U.S. Department
of Transportation
Federal Aviation
Administration

Advisory Circular

Subject: Development of State Standards for Nonprimary Airports	**Date:** 8/31/2011 **Initiated by**: AAS-100	**AC** No.**:** 150/5100-13B **Change**:

1. PURPOSE. This advisory circular (AC) provides guidelines for the development of State standards for and the use of State highway specifications for pavement construction at nonprimary public-use airports as provided for in title 49 United States Code (USC), Sections 47105(c) and 47114(d)(5), respectively.

2. CANCELLATION. AC 150/5100-13A, Development of State Standards for Non-Primary Airports, dated September 28, 1999, is cancelled.

3. SCOPE. This AC contains guidelines for the development of State standards and the use of State highway specifications for pavement construction at nonprimary public-use airports. Upon approval by the Federal Aviation Administration (FAA), such standards will be applicable instead of the comparable standards prescribed by the Secretary under title 49 USC, §47105(b)(3).

4. APPLICATION. The FAA recommends the use of the guidelines and standards in this AC for the preparation and submission to the FAA for approval of State standards and the use of State highway specifications for airfield pavement construction at nonprimary public-use airports. In general, use of this AC is not mandatory. However, use of this AC is mandatory for all projects funded with federal grant monies through the Airport Improvement Program (AIP) and with revenue from the Passenger Facility Charges (PFC) Program. See Grant Assurance No. 34, Policies, Standards, and Specifications, and PFC Assurance No. 9, Standards and Specifications.

5. PRINCIPAL CHANGES.

a. Standards for geometric layout of airports are excluded from consideration for development of State standards. FAA standards are minimum standards and it is not possible to establish adequacy of lesser standards.

b. Appendix 3 has been added to provide guidance in developing State standard airport pavement (SSAP) specifications.

6. APPLICABLE DOCUMENTS. For related reading material, consult the following FAA documents:

a. The following ACs may be obtained from the FAA web page at http://www.faa.gov/airports/resources/advisory_circulars/:

(1) AC 150/5320-6, Airport Pavement Design and Evaluation

(2) AC 150/5300-13, Airport Design

(3) AC 150/5320-5, Surface Drainage Design

(4) AC 150/5370-10, Standards for Specifying Construction of Airports

b. Electronic copies of the following Airports orders can be found at http://www.faa.gov/airports/resources/publications/orders/.

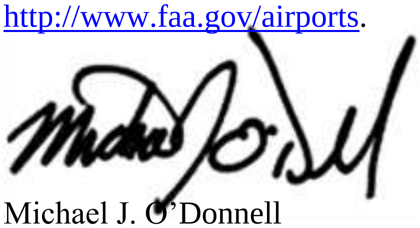
(1) Order 5100.38, Airport Improvement Program (AIP) Handbook

(2) Order 5300.1, Modifications to Agency Airport Design, Construction, and Equipment Standards

7. COMMENTS OR SUGGESTIONS for improvements to this AC should be sent to:

Manager, Airport Engineering Division
Federal Aviation Administration
800 Independence Avenue, S.W.
Washington, DC 20591

8. REQUESTS FOR INFORMATION. For more contact information, please see http://www.faa.gov/airports.



Michael J. O'Donnell
Director of Airport Safety and Standards

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1. GENERAL. This AC provides guidelines for the development of State standards for nonprimary public-use airports as provided for in 49 U.S.C. §47105 (c) and §47114 (d)(5). The former permits the FAA to allow the use of state standards for airport development in general, and the latter restricts the use of State highway specifications to runways 5,000 feet or shorter serving aircraft that do not exceed 60,000 pounds gross weight. The FAA has decided to limit consideration of standards to those detailed in Paragraph 3 below. If approved, such standards will be applicable in lieu of any comparable FAA standards.

Appendix 1 contains information that will be employed when State highway specifications form the basis for development of State standards for pavement design and construction. A recommended format and content for proposals to use State highway specifications for construction of nonprimary airports in lieu of FAA specifications is presented in Appendix 2. Appendix 3 provides guidance in developing State standard airport pavement (SSAP) specifications.

2. DEFINITIONS. Whenever the following terms are used in this guidance, the meaning is as follows.

a. "Airport" means an area of land or water used or intended to be used for the landing and taking off of aircraft and includes a heliport.

b. "Public-use airport" means an airport open to the public that also meets the following criteria:

(1) publicly owned, or

(2) privately owned but designated by FAA as a reliever, or

(3) privately owned but having scheduled service and at least 2,500 annual enplanements.

c. "Primary airport" means a commercial service airport that has more than 10,000 passenger boardings each year.

d. "Commercial service airport" means a public airport, in a State, that has at least 2,500 passenger boardings each year and is receiving scheduled passenger aircraft service.

e. "Passenger boardings" means revenue passenger boardings on an aircraft in service in air commerce, whether or not in scheduled service, and includes passengers who continue on an aircraft in international flight that stops at an airport in the 50 States for a non-traffic purpose, such as refueling or aircraft maintenance, rather than passenger activity.

f. "Nonprimary airport" includes, for the purpose of this AC, all civil airports with 10,000 passenger boardings or less each year.

g. "Public airport" means an airport used or intended to be used for public purposes that are under the control of a public agency, and of which the area used or intended to be used for the landing, taking off, or surface maneuvering of aircraft is publicly owned.

h. "Public agency" means a State or political subdivision of a State, a tax-supported organization, or an Indian tribe or pueblo.

i. "State" means a State of the United States, the District of Columbia, Puerto Rico, the Virgin Islands, American Samoa, the Northern Mariana Islands, the Trust Territory of the Pacific Islands, and Guam, for the purposes of developing "State" standards.

3. AFFECTED STANDARDS. Only those standards noted below are for consideration.

a. Design Standards. Standards for the design of airport pavements and drainage systems.

(1) Pavement Design. FAA standards for airport pavement structural design are contained in AC 150/5320-6, and should be used as guidance in developing State standards. Development of methods contained in this document is based on theoretical analysis of load distribution, analysis of experimental data, and studies of pavement performance under actual service conditions. Pavements constructed in accordance with these standards are intended to provide a pavement life of 20 years and have generally proven satisfactory. All design methods must be supported by adequate documentation. An acceptable method to develop pavement designs for nonprimary public-use airports, for runways of 5,000 feet or shorter serving aircraft of 60,000 pounds gross weight and under is presented in Appendix 1. It is based on the American Association of State Highway and Transportation Officials (AASHTO) Guide for Design of Pavement Structures, 1993. Pavement designs using the parameters contained in Appendix 1 are considered comparable to FAA standard pavement designs. State standards developed for pavement design should consider the following factors:

(a) maximum gross weight of aircraft

(b) gear type and configuration

(c) traffic volume and distribution

(d) strength of subgrade soil

(2) Drainage Design. FAA guidance for drainage systems is contained in AC 150/5320-5. State highway department standards are generally adequate for the construction of drainage systems for runways noted in paragraph a above0 above, and may be approved as State standards. However, it is critical that design of drainage structures be adequate for all anticipated aircraft loads.

b. Construction Standards. Construction standards relate primarily to materials and methods employed in the construction of airport improvements and are used in the preparation of contract specifications.

