

**AAMA 1503-09 THERMAL PERFORMANCE
TEST REPORT**

Rendered to:

CORAL ARCHITECTURAL PRODUCTS

SERIES/MODEL: FS400T Storefront System

TYPE: Glazed Wall Systems (Site-built)

Summary of Results	
Thermal Transmittance (U-Factor)	0.46
Condensation Resistance Factor - Frame (CRF_f)	61
Condensation Resistance Factor - Glass (CRF_g)	68
Unit Size	78-7/8" x 78-3/4" (2003 mm x 2000 mm)
Layer 1	3/16" Clear Annealed
Gap 1	0.47" Gap, Super Spacer (ZF-S), Air-Filled*
Layer 2	3/16" AFG Comfort Ti-R ($e=0.035^*$, #3)

Reference must be made to Report No. 93279.02-116-46, dated 10/08/09 for complete test specimen description and data.

AAMA 1503-09 THERMAL PERFORMANCE TEST REPORT

Rendered to:

CORAL ARCHITECTURAL PRODUCTS
3010 Rice Mine Road
Tuscaloosa, Alabama 35406

Report Number: 93279.02-116-46
Test Date: 10/03/09
Report Date: 10/08/09
Expiration Date: 10/03/13

Test Sample Identification:

Series/Model: FS400T Storefront System

Type: Glazed Wall Systems (Site-built)

Test Sample Submitted by: Client

Test Procedure: The condensation resistance factor (CRF) and thermal transmittance (U) were determined in accordance with AAMA 1503-09, *Voluntary Test Method for Thermal Transmittance and Condensation Resistance of Windows, Doors and Glazed Wall Sections*

- | | |
|---|---------|
| 1. Average warm side ambient temperature | 69.80 F |
| 2. Average cold side ambient temperature | -0.39 F |
| 3. 15 mph dynamic wind applied to test specimen exterior. | |
| 4. 0.0" \pm 0.04" static pressure drop across specimen. | |

Test Results Summary:

- | | |
|---|------|
| 1. Condensation resistance factor - Frame (CRF _f) | 61 |
| Condensation resistance factor - Glass (CRF _g) | 68 |
| 2. Thermal transmittance due to conduction (U _c) | 0.46 |
| (U-factors expressed in Btu/hr·ft ² ·F) | |

Test Sample Description:

CONSTRUCTION	Frame
Size (in.) Non-Standard	78-7/8" x 78-3/4"
Daylight Opening (in.)	36-3/8" x 74-5/8" (x2)
CORNERS	Butt
Fasteners	Screws
Sealant	Yes
MATERIAL	AU (0.18") *
Color Exterior	Gray
Finish Exterior	Anodized
Color Interior	Gray
Finish Interior	Anodized
GLAZING METHOD	Pocket

* Thermal Break is poured and skipped debridged, skip is 2-1/2"

Glazing Information:

Layer 1	3/16" Clear Annealed
Gap 1	0.47" Gap, Super Spacer (ZF-S), Air-Filled*
Layer 2	3/16" AFG Comfort Ti-R (e=0.035*, #3)
Gas Fill Method	N/A*
Desiccant	Yes

**Stated per Client/Manufacturer*

NA Non-Applicable

See Description Table Abbreviations

Test Sample Description: (Continued)

COMPONENTS		
Type	Quantity	Location
WEATHERSTRIP		
Wedge Gasket	1 Row	Interior and exterior glazing perimeter
HARDWARE		
No hardware		
DRAINAGE		
No visible weeps		

Test Duration:

1. The environmental systems were started at 16:39 hours, 10/02/09.
2. The thermal performance test results were derived from 10:56 hours, 10/03/09 to 14:56 hours, 10/03/09.

Condensation Resistance Factor (CRF):

The following information, condensed from the test data, was used to determine the condensation resistance factor:

T_h	=	Warm side ambient air temperature	69.80 F
T_c	=	Cold side ambient air temperature	-0.39 F
FT_p	=	Average of pre-specified frame temperatures (14)	43.69 F
FT_r	=	Average of roving thermocouples (4)	32.10 F
W	=	$(FT_p - FT_r) / [FT_p - (T_c + 10)] \times 0.40$	0.136
FT	=	$FT_p(1-W) + W (FT_r) =$ Frame Temperature	42.11 F
GT	=	Glass Temperature	47.22 F
CRF_g	=	Condensation resistance factor – Glass	68
		$CRF_g = (GT - T_c) / (T_h - T_c) \times 100$	
CRF_f	=	Condensation resistance factor – Frame	61
		$CRF_f = (FT - T_c) / (T_h - T_c) \times 100$	

The CRF number was determined to be 61 (on the size as reported). When reviewing this test data, it should be noted that the frame temperature (FT) was colder than the glass temperature (GT) therefore controlling the CRF number. Refer to the 'CRF Report' page and the 'Thermocouple Location Diagram' page of this report.

