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Legacy report on the 2000 *International Building Code*[®], 2000 *International Residential Code*[®], the 2002 *Accumulative Supplement to the International Codes*[™], the BOCA[®] *National Building Code/1999*, the 1999 *Standard Building Code*[®] and the 1997 *Uniform Building Code*[™]

DIVISION 08 - DOORS AND WINDOWS Section 08620 - Unit Skylights

VELUX AMERICA, INC.
PO BOX 5001
GREENWOOD, SC 29648-5001

1.0 SUBJECT

VELUX Roof Windows and Skylights

2.0 PROPERTY FOR WHICH EVALUATION IS SOUGHT

Structural Performance

3.0 DESCRIPTION

VELUX skylights are available in Model VS, VSE, FS, and FCM. Various outside frame dimensions are available, ranging in orientation from 15^{5/16}-inches (389 mm) in width to 55 inches (1397 mm) in length.

The VELUX VS, VSE, and FS skylights are constructed of laminated nordic pine wood framing having a specific gravity of 0.47, encased on the exterior in No. 22 gage aluminum cladding. The VS skylight is hinged at the top, and is crank operated to open. The VSE skylight is hinged at the top, and utilizes a production mounted electric chain to open. The FS skylight is a fixed skylight with integral frame. Refer to Figure 1 at the end of this report for typical cross sectional view of the VS, VSE, and FS skylights. Refer to Tables 1 and 2 at the end of this report for sizes and allowable loads for VS, VSE, and FS skylights.

The VELUX FCM skylights are curb mounted fixed skylights constructed of an exterior roll-formed aluminum frame. Refer to Figure 3 at the end of this report for typical cross sectional view of the FCM skylights. Refer to Tables 3 and 4 at the end of this report for sizes and allowable loads for FCM skylights.

VELUX skylights are available in two glazing options:

Glazing Type 0074 consists of a 1/8-inch (3.0 mm) thick fully tempered glass exterior pane, a 5/16-inch (8.1 mm) to 7/16-inch (11.1 mm) thick airspace, and a 13/64-inch (5.2 mm) laminated heat-strengthened glass interior pane. The laminated heat-strengthened interior pane consists of two plies of 3/32-inch-thick (2.2 mm) heat-strengthened glass laminated

together with a 0.030-inch (0.76 mm) polyvinyl butyral interlayer.

Glazing Type 9910 consists of a 1/8-inch (3.0 mm) thick fully tempered glass exterior pane, a 5/16-inch (8.1 mm) to 7/16-inch (11.1 mm) thick airspace, and a 1/4-inch (6.4 mm) laminated tempered glass interior pane. The laminated tempered glass interior pane consists of two plies of 1/8-inch-thick (3.0 mm) fully tempered glass laminated together with a 0.030-inch-thick (0.76 mm) polyvinyl butyral interlayer.

4.0 INSTALLATION

VELUX skylights, Models VS, VSE, and FS with integral frame, shall be attached to roof framing members by L-shaped mounting brackets. Four brackets shall be used with Models FS skylights except size 112, which requires six brackets. Six brackets shall be used with all sizes of Model VS and VSE skylights, except four brackets are required for the 21^{1/2}-inch by 38^{1/2}-inch (546 mm by 978 mm) and the 21^{1/2}-inch by 27^{1/2}-inch (546 mm by 698 mm) VS and VSE skylight models. The brackets are zinc-chromate-coated steel angles 2^{1/32} inches (51.6 mm) by 1^{11/32} inches (34 mm) by 2^{3/64} inches (52 mm), 1/8 inch (3.2 mm) in thickness. The bracket shall be positioned and premounted on the skylight frame with two No. 8 by 1^{1/8}-inch-long (28.6 mm) stainless steel wood screws. At the jobsite, the bracket shall be bent over, tab inserted into the slot, and bent over to lock. See Figure 2. The other leg of the bracket shall be attached with three 1^{1/4}-inch long ring shank nails with 0.150 (3.8 mm) body diameter a 3/8 (9.5 mm) diameter head. Where roof sheathing exceeds 1/2 inch (12.7 mm) in thickness, fasteners attaching the brackets to the roof deck shall have sufficient length to penetrate wood structural framework a minimum of 3/4 inch (19 mm). The bracket shall be replaced if fractured or broken while being bent at the jobsite. No. 22 gage aluminum or copper flashing shall be attached over the fasteners at the perimeter of the skylights. See Figure 1 for typical installation details for Models FS, VS, and VSE (integral frames). Models FS skylights shall be installed in accordance with the VELUX Installation Instructions, No. V-USA-1171-1200, dated 2000. Model VS skylights shall be installed in accordance with the VELUX Installation Instructions, No. V-USA-1714-0201, dated 2001. Model VSE skylights shall be installed in accordance with the VELUX Installation Instructions, No. V-USA-1715-0201, dated 2001.