(1) FAA Standards. These standards are contained in AC 150/5370-10, are general in scope, and serve as a guide to develop specifications for specific projects. They are not limited to construction of pavements. It is recommended that the format, language, and options of these standards be used to the maximum extent possible in developing State standards and that modifications and changes be made if necessary to adjust to local conditions, policies, or available materials. For runways longer than 5,000 feet or those that will receive use by aircraft exceeding 60,000 pounds gross weight, FAA standards apply.

(2) State Highway Specifications. Approval of the use of State highway specifications for airport construction will be based on assurance that safety will not be negatively affected and the life of the pavement will not be shorter than it would be if constructed using FAA standards. State highway specifications have been developed specifically for use in construction of roads and highways using design considerations different from those developed for airport pavement. Highway specifications should be adopted as standards for airport construction only if the performance record under equivalent loadings and exposure has been satisfactory. In general, an airport may not seek AIP funds for runway rehabilitation or reconstruction of any airfield pavement constructed using State highway specifications for a period of 10 years after construction is completed. The pavement structural sections to be employed when State highway construction specifications are used are presented in Appendix 1. They are considered comparable to FAA standard pavement structural sections. Airport pavements constructed at nonprimary public-use airports serving aircraft of 60,000 pounds gross weight or less using State highway specifications fall within one of the following design conditions:

(a) pavements serving aircraft with gross weights of 12,500 pounds and under

(b) pavements serving aircraft with gross weights of 30,000 pounds and under, and

(c) pavements serving aircraft with gross weights of 60,000 pounds and under.

4. EXCLUDED STANDARDS. Excluded for consideration is the development of standards which relate to safety of airport approaches and airport geometric standards. FAA standards must be used in these areas. They provide guidance to pilots intending to land at or maneuver on an airport and are considered minimum standards for conducting safe operations during daylight, nighttime, or periods of reduced visibility. The FAA may approve the use of higher standards for specific projects, but will not do so on a state-wide basis. Typical items are:

a. runway and taxiway lighting configurations

b. runway and taxiway markings

c. visual aids

d. approach surface, size, and slope

e. obstruction removal and protection

f. runway length

g. runway and taxiway width

h. runway to taxiway, taxiway to taxiway, and taxiway to object distances

i. runway and taxiway safety areas, object free areas, and obstacle free zones

5. FAA APPROVAL OF STANDARDS.

a. For approval of State standards, title 49 U.S.C. 47114(d)(5) requires that the FAA determine that:

(1) safety will not be negatively affected, and

(2) the life of the pavement will not be shorter than it would be if constructed using Administration standards.

b. FAA Order 5300.1, Modifications to Agency Airport Design, Construction, and Equipment Standards, contains details on the process for approval of State standards. An application for use of State standards may be submitted to the appropriate FAA Airports District or Regional Office by a State. On completion of the application for the use of State standards, the State must submit a final report in draft form to the appropriate FAA Airports District or Regional office. The report must contain relevant State standards and include the rationale used to establish these standards. The FAA will review the report and submit comments in writing to the State. If the FAA takes exception to certain portions of the application, it will suggest the State modify the standards accordingly. Upon resolution of problem areas the final report must be submitted to the appropriate FAA Airports District or Regional Office. Upon approval, the State standards may apply to projects at nonprimary public-use airports in that State, in lieu of comparable Federal standards.

6. REVISION OF STATE STANDARDS. The State may submit revisions to approved State standards when deemed necessary. Revision of standards will also be subject to the FAA approval process.

7. AVAILABILITY OF APPROVED STATE STANDARDS. Upon approval, the FAA may place all information related to the approval of State standards on its internet page.

APPENDIX 1.
RECOMMENDED PAVEMENT DESIGN STRUCTURAL SECTIONS WHEN STATE HIGHWAY CONSTRUCTION SPECIFICATIONS ARE USED

1. PURPOSE. This appendix presents three methods for developing pavement design structural sections for use at nonprimary public-use airports serving aircraft with gross weights of 60,000 pounds or less when State highway specifications are employed in lieu of FAA construction specifications. The information in this appendix focuses on airside pavement for aircraft loadings. Designs should also consider the pavement section required to support the weight of maintenance and fueling equipment.

2. REFERENCES. The publications listed below provide further guidance and detailed information on the design of pavements.

a. AC 150/5320-6, Airport Pavement Design and Evaluation.

b. AASHTO Guide for Design of Pavement Structures, 1993.

3. METHOD A. MINIMUM THICKNESS FOR PAVEMENT STRUCTURAL SECTIONS. The pavement structural sections that are considered equivalent to FAA standard pavement structural sections when State highway materials and specifications are described in Table A1-1. Unless indicated otherwise, the pavement design is based on the FAA standard pavement design procedure. The density and compaction requirements should be the highest specifiable value in the State specification book that is comparable to FAA materials.

TABLE A1-1. MINIMUM PAVEMENT STRUCTURAL SECTIONS

Aircraft Gross Weight Category	**Recommended State Standard Equivalent Pavement Sections When Using State Highway Materials and Specifications.**	
	Asphaltic Concrete (AC) Pavements	**Portland Cement Concrete (PCC) Pavements**
12,500 and Under	AC = FAA design thickness +¼" 50-blow Marshall equivalent	5" PCC Minimum compressive strength of 4,400 psi and minimum cementitious material content of 564#/CY
	Base = FAA design thickness +1"	4" Subbase
	Subbase = Thickness required to meet FAA design total thickness.	
30,000 and Under	AC = FAA design thickness +½" 50-blow Marshall equivalent	6" PCC Minimum compressive strength of 4,400 psi and minimum cementitious material content of 564#/CY
	Base = FAA design thickness +1"	4" Subbase
	Subbase = Thickness required to meet FAA design total thickness.	
60,000 and Under	50-blow Marshall equivalent when tire pressure less than 100 psi. AC = FAA thickness +1"	FAA Design thickness based on 600 psi flexural strength. Minimum cementitious material content of 564#/CY
	75-blow Marshall equivalent when tire pressure more than 100 psi. AC = FAA thickness +½"	
	Base = FAA design thickness +2"	4" Subbase
	Subbase = Thickness required to meet FAA design total thickness.	

4. METHOD B. AASHTO ALTERNATE FOR PAVEMENT STRUCTURAL SECTIONS. The recommended minimum AASHTO pavement structural numbers and pavement thickness values presented herein are an alternate method to satisfy the requirements for considering maximum gross weight of aircraft, gear type and configuration, traffic volume and distribution, and strength of subgrade soil. They have been developed using the AASHTO Guide for Design of Pavement Structures, 1993, in conjunction with AC 150/5320-6, and the minimum pavement structural sections given in Table A1-1. In all cases a crushed aggregate base course (Item P-209) was used in the FAA design procedure.

a. The recommended structural and drainage coefficients are listed in Table A1-2. All material and related properties were selected to be within the upper quality from the 1993 AASHTO recommendations.

