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USACE / NAVFAC / AFCEC **UFGS-32 01 18.71 (November 2023)**

Preparing Activity: USACE **Superseding**
UFGS-32 01 18.71 (May 2017)

UNIFIED FACILITIES GUIDE SPECIFICATIONS

References are in agreement with UMRL dated January 2025
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11/23

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Grooving Test Section/Inspection Diagram

Grooving Depth Measurement Spreadsheet

-- End of Section Table of Contents --

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SECTION 32 01 18.71

GROOVING OF AIRFIELD PAVING
11/23

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NOTE: This guide specification covers the requirements for providing grooves in airfield pavements to reduce the potential for hydroplaning of aircraft by providing a skid-resistance surface..

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).

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PART 1 GENERAL

1.1 FULL PAYMENTe

[1.1.1 Method of Measurement

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NOTE: For unit price bidding, ensure appropriate CLIN is included in bid schedule for grooving per square metersquare yard. Keep paragraph METHOD OF MEASUREMENT.

For lump sum bidding, delete paragraph METHOD OF MEASUREMENT but keep paragraph paragraph BASIS OF PAYMENT.

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The quantity of grooving to be paid for will be the number of square meters square yards of grooving performed in accordance with the contract documents and accepted by the Government in accordance with paragraph ACCEPTANCE.

]1.1.2 Basis of Payment

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NOTE: For unit price bidding, select first bracketed text. For lump sum bidding, select second bracketed text.
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[Payment for grooving will be made at the Contract unit price per square meter square yard. Unit price will include full compensation for furnishing all materials, preparation, delivering, and application of those materials, and for all labor, equipment, tools, and incidentals necessary to complete the work.][The measured quantity of grooves will be paid for and included in the lump sum Contract price. Lump sum value will include furnishing all materials, preparation, delivering and application of those materials, and for all labor, equipment, tools, and incidentals necessary to complete the work.]

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 Reference Identifier (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 C31/C31M	(2024c) Standard Practice for Making and Curing Concrete Test Specimens in the Field
ASTM C78/C78M	(2022) Standard Test Method for Flexural Strength of Concrete (Using Simple Beam with Third-Point Loading)

1.3 SUBMITTALS

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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 and Air Force 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.

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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. Submittals not having a "G" or "S" classification are 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-02 Shop Drawings

Environmental Requirements; G, [_____]

SD-03 Product Data

Equipment; G, [_____]

Procedures; G, [_____]

SD-06 Test Reports

Test Section; G, [_____]

Inspection Test Reports; G, [_____]

1.4 ENVIRONMENTAL REQUIREMENTS

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NOTE: Consult with airfield manager and installation engineer on method of waste disposal. While on-site disposal methods are favorable regarding cost/productivity, local/state environmental requirements may not permit such.

Retain the first bracketed item if the Contractor will be required to dispose of the waste material off base. Retain second bracketed item for unique requirements given by the airfield/installation. Retain third bracketed item if on-site dewatering locations are accessible to the Contractor during construction.

****

Grooving operations are not permitted when expected freezing conditions prevent the immediate removal of debris and/or drainage of water from the grooved area. Remove and dispose of hardened waste slurry[off base][in accordance with the base waste disposal requirements] after it has been dewatered.[On-site dewatering locations are to be provided by the Government.] No less than 30 days before the start of grooving, submit information and details on the following, and ensure all items are in accordance with base environmental regulations:

a. Plan to flush debris off pavement (if permitted).

b. Plan to discharge and dispose of waste slurry.

c. Plan to maintain temporary storm drainage, pollution control and erosion control.

d. Plan describing how disposal pit areas will be regraded and restored to original conditions.

[1.5 ANTICIPATED DELAYS DUE TO MISSION REQUIREMENTS

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NOTE: If grooving on an active runway, include paragraph ANTICIPATED ADVERSE DELAYS DUE TO MISSION REQUIREMENTS; otherwise, do not include.

Coordinate with the local base, airfield manager, or other user representatives to configure an appropriate amount of days to be allotted to the Contractor for interruptions during grooving. Fill bracketed options below. Ensure to make user aware that Notices to Air Missions (NOTAMs) may be required to safely coordinate grooving in an active area, as well as to coordinate concurrent and/or subsequent activities with pilot landing/trafficking in the grooving area.

Ensure project restrictions are captured on the contract drawings, for example, need for removal of grooving equipment during non-shift hours, or

communication required with air traffic control.
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Grooving operations are to expect [_____] interruptions per day, with each interruption not anticipated to exceed [_____] hours. Grooving equipment is not permitted to be in any possible active aircraft operations areas during non-shift hours. Adhere to the [base][airfield] safety requirements when performing work in any possible active aircraft operations areas.

