



America's Favorite Garage Doors™

Technically Speaking

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Introduction

Building code officials, builders, insurance companies and homeowners are increasingly aware of the need for structures to withstand high winds resulting from hurricanes, tropical storms and other weather related events. With the introduction and adoption of the International Building Code in most areas of the U.S., wind load is no longer an issue exclusively in Florida and other hurricane prone areas.

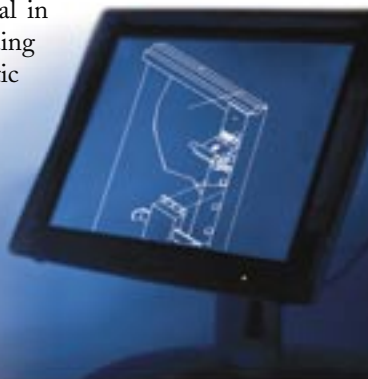
Clopay Building Products has created a user-friendly system for selecting the right garage door for your area and building structure. Clopay Building Products is the leader in the garage door industry and is committed to designing, testing and providing the most complete line of code-compliant products.



Building Codes and Windloads

Most building codes used in the U.S. today are based on the International Building Code (IBC). Even those jurisdictions having their own statewide building code (incl. Florida, North Carolina and Texas) use the same wind load provisions found in the IBC. All building codes in the U.S. use the engineering standard ASCE7 for wind load design and calculations. ASCE is the American Society of Civil Engineers and their standard #7 is titled "Minimum Design Loads for Buildings and Other Structures". ASCE7-98 (issued in 1998) and the newest revision, ASCE7-02 (issued in 2002) utilize the same wind load calculation method.

The final authority on building code interpretation is the "authority having jurisdiction" (AHJ). The AHJ could be the state building official, county building official or city building official in which a building resides. Building code changes are not automatic but must be approved by the AHJ through an approved resolution or bill.



Wind Speed and Wind Pressure

The International Building Code (and ASCE7) includes a wind speed map based on data compiled by the National Weather Service (NWS). The NWS records data at airfields 33' (10 meters) from the ground and is based on '3-second gusts'. The '3-second gust' wind speeds range from 85 MPH to 175 MPH. See Figure 1.

Wind speed is converted to design pressure and measured in pounds per square foot (PSF) to develop a product rating. Since the NWS measures wind speed in open field conditions (i.e. airfields), structures located in urban, suburban, or wooded areas (where the effects of the wind are broken up by the terrain), the design pressures will be less than if the structure is located in an open field or along a body of water. In the IBC and ASCE7 this terrain effect is called the exposure level. Exposure B is used in most situations (urban, suburban, and wooded areas) and Exposure C is generally used in open land with few obstructions or within 1500 feet of the coastline.

Buildings with roof heights of less than 30' have lower design pressures than those 30' high and above.

Wind pressure on a structure will be positive (windward) and negative (leeward), depending on the direction of the wind and the orientation of the building on the site. For that reason, wind speeds are converted to both positive and negative design pressures, and products are tested in both positive and negative directions as well.

Wind Load Testing

Wind load testing for garage doors is performed by the nationally recognized American Society for Testing and Materials (ASTM) test standard E330. ASTM E330 (and its garage door industry related test standard DASMA 108) tests garage doors to a pressure (PSF), not a wind speed. Depending on the orientation of the reinforcement, the door is tested to a maximum width, therefore doors smaller than the maximum width tested will also meet the same design loads. Since Clopay Building Products utilizes horizontal reinforcement (struts, C-channels), taller doors are not required to be retested to the same wind load pressure as each section is reinforced exactly like the section below. Doors with lesser sizes will meet the test loads of the larger door size.

Test protocols (ASTM E330 and DASMA 108) require a 50% safety factor over the design load pressures.

Clopay Building Products Company has a full scale, state-of-the-art wind load chamber at its Technical Center in Mason, Ohio designed to perform testing according to the ASTM E330 and DASMA 108 standards. Clopay's wind load chamber is capable of testing garage doors in sizes up to 20'2" wide, from the lowest pressures to over 100 PSF. All Clopay Building Products Company certified wind load tests are witnessed by an independent, licensed Professional Engineer to certify the wind load testing is performed to the test standards. In addition, Clopay WindCode doors are designed by a staff headed by a licensed Professional Engineer employed at our Technical Center. Clopay's engineering team has dozens of years of cumulative wind load design experience with testing conducted on hundreds of doors. As required, supplemental certified wind load testing is performed at outside laboratories, including windborne debris testing per the Florida Building Code.

DASMA Wind Load Guides

The Door and Access Systems Manufacturers Association (DASMA) assists its industry members in providing information regarding building codes and garage doors, particularly wind loads. As part of this program DASMA has published several wind load guides for different building codes. Each DASMA wind load guide contains information on wind speeds, roof heights, door sizes, and exposure levels (terrain). The notes on the bottom of each DASMA wind load guide contains the parameters from which the guide was calculated. DASMA wind load guides can be obtained at www.dasma.com.