TABLE A1-2. AASHTO MATERIAL LIBRARY CONSTANTS FOR NONPRIMARY AIRPORTS

Material Description	Structural Coefficient	Drainage Coefficient
Asphaltic Concrete (AC)	0.44	1.0
Crushed Aggregate Base	0.14	1.0
Aggregate Subbase	0.11	0.9

b. Strength of Subgrade Soil. The subgrade strength parameters for flexible and rigid pavements have been related to the AASHTO equivalent Roadbed Soil Resilient Modulus (psi), MR as follows:

(1) Flexible pavements. The California Bearing Ratio (CBR) has been converted to:

M_R = 1500 x CBR (Valid for CBR values ranging from 3 through 20.)

(2) Rigid pavements. The modulus of subgrade reaction subgrade (k) is equal to the AASHTO equivalent Effective Modulus of Subgrade Reaction (k).

c. Additional Design Considerations for Flexible and Jointed Rigid Pavements. The additional inputs required in the AASHTO guide method for flexible and jointed rigid pavements used to determine the recommended minimum pavement structural number are as follows:

TABLE A1-3. AASHTO DESIGN INPUT VALUES FOR FLEXIBLE AND JOINTED RIGID PAVEMENTS

Design Factor	Value	
	Flexible Pavement	Rigid Pavement
Initial Serviceability:	4.2	---
Terminal Serviceability:	3.5	---
Reliability Level (%):	90	---
Overall Standard Deviation:	0.44	---
28-day mean PCC Modulus of Rupture (psi):		600
Elastic Modulus of Asphaltic Concrete (psi)	400,000	---
Resilient Modulus of Crushed Aggregate Base (psi)	30,000	---
Resilient Modulus of Aggregate Subbase (psi)	15,000	---
Roadbed Soil Resilient Modulus (psi)	1500 x CBR	---
Effective Modulus of Subgrade Reaction (k)		AASHTO method

d. Minimum Structural Number--Flexible Pavements. Table A1-4 shows the recommended minimum structural numbers when using the AASHTO Design Guide for flexible pavements. The values were derived by calculating a structural number using the layer thickness values given in table A1-1, the material constants listed in table A1-2, the strength of subgrade soil determined in accordance with the guidance given in paragraph 4b, and the design input values listed in table A1-3. Under METHOD B, the designer can use the FAA recommended minimum structural number in conjunction with State approved AASHTO parameters to develop a variety of possible thickness designs based on the AASHTO Design Guide options that still meet FAA assumptions.

TABLE A1-4. MINIMUM AASHTO STRUCTURAL NUMBERS, FLEXIBLE PAVEMENT DESIGN

FAA CBR	AASHTO Subgrade M_R	Structural Number (minimum)			
		12,500 and Under	30,000 and Under	60,000 and Under 1,200 Annual Departures	60,000 and Under 3,000 Annual Departures
3	4,500	2.51	3.60	4.93	5.13
4	6,000	2.29	3.19	4.49	4.63
5	7,500	2.14	2.88	4.14	4.34
6	9,000	2.03	2.66	3.94	4.09
7	10,500	1.91	2.53	3.74	3.89
8	12,000	1.82	2.43	3.60	3.74
9	13,500	1.75	2.34	3.50	3.60
10	15,000	1.69	2.21	3.35	3.50
11	16,500	1.63	2.16	3.30	3.40
12	18,000	1.58	2.12	3.20	3.30
13	19,500	1.55	2.08	3.15	3.20
14	21,000	1.55	2.05	3.10	3.15
15	22,500	1.55	2.05	3.10	3.10
16	24,000	1.55	2.05	3.10	3.10
17	25,500	1.55	2.05	3.10	3.10
18	27,000	1.55	2.05	3.10	3.10
19	28,500	1.55	2.05	3.10	3.10
20	30,000	1.55	2.05	3.10	3.10
20+	30,000+	1.55	2.05	3.10	3.10

e. Minimum Thickness Design--Rigid Pavements. The recommended thickness values for rigid pavements were derived using the FAA rigid pavement design procedures for 600 psi. flexural strength concrete. The modulus of subgrade reaction values used were derived using the AASHTO equivalent effective modulus of subgrade reaction (k). The effective modulus of subgrade reaction was calculated using the layer information listed in Table A1-5, and the soil resilient modulus. Table A1-6 shows the recommended minimum pavement thickness for rigid pavements.

TABLE A1-5. LAYER INFORMATION FOR JOINTED RIGID PAVEMENTS

Layer Information	Value
Base type	unbound
Base Thickness (in)	4
Depth to bedrock (ft)	25
Projected slab thickness (in)	8
Loss of support	1

TABLE A1-6. MINIMUM PAVEMENT THICKNESS RIGID PAVEMENT DESIGN, 600 psi STRENGTH

Subgrade M_R	Effective Modulus of Subgrade Reaction (k) (see Table A1-4)	Recommended Minimum Portland Cement Concrete Thickness (in.)			
		12,500 and Under	30,000 and Under	60,000 and Under 1,200 Annual Departures	60,000 and Under 3,000 Annual Departures
4,500	85	5.0	6.0	10.0	10.5
6,000	105	5.0	6.0	10.0	10.5
7,500	124	5.0	6.0	9.5	10.0
9,000	142	5.0	6.0	9.5	10.0
10,500	159	5.0	6.0	9.5	10.0
12,000	175	5.0	6.0	9.5	10.0
13,500	191	5.0	6.0	9.0	10.0
15,000	207	5.0	6.0	9.0	9.5
16,500	222	5.0	6.0	9.0	9.5
18,000	237	5.0	6.0	9.0	9.5
19,500	251	5.0	6.0	9.0	9.5
21,000	266	5.0	6.0	9.0	9.5
22,500	280	5.0	6.0	9.0	9.5
24,000	293	5.0	6.0	9.0	9.5
25,500	307	5.0	6.0	9.0	9.5
27,000	320	5.0	6.0	8.5	9.0
28,500	333	5.0	6.0	8.5	9.0
30,000	346	5.0	6.0	8.5	9.0
30,000+	346	5.0	6.0	8.5	9.0

5. METHOD C. When Method A or B do not provide a suitable means for a State to develop pavement structural designs for nonprimary public-use airports in the State, a detailed submittal of the method proposed is required.

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APPENDIX 2.
RECOMMENDED FORMAT AND CONTENT FOR STATE STANDARDS REPORTS WHEN STATE HIGHWAY SPECIFICATIONS ARE PROPOSED

1. PURPOSE. This appendix presents information to facilitate an FAA review of a State's proposed use of standard State Highway Specifications, or portions thereof, in lieu of FAA standard specifications as contained in AC 150/5370-10.

