
USACE / NAVFAC / AFCEA

UFGS-10716 (August 2004)

Preparing Activity: NAVFAC

Superseding

UFGS-10716N (August 2001)

UNIFIED FACILITIES GUIDE SPECIFICATIONS

References are in agreement with UMRL dated 25 June 2004

Latest change indicated by CHG tags

SECTION TABLE OF CONTENTS

DIVISION 10 - SPECIALTIES

SECTION 10716

STORM SHUTTERS

08/04

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 --

USACE / NAVFAC / AFCESA UFGS-10716 (August 2004)

Preparing Activity: NAVFAC Superseding
UFGS-10716N (August 2001)

UNIFIED FACILITIES GUIDE SPECIFICATIONS

References are in agreement with UMRL dated 25 June 2004

Latest change indicated by CHG tags

SECTION 10716

STORM SHUTTERS 08/04

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

Comments and suggestions on this guide specification are welcome and should be directed to the technical proponent of the specification. A listing of technical proponents, including their organization designation and telephone number, is on the Internet.

Recommended changes to a UFGS should be submitted as a Criteria Change Request (CCR).

Use of electronic communication is encouraged.

Brackets are used in the text to indicate designer choices or locations where text must be supplied by the designer.

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: Issue (date) of references included in
project specifications need not be more current than
provided by the latest guide specification. Use of
SpecsIntact automated reference checking is
recommended for projects based on older guide
specifications.

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 101 | (1999) Voluntary Specifications for Aluminum, Vinyl (PVC) and Wood Windows and Glass Doors |
| AAMA 2604 | (2002) Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels |
| AAMA 611 | (1998) Voluntary Specification for Anodized Architectural Aluminum; includes 604.2, 606.1, 607.1 and 608.1 (which are no longer available as separate documents) |

ASTM INTERNATIONAL (ASTM)

| | |
|-------------------|---|
| ASTM A 653/A 653M | (2003) Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process |
| ASTM B 221 | (2002) Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes |
| ASTM B 221M | (2002) Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric) |
| ASTM D 4216 | (2003) 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 38 miles per hour 61 km/hr (33 knots) or less.
- c. Tropical storm: Wind speed range of 39 to 73 miles per hour 63 to 117 km/hr (34 to 63 knots).
- d. Hurricane: Wind speed 74 miles per hour 119 km/hr 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 39-54 miles per hour 63-87 km/hr (34-47 knots).
- b. Storm warnings: Issued for expected wind velocity of 55-73 miles per hour 89-117 km/hr (48-63 knots).
- c. Hurricane watch: Issued for hurricane conditions within 36 hours.
- d. Hurricane warning: Issued for sustained winds of 74 miles per hour 119 km/hr (64 knots) expected in 24 hours or less.

1.2.3 Wind Velocities

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

1.3 SUBMITTALS

NOTE: Submittals must be limited to those necessary for adequate quality control. The importance of an item in the project should be one of the primary factors in determining if a submittal for the item should be required.

A "G" following a submittal item indicates that the submittal requires Government approval. Some submittals are already marked with a "G". Only delete an existing "G" if the submittal item is not complex and can be reviewed through the Contractor's Quality Control system. Only add a "G" 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 projects.

Submittal items not designated with a "G" are considered as being for information only for Army projects and for Contractor Quality Control approval for Navy projects.

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are [for Contractor Quality Control approval.] [for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government.] The following shall be submitted in accordance with Section 01330 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 01781 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 <u>less than 38 mph</u> greater than 39 mph |
| 30 | 48 | 4 | 0.19 | |
| 35 | 56 | 5 | 0.24 | |
| 40 | 64 | 6 | 0.29 | |
| 45 | 72 | 8 | 0.38 | |
| 50 | 80 | 10 | 0.48 | Tropical Depression <u>less than 73 mph</u> greater than 74 mph |
| 55 | 89 | 12 | 0.57 | |
| 60 | 97 | 15 | 0.72 | |
| 65 | 105 | 17 | 0.81 | |
| 70 | 113 | 20 | 0.96 | |
| 75 | 121 | 23 | 1.10 | Hurricane |
| 80 | 129 | 26 | 1.24 | |
| 85 | 137 | 29 | 1.39 | |
| 90 | 145 | 33 | 1.58 | |
| 95 | 153 | 37 | 1.77 | |
| 100 | 161 | 40 | 1.92 | |
| 110 | 177 | 49 | 2.35 | |
| 120 | 193 | 58 | 2.78 | |
| 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 | |

| Velocity mph | Velocity Km/hr | Pressure psf | Pressure KPa | Tropical Cyclones |
|-----------------|-------------------|-----------------|-----------------|----------------------|
| 200 | 322 | 162 | 7.76 | |

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

2. Load Information Sources:

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

b. AAMA 101 (1997) Aluminum, Vinyl (PVC) and Wood Windows and Glass Doors

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

- The removable shutter location drawings must include a floor plan and a shutter schedule.
- The drawings will be computer generated quality.
- Maximum drawing sheet size will be "D" size, 24 by 36 inches or "A1" size, 841 mm x 594 mm.

]PART 2 PRODUCTS

2.1 MATERIALS

2.1.1 Aluminum

AAMA 101 and ASTM B 221M ASTM B 221.

2.1.2 Polyvinyl Chloride (PVC)

ASTM D 4216.

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 0.50 inch 12.7 mm [_____] thick and 2 inches 50 mm [_____] wide, with bottom bars complete with weatherseal. Maximum wall thickness of 0.50 inch 1.3 mm.]
- [b. Polyvinyl Chloride (PVC) Slats. Reinforced double wall extruded slats, curved profile of 0.50 inch 12 mm [_____] thick and 2 inches 50 mm [_____] wide with bottom slat or bar complete with weather seal. Minimum wall thickness of 0.04 inch one mm. Color shall be uniform through the thickness of the PVC slats.]

2.2.1.2 Housing

Aluminum, 0.04 inch one mm 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 0.03 inch per foot 0.7 mm per 300 mm 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 16402 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 B 221M ASTM B 221. Aluminum alloy, 6063-T5/T6. Extruded louvered blades and frames shall have minimum thickness of 0.05 inch 1.2 mm. 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 [0.030] [0.040] [0.050] [0.060] inches [0.7] [1] [1.2] [1.5] mm [_____].
- 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 2 inch high 50 mm 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 (0.7 mil0.02 mm or thicker).]

[Integral color-anodized, designation AA-M10-C22-A42, Architectural Class I (0.07 mil0.02 mm or thicker).]

[Electrolytically deposited color-anodized, designation AA-M10-C22-A44, Architectural Class I (0.7 mil0.02 mm 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 1.2 mil 0.03 mm. 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 A 653/A 653M, 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 3 inches 75 mm 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 101. 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:

| <u>Items</u> | <u>English Units</u> | <u>Metric Units</u> |
|--------------------------|----------------------|---------------------|
| 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 | .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 |
| Installation | 3 inches | 75 mm |
| -- End of Section -- | | |