



OSHA FALL PROTECTION TEST REPORT

Rendered to:

VELUX America Inc.

SERIES/MODEL: VCM/VCE 4646 2004B
PRODUCT TYPE: Venting Curb Mounted Skylight

Report No: 96235.01-109-44
Test Date: 01/06/10
Report Date: 03/15/10
Expiration Date: 01/06/14



OSHA FALL PROTECTION TEST REPORT

Rendered to:

VELUX America Inc.
P.O. Box 5001
Greenwood, South Carolina 29648-5001

Report No: 96235.01-109-44
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Project Summary: Architectural Testing, Inc. was contracted by VELUX America Inc. to perform testing on a Series/Model VCM/VCE 4646 2004B, venting curb mounted skylight. The test specimen description and results are reported herein. The test sample was provided by the client.

Test Specification: The test specimen was tested to assess compliance with Occupational Safety and Health Administration/U.S. Department of Labor Regulations (Standards- 29 CFR)-1910.23(e)(8). A 200 lbf weight, fabricated from a bag filled with sand, was placed on the center of the dome for a minimum of 60 seconds and then dropped from increasing heights above the skylight starting at 2' until permanent visible damage was noted. All impact load drops were noted, and the resulting damage was recorded.

Test Specimen Description:

Series/Model: VCM/VCE 4646 2004B

Product Type: Venting Curb Mounted Skylight

Overall Size: 51-1/4" wide by 51-1/4" long

Sash Size: 51-1/4" wide by 51-1/4" long

Overall Area: 18.24 ft²

Finish: All ABS structural members were white and aluminum was coated.

Test Specimen Description: (Continued)

Frame Construction: All frame members were constructed of ABS capped with ASA with mitered and welded corner construction. Extruded aluminum counter flashing with mitered and welded corners was secured to the frame at the bottom using #10 x 1/2" self-tapping pan head screws, located 4-7/8" from each end and spaced 13-3/4" on center. The aluminum counter flashing was secured to each side using 2.2-2.5 x 13 mm T-nails, located 4-7/8" from each end and midspan. An ASA-Luran S 778 T-operator cover was secured to the bottom rail interior using #8 x 3/4" pan head screws.

Sash Construction: The sash frame members were constructed of ABS capped with ASA with mitered and welded corner construction. A roll-formed aluminum cover with mitered and butted corners was sealed using butyl tape and secured at each end to a molded ASA plastic corner key using a 2.2-2.5 x 13 mm T-nail. The ABS/ASA sash members were secured to the aluminum outer cover using #10 x 1-1/4" wafer head Phillips screws. An extruded aluminum hinge was utilized on the top and was secured using #10 x 5/8" long self-tapping Phillips pan head screws, located 2-1/2" from each end and spaced 10" on center.

Weatherstripping:

<u>Description</u>	<u>Quantity</u>	<u>Location</u>
3/8" diameter custom shaped hollow EPDM bulb glazing gasket	1 Row	Sash, all members under the glazing
Custom shaped EPDM durometer condensation gasket	1 Row	Frame, all members
Custom TPE frame to sash gasket	1 Row	Frame, all members

Glazing Detail: The unit was glazed with 17.6 mm (11/16") thick insulating glass, fabricated from a sheet of 3.0 mm (1/8") thick clear Lo-E coated tempered glass outboard, a sheet of 5.8 mm (7/32") thick laminated glass inboard, and a stainless steel box spacer system. The laminated glass was fabricated from two sheets of 2.5 mm (3/32") thick clear heat-strengthened glass and a 0.76 mm (0.030") thick PVB interlayer. The glass was interior glazed against a bead of sealant on the aluminum outer frame. The glazing was secured as the ABS/ASA sash was secured to the roll-formed aluminum outer frame using #10 x 1-1/4" wafer head Phillips screws.

Drainage: Condensation weepage holes were utilized on the frame sill.

Test Specimen Description: (Continued)

Hardware:

<u>Description</u>	<u>Quantity</u>	<u>Location</u>
Remote automatic operator with chain drive (VCE Specimen)	1	Midspan of frame bottom rail
Extruded aluminum hinge	1	Full length of frame and vent top rail
Rotary operator handle with chain drive (VCM Specimen)	1	Midspan of frame bottom rail

Reinforcement: No reinforcement was utilized.

