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USACE / NAVFAC / AFCEC / NASA **UFGS-10 71 13.13 (April 2006)**

Preparing Activity: NAVFAC **Replace without change UFGS-10716 (August 2004)**

UNIFIED FACILITIES GUIDE SPECIFICATIONS

References are in agreement with UMRL dated January 2021

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SECTION TABLE OF CONTENTS

DIVISION 10 - SPECIALTIES

SECTION 10 71 13.13

STORM SHUTTERS

04/06

PART 1 GENERAL

1.1 REFERENCES
1.2 DEFINITIONS
1.2.1 Tropical Cyclones
1.2.2 Weather Warnings
1.2.3 Wind Velocities
1.3 SUBMITTALS
1.4 DELIVERY, STORAGE, AND HANDLING
1.5 PERFORMANCE REQUIREMENTS
1.6 STORM READINESS REQUIREMENTS
1.6.1 Removable Shutter Location Drawings

PART 2 PRODUCTS

2.1 MATERIALS
2.1.1 Aluminum
2.1.2 Polyvinyl Chloride (PVC)
2.2 SHUTTERS
2.2.1 Roll Shutters
2.2.1.1 Slats
2.2.1.2 Housing
2.2.1.3 Frame and Tracks
2.2.1.4 Structural Supports
2.2.1.5 Reel and Counterbalance Assembly
2.2.1.6 Locking Device
2.2.1.7 Manual Operation
2.2.1.8 Electrical Operation
2.2.1.9 Accessories
2.2.2 Accordion Shutters
2.2.3 Hinged Louvered Shutters
2.2.4 Removable Shutters
2.3 FINISHES
2.3.1 Aluminum Surfaces
2.3.2 Concealed Metal Surfaces

PART 3 EXECUTION

3.1 EXAMINATION
3.1.1 Field Measurement
3.1.2 Windows
3.2 INSTALLATION
3.2.1 Method of Installation
3.2.2 Dissimilar Materials
3.2.3 Field Quality Control
3.3 ADJUSTING
3.4 SCHEDULE

-- End of Section Table of Contents --

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SECTION 10 71 13.13

STORM SHUTTERS
04/06

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NOTE: This guide specification covers the requirements for roll shutters, hinged louvered shutters, accordion shutters, and removable shutters.

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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NOTE: Show the following on the project drawings:

1. Shutter schedules, indicating size, types, and materials.

2. Shutter design drawings, including floor plans, locations, sizes, elevations, and details. On details of shutters, show materials and sizes of adjoining walls, windows, types of clips, anchors, screws, or other fasteners.

3. Shutters requiring special operators. Show location and method of operation and concealment of operators. Show wiring diagrams for motor driven operators.
****

PART 1 GENERAL

1.1 REFERENCES

****

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

Use the Reference Wizard's Check Reference feature when you add a 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.

AMERICAN ARCHITECTURAL MANUFACTURERS ASSOCIATION (AAMA)

AAMA 611	(2014) Voluntary Specification for Anodized Architectural Aluminum
AAMA 2604	(2017a) Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels
AAMA/WDMA/CSA 101/I.S.2/A440	(2017) North American Fenestration Standard/Specification for Windows, Doors, and Skylights

ASTM INTERNATIONAL (ASTM)

ASTM A653/A653M	(2020) Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
ASTM B221	(2014) Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes
ASTM B221M	(2013) Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric)
ASTM D4216	(2017) Standard Specification for Rigid

Poly (Vinyl Chloride) (PVC) and Related PVC and Chlorinated Poly (Vinyl Chloride) (CPVC) Building Products Compounds

1.2 DEFINITIONS

1.2.1 Tropical Cyclones

Tropical Cyclone is a terminology for storms of cyclonic atmospheric conditions originating over tropical waters. The following are international classifications for tropical cyclones:

a. Tropical disturbance: Thunderstorms in the tropics for 24 hours or more.

b. Tropical depression: Wind speed 61 km/hr 38 miles per hour (33 knots) or less.

c. Tropical storm: Wind speed range of 63 to 117 km/hr 39 to 73 miles per hour (34 to 63 knots).

d. Hurricane: Wind speed 119 km/hr 74 miles per hour or more (64 knots).

1.2.2 Weather Warnings

Weather warnings are issued for expected wind velocities. The following are international terminologies issued for weather warnings:

a. Gale warnings: Issued for expected wind velocity of 63-87 km/hr 39-54 miles per hour (34-47 knots).

b. Storm warnings: Issued for expected wind velocity of 89-117 km/hr 55-73 miles per hour (48-63 knots).

c. Hurricane watch: Issued for hurricane conditions within 36 hours.

d. Hurricane warning: Issued for sustained winds of 119 km/hr 74 miles per hour (64 knots) expected in 24 hours or less.