Clopay WindCode® System

Clopay has a wide selection of garage doors designed to meet many different code requirements. To meet the applicable code, choose a door meeting those requirements or, if not available, choose a higher rated door. Clopay has developed a "W" rating system for its wind load rated products. The higher the "W" rating, the higher the pressure rating of the door. This rating is added to the model number of the door (e.g. Model 4050W5). See Figure 2 for the garage door selection guide using the Clopay "W" rating system. Local requirements and construction details can affect the actual selection process, therefore confirm the pressure rating with the building code authority.

To select the correct "W" rated door for your structure you will need to know the following:

- The code jurisdiction the structure is in.
- The wind speed from the map in Figure 1.
- Structure exposure B or C.
- The mean roof height of the building.

Using that information, follow the selection guide in Figure 2 to determine the correct "W" rating. There are variables that may affect the final WindCode® selection so check with your local building official or design professional for specific requirements.

IMPORTANT!

PSF not MPH!

Comparing wind loaded doors in miles per hour (MPH) rather than pounds per square foot (PSF) doesn't work- and here's why: Job-site conditions can affect how wind pressure affects a structure. Variables such as mean roof height, opening size, the proximity of the opening to the corner of the structure, the use of the building and even the nature of the surrounding terrain all are part of the calculating the design pressure for a given building. It is because of all these variables, that building officials are increasingly requiring that the building engineer or architect include the design wind load pressures for each building opening into their building plans. Pressures provide the actual performance of the product under controlled conditions, allowing for easier product comparisons and less confusion.

Clopay Product Availability

Drawings, Jamb Attachment and Supporting Structure

Clopay Building Products has wind load product drawings for each of its WindCode® door models. Included with the wind load drawing is information about the door sections, horizontal reinforcement, door hardware (e.g. hinges), track, and pressures. Also included is jamb attachment information about how the jambs are attached to ensure that the wind load pressures on the door are successfully transmitted to the building's structure. However, how the supporting structure is designed to resist these wind loads is the responsibility of the licensed architect or engineer for the building, not the garage door installer or garage door manufacturer.

The Clopay WindCode® Advantage

Clopay Building Products Company is an industry leader in building code issues. We are well represented on industry committees and actively participate in building code development at the state and local level. Our extensive line of tested and approved WindCode® products will provide you with the right garage door to meet the building codes in your area.

IMPORTANT!

Design vs. Test Loads

The pressure ratings are based on design pressures, not the test pressures.

Figure 1

Notes:

1. Values are nominal design 3-second gust wind speeds in miles per hour (m/s) at 33 ft (10 m) above ground for Exposure C category.
2. Linear interpolation between wind contours is permitted.
3. Islands and coastal areas outside the last contour shall use the last wind speed contour of the coastal area.
4. Mountainous terrain, gorges, ocean promontories, and special wind regions shall be examined for unusual wind conditions.