Thermal Transmittance (U_c):

T_h	= Average warm side ambient temperature	69.80 F
T_c	= Average cold side ambient temperature	-0.39 F
P	= Static pressure difference across test specimen 15 mph dynamic perpendicular wind at exterior	0.00 psf
	Nominal sample area	43.13 ft ²
	Total measured input to calorimeter	1473.04 Btu/hr
	Calorimeter correction	85.96 Btu/hr
	Net specimen heat loss	1387.08 Btu/hr
U_c	= Thermal Transmittance	0.46 Btu/hr·ft ² ·F

Glazing Deflection (in.):

	Left Glazing	Right Glazing
Edge Gap Width	0.47	0.47
Estimated center gap width upon receipt of specimen in laboratory (after stabilization)	0.47	0.44
Center gap width at laboratory ambient conditions on day of testing	0.47	0.44
Center gap width at test conditions	0.47	0.44

The sample was inspected for the formation of frost or condensation, which may influence the surface temperature measurements. The sample showed no evidence of condensation/frost at the conclusion of the test.

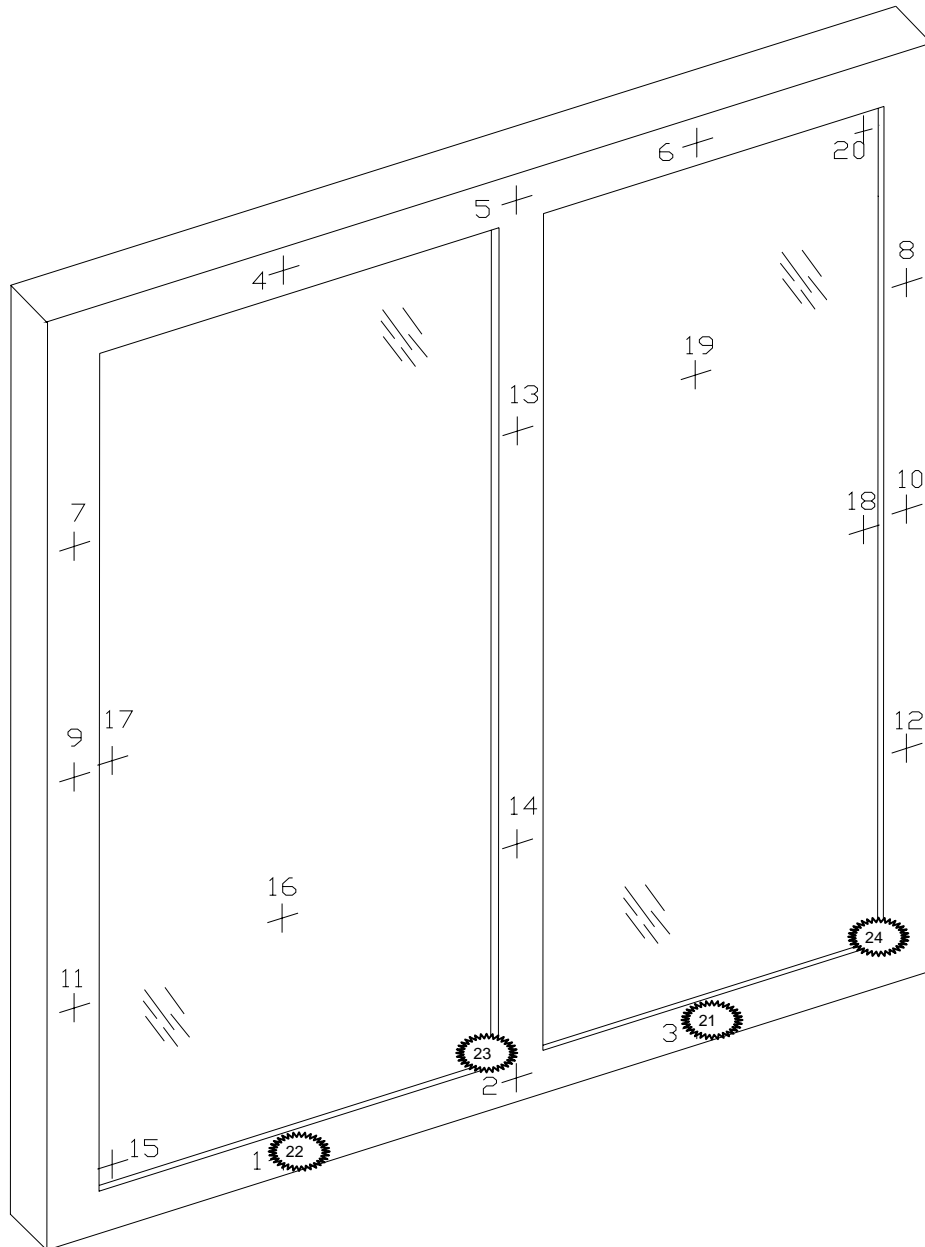
A calibration of the Architectural Testing Inc. 'thermal test chamber' (ICN 000001) in York, Pennsylvania was conducted in April 2009 in accordance with Architectural Testing Inc. calibration procedure.