1.2.3 Wind Velocities

Wind velocities for tropical cyclones and weather warnings are measurements taken 10 meters 32 feet 10 inches above ground level.

1.3 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-02 Shop Drawings

Roll shutters

Accordion shutters

Hinged louvered shutters

Removable shutters

Submit plans coordinated with shutter schedule, elevations of shutter units, half-sized sections, thickness and gages of materials, fastenings, method of anchorage, size and spacings of anchors, and location of hardware. Include frame and mullion details, details of installation, and connection to other work, including details of adjacent window and wall construction.

Schedule of shutters

Identification numbers, locations, sizes, and types of shutters.

SD-03 Product Data

Roll shutters

Accordion shutters

Hinged louvered shutters

Removable shutters

Submit for shutters and accessories.

SD-04 Samples

Shutters; G[, [_____]]

Where colors are not indicated, submit no less than [3] [_____] different samples of the manufacturer's standard colors for selection.

SD-10 Operation and Maintenance Data

Shutters; ; G[, [_____]]

Submit data package in accordance with Section 01 78 23 OPERATION AND MAINTENANCE DATA.

[SD-11 Closeout Submittals

Removable shutter location drawings

Submit preliminary shutter location drawings following removable shutter work. Deliver two [_____] sets of the final drawings and originals to the Contracting Officer. The two drawings shall be framed and plastic glazed.]

1.4 DELIVERY, STORAGE, AND HANDLING

Deliver products to the project site in undamaged condition. Store products out of contact with the ground, under weathertight covering, and protect against damage. Damaged shutters shall be repaired to an "as new" condition as approved by the Contracting Officer. If shutters cannot be repaired, the Contractor shall replace the damaged units.

1.5 PERFORMANCE REQUIREMENTS

****

NOTE:
1. Wind Load Design Performance Guide

Velocity mph	**Velocity Km/hr**	**Pressure psf**	**Pressure KPa**	**Tropical Cyclones**
25	**40**	**3**	**0.14**	**Tropical Disturbance less than 38 mph**
30	**48**	**4**	**0.19**	
35	**56**	**5**	**0.24**	

Velocity mph	Velocity Km/hr	Pressure psf	Pressure KPa	Tropical Cyclones
40	65	6	0.29	Tropical Disturbance greater than 39 mph
45	72	8	0.38	
50	80	10	0.48	
55	89	12	0.57	Tropical Depression less than 73 mph
60	97	15	0.72	
65	105	17	0.81	
70	113	20	0.96	
75	121	23	1.10	Tropical Depression greater than 74 mph
80	129	26	1.24	
85	137	29	1.39	
90	145	33	1.58	
100	1.61	40	1.92	
110	177	49	2.35	
120	193	58	2.78	Hurricane
130	209	68	3.26	
140	225	79	3.78	
150	241	91	4.36	
160	258	104	4.98	
170	274	117	5.60	
180	290	131	6.27	
190	306	146	6.99	
200	322	162	7.76	

The above velocity pressures are provided as a guide and are based on ASCE 7-16 at a height of 10 m 33 feet above ground level for a building less than 18 m 60 feet or less in height. The building is a fully enclosed, Category II, and sited on level ground.

2. Load Information Sources:

a. ASCE 7-16 (1996) American Society of Civil Engineers, Minimum Design Loads for Buildings and Other Structures

b. AAMA/WDMA/CSA 101/I.S.2/A440 (1997) Aluminum, Vinyl (PVC) and Wood Windows and Glass Doors

****

Storm shutters shall be fabricated and reinforced to withstand a minimum wind load [1] [1.4] [2] [3.8] [5.5] [_____] kPa [20] [30] [40] [80] [115] [_____] pounds per square foot. The maximum allowable deflection is 1/30 of the opening width or 50 mm 2 inches, whichever is less. The maximum deflection shall be a minimum of 25 mm one inch from the window glass.

1.6 [STORM READINESS REQUIREMENTS

****

NOTE: Omit paragraph if removable shutter location drawings are required in A/E Statement of Work. Verify with Project Manager, EIC, or PDE.

****

1.6.1 Removable Shutter Location Drawings

Provide shutter location drawings for the custodian to install the removable shutters in designated locations during a weather warning period. Prepare drawings if there is more than one panel size or the total number of panels exceeds five.

a. The removable shutter location drawings must include a floor plan and a shutter schedule.

b. The drawings will be computer generated quality.

c. Maximum drawing sheet size will be "A1" size, 841 mm by 594 mm "D" size, 24 by 36 inches.

