



DASMA
Door & Access Systems
Manufacturers Association
International

COMMERCIAL & RESIDENTIAL GARAGE DOOR DIVISION

TECHNICAL DATA SHEET

#155r

1300 Sumner Avenue
Cleveland, Ohio 44115-2851
Phone: 216-241-7333 • Fax: 216-241-0105
E-mail: dasma@dasma.com

Garage Door and Commercial Door Wind Load Guide Based on the 2005 National Building Code of Canada

DASMA (the Door & Access Systems Manufacturers Association) has created a ***GARAGE DOOR WIND LOAD GUIDE*** based on the 2005 National Building Code of Canada wind load requirements¹. The guide is intended to be used by code officials, engineers, architects, builders, owners, insurance companies and other interested parties. The Wind Load Guide also references a DASMA test procedure (ANSI/DASMA 108), which may be used by manufacturers to determine structural load performance of a garage door.

The guide is published by the Commercial & Residential Garage Door Division of DASMA, which represents an estimated 95% of all sectional garage doors sold in the United States and which is also well represented in Canada. The Division's Technical Committee, the best technical talent in the garage door industry, developed these tables based on the latest civil engineering and building code criteria.

The DASMA members believe the ***DASMA GARAGE DOOR WIND LOAD GUIDE*** will improve understanding of the issues related to garage doors and wind loads. DASMA continues to monitor developments regarding wind loads and the building codes in general, and continues to develop solutions to problems, which affect the garage door industry. Please contact DASMA for any questions or comments.

¹ *Wind Loads for the Garage Door Wind Load Guide were calculated using the following variables, and were based on the following referenced sections, found in the 2005 National Building Code of Canada:*

1. Step 1: Specified Load and Effects to be designed for "Wind Load." See Vol. 1, Sec. 4.12.1(1)(W) → Vol. 1, Sec. 4.1.7
2. Step 2: Importance Category for Building to be "Normal." See Vol.1, Sec. 4.1.2.1(3) → Vol.1, Table 4.1.2.1
3. Step 3: Calculation Method used to be "Static Procedure." See Vol. 1, Sec. 4.1.7.1(1) → Appendix A → User's Guide, Commentary I, Par. 2. "Static Procedure used for cladding of all buildings." Par. 5 flow chart Fig. I-1.
4. Step 4a: Specified External Pressure Formula defined as $p=I_w q C_e C_g C_p$. See Vol. 1, Sec. 4.1.7.1(1)

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.