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Model FCM skylights, curb mounted, shall be mounted to site-built wood curbs by attaching the aluminum frame of the skylight to the site-built curb (evaluation of the attachment of the wood curb to the roof deck is outside the scope of this report). The wood curb shall have a minimum specific gravity of 0.42 and a minimum dowel bearing strength F_d of 3350 psi. The skylights are attached to the curb with corrosion resistant fasteners (stainless steel wood screws) furnished by VELUX America Inc. The fasteners shall achieve full penetration into the wood curb. Tables 3 and 4 indicate the number of fasteners to be installed for each skylight model size. See Figure 3 for typical installation details or Model FCM skylights. Model FCM skylights shall be installed in accordance with the VELUX Installation Instructions, No. V-USA-1501-0202, dated 2002.

In cases of conflict, installation details described in this report govern over the manufacturer's installation instructions.

5.0 IDENTIFICATION

The VELUX skylights are identified with the name and address of the manufacturer, the glazing types and the ICC-ES Legacy report number (NER-216).

The type of laminated pane shall be identified by a numerical code in the production code which is stamped into the stainless steel spacer between the panes, located in the upper left corner. The numerical code for the laminated heat-strengthened pane is 74 (VELTERM G*74) and the numerical code for the laminated tempered pane is 9910 (VELTERMG*9910).

6.0 EVIDENCE SUBMITTED

6.1 Manufacturer's brochure, 2002 edition (V-USA-1517-0502 © 1997, 2002).

6.2 Manufacturer's installation instructions:

1. Models FS skylights: VELUX Installation Instructions, No. V-USA-1171-1200, dated 2000.
2. Model VS skylights: VELUX Installation Instructions, No. V-USA-1714-0201, dated 2001.
3. Model VSE skylights: VELUX Installation Instructions, No. V-USA-1715-0201, dated 2001.
4. Model FCM skylights: VELUX Installation Instructions, No. V-USA-1501-0202, dated 2002.

6.3 Reports of structural tests in accordance with ASTM E 330, prepared by Architectural Testing, Inc:

1. Report No. 01-39585.01, dated September 14, 2001, on Model VS 01 with 0074 glazing.
2. Report No. 01-39585.02, dated September 14, 2001, on Model VS 01 with 9910 glazing.
3. Report No. 01-37435.01, dated November 29, 2000, on Model VS 2000 with MVA 2000 brackets and 0074 glazing.
4. Report No. 01-35572.01, dated July 14, 2000, on Model VS with 0074 glazing.
5. Report No. 01-35573.01, dated July 13, 2000, on Model VS (2000) with 9910 glazing.
6. Report No. 01-36653.02, dated December 28, 2000, on Model FS with MVA 2000 brackets and 0074 glazing.
7. Report No. 01-35569.01, dated July 7, 2000, on Model FS with 0074 glazing.
8. Report No. 01-35570.01, dated July 7, 2000, on Model FS with 9910 glazing.

9. Report No. 01-35575.01, dated July 14, 2000, on Model FCM with 0074 glazing.
10. Report No. 01-35576.01, dated July 17, 2000, on Model FCM with 9910 glazing.
11. Report No. 01-42322.02, dated November 4, 2003, on Model FCM with 0074 glazing.

6.4 Structural calculations submitted by Architectural Testing, Inc.:

1. dated December 27, 2000, revised October 28, 2001, signed and sealed by Allan N. Reeves.
2. dated July 27, 2000, revised December 26, 2000, signed and sealed by Allan N. Reeves.