2. STATE STANDARDS APPROVAL PROCESS. The approval process to use State standards for the construction of nonprimary public-use commercial service airports is as follows:

a. Each State must apply for approval to use its State highway construction standards for FAA funded pavement projects to the appropriate FAA Airport District Office or Regional Office.

b. No special forms are required. The request for approval must contain the information listed below. An example of an approval submission is shown in table A2-1.

(1) The pavement section (thickness, material, and compaction requirements) proposed for use for each pavement course for pavements intended to serve all weight ranges under consideration. The proposed pavement sections must be related to one of the methods presented in Appendix 1 to this AC.

(2) Quality control and quality acceptance plans, if different from FAA requirements, must also be submitted for approval.

(3) Method of measurement for each material must be submitted for approval.

(4) Basis for payment for each material must be submitted for approval. The basis of payment must also include pay factor schedules, if part of the specification.

c. The FAA will maintain a listing of approved State standards on the FAA Airports web page, http://www.faa.gov/airports/.

d. Revisions to State standards must be submitted to the FAA for approval.

TABLE A2-1. EXAMPLE SUBMISSION. INFORMATION FOR APPROVAL OF STATE HIGHWAY SPECIFICATIONS

FAA Specification Item	Specific State Highway Specification Reference Section or Paragraph				
	Materials	**Mixture Composition**	**Density or Strength Requirements**	**Acceptance Criteria**	**Basis of Payment (Include Pay Adjustment Schedule)**
Item P-401 Plant Mix Bituminous Pavements					
Item P-501 Portland Cement Concrete Pavements					
Item P-209 Crushed Aggregate Base Course					
Item P-208 Aggregate Base Course					
Item P-154 Subbase Course					
Item P-152 Excavation and Embankment					
Notes: 1. If the FAA Standard is desired, insert "FAA Standard". 2. If a column is not applicable to the specification, insert "N.A."					

APPENDIX 3.
GUIDELINES FOR DEVELOPING STATE STANDARD AIRPORT PAVEMENT (SSAP) SPECIFICATIONS

1. INTRODUCTION. Federal regulations permit the use of State Department of Transportation highway specifications for airports with runways less than 5,000 feet long and service aircraft weighing less than 60,000 pounds. The use of the state specification provides opportunities to obtain high quality hot mix asphalt (HMA) pavements for airports. Since state specifications are primarily designed for highway pavements, selection of the proper specification and criteria for airport pavements is not always compatible. Specifications that do not consider key factors for airport pavement may result in lower airport pavement performance than typically achieved using FAA criteria. This appendix has been prepared as a guideline to ensure that the critical elements in the FAA HMA specifications [P-401, P-401(SP), and P-403] are being addressed when state specifications are selected for development into State standards for nonprimary airports.

2. PURPOSE. The purpose of this appendix is to provide interim guidance for developing a State Standard Airport Pavement (SSAP) specification in conjunction with supporting sections of the respective State Standard Highway Pavement (SSHP) specifications and State Standard Specifications Manual (SSSM). The SSAP specifications, after being developed with the use of this appendix, should include the elements necessary to insure good airport pavement performance. This appendix will be limited to HMA pavement for aircraft gross weight (AGW) less than 60,000 pounds. The guidelines are applicable to the Superpave Method and Marshall Method of mix design.

3. DIFFERENCE BETWEEN AIRPORT AND HIGHWAY PAVEMENTS. It is important to recognize that airport pavements are fundamentally different from highway pavements. Highway pavements are typically constructed to support a high volume of automobile and truck traffic that can amount to thousands of load repetitions per day. The vast majority of airport pavements see only a few dozen aircraft passes per day. For some airport pavements, such as overruns and shoulders, only a few dozen loadings may be experienced in an entire 20-year lifetime. In the absence of high volume loading, the overriding cause of distress in these pavements is the continual exposure to the damaging effects of the sun, air, rain, and other climatic phenomena. Airport pavements predominately exhibit environmental associated distress types, such as weathering, raveling, and cracking. This is especially true for airfields designed to support relatively light weight aircraft. On the contrary, highway pavements are more prone to load associated distress types, such as rutting (permanent deformation) and fatigue cracking. Foreign object damage (FOD) is of great concern to the safe operation of aircraft, while it is not a major issue on highway pavements. Loose aggregate particles from in-service airport pavements can be ingested into high thrust jet engines and/or impact critical aircraft surfaces. Due to the safety implications, minimizing FOD must be considered one of the primary goals of the airfield pavement design and construction processes. Recognizing the specific challenges of airport pavements with regard to traffic volume, distress types, and FOD, the construction specifications must contain specific criteria to ensure that the airport pavement is stable, durable, and impermeable to permit safe, long term performance.

4. DEFINITIONS.

a. "State Standard Highway Pavement (SSHP)" specifications – SSHP specification is used throughout this appendix to identify the current State specifications for HMA highway pavements covering materials, mix design, and selection, manufacture, transport, placement, compaction and acceptance of HMA pavement as well as the contractor's quality control plan and requirements.

b. "State Standard Specifications Manual (SSSM)" – SSSM is used throughout this appendix to identify the current edition of the State Standard Specifications of Highway Construction, State Standard Specifications for Transportation Systems, State Standard Specification for Road and Bridge Construction, or any other title used for a SSSM.

c. "State Standard Airport Pavement (SSAP)" specifications – SSAP specification is used throughout this appendix to identify a State specification for HMA airport pavements developed in accordance with the guidance provided by AC 150/5100-13A and submitted for FAA approval. The SSAP specification must comply with critical requirements for airport pavements and instructions on how to reference, or insert, portions of SSHP specifications, or vice versa.

5. BASIS FOR FORMAT CHECKLIST ITEMS FOR SSAP SPECIFICATION.

Throughout the United States, the individual States' specifications covering HMA pavement generally have different titles, identification numbers, a range of criteria and requirements, and State-specific test methods which are based on local experience for material characteristics, environmental conditions, political considerations, etc. The overall general format and requirements for SSAP specifications can be grouped under the following topical area, These topical areas form the outline for the next section, which represents a checklist of specification requirements that should be met when developing SSAP specifications, or amending SSHP specifications, for airport pavement applications [AGW <60,000 pounds].

a. Description: definitions, explanations, etc.

b. Materials: normally covers coarse aggregate, fine aggregate, asphalt binder, reclaimed asphalt material, etc.

c. Composition: includes information about the mix design and job mix formula. This is under MATERIALS in some SSHP specifications.

d. Construction: includes information on plant, equipment, placement and compaction procedures, etc.

e. Acceptance: establishes the criteria and measure for material acceptance based on established sampling and testing requirements.

f. Quality Control: information for contractor's quality control program.

g. Measurement: identifies unit (units) for accountability.

h. Payment: identifies item (items) per unit for payment calculation.

6. CHECKLIST OF SSAP SPECIFICATION REQUIREMENTS. Use the requirements defined in this section to write SSAP specifications.

a. Description.

