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USACE / NAVFAC / AFCEC / NASA **UFGS-32 11 20 (August 2017)**

Preparing Activity: USACE **Superseding**
UFGS-32 11 16 (August 2008)

UNIFIED FACILITIES GUIDE SPECIFICATIONS

References are in agreement with UMRL dated January 2021

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SECTION 32 11 20

[BASE COURSE FOR RIGID][AND][SUBBASES FOR FLEXIBLE] PAVING
08/17

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NOTE: This guide specification covers the requirements for subbase, select-material subbase and rigid base courses for airfield pavements, roads and streets.

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 item(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).

****

PART 1 GENERAL

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NOTE: This guide specification is applicable to subbase courses for airfield pavements, roads and streets including select-material subbase courses in the lower levels of the pavement structure. This specification will be used for any subbase course that has a design California bearing ratio (CBR) between 20 and 50 or any select-material with design CBR less than 20. Select material subbase will not require processing or blending.

This specification may also be used for:

a. The base course directly beneath the bituminous

surface of a pavement design for roads and streets where the required CBR value of the material is 50 or more and the material conforms to Gradation No. 1.

b. The base course beneath rigid pavements.

When this guide specification is used for aggregate base course under rigid pavement, section title of the project specification will be: BASE COURSE FOR RIGID PAVING and the words "rigid pavement base course" selected throughout. When this guide specification is used in combination for a subbase course under flexible pavements and a base course under rigid pavements, the section title will be: BASE COURSE FOR RIGID AND SUBBASES FOR FLEXIBLE PAVING and the words "or rigid pavement base course" will be included after "subbase" throughout.

****

1.1 UNIT PRICES

****

NOTE: Delete unit price paragraphs when the work is covered by a lump-sum contract price.

****

1.1.1 Measurement

****

NOTE: Delete the method of measurement paragraph not applicable to job conditions. The provision for stockpiling will be retained or deleted as applicable.

****

1.1.1.1 Area

Measure the quantity of [_____] mm inch thick [subbase] [and] [select-material subbase] [or] [rigid pavement base] course completed and accepted, as determined by the Contracting Officer, in square meters yards.

1.1.1.2 Volume

Measure the quantity of [subbase] [and] [select-material subbase] [or] [rigid pavement base] course completed and accepted, as determined by the Contracting Officer, in cubic meters yards. The volume of material in-place and accepted will be determined by the average job thickness obtained in accordance with paragraph LAYER THICKNESS and the dimensions shown on the drawings.

1.1.1.3 Weight

The tonnage of [subbase] [and] [select-material subbase] [or] [rigid pavement base] course material will be the number of metric tons tons of aggregate, [placed and accepted in the completed course] [plus the amount] [placed in authorized stockpiles] as determined by the Contracting Officer. Deductions will be made for any material wasted, unused, rejected, or used for convenience of the Contractor, and for water exceeding specified amount at time of weighing.

1.1.2 Payment

1.1.2.1 Course Material

Quantities of [subbase] [and] [select-material subbase] [or] [rigid pavement base] course, determined as specified above, will be paid for at the respective contract unit prices, which will constitute full compensation for the construction and completion of the [subbase] [and] [select-material subbase] [or] [rigid pavement base] course.

1.1.2.2 Stabilization

Cohesionless subgrade or select subbase courses to be stabilized, as specified in paragraph PREPARATION OF UNDERLYING COURSE OR SUBGRADE, will be paid for as a special item on a tonnage basis including extra manipulation as required.

1.1.3 Waybills and Delivery Tickets

Submit copies of waybills and delivery tickets during progress of the work. Before the final payment is allowed, file certified waybills and certified delivery tickets for all aggregates actually used.

1.2 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.

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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.

