
USACE / NAVFAC / AFCEC / NASA UFGS-32 10 00 (August 2008)
Change 1 - 11/13

Preparing Activity: NAVFAC Superseding
UFGS-32 10 00 (July 2006)

UNIFIED FACILITIES GUIDE SPECIFICATIONS

References are in agreement with UMRL dated October 2013

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SECTION 32 10 00

[PERVIOUS] BITUMINOUS CONCRETE PAVEMENT

08/08

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SECTION 32 10 00

[PERVIOUS] BITUMINOUS CONCRETE PAVEMENT
08/08

NOTE: This guide specification covers the requirements for pervious and impervious asphaltic concrete paving for vehicular traffic.

Adhere to UFC 1-300-02 Unified Facilities Guide Specifications (UFGS) Format Standard when editing this guide specification or preparing new project specification sections. Edit this guide specification for project specific requirements by adding, deleting, or revising text. For bracketed items, choose applicable items(s) or insert appropriate information.

Remove information and requirements not required in respective project, whether or not brackets are present.

Comments, suggestions and recommended changes for this guide specification are welcome and should be submitted as a Criteria Change Request (CCR).

NOTE: Do not be used for airfield paving.

NOTE: The designer shall verify that the application of the state specification is indeed appropriate for the facility being designed or constructed. The following information shall be shown on the project drawings:

1. Plan with dimensions of the various types of paving.

2. Typical cross sections indicating dimensions of components of various types of paving, shoulders, and ditches, if any.

3. Joints between new and existing paving and between different types of paving.

4. A longitudinal profile of paving. Transverse profile will be shown in typical cross section.

PART 1 GENERAL

1.1 REFERENCES

NOTE: This paragraph is used to list the publications cited in the text of the guide specification. The publications are referred to in the text by basic designation only and listed in this paragraph by organization, designation, date, and title.

Use the Reference Wizard's Check Reference feature when you add a RID outside of the Section's Reference Article to automatically place the reference in the Reference Article. Also use the Reference Wizard's Check Reference feature to update the issue dates.

References not used in the text will automatically be deleted from this section of the project specification when you choose to reconcile references in the publish print process.

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS
(AASHTO)

AASHTO T 230 (1968; R 2000) Determining Degree of Pavement Compaction of Bituminous Aggregate Mixtures

AASHTO T 30 (2013) Standard Method of Test for Mechanical Analysis of Extracted Aggregate

ASTM INTERNATIONAL (ASTM)

ASTM D2172/D2172M (2011) Quantitative Extraction of Bitumen from Bituminous Paving Mixtures

ASTM D2950/D2950M (2011) Density of Bituminous Concrete in Place by Nuclear Methods

ASTM D4552/D4552M (2010) Classifying Hot-Mix Recycling Agents

ASTM D4887/D4887M (2011) Preparation of Viscosity Blends for Hot Recycled Bituminous Materials

ASTM D5106	(2013) Steel Slag Aggregates for Bituminous Paving Mixtures
ASTM D5505	(2006) Classifying Emulsified Recycling Agents
ASTM D6155	(2013) Nontraditional Coarse Aggregate for Bituminous Paving Mixtures
ASTM D6270	(2008; R 2012) Use of Scrap Tires in Civil Engineering Applications
ASTM D6927	(2006) Standard Test Method for Marshall Stability and Flow of Bituminous Mixtures

U.S. FEDERAL HIGHWAY ADMINISTRATION (FHWA)

MUTCD	(2009) Manual on Uniform Traffic Control Devices
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U.S. GENERAL SERVICES ADMINISTRATION (GSA)

FS TT-P-1952	(Rev E) Paint, Traffic and Airfield Markings, Waterborne
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U.S. GREEN BUILDING COUNCIL (USGBC)

LEED NC	(2009) Leadership in Energy and Environmental Design(tm) New Construction Rating System
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1.2 RELATED SECTIONS

NOTE: Pervious pavement systems shall be installed in areas with gently sloping or flat ground, light traffic, limited heavy truck use, and where pavements will not receive snow and ice treatments (salt, sand, or chemical). Consult manufacturer's recommendations for cold regions, arid regions, and regions with high wind erosion. Parking lots are generally good pervious pavement applications. Installing pervious pavement systems contributes to the following LEED credit: SS6.