(1) General. This section should describe airport pavement courses as composed of mineral aggregate and asphalt binder mixed in a central mixing plant and placed on a prepared course in accordance with these specifications and must conform to the lines, grades, thicknesses, and typical cross sections shown on the plans. Each course must be constructed to the depth, typical section, and elevation required by the plans and must be rolled, finished, and approved before the placement of the next course. The materials and composition must meet the appropriate requirements in the SSSM and SSHP specifications, except as modified herein.

(2) Terminology. There are terms used in SSHP specifications which are synonymous with airport pavement terminology that should be identified in the development of SSAP specifications, or in amending SSHP specifications for airport pavement applications. Common examples of the synonymous terms include:

(a) Department, synonymous with airport owner [or owner authorized representative (OAR)]

(b) Engineer, synonymous with airport owner [or OAR]

(c) Roadway, synonymous with airport pavement

(3) Traffic Levels. Performance-Graded (PG) asphalt binder, Superpave (SP) aggregate consensus properties, and SP mix design requirements in SSHP specifications are all determined based on traffic levels defined in terms of 18,000 pound Equivalent Single Axle Loads (ESALs). In order to bridge the criterion placed in highway specifications and criterion used in airfield specifications, a correlation was established between ESALs and AGW less than 60,000 pounds. This correlation is shown in Table A3-1 which establishes a Traffic Level A and a Traffic Level B.

TABLE A3-1. TRAFFIC LEVEL CORRELATION FOR SUPERPAVE HMA

Traffic Level	Million ESALs	Aircraft Gross Weight, (#)
A	<0.3	<12,500
B	0.3 to <3.0	12,500 to <60,000

b. Materials.

(1) General Requirements. Meet the material requirements in the appropriate sections of the SSHP and SSSM, except as modified herein, for the following:

(a) coarse aggregate

(b) fine aggregate

(c) mineral filler

(d) Performance-Graded (PG) asphalt binder.

(2) Asphalt Binder. The PG asphalt binder must conform to the requirements of AASHTO M-320 and any additional SSHP specifications, or referenced sections of the SSSM requirements. The PG grade specified should be the standard grade normally required by the State DOT for the project's geographic location and traffic level. A PG asphalt binder grade bump is required for Traffic Level B, Table A3-1; i.e., one PC binder grade adjustment of +6 degrees centigrade on the high temperature grade. The low temperature grade should remain the same.

c. Composition.

(1) Mix Composition and Lab Compaction Level. The HMA plant mix must be composed of a mixture of well-graded aggregate, filler, asphalt binder, and anti-strip agent **(**if required). The several aggregate fractions must 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) as specified in the SSHP specifications, except as modified herein. For Marshall Method mix design, a 50- Blow mixture must be used for Traffic Level A and B. For Superpave Method mix design, Ndes = 50 gyrations is to be used for Traffic Level A and Ndes = 65 gyrations is to be used for Traffic Level B.

(2) Job Mix Formula (JMF). No HMA mixture for payment will be produced until a JMF has been approved in writing by the engineer. The HMA mixture must be designed using Superpave Method, or Marshall Method, of mix design in accordance with SSHP specifications requirements. The JMF must be submitted to the engineer at least 15 days prior to the start of paving operations. The JMF must have been developed no more than three months prior to submittal and must include as a minimum:

(a) percent passing each sieve size for total combined gradation, individual gradation of all aggregate stockpiles and percent by weight of each stockpile used in the job mix formula

(b) percent of asphalt binder

(c) PG asphalt binder used, and type of modifier, if used

(d) mixing temperature

(e) compaction temperature

(f) temperature of mix when discharged from the mixer

(g) temperature-viscosity relationship of the asphalt binder

(h) plot of the combined gradation on the Federal Highway Administration (FHWA) 45 power gradation curve

(i) graphical plots of air voids, voids in the mineral aggregate, and unit weight versus asphalt binder content

(j) percent natural sand, if used

(k) percent fractured faces

(l) antistrip agent (if required)

(m) date the job mix formula was developed

(3) JMF Test Submittal. The contractor must submit to the engineer the results of verification testing of three (3) HMA samples prepared at the optimum asphalt content. The average of the results of this testing must indicate conformance with the JMF requirements, except as modified herein, for criteria listed as follows:

(a) Marshall Method - Traffic Level A and B: Mix Design @ 50-Blow Marshall – Stability [pounds], Flow [0.01 in], Air Voids [percent], and Voids in Mineral Aggregate [percent], Tensile Strength Ratio [percent].

(b) Superpave Method - Ndes Gyrations, Nini Gyrations, Nmax Gyrations, Air Voids @Ndes [percent], Voids Filled with Asphalt @ Ndes [percent], Dust Proportion [percent], Fine Aggregate Angularity, %Gmm@Nini, %Gmm@Nmax, Tensile Strength Ratio [percent].

(4) JMF Aggregate Gradation.

(a) Marshall Method - The aggregate gradation must be in reasonable agreement with the gradations specified from table 2. The gradations are defined by maximum aggregate size (MAS), which is the sieve size that is one size larger than the first sieve to retain material. Table A3-2 gradation bands are from the FAA P-401 and P-403 specifications and provide a 1½-inch, 1.0-inch, ¾-inch, and ½-inch MAS. The 1½-inch MAS (from P-403) is normally reserved for base course layers while the ½-inch MAS (from P-403) is primary used as a leveling material for very thin lifts. The ¾-inch MAS and the 1-inch MAS (from P-401 and P-403) are the dominant aggregate gradations used for base and surface course mixes.

TABLE A3-2. AGGREGATE GRADATION, AFTER FAA ITEM P 401 & P 403

Sieve Size	All Pavements			
	Percent by Weight Passing Sieves			
	1.5 in. MAS	**1.0 in. MAS**	**3/4 in. MAS**	**1/2 in. MAS**
	1.5 in.(37.5 mm)	100	100	100
	1.0 in.(25.0 mm)	86 to 98	100	100
¾ in.(19.0 mm)	68 to 93	76 to 98	100	100
½ in.(12.5 mm)	57 to 81	66 to 86	79 to 99	100
⅜ in.(9.5 mm)	49 to 69	57 to 77	68 to 88	79 to 99
No. 4(4.75 mm)	34 to 54	40 to 60	48 to 68	58 to 78
No. 8(2.36 mm)	22 to 42	26 to 46	33 to 53	39 to 59
No. 16(1.18 mm)	13 to 33	17 to 37	20 to 40	26 to 46
No. 30(0.600 mm)	8 to 24	8 to 24	14 to 30	19 to 35
No. 50(0.300 mm)	6 to 18	4 to 12	9 to 21	12 to 24
No. 100(0.150 mm)	4 to 12	6 to 16	6 to 16	7 to 17
No. 200(0.075 mm)	3 to 6	3 to 6	3 to 6	3 to 6

(b) Superpave Method - The aggregate gradations must be in reasonable agreement with the gradations specified from Table A3-2 or Table A3-3. The gradations are defined by nominal maximum aggregate size (NMAS), which is one sieve size larger than the first sieve to retain more than 10 percent. Generally, the NMAS is one sieve size smaller that the MAS. Table A3-3 aggregate gradations are representative of the NMAS Superpave mixtures with gradations requirements based on control points established by AASHTO M 323.