6.5 Letter prepared by Architectural Testing, Inc., dated August 25, 2003, signed and sealed by Allan N. Reeves.

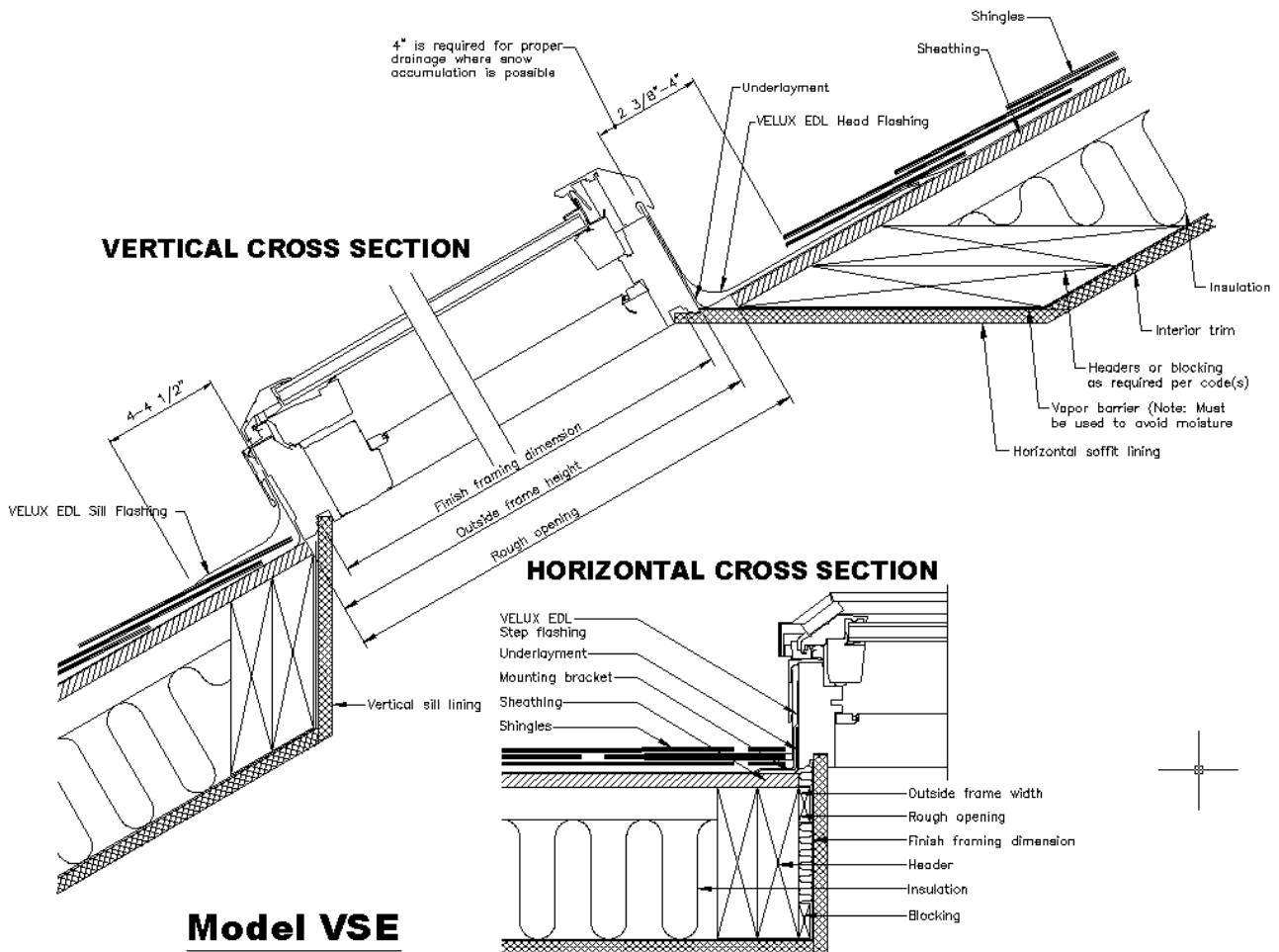
7.0 CONDITIONS OF USE

The ICC-ES Subcommittee for the National Evaluation Service finds that the VELUX-America Roof Windows and Skylights described in this report comply with, or are suitable alternatives to that specified in the 2000 *International Building Code*[®], 2000 *International Residential Code*[®], the 2002 *Accumulative Supplement to the International Codes*[™], the BOCA[®] *National Building Code*/1999, the 1999 *Standard Building Code*[®], and the 1997 *Uniform Building Code*[™], subject to the following conditions:

- 7.1** Roof windows and skylights are limited to loads indicated in this report. The allowable loads in Tables 1, 2, 3, and 4 shall not be increased for duration of load.
- 7.2** Installation conforms with the applicable code and this report.
- 7.3** For FCM skylights, the evaluation of the attachment of the wood curb to the roof deck is outside the scope of this report.
- 7.4** Installations of roof windows and skylights are limited to the following types of construction:
 - 7.4.1** Types III, IV, and V construction in areas where the International Building Code is enforced.
 - 7.4.2** Types III, V, and VI construction in areas where the Standard Building Code is enforced.
 - 7.4.3** Types III, IV, and V construction in areas where the Uniform Building Code is enforced.
 - 7.4.4** Types 3, 4, and 5 construction in areas where the BOCA National Building Code is enforced.
- 7.5** The glazing of units set at an angle of less than 45 degrees from the horizontal shall be mounted at least 4 inches (102 mm) above the plane of the roof.

Exception: In areas using the *BOCA National Building Code*, the *Standard Building Code*, or the *International Residential Code* curbs for skylights are not required on one or two family dwellings when the roof slope is a minimum of 3:12.

7.6 This report is subject to periodic reexamination. For information on the current status of this report, consult the ICC-ES website.



Note: Model VSE shown for illustration purposes.

For SI: 1 inch = 25.4 mm

Figure 1
Typical Installation Detail for Model VS, VSE and FS Skylights

*THIS DRAWING IS FOR ILLUSTRATION PURPOSES ONLY. IT IS NOT INTENDED FOR USE AS A CONSTRUCTION DOCUMENT FOR THE PURPOSE OF DESIGN, FABRICATION OR ERECTION.

