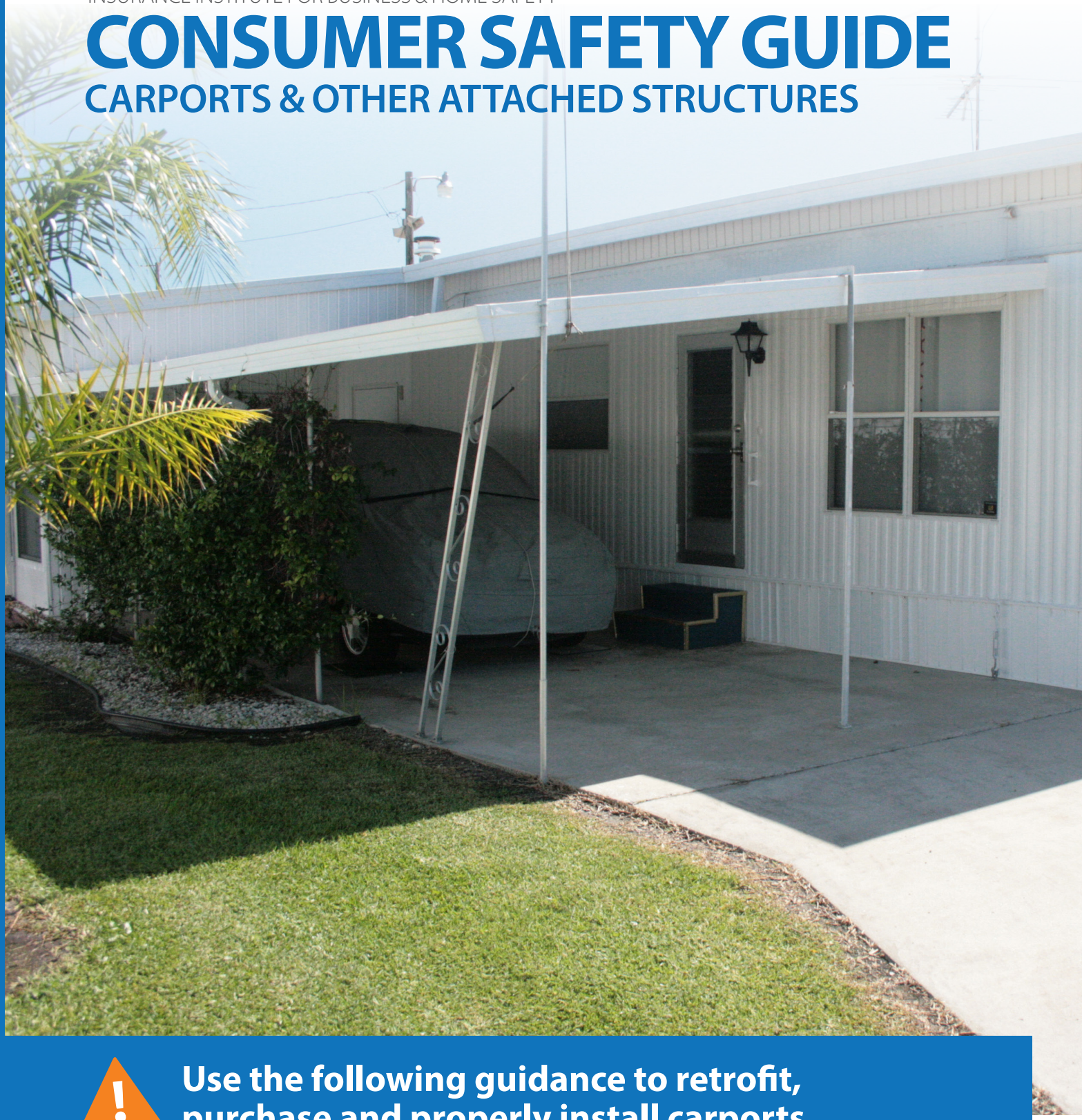
INSURANCE INSTITUTE FOR BUSINESS & HOME SAFETY

CONSUMER SAFETY GUIDE

CARPORTS & OTHER ATTACHED STRUCTURES



Use the following guidance to retrofit, purchase and properly install carports.

IBHS conducted scientific research to evaluate the performance of structures that are often attached to homes, such as carports and porches, during high wind weather events. While the research focused on carports attached to factory-built manufactured homes, the test results are equally applicable to site-built homes and other attached structures such as canopies, awnings, porches, etc.

This guide provides a checklist for homeowners to evaluate existing attached structures with cost estimates. Guidelines for purchasing new structures also are provided. For additional research information about the performance of attached structures, visit DisasterSafety.org.

