Design 3
Shutters for Masonry Block Structures

Steel or Aluminum Angle and Screw Supports

One of the best ways to protect a home from damage in wind storms is to install shutters over all large windows and glass doors. Shutters protect doors and windows from wind-borne objects. They also prevent damage caused by sudden pressure changes when a window or door is broken.

This design guide from *APA – The Engineered Wood Association* describes how to construct structural panel shutters for attachment to masonry block buildings, using steel or aluminum angle and screw supports. The design is less costly to build than shutters with permanent hardware for attachment and removal. This publication also includes basic design considerations for all structural panel shutters. Additional designs from APA provide details for shutters that use alternative attachment systems and shutter designs for wood-frame buildings.

Design Considerations

General

Most building codes currently do not include provisions for storm shutters. For those codes that do, or have had provisions in the past, the design requirements for these shutters generally call for a deflection of less than the shutter span (in inches) divided by 30 (for instance, a 40-inch span should not bend more than 40/30 = 1.33 inches when the wind blows). They also should bend less than 2 inches maximum and should remain at least one inch away from the window when under full wind force.

The easiest designs are those that simply cover the opening with a wood structural panel. In wood-frame construction, panels can be nailed over the openings when a hurricane approaches. Buildings made with concrete blocks, however, require advance preparation.

This APA hurricane shutter design is based on pressures associated with a design fastest-mile wind speed of 120 mph. Building codes are currently being reviewed for possible changes. Before constructing shutters, therefore, it is important to check with your local building department for an update on current code requirements.

TABLE 1

MAXIMUM SPAN WITHOUT STIFFENERS

APA Panel Span Rating	Approximate Weight (lb./ft.^{2})	Maximum Shutter Span	Approximate Deflection (in.) at 120 mph Design Wind Speed at 15-ft. Height
32/16	1.5	30	0.5
40/20	2	36	0.5
48/24	2.4	48	0.9
48 oc	3.6	72	1.5

TABLE 2

ESTIMATED DEFLECTION AT 120 MPH DESIGN WIND SPEED AT 15-FT. HEIGHT FOR SHUTTERS WITH 2 X 4s AT 16 INCHES o.c.

APA Panel Span Rating	Approximate Weight (lb./ft.^{2})	Shutter Span (in.)						
		24	36	48	60	72	84	96
32/16	2.5	0.2	0.2	0.3	0.4	0.5	0.8	–
40/20	2.9	0.1	0.1	0.2	0.2	0.4	0.7	1.1
48/24	3.4	–	–	0.1	0.2	0.3	0.6	1.0
48 oc	4.6	–	–	0.1	0.1	0.3	0.5	0.9

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In some cases, stiffeners may be necessary to limit deflection of the shutter against the glass. Stiffeners function best if the 2 x 4s are on the outside of the shutter and oriented with the narrow edge against the shutter.

Note: The shutter design shown herein will provide significant protection from hurricane-force winds. This publication contains recommendations to serve as a guide only. It does not include all possible shutter, anchor and fastening systems, and the installer must adjust all dimensions to compensate for particular installations and hardware used. These shutter designs by no means represent all possible workable designs and can always be upgraded to provide even greater margins of safety and protection. All shutter designs herein are intended to be temporary, and mounted and removed from outside the building. All designs are based on wind pressure capacities only.

While the design wind pressures used are based on ASCE 7-95, the building owner/installer must still carefully evaluate each system and then, if necessary, make any modifications consistent with good design and building practices.

Anchorage to Masonry Block

The plastic anchors* referenced in this plan have sufficient lateral and withdrawal capacity to handle the expected forces and are recommended because they are rated as being vibration resistant – a characteristic that may be of some value under buffeting wind loads. (Standard lead anchors are not usually rated as vibration resistant.)

Keep masonry anchors at least 1-1/2 inches from the block edges, joints and corners to minimize the danger of cracking the concrete blocks.

*Lateral ultimate value 350 lbs. or greater in 4000 psi concrete, with screws specified (1-1/2 inches with stucco).