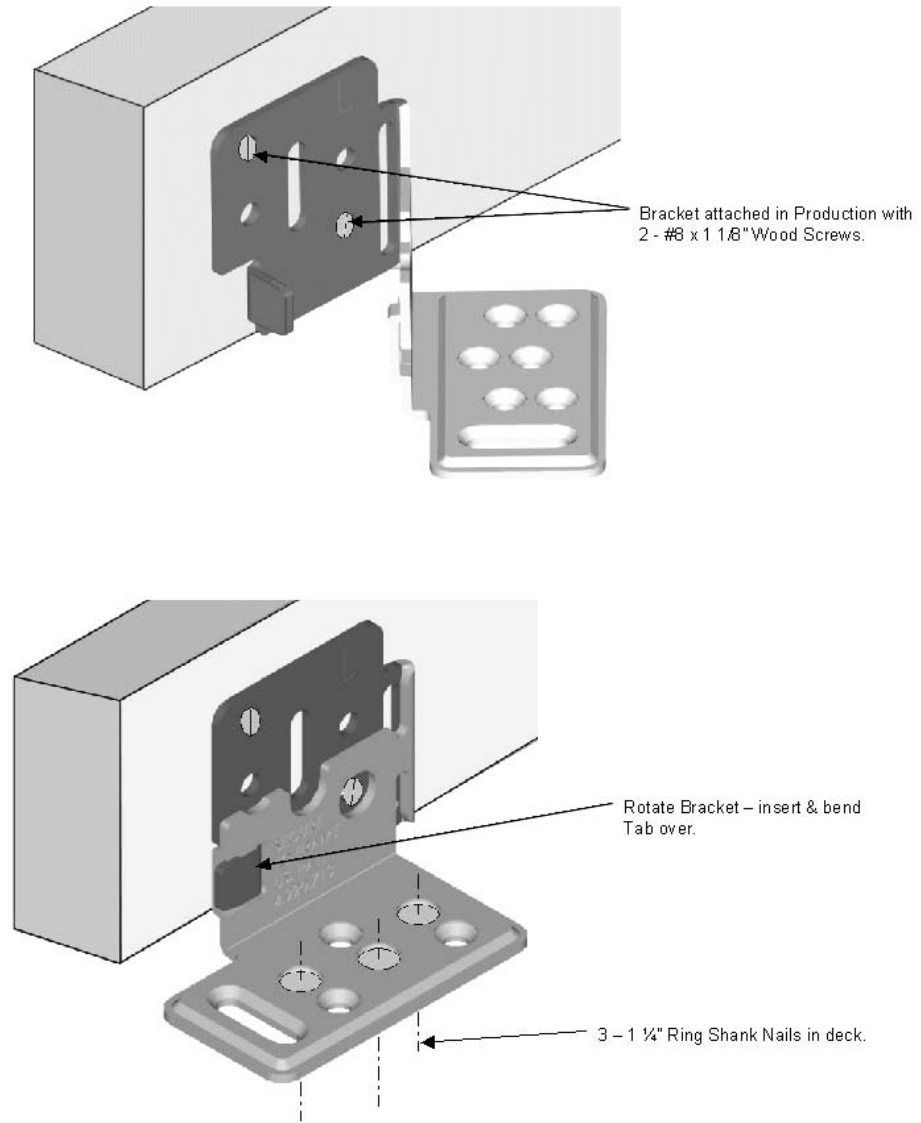


Figure 2
Bracket to Skylight Frame Installation Detail

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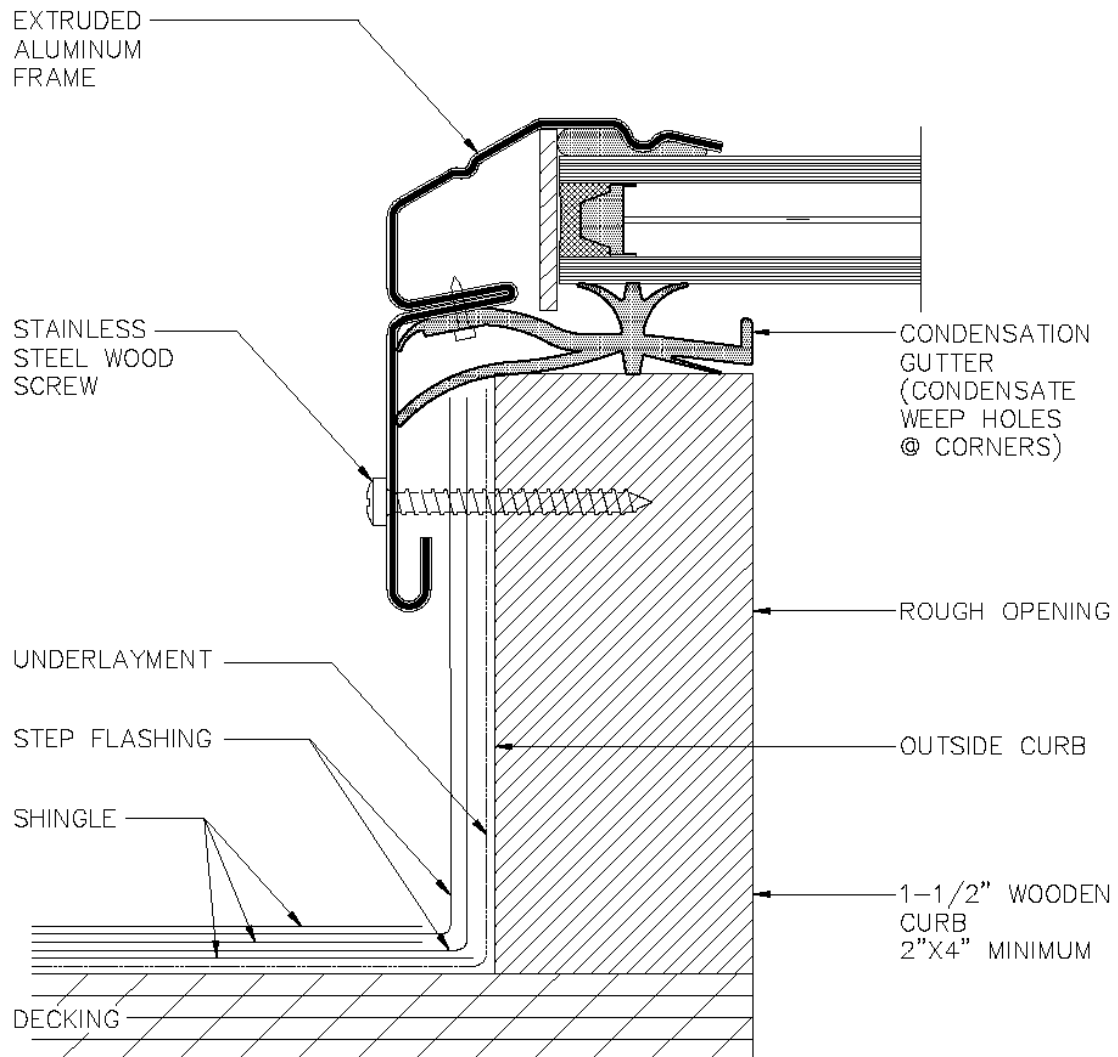