TABLE A3-3. AGGREGATE GRADUATION CONTROL POINTS, AFTER AASHTO M 323

Sieve Size	All Pavements Percent by Weight Passing Sieves				
	1 1/2 in NMAS (37.5 mm) Control Points	**1.0 in. NMAS (25.0 mm) Control Points**	**3/4 in NMAS (19 mm) Control Points**	**1/2 in NMAS (12.5 mm) Control Points**	**3/8 in NMAS (9.5 mm) Control Points**
1.5 in (50.0 mm)	100 to 100				
1.25 in (37.5 mm)	90 to 100	100 to 100			
1.0 in.(25.0 mm)		90 to 100	100 to 100		
¾ in.(19.0 mm)	90 to 100		90 to 100	100 to 100	
½ in.(12.5 mm)				90 to 100	100 to 100
⅜ in.(9.5 mm)					90 to 100
No. 4(4.75 mm)					
No. 8(2.36 mm)	15 to 41	19 to 45	23 to 49	28 to 58	32 to 67
No. 16(1.18 mm)					
No. 30(0.600 mm)					
No. 50(0.300 mm)					
No. 100(0.150 mm)					
No. 200 (0.075 mm)	0 to 6	1 to 7	2 to 8	2 to 10	2 to 10

(i) The combined aggregate gradation is classified as coarse-graded when it passes below the Primary Control Sieve (PCS) control point as defined in Table A3-4. All other gradations are classified as fine-graded.

TABLE A3-4. GRADATION CLASSIFACTION AFTER AASHTO M

PCS Control Point for Mixture Nominal Maximum Aggregate Size (% Passing)					
Nominal Maximum Aggregate Size	37.5 mm	25.0mm	19.0 mm	12.5 mm	9.5 mm
Primary Control Sieve	9.5 mm	4.75 mm	4.75 mm	2.36 mm	2.36 mm
PCS Control Point (%Passing)	47	40	47	39	47

(ii) At the discretion of the design engineer, the 37.5 mm, 25.0 mm, and 19.0 mm NMAS gradations may be used for base and/or intermediate course layers, the 9.5 mm and 12.5 mm NMAS gradations may be used for leveling course layers, and the 12.5 mm and 19.0 mm NMAS gradations are normally specified for surface course layers. All surface course layers must be specified as the fine-graded aggregate classification.

(5) Reclaimed Asphalt Pavement (RAP) Material. RAP material may be used in the JMF in accordance with the following provisions:

(a) The RAP must not contain any material that has been treated with a coal-tar sealer rejuvenator or material that contains coal-tar.

(b) The maximum percent of RAP allowed in the Job Mix Formula is 15% which may be increase up to 30% if the asphalt binder grade is lowered by one grade to account for hardening with the addition of the RAP according to Table A3-5 [After AAPTP 05-06, Final Report, Use of Reclaimed Asphalt Pavements (RAP) in HMA Mixes of Asphalt Pavements, July, 2008].

TABLE A3-5. RECOMMENDATION ON THE USE OF RAP [AFTER AAPTP 05 06, JULY 2008]

Type of Mix	Recommended Virgin Binder Grade	RAP Percentage		
		Recovered RAP Grade		
		PGXX-22 Or Lower	PGXX-16	PGXX-10 Or Higher
Surface and Base Mix	No Change in Binder Selection	<20%	<15%	--
Base Mix	Select virgin binder in grade softer than normal (i.e. select a PG58-28 if a PG64-22 would normally be used)	15%-30%	15%-30%	--
Surface and Base Mix	Follow recommendations from blending charts	--	--	<10%

d. Construction.

(1) Plant and Equipment. Comply with requirements contained in SSHP specifications, or as specified in other sections referenced in the SSSM, for plants and methods of operation for preparing all plant-mixed HMA mixtures, and the requirements for the equipment to be used in the construction of the pavement layers, except as modified herein.

(2) General Construction Requirements. Construction of plant-mixed HMA pavement layers must be in accordance with SSHP specifications, or as specified in other sections referenced in the SSSM, except as modified herein. The construction requirements are normally associated with, but not limited to, contractor quality control and acceptance testing; limitations placed on construction operations; preparation of asphalt binder, aggregates, and HMA composition; transportation of HMA; preparation of application surface, including placement of bituminous tack coat; placing the HMA mixture; compaction operations; and protection of the finished surface.

(3) Joint Construction. High quality joint construction is required for airport pavement. The formation of all joints must be made in such manner as to ensure a continuous bond between the courses and obtain the required density for acceptance. All joints must have the same texture as other sections of the course and meet the acceptance requirements for smoothness and grade. Most SSHP specifications do not contain acceptance criteria for joint density; however, for airport pavement, the joint construction quality warrants acceptance criteria and consideration when pay factor, sliding scale, pass/fail, and/or other acceptance/payment methodologies are used in SSHP specifications, or as referenced in other sections in the SSSM.

(4) Test Section [or Initial Production Lot]. Prior to full production, the contractor must prepare and place a quantity of HMA mixture according to the JMF. As a minimum, and since joint density is required for acceptance, the amount of mixture must be sufficient to construct a test section a minimum of 300 feet long and 30 feet wide**,** placed in two lanes, with a longitudinal cold joint, and must be of the same depth specified for the construction of the course which it represents. A cold joint is an exposed construction joint at least 4 hours old or whose mat has cooled to less than 160° F. The underlying grade or pavement structure upon which the test section is to be constructed must be the same as the remainder of the course represented by the test section. The equipment used in construction of the test section must be the same type and weight to be used on the remainder of the course represented by the test section. The test section must be evaluated for acceptance as a single lot in accordance with the acceptance criteria specified in the SSHP specifications, or as specified in other sections referenced in the SSSM, except as modified herein. The test section will be divided into equal sublots. As a minimum, the test section will consist of three sublots. The test section will be considered acceptable if it meets the acceptance criteria specified in the SSHP specification, or as specified in other sections referenced in the SSSM, or as modified herein.

(5) Skid Resistance Surfaces/Saw-Cut Grooves. If shown on the plans, skid resistant surfaces for HMA pavements will be provided by construction of saw-cut grooves. Grooves must meet the requirements of AC 150/5370-10, Item P-621, Saw-Cut Grooves.

e. Material Acceptance.

(1) Acceptance Sampling and Testing. Unless otherwise specified, all acceptance sampling and testing necessary to determine conformance with the requirements specified in this section will be performed by the engineer at no cost to the contractor except that coring as required in this section will be completed and paid for by the contractor. Testing organizations performing these tests must meet the requirements of ASTM D 3666. All equipment in contractor furnished laboratories must be calibrated by an independent testing organization prior to the start of operations at the contractor's expense.

