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USACE / NAVFAC / AFCEA / NASA UFGS-32 11 16.13 (April 2006)  
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Preparing Activity: NAVFAC Replacing without change  
UFGS-02723 (August 2004)

## UNIFIED FACILITIES GUIDE SPECIFICATIONS

References are in agreement with UMRL dated January 2012

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04/06

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### SECTION 32 11 16.13

SAND-CLAY [BASE] [SUBBASE] COURSE  
04/06

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NOTE: This guide specification covers the requirements for subbase course in conjunction with all airfield paving.

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).

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NOTE: This guide specification is to be used regardless of quantity and with any vehicular paving which requires more than 8500 sq. m 10,000 sq. yds. of sand-clay base or subbase. Use Section 32 11 26.16 BITUMINOUS CONCRETE BASE COURSE for base course for lesser quantities of flexible pavement for vehicular paving. Use this guide specification for base course directly under bituminous pavements for secondary roads and vehicular parking areas where a material having a CBR of 50 is adequate. This guide specification is also appropriate for specifying subbase under flexible pavements where a CBR of 30 is required.

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NOTE: Project drawings shall indicate plan location of base course, profile or elevation of base course,

thickness of base course, and relation of base  
course to other paving courses.

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## PART 1 GENERAL

### 1.1 REFERENCES

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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.

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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.

#### ASTM INTERNATIONAL (ASTM)

ASTM C117	(2004) Standard Test Method for Materials Finer than 75-um (No. 200) Sieve in Mineral Aggregates by Washing
ASTM C136	(2006) Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates
ASTM D1556	(2007) Density and Unit Weight of Soil in Place by the Sand-Cone Method
ASTM D1557	(2009) Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft <sup>3</sup> ) (2700 kN-m/m <sup>3</sup> )
ASTM D1883	(2007e2) CBR (California Bearing Ratio) of Laboratory-Compacted Soils
ASTM D422	(1963; R 2007) Particle-Size Analysis of Soils
ASTM D4318	(2010) Liquid Limit, Plastic Limit, and Plasticity Index of Soils

## 1.2 SUBMITTALS

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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, Air Force, and NASA projects.

Choose the first bracketed item for Navy, Air Force and NASA projects, or choose the second bracketed item for Army projects.

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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-06 Test Reports

Materials sieve and particle size analysis

Liquid limit

Plasticity index

California Bearing Ratio test

Submit for materials to be provided in the work, before materials are delivered.

Sieve and particle size analysis

Smoothness test

Field density tests

Laboratory density tests

Thickness tests

## PART 2 PRODUCTS

### 2.1 SAND-CLAY

Sand-clay for [base] [subbase] shall consist of soils from selected sources approved by the Contracting Officer. Sand-clay may be either naturally or artificially proportioned and blended. Sand-clay that has been processed and is in place ready for compaction, shall be uniform and homogeneous throughout, free from deleterious materials, vegetation, roots, trash, and organic matter and shall have the following properties (percent by weight):

- a. 100 percent shall pass a 50 mm 2 inch sieve, and 80 to 100 percent shall pass a 3.75 mm 1 1/2 inch sieve.
- b. Material passing the 2.00 mm No. 10 sieve shall meet the following requirements:

Passing 2.00 mm No. 10 sieve 100 percent

Passing 250 micrometers No. 60 sieve 15-60 percent

Passing 75 micrometers No. 200 6-30 percent

Silt 0-10 percent

Clay 6-20 percent

Distribution of silt and clay particles shall be determined by  
ASTM D422.

- c. Material passing the 425 micrometers No. 40 sieve shall have a liquid limit of 25 or less and a plasticity index of 6 or less as determined by ASTM D4318.
- d. Natural, or artificially proportioned and blended material shall have a California Bearing Ratio of not less than [50] [30] at 95 percent of maximum laboratory density as determined by ASTM D1883 and ASTM D1557, respectively.

#### 2.1.1 Optional Materials

At the Contractor's option, materials such as screenings from stone, slag, or other mineral filler, may be provided if necessary to meet specified sand-clay property requirements, if the materials have been approved by the Contracting Officer.

## PART 3 EXECUTION

### 3.1 SURFACE PREPARATION

Clean underlying surface of foreign substances. Provide adequate grade and line stakes for accurate placement and completion of the [subbase] [base] course. Surface shall be of the specified line, grade, smoothness and

compaction immediately before placement of [subbase] [base] materials.