Pervious pavement systems shall use Section 32 11 16.16 [BASE COURSE FOR RIGID] [AND SUBBASE COURSE FOR FLEXIBLE] [SUBBASE COURSE FOR PERVIOUS] PAVING, Section 32 11 24 GRADED CRUSHED AGGREGATE BASE COURSE FOR [PERVIOUS] [FLEXIBLE] PAVEMENT, and Section 32 12 10 BITUMINOUS TACK AND PRIME COATS in addition to this section.

1.3 SUBMITTALS

NOTE: Review Submittal Description (SD) definitions in Section 01 33 00 SUBMITTAL PROCEDURES and edit the following list to reflect only the submittals required for the project.

The Guide Specification technical editors have designated those items that require Government approval, due to their complexity or criticality, with a "G". Generally, other submittal items can be reviewed by the Contractor's Quality Control System. Only add a "G" to an item, if the submittal is sufficiently important or complex in context of the project.

For submittals requiring Government approval on Army projects, a code of up to three characters within the submittal tags may be used following the "G" designation to indicate the approving authority. Codes for Army projects using the Resident Management System (RMS) are: "AE" for Architect-Engineer; "DO" for District Office (Engineering Division or other organization in the District Office); "AO" for Area Office; "RO" for Resident Office; and "PO" for Project Office. Codes following the "G" typically are not used for Navy projects.

Submittal items not designated with a "G" are considered as being for information only for Army projects and for Contractor Quality Control approval for Navy projects.

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are [for Contractor Quality Control approval.] [for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government.] The following shall be submitted in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Precast car stops; (LEED NC)
Aggregate; (LEED NC)
Asphalt cement; (LEED NC)

Submit documentation indicating percentage of post-industrial and post-consumer recycled content per unit of product. Indicate relative dollar value of recycled content products to total dollar value of products included in project.

[Local/Regional Materials; (LEED NC)

Submit documentation indicating distance between manufacturing facility and the project site. Indicate distance of raw material origin from the project site. Indicate relative dollar value of local/regional materials to total dollar value of products included in project.

] [Albedo; (LEED NC)

Provide information identifying the reflectance of the pavement.

] SD-04 Samples
[Field-Constructed Mockup
] Uncompacted mix
Pavement cores

SD-06 Test Reports

Trial batch reports
Mix design
Asphalt concrete
Density
Thickness
Straightedge test

Submit reports for testing specified under paragraph entitled
"Field Quality Control."

SD-07 Certificates

Asphalt mix delivery record
Asphalt concrete and material sources

Obtain approval of the Contracting Officer for materials and
material sources 2 days prior to the use of such material in the
work.

Asphalt concrete
Curbs
Guard (Guide) rails
Median barriers
Traffic signs

Submit certificates, signed by the producer, that paving
materials and incidental construction items conform to
specification requirements.

1.4 QUALITY ASSURANCE

NOTE: Insert abbreviation for the state highway
department document (SHS) appropriately throughout
this specification.

NOTE: Use words in brackets or fill in blanks with

correct terminology from the referenced state highway department document to identify specific portions of the referenced state highway department document.

1.4.1 Regulatory Requirements

Provide work and materials in accordance with applicable requirements of SHS [____]. [Divisions and Sections] [Sections and Paragraphs] [[____] and [____]] mentioned herein refer to those specifications. Paragraphs in SHS [____] entitled ["Quantity and Payment"] ["Method of Measurement" and "Basis of Payment"] ["____"] shall not apply.

1.4.2 Modification of References

Where term "Engineer" is used in SHS [____] it shall be construed to mean [Contracting Officer] [Contractor's Quality Control representative]. [Where term "state" is used, it shall mean "Federal Government"].

1.4.3 Mix Delivery Record Data

Record and submit the following information to each load of mix delivered to the job site. Submit within one day after delivery on Government-furnished forms:

- a. Truck No:
- b. Time In:
- c. Time Out:
- d. Tonnage and Discharge Temperature:
- e. Mix Type:
- f. Location:
- g. Stations Placed:

1.4.4 Trial Batch

Submit current bituminous design reports for all mix types proposed for use on the project.

1.4.5 Mix Design

Submit results of laboratory tests performed on each mix design. Testing shall have been accomplished not more than one year prior to date of material placement.