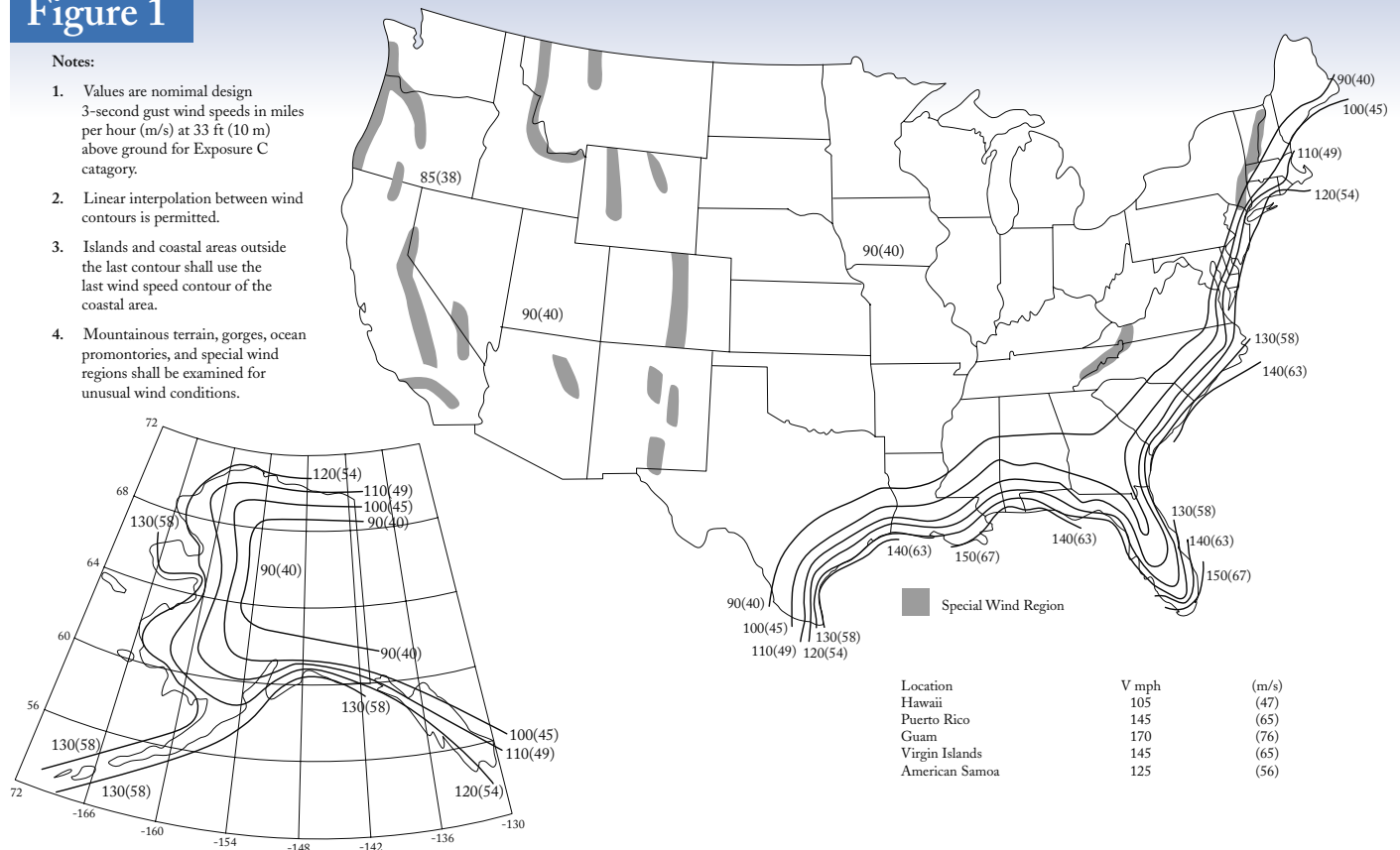


Figure 2 WindCode® Garage Door Selection Guide

The charts below are intended as a reference only. Please refer to the specific windload guides and engineering drawings to match your application with a specific door.

International Building Code or Florida Building Code (ASCE7) - (Exposure B**)

Mean Roof Height	90 MPH	100 MPH	110 MPH	120 MPH	130 MPH	140 MPH	150 MPH
15' One-story	W1	W2/W3	W3	W4	W5	W6	W7
25' Two-story	W1	W2/W3	W3	W4	W5	W6	W7

International Building Code or Florida Building Code (ASCE7) - (Exposure C***)

Mean Roof Height	90 MPH	100 MPH	110 MPH	120 MPH	130 MPH	140 MPH*	146 MPH*	150 MPH
15' One-story	W3/W4	W3/W4	W4	W5	W6	W7	W7	W8
25' Two-story	W4	W4	W5	W6	W7	W7	W8/W9	W8/W9

* Broward County, Florida is 140 MPH and Miami-Dade County, Florida is 146 MPH, exposure C only.

** Exposure B is defined as urban and suburban areas, wooded areas, or other terrain with numerous closely spaced obstructions. Exposure B is assumed unless building site meets the definition of another exposure.

*** Exposure C is defined as open terrain with scattered obstructions including flat open ground, grasslands and shorelines in hurricane prone regions, and all of Miami-Dade and Broward County is exposure C.



Glossary

ASTM E330

The testing standard used in the garage door industry. Also known as uniform static air pressure testing. This standard was developed by the American Society for Testing and Materials (ASTM) to allow products to be measured in air pressure chambers.

ASCE7

Design standard developed by the American Society of Civil Engineers titled "Minimum Design Loads for Buildings and Other Structures". Section 6 of this standard deals with wind loads. ASCE7 is the basis for wind load calculations used in most building codes.

International Building Code

Model building code developed by the International Code Council. Most of the U.S. has adopted this building code (sometimes with slight, locally adopted variations). The wind load provisions in this code specifically call out ASCE7 to be using in wind load calculations.

Design Pressure

The measurement of resistance in both positive and negative directions that a door system must withstand. Design Pressures are usually expressed in both positive (PSF+) and negative (PSF-) values. Also known as design load.

Test Pressure

The actual tested wind pressure resistance that a door system will withstand during laboratory testing. Most building officials usually require that the test pressure to be equal to 150% of the design pressure. Also known as test load.

3-Second Gust

How wind is measured by the National Weather Service. This data is then compiled into wind maps incorporated into ASCE7 and the International Building Code. The wind speed maps are based on a yearly 2% probability of occurrence (50-year average peak wind).

Mean Roof Height

The height above grade level of the midpoint of the a roof. Mean Roof Height is calculated by averaging the eave and ridge heights, and is used as part of design pressure calculations in both ASCE7 and the International Building Code.

Wind Velocity

The actual measured speed of airflow during a wind event; usually expressed in MPH. Wind Velocity is typically measured at 33 feet (10 meters) above ground level at airports and similar open-country locations.

WindCode®

The registered name for all Clopay Building Products garage door products designed and tested to comply with wind resistance requirements of local, state, and national building codes. The WindCode® program includes Engineering, Marketing and Sales efforts designed to assist Clopay's customers understand code issues and to offer the best products for their market.

Wind Load

An engineering term related to pressures placed on a structure or component from weather events such as thunderstorms, hurricanes, and tornadoes. Wind Load is both a positive and negative force depending on the direction of the wind in relation to the orientation of the structure.