### 3.2 PLACEMENT AND PROCESSING

Place materials without damaging underlying material. Moisture content of the course shall be increased or decreased to facilitate mixing. During compaction, maintain moisture content uniform and as near optimum as is necessary to obtain the specified density. Before commencing compaction, ensure that materials are uniform and homogeneous throughout and meet specified requirements.

### 3.3 COMPACTING AND FINISHING

Compact each layer of [subbase] [base] course through full depth to at least 98 percent of the maximum laboratory density obtained in accordance with ASTM D1557, Method B or D. Determine in-place density in accordance with ASTM D1556. Surface shall be smooth, free from waves, and shall not deviate by more than 6 mm 1/4 inch when tested with a 3 m 10 foot straightedge. Correct nonconforming areas before applying the next course. Place earth, or other approved materials, along the exposed edges of each course to the same height and for a width of at least 300 mm one foot and compact with each course.

#### 3.3.1 Layer Thickness

When the specified compacted thickness of the course is greater than 200 mm 8 inches, construct the course in two or more layers. When the specified compacted thickness is 200 mm 8 inches or less, one course construction may be used if the Contractor can demonstrate that satisfactory mixture of materials, proper moisture content, and required density can be achieved. Otherwise, two or more layer construction shall be provided.

#### 3.3.2 Maintenance

Perform additional reworking, mixing, shaping, and compacting necessitated by damage from atmospheric conditions, traffic, or other causes. Ensure that the true grade and cross section are maintained, with no rutting or other distortion, and that the [base] [subbase] meets all requirements at the time the subsequent [base] [surface] course is applied. [Base] [Subbase] shall be properly drained at all times.

### 3.4 FIELD QUALITY CONTROL

Supply samples of coarse aggregate and binder material. Obtain approval for materials and select sources well in advance of the time when materials shall be required in the work.

#### 3.4.1 Sampling

Obtain samples in accordance with ASTM D75/D75M. Place each sample in a clean container and securely fasten to prevent material loss. Identify each sample with a tag containing the following information:

Contract No.:	[_____]	
Sample No.:	[_____]	Quantity: [_____]
Date of Sample:	[_____]	
Sampler:	[_____]	
Source:	[_____]	
Intended Use:	[_____]	

For Testing: [\_\_\_\_\_]

### 3.4.2 Testing

#### 3.4.2.1 Sieve Analysis

Make **sieve and particle size analysis** from each sample collected during the course of the project. Tests shall include an analysis of each grade of material and an analysis of the combined material representing the blend or mixture. Make sieve analysis in accordance with **ASTM C136**; determine amount of material passing the **75 micrometers No. 200** sieve in accordance with **ASTM C117**; and determine particle size distribution smaller than **75 micrometers No. 200** sieve in accordance with **ASTM D422**. During construction, take one random sample from each **[1000] [\_\_\_\_\_] metric tons [1000] [\_\_\_\_\_] tons** of completed course, but not less than one random sample per day's run. Take samples in accordance with **ASTM D75/D75M**.

#### 3.4.2.2 Smoothness Test

Perform smoothness test with a **3 m 10 foot** straightedge applied parallel with and at right angles to the center line of the finished surface. Correct surface deviations in excess of **6 mm 1/4 inch** by loosening, adding or removing material, reshaping, watering, and compacting. When **[base] [subbase]** course is constructed in more than one layer, smoothness requirements apply only to the top layer.

#### 3.4.2.3 Field Density Tests

**ASTM D1556**. Perform one field density test for each **420 [\_\_\_\_\_] square meters [500] [\_\_\_\_\_] square yards** of each layer of **[base] [subbase]** course.

#### 3.4.2.4 Laboratory Density Tests

**ASTM D1557**, Method B or D, for all material.

#### 3.4.2.5 Thickness Tests

Take at least one depth measurement for each **[420] [\_\_\_\_\_] square meters [500] [\_\_\_\_\_] square yards** of completed **[base] [subbase]** course. Make depth measurements by test holes, at least **75 mm 3 inches** in diameter, through the course. Where thickness deficiency exceeds **13 mm 1/2 inch**, correct by scarifying, adding mixture of proper gradation, reblading, and recompacting. Where measured thickness exceeds **13 mm 1/2 inch** thicker than shown, it shall be considered as the indicated or specified thickness plus **3 mm 1/2 inch** for determining the average. Average thickness shall be the average of the depth measurements and shall not underrun the thickness shown by more than **6 mm 1/4 inch**.

-- End of Section --