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USACE / NAVFAC / AFCEC / NASA UFGS-32 16 15 (April 2008)  
Change 1 - 11/14  
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Preparing Activity: USACE Superseding  
UFGS-32 16 15 (April 2006)

## UNIFIED FACILITIES GUIDE SPECIFICATIONS

References are in agreement with UMRL dated October 2014

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04/08

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### SECTION 32 16 15

#### CONCRETE BLOCK PAVEMENTS 04/08

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NOTE: This guide specification covers the requirements for constructing a concrete block pavement.

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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#### PART 1 GENERAL

##### 1.1 PAYMENT PROCEDURES

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NOTE: Delete this paragraph in fixed price contracts.

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##### 1.1.1 Pavements

The blocks, cut blocks, bedding sand, and jointing sand will be paid per square meter foot of satisfactorily installed block pavement surface.

##### 1.1.2 Edge Restraint

The edge restraint will be paid per lineal meter foot of satisfactorily

installed edge restraint.

## 1.2 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.

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS  
(AASHTO)

AASHTO M 133 (2012) Standard Specification for  
Preservatives and Pressure Treatment  
Processes for Timber

AMERICAN CONCRETE INSTITUTE INTERNATIONAL (ACI)

ACI 301 (2010; Errata 2011) Specifications for  
Structural Concrete

ACI 301M (2010) Metric Specifications for  
Structural Concrete

ASTM INTERNATIONAL (ASTM)

ASTM C117 (2013) Standard Test Method for Materials  
Finer than 75-um (No. 200) Sieve in  
Mineral Aggregates by Washing

ASTM C131 (2006) Standard Test Method for Resistance  
to Degradation of Small-Size Coarse  
Aggregate by Abrasion and Impact in the  
Los Angeles Machine

ASTM C136 (2006) Standard Test Method for Sieve  
Analysis of Fine and Coarse Aggregates

ASTM C1645/C1645M (2011) Standard Test Method for

Freeze-thaw and De-icing Salt Durability  
of Solid Concrete Interlocking Paving Units

ASTM C936/C936M	(2013) Standard Specification for Solid Concrete Interlocking Paving Units
ASTM C979/C979M	(2010) Pigments for Integrally Colored Concrete
ASTM D4318	(2010; E 2014) Liquid Limit, Plastic Limit, and Plasticity Index of Soils
ASTM D75/D75M	(2014) Standard Practice for Sampling Aggregates
ASTM E11	(2013) Wire Cloth and Sieves for Testing Purposes

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 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.

An "S" following a submittal item indicates that the submittal is required for the Sustainability Notebook to fulfill federally mandated sustainable requirements in accordance with Section 01 33 29 SUSTAINABILITY REQUIREMENTS.

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.] [information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government.] Submittals with an "S" are for inclusion in the Sustainability Notebook, in conformance to Section 01 33 29 SUSTAINABILITY REQUIREMENTS. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-04 Samples

Concrete Paving Block[; G][; G, [\_\_\_\_\_]]

SD-06 Test Reports

Tests, Inspections and Verifications

1.4 MAINTENANCE

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NOTE: This paragraph will be included only if the project has aesthetic considerations where future maintenance must exactly match the color of the block.  
\*\*\*\*\*

At the completion of work provide [\_\_\_\_\_] paving blocks matching those used in the project. These paving blocks shall be delivered stacked on pallets.

PART 2 PRODUCTS

2.1 MATERIALS

2.1.1 Bedding and Jointing Sand

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NOTE: If the pavement is to be subjected to Design Index traffic of 8 or higher, both the bedding and jointing sands will consist of 100 percent crushed sand, if it is available in the construction locale. For block pavements to be used for walkway, driveway, storage area, parking area, or subject to traffic Design Indexes of 1 or 2, the bedding sand gradation can be changed to the fine aggregate gradation in ASTM C33/C33M with the additional requirement of 0-10 percent passing the 0.075 mm (No. 200) sieve.  
\*\*\*\*\*

Use two separate sand gradations for the bedding layer and in the block joints. Both sand gradations shall consist of crushed sand, natural sand, or a combination of crushed and natural sand. Both sand gradations shall have a minimum L.A. Abrasion of 40 percent when tested in accordance with ASTM C131. Both sand gradations shall be nonplastic when tested in accordance with ASTM D4318 and shall be free of lumps, clay, vegetation, soft particles, sulphates, and other contaminants. The bedding and jointing sands shall conform to the following gradations, determined in accordance with ASTM C136 and ASTM C117, using ASTM E11 sieve.