1.4.6 Field-Constructed Mockup

NOTE: Mockup and other permeability and pervious pavement requirements in this section are required only for pervious pavements. Pervious pavement (porous pavement, permeable pavement) is a porous surface with an underlying stone reservoir to

temporarily store surface runoff before it infiltrates into the subsoil. This porous surface replaces traditional pavement, allowing parking lot storm water to infiltrate directly and receive water quality treatment. Pervious asphalt and concrete appear to be the same as traditional pavement from the surface, but are manufactured without "fine" materials, and incorporate void spaces to allow infiltration.

[Install minimum 21 square meters 225 square feet to demonstrate typical joints, surface finish, texture, color, permeability, and standard of workmanship. When Contracting Officer determines that mockup does not meet requirements, demolish and remove it from the site and install another until the mockup is accepted. Keep accepted mockup undisturbed during construction as a standard for judging completed paving. Accepted mockup may be incorporated into final work when approved by Contracting Officer.

] 1.5 ENVIRONMENTAL REQUIREMENTS

Do not produce or place bituminous concrete when the weather is rainy or foggy, when the base course is frozen or has excess moisture, or when the ambient temperature is less than 4.4 degrees C 40 degrees F in the shade away from artificial heat.

1.6 SUSTAINABLE DESIGN REQUIREMENTS

1.6.1 Local/Regional Materials

NOTE: Using local materials can help minimize transportation impacts, including fossil fuel consumption, air pollution, and labor. Using materials harvested and manufactured within a 500 mile radius from the project site contributes to the following LEED credit: MR5. Coordinate with Section 01 33 29 LEED(tm) DOCUMENTATION. Use second option if Contractor is choosing local materials in accordance with Section 01 33 29 LEED(tm) DOCUMENTATION. Use second option for USACE projects. Army projects shall include option only if pursuing this LEED credit.

[Use materials or products extracted, harvested, or recovered, as well as manufactured, within a [800] [] kilometer [500] [] mileradius from the project site, if available from a minimum of three sources.][See Section 01 33 29 LEED(tm) DOCUMENTATION for cumulative total local material requirements. Paving materials may be locally available.

] PART 2 PRODUCTS

2.1 ASPHALT CONCRETE

NOTE: Insert abbreviation for the state highway department document referenced above.

Provide asphalt concrete in accordance with the applicable requirements of the SHS [____], except where specified otherwise. Recycled asphalt pavement material may be used as permitted by SHS [____].

2.1.1 Albedo

NOTE: The urban heat island effect forms as vegetation is replaced by low reflectivity materials such as dark colored paving. These surfaces absorb - rather than reflect - the sun's heat, causing surface temperatures and urban ambient temperatures to be 1 to 6 degrees C 2 to 10 degrees F hotter than surrounding rural areas. Using high-albedo materials contributes to the following LEED credit: SS7. Include submittal if pursuing this LEED credit, and coordinate with Section 01 33 29 LEED(tm) DOCUMENTATION.

Installed system shall have a minimum solar reflectance of 0.3.

[2.1.2 Permeability

Installed system shall have a minimum permeability rate of [60] [____] percent.

]2.2 SUBBASE

NOTE: Use words in brackets or fill in blanks with correct terminology and insert appropriate numbers from referenced state highway department document. Be certain that terminology used in these paragraphs is identical to that used on drawings for same item.

SHS [____], materials for construction of the subbase shall be in accordance with [Division [____], Section [____]] [Section [____], paragraph [____]] [[____], [____]].

2.3 BASE COURSE

NOTE: Use words in brackets or fill in blanks with correct terminology and insert appropriate numbers from referenced state highway department document. Be certain that terminology used in these paragraphs is identical to that used on drawings for same item.

SHS [____], materials for construction of the base course shall be in accordance with [Division [____], Section [____]] [Section [____], paragraph [____]] [[____], [____]], [Type [____]] [Class [____]].

2.4 SURFACE COURSE

NOTE: Use words in brackets or fill in blanks with correct terminology and insert appropriate numbers from referenced state highway department document. Be certain that terminology used in these paragraphs is identical to that used on drawings for same item.

SHS [____], materials for construction of the surface course shall be in accordance with [Division [____], Section [____]] [Section [____], paragraph [____]] [Type [____]] [Class [____]]. [Edge restraints for pervious systems shall be [concrete] [____].]

