field placed material shall correspond to that of the plant material, except that in no cases less than (2) cored samples shall be obtained.

406.9 Acceptance Criteria – Asphalt Mix

406.9.1 General

Acceptance will be based on the following characteristics of the bituminous mixture and completed pavement as well as the implementation of the contractor's quality control plan and test results:

Plant Mix

- % Air Voids
- % VMA
- % AC content
- Mix gradation
- *APA rut test
- * OT cracking test

*Samples may be obtained by the Engineer to check compliance with Table 2

Field Mat

- mat density
- thickness
- smoothness

A complete report of the field mat lot must be presented to the project Engineer within 18 hours of the completion of the lot. A complete report of the plant mix lot must be presented to the Project Engineer within four hours of the completion of the lot. Acceptance of materials and workmanship will be based on the criteria contained in Table 5.

The Engineer may at any time, notwithstanding previous plant acceptance, reject and require the contractor to dispose of any batch of bituminous mixture which is rendered unfit for use due to contamination, segregation, incomplete coating of aggregate, or improper mix temperature. Such rejection may be based on only visual inspection or temperature measurements. In the event of such rejection, the contractor may take a representative sample of the rejected material in the presence of the engineer, and if he can demonstrate in the laboratory, in the presence of the Engineer, that such material was erroneously rejected, payment will be made for the material at the contract unit price.

406.9.2 Plant mix – lab compacted mix properties

Acceptance of each lot of plant produced material will be based on the average of the individual sub lot values and the acceptance criteria in Table 4.

406.9.3 Field Mat Density

Acceptance of each lot of in-place pavement for mat density shall be based on the average % air voids of the sub lot cores and the criteria in Table 5.

406.9.4 Plant mixed - lab compacted material test properties

All lots shall meet the requirements of Table 4.

Table 4 – Acceptance Criteria for Plant Lab

Property	Sub lot average	Max. range – sub lot
% AC content*	± 0.25	0.5
% pass #8*	± 4.0	6.5
% pass #200*	± 1.0	1.5
% air voids	2.0 – 4.0	2.0
% VMA	> 18	None < 18

* from the JMF

If any of the property requirements in Table 4 are not in compliance, the Project Engineer may require that production be halted, a corrective action plan be provided by the contractor, and/or a new test strip be constructed, at no cost to the owner, prior to the continuation of the project.

406.9.5 Field Mat Density / Air Voids

Each lot of mat cores must meet the requirements of Table 5.

Table 5 – Acceptance criteria for Mat Cores

	Sub lot average					Range between sub lot values			
% Air Voids Specification Limit	2.0 - 6.0					3.5			
Amount ± the specification limit	.10 to .40	.41 to .60	.61 to 1.0	> 1.1		.10 to 0.5	.51 to 1.0	> 1.1	
Reduction in unit price	5%	10%	20%	50%		5%	10%	50%	

406.9.6 Thickness

Thickness shall be evaluated for compliance by the Engineer to the requirements shown on the plans. If FlexGard™ paving is bid on a tonnage unit price basis, the plan quantity will reflect material required to place the designed thickness on the project and final quantities may not exceed the plan quantities by more than 10%. If FlexGard™ paving is bid on a square yard basis, measurements of thickness shall be made by the engineer using the cores extracted for each sub-lot for density measurement. The mat thickness must meet the requirements of Table 6.

Table 6 – Acceptance criteria for Mat thickness

	Sub lot average	Sub lot range	Payment reduction
% above or below that specified	20 - 25	> ½ inch	20%
% above or below that specified	> 25	> ¾ inch	50%

406.9.7 Smoothness

The finished surfaces of the pavement shall not vary more than ¼ inch for the surface course. Each lot may be evaluated with a 12-foot straightedge. The lot size shall be 2,000 square yards. Measurements will be made perpendicular and parallel to the centerline at distances not to exceed 50 feet. When more than 15 percent of all measurements within a lot exceed the specified tolerance, the Contractor shall remove the deficient area and replace with new material. Sufficient material shall be removed to allow at least one inch of asphalt concrete to be placed. Skin patching shall not be permitted. High points may be ground off as required.