

March 2020

Make Building Enclosure a Breeze

Wind Enclosure for IBC 2015 and prior are classified by three different terms: Open, Enclosed, and Partially Enclosed. In ASCE7-16 (IBC 2018), the code added a fourth term, Partially Open. Each condition only impacts the internal pressure felt by the building. For the purpose of this document, “Opening(s)” refers to holes in the building envelope that allow air to flow through the building, and that are designed as “open” during design winds. This includes framed openings and wall deletion materials that are not specifically designed to withstand the wind loads required.

Building Wind Enclosure definitions for ASCE7-16:

Table 26.13-1 Main Wind Force Resisting System and Components and Cladding (All Heights): Internal Pressure Coefficient, (GC_{pi}), for Enclosed, Partially Enclosed, Partially Open, and Open Buildings (Walls and Roof)

Enclosure Classification	Criteria for Enclosure Classification	Internal Pressure	Internal Pressure Coefficient, (GC_{pi})
Enclosed buildings	A_o is less than the smaller of $0.01A_g$ or 4 sq ft (0.37 m) and $A_{oi}/A_{gi} \leq 0.2$	Moderate	+0.18 -0.18
Partially enclosed buildings	$A_o > 1.1A_{oi}$ and $A_o >$ the lesser of $0.01A_g$ or 4 sq ft (0.37 m) and $A_{oi}/A_{gi} \leq 0.2$	High	+0.55 -0.55
Partially open buildings	A building that does not comply with Enclosed, Partially Enclosed, or Open classifications	Moderate	+0.18 -0.18
Open buildings	Each wall is at least 80% open	Negligible	0.00

Notes

1. Plus and minus signs signify pressures acting toward and away from the internal surfaces, respectively.
2. Values of (GC_{pi}) shall be used with q_z or q_h as specified.
3. Two cases shall be considered to determine the critical load requirements for the appropriate condition:
 - a. A positive value of (GC_{pi}) applied to all internal surfaces, or
 - b. A negative value of (GC_{pi}) applied to all internal surfaces.

Figure 1: (taken from ASCE7-16: Minimum Design Loads and Associated Criteria for Buildings and Other Structures; table 26.13-1)

What does this mean?

Partially enclosed buildings have the highest internal pressure coefficient. When a building has this classification, wind can get through an opening or multiple opening on one wall, but the wind can't escape causing a “ballooning” effect on the building. This ballooning effect can mean a 30% or more increase to the total wind forces on the building!

Open structures on the other hand allow wind to blow through the building with little to no interferences causing a negligible amount of wind load. For this reason, no internal wind pressures are required to be applied to the building.

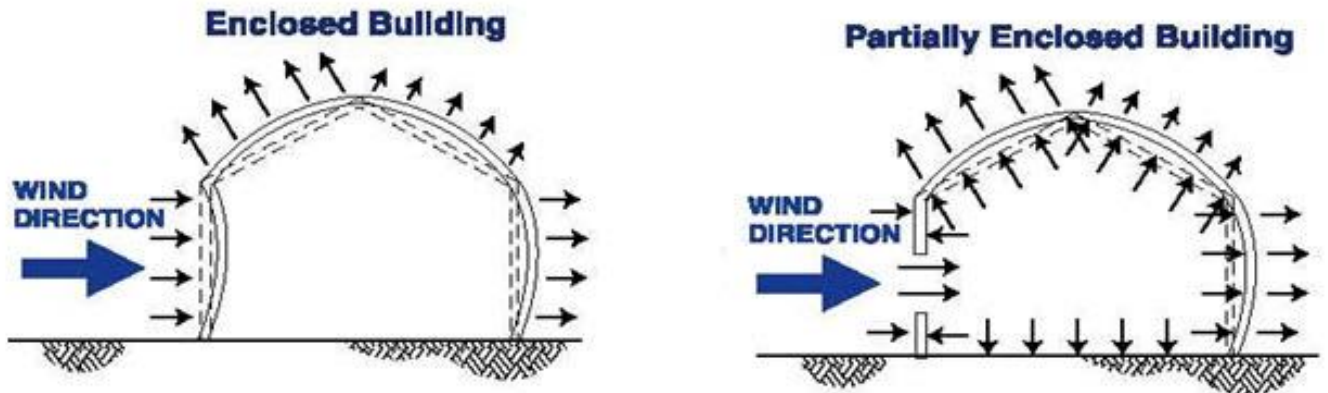


Figure 2: Graphical representation of Enclosed vs. Partially Enclosed

Here's a few things to watch out for:

- 1) Framed openings, materials in wall deletions and their accessories must be designed to be fully wind-resistant based on the loading specified in the NBG Order Document to be "Wind Load Confirmed: YES."
- 2) Existing buildings that are Partially Enclosed or Open should be classified as "Wind Load Confirmed: **No**" in the order document. The new structure could also impact the existing building, and the Project Engineer of Record should be consulted.
- 3) Using large frame openings can be a great way to create air flow through a non-conditioned building during the summer heat. Make sure to balance openings on opposite walls to avoid making the building partially enclosed.
- 4) Always consult with the Project Engineer of Record to ensure the proper Wind Enclosure condition is specified on the Order Document.