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS (AASHTO)

AASHTO T 88	(2013) Standard Method of Test for Particle Size Analysis of Soils
AASHTO T 180	(2017) Standard Method of Test for Moisture-Density Relations of Soils Using

	a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop
AASHTO T 224	(2010) Standard Method of Test for Correction for Coarse Particles in the Soil Compaction Test

ASTM INTERNATIONAL (ASTM)

ASTM C29/C29M	(2017a) Standard Test Method for Bulk Density ("Unit Weight") and Voids in Aggregate
ASTM C117	(2017) Standard Test Method for Materials Finer than 75-um (No. 200) Sieve in Mineral Aggregates by Washing
ASTM C131/C131M	(2020) Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
ASTM C136/C136M	(2019) Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates
ASTM D75/D75M	(2019) Standard Practice for Sampling Aggregates
ASTM D1556/D1556M	(2015; E 2016) Standard Test Method for Density and Unit Weight of Soil in Place by Sand-Cone Method
ASTM D1557	(2012; E 2015) Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3) (2700 kN-m/m3)
ASTM D2167	(2015) Density and Unit Weight of Soil in Place by the Rubber Balloon Method
ASTM D2487	(2017; E 2020) Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System)
ASTM D4318	(2017; E 2018) Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils
ASTM D6938	(2017a) Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)
ASTM E11	(2020) Standard Specification for Woven Wire Test Sieve Cloth and Test Sieves

1.3 DEGREE OF COMPACTION

Degree of compaction required, except as noted in the second sentence, is expressed as a percentage of the maximum laboratory dry density obtained by the test procedure presented in ASTM D1557 abbreviated as a percent of laboratory maximum dry density. Since ASTM D1557 applies only to soils that have 30 percent or less by weight of their particles retained on the 9.0 mm 3/4 inch sieve, the degree of compaction for material having more than 30 percent by weight of their particles retained on the 9.0 mm 3/4 inch sieve will be expressed as a percentage of the laboratory maximum dry density in accordance with AASHTO T 180 Method D and corrected with AASHTO T 224.

1.4 SUBMITTALS

****

NOTE: Review submittal description (SD) definitions in Section 01 33 00 SUBMITTAL PROCEDURES and edit the following list, and corresponding submittal items in the text, to reflect only the submittals required for the project. The Guide Specification technical editors have classified 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 Army projects, fill in the empty brackets following the "G" classification, with a code of up to three characters 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.

The "S" classification indicates submittals required as proof of compliance for sustainability Guiding Principles Validation or Third Party Certification and as described in Section 01 33 00 SUBMITTAL PROCEDURES.

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

****

Government approval is required for submittals with a "G" or "S" classification. Submittals not having a "G" or "S" classification are [for Contractor Quality Control approval.][for information only. When used, a code following the "G" classification identifies the office that will review the submittal for the Government.] Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Plant, Equipment, and Tools; G[, [_____]]

Waybills and Delivery Tickets

SD-06 Test Reports

Initial Tests; G[, [_____]]

In-Place Tests; G[, [_____]]

1.5 EQUIPMENT, TOOLS, AND MACHINES

****
NOTE: If desirable, requirements for types of equipment applicable to methods of construction based on local conditions will be included.
****

All plant, equipment, and tools used in the performance of the work will be subject to approval by the Contracting Officer before the work is started. Maintain all plant, equipment, and tools in satisfactory working condition at all times. Submit a list of proposed equipment, including descriptive data. Use equipment capable of minimizing segregation, producing the required compaction, meeting grade controls, thickness control, and smoothness requirements as set forth herein.

1.6 QUALITY ASSURANCE

Sampling and testing are the responsibility of the Contractor. Perform sampling and testing using a laboratory approved in accordance with Section 01 45 00.00 1001 45 00.00 2001 45 00.00 40 QUALITY CONTROL. Work requiring testing will not be permitted until the testing laboratory has been inspected and approved. Test the materials to establish compliance with the specified requirements and perform testing at the specified frequency. The Contracting Officer may specify the time and location of the tests. Furnish copies of test results to the Contracting Officer within 24 hours of completion of the tests.

1.6.1 Sampling

Take samples for laboratory testing in conformance with ASTM D75/D75M. When deemed necessary, the sampling will be observed by the Contracting Officer.

1.6.2 Tests

1.6.2.1 Sieve Analysis

****
NOTE: Testing in accordance with AASHTO T 88 will be required when the materials need to be tested for the 0.02 mm particle size.
****

Perform sieve analysis in conformance with ASTM C117 and ASTM C136/C136M using sieves conforming to ASTM E11. [Perform particle-size analysis of the soils in conformance with AASHTO T 88.]

1.6.2.2 Liquid Limit and Plasticity Index

Determine liquid limit and plasticity index in accordance with ASTM D4318.

