The Truth About Louvers and Wind

Do louvers really reduce wind loads on a structure?

March 2015

Louvers look great on an equipment screen or as an architectural feature on a building, and are a favorite among designers and architects when a high-end, streamlined aesthetic is desired. But the big question that comes up almost every time is “will it reduce the wind load?” The typical thinking is that since louvers allow air to pass between the blades, their use must result in less wind pressure on the structure. With less pressure on the structure, fewer supports would be required resulting in lower costs. Seems logical, but it isn’t quite that simple.

Defining the term wind load

Wind load, sometimes referred to as design pressure, is an amount of force measured in pounds per square foot, applied to a surface. When designing for construction, rules for how to calculate and apply wind loads to a structure are detailed in ASCE’s Standard 7-10 Minimum Design Loads for Buildings and Other Structures, which is adopted by the International Building Code (IBC). Some of the parameters used in determining the exact wind load (psf) for a particular project are wind speed, building height, wind exposure and risk category. Once this psf wind load is determined, it is never reduced based on the type of structure it is applied to (e.g. louvered equipment screen). However, how that psf wind load is applied to the surface will determine whether some reduction in aggregate load on the structure can be justified.

Applying wind load to louvers

There are 3 basic methods people use to apply wind loads to louvers. Each one is explained below, with emphasis on the first because it is the most common, and most accepted by engineers, building officials and other governing agencies.

1. Analytical Procedure

The most common and widely accepted method for applying wind loads to louvers is to follow the guidelines in ASCE7-10, Chapter 30 - Components and Cladding. This is the same category used for solid wall panels. This section stipulates that the wind load (psf) is to be applied to the area of all exposed members and elements projected on a plane normal (perpendicular) to the wind direction.

The illustration in Figure 1 shows 6” high louvers configured so that the top of one louver is even with the bottom of the next. In this case, the wind load needs to be applied to the whole 18” height as if it was a solid panel. Even though wind can pass through the louvers, as illustrated by the curved
arrows, without open area perpendicular to the wind direction, the Code won’t allow a reduction. Wind is also applied to the 5” surface in the vertical direction.

In Figure 2, the louvers have been spaced to allow a 2” gap between the top of one louver to the bottom of the next. This allows wind to pass straight through, unobstructed. In this configuration the wind load would be applied to the 6” louver surfaces and not to the 2” gaps. The total height of the configuration is 22”, but wind load is only applied to 18” – a reduction of 18.2%.

Louvers can be spaced as far apart as desired to gain relief from the wind load on the structure. However, this also reduces the vision barrier which is often a primary objective of a louver system. One way to mitigate the ability to see through the louvers is to calculate line-of-sight. Assuming the louvers are at an elevation which is higher than the viewing public, it may not be possible to see through the gaps between louvers. This will be dependent on the installation height, louver blade spacing and distance (see Figure 3).
2. **Wind Tunnel Testing**

ASCE7-10 does allow wind tunnel testing to determine the actual effects on louvers for a specific configuration as outlined in Chapter 31. This is physical testing (not computer simulations) typically requiring test sections 6’ to 12’ wide by 6’ to 10’ high, and 50’ to 100’ long. The procedures for wind tunnel testing are very specific, as are the rules for interpreting and applying the results.

For wind tunnel tests to comply with the Code, the test model must represent the conditions and configuration of the actual product installation. This means that not only does the model need to be properly scaled, but other environmental conditions like surrounding obstructions, surface roughness, openings, gaps, proximity to walls & building edges, etc., need to be considered and addressed in the model.

Wind tunnel testing can yield wind loads that are significantly lower than those required by the analytical procedure. However, the Code limits the pressure determined by wind tunnel testing to not less than 80%* of those calculated using the analytical method outlined in Chapter 30.
With such specific rules for configuring wind tunnel test models, along with the limitations in the Code for allowable pressure reductions, the practicality of using this method for general application is greatly diminished.

*The limiting value of 80% may be reduced to 65% if certain conditions are met. See ASCE7-10, Chapter 31 for more information.

3. **Computational Fluid Dynamics**

Some louver manufacturers use Computational Fluid Dynamics (CFD) to justify pressures and wind load reductions on their products. CFD is the use of applied mathematics, physics and computational software to visualize how gas or liquid flows past and affects objects. This method is not recognized as an acceptable approach by ASCE and therefore cannot be used for construction applications regulated by the IBC.

**Summary**

So the answer to the question posed in the subtitle of this article “Do louvers really reduce wind loads on a structure” is *it depends*. When configured with open space between louver blades, the answer is yes. But you also pay a price by giving up some of the vision barrier. If louvers are being chosen for the sole purpose of reducing wind loads to save money, you’re probably not going to get there, at least not without sacrificing much of the vision barrier to do it. Louvers are more expensive than most other types of metal siding that could be used instead. But if the choice to use louvers is more for the architectural look, configuring the blades to allow some wind reduction, while maintaining adequate vision barrier, may serve to make a louver project more economical.