



**1.2 PROBLEM STATEMENT**

This example shows the application of enclosure classifications, including distinction between *open buildings*, *enclosed buildings*, *partially open buildings*, and *partially enclosed buildings*.

## 2.1 DETERMINATION OF ENCLOSURE

### Step 1: Identify the openings

	Opening Size, $A_o$
Windward wall	$200' \times 25' = 5,000 \text{ ft}^2$
Side walls (2)	$2 \times (100' \times 30') = 6,000 \text{ ft}^2$
Leeward wall	$0 \text{ ft}^2$
Roof	$0 \text{ ft}^2$

For simplification, the pitch of the roof is not considered in this problem and is approximated using a single height; also, the structural member sizes are ignored.

### Step 2: Check *Open Building* Requirements

An open building is one in which each wall is at least 80 percent open.

	Opening Size, $A_o$	Gross Area, $A_g$	Percentage of Wall Open, $A_o/A_g$	80% Open?
Windward wall	$200' \times 25' = 5,000 \text{ ft}^2$	$200' \times 25' = 5,000 \text{ ft}^2$	100	Yes
Side walls (2)	$2 \times (100' \times 30') = 6,000 \text{ ft}^2$	$2 \times (100' \times 30') = 6,000 \text{ ft}^2$	100	Yes
Leeward wall	$0 \text{ ft}^2$	$200' \times 25' = 5,000 \text{ ft}^2$	0	No

In order to check this condition, we should compare the percentage of openings in each wall. However, it is immediately clear that the leeward wall does not meet this requirement, as it has no openings. Thus, this building cannot be classified as an *open building*. In other words, this building will generate some internal pressures. We must now determine if those internal pressures are “moderate” or “high” as defined by Table 26.13-1.

### Step 3: Check *Partially Enclosed Building* Requirements

A partially enclosed building has a three-part definition. The building must comply with both of the following conditions:

1. The total area of openings in a wall must exceed the sum of the areas in the balance of the building envelope by more than 10 percent.
- 2a. The total area of openings in a wall must exceed the lesser of
  - a. 1 percent of the area of the wall.
  - b. 4 square feet
- 2b. The percentage of openings in the balance of the building envelope does not exceed 20 percent.

In order to check the first requirement, we must compare the windward wall openings with the sum of the remainder of the openings.

Equation: Windward wall openings  $> 1.10 \times$  (leeward wall openings + side wall openings + side wall openings + roof openings)

$$5,000 \text{ ft}^2 \not> 1.10 (3,000 \text{ ft}^2 + 3,000 \text{ ft}^2) = 6,600 \text{ ft}^2$$

In this case, the openings in the windward wall do not exceed the balance of the building by 10 percent. As a result, this building cannot be classified as a *partially enclosed building*.

We are not required to check condition 2a or 2b, as a *partially enclosed building* classification must meet both condition 1 and conditions 2a and 2b. See problem 1b for a check of conditions 2a and 2b.

#### Step 4: Check Enclosed Building Requirements

In previous versions of ASCE 7, the definition for an enclosed building was one that did not comply with that of an open building or a partially enclosed building. In ASCE 7-16, there is a more explicit definition:

Enclosed Building: A building that has the total area of openings in each wall that receives positive external pressure less than or equal to 4 square feet or 1 percent of the area of that wall, whichever is smaller.

	Opening Size	Gross Area, $A_g$	Percentage of Wall Open	$< 4\text{ft}^2$ or 1% of Wall?
Windward wall	$200' \times 25' = 5,000 \text{ ft}^2$	$200' \times 25' = 5,000 \text{ ft}^2$	100	No
Side walls (2)	$2 \times (100' \times 30') = 6,000 \text{ ft}^2$	$2 \times (100' \times 30') = 6,000 \text{ ft}^2$	100	No
Leeward wall	$0 \text{ ft}^2$	$200' \times 25' = 5,000 \text{ ft}^2$	0	Yes

Due to the large openings in the windward and side walls, this building does not classify as an enclosed building or partially enclosed building.

#### Step 5: Check Partially Open Building Requirements

New to ASCE 7-16 is the partially open building classification. It is defined as a building which does not comply with open building, partially enclosed building, or enclosed building guidelines.

## 2.2 SUMMARY

Because this structure doesn't fall under the classification of an open building, partially enclosed building, or enclosed building, this building would be classified as a partially open building, using an internal pressure coefficient of  $GC_{pi} = \pm 0.18$ .