1.6.2.3 Moisture-Density Determinations

Determine the laboratory maximum dry density and optimum moisture in accordance with paragraph DEGREE OF COMPACTION.

1.6.2.4 Field Density Tests

Measure field density in accordance with ASTM D1556/D1556M, ASTM D2167, or ASTM D6938. For the method presented in ASTM D1556/D1556M, use the base plate, as shown in the drawing. For the method presented in ASTM D6938, check the calibration curves and adjust them, if necessary, using only the sand cone method as described in paragraph Calibration, of the ASTM publication. Tests performed in accordance with ASTM D6938 result in a wet unit weight of soil and ASTM D6938 will be used to determine the moisture content of the soil. Also check the calibration curves furnished with the moisture gauges along with density calibration checks as described in ASTM D6938. Make the calibration checks of both the density and moisture gauges using the prepared containers of material method, as described in paragraph Calibration, in ASTM D6938, on each different type of material to be tested at the beginning of a job and at intervals as directed. Submit calibration curves and related test results prior to using the device or equipment being calibrated.

1.6.2.5 Wear Test

****

NOTE: Wear tests are not required for select-material subbase course materials.

****

Perform wear tests on [subbase course] [and] [or] [rigid pavement base course] material in conformance with ASTM C131/C131M.

1.6.2.6 Weight of Slag

****

NOTE: This paragraph will be omitted when it is highly unlikely that slag will be supplied.

****

Determine weight per cubic meter foot of slag in accordance with ASTM C29/C29M.

1.7 ENVIRONMENTAL REQUIREMENTS

****

NOTE: This paragraph may be deleted in localities where freezing temperatures do not occur, and

elsewhere when it is definitely known that the work will not be carried on during periods when such temperatures are to be expected. Otherwise, this requirement will be retained, but the protective measures specified may be modified to suit local conditions and individual project requirements.
****

Perform construction when the atmospheric temperature is above 2 degrees C 35 degrees F. When the temperature falls below 2 degrees C 35 degrees F, protect all completed areas by approved methods against detrimental effects of freezing. Correct completed areas damaged by freezing, rainfall, or other weather conditions to meet specified requirements.

PART 2 PRODUCTS

2.1 MATERIALS

2.1.1 Subbase Course

****
NOTE: As written, this paragraph applies to general conditions. Other materials such as disintegrated granite, volcanic ash or cinders, limerock, caliche, or asphalt millings will be specified when supported by adequate performance data. The requirement for percentage of wear will be deleted when local experience indicates the material is satisfactory. The material requirements from State or other local highway agency specifications may be incorporated in contract documents for constructing subbase course for roads, streets, or similar-use pavements if conditions a, b, c, and d below are met:

a. The percentage of material by weight passing the 0.075 mm (No. 200) sieve will not exceed 8.

b. When local conditions dictate a nonfrost-susceptible material, particles having a diameter of less than 0.02 mm will not be in excess of 3 percent.

c. The portion of the material passing the 0.425 mm (No. 40) sieve will have a liquid limit not greater than 25 and a plasticity index not greater than 5.

d. The project requires less than 600 cubic meters (750 cubic yards) of material and it is not an airfield pavement. (See item e below if project does not meet this requirement).

e. Approval from AFCEC, the Navy EFDs, or USACE TSMCX is required before state or other local highway specifications may be used for road or street projects requiring over 600 cubic meters (750 cubic yards) and/or airfield projects. Project specific information will be submitted to AFCEC, the Navy EFDs, or USACE TSMCX with the request for approval.

The desired maximum top size will be inserted in the blank. The necessity for meeting grades dictates that maximum top size should not exceed 75 mm (3 inches).

Gradation No.	Design CBR
1	50 Max
2	40 Max
3	30 Max
Select Material	20 Max

Gradation band No. 1 or 2 may be used for lower design CBR values than specified above where no increase in price results. Gradation No. 1 will be used when a drainage layer will be placed above the subbase and the subbase is designed as a separation layer. Exceptions to the gradation requirements will be permitted when supported by adequate in-place CBR data. When this specification is to be used as base course for roads, streets, and parking areas, the maximum top size will not exceed 50 mm (2 inches) for a layer thickness of less than 150 mm (6 inches). The inapplicable gradation will be deleted.