2.5 STRIPING

NOTE: Select the first option when the referenced state highway department document includes paint and striping. Select the second option when the referenced state highway department document does not include paint and striping.

NOTE: Use words in brackets or fill in blanks with correct terminology and insert appropriate numbers from referenced state highway department document. Be certain that terminology used in these paragraphs is identical to that used on drawings for same item.

SHS [____], materials for paint striping shall be in accordance with [Division [____], Section [____]] [Section [____], paragraph [____]], [[____], [____]].

[Paint shall conform to FS TT-P-1952, Types I, or II.

] 2.6 CURBS [AND GUTTERS]

NOTE: Select the first option when the referenced state highway department document includes materials for curbs and gutters, or when excess paving material shall be used for curbs. Select the second option when the referenced state highway department document does not include concrete materials for curbs and gutters and include Section 03 30 00 CAST-IN-PLACE CONCRETE in the project specification, as appropriate.

NOTE: Use words in brackets or fill in blanks with correct terminology and insert appropriate numbers from referenced state highway department document. Be certain that terminology used in these paragraphs is identical to that used on drawings for same item.

SHS [____], materials for construction of curbs [and gutters] shall be in

accordance with [Division [____], Section [____]] [Section [____], paragraph [____]] [[____], [____]].

[Concrete is specified in Section 03 30 00 CAST-IN-PLACE CONCRETE.

] 2.7 GUARD (GUIDE) RAILS

NOTE: Use words in brackets or fill in blanks with correct terminology and insert appropriate numbers from referenced state highway department document. Be certain that terminology used in these paragraphs is identical to that used on drawings for same item.

SHS [____], materials for construction of the guard (guide) rails shall be in accordance with [Division [____], Section [____]] [Section [____], paragraph [____]] [[____], [____]].

2.8 MEDIAN BARRIERS

NOTE: Use words in brackets or fill in blanks with correct terminology and insert appropriate numbers from referenced state highway department document. Be certain that terminology used in these paragraphs is identical to that used on drawings for same item.

SHS [____], materials for construction of the median barriers shall be in accordance with [Division [____], Section [____]] [Section [____], paragraph [____]] [[____], [____]].

2.9 TRAFFIC SIGNS

NOTE: Use words in brackets or fill in blanks with correct terminology and insert appropriate numbers from referenced state highway department document. Be certain that terminology used in these paragraphs is identical to that used on drawings for same item.

SHS [____], provide traffic signs in accordance with [Division [____], Section [____]] [Section [____], paragraph [____]] [[____], [____]].

2.10 PRECAST CAR STOPS

NOTE: Concrete, plastic, and rubber car stops are EPA designated products for recycled content. See Section 01 62 35 RECYCLED/RECOVERED/BIOBASED MATERIALS and include recycled content options unless designer determines that justification for non-use exists. Use of materials with recycled content, calculated on the basis of post-industrial and post-consumer percentage content, contributes to the following LEED credit: MR4. Coordinate all recycled content products with Section 01 33 29

LEED (tm) DOCUMENTATION.

Provide car stops to the profile and size indicated. [Manufacture with air entrained concrete having a minimum compressive strength of 25 MPa 3,000 psi at 28 days, with two No. 4 reinforcing rods located at mid-point of its cross section and with two galvanized sleeves for anchoring. Concrete shall contain a minimum of [[20][40][_____] percent fly ash][[25][70][_____] percent slag].] [Manufacture with 100 percent recycled content level of plastic or rubber in accordance with MUTCD].

2.11 COMPOSITION OF MIXTURE REQUIREMENTS

2.11.1 Mixture Properties

Gradation of mineral aggregate shall be as specified. Percentage of bituminous material provided in the bituminous mixtures shall be within the limits specified. Mixtures shall have the following physical properties:

<u>Test Property</u>	<u>Values</u>
Stability (50 Blows)	Not less than 454 kg
Flow (0.25 mm)	Not more than 20 nor less than 8
Percent Air Voids	Not less than 3 nor more than 8 for binder course; not less than 3 nor more than 5 for wearing course
Percent Voids in Mineral Aggregates	See Table I

<u>Test Property</u>	<u>Values</u>
Stability (50 Blows)	Not less than 1000 pounds
Flow (0.01 inch)	Not more than 20 nor less than 8
Percent Air Voids	Not less than 3 nor more than 8 for binder course; not less than 3 nor more than 5 for wearing course
Percent Voids in Mineral Aggregates	See Table I