Prior to testing the specimen was sealed with silicone on the interior side and checked for air infiltration per Section 9.3.4.

CRF Report

Time:	12:55	13:25	13:55	14:26	14:56	AVERAGE
Pre-specified Thermocouples - Frame						
1	32.40	32.39	32.38	32.40	32.43	32.40
2	36.22	36.27	36.25	36.23	36.23	36.24
3	29.77	29.78	29.78	29.76	29.76	29.77
4	43.78	43.72	43.75	43.71	43.71	43.73
5	45.74	45.75	45.74	45.75	45.77	45.75
6	41.97	42.05	41.98	42.02	42.01	42.01
7	54.68	54.70	54.67	54.69	54.78	54.71
8	53.16	53.14	53.16	53.16	53.11	53.14
9	51.67	51.65	51.65	51.68	51.69	51.67
10	50.76	50.78	50.77	50.78	50.75	50.77
11	41.89	41.83	41.85	41.86	41.87	41.86
12	41.61	41.60	41.61	41.62	41.62	41.61
13	47.31	47.38	47.35	47.37	47.37	47.36
14	40.66	40.69	40.67	40.67	40.68	40.67
FTP	43.69	43.70	43.69	43.69	43.70	43.69
Pre-specified Thermocouples - Glass						
15	30.32	30.30	30.24	30.25	30.27	30.28
16	52.72	52.67	52.67	52.68	52.63	52.67
17	50.36	50.39	50.39	50.32	50.40	50.37
18	48.94	48.95	48.97	49.00	48.94	48.96
19	55.94	55.88	55.91	55.90	55.93	55.91
20	45.17	45.14	45.14	45.11	45.11	45.13
GT	47.24	47.22	47.22	47.21	47.22	47.22
Cold Point (Roving) Thermocouples						
21	29.80	29.80	29.80	29.80	29.80	29.80
22	32.40	32.40	32.40	32.40	32.40	32.40
23	33.00	33.00	33.00	33.00	33.00	33.00
24	33.20	33.20	33.20	33.20	33.20	33.20
FT _R	32.10	32.10	32.10	32.10	32.10	32.10
W	0.14	0.14	0.14	0.14	0.14	0.14
FT	42.11	42.12	42.11	42.11	42.12	42.11
Warm Side - Room Ambient Air Temperature						
	69.80	69.80	69.80	69.80	69.80	69.80
Cold Side - Room Ambient Air Temperature						
	-0.40	-0.39	-0.34	-0.37	-0.41	-0.38
CRF _f	61	61	61	61	61	61
CRF _g	68	68	68	68	68	68

Thermocouple Location Diagram



Cold Point Locations

21	21. 29.80
22	22. 32.40
23	23. 33.00
24	24. 33.20

Detailed drawings, data sheets, representative samples of the test specimens, a copy of this report, or other pertinent project documentation will be retained by Architectural Testing, Inc. until 10/3/2013. At the end of this retention period such materials shall be discarded without notice and the service life of this report by Architectural Testing, Inc. 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.

Benjamin W. Green
Technician

Shon W. Einsig
Senior Technician
Individual-In-Responsible-Charge

BWG:kmm
93279.02-116-46

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

Appendix-A: Description Table Abbreviations (1)

Appendix-B: Drawings (6)

Revision Log

<u>Rev. #</u>	<u>Date</u>	<u>Page(s)</u>	<u>Revision(s)</u>
.02R0	10/08/09	All	Original Report Issue. Work requested by David Welch of Coral Architectural Products.

Appendix A: Description Table Abbreviations

CODE	Frame / Sash Types
AI	Aluminum w/ Vinyl Inserts (Caps)
AL	Aluminum
AP	Aluminum w/ Thermal Breaks - Partial
AS	Aluminum w/ Steel Reinforcement
AT	Aluminum w/ Thermal Breaks - All Members ($> 0.21"$)
AU	Aluminum Thermally Improved - All Members ($0.062" - 0.209"$)
AV	Aluminum / Vinyl Composite
AW	Aluminum-clad Wood
FG	Fiberglass
PA	ABS Plastic w/ All Members Reinforced
PC	ABS Plastic-clad Aluminum
PF	ABS Plastic w/ Foam-filled Insulation
PH	ABS Plastic w/ Horizontal Members Reinforced
PI	ABS Plastic w/ Reinforcement - Interlock
PL	ABS Plastic
PP	ABS Plastic w/ Reinforcement - Partial
PV	ABS Plastic w/ Vertical Members Reinforced
PW	ABS Plastic-clad Wood
ST	Steel
VA	Vinyl w/ All Members Reinforced
VC	Vinyl-clad Aluminum
VF	Vinyl w/ Foam-filled Insulation
VH	Vinyl w/ Horizontal Members Reinforced
VI	Vinyl w/ Reinforcement - Interlock
VP	Vinyl w/ Reinforcement - Partial
VV	Vinyl w/ Vertical Members Reinforced
VW	Vinyl-clad Wood
VY	Vinyl
WA	Aluminum / Wood composite
WD	Wood
WV	Vinyl / Wood composite
WF	Fiberglass/Wood Combination
WC	Composite/Wood Composite (Shaped vinyl/wood composite members)
CW	Copper Clad Wood
CO	Vinyl/Wood Composite Material