5. Step 4b: Specified Internal Pressure Formula defined as $p_i = I_w q C_e C_{gi} C_{pi}$. See Vol. 1, Sec. 4.1.7.1(3)

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6. Step 5: Determine Importance Factor for Wind Load, I_w . $I_w = 1.0$. See Vol. 1, Table 4.1.7.1, ULS column
7. Step 6a: Determine Reference Velocity Pressure, q . Probability 1 in 50, per Vol. 1, Sec. 4.1.7.1(4) → Commentary 1, Par. 6
8. Step 6b: Determine Velocity Pressure, q , in kPa for Providence & Site Location. For Example: $q = 0.52$ kPa for Toronto, Ontario hourly wind pressure for a return period of 1 in 50. As determined by Vol. 2, Appendix C, page C-24.
 - A. Conversions, if needed: kPa to Mean Hourly Wind Speed (m/s) to Mean Hourly Wind Speed (MPH) to Fastest Mile Wind Speed (MPH).
 1. kPa to Mean Hourly Wind Speed (m/s). See Vol. 2, Appendix C, Table C-1, page C-9
 - i. Toronto, Ontario: $0.52 \text{ kPa} = 28.4 \text{ m/s}$
 2. Mean Hourly Wind Speed (m/s) to Mean Hourly Wind Speed (MPH)
 - ii. $28.4 \text{ m/s} \times 2.2361 = 63.5 \text{ MPH}$
 3. Mean Hourly Wind Speed (MPH) to Fastest Mile Wind Speed (MPH), using factor per ASCE 7-05, Fig. C6-4
 - iii. $63.5 \text{ MPH} \times 1.285 = 81.6 \text{ MPH}$
9. Step 6c: Reference Velocity Pressure Range as determined for *DASMA GARAGE DOOR WIND LOAD GUIDE*. Per Vol. 2, Appendix C the lowest 1/50 mean hourly q value = 0.27 kPa {several locations, Ontario}, the highest 1/50 mean hourly q value = 1.30 kPa {Resolution Island, Nunavut}. Chart illustrates values from 0.20 kPa to 0.80 kPa in 0.10 kPa increments.
10. Step 7: Determine Exposure Factor, C_e , to be either 0.9 for “open terrain” (equivalent to Exp. C of the NBC 1995) or 0.7 for “rough terrain” (equivalent to Exp. B of the NBC 1995). $C_e = 0.9$ or 0.7 is specified in Vol. 1, Sec. 4.1.7.1(5)(a) or (b). For the purposes of the *DASMA GARAGE DOOR WIND LOAD GUIDE* a $C_e = 0.7$ “rough terrain” will be used.
11. Step 8: Determine combined External Pressure Coefficient & Gust Effect Factor, $C_p C_g$, for building less than 20 meters. See Vol. 1, Sec. 4.1.7.1(1) → Appendix A → User’s Guide, Commentary I, Par. 25, 26 → Par. 28 → Fig. I-8. Figure I-8 equations to determine external peak composite pressure-gust coefficients, $C_p C_g$:
 - A. Equation to determine Negative $C_p C_g$, End Surface: $-2.10 + .35312 \log A$
 - B. Equation to determine Negative $C_p C_g$, Interior Surface: $-1.80 + .17658 \log A$
 - C. Equation to determine Positive $C_p C_g$, End or Interior Surface: $1.75 - .26487 \log A$
12. Step 9: Internal Gust Effect Factor, C_{gi} , to be 2.0 . See Vol. 1, Sec. 4.1.7.1(6)(c)

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13. Step 10: Internal Pressure Coefficient, C_{pi} , to be based off Category 3. Use (0.7) in conjunction with positive $C_p C_g$ values and (-0.7) in conjunction with negative $C_p C_g$ values. See Vol. 1, Sec. 4.1.7.1(3) → Appendix A → User's Guide, Commentary I, Par. 31
14. Step 11: Determine Maximum Positive & Negative Surface Pressure Formulas based off information gathered from steps above.

Specified External Surface Pressure	$p = I_w q C_e C_g C_p$ where p is in kPa
Specified Internal Surface Pressure	$p_i = I_w q C_e C_{gi} C_{pi}$ where p_i is in kPa
$A =$ Garage Door Surface Area	

Positive - Rough Terrain:

$$p = q (C_e) [(positive\ C_p C_g \times A) + (C_{pi})(C_{gi})]$$

$$p = q (0.7) [(1.75 - .26487 \log A) + (0.7)(2.0)]$$

Positive - Open Terrain:

$$p = q (C_e) [(positive\ C_p C_g \times A) + (C_{pi})(C_{gi})]$$

$$p = q (0.9) [(1.75 - .26487 \log A) + (0.7)(2.0)]$$

Negative - End Surface - Rough Terrain:

$$p = q (C_e) [(neg.\ end\ C_p C_g \times A) - (C_{pi})(C_{gi})]$$

$$p = q (0.7) [(-2.10 + .35312 \log A) - (0.7)(2.0)]$$

Negative - End Surface - Open Terrain:

$$p = q (C_e) [(neg.\ end\ C_p C_g \times A) - (C_{pi})(C_{gi})]$$

$$p = q (0.9) [(-2.10 + .35312 \log A) - (0.7)(2.0)]$$

Negative - Interior Surface - Rough Terrain:

$$p = q (C_e) [(neg.\ int.\ C_p C_g \times A) - (C_{pi})(C_{gi})]$$

$$p = q (0.7) [(-1.80 + .17658 \log A) - (0.7)(2.0)]$$

Negative - Interior Surface - Open Terrain:

$$p = q (C_e) [(neg.\ int.\ C_p C_g \times A) - (C_{pi})(C_{gi})]$$

$$p = q (0.9) [(-1.80 + .17658 \log A) - (0.7)(2.0)]$$

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COMMERCIAL DOOR WIND LOAD GUIDE
BASED ON THE 2005 NATIONAL BUILDING CODE OF CANADA (METRIC UNITS)