Screen Construction: All screen members were constructed of roll-formed aluminum with square-cut corners, secured using an outside plastic corner key. The fiberglass mesh was secured to the frame using a flexible vinyl spline. A spring retention latch was located 9" from the head on each stile.

Installation: The unit was installed into a Spruce-Pine-Fir wood buck upon a 2x4 wood curb. The installation counter flashing was set over the wood curb, with the ABS/ASA frame and foam tape against the curb. The skylight was secured through all sides of the frame counter flashing using #8 x 1-3/4" pan head screws, (supplied by the manufacturer) located 4-1/2" from each end and midspan. The specimen was installed in accordance with the installation instructions provided by the manufacturer.

Test Results: The results are tabulated as follows:

OSHA Safety Drop Test

<u>Test Method</u>	<u>Load Location</u>	<u>Results</u>
200 lbf at rest	Center of glass	No visible damage See Note #1
400 lbf-ft (2' drop height)	Center of glass	No visible damage
800 lbf-ft (4' drop height)	Center of glass	No visible damage
1200 lbf-ft (6' drop height)	Center of glass	See Note #2
1600 lbf-ft (8' drop height)	Center of glass	See Note #3

General Note: *The test specimen was tested at a 0° slope (Reference Photo #1).*

Note #1: *The 200 lbf weight was gently applied perpendicular to the center of glass. After 60 seconds of rest time, there was no visible damage to the skylight.*

Note #2: *At the 6' drop height, bag shattered exterior tempered glass. The bag did not fall through the skylight.*

Note #3: *At the 8' drop height, the bag penetrated the interior laminated glass, deglazing the glass from frame at multiple locations (Reference Photo #2).*

Detailed drawings, data sheets, representative samples of test specimens, a copy of this report, or other pertinent project documentation will be retained by Architectural Testing, Inc. for a period of four years from the original test date. At the end of this retention period, such materials shall be discarded without notice and the service life of this report will expire.

Results obtained are tested values and were secured by using the designated test methods. This report does not constitute certification of this product nor an opinion or endorsement by this laboratory. It is the exclusive property of the client so named herein and relates only to the specimen(s) tested. This report may not be reproduced, except in full, without the written approval of Architectural Testing, Inc.

For ARCHITECTURAL TESTING, INC:

Russell W. Clark
Technician

Michael D. Stremmel, P.E.
Senior Project Engineer

RWC:vlm/dem

Attachments (pages): This report is complete only when all attachments listed are included.

Appendix-A: Photographs (1)

Appendix-B: Drawings (2) Complete drawings packet on file with Architectural Testing, Inc.

Revision Log

<u>Rev. #</u>	<u>Date</u>	<u>Page(s)</u>	<u>Revision(s)</u>
0	03/15/10	N/A	Original report issue