(2) Plant Produced Material (PPM). The PPM will be tested by the engineer for air voids in accordance with requirements of SSHP specifications on lot basis. The lot will be consistent with that defined by the SSHP specifications and as a guideline may be considered as:

- One day's production not to exceed 2,000 tons, or
- A half day's production where a day's production is expected to consist of between 2,000 and 4,000 tons, or
- Similar subdivision for tonnages over 4,000 tons.

Each lot will consist of four equal sublots. Sufficient material for testing and/or preparation of test specimens for all testing will be sampled by the engineer for each sublot on a random basis, in accordance with the procedures contained in ASTM D 3665. The engineer will prepare laboratory compacted test specimens in accordance with procedures outlined in the SSHP specifications, or as specified in other sections referenced in the SSSM. Each set of laboratory compacted specimens will consist of two test portions prepared from the same sample increment. As an option, if required by the SSHP specifications, the material passing the #8 sieve and/or the #200 sieve will be determined by the engineer.

(3) Field Placed Material (FPM). Material placed in the field will be tested for mat and joint density by the engineer on a lot basis.

(a) Mat Density. The lot size must be the same as that determined for the PPM and will be divided into four equal sublots. Core(s) will be taken, as required by the SSHP specifications, from each sublot.

(b) Joint Density. The lot size will be the total length of longitudinal joints constructed by the same lot determined for the PPM and will be divided into four equal sublots. For each sublot, the same number of joint core(s) will be taken, as required by the SSHP specifications for the mat.

(4) Acceptance Criteria. Acceptance will be based on the following characteristics of the HMA mixture and completed pavement as well as the implementation of the contractor quality control plan and engineer acceptance test results:

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NOTE TO THE ENGINEER: *The engineer should exercise judgment to use similar acceptance criteria from SSHP specifications, or other sections referenced in the SSSM, for SSAP specifications. Specific acceptance criteria have been labeled as **Mandatory**; whereas, the remaining criteria must be considered as **Optional**, at the discretion of the engineer. The **Optional** criterion is predicated on the engineers' judgment that the SSHP specifications, or other sections referenced in the SSSM, have demonstrated reasonable confidence in their application for well-performing pavements.*

****

(a) Air Voids [Mandatory]. Evaluation for acceptance of each lot of PPM for air voids will be based on criteria provided by the SSHP specifications. As a guideline for airport pavement, the target PPM air voids is 3.5 ± 1.0 percent for Marshall Method mixtures and 4.0 ± 1.0 percent for the Superpave Method mixtures.

(b) Pass #8 Sieves [Optional]. If and as required by SSHP specifications, or other sections referenced in the SSSM.

(c) Pass #200 Sieves [Optional]. Optional, if and as required by SSHP specifications, or other sections referenced in the SSSM.

(d) Mat Density [Mandatory]. Evaluation for acceptance of each FPM lot for mat density will be based on criteria provided by the SSHP specifications. As a guideline for airport pavement, the average in-place mat density is expressed as a percentage of the average theoretical maximum density (TMD) for the lot. The average TMD for each lot will be determined as the average TMD of the sublots. The average in-place mat density for a lot must be 94.5% ± 1.0% TMD with the allowable tolerance from 92.0% to 97.0% of TMD for individual tests.

(e) Joint Density [Mandatory]. Evaluation for acceptance of each FPM lot for joint density will be based on the average in-place joint density expressed as a percentage of the average TMD for the lot. As a guideline for airport pavement, the average TMD for each lot will be determined as the average TMD of the sublots. The average in-place joint density for a lot must be 93.0% ± 2.0% TMD with the allowable tolerance of 91.0% to 97.0% of TMD for individual tests.

(f) Thickness [Optional]. Thickness will be evaluated for compliance by the engineer to the requirements shown on the plans. Measurements of thickness will be made by the engineer using cores extracted for each sublot for density measurement, or as required by SSHP specifications, or as specified in other sections referenced in the SSSM.

(g) Smoothness [Mandatory]. The final surface must be free from roller marks. The finished surfaces of each course of the pavement, except the finished surface of the final course, must not vary more than ⅜ inch when evaluated with a 16 foot straightedge. The finished surface of the final course of pavement must not vary more than ¼ inch when evaluated with a 16 foot straightedge. The lot size will be 2,000 square yards. Smoothness measurements will be made at 50 foot intervals and as determined by the engineer. In the longitudinal direction, a smoothness reading will be made at the center of each paving lane. In the transverse direction, smoothness readings will be made continuously across the full width of the pavement. However, transverse smoothness readings must not be made across designed grade changes. At warped transition areas, straightedge position will be adjusted to measure surface smoothness and not design grade transitions. When more than 15 percent of all measurements within a lot exceed the specified tolerance, the contractor must remove the deficient area to the depth of the final course of pavement and replace with new material. Skin patching will not be permitted. Isolated high points may be ground off providing the course thickness complies with the thickness specified on the plans. High point grinding will be limited to 15 square yards. Areas in excess of 15 square yards will require removal and replacement of the pavement in accordance with the limitations noted above.

(h) Grade [Mandatory]. The finished surface of the pavement must not vary from the grade line elevations and cross sections shown on the plans by more than ½ inch (12.70 mm). The finished grade of each lot will be determined by running levels at intervals of 50 feet (15.2 m) or less longitudinally and all breaks in grade transversely (not to exceed 50 feet) to determine the elevation of the completed pavement. The contractor will pay the cost of surveying of the level runs that must be performed by a licensed surveyor. The documentation, stamped and signed by a licensed surveyor, must be provided by the contractor to the engineer. The lot size will be 2,000 square yards (square meters). When more than 15 percent of all the measurements within a lot are outside the specified tolerance, or if any one shot within the lot deviates ¾ inch or more from planned grade, the contractor must remove the deficient area to the depth of the final course of pavement and replace with new material. Skin patching will not be permitted. Isolated high points may be ground off providing the course thickness complies with the thickness specified on the plans. The surface of the ground pavement must have a texture consisting of grooves between 0.090 and 0.130 inches wide. The peaks and ridges must be approximately $^{1}/_{32}$ inch higher than the bottom of the grooves. The pavement must be left in a clean condition. The removal of all of the slurry resulting from the grinding operation must be continuous. The grinding operation must be controlled so the residue from the operation does not flow across other lanes of pavement. High point grinding will be limited to 15 square yards. Areas in excess of 15 square yards will require removal and replacement of the pavement in accordance with the limitations noted above.

f. Contractor Quality Control.

(1) General.

(a) Applicable Standard. The contractor will develop a Quality Control Program in accordance with:

(i) AC 150/5370-10, Section 100 - Contractor Quality Control Program, of the General Provisions, or

(ii) the Section specifying Contractor Quality Control in the SSHP specification requirements, or as specified in other sections referenced in the SSSM, except as modified herein.

