



DASMA
Door & Access Systems
Manufacturers Association
International

COMMERCIAL & RESIDENTIAL GARAGE DOOR DIVISION

TECHNICAL DATA SHEET

#177

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Application of Kd Factor to Garage Door Wind Load Determination Using ASCE 7

When calculating wind loads on garage doors using ASCE 7, the directionality factor Kd required to be used shall be 0.85. Following is documentation supporting this assertion.

Calculations

DASMA Technical Research Document #1029 (attached) outlines the method of determining combined nominal loads using allowable stress design based on ASCE 7-98 Section 2.4, specifically addressing wind loads on sectional garage doors, and describes how ASCE 7-98 mandates the use of directionality factor Kd of 0.85 for wind loads on garage doors when using loads determined by Section 2.4.

Using a Kd of 0.85 is also required by both ASCE 7-02 and ASCE 7-05. Differences between the standards are as follows

ASCE 7-02 versus ASCE 7-98

There are three possible load combinations in ASCE 7-02, using Section 2.4, as opposed to two using ASCE 7-98. The three combinations include equations 5, 6 and 7. All values other than dead load and wind load should be set to zero, since they are not applicable to garage doors. Worst case is equation 3, which is the same worst case condition as found in ASCE 7-98.

ASCE 7-05 and ASCE 7-10, versus ASCE 7-98

Content of ASCE 7-05 and ASCE 7-10 is not materially different from ASCE 7-02 regarding this assertion. In ASCE 7-10 Table 26.6-1, it is noted that Kd is to be 0.85 for components and cladding which includes garage doors.

Note: Technical Data Sheets are information tools only and should not be used as substitutes for instructions from individual manufacturers. Always consult with individual manufacturers for specific recommendations for their products and check the applicable local regulations.

This Technical Data Sheet was prepared by the members of DASMA's Commercial & Residential Garage Door Division Technical Committee. DASMA is a trade association comprising manufacturers of rolling doors, fire doors, grilles, counter shutters, sheet doors, and related products; upward-acting residential and commercial garage doors; operating devices for garage doors and gates, sensing devices, and electronic remote controls for garage doors and gate operators; as well as companies that manufacture or supply either raw materials or significant components used in the manufacture and installation of the Active Members' products.

Garage Door Wind Load Determination Using ASCE 7-98 Application of K_d Factor

- Garage doors are considered “Components and Cladding”
- Table 6-6: Directionality Factor = 0.85
- Note in Table 6-6: “Directionality Factor K_d has been calibrated with combinations of loads specified in Section 2. This factor shall only be applied when used in conjunction with load combinations specified in 2.3 and 2.4.”
- Section 2.3 is entitled “Combining Factored Loads Using Strength Design”. This section is not applicable because the garage door industry does not employ strength design.
- Section 2.4 is entitled “Combining Factored Loads Using Allowable Stress Design”.
- The two possible load combinations are equation #3 (dead load + wind load + live load + [roof live load or snow load or rain load]) and equation #4 ([0.6] x [dead load] + wind load + [load due to lateral earth pressure, ground water pressure, or pressure of bulk materials])
- Garage doors should be assumed to be in the fully closed, vertical position.
- Based on building location and orientation, the following loads are not applicable to garage doors and should be set at zero: Live load; roof live load; snow load, rain load; load due to lateral earth pressure, ground water pressure, or pressure of bulk materials
- Therefore, garage door load combination per equation #3 would be the vertical dead load plus the horizontal wind load acting on the surface of the door, and per #4 would be 60% of the vertical dead load plus the horizontal wind load acting on the surface of the door.
- Garage doors are counterbalanced such that when the door is in the fully closed vertical position, the majority of the dead load of the door is supported by stored energy in the counterbalance system (such as torsion springs). This stored energy usually accounts for more than 95% of the total dead load of the door. Therefore, the net dead load acting vertically down at the bottom of the door is usually less than 5% of the total door dead load.
- A 16 ft x 7 ft door designed to support a minimal wind load of 10 PSF would have a total maximum weight of approximately 3 PSF. Thus, the wind load would be 1120 pounds (10 psf x 16 ft x 7 ft) and

- the net dead load would be 17 pounds (3 psf x 16 ft x 7 ft x 5%). A 16 ft x 7 ft door designed to support a wind load of 40 PSF would have a total maximum weight of approximately 4 PSF. Thus, the wind load would be 4480 pounds (40 psf x 16 ft x 7 ft) and the net dead load would be 22 pounds (4 psf x 16 ft x 7 ft x 5%).
- Both load combinations #3 and #4 result in negligible dead load components in comparison to the wind load components.
- Although door dead loads need to be accounted for in load combinations because they exist, such dead loads need not be figured in door strength analyses because they are negligible.
- Load reductions per Section 2.4.3 are not applicable. The full wind load, as calculated using $K_d=0.85$, shall be used.