Metal Roof Panel HVHZ Deflection Limits
Increasing in 2017 Florida Building Code

Vincent E. Sagan, P.E., Senior Staff Engineer, Metal Building Manufactures Association, and Dale Nelson, Chair, Metal Construction Association

The code change process for the Sixth Edition of the Florida Building Code is underway. The Fifth Edition Florida Building Codes, which became effective on June 30, 2015, are accessible online for free at http://floridabuilding2.iccsafe.org/. The purpose of this article is to inform contractors, engineers, and building officials of some of the changes significantly affecting metal roofing. When the Sixth Edition of the Florida Building Code becomes effective in 2017, metal roofing designs on buildings located in the High Velocity Hurricane Zone (HVHZ) of south Florida will be subject to new deflection limits. Deflection limits, or how much a member is permitted to deflect between supports, and not strength, surprisingly controls the design of structural metal roofing on buildings in the HVHZ. These limits reduce the usable structural capacity of metal roofing.

Deflection Limits in the Florida Building Code
Deflection limits applicable to metal roofing in the Florida Building Code can be found in three locations: Section 1604.3, specifically Table 1604.3 Deflection Limits, Section 1616.3.1, and Section 2222.4.4. Section 1604.3 is applicable to the entire state of Florida except the HVHZ, while the last two sections are applicable only to HVHZ.

Table 1604.3 includes multiple footnotes. Footnote "a" applies to metal roofing, which states:

For structural roofing and siding made of formed metal sheets, the total load deflection shall not exceed L/60. For secondary roof structural members supporting formed metal roofing, the live load deflection shall not exceed L/150. For secondary wall members supporting formed metal siding, the design wind load deflection shall not exceed L/90. For roofs, this exception only applies when the metal sheets have no roof covering.

Note that "L" is length of the member between supports. These provisions were first introduced in the 1988 and 1991 Standard Building Code, one of the predecessor codes of the International Building Code (IBC). The IBC is the base code for the Florida Building Code.

The HVHZ provisions are a result of the effects of Hurricane Andrew in 1992. Recommendations following that hurricane included limiting deflections of metal roof and wall panels to L/240, where L is the length of the panel between supports.

In Section 1616.3.1, Allowable Deflections, there is nothing specific for metal roof panels. For roof members, the allowable deflection limits are:

1. Roof and ceiling or components supporting plaster L/360
2. Roof members or components not supporting plaster under L/240

These limits are similar to those in Table 1604.3. HVHZ provisions for deflection limits for metal panels are found in Chapter 22.

TAS 125, Standard Requirements for Metal Roofing Systems, covers “...the testing requirements for structural and non-structural (architectural) metal roofing systems and the approval process for all systems, which have successfully met the testing criteria.” TAS 125 includes a deflection limit for metal panels in Section 5.1.1 Structural Metal Roofing Systems, as shown below:

Deflection of structural metal roof panels shall not exceed L/240.

These building code deflection limits, when applied to metal roof panels installed with a typical span of 5 feet, result in the following deflections:

L/360 = 0.17 inches
L/240 = 0.25 inches
L/150 = 0.40 inches
L/90 = 0.67 inches
L/60 = 1.00 inches

Summary of Changes
The actual code changes affect three sections of the HVHZ provisions, two in the building code, Section 1616.3.1 and Section 2222.4.4, and one in TAS 125.
The Preferred Choice of Roof Vacuming

Serving the Southeast for over 30 Years!

Dedicated to the Roofing Industry with a full line of Roof Vacuuming Services:

- Ballast Removal
- One Pass Dry Vacuum
- Wet Vacuum

800-762-8361

FREE QUOTE Call or email today

We strive to provide the most reliable roof preparation in the business. RK’s experience, technology, and timeliness permit us to handle numerous projects at a time and we are available 364 days a year. RK is setting the standard in roof vacuuming services.

Section 1616.3.1 is located in Section 1616, High-Velocity Hurricane Zones - General, Deflection, Volume Changes and Minimum Loads. Within Section 1616.3 Deflection, Section 1616.3.1 addresses allowable deflection and consists of a list of twelve structural members and components and a corresponding maximum deflection. The revision adds a new item for structural metal roof panels of cold-formed steel construction in order to not create a conflict with changes in Section 2222.4.4, as shown below:

1616.3.1 Allowable deflections. The deflection of any structural member or component when subjected to live, wind and other superimposed loads set forth herein shall not exceed the following:

1. Roof and ceiling or components supporting plaster L/360
2. Roof members or components not supporting plaster under L/240
3. Structural metal roof panels of cold-formed steel construction L/180

The remaining nine items in the list are renumbered. Section 2222.4.4 is part of Section 2222, High-Velocity Hurricane Zones - Cold-Formed Steel Construction, and is a subsection of Section 2222.4, Structural Sheets. The code changes the deflection limit for structural metal roof panels from L/240 to L/180, as shown below.

2222.4.4 Deflection of metal siding and roof panels shall not exceed L/240.

2222.4.4.1 Deflection of structural metal siding shall not exceed L/240.

2222.4.4.2 Deflection of structural metal roof panels shall not exceed L/180.

The code change in TAS 125, Standard Requirements for Metal Roofing Systems, modifies the second bullet of Section 5.1.1 Structural Metal Roofing System, as shown below:

Deflection of structural metal roof panels shall not exceed L/240 L/180.