]PART 2 PRODUCTS

2.1 EQUIPMENT

2.1.1 Grooving Machine

Provide a grooving machine that is self-propelled, specifically designed and manufactured for pavement grooving, and has a self contained and integrated continuous slurry vacuum system as the primary method for removing waste slurry. Equip the grooving machine with diamond-saw cutting blades capable of making one pass of grooving with a minimum width of 914 mm 36 inches. Use cutting blades capable of making the required width and depth of grooves in one pass of the machine. A mixture of new and worn blades or blades of unequal wear or diameter are not permitted in the cutting head. Match the blade type and configuration with the hardness of the existing airfield pavement. Provide wheels on the grooving machine which do not scar or spall the pavement. Provide the machine with devices to control alignment within the specified tolerances. Provide depth-control wheels or outriggers to control depth of grooves.

2.1.2 Auxiliary Grooving Machine

In areas inaccessible to the equipment specified in paragraph GROOVING MACHINE, a smaller grooving machine is permitted. All requirements specified in paragraph GROOVING still apply to any grooving performed by auxiliary equipment.

2.2 MEASUREMENT TOOLS

Utilize a measuring tool capable of measuring length in increments of 2.0 mm 1/16 inch, except for all depth measurements, where a tire tread depth gauge graduated in 1 mm 1/32 inch is required. Utilize tools or molds to accurately measure the top and bottom width of trapezoidal grooves to the nearest 2.0 mm 1/16 inch.

PART 3 EXECUTION

3.1 PREPARATION

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NOTE: Limits of the grooved area are described in UFC 3-260-02. Grooves will be perpendicular to the runway centerline. Do not groove the following areas: overruns, UAS only runways, rotary-wing runways (i.e. heliport runways), the first and last 3m 10 feet of the runway, and 6m 20 feet either side of an arresting barrier cable that requires hook engagement for operation. Existing

aircraft-arresting systems (AAS) which have only 6 m 10 feet free of grooves on each side do not require pavement repair solely to comply with the requirements within this designer note. For full-strength overruns, consult with the airfield manager or installation engineer if grooving is desired. Figures 2-10 and 2-11 of FAA Advisory Circular 150/5320-12. Show examples of saw-cut step patterns at the intersection of secondary runways and exit taxiways to primary runways, respectively.

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3.1.1 Existing Pavements

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NOTE: If grooving is to be done adjacent to existing pavement, include the bracketed text. When tying into existing pavements, larger variations in groove depth can be expected, and alignment should be established by method of survey markings.

****

Do not groove bumps, depressed areas, bad or faulted joints, and badly cracked and/or spalled areas in the pavement until such areas are adequately repaired or replaced.[The depth tolerances specified in Table 1 do not apply for the first 9 meters 30 feet from existing (not in contract) pavements. Do not perform the test section within 9 meters 30 feet of existing (not in contract) pavement. Utilize survey marks to establish proper alignment when grooving adjacent to existing pavements.]

3.1.2 New Pavements

Allow new asphalt concrete pavements to cure for a minimum of 30 days before grooving. Allow new portland cement concrete pavements to cure for a minimum of 28 days before grooving. As a construction expedient, grooving of new portland cement concrete pavements is permitted before 28 days if all of the following conditions are met:

a. Pavement has been cured for a minimum of 14 days.

b. All joints have been sealed or otherwise protected.

c. Concrete has attained a minimum field cured flexural strength of 4.5 MPa 650 psi in accordance ASTM C31/C31M and evaluated in accordance with ASTM C78/C78M.

d. Grooves are stable with no spalling, tearing or raveling of the grooved edges.

3.2 WATER SUPPLY

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NOTE: If transportation of the water by surface laid pipe is permitted, show the routing of the pipe. Identify the available source location on the drawings. Coordinate with airfield manager or installation engineer to confirm if water will be supplied by the Government, or if water for grooving

operations will need to be supplied by the Contractor. Note on the drawings the location of where the water is to be supplied from.

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[Provide water for the grooving operation][The Government will provide water for the grooving operation as shown in the drawings].

3.3 GROOVING

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NOTE: Selection of standard grooves or trapezoidal-shaped grooves should mirror existing conditions, or for full replacements, consult with the airfield manager and installation engineer on preference between groove style.

Benefits to trapezoidal-shaped grooves include added resistance to rubber contamination, improved performance with regards to heavy aircraft tire loading, water dispersion, and resistance to chipping and closing. Due to expected increased blade wear, the option of trapezoidal-shaped grooves is most likely more expensive than standard grooves.

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3.3.1 Grooving Dimensions

Cut grooves that meet the dimensions and tolerances specified in Table 1.