]PART 2 PRODUCTS

2.1 MATERIALS

2.1.1 Aluminum

AAMA/WDMA/CSA 101/I.S.2/A440 and ASTM B221M ASTM B221.

2.1.2 Polyvinyl Chloride (PVC)

ASTM D4216.

2.2 SHUTTERS

2.2.1 Roll Shutters

2.2.1.1 Slats

[a. Aluminum slats. Extruded aluminum 6063-T6, double wall slats, curved profile 12.7 mm 0.50 inch [_____] thick and 50 mm 2 inches [_____] wide, with bottom bars complete with weatherseal. Maximum wall thickness of 1.3 mm 0.50 inch.]

[b. Polyvinyl Chloride (PVC) Slats. Reinforced double wall extruded slats, curved profile of 12 mm 0.50 inch [_____] thick and 50 mm 2 inches [_____] wide with bottom slat or bar complete with weather seal. Minimum wall thickness of one mm 0.04 inch. Color shall be uniform through the thickness of the PVC slats.]

2.2.1.2 Housing

Aluminum one mm 0.04 inch thick with cast aluminum end frame covers.

2.2.1.3 Frame and Tracks

Extruded aluminum alloy, 6063-T6, standard with the manufacturer.

2.2.1.4 [Structural Supports

Provide storm bar assembly of [_____] [purlins] [, header frames] [and] [mullions] of aluminum tube extrusions, 6063-T5, as indicated. Finish shall be the same as the frame and tracks.

]2.2.1.5 Reel and Counterbalance Assembly

a. Extruded aluminum reel, 6063-T.

b. Spring barrel or shaft shall be corrosion resistant metal of sufficient strength with maximum deflection of 0.7 mm per 300 mm 0.03 inch per foot of span. Barrel or shaft shall house oil-tempered, helically wound steel spring. Springs shall be adjustable.

2.2.1.6 Locking Device

The operation of the roll shutter shall automatically hold the shutters in a closed position. [Provide non-key locking device to hold shutter in closed position.] The shutter shall be closed from the [inside] [outside].

2.2.1.7 [Manual Operation

a. Manual Strap Operator shall be a [recoil strap, 3-1 strap crank] [_____]. [Locate the operator as indicated.]

b. Pole Crank Operator shall be fully encased with self-lubricating hardened steel gears. The crank shall be [fixed] [removable] and located as indicated.

]2.2.1.8 [Electrical Operation

****

NOTE: Verify with the Fire Protection Engineer on existing requirements when using electrical operating shutters without manual releases.

****

a. Motor will be [110] [120] volt, 60 HZ UL listed, thermally protected.

b. Provide for manual override operation in the event of power failure.

c. Provide conduit, wiring, and mounting of controls in accordance with Section 26 20 00 INTERIOR DISTRIBUTION SYSTEM.

]2.2.1.9 Accessories

Provide shutters complete with hardware, stainless steel fasteners, anchors, and other items necessary for complete installation, resist windloads and corrosion for proper operation.

2.2.2 Accordion Shutters

a. Aluminum slats. Aluminum alloy, 6063-T5/T6 or 6005-T5/T6.

b. Aluminum tracks. Aluminum alloy, 6063-T5/T6 or 6005-T5/T6. Wall mount [surface mount top and bottom] [recessed top and bottom] extruded tracks.

c. Locking device. Provide heavy duty non-key locking device. Accordion shutters shall be locked from the [inside] [outside].

d. Accessories. Stainless steel wheel carriers, heavy duty nylon wheels, nylon guides, stainless steel fasteners, and other accessories for complete installation, resist design windloads, and proper shutter operation.

2.2.3 Hinged Louvered Shutters

a. Louvered Panels. ASTM B221M ASTM B221. Aluminum alloy, 6063-T5/T6. Extruded louvered blades and frames shall have minimum thickness of 1.2 mm 0.05 inch. Allow minimum space between horizontal louver blades.

[b. Storm Bars. Storm bars shall be of same material as louvers or fabricated of metal compatible with the louvered panels. Storm bars shall be secured with locking device.]

c. Accessories. Provide hinges, holders, fasteners, and other accessories to resist design windloads and for proper shutter operations. Accessories shall be stainless steel.

2.2.4 Removable Shutters

****
NOTE: Clips are not acceptable in certain areas in Florida. Verify approval requirements with local governmental agencies.
****

Provide material gages of frames [, clips] and panel assemblies to meet wind velocity requirements as recommended by the manufacturer.

a. Panels. Fabricate to sizes indicated on drawings of aluminum alloy of 3003-H16. Panel thickness shall be [0.7] [1] [1.2] [1.5] mm [0.030] [0.040] [0.050] [0.060] inches [_____].

b. Aluminum frames. Provide header and base frame surface [recessed] applications.

c. Accessories. [Provide spring tempered stainless steel clips.] [Removal shutters shall be installed with stainless steel fasteners.]