The resulting change for structural metal roof panels installed with a typical span of five feet is an increase in the allowable deflection, from 0.25 inches to 0.33 inches.

Figure 1: Standing seam metal roof testing at the FIU Wall of Wind.
Code Change Process

The process to change the HVHZ deflection limits started several years ago with a meeting between industry representatives and Miami-Dade County building officials. The changes would not have been possible without the assistance of Miami-Dade County building officials. Their assistance included multiple meetings with industry representatives, including the Metal Construction Association (MCA) and the Metal Building Manufacturers Association (MBMA) to discuss the HVHZ deflection limits and what testing would be required to justify their revision. They also provided input on the development of a testing protocol and observed testing.

The current code change process started in 2015, when proposed modifications to the Florida Building Code were accepted from July 1, 2015 to January 3, 2016. MBMA submitted two code modifications that would revise the HVHZ deflection limits for structural metal roof panels. One revised the building code, while the other revised TAS 125.

There were two comment periods, followed by Technical Advisory Committee (TAC) hearings. The proposed modifications were assigned to the Structural TAC. At the end of this process, the Structural TAC recommended that the modifications be approved as submitted. On August 16, 2016, the Florida Building Commission accepted the Structural TAC’s recommendation and approved both modified modifications unanimously.

According to the schedule provided by the Department of Business and Professional Regulation, the Sixth Edition of the Florida Building Code will be effective December 31, 2017, six months after publication.

Justification for the Changes

In order to justify the changes, testing was performed to demonstrate the performance of standing seam metal roofs. There were two phases of testing, the first being to demonstrate the strength and resiliency of standing seam metal roofs when subjected to hurricane magnitude winds. Testing was performed in the Wall of Wind facility at the International Hurricane Research Center at Florida International University (FIU). Both vertical rib and trapezoidal standing seam roofs sustained wind speeds of 145 mph before failure (see figure 1 on page 12).

The purpose of the second phase of testing was to demonstrate the ability of standing seam roof panels to resist leakage when deflected greater than the HVHZ limit of L/240. In the FIU testing, it was observed that the trapezoidal panel experienced greater deflections and more localized buckling than the vertical rib panel. Therefore, only a trapezoidal panel was tested in the second phase. A testing protocol was developed, with input from Miami-Dade County building officials, to evaluate the likelihood of water intrusion when the panel experiences measured deflections under an actual wind uplift event. The protocol required no leakage to occur for six hours when subjected to the target deflection and six inches of water head (see Figure 2 next page).
Impact of Code Modifications

What will be the impact of the code modifications? The changes are limited to High Velocity Hurricane Zone, which is defined in the Florida Building Code as Broward and Dade Counties. These counties are located in south Florida and include the cities of Ft. Lauderdale and Miami. The rest of Florida is unaffected.

These modifications may result in the following:

- Support framing spacing may be increased, especially in corners and along edges of metal roof systems.
- Structural metal roof panels may be thinner, but not thinner than 24 gauge in accordance with the HVHZ provisions.
- Metal roof designs may be more similar to designs used in the rest of the state.
- More roofing products may be able to pass the TAS 125 testing, allowing for more options to building owners.

However, the wind load provisions are changing with each edition of ASCE 7, which is adopted by the International Building Code, the base code for the Florida Building Code. Increases are expected in the component and cladding wind loads in roof corners and edges for
buildings located in hurricane zones, so these impacts may be short lived.

What is Not Changing
It is important to note what is not changing in the Sixth Edition of the Florida Building Code regarding metal panels:

- Metal siding/wall panels deflection limit is L/240 in the HVHZ (Section 2222.4.4).
- Metal panel minimum thickness shall not be less than 24 gauge (Section 2222.4.3).
- The panels need to be tested and pass the requirements of TAS 125.
- The resistance to uplift pressure of structural metal roof panels, as determined in compliance with ASTM E 1592, shall be subject to a margin of safety of 2. (TAS 125, Section 5.1.1).

In addition, deflection limits for non-structural metal roof panels have not been changed.

Summary
Changes in the next edition of the Florida Building Code should not be a surprise. However, the changes in the HVHZ deflection limits for structural metal roof panels are significant, which increase the usable structural capacity of metal roof panels, and may result in more economical roofs and more options for building owners.

Vincent E. Sagan, P.E., is Senior Staff Engineer for the Metal Buildings Manufacturers Association (MBMA). He is responsible for the administration of metal building industry research and engineering projects, and interacting with United States code and standards organizations. He represents MBMA on several technical committees, including AISC Committee on Specifications for the Design of Cold-Formed Steel Structural Members and ASCE 7 Subcommittee on Snow and Rain Loads. Vince has a Master of Science degree in structural engineering from Cornell University, and over 25 years of experience in all phases of investigation, design, and construction of buildings and other structures.

Dale Nelson is the President of Roof Hugger, Inc., Tampa, Florida. Dale holds a Class-A Florida Contractors License and has been in general contracting since 1973, constructing commercial and industrial buildings of all construction types, including wood column and beam, masonry, formed and poured, tilt-wall, and pre-engineered steel buildings. Roof Hugger, founded in 1991, is a nationally recognized manufacturer of retro-fit framing systems for existing metal roofed buildings.

FRSA’s Convention and the Florida Roofing & Sheet Metal Expo
June 22-24, 2017
Hyatt Regency Orlando

FRM

Serving Up the Industry’s Best Classified Ads Since 2002
Order One Today!
www.rooferscoffeeshop.com