TABLE I		
MINIMUM PERCENT VOIDS IN MINERAL AGGREGATE (VMA)		
<u>U.S.A. Standard Sieve Designation</u>	<u>Nominal Maximum Particle Size, mm</u>	<u>Minimum VMA Percent</u>
4.75 mm	4.75	18
9.5 mm	9.5	16
12.5 mm	12.5	15
19.0 mm	19.0	14
25.0 mm	25.0	13

TABLE I		
MINIMUM PERCENT VOIDS IN MINERAL AGGREGATE (VMA)		
<u>U.S.A. Standard Sieve Designation</u>	<u>Nominal Maximum Particle Size, Inch</u>	<u>Minimum VMA Percent</u>
No. 4	0.187	18
3/8 inch	0.375	16
1/2 inch	0.500	15
3/4 inch	0.750	14
1 inch	1.000	13

2.11.2 Aggregate

NOTE: Designer must verify that products meeting the indicated minimum recycled content are available, preferably from at least three sources, to ensure adequate competition. If not, write in suitable recycled content values that reflect availability and competition. Use second option if Contractor is choosing recycled content products in accordance with Section 01 33 29 LEED(tm) DOCUMENTATION.

2.11.2.1 Course Aggregate

[Coarse aggregate shall contain a minimum of [25][_____] percent recycled porcelain, concrete, stone, or other recycled material complying with ASTM D6155.] [See Section 01 33 29 LEED(tm) DOCUMENTATION for cumulative total recycled content requirements. Aggregate may contain post-consumer

or post-industrial recycled content.

]2.11.2.2 Tire

Comply with **ASTM D6270**, [Class I Fill] [Class II Fill]. [Tire shall be a minimum of [5] [10] [_____] percent post-consumer recycled material, or a minimum of [20] [40] [_____] percent post-industrial recycled material.] [See Section 01 33 29 LEED(tm) DOCUMENTATION for cumulative total recycled content requirements. Tire may contain post-consumer or post-industrial recycled content.]

2.11.2.3 Slag

Comply with **ASTM D5106**. [Slag shall comprise a minimum of [25] [50] [70] [_____] percent by weight of cementitious material.] [See Section 01 33 29 LEED(tm) DOCUMENTATION for cumulative total recycled content requirements. Slag may be used as post-consumer or post-industrial recycled content.]

2.11.3 Quantity of Bituminous Material

NOTE: If slag or any unusually porous aggregate is anticipated for possible use in the mix, the maximum asphalt cement percentages indicated may need to be increased. Check requirements of local materials and modify percentages as necessary.

[Asphalt cement shall contain a minimum of [5] [10] [_____] percent post-consumer recycled content, or a minimum of [20] [40] [_____] percent pre-consumer recycled content.] [See Section 01 33 29 LEED(tm) DOCUMENTATION for cumulative total recycled content requirements. Asphalt cement may contain post-consumer or post-industrial recycled content.] Recycling agents shall comply with **ASTM D5505**, Class ER [1] [2] [3]. Hot recycling agents shall comply with **ASTM D4552/D4552M**, Grade RA [1] [5] [25] [75] [250] [500]. Evaluate blends in accordance with **ASTM D4887/D4887M**. Mix asphalt cement with aggregates of corresponding mixes in the following proportions:

ASPHALT CEMENT PERCENT BY WEIGHT OF TOTAL MIX	
Binder Course	Wearing Course
4 to 8	5 to 9

PART 3 EXECUTION

3.1 PREPARATION

3.1.1 Excavation and Filling

Excavation and filling to establish elevation of subgrade is specified in Section 31 00 00 EARTHWORK.

3.2 CONSTRUCTION

NOTE: Insert abbreviation for the state highway department document referenced above.

Provide construction in accordance with the applicable requirements of the SHS [____], except where indicated or specified otherwise. [Install pervious paving system in accordance with manufacturer's recommendations and as indicated.]

3.2.1 Subgrade

NOTE: Use words in brackets or fill in blanks with correct terminology and insert appropriate numbers from referenced state highway department document. Be certain that terminology used in these paragraphs is identical to that used on drawings for same item.