Retrofitting Existing Attached Structures

Homeowners can end up spending a large amount of the cost of a new well-designed and well-built carport trying to strengthen one of the older units to make it wind-resistant. Consequently, you should check the cost of replacing the carport and use that as a guide in deciding how much to invest in strengthening an old one. The retrofits that are likely to make the most financial sense include:

- ✓ replacing any small, weak, or damaged posts, and strengthening post connections to the foundation/carport slab using appropriate brackets, bolts, and anchors;
- ✓ supplementing attachments of roof pans fastened with corroded fasteners, or fasteners without washers, by adding larger-size fasteners that use combination metal/neoprene washers – and installing fasteners no more than 4" apart across each panel; and
- ✓ unless the home included specific anchorage designed to support the roof of the attached structure, install posts and a support beam near the side of the home, and attach roof pans to this beam.

CHECKLIST FOR EVALUATING EXISTING ATTACHED STRUCTURES

Attachments of Post Bottoms to Concrete

A METAL CONNECTORS ($)

- ○ OK
- ○ Not OK
- ○ Not Sure
- ○ Need Expert Advice

Check metal connectors at the bottom of the posts to determine if they are made of thin sheet metal (less than 1/8" thick) or cast aluminum, which are not strong enough to hold down the posts during a severe wind storm. They need to be replaced with connectors that are at least 1/8" thick, which is one of the least expensive strengthening methods.

B CONCRETE ANCHORS ($)

- ○ OK
- ○ Not OK
- ○ Not Sure
- ○ Need Expert Advice

Check concrete anchors (screws or bolts) that hold the connectors at the bottom of posts. Unfortunately, these anchors may be hidden under the post. If they are loose or have pulled up a bit, or are obviously ineffective, they need to be replaced. Cost of replacement is quite reasonable.

C CENTERS OF CONCRETE ANCHORS ($$$)

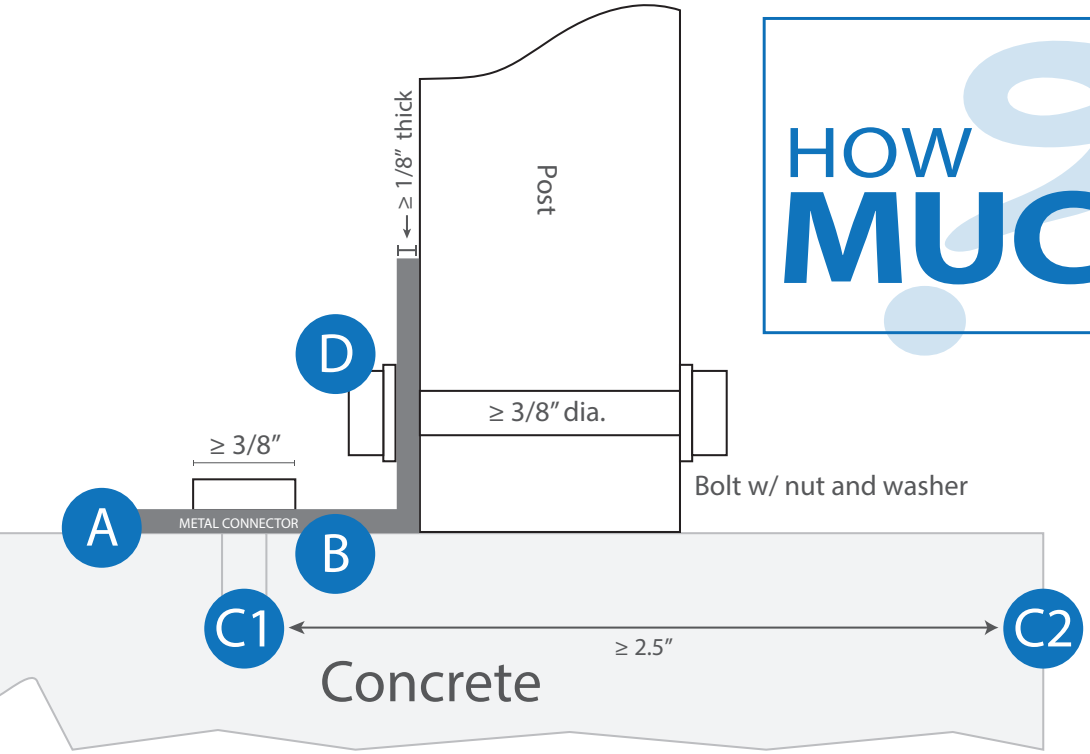
- ○ OK
- ○ Not OK
- ○ Not Sure
- ○ Need Expert Advice

If the centers of the concrete anchors are less than 2-1/2" away from the edge of the concrete, they have substantially reduced ability to hold down the post. Usually, the easiest and least expensive way to fix this is to replace the post base connector with one that is designed for the anchor to be located further from the edge.