Sieve (ASTM E11)	Percent Passing	
	Bedding Sand	Jointing Sand
9.5 mm	100	100
4.75 mm	80-100	100
2.36 mm	60-90	95-100
1.18 mm	25-70	70-100
0.600 mm	10-35	40-75
0.300 mm	5-20	10-40
0.150 mm	0-10	2-25
0.075 mm	0-5	0-10

Sieve (ASTM E11)	Percent Passing	
	Bedding Sand	Jointing Sand
3/8 in.	100	100
No. 4	80-100	100
No. 8	60-90	95-100
No. 16	25-70	70-100
No. 30	10-35	40-75
No. 50	5-20	10-40
No. 100	0-10	2-25
No. 200	0-5	0-10

#### 2.1.2 Concrete Paving Block

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**NOTE: Color and shape of block may be specified.**  
**Check local availability of specific colors or**  
**shapes before specifying. Organic pigments should**  
**not be used, since they are unstable in the alkaline**  
**concrete environment and subject to weathering.**  
**Shape is generally rectangular or interlocking.**  
 \*\*\*\*\*

Submit a sample of five paving blocks prior to the start of the work.  
 Also, a representative sample of not less than 15 blocks as directed by the  
 Contracting Officer, from each lot of 20,000 concrete paving blocks or  
 fraction thereof. The concrete paving block shall conform to  
 ASTM C936/C936M, and shall be [\_\_\_\_\_] thick, [\_\_\_\_\_] in color, and [\_\_\_\_\_]   
 in shape. Pigmentation shall conform to ASTM C979/C979M.

#### 2.1.3 Edge Restraints

##### 2.1.3.1 Treated Wood

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**NOTE: Treated wood edge restraint is only**  
**acceptable for walkways and residential driveways.**  
**Delete this paragraph when this option is not**  
**retained.**  
 \*\*\*\*\*

The edge restraint shall be wood treated in accordance with AASHTO M 133 and of dimensions shown on the plans.

#### 2.1.3.2 Precast Concrete

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NOTE: Minimum compressive strength of precast concrete should be 21 MPa (3,000 psi) unless analysis requires some other value. Entrained air content of the fresh concrete should be 6 percent plus or minus 1.5 percent in areas where freezing and thawing coverage is a design consideration. Delete this paragraph when this option is not retained.

\*\*\*\*\*

The edge restraint shall be precast portland cement concrete elements with the dimensions shown on the plans. The precast concrete shall have a compressive strength of not less than [\_\_\_\_\_] at 28 days and an entrained air content of not less than [\_\_\_\_\_] .

#### 2.1.3.3 Cast-in-Place Concrete

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NOTE: Minimum compressive strength of cast-in-place concrete should be 21 MPa (3,000 psi) unless analysis requires some other value. Entrained air content of the fresh concrete should be 6 percent plus or minus 1.5 percent in areas where freezing and thawing coverage is a design consideration. Delete this paragraph when this option is not retained.

\*\*\*\*\*

The edge restraint shall be portland cement concrete placed with the dimensions shown in the plans. Concrete shall conform to the requirements of ACI 301/ASTM C301, except that it shall have a compressive strength of not less than [\_\_\_\_\_] at 28 days and an entrained air content of not less than [\_\_\_\_\_] .

### 2.2 TESTS, INSPECTIONS AND VERIFICATIONS

Submit a written report within 7 calendar days after completion of the work, covering the testing required for each lot.

#### 2.2.1 Paving Block

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NOTE: Sampling of paving blocks prior to the start of the work for the purposes of verifying the color and shape of the blocks will only be required when these considerations are critical to the project aesthetics. For jobs of less than 1000 square meters (10,000 square feet) or for pavements not to be exposed to vehicular traffic, a manufacturer's certificate which certifies that the paving blocks meet the requirements of ASTM C936/C936M can be accepted in lieu of sampling and testing the blocks

of each lot.

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Conduct the tests prescribed by ASTM C936/C936M and the following tests on the remaining 13 blocks of each sample from each lot.

#### 2.2.1.1 Freezing and Thawing

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NOTE: The freezing and thawing test may be waived for climates not subject to freezing and thawing. For jobs of less than 1000 square meters (10,000 square feet), a manufacturer's certificate which certifies that the paving blocks meet the requirements of this paragraph may be accepted in lieu of sampling and testing the blocks of each lot.

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Determine resistance to freezing and thawing, when tested in accordance with ASTM C1645/C1645M, must meet the freeze-thaw requirements stated in ASTM C936/C936M.

#### 2.2.1.2 Dimensional Tolerance

The length and width of each block in the sample shall not vary from any other block in this or any other lot sample by more than 3 mm 1/8 inch. Thickness of any block in the sample shall not vary by more than 3 mm 1/8 inch from the specified block thickness.

#### 2.2.1.3 Retest

Notify the Contracting Officer if any blocks fail to meet the specified requirements. In case the shipment fails to conform to the specified requirements, the Contractor may sort it, and new specimens selected from the retained lot for retesting, as directed by the Contracting Officer. All concrete paving block retests shall be performed at the expense of the Contractor. In case the second set of specimens fail to conform to the test requirements, the entire lot shall be rejected.