Where local conditions dictate a nonfrost-susceptible material, retain the sentence in brackets requiring particles having a diameter of less than 0.02 mm not to exceed 3 percent by weight of the total aggregate, as determined in accordance with AASTHO T 88.

****

Provide aggregates consisting of crushed stone or slag, gravel, shell, sand, or other sound, durable, approved materials processed and blended or naturally combined. Provide aggregates which are free from lumps and balls of clay, organic matter, objectionable coatings, and other foreign material. The percentage of loss of material retained on the 4.75 mm No. 4 sieve must not exceed 50 percent after 500 revolutions when tested in accordance with ASTM C131/C131M. Provide aggregate that is reasonably uniform in density and quality. Provide slag that is an air-cooled, blast-furnace product having a dry weight of not less than 1050 kg/cubic meter 65 pcf. Provide aggregates with a maximum size of [_____] mm inch and within the limits specified as follows:

Maximum Allowable Percentage by Weight
Passing Square-Mesh Sieve

Sieve Designation	No. 1	No. 2	No. 3
2 mm	50	80	100
0.075 mm	8	8	8

Maximum Allowable Percentage by Weight Passing Square-Mesh Sieve			
Sieve Designation	No. 1	No.2	No. 3
No. 10	50	80	100
No. 200	8	8	8

[Particles having diameters less than 0.02 mm must not be in excess of 3 percent by weight of the total sample tested as determined in accordance with AASHTO T 88.] The portion of any blended component and of the completed course passing the 0.425 mm No. 40 sieve must be either nonplastic or have a liquid limit not greater than 25 and a plasticity index not greater than 5.

2.1.2 Select-Material Subbase Course

****

NOTE: When used as material for embankment, the applicable specification will be used to determine the maximum size of particles. The requirement on the amount passing the 0.075 mm (No. 200) sieve may be increased for locally available materials but will not be relaxed to the point where materials with insufficient CBR under ASTM D4429 will pass.

Where local conditions dictate a nonfrost-susceptible material, retain the sentence in brackets requiring particles having a diameter of less than 0.02 mm not to exceed 3 percent by weight of the total aggregate, as determined in accordance withAASHTO T 88.

****

Provide materials consisting of selected soil or other materials from field excavation, stockpiles, or other sources and free from lumps and balls of clay and from organic and other objectionable matter. Provide materials with not more than 25 percent by weight passing the 0.075 mm No. 200 sieve. The portion of material passing the 0.425 mm No. 40 sieve must have a liquid limit less than 35 and a plasticity index less than 12. Provide materials having a maximum particle size not exceeding 75 mm 3 inches. [Particles having diameters less than 0.02 mm must not be in excess of 3 percent by weight of the total sample tested as determined in accordance with AASHTO T 88.]

2.1.3 Rigid Pavement Base Course

****

NOTE: For airfields, reduce the maximum allowable percentage passing the No. 200 sieve to 8 and increase the maximum plasticity index to 8.

****

Provide aggregates consisting of crushed stone or slag, gravel, shell, sand, or other sound, durable, approved materials processed and blended or naturally combined. Provide aggregates which are durable and sound, free

from lumps and balls of clay, organic matter, objectionable coatings, and other foreign material. The percentage of loss of material retained on the 4.75 mm No. 4 sieve must not exceed 50 percent after 500 revolutions when tested in accordance with ASTM C131/C131M. At least 50 percent by weight retained on each sieve must have one freshly fractured face with the area at least equal to 75 percent of the smallest midsectional area of the piece. Provide aggregate that is reasonably uniform in density and quality. Provide slag that is an air-cooled, blast-furnace product having a dry weight of not less than 1050 kg/cubic meter 65 pcf. Provide aggregates having a maximum size of 50 mm 2 inches and within the limits specified as follows:

Maximum Allowable Percentage by Weight
Passing Square-Mesh Sieve

Sieve Designation	Rigid Pavement Base Course
2 mm	85
0.075 mm	15

Maximum Allowable Percentage by Weight
Passing Square-Mesh Sieve

Sieve Designation	Rigid Pavement Base Course
No. 10	85
No. 200	15

[Particles having diameters less than 0.02 mm must not be in excess of 3 percent by weight of the total sample tested as determined in accordance with AASHTO T 88.] The portion of any blended component and of the completed course passing the 0.425 mm No. 40 sieve must be either nonplastic or have a liquid limit not greater than 25 and a plasticity index not greater than 6. The Contractor is responsible for any additional stability required to provide a working platform for construction equipment. If the Contractor can demonstrate with a test section that a material has adequate stability to support construction equipment, the fractured face requirement can be deleted, subject to the approval of the Contracting Officer.