SHS [____], preparation of subgrade shall be in accordance with [Division [____], Section [____]], [Section [____], paragraph [____]] [[____], [____]] [Section 31 00 00 EARTHWORK.] Verify compacted subgrade, granular base, or stabilized soil is acceptable and ready to support paving and imposed loads.

3.2.2 Subbase

NOTE: Use words in brackets or fill in blanks with correct terminology and insert appropriate numbers from referenced state highway department document. Be certain that terminology used in these paragraphs is identical to that used on drawings for same item.

SHS [____], methods of construction of the subbase shall be in accordance with [Division [____], Section [____]] [Section [____], paragraph [____]] [[____], [____]].

3.2.3 Base Course

NOTE: Use words in brackets or fill in blanks with correct terminology and insert appropriate numbers from referenced state highway department document. Be certain that terminology used in these paragraphs is identical to that used on drawings for same item.

SHS [____], methods of construction of the base course shall be in accordance with [Division [____], Section [____]] [Section [____], paragraph [____]] [[____], [____]].

[3.2.4 Edge Restraints

Install edge restraints of pervious systems per the drawings and manufacturer's recommendations.

3.2.5 Surface Course

NOTE: Use words in brackets or fill in blanks with correct terminology and insert appropriate numbers from referenced state highway department document. Be certain that terminology used in these paragraphs is identical to that used on drawings for same item.

SHS [____], methods of construction of the surface course shall be in accordance with [Division [____], Section [____]] [Section [____], paragraph [____]] [[____], [____]]. Placement will not be permitted unless the Contractor has a working asphalt thermometer on site. Install surface elevation of the pervious paving system 3 to 6 mm 1/8 to 1/4 inch above adjacent drainage inlets, concrete collars, or channels.

3.2.6 Striping

NOTE: Include the bracketed portion (first sentence) when the referenced state highway department document includes paint and striping.

NOTE: Use words in brackets or fill in blanks with correct terminology and insert appropriate numbers from referenced state highway department document. Be certain that terminology used in these paragraphs is identical to that used on drawings for same item.

SHS [____], provide paint striping in accordance with [Division [____], Section [____]] [Section [____], paragraph [____]] [[____], [____]]. Allow bituminous pavement to cure for at least 21 days before paint is applied. Pavement shall be thoroughly clean and entirely free of loose sand, stones, dust, oil, grease, water, and other substances that will be deleterious to the paint or will adversely affect the adhesion of the paint. Do not apply paint during high wind (over 24 km/h) (over 15 miles per hour) or high humidity (over 70 percent). Apply paint only when ambient temperature is 5 degrees C 40 degrees F or above and rising but not more than 35 degrees C 95 degrees F. Dimensions and arrangement of striping shall be as indicated. Apply paint to a wet film thickness of 0.38 mm 0.015 inch by means of conventional traffic line striping equipment. Traffic shall not be permitted to use the painted areas for a minimum of 30 minutes after painting of lines has been completed.

3.2.7 Curbs [and Gutters]

NOTE: Select the first option when the referenced state highway department document includes materials for curbs and gutters. Select the second option when the referenced state highway department document does not include concrete materials for curbs and gutters and include Section 03 30 00 CAST-IN-PLACE CONCRETE in the project specification, as appropriate.

NOTE: Use words in brackets or fill in blanks with correct terminology and insert appropriate numbers from referenced state highway department document. Be certain that terminology used in these paragraphs is identical to that used on drawings for same item.

SHS [____], methods of construction of curbs [and gutters] shall be in accordance with [Division [____], Section [____]] [Section [____], paragraph [____]] [[____], [____]].

[Provide curbs [and gutters] as indicated. Provide concrete construction as specified in Section 03 30 00 CAST-IN-PLACE CONCRETE.]

3.2.8 Guard (Guide) Rails

NOTE: Use words in brackets or fill in blanks with correct terminology and insert appropriate numbers from referenced state highway department document. Be certain that terminology used in these paragraphs is identical to that used on drawings for same item.

SHS [____], methods of construction of the guard (guide) rails shall be in accordance with [Division [____], Section [____]] [Section [____], paragraph [____]] [[____], [____]].

3.2.9 Median Barrier

NOTE: Use words in brackets or fill in blanks with correct terminology and insert appropriate numbers from referenced state highway department document. Be certain that terminology used in these paragraphs is identical to that used on drawings for same item.