Mean Roof Height	Door Size	.20 kPa	.30 kPa	.40 kPa	.50 kPa	.60 kPa	.70 kPa	.80 kPa
4.57 m Single Story	2.44m x 2.44m	.41 -.43	.62 -.65	.82 -.87	1.03 -1.09	1.24 -1.3	1.44 -1.52	1.65 -1.74
	3.05m x 3.05m	.41 -.43	.61 .64	.81 -.86	1.01 -1.07	1.22 -1.28	1.42 -1.50	1.62 -1.71
7.62 m Double Story	2.44m x 2.44m	.41 -.43	.62 -.65	.82 -.87	1.03 -1.09	1.24 -1.3	1.44 -1.52	1.65 -1.74
	3.05m x 3.05m	.41 -.43	.61 .64	.81 -.86	1.01 -1.07	1.22 -1.28	1.42 -1.50	1.62 -1.71

Design pressures above are in kilopascals (kPa)

Testing, if required by local authority may be performed to ASTM E-330, or preferably ANSI/DASMA 108, with acceptance criteria in accordance with ANSI/DASMA 108.

Test conditions are:

1. Garage doors shall be tested to both negative and positive pressures. Doors shall be installed simulating normal conditions (i.e., top roller in track radius, other rollers in tracks, all hinges in place, reinforcing hardware in place)
2. Total test duration for each test direction shall be as follows:
 - a. Ten seconds at design pressure.
 - b. Pressure equal to 1.5 times the design pressure shall be included for 10 seconds during each test.

Standard engineering principles may be used to interpolate or extrapolate test results to door sizes not specifically tested. Doors shall include a manufacturer's label certifying compliance to specific load.

This guide is provided for reference purposes only. In all cases the local building authority is the sole and final determiner of the structural and safety requirements, and suitability of the garage door.

Notes:

- Basic Wind Speeds above are mean-hourly values
- Doors larger than 10 square meters should use the 3.05 x 3.05 loads. Doors less than 10 square meters may be interpolated.
- Negative pressures assume door has 0.61 meters of width in building's end zone.
- Garage doors evaluated as attached to enclosed buildings with an Importance Factor of 1.0.
- Installation details vary. Consult manufacturer's instructions.
- Open Terrain: 0.9 for open terrain, where open terrain is level terrain with only scattered buildings, trees or other obstructions, open water or shorelines thereof.
- Rough Terrain: 0.7 for rough terrain, where rough terrain is suburban, urban or wooded terrain extending upwind from the building uninterrupted for at least 1 km (0.6214 miles) or 10 times the building height, whichever is greater.
- Values above are for Rough Terrain. Multiply table values by 1.285 to obtain Open Terrain values.

For more information, contact DASMA, 1300 Sumner Avenue, Cleveland OH 44115-2851 Phone (216) 241-7333

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GARAGE DOOR WIND LOAD GUIDE

BASED ON THE 2005 NATIONAL BUILDING CODE OF CANADA (METRIC UNITS)

Mean Roof Height	Door Size	.20 kPa	.30 kPa	.40 kPa	.50 kPa	.60 kPa	.70 kPa	.80 kPa
4.57 m Single Story	Single <i>2.74m x 2.13m</i>	.41 -.43	.62 -.65	.83 -.87	1.03 -1.09	1.24 -1.30	1.44 -1.52	1.65 -1.74
	Double <i>4.88m x 2.13m</i>	.40 -.42	.60 -.64	.81 -.85	1.01 -1.06	1.21 -1.27	1.41 -1.49	1.61 -1.70
7.62 m Double Story	Single <i>2.74m x 2.13m</i>	.41 -.43	.62 -.65	.83 -.87	1.03 -1.09	1.24 -1.30	1.44 -1.52	1.65 -1.74
	Double <i>4.88m x 2.13m</i>	.40 -.42	.60 -.64	.81 -.85	1.01 -1.06	1.21 -1.27	1.41 -1.49	1.61 -1.70

Design pressures above are in kilopascals (kPa)

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- Negative pressures assume door has 0.61 meters of width in building's end zone.
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