2.2 TESTS, INSPECTIONS, AND VERIFICATIONS

2.2.1 Initial Tests

****
NOTE: The 0.02 mm sieve analysis requirements will be included when frost susceptiblity concerns exist.
****

Perform one of each of the following tests on the proposed material prior to commencing construction to demonstrate that the proposed material meets all specified requirements prior to installation. Complete this testing for each source if materials from more than one source are proposed.

a. Sieve Analysis [including 0.02 mm size material].

b. Liquid limit and plasticity index.

c. Moisture-density relationship.

d. [Wear.]

e. [Weight per cubic meter foot of Slag.]

f. [_____].

Submit certified copies of test results for approval not less than [30] [_____] days before material is required for the work.

2.2.2 Approval of Material

Tentative approval of material will be based on initial test results.

PART 3 EXECUTION

3.1 GENERAL REQUIREMENTS

Provide adequate drainage during the entire period of construction to prevent water from collecting or standing on the working area.

3.2 OPERATION OF AGGREGATE SOURCES

****

NOTE: Retain the first sentence in brackets for aggregate sources on private lands. Retain the second sentences in brackets for aggegate sources on Government-owned land.

****

[Condition aggregate sources on private lands in accordance with local laws and authorities.] [Clearing, stripping and excavating are the responsibility of the Contractor. Condition aggregate sources on Government property to readily drain and leave in a satisfactory condition upon completion of the work.]

3.3 STOCKPILING MATERIAL

Clear and level storage sites prior to stockpiling of material. Stockpile all materials, including approved material available from excavation and grading, in the manner and at the locations designated. Stockpile aggregates on the cleared and leveled areas designated by the Contracting Officer to prevent segregation. Stockpile materials obtained from different sources separately.

3.4 PREPARATION OF UNDERLYING COURSE OR SUBGRADE

Clean the underlying course or subgrade of all foreign substances prior to constructing the [subbase] [or] [select-material subbase] [or] [rigid pavement base] course. Do not construct [subbase] [or] [select-material subbase] [or] [rigid pavement base] course on underlying course or subgrade that is frozen. Construct the surface of the underlying course or subgrade to meet specified compaction and surface tolerances. Correct ruts or soft yielding spots in the underlying courses, areas having inadequate compaction, and deviations of the surface from the specified requirements set forth herein by loosening and removing soft or unsatisfactory material and adding approved material, reshaping to line

and grade, and recompacting to specified density requirements. For cohesionless underlying courses or subgrades containing sands or gravels, as defined in ASTM D2487, stabilize the surface prior to placement of the overlying course. Stabilize by mixing the overlying course material into the underlying course and compacting by approved methods. Consider the stabilized material as part of the underlying course and meet all requirements of the underlying course. Do not allow traffic or other operations to disturb the finished underlying course and maintain in a satisfactory condition until the overlying course is placed.

3.5 GRADE CONTROL

Provide a finished and completed [subbase] [select-material subbase] [and] [rigid pavement base] course[s] conforming to the lines, grades, and cross sections shown. Place line and grade stakes as necessary for control.

3.6 MIXING AND PLACING MATERIALS

****

NOTE: More details on applicable methodS of placing, mixing, and spreading will be included when appropriate.

****

Mix and place the materials to obtain uniformity of the material at the water content specified. Make such adjustments in mixing or placing procedures or in equipment as may be directed to obtain the true grades, to minimize segregation and degradation, to reduce or accelerate loss or increase of water, and to insure a satisfactory subbase course.

3.7 LAYER THICKNESS

****

NOTE: When subbase or rigid pavement base courses are constructed less than 150 mm (6 inches) in total thickness, a deficiency of 13 mm (1/2 inch) in the thickness of any area of such paving is considered excessive. Applicable to job conditions, the thickness tolerance provisions may be modified as required, restricting all deficiencies to not more than 6 mm (1/4 inch).