FIGURE 1

SHUTTER STIFFENER ATTACHMENT – IF REQUIRED

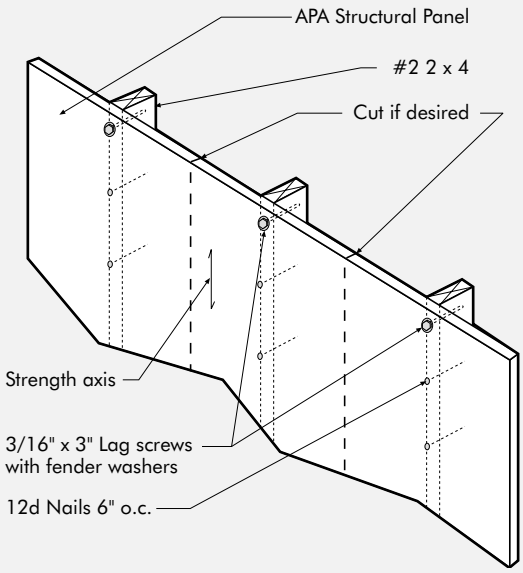


FIGURE 2

SHUTTER ATTACHMENT DETAIL

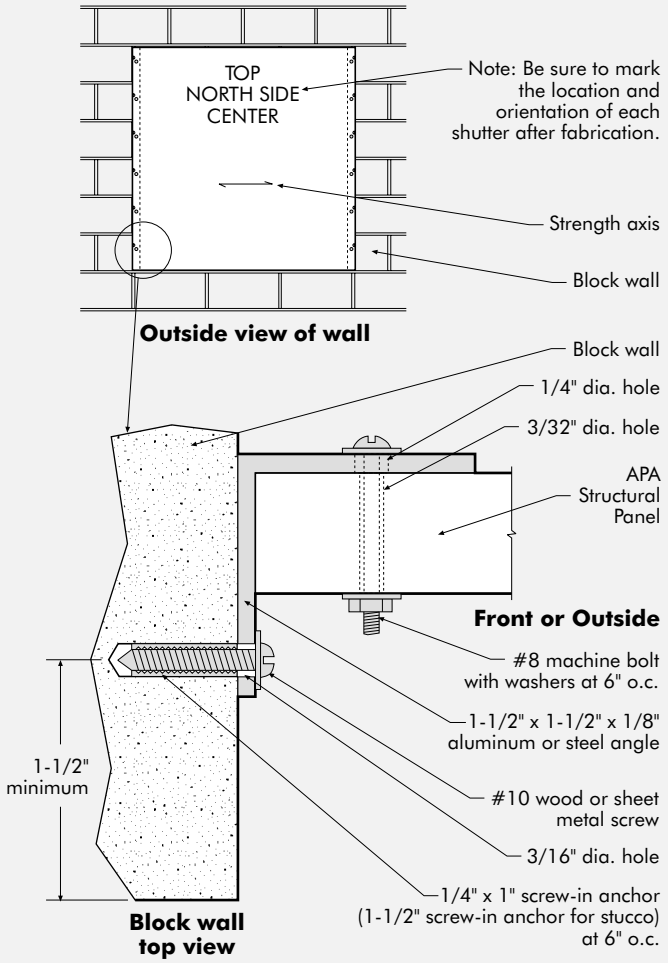


FIGURE 3

ANGLE-TO-SHUTTER ATTACHMENT DETAIL

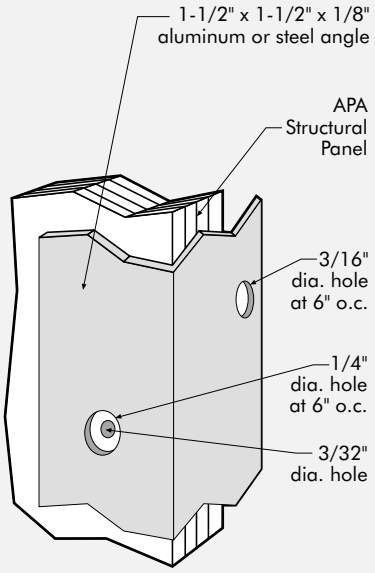
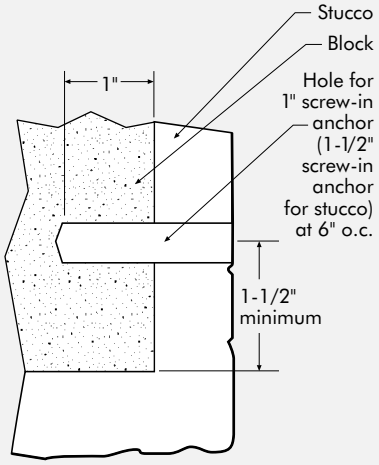


FIGURE 4

SCREW-IN ANCHOR HOLE IN SIDE OF WINDOW OPENING



Steps to Constructing Shutters

1. Use Tables 1 and 2 in the Design Considerations section to determine if stiffeners are needed. Attach stiffeners as shown in Figure 1.

2. In the dimension from support to support, cut the panel 3/8 inch less than the measurement of the window opening (side to side in Figure 2). In the dimension from unsupported edge to unsupported edge, cut the panel 1/8 inch less than the measurement of the opening. The long-panel axis (stgrength axis) must be oriented perpendicular to the supported sides (side to side in Figure 2), regardless of which shutter dimension is longer.

3. Cut 1-1/2 x 1-1/2 x 1/8-inch steel or aluminum angles to the same length as the width of the shutter ends to be supported.

4. Drill 1/4-inch diameter holes at 6 inches o.c. in one side of the angle. These holes are for bolts that hold the angle to the panel and may be centered between the corner and the edge of the angle.

5. Drill 3/16-inch-diameter holes at 6 inches o.c., offset 1 inch from the panel bolt holes, in the remaining leg of the angle. Make the centerline of the holes 1/4 inch from edge of the angle. These holes are to receive #10 screws that will go through the holes into masonry anchors in the concrete blocks. (Figure 3)

6. Drill holes in blocks for the plastic anchors. (Figure 4)

7. Mount the shutter, with angles mounted, to the window frame using #10 screws with washers. (Figure 2)

8. Any permanently installed hardware, shims or fastening devices must be installed using standard/acceptable methods of waterproofing. All abandoned holes must be sealed.

9. After fabrication each shutter should be marked for orientation and location to simplify installation.

Hurricane Shutter Designs from *APA – The Engineered Wood Association*

APA offers a series of Hurricane Shutter Designs. They include:

Design 1: Shutters for Wood-Frame Buildings

Design 2: Shutters for Masonry Block Structures, *Barrel Bolt Latch Supports*

Design 3: Shutters for Masonry Block Structures, *Steel or Aluminum Angle and Screw Supports*

Design 4: Shutters for Masonry Block Structures, *Shutters Attached to Outside Wall with Permanently Mounted Brackets*

Design 5: Shutters for Masonry Block Structures, *For Openings Wider than 8 Feet*

Each design is available from *APA – The Engineered Wood Association* for $1. Designs may also be ordered as a complete set for $5. To order, contact *APA – The Engineered Wood Association,* P.O. Box 11700, Tacoma, Washington 98411-0700. Phone: (253) 565-6600. Fax: (253) 565-7265.

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