Appendix A

Photographs



**Photo No. 1
Test Set-up**



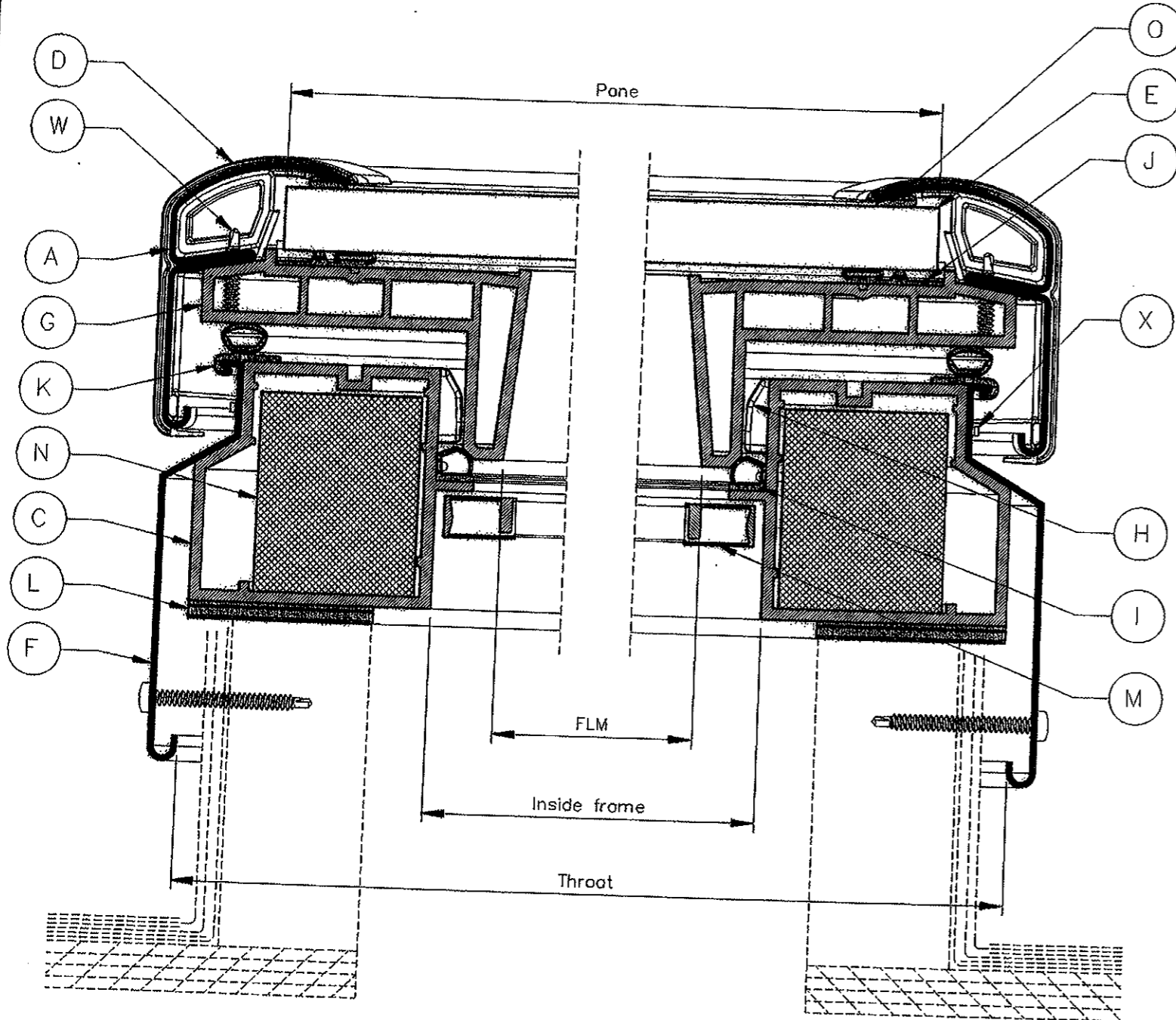
**Photo No. 2
Damage from 1600 lbf Drop at 8'**

Appendix B

Drawings

Note: Complete drawings packet on file with Architectural Testing, Inc.

Size	Inside frame	Throat	FLM	Pane
22	540.3	675.3	504.7	629
30	743.4	878.4	707.9	832
34	845	980	809.5	933.5
46	1149.84	1284.8	1114.3	1238.5