CODE	Spacer Types (See sealant)
A1	Aluminum
A2	Aluminum (Thermally-broken)
A3	Aluminum-reinforced Polymer
A4	Aluminum / Wood
A5	Aluminum-reinforced Butyl (Swiggle)
A6	Aluminum / Foam / Aluminum
A7	Aluminum U-shaped
A8	Aluminum-Butyl (Corrugated) (Duraseal)
ER	EPDM Reinforced Butyl
FG	Fiberglass
GL	Glass
OF	Organic Foam
P1	Duralite
PU	Polyurethane Foam
SU	Stainless Steel, U-shaped
CU	Coated Steel, U-shaped (Intercept)
S2	Steel (Thermally-broken)
S3	Steel / Foam / Steel
S5	Steel-reinforced Butyl
S6	Steel U-channel w/ Thermal Cap
SS	Stainless Steel
CS	Coated Steel
TP	Thermo-plastic
WD	Wood
ZE	Elastomeric Silicone Foam
ZF	Silicone Foam
ZS	Silicone / Steel
N	Not Applicable
TS	Thermo-plastic w/ stainless steel substrate

CODE	Tint Codes
AZ	Azurlite
BL	Blue
BZ	Bronze
CL	Clear
EV	Evergreen
GD	Gold
GR	Green
GY	Gray
LE	Low 'e' Coating
OT	Other (use comment field)
RC	Solar or Reflective Coating
RG	Roller Shades between glazing
RS	Silver (reflective coating)
SF	Suspended Polyester Film
SR	Silver
BG	Blinds between the Glazing
DV	Dynamic Glazing-Variable
DY	Dynamic Glazing-NonVariable

CODE	Gap Fill Codes
AIR	Air
AR2	Argon/Krypton Mixture
AR3	Argon / Krypton / Air
ARG	Argon/Air
CO2	Carbon Dioxide
KRY	Krypton/Air
SF6	Sulfur Hexafluoride
XE2	Xenon/Krypton/Air
XE3	Xenon/Argon/Air
XEN	Xenon/Air
N	Not Applicable

DOOR DETAILS	
N	Not Applicable
CODE	Door Type
EM	Embossed
FL	Flush
LF	Full Lite
LH	1/2 - Lite
LQ	1/4 - Lite
LT	3/4 - Lite
RP	Raised Panel
CODE	Skin
AL	Aluminum
FG	Fiberglass
GS	Galvanized Steel
ST	Steel
WD	Wood
VY	Vinyl
CODE	Panel
FG	Fiberglass
PL	Plastic
WP	Wood - Plywood
WS	Wood - Solid
CODE	Sub-Structure
GS	Galvanized Steel
ST	Steel
WD	Wood
VY	Vinyl
CODE	Core Fill
CH	Cellular - Honeycomb
EP	Expanded Polystyrene
PI	Polyisocyanurate
PU	Polyurethane
WP	Wood - Plywood
WS	Wood - Solid
XP	Extruded Polystyrene

CODE	Spacer Sealant
D	Dual Seal Spacer System
S	Single Seal Spacer System

CODE	Grid Description
N	No Muntins
G	Grids between glass
S	Simulated Divided Lites
T	True Muntins

CODE	Grid Size Codes
	Blank for no grids
0.75	Grids $< 1"$
1.5	Grids $\geq 1"$

CODE	Thermal Breaks
F	Foam
U	Urethane
V	Vinyl
FB	Fiberglass
O	Other
AB	ABS
NE	Neoprene
AI	Air
N	Not Applicable
P	Polyamide

Appendix B: Drawings

THERMAL TEST REPORT DRAWINGS FOR FS400T FRAMING SYSTEM

- INDEX TO DRAWINGS
- SHEET 1 INDEX TO DRAWINGS
 - SHEET 2 TYPICAL ELEVATION
 - SHEET 3 FRAMING DETAILS
 - SHEET 4 FRAMING DETAILS
 - SHEET 5 BILL OF MATERIALS



