Design 5
Shutters for Masonry Block Structures

For Openings Wider Than 8 Feet

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, where glass windows and doors are wider than 8 ft. The shutters run from top to bottom and are attached to a temporary 2 x 4 lumber strip at the top and bottom of the opening. 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.

In some cases, stiffeners may be necessary to limit deflection of the shutter against the glass. Stiffeners

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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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

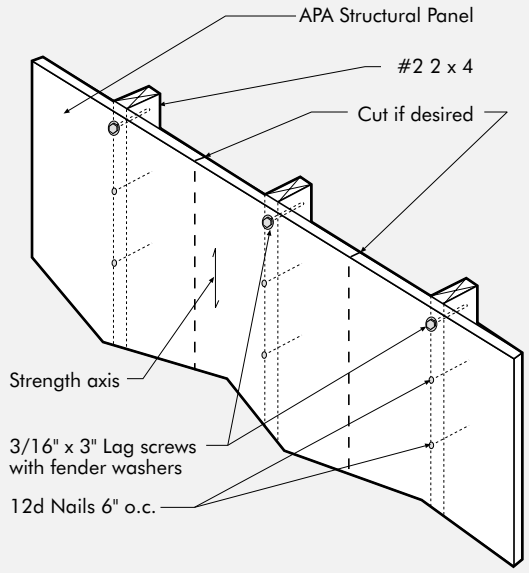
The plastic anchors* referenced in this plan have sufficient lateral and withdrawal capacity to handle the expected forces and are recommended because they are rated as being vibration resistant – a characteristic that may be of some value under buffeting wind loads. (Standard lead anchors are not usually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

*Withdrawal ultimate value 490 lbs. or greater in 4000 psi concrete, with screws specified (1-1/2 inches with stucco).

FIGURE 1

SHUTTER STIFFENER ATTACHMENT – IF REQUIRED



Steps to Constructing Shutters

1. Use Table 2 in the Design Considerations section to determine which panel to use.

2. Cut two 2 x 4s to a length that is 1 inch less than the width of the door opening to be covered. Rip the 2 x 4s lengthwise, if necessary, to the width of the distance of the door frame to the front of the wall. (Note: If holes or hole plugs on the front of the building are not a concern, the top 2 x 4 may be eliminated by extending the shutter above the opening and attaching the top of the shutter directly to the front of the header.) (Figure 1)

3. Predrill 1/4-inch-diameter holes in the 2 x 4s at 12 inches o.c. and at least 1-1/2 inches from the front edge of the 2 x 4s.

4. Drill holes in the concrete blocks.

5. Tap vibration-resistant anchors into the holes in the concrete.

6. Attach the 2 x 4s to top and bottom of the opening using 2-1/2-inch #14 round or pan head wood or sheet metal screws with washers. (Figure 2)

7. Cut the shutter to span the opening (plus the width of the supports – 3 inches for two 2 x 4s). Orient the long panel axis (strength axis) as shown in Figure 1.

8. Drill holes at 16 inches o.c. along the supported panel edges and in the 2 x 4s.

9. Attach the shutter to the 2 x 4s with 2-inch #10 wood or sheet metal screws.

10. To prevent the bottom 2 x 4 anchor holes in the concrete block from becoming clogged with dirt between shutter uses, insert 1/2-inch #14 pan- or flathead screws into the anchor holes. Remove these screws prior to reattaching the 2 x 4s.

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

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

Additional 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*

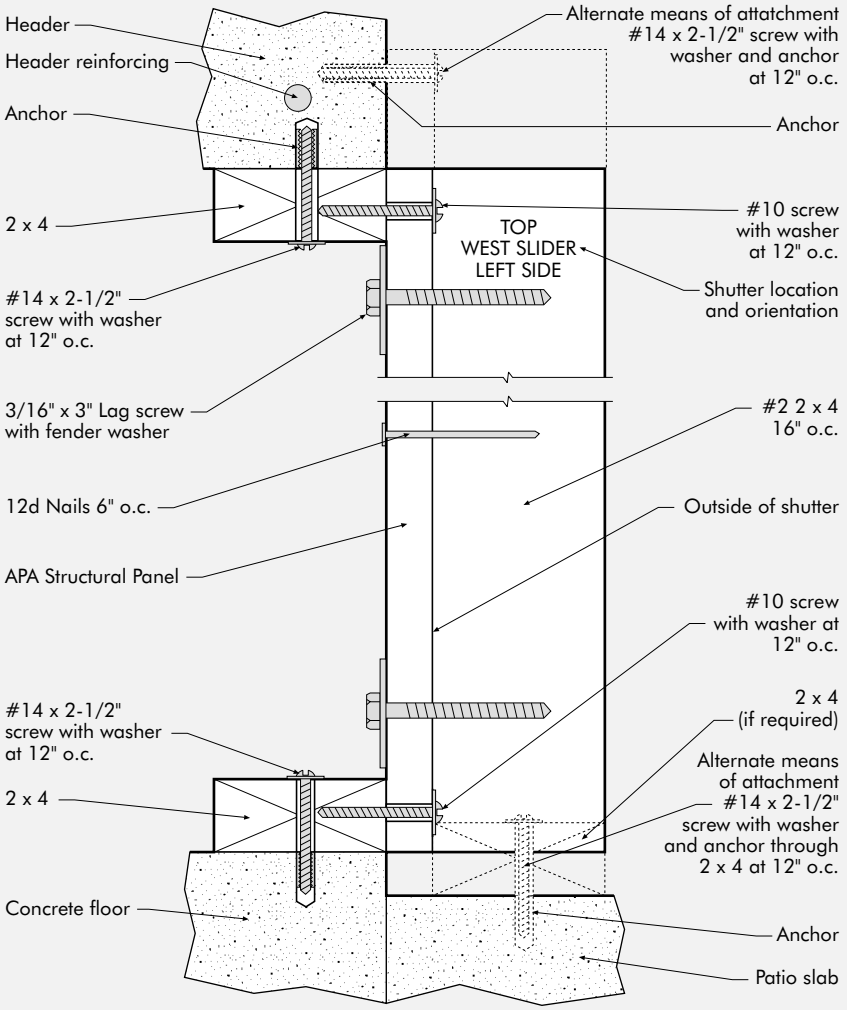
Design 4: Shutters for Masonry Block Structures, *Shutters Attached to Outside Wall with Permanently Mounted Brackets*

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.

FIGURE 2

SHUTTER ATTACHMENT TO HEADER AND SLAB FLOOR



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