Figure 3
Typical Installation Detail for Model FCM Skylights

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**Table 1— Models VS, VSE and FS
Interior Pane - Laminated Tempered Pane (9910)**

Unit Size in Inches (and Model #)	Skylight Model and Design Pressures (pounds per square foot)					
	Venting Skylight VS (manual)		Venting Skylight VSE (electric)		Fixed Skylight FS	
	Downward	Wind Uplift	Downward	Wind Uplift	Downward	Wind Uplift
15 ⁵ / ₁₆ x 46 ³ / ₈ (056)	NA	NA	NA	NA	NA	NA
21 ¹ / ₂ x 27 ¹ / ₂ (101)	174	63	174	63	174	63
21 ¹ / ₂ x 38 ¹ / ₂ (104)	123	37	123	37	123	37
21 ¹ / ₂ x 46 ³ / ₈ (106)	155	46	105	40	155	46
21 ¹ / ₂ x 55 (108)	129	48	129	48	129	48
21 ¹ / ₂ x 70 ⁷ / ₈ (112)	NA	NA	NA	NA	NA	NA
23 ⁵ / ₁₆ x 23 ⁹ / ₁₆ (150)	NA	NA	NA	NA	NA	NA
23 ⁵ / ₁₆ x 46 ³ / ₈ (156)	NA	NA	NA	NA	NA	NA
30 ⁵ / ₈ x 30 ⁵ / ₈ (302)	NA	NA	NA	NA	NA	NA
30 ⁵ / ₈ x 38 ¹ / ₂ (304)	85	32	85	32	85	32
30 ⁵ / ₈ x 46 ³ / ₈ (306)	100	31	72	28	100	31
30 ⁵ / ₈ x 55 (308)	89	27	89	27	89	27
44 ³ / ₄ x 27 ¹ / ₂ (601)	81	25	81	25	81	25
44 ³ / ₄ x 46 ¹ / ₂ (606)	72	23	72	23	72	23
47 ⁵ / ₁₆ x 46 ³ / ₈ (656)	NA	NA	NA	NA	NA	NA

Notes:

1. 1 in. = 25.4 mm
2. Downward Load (including dead load) shall be determined from the largest of the following combinations:
 - 1) Downward Wind Load + 0.5 (Snow Load)
 - 2) 0.5 (Downward Wind Load) + Snow Load
3. 1 psf = 6.895 kPa