D SCREW HEAD SIZE ($)

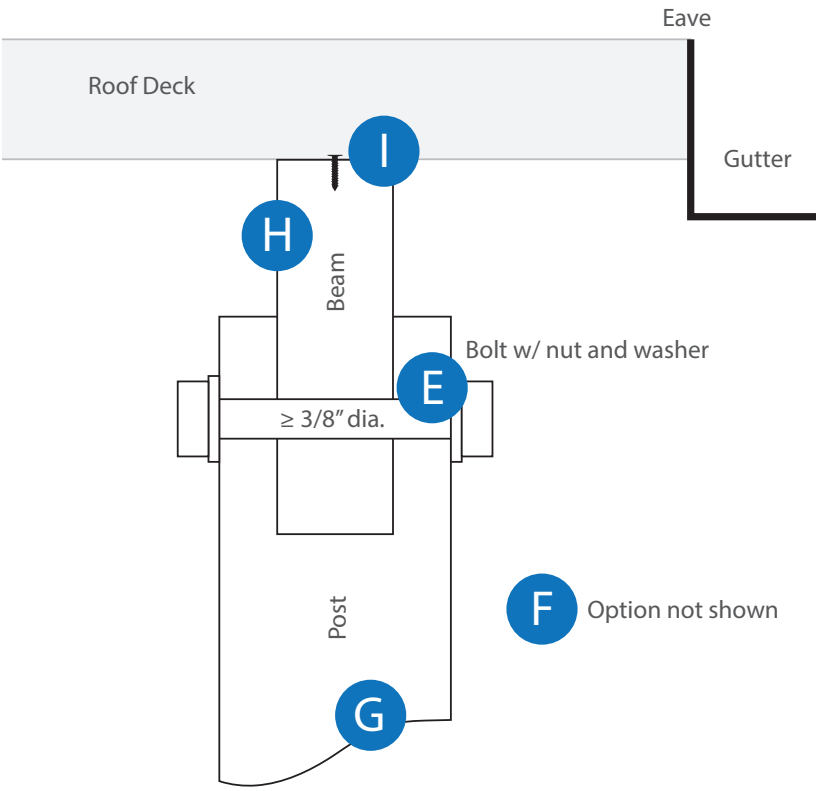
- ○ OK
- ○ Not OK
- ○ Not Sure
- ○ Need Expert Advice

If the bottom of a post is fastened to its post base connector with screws that have heads smaller than ½" across, they are probably too small to hold the post down even if there are several of them. Replacing them with a 3/8" diameter bolt is not costly. Consider just adding bolts without removing existing ones if they are difficult to remove.



HOW MUCH

$	$50 or less
$$	$50 - $100
$$$	$100 - $250
$$$$	$250 - $500
$$$$$	$500 - $1,000
$$$$$$	$1,000 or more



Attachments at Tops of Posts

E BOLTS ($)

- ○ OK
- ○ Not OK
- ○ Not Sure
- ○ Need Expert Advice

If the top of the posts are connected with bolts to a beam that runs parallel to the carport eave, the bolts should be 3/8" diameter or larger, and free of rust. Rusted bolts are inexpensive to replace but it may be necessary to cut the old bolts if they are so rusted that you can't remove the nuts.

F METAL BRACKETS ($)

- ○ OK
- ○ Not OK
- ○ Not Sure
- ○ Need Expert Advice

If metal brackets are used at the top of posts to connect to beams and they are made of thin sheet metal (less than 1/8" thick), that metal is not strong enough to hold down the beam in a severe wind storm. They should be replaced with ones that are at least 1/8" thick, which is a reasonable cost.

Posts and Eave Beam

G POST SIZE AND CONDITION ($$$)

- ○ OK
- ○ Not OK
- ○ Not Sure
- ○ Need Expert Advice

Round posts less than 2" in diameter, or square posts less than 2" on a side are likely too thin and too weak to hold down a carport roof in a moderate wind storm. Also, any damaged posts should be repaired or preferably replaced. Fortunately, post replacement is not that difficult and can be done at a reasonable and almost always justifiable cost. You will likely also need to replace the brackets/hardware used to connect the tops and bottoms of the posts.

H BEAM SIZE ($$$$)

- ○ OK
- ○ Not OK
- ○ Not Sure
- ○ Need Expert Advice

Smaller beams require a closer spacing of posts in order to keep the roof from buckling upward between the posts in a strong wind storm. If the beam where the posts are connected is an angle as shown in Figure 16, or a round beam as shown in Figure 29, you should consider installing a replacement beam or supplementing the existing beam with a new one and installing the number of posts appropriate for the new or replacement beam size for your location and wind exposure. This will have to be determined by a knowledgeable carport installer using current design information. Note that a new installation will likely include the beam plus new posts, brackets to anchor the posts, and fasteners to attach the roof pans to the beam.