SHS [____], methods of construction of the median barriers shall be in accordance with [Division [____], Section [____]] [Section [____], paragraph [____]] [[____], [____]].

3.2.10 Traffic Signs

NOTE: Use words in brackets or fill in blanks with correct terminology and insert appropriate numbers from referenced state highway department document. Be certain that terminology used in these paragraphs is identical to that used on drawings for same item.

SHS [____], install traffic signs in accordance with [Division [____], Section [____]] [Section [____], paragraph [____]] [[____], [____]].

3.2.11 Precast Car Stops

Provide car stops where indicated. Install with an anchor rod driven through each sleeve.

3.3 FIELD QUALITY CONTROL

Sample shall be taken by Contractor as specified herein. Contractor shall replace pavement where sample **cores** have been removed. Submit [2] [_____] pavement cores when using the in-place nuclear density method.

3.3.1 Sample and Core Identification

Place each sample and core in a container and securely seal to prevent loss of material. Tag each sample for identification. Tag shall contain the following information:

- a. Contract No.
- b. Sample No.
- c. Quantity
- d. Date of Sample
- e. Sample Description
- f. Source/Location/Stations Placed/depth below the finish grade
- g. Intended Use
- h. Thicknesses of various lifts placed

3.3.2 Testing

3.3.2.1 Bituminous Mix Testing

Take two samples per day per mix type at plant or from truck. Test **uncompacted mix** for extraction in accordance with **ASTM D2172/D2172M** and sieve analysis in accordance with **AASHTO T 30**. Test samples for stability and flow in accordance with **ASTM D6927**. When two consecutive tests fail to meet requirements of specifications, cease placement operations and test a new trial batch prior to resumption of placement operations. Submit [2] [_____] per day of each mix type. When two tests on uncompacted mix fail submit new trial batch for approval.

3.3.2.2 Testing of Pavement Course

- a. **Density**: Determine density of pavement by testing cores obtained from the binder and wearing course in accordance with **AASHTO T 230**. Take three cores at location designated by Contracting Officer for each **[18 metric tons] [200 tons] [_____]**, or fraction thereof, of asphalt placed. Deliver cores undisturbed and undamaged to laboratory and provide test results within [48] [_____] hours of each day placement of paving materials.
- b. **Thickness**: Determine thickness of the binder and wearing course from cores taken for density test.

- c. **Straightedge Test:** Test compacted surface of binder course and wearing course with a straightedge as work progresses. Apply straightedge parallel with and at right angles to center line after final rolling. Variations in the binder course surface shall not be more than 6 [13] [3] mm 1/4 [1/2] [1/8] inches from the lower edge of the 3.0 m 10 foot straightedge; variations in wearing course surface shall not be more than 6 [13] [3] mm 1/4 [1/2] [1/8] from the lower edge of the 3.0 m 10 foot straightedge. [Variations in final pervious surface shall not be more than [3/8] [] inch [10] [] mm under a 3.0 m 10 foot straightedge.] Pavement showing irregularities greater than that specified shall be corrected as directed by Contracting Officer.

3.3.2.3 Alternate Testing Method for Pavement Courses

At Contractor's option the following in-place testing method may be used to determine density and thickness in lieu of testing specified above. Frequency of testing shall be the same. When in-place nuclear method to determine density is used, take two pavement cores at locations designated by Contracting Officer and turn over to Government to verify pavement thickness.

- a. **Density:** Determine density of pavement by in-place testing using Nuclear Method in accordance with ASTM D2950/D2950M.
- b. **Thickness:** Determine thickness of finished pavement by use of following equation:

$$t = \frac{W(1000)}{d}$$

Where t= pavement thickness, in mm.

W= average weight per square weight by kg per square meter of mixture actually used in work.

d= compacted density as measured by nuclear density device, (psf) (kg/3

$$t = \frac{W}{0.75d}$$

Where t= pavement thickness, in inches.

W= average weight per square yard of mixture actually used in work.

d= compacted density as measured by nuclear density device.

3.4 WASTE MANAGEMENT

NOTE: Diverting waste from the landfill contributes to the following LEED credit: MR2. Coordinate with Section 01 33 29 LEED(tm) DOCUMENTATION.

Protect excess material from contamination and return to manufacturer, or reuse on-site for walkways, patching, ditch beds, speed bumps, or curbs.

-- End of Section --