**Table 2 — Models VS, VSE and FS
Interior Pane - Laminated Heat-Strengthened Pane (74)**

Unit Size in Inches (and Model #)	Skylight Model and Design Pressures (pounds per square foot)					
	Venting Skylight VS (manual)		Venting Skylight VSE (electric)		Fixed Skylight FS	
	Downward	Wind Uplift	Downward	Wind Uplift	Downward	Wind Uplift
15 ⁵ / ₁₆ x 46 ³ / ₈ (056)	NA	NA	NA	NA	144	53
21 ¹ / ₂ x 27 ¹ / ₂ (101)	135	63	135	63	121	63
21 ¹ / ₂ x 38 ¹ / ₂ (104)	121	31	121	45	100	45
21 ¹ / ₂ x 46 ³ / ₈ (106)	114	39	101	38	93	38
21 ¹ / ₂ x 55 (108)	107	48	107	48	85	32
21 ¹ / ₂ x 70 ⁷ / ₈ (112)	NA	NA	NA	NA	77	37
23 ⁵ / ₁₆ x 23 ⁹ / ₁₆ (150)	NA	NA	NA	NA	188	68
23 ⁵ / ₁₆ x 46 ³ / ₈ (156)	NA	NA	NA	NA	93	35
30 ⁵ / ₈ x 30 ⁵ / ₈ (302)	NA	NA	NA	NA	108	40
30 ⁵ / ₈ x 38 ¹ / ₂ (304)	85	32	85	32	85	32
30 ⁵ / ₈ x 46 ³ / ₈ (306)	82	26	72	28	70	26
30 ⁵ / ₈ x 55 (308)	66	23	66	33	58	22
44 ³ / ₄ x 27 ¹ / ₂ (601)	81	26	81	30	81	30
44 ³ / ₄ x 46 ¹ / ₂ (606)	59	23	59	37	46	18
47 ⁵ / ₁₆ x 46 ³ / ₈ (656)	NA	NA	NA	NA	NA	NA

Notes:

- 1 in. = 25.4 mm
- Number of fasteners used to attach the unit to curb. Fasteners shall be #8 x 1-1/2 inch (38.1 mm) long stainless steel wood screws.
- Downward Load (including dead load) shall be determined from the largest of the following combinations:
1) Downward Wind Load + 0.5 (Snow Load)
2) 0.5 (Downward Wind Load) + Snow Load
- 1 psf = 6.895 kPa

**Table 3 — Model FCM
Interior Pane - Laminated Tempered (9910)**

Model Number	Size ¹	Fasteners ²	Downward Load ³	Wind Uplift Load
2222	26 ⁵ / ₈ in x 26 ⁵ / ₈ in	2 per side 8 total	121 psf	110 psf
2246 or 4622	26 ⁵ / ₈ in x 50 ⁵ / ₈ in or 50 ⁵ / ₈ in x 26 ⁵ / ₈ in	2 per short side 3 per long side 10 total	79 psf	84 psf
3030	34 ⁵ / ₈ in x 34 ⁵ / ₈ in	3 per side 12 total	100 psf	105 psf
4646	50 ⁵ / ₈ in x 50 ⁵ / ₈ in	3 per side 12 total	40 psf	45 psf

Notes:

- 1 in. = 25.4 mm
- Number of fasteners used to attach the unit to curb. Fasteners shall be #8 x 1-1/2 inch (38.1 mm) long stainless steel wood screws.
- Downward Load (including dead load) shall be determined from the largest of the following combinations:
1) Downward Wind Load + 0.5 (Snow Load)
2) 0.5 (Downward Wind Load) + Snow Load
- 1 psf = 6.895 kPa

**Table 4 — Model FCM
Interior Pane - Laminated Heat-Strengthened (74)**

Model Number	Size ¹	Fasteners ²	Downward Load ³	Wind Uplift Load
2222	26 ⁵ / ₈ in x 26 ⁵ / ₈ in	2 per side 8 total	121 psf	110 psf
2246 or 4622	26 ⁵ / ₈ in x 50 ⁵ / ₈ in or 50 ⁵ / ₈ in x 26 ⁵ / ₈ in	2 per short side 3 per long side 10 total	79 psf	84 psf
3030	34 ⁵ / ₈ in x 34 ⁵ / ₈ in	3 per side 12 total	100 psf	105 psf
4646	50 ⁵ / ₈ in x 50 ⁵ / ₈ in	3 per side 12 total	40 psf	45 psf

Notes:

1. 1 in. = 25.4 mm
2. Number of fasteners used to attach the unit to curb. Fasteners shall be #8 x 1-1/2 inch (38.1 mm) long stainless steel wood screws.
3. Downward Load (including dead load) shall be determined from the largest of the following combinations:
 - 1) Downward Wind Load + 0.5 (Snow Load)
 - 2) 0.5 (Downward Wind Load) + Snow Load
4. 1 psf = 6.895 kPa