Roof Panel Attachment to Eave Beam

I ROOF PANEL SCREWS ($)

- ○ OK
- ○ Not OK
- ○ Not Sure
- ○ Need Expert Advice

Using a ladder, you can see the heads of screws used to attach the roof pans to the eave beam. Ideally, there should be at least 3 screws with special metal/neoprene combination washers (see Figure 32) attaching each 8" wide roof panel and 4 screws with these washers attaching each 12" wide panel. If there are not that many, or the screws do not have the special washers, additional fasteners (#10 size) with these washers should be added. The screws with special washers cost about $20 for 100. Even if you find out the roof pans are likely to buckle in a strong wind event, improving the connection of the pans at the eave is a low cost item and worth doing as it may help your carport survive if the winds don't get too strong.

Attachment to the Home

J ATTACHMENT OF CARPORT/ STRUCTURE TO HOME ($$$$)

- ○ OK
- ○ Not OK
- ○ Not Sure
- ○ Need Expert Advice

Look for a row of posts and a beam near the house that supports the carport roof (this is referred to as a 4th wall), or a special beam that was provided by the home builder to support the attachment of a carport. Building codes in Florida require that carports attached to factory-built manufactured homes have a 4th wall unless the home manufacturer specifically provided an attachment point that was designed to support the edge of the carport at the home. Unfortunately, the connection of the carport to a home may be difficult to evaluate because the actual connection lumber, aluminum beams, and hardware may be hidden from view underneath roofing or flashing. If you do not know whether the manufacturer provided the required attachment structure, and you do not see a beam and posts near the home supporting that edge of the carport roof, it would be prudent to have the connection evaluated and/or consider adding a beam and posts so that the carport is adequately supported against uplift, thus reducing the risk to the home. If the carport roof rips away from the home, it may take flashing, siding, and possibly roof sheathing with it (see Figure 28), and create an opening or hole exposing your home to wind and water that could destroy interior finishes and the contents of your home.

Strength/Buckling of Roof Pans

K FRAMING ($$$$$-$$$$$$)

- ○ OK
- ○ Not OK
- ○ Not Sure
- ○ Need Expert Advice

Determine what type of metal roof is used on the carport.

- Is it made of insulated pans (rigid foam insulation with metal glued to both the top and bottom surfaces)?
- Is it made of thin gage metal pans that snap together or overlap at vertical ribs and usually referred to as pans because of the vertical edges (flat or W shaped pans with vertical ribs at the edges of the pans)?
- Does it have two layers of metal pans with loose rigid insulation between the metal pans – these have been known as composite or sandwich pans?

Once you know what type of roof you have, try to determine the thickness of the insulated pans or the height of ribs at the edges of the flat or W pans. Typical insulated pans are 3", 4", 5" or 6" thick. Older flat pans frequently had vertical edges that were only 1-3/4" tall while most new pans have ribs that are 3" tall.

Insulated pans with metal glued on both sides are stronger than thin type pans and are capable of spanning much greater distances between support beams (often 1.5 to 2.0 times the span allowed for thin type pans. A 3" thick insulated panel will likely do well resisting wind uplift buckling for spans up to 12' when winds are less than about 110 mph. Thicker insulated pans will do even better.

If you have flat or W metal pans or sandwich pans where the metal is not glued to the foam insulation, you need to be much more concerned about how these pans are held down. Many pans are supported at the wall of the house and by some sort of beam at the eave away from the house. If that distance is more than 6' to 8', and there isn't another beam supporting the pans midway between the wall and the eave, you should have the roof pans evaluated by a knowledgeable contractor. It is possible to add structural supports under the pans and screw down the pans to those supports. This will significantly increase the wind resistance of the roof. A knowledgeable contractor will know how to frame this up to provide adequate support. Unfortunately, it may not be possible to provide this additional framing unless the eave beam and posts also are replaced and the support of a 4th wall is also added. The cost for framing alone is very expensive, and replacing eave beams and posts and adding a fourth wall in addition to the framing is extremely expensive.

Purchasing New Attached Structures

- ✓ If adding a carport or any attached structure, IBHS engineers recommend purchasing one with the highest wind rating (known as "design wind speed" on labels and specifications) that is affordable. Increasing the "design wind speed" by 10 mph will actually increase the strength of the carport or other attached structure by about 20 %.

- ✓ An attached structure with a high wind-rated thin metal panel roof should have a support structure under the roof, so that the unsupported span of the pans is no more than about 6'.

- ✓ An insulated panel roof with metal glued to both sides of a foam core will be stronger than a thin metal roof and may allow you to avoid extra structure that would be needed to improve the wind resistance of a carport with thin pans. Insulated pans also will keep the area under the roof cooler in the summer.

- ✓ Insist on #10 (or larger) TEK screws with combination metal-neoprene washers for all attachments of roof pans to framing posts and insist that the screws be spaced no more than 4" apart across the panel. Don't let the contractor simply use small screws without these special washers for these connections.

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