****

Compact the completed course to the thickness indicated. No individual layer may be thicker than 150 mm 6 inches nor be thinner than 75 mm 3 inches in compacted thickness. Compact the course(s) to a total thickness that is within 13 mm 1/2 inch of the thickness indicated. Where the measured thickness is more than 13 mm 1/2 inch deficient, correct such areas by scarifying, adding new material of proper gradation, reblading, and recompacting as directed. Where the measured thickness is more than 13 mm 1/2 inch thicker than indicated, the course will be considered as conforming to the specified thickness requirements. The average job thickness will be the average of all thickness measurements taken for the job and must be within 6 mm 1/4 inch of the thickness indicated. Measure the total thickness of the course(s) at intervals of one measurement for each [500] [_____] square meters yards of completed course. Measure total thickness using 75 mm 3 inch diameter test holes penetrating the completed course.

3.8 COMPACTION

****

NOTE: Appropriate percentage will be inserted in the first bracketed blank. Cohesionless materials are often free-draining; as such, the optimum water content is normally limited to the maximum water content the material will retain. This is usually evidenced by free water running from the mold during compaction testing.

****

Compact each layer of the material, as specified, with approved compaction equipment. Maintain water content during the compaction procedure to within plus or minus [2] [_____] percent of optimum water content determined from laboratory tests as specified in this Section. Begin rolling at the outside edge of the surface and proceed to the center, overlapping on successive trips at least one-half the width of the roller. Slightly vary the length of alternate trips of the roller. Adjust speed of the roller as needed so that displacement of the aggregate does not occur. Compact mixture with hand-operated power tampers in all places not accessible to the rollers. [Continue compaction of the [subbase] [or select-material subbase] until each layer is compacted through the full depth to at least 100 percent of laboratory maximum density.] [Continue compaction of the rigid base course until each layer is compacted through the full depth to at least 95 [_____] percent of laboratory maximum density.] Make such adjustments in compacting or finishing procedures as may be directed by the Contracting Officer to obtain true grades, to minimize segregation and degradation, to reduce or increase water content, and to ensure a satisfactory [subbase] [and] [select-material subbase] [rigid pavement base] course. Remove any materials that are found to be unsatisfactory and replace with satisfactory material or rework, as directed, to meet the requirements of this specification.

3.9 PROOF ROLLING

****

NOTE: Drawings should be checked to ensure that any supplementary information required by this paragraph has been shown and that there is no conflict between the drawings and the specifications.

Proof rolling is only required when a subbase course is used under a flexible airfield pavement with the following conditions:

Proof roll the top of the completed subbase course of Type A traffic areas (primary taxiways) and the center 23 m (75 feet) of runways with 30 coverages for Class IV as well as heavy, modified heavy, and medium load runways. Proof roll top of completed subbase course on center 30.5 meters (100 feet) of runways that support fighter aircraft only (no P-8 or heavier aircraft) with 8 coverages. Proof roll top of completed subbase course on center 12 meters (40 feet) of taxiways that are not Type A traffic.

Apply 4 coverages to all other paved areas, exclusive of runway overrun and blast protection areas.

The required proof roller is a rubber-tired roller ballasted to 13,600 kg (30,000 pounds) per tire with a tire inflation pressure of at least 862 kPa (125 psi). Typical commercial models have four wheels abreast and a gross load of 54,430 kg (60 tons).

****

In addition to the compaction specified, proof roll subbase course in areas designated on the drawings by application of [_____] coverages of a heavy pneumatic-tired roller having four or more tires abreast, each tire loaded to a minimum of 13,600 kg 30,000 pounds and inflated to a minimum of 862 kPa 125 psi. A coverage is defined as the application of one tire print over the designated area. In the areas designated, apply proof rolling to the top layer of the completed subbase course. Maintain water content of the top layer of the subbase course as specified in paragraph COMPACTION from start of compaction to completion of proof rolling. Remove any subbase course materials that produce unsatisfactory results by proof rolling and replace with satisfactory materials. Then recompact and proof roll to meet specifications.

