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How to Prevent Cracks from Driving You Up the Wall

Deflection is the amount of displacement when a force is applied to a member. The displacement could be frame drift when the wind blows or purlin movement when someone is walking on the roof. When metal buildings are supporting brittle material (brick, masonry, glass, plaster, drywall, etc), deflections of the building may need to be limited for better performance.

The standard metal building with metal panels on the roof and wall will typically have a horizontal 10-year wind lateral drift (sidesway) limit of H/60. The variable, H, is depicted in Figure 1 and represents the eave height in this example. If we have a 14ft eave height, the maximum allowable 10-year wind sidesway of the frames is 2.8 inches (14ft * 12 in/ft ÷ 60). This same lateral drift may lead to performance issues of brittle materials. Consulting the Design Professional responsible for these materials is key to getting the desired performance.

The most common ways to control sidesway is to add steel into the frames. This may include deepening columns and rafters and/or widening/thickening flanges.
Another method of controlling sidesway is utilizing fixed based columns.
This method will be discussed in a future *Tips from Engineering*.
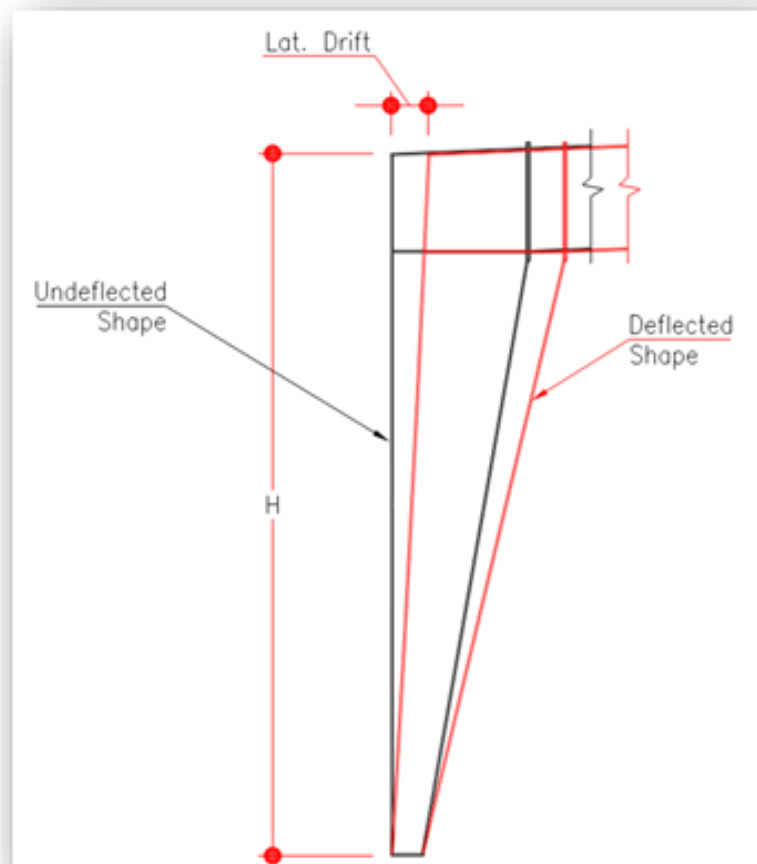

Figure 1 - Frame Lateral Drift (sidesway)

See the example below.

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Example

Framing Type: Rigid Modular Single-Slope (4@28')
Wind Speed = 115mph
Building Width: 76'-0"
Building Low Eave Height: 14'-0"
Slope: 0.375:12

	H/60	H/200
10-yr wind Sidesway Required		
Frame Weight	2,730 lbs	4,026 lbs

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Metal buildings can provide an economical design, but the flexibility of the building is unique. When brittle materials become part of the finished building product, more stringent deflections limits may be necessary. Working closely with the Engineer of Record, or other responsible Design Professional, will help to get the desired performance of the building.