PART SCHEDULE						
ITEM	QTY	PART/COMPONENT	COMPONENT NO.	DESCRIPTION	DRAWING NO.	COMMENTS
A	1	Outer Frame	302192	Roll formed Aluminum - Cool Grey	2130219200000001	Profile drawing
					213021920AC3101	Cutting and punching drawing
					213021920AC4302	Placement of sealant, Part assembly drawing
B	4	Pone Spacer (Not shown)	303392	Acetal Color: white	2130339200000001	Lens outer frame, Cutting and punching
					213033920AC3602	Commodity drawing
					213033920AC5101	Placement drawing
					213033920AC5103	Profile drawing
C	1	Inner frame	303368	ABS with ASA coating Color: White	2130336800000001	Top, bottom and sides, Cutting drawing
					213033680AC1104	Welding drawing
					213033680AC4202	Drilling and routing drawing, Commodity drawing
					213045120AC0004	Drilling and routing drawing
					213045130AC3603	Commodity drawing
D	4	Corner Key	303380	ASA-Luran S 778 T or equivalent Color: NCS S-7500-N (grey)	2130338000000001	Sealant placement drawing (Black Butyl-102011.64)
					213033800AC5202	Placement of t-nail, Assembly drawing
E	1	Pone	N/A	Panes and Spacer Bars	213045410AC00001	Typical arrangement of panes & spacer bars
					213021920AC00001	Profile drawing
F	1	Counter flashing	302190 (Lineol) 304463xx (Complete)	(Sides & bottom) Extruded aluminum	213021920AC1102	Cutting drawing
					213021920AC3603	Punching drawing
					213021920AC5201	T-nail location
					213044830004202	Welding drawing
G	1	Sash Frame	303370	ABS with ASA coating Color: White	2130337000000001	Profile drawing
					213033700AC1102	Cutting drawing
					213033700AC4202	Welding drawing
					213033700AC5201	ABS sash frame/lens installation
H	2	Sash steering block	303413	ASA-Luran or equivalent Color: RCS S-0500 N (White)	213044650AC1702	Drilling drawing
					2130341300000001	Commodity drawing
I	4	STF gasket	303426	Condensation gasket EPDM 64 shore A	213034260AC00002	Profile
					213034260AC5201	Installation
J	4	PR gasket	303427	EPDM, Durometer 64, Color: Black	213034270AC00004	Commodity drawing
					213034270AC5102	Placement & staple drawing
K	1	OFG gasket	303367x	TPE-Durometer 64, Color: Black	2130336700000002	Commodity drawing
					213033670AC4201	Welding drawing
					213033670AC5201	Staple drawing
L	4	Foam	303200	Closed cell PVC foam with PSA	2130320000000003	Commodity drawing
					2130320000005201	Curb foam placement
M	1	Screen	304472xxxx	Frame and corner keys to be white	213044720AC00002	Assembly drawing
N	2	Insulation (sides)	303419xx	EPS 20kg/m³	2130341900000002	Commodity drawing
O	-	Sealant	309001B 309001C	Base for Outer Frame Sealant Catalyst for Outer Frame Sealant	21309001B 21309001C	Material specification - o two-part silicone sealant

GENERAL NOTES:
 1. Reference Drawings include 21.---CER.0A0.61.xx for "A21 VCM/E List of Ports". (PROPRIETARY),
 2. A copy of this drawing plus any other supplemental documentation regarding these skylight models will be maintained at the Skylight Technical Database in the following category location: Technical Data/Submittal Data/ "Certification List of Parts / Compliance Documents". Horizontal and Vertical Cross-Section part sizes, materials and assembly are identical.
 3. Dimensions and Quantities shown on this drawing are for Standard Size VCM/VCE model skylights.