(b) Elements. The program must address all elements which affect the quality of the pavement including, but not limited to:

(i) mix design

(ii) aggregate grading

(iii) quality of materials

(iv) stockpile management

(v) proportioning

(vi) mixing and transportation

(vii) placing and finishing

(viii) joints

(ix) compaction

(x) surface smoothness

(2) Laboratory Testing.

(a) The contractor must provide a fully equipped asphalt laboratory located at the plant or job site. It must be available for joint use by the contractor for quality control testing and by the engineer for acceptance testing and must have adequate equipment for the performance of the tests required by these specifications. The engineer must have priority in use of the equipment necessary for acceptance testing.

(b) The effective working area of the laboratory must be a minimum of 150 square feet with a ceiling height of not less than 7.5 feet. Lighting must be adequate to illuminate all working areas. It must be equipped with heating and air conditioning units to maintain a temperature of 70 degrees F + 5 degrees.

(c) Laboratory facilities must be kept clean and all equipment must be maintained in proper working condition. The engineer must be permitted unrestricted access to inspect the contractor's laboratory facility and witness quality control activities. The engineer will advise the contractor in writing of any noted deficiencies concerning the laboratory facility, equipment, supplies, or testing personnel and procedures. When the deficiencies are serious enough to be adversely affecting test results, the incorporation of the materials into the work will be suspended immediately and will not be permitted to resume until the deficiencies are satisfactorily corrected.

(3) Quality Control Testing. The contractor must perform all quality control tests necessary to control the production and construction processes applicable to these specifications and as set forth in the Quality Control Program. The testing program must include, but not necessarily be limited to, tests for the control of asphalt content, aggregate gradation, temperatures, aggregate moisture, field compaction, and surface smoothness. A Quality Control Testing Plan must be developed as part of the Quality Control Program.

(a) Asphalt Content. A minimum of two extraction tests must be performed per lot in accordance with ASTM D 2172 for determination of asphalt content. The weight of ash portion of the extraction test, as described in ASTM D 2172, will be determined as part of the first extraction test performed at the beginning of plant production, and as part of every tenth extraction test performed thereafter, for the duration of plant production. The last weight of ash value obtained will be used in the calculation of the asphalt content for the mixture.

(b) Gradation. Aggregate gradations will be determined a minimum of twice per lot from mechanical analysis of extracted aggregate in accordance with AASHTO T 30 and ASTM C 136 (dry sieve). When asphalt content is determined by the nuclear method, aggregate gradation will be determined from hot bin samples on batch plants, or from the cold feed on drum mix or continuous mix plants, and tested in accordance with ASTM C 136 (dry sieve) using actual batch weights to determine the combined aggregate gradation of the mixture.

(c) Moisture Content of Aggregate. The moisture content of aggregate used for production will be determined a minimum of once per lot in accordance with ASTM C 566.

(d) Moisture Content of Mixture. The moisture content of the mixture will be determined once per lot in accordance with ASTM D 1461.

(e) Temperatures. Temperatures will be checked, at least four times per lot, at necessary locations to determine the temperatures of the dryer, the bitumen in the storage tank, the mixture at the plant, and the mixture at the job site.

(f) In-Place Density Monitoring. The contractor will conduct any necessary testing to ensure that the specified density is being achieved. A nuclear gauge may be used to monitor the pavement density in accordance with ASTM D 2950.

(g) Additional Testing. Any additional testing that the contractor deems necessary to control the process may be performed at the contractor's option

(h) Monitoring. The engineer reserves the right to monitor any or all of the above testing.

(i) Aggregate Quality. The contractor will perform specific gravity and absorption tests on all aggregates used. These tests will be run at least once per week. If the specific gravity parameters vary more than plus or minus 10 percent of the values obtained in the mix design, the contractor will be required to submit a new job mix formula.

(4) Sampling. When directed by the engineer, the contractor will sample and test any material which appears inconsistent with similar material being sampled, unless such material is voluntarily removed and replaced or deficiencies corrected by the contractor. All sampling must be in accordance with standard procedures specified.

(5) Control Charts. Subject to the direction of the engineer the contractor will maintain linear control charts both for individual measurements and range (i.e., difference between highest and lowest measurements) for aggregate gradation and asphalt content. Control charts will be posted in a location satisfactory to the engineer and must be kept current. As a minimum, the control charts must identify the project number, the contract item number, the test number, each test parameter, the Action and Suspension Limits applicable to each test parameter, and the contractor’s test results. The contractor will use the control charts as part of a process control system for identifying potential problems and assignable causes before they occur. If the contractor’s projected data during production indicates a problem and the contractor is not taking satisfactory corrective action, the engineer may suspend production or acceptance of the material.

g. Measurement. The HMA placed will be measured by the number of tons mixture used in the accepted work, or other unit(s) of measurement specified by the SSHP specifications, or as specified in other sections referenced in the SSSM.

h. Payment.

(1) Payment. Payment for an accepted lot of HMA pavement will be made at the contract unit price per ton, or in accordance with requirements contained in SSHP specifications, or as specified in other sections referenced in the SSSM.

(2) Basis for Adjusted Pay Factor. The pay factor for each individual lot will be calculated in accordance with the procedures outlined in the SSHP specifications, or as specified in other sections referenced in the SSSM.

(3) Total Project Payment. The total project payment for HMA pavement will not exceed 100 percent of the product of the contract unit price and the total number of tons of HMA mixture used in the accepted work. Payment in excess of 100 percent for accepted lots of HMA pavement will be used to offset payment for accepted lots of HMA pavement that achieve a lot pay factor less than 100 percent. The calculation of excess and offset will be applied as equivalent amounts. In the event a lot is identified for removal and replacement in accordance with criteria specified in the SSHP specifications, or as specified in other sections referenced in the SSSM, the engineer may decide to allow the rejected lot to remain. In that case, if the engineer and the contractor agree in writing that the lot will not be removed, it will be paid for at 50 percent of the contract unit price and the total project payment limitation will be reduced by the amount withheld for the rejected lot.

7. REFERENCES.

a. U.S. Department of Transportation. Federal Aviation Administration. AC 150/5370-10, Standards for Specifying Construction of Airports, Item P-401, Plant Mix Bituminous Pavement, current edition.

b. U.S Department of Transportation. Federal Aviation Administration. Engineering Brief No. 59A, Item P-401 (Superpave), Plant Mix Bituminous Pavement, May 12, 2006.

c. U.S Department of Transportation. Federal Aviation Administration. Advisory Circular 150/5370-10, Standards for Specifying Construction of Airports, Item P-403, Plant Mix Bituminous Pavement (Base, Leveling or Surface Course).

d. Association of State Highway and Transportation Officials M 323, Standard Specification for Superpave Volumetric Mix Design, 2007.

e. Asphalt Institute, Manual Series No. 2, Mix Design Methods, 1997, 6th Edition.

f. Airfield Asphalt Pavement Technology Program, Final Report Project 05-06, Use of Reclaimed Asphalt Pavements (RAP) in Airfields HMA Pavements, July 2008.