[d. Shutter Identification Notations. Provide 50 mm 2 inch high identifying notations on removable panels corresponding to the identifying notations on the shutter locations drawings.]

2.3 FINISHES

2.3.1 Aluminum Surfaces

****
NOTE: Specify Architectural Class I finish in highly corrosive environments.
****

Provide exposed aluminum with [mill finish] [factory finish of anodic coating or organic coating].

[a. Anodic Coating: AAMA 611

[Clear (natural), designation AA-M10-C22-A41, Architectural Class I (0.02 mm 0.7 mil or thicker).]

[Integral color-anodized, designation AA-M10-C22-A42, Architectural Class I (0.02 mm 0.07 mil or thicker).]

[Electrolytically deposited color-anodized, designation AA-M10-C22-A44, Architectural Class I (0.02 mm 0.7 mil or thicker).] The finish color shall be [_____] [as indicted].]

[b. Organic Coating

****
NOTE: Specify high-performance finish as an option to Class I anodized.
****

Clean and prime aluminum surfaces. [Powder coated] finish shall be a high performance finish in accordance with AAMA 2604 with total dry film thickness of not less than 0.03 mm 1.2 mil. The finish color shall be [_____] [as indicated].]

2.3.2 Concealed Metal Surfaces

a. Concealed [metal surfaces shall be stainless steel] [ferrous metal surface shall be hot dipped galvanized].

b. Surfaces to receive a finish shall have a zinc coating, a phosphate treatment, and a shop prime coat of rust-inhibitive paint. The galvanized coating shall conform to ASTM A653/A653M, coating designation products. The prime coat shall be compatible with phosphate treatments and applied by dipping or spraying.

PART 3 EXECUTION

3.1 EXAMINATION

3.1.1 Field Measurement

Field measure for exact dimensions to fabricate shutters [within openings] [and] [on exterior surface of wall].

3.1.2 [Windows

Verify location of operable window sash to lock shutters from inside the building.

]3.2 INSTALLATION

3.2.1 Method of Installation

Install shutters on exterior wall surfaces [and soffits] with stainless steel fasteners and in accordance with manufacturer's printed instructions. Locate the fasteners a minimum of 75 mm 3 inches from the [concrete masonry] [and] [concrete] edge. [as indicated.]

3.2.2 Dissimilar Materials

Where aluminum surfaces are in contact or fastened to masonry, concrete, wood, or dissimilar metals, except stainless steel or zinc, the aluminum surface shall be protected from dissimilar materials as recommended in the Appendix to AAMA/WDMA/CSA 101/I.S.2/A440. Surfaces in contact with sealants after installation shall not be coated with any type of protective material.

3.2.3 [Field Quality Control

The manufacturer's technical representative shall visit the site as necessary during installation of shutters. Inspections shall be conducted in the presence of the Contracting Officer. An inspection report shall be submitted to the Contracting Officer within 2 working days. The inspection report shall note compliance with manufacturer's instructions and requirements, work quality, deficiencies, and recommended corrective actions.

]3.3 ADJUSTING

Test every shutter for ease of operations and lock position in the presence of the Contracting Officer. Lubricate and adjust the roll, accordion, and hinged shutters to operate freely. Adjust the frames of removable shutters to receive the panels.

3.4 SCHEDULE

Metric measurements in this section are based on mathematical conversion of English unit measurement, and not on metric measurement commonly agreed to by the manufacturers or other parties. The English and metric units for the measurements specified are as follows:

Items	English Units	Metric Units
Tropical Cyclones	38 mph	61 km/hr
	39 mph	63 km/hr
	73 mph	117 km/hr
	74 mph	119 km/hr
Weather Warnings	39 mph	63 km/hr
	54 mph	87 km/hr
	55 mph	89 km/hr
	73 mph	117 km/hr
	74 mph	119 km/hr
Performance Requirements	20 psf	1 kPa
	30 psf	1 kPa
	40 psf	2 kPa
	80 psf	3.8 kPa
	115 psf	5.5 kPa
	1 inch	25 mm
Shutters	0.03 inch	0.7 mm
	0.04 inch	1.0 mm
	0.05 inch	1.2 mm
	0.06 inch	1.5 mm
	0.5 inch	12.7 mm
	2 inches	50 mm
	3 inches	75 mm
	1 foot	300 mm
Surface Coatings	0.7 mil	0.02 mm
	1.2 mil	0.03 mm

Items	English Units	Metric Units
Installation	3 inches	75 mm

-- End of Section --