Table 1

Standard Grooving Dimensions and Tolerances

Component	Required dimension	Tolerance above required dimension	Tolerance below required dimension
Width	6 mm1/4 inch	2 mm1/16 inch	0 mm0 inch
Depth	6 mm1/4 inch	2 mm1/16 inch	2 mm1/16 inch
Center-to-center spacing	38 mm1-1/2 inch	0 mm0 inch	3 mm1/8 inch

Table 1

Trapezoidal Grooving Dimensions and Tolerances

Component	Required dimension	Tolerance above required dimension	Tolerance below required dimension
Width at top of groove	12 mm1/2 inch	2 mm1/16 inch	0 mm0 inch
Width at bottom of groove	6 mm1/4 inch	2 mm1/16 inch	0 mm0 inch

Table 1			
Trapezoidal Grooving Dimensions and Tolerances			
Component	Required dimension	Tolerance above required dimension	Tolerance below required dimension
Depth	6 mm1/4 inch	2 mm1/16 inch	2 mm1/16 inch
Center-to-center spacing	57 mm2-1/4 inch	0 mm0 inch	3 mm1/8 inch

3.3.2 Procedures

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NOTE: Include applicable Sections regarding field molded sealants, preformed compression seals where prompted below. If both field molded sealants and preformed compression seals are used, utilize bracketed text accommodating both specification sections to be referenced.

If the designer chooses to not groove through PCC longitudinal joints, include the last bracketed statement. The choice to skip every PCC longitudinal joint may result in lower production rates and increased pricing. Skipping every PCC longitudinal joint may not fully disperse water off of runways at these areas, which may be hazardous in freezing climates. Reflect the prescriptions below in the contract drawings.

Coordinate depth of grooves and joint material with Section 32 13 73.19 COMPRESSION CONCRETE PAVING JOINT SEALANT and Section 32 01 19.61 SEALING OF JOINTS IN RIGID PAVEMENT. Depth tolerances associated with the grooves are 1/4-inch plus or minus 1/16-inch. For airfields, depth tolerances associated with compression joint sealants are 3/16-inch plus or minus 1/8-inch from the pavement surface or from the bottom of the joint bevel, if a bevel is present. Depth tolerances for field molded sealants are 1/8-inch plus or minus 1/16-inch from the pavement surface or from the bottom of the joint bevel, if a bevel is present. Ensure drawing details reflect the recess of joint material such that the maximum depth of grooving is taken into account.

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No less than 30 days before the start of grooving, submit a procedures plan to indicate grooving sequence, methods to inspect equipment wear, and methods to control grooving operations in order to meet the requirements of this section. Indicate areas which may be inaccessible to the equipment specified paragaph GROOVING MACHINE above, how these areas will be grooved, and how slurry will be captured. Damage or roughening of the pavement between grooves is prohibited. Spalling along or tearing or raveling of the groove edges is not allowed. Cut grooves that are normal

to the longitudinal axis of the centerline of the [runway][taxiway]. Do not vary the transverse alignment of the grooves more than plus or minus 38 mm 1-1/2 inches per 20 m 65 feet of groove length. Do not groove within 150 mm plus or minus 75 mm 6 inches plus or minus 3 inches of the runway centerline, the edge of portland cement concrete transverse joints, or the center of asphalt transverse joints. If damage to longitudinal joint material is caused by grooving, repair damaged joint material as specified in Section [_____][and [_____]].[Do not groove within 150 mm plus or minus 75 mm 6 inches plus or minus 3 inches of each longitudinal PCC joint.] Provide grooves that are no closer than 150 mm 6 inches and no further than 457 mm 18 inches from all working cracks and in-pavement lighting fixtures, including block-outs for lighting structures. Provide grooves that are at least 3 meters 10 feet away, not to exceed 4.5 meters 15 feet away, from the beginning and end of the runway. Provide grooves that are at least 6 meters 20 feet away, not to exceed 7.5 meters 25 feet, from either side of the arresting barrier cable. Terminate grooves 3 meters10 feet from the pavement edge, such that grooving equipment is allowed to operate. Lowering of the cutting head over existing grooving to match new grooves (overlapping) is not permitted.

3.4 TEST SECTION

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NOTE: Edit for runway or taxiway as required by the project. It is recommended to begin grooving at runway ends.
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Groove a test section which consists of two adjacent passes, and spans the required grooving width of the [runway][and][taxiway]. Conduct the test section in the presence of the Government[at the beginning or end of the runway][in an area approved by the Government]. Conduct a test section for each piece of grooving equipment. Demonstrate the setup and alignment process, the grooving operation, and the waste slurry disposal.