Architectural Testing
 Client Velux
 Report # 96235
 Date 10/6/09
 Tech K. Clark

VELUX CONFIDENTIAL

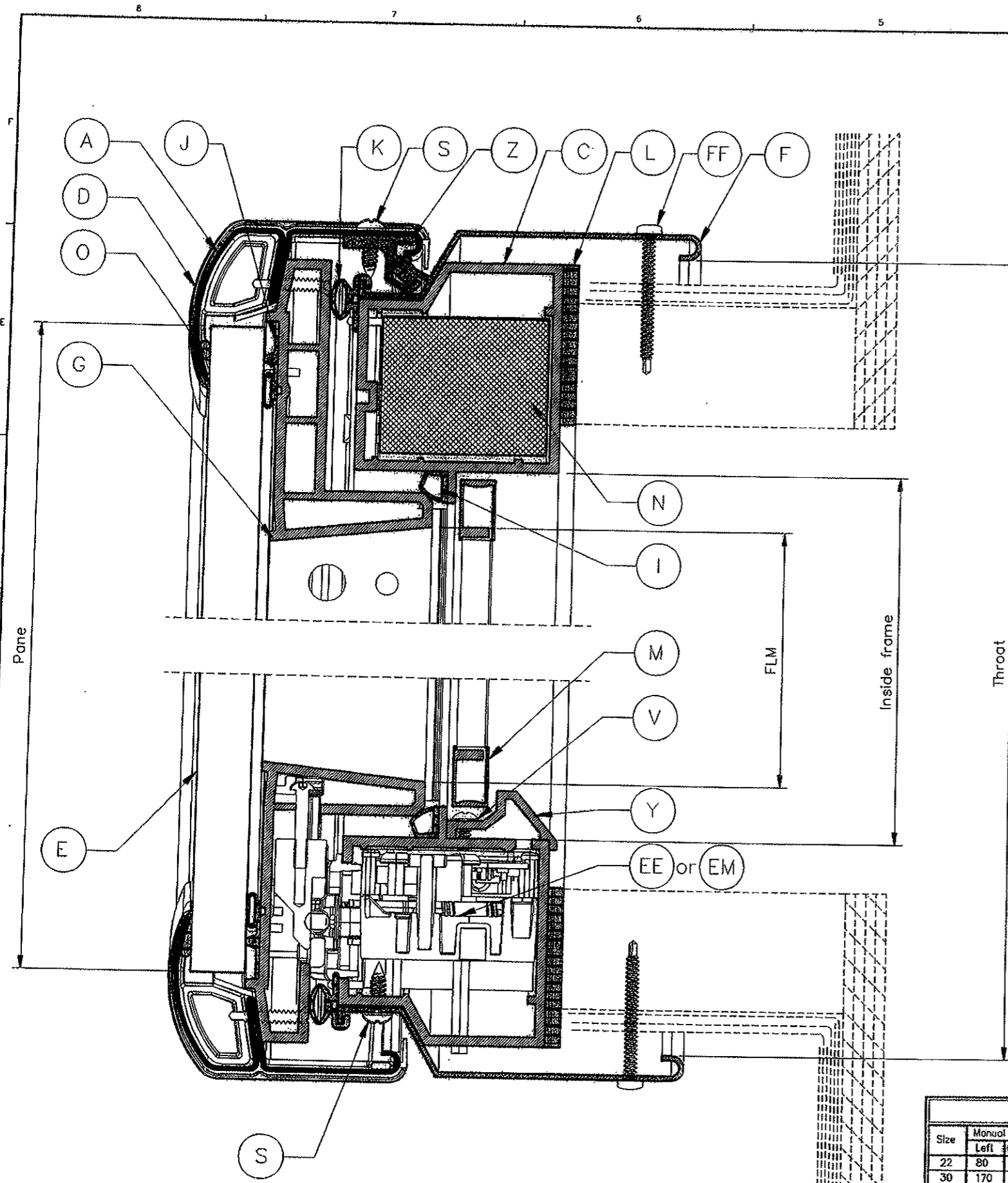
THIS DRAWING IS THE SOLE PROPERTY OF VELUX AMERICA INC. ANY REPRODUCTION IN PART OR AS A WHOLE WITHOUT THE WRITTEN PERMISSION OF VELUX AMERICA IS PROHIBITED.

DIMENSIONS ARE IN MM
 GENERAL TOLERANCES:
 ANGULAR: ±1
 ONE PLACE DECIMAL: ±0.5

NOTE: SKY-PRM
 1418 Evans Pond Road PO Box 5001
 Greenwood, South Carolina 29848-5001

VELUX
 VCM/VCE
 Product Certification
 Typical Horizontal Arrangement with
 Product List of Parts

DATE: 10/6/09
 REV: 1
 DRAWN: K. CLARK
 CHECK: J. CLARK



PART SCHEDULE						
ITEM	QTY.	PART/COMPONENT	COMPONENT NO.	DESCRIPTION	DRAWING NO.	COMMENTS
F	1	Counter flashing	302189 (Lineal)	(Top only) Extruded aluminum	213021B90A03602	Punching drawing
N	3	Insulation (Top & bottom)	303419xx	EPS 20kg/m ³	213021B90A00001	Profile drawing
Y	1	Screen retainer	303369	ABS with ASA coating Color:White	213033690A00002	Cutting drawing
Z	1	Female hinge bar	302191	Extruded aluminum	213033690A03102	Top & sides, Commodity drawing
AA	1	Operator cover	303391	ASA-Luran S 778 T or equivalent	213033690A03201	Bottom, Commodity drawing
BB	1	Plug	303418	Sash Plug for CAP Note, ASA-Luran S 778 T or equivalent	213033690A03202	Profile drawing
CC	1	Mounting bracket	303417	ASA-Luran S 778 T or equivalent	213033690A03104	Assembly drawing
DD	1	Brass Insert	306151	10-32 Brass Insert	213033690A03102	Cutting and drilling drawing
EE	1	Operator (Electrical)	-----	-----	-----	Installation drawing
EM	1	Operator (Mechanical)	-----	-----	-----	Hinge Socket Profile and Cutting drawing