#### 2.2.2 Sand

Obtain a representative sample in accordance with ASTM D75/D75M from each 75 cubic meters 100 cubic yard of sand to be used in the project. If the sand fails to meet the gradation requirements the Contractor may take another sample and retest it at no cost to the Government. If this retest fails or if no second test is taken, the sand is rejected by the Government and shall be removed from the job site.

### PART 3 EXECUTION

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NOTE: The base course for the block pavement must be a dense graded or bound material to avoid loss of the sands from the bedding layer. It must also be properly graded and leveled. A smoothness of no more than 10 mm (3/8 inch) deviation from a 3 m (10 foot) straight edge is needed. The project specification for the pavement base course should be checked to ensure these requirements are met.

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### 3.1 PREPARATION

#### 3.1.1 Edge Restraint Location

Install the edge restraint as shown in the drawings prior to placement of the blocks.

#### 3.1.2 Sand Bedding Layer

The bedding sand shall be spread evenly over the area to be paved and shall be screeded to an uncompacted average thickness of 30 mm 1-1/4 inch with a tolerance for grade and surface smoothness of plus or minus 6 mm 1/4 inches. This bedding sand shall not be used to fill low areas that exceed the specified tolerance for the base. The sand shall be left uncompacted and shall not be disturbed by any pedestrian or vehicle construction traffic.

### 3.2 BLOCK PLACEMENT

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**NOTE: Paving block to be subject to vehicular traffic should be placed in herringbone pattern, and this pattern can be specified here.**

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The paving block shall be placed by hand or machine in the indicated pattern. Placement of paving block shall start from a corner or straight edge and proceed forward over the undisturbed sand bedding layer. The joints, excluding any chamfer between paving blocks, shall be not less than 2 mm 1/16 inch or more than 6 mm 1/4 inch in width. After seating, the block surface shall be flush or up to 6 mm 1/4 inch above the edge restraint.

#### 3.2.1 Unfilled Gaps

Any gaps between paving blocks and any edge restraint, drainage structures, or other members that cannot be filled with a whole block shall be filled with a paving block cut to fit the gap, except that slivers will not be allowed and the minimum size of cut block shall be [\_\_\_\_]. Cutting shall be done with a hydraulic splitter, a masonry saw, or other device that accurately leaves a clean, vertical face without spalling. Any remaining gap between the block and adjoining edge restraint or structure greater than 6 mm 1/4 inch will not be accepted; adjacent blocks shall be cut or rearranged to prevent this.

#### 3.2.2 Seating Blocks

The blocks shall be seated in the bedding sand by compacting them with a minimum of three passes of a vibratory plate compactor, sized as follows: [\_\_\_\_].

#### 3.2.3 Jointing Sand

The jointing sand shall be swept into joints and vibrated with a vibratory plate or vibratory roller compactor. This process shall be continued until sweeping and vibrating have filled all joints with sand and further vibration cannot force additional sand into the joints. The coarser particles of the sand will not enter the joints and will remain on the

surface. These particles and any excess sand shall be swept off the pavement.

#### 3.2.4 Timing of Operations

Seating of blocks and placement of jointing sand can be done concurrently with block placement. However, seating of blocks and placement of jointing sand shall not be done within 1.5 m 5 feet of any unfinished edge of the block pavement that is not supported by the edge restraint.

#### 3.2.5 Final Rolling

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**NOTE: This paragraph can be deleted for light load pavements such as driveways or pedestrian walkways.**  
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The final finished paving block surface shall be rolled with four passes of a vibratory or pneumatic roller with a static weight of not less than 4.5 metric tons 10,000 pounds.

#### 3.2.6 Construction Traffic

Construction traffic shall not be allowed on the paving block surface until the jointing sand has been placed and vibrated into the joints and all debris and excess sand has been swept off.

### 3.3 CLEANUP

Sweep the entire pavement surface and remove all excess sand, blocks and debris from the project area.

### 3.4 SMOOTHNESS AND GRADE TOLERANCES

#### 3.4.1 Smoothness

No portion of the finished pavement surface shall deviate by more than 10 mm 3/8 inch from a 3 m 10 foot long metal straightedge placed on the pavement surface.

#### 3.4.2 Block Height

The finished block surface shall be either flush or up to 6 mm 1/4 inch higher than all edge restraints or drainage structures.

#### 3.4.3 Grade

The finished pavement shall be within 12 mm 0.04 feet of planned grade shown on the plans.

#### 3.4.4 Remedial Action

Any area not meeting the smoothness, block height, or grade tolerance shall be taken up, adjustments made, and the blocks relaid.

-- End of Section --