3.4.1 Test Section Requirements

During the test section, for each pass, record six random groove measurements for depth of each cutting head, per zone. Each zone is identified in Table 2. Record two measurements each for center-to-center spacing (one measurement between grooves within the same cutting head, and one measurement between two separate passes), width, and alignment per cutting head, per pass. Conduct a visual inspection for correct groove shape, stable grooves and damaged joint material, providing two photographs per measurement with scale in photo. Include all measurements in the test section report, and take the average of all depth measurements across all zones, per cutting head. A successful test section consists of an average depth measurement that meets the tolerances of Table 1, as well as meeting all other tolerances and clearances of Table 1 and paragraph PROCEDURES above, per cutting head. Consult with the grooving operator about all measurables. After any failing test sections, make revisions to grooving operations and control processes, and perform another test section to demonstrate compliance. See Grooving Test Section/Inspection Diagram for an illustration of zone testing for the test section. Utilize the Grooving Depth Measurement Spreadsheet, or other means of recording depth measurements, to determine an average of groove depth measurements.

Table 2	
Zone Identification	
Zone 1	Centerline to 1.5 meters 5 feet left and right of centerline.
Zone 2	1.5 meters5 feet to 7.5 meters25 feet left of centerline.
Zone 3	1.5 meters5 feet to 7.5 meters25 feet right of centerline.
Zone 4	7.5 meters25 feet to edge of grooving, left of centerline.
Zone 5	7.5 meters25 feet to edge of grooving, right of centerline.

3.5 ACCEPTANCE

At the beginning of each work shift, furnish a full complement of grooving blades with each saw that are capable of cutting grooves of the specified width, depth, and spacing. If during the work, a single grooving blade on a machine becomes incapable of cutting a groove, work may be continued for the remainder of the work shift. It is not required to cut the groove omitted because of the failed blade. Should two or more grooving blades on a machine become incapable of cutting grooves, cease operating the machine until it is repaired. If during work, a single grooving blade on a machine becomes incapable of cutting a groove to the required dimensions of Table 1, cease operating the machine until it is repaired.

3.5.1 Inspection Test Reports

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NOTE: Include testing frequency within brackets which corresponds to the magnitude of grooving for the project. For large-scale grooving operations, a recommended number of daily inspections is three per day. Consider project magnitude, grooving limits, and schedule when recommending a testing interval.

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A test is defined as the set of measurements for depth, width, for center-to-center spacing, alignment, and a visual assessment of grooves specified herein. For each day's production, record [3] separate tests, each one consisting of six random groove measurements for depth for each cutting head, per zone. Each zone is identified in Table 2. For each separate test, record two measurements each for center-to-center spacing (one measurement between grooves within the same cutting head, and one measurement between two separate passes), width, and alignment per cutting head, per pass. Conduct a visual inspection for groove shape, stable grooves and damaged joint material. Submit inspection test reports for each day of production, to include at a minimum: beginning and ending limits of day's grooving shift(s), measurements made with their approximate stationing identified, two photos per measurement with scale in picture, and corrective actions for damaged pavement, lighting fixtures or joints. Indicate any items which are damaged or out of compliance on inspection test reports. For each separate test, if the average of all depth measurements across all zones, per cutting head, is outside of the

tolerances of Table 1, or if any other tolerances of Table 1 or clearances of paragraph PROCEDURES above are not being met, consult with the grooving operator prior to any additional grooving. Revise grooving procedures and test the latest pass of grooving. Acceptance of airfield grooving is not complete until all inspection test reports are approved. See attachments Grooving Test Section/Inspection Diagram for an illustration of zone testing for daily tests. Utilize the Grooving Depth Measurement Spreadsheet attachment, or other means of recording depth measurements, to determine an average of groove depth measurements.

3.6 Clean-Up

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NOTE: Provide additional guidance in open bracketed text if base environmental requirements do not permit flushing of dust, debris, or slurry. Include first bracketed text if base environmental requirements permit flushing of debris, dust and slurry.
****

Continuously clean-up debris from the grooving operation.[Flush debris produced by the equipment to the edge of the grooved area or pick it up before it dries and hardens. Flush the remaining dust coating to the edge of the area if the resultant accumulation is not detrimental to the vegetation or storm drainage system. Accomplish all flushing operations in a manner to prevent erosion on the shoulders, damage to vegetation, or clogging of storm drainage.][_____]

3.7 Repair of Damaged Pavement

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NOTE: Include references to applicable Sections as necessary in bracketed statement below. If both asphalt and portland cement concrete pavements are used, include last bracketed item which permits two specification sections.
****

Repair any pavement damaged as a result of grooving operations in accordance with Section [_____][and [_____]], at no additional cost to the Government.

-- End of Section --