FASTENER SCHEDULE						
ITEM	PART/COMPONENT	COMPONENT NO.	DESCRIPTION	DRAWING NO.	QUANTITY	COMMENTS
P	Staple	306012	ST 1.2x0.9x8.8x10MM, All, SS	-----	-----	Staple Frame gasket, sash gaskets
Q	Screw	306145	FHMS 8-32x3/4" Phillips Recess TI 80-82"	-----	-----	-----
R	Tee nut	306146	#8-32-1/4" barrel, No prongs	213061460000001	-----	Tee nut, 8-32 internal thread, without prongs
S	Screw	306148	#10 x 1/2 self tap PH SS with grey head	213061480000001	-----	Commodity drawing
T	Wood Screw	306149	#8-15 1-1/4" Type 17 PH w/ pvc seal	213061490000001	-----	Commodity drawing
U	Machine Screw	306153	#10-32 x 2" PH SS White Head	213061530000002	-----	Machine screw, #10-32
V	Screw	306154	#8 x 3/4" PH PH2 SS Self Tap White Head	-----	-----	-----
W	Screw	306166	#10 x 1-1/4" Wafer Hd Phill CZC Coarse	-----	-----	-----
X	T-nail	421020	T-nail 2.2-2.5x13 mm Fe/Zn Bl	214210200000001	-----	Commodity drawing
FF	Wood Screw	306136	P.H. w/drill point #8, 18-8 SS Finish: Black Zinc	213060560000006	-----	1.75" Length

* Note designates, this item is Not Shown on this drawing (21.VC-VER.A21.61.XX) or Sheet 1 of this set.
 *Typical Horizontal Arrangement with Product List of Parts" drawing (21.VC-HOR.A21.61.XX).
 V = Visible
 NV = Non-Visible

Item P Quantities Staple		Item Q Quantities Screw		Item R Quantities Tee nut		Item S Quantities Screw		Item T Quantities Wood Screw (VCE only)	
Size Code	Fasteners	Size Code	Fasteners	Size Code	Fasteners	Size Code	Fasteners	Size Code	Fasteners
2222	33	2222	4	2222	4	2222	7	2222	2
2234	39	2234	4	2234	4	2234	7	2234	2
2246	45	2246	4	2246	4	2246	7	2246	2
3030	43	3030	4	3030	4	3030	7	3030	2
3046	51	3046	4	3046	4	3046	7	3046	2
3434	43	3434	4	3434	4	3434	7	3434	2
4646	73	4646	4	4646	4	4646	9	4646	2

Item U Quantities Machine Screw		Item V Quantities Screw		Item W Quantities Screw		Item X Quantities T-nail		Item FF Quantities Wood Screw	
Size Code	Fasteners	Size Code	Fasteners	Size Code	Fasteners	Size Code	Fasteners	Size Code	Fasteners
2222	3	2222	5 4	2222	9	2222	12	2222	12
2234	3	2234	5 5	2234	11	2234	8	2234	12
2246	3	2246	5 5	2246	11	2246	12	2246	12
3030	3	3030	5 5	3030	14	3030	12	3030	14
3046	3	3046	5 5	3046	14	3046	12	3046	14
3434	3	3434	5 5	3434	14	3434	12	3434	14
4646	3	4646	5 5	4646	16	4646	10	4646	14

Architectural Testing
 Client Velux
 Report # 96235
 Date 10/6/09
 Tech R-Clark

Note:
 Item X Quantities, T-nail totals include (2) T-Nails per Corner Key, allowing for a total of (8) T-Nails for Corner Keys of each skylight.
 Remaining T-Nails secure the PR Gasket.

Lengths of Bottom Frame Filers									
Size	Manual Operator (VCM)			Cavity Length	Size	Electric Operator (VCE)			Cavity Length
	Left	Operator	Right		Left	Operator	Right		
22	80	260	220	672.3	22	--	445	60	672.3
30	170	260	330	875.5	30	--	445	100	875.5
34	190	260	370	977.1	34	80	445	220	977.1
46	370	260	540	1281.9	46	220	445	330	1281.9

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DIMENSIONS ARE IN MM GENERAL TOLERANCES: ANGULAR: ±1 ONE PLACE DECIMAL: ±0.5 FINISH:	NOTE: VELUX 1418 Evans Pond Road PO Box 5001 Greenwood, South Carolina 29648-5001
SPECIFICATION: FINISH: PERFORMANCE:	VCM/VCE Product Certification Typical Vertical Arrangement with Product List of Parts