Designing for Wind

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The complete text of this, the first in a series of articles to assist the truss designer in determining appropriate design parameters when developing designs for wood and light-gage steel trusses for environmental loads (such as wind and snow), is on the CD attached and online at www.alpeng.com/windarticle.

Here is a short summary:
Before beginning, the truss designer should get as much loading information as possible from the building designer, who is responsible for producing the structural design documents and providing all the information necessary to develop the design of the trusses in the building.

Use the Appropriate Load Standard
It's necessary to abide by the governing building code for the jurisdiction where the project is located. Each code references a version of ASCE7 in the design of a structure. Knowing which code has been adopted allows you to determine which version of ASCE7 to use.

Use the Appropriate Analysis Method
ASCE7 outlines two methods for calculating wind pressures – Main Wind Force Resisting System and Components & Cladding.

Use the Correct Wind Speed
ASCE7 and most building codes contain a wind speed map developed by ASCE's Task Committee on Wind Loads.

Building Enclosure Type
The size and location of openings in a building determines whether it is considered a closed building, a partially enclosed building or an open building. This determination is used to calculate the wind pressure on the inside of the building that acts against the underside of the ceiling or roof sheathing.

Building Usage
The intended usage of a building determines the importance factor used in the calculation of the wind pressures. The more people expected to occupy a building, the higher the importance factor, which results in higher wind pressures.

Building Exposure
The surrounding area will affect the resulting wind pressures on the structure. Flat areas or adjacent large bodies of water increase wind pressures. Conversely, structures or trees surrounding the building result in decreased wind pressures because they tend to obstruct the wind.

Mean Roof Height
The distance from the ground to a point midway between the roof eave and roof peak is referred to as the mean roof height. This information is necessary because, as the elevation of the exposed roof surface increases, the calculated wind pressures increase.

Wind Dead Loads
Design dead loads used in the gravity load cases are typically increased due to the uncertainty of the materials used and their actual weight, and the possible addition of materials, such as the application of a second or third layer of roofing shingles.

Load Duration Factor
If you're familiar with wood design, you know that the strength of a wood member is dependant on the length of time that member is required to support a given load. The shorter the time, the greater the load duration factor that is applied to the wood members.

Location of the Truss in the Roof System
Roof surfaces near eaves, peaks and ends of buildings are subject to increased wind pressures from the turbulence caused by areas of discontinuity in the roof profile. The size of the increased wind pressure zone is determined by the roof' dimensions.
Finally, be aware of the truss surfaces that are exposed to wind pressures. Be sure to make the proper selections in your truss design software to indicate surfaces that are exposed to wind.