3.10 EDGES OF [SUBBASE] [AND] [SELECT-MATERIAL SUBBASE] [RIGID PAVEMENT BASE COURSE]

Place approved material along the outer edges of the [subbase] [and] [select-material subbase] [rigid pavement base] course in sufficient quantity to compact to the thickness of the course being constructed. When the course is being constructed in two or more layers, simultaneously roll and compact at least a 600 mm 2 foot width of this shoulder material with the rolling and compacting of each layer of the [subbase] [and] [select-material subbase] [rigid pavement base] course, as directed.

3.11 FINISHING

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NOTE: Delete paragraph if rigid pavement base course is not included in the project.

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Finish the surface of the top layer of rigid pavement base course after [final compaction] [and] [proof rolling] by cutting any overbuild to grade and rolling with a steel-wheeled roller. Do not add thin layers of material to the top layer of rigid pavement base course to meet grade. If the elevation of the top layer of rigid pavement base course is 13 mm 1/2 inch or more below grade, scarify the top layer to a depth of at least 75 mm 3 inches and blend new material in and compact [and proof roll] to bring to grade. Make adjustments to rolling and finishing procedures as directed by the Contracting Officer to minimize segregation and degradation, obtain grades, maintain moisture content, and insure an acceptable rigid pavement base course. Should the surface become rough, corrugated, uneven in texture, or traffic marked prior to completion, scarify the unsatisfactory portion and rework and recompact it or replace as directed.

3.12 SMOOTHNESS TEST

Construct the top layer so that the surface shows no deviations in excess of 10 mm 3/8 inch when tested with a 3.66 m 12 foot straightedge. Take measurements in successive positions parallel to the centerline of the area to be paved. Also take measurements perpendicular to the centerline at [15] [_____] meter [50] [_____] foot intervals. Correct deviations exceeding this amount by removing material and replacing with new material, or by reworking existing material and compacting it to meet these specifications.

3.13 FIELD QUALITY CONTROL

3.13.1 In-Place Tests

Perform one of each of the following tests on samples taken from the placed and compacted [subbase] [and] [select-material subbase] [rigid pavement base] course. Take samples and test at the rates indicated.

a. Perform density tests on every lift of material placed and at a frequency of one set of tests for every 500 [_____] square meters yards, or portion thereof, of completed area.

b. Perform sieve analysis [including 0.02 mm size material] on every lift of material placed and at a frequency of one sieve analysis for every 1,000 [_____] square meters yards, or portion thereof, of material placed.

c. Perform liquid limit and plasticity index tests at the same frequency as the sieve analysis.

d. Measure the thickness of each course at intervals providing at least one measurement for each 500 [_____] square meters yards or part thereof. Measure the thickness using test holes, at least 75 mm 3 inches in diameter through the course.

3.13.2 Approval of Material

Final approval of the materials will be based on tests for gradation, liquid limit, and plasticity index performed on samples taken from the completed and fully compacted course(s).

3.14 TRAFFIC

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NOTE: Traffic will not be allowed on any base course placed for airfield pavements. For roads, traffic should only be allowed on the base courses when it cannot be diverted elsewhere; but precautions should be taken to limit the traffic and keep heavy equipment off. Any damage caused by traffic should be repaired to meet these specification requirements. Designer will choose the appropriate bracketed information.

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[Do not allow traffic on the completed [subbase] [and] [rigid pavement base] course.] [Completed portions of the rigid pavement base course may be opened to limited traffic, provided there is no marring or distorting

of the surface by the traffic. Do not allow heavy equipment on the completed rigid pavement base course except when necessary for construction. When it is necessary for heavy equipment to travel on the completed rigid pavement base course, protect the area against marring or damage to the completed work.]

3.15 MAINTENANCE

Maintain the completed course in a satisfactory condition until the full pavement section is completed and accepted. Immediately repair any defects and repeat repairs as often as necessary to keep the area intact. Retest any course that was not paved over prior to the onset of winter to verify that it still complies with the requirements of this specification. Rework or replace any area that is damaged as necessary to comply with this specification.

3.16 DISPOSAL OF UNSATISFACTORY MATERIALS

Dispose of any unsuitable materials that have been removed [outside the limits of Government-controlled land] [as directed] [in waste disposal areas indicated]. No additional payments will be made for materials that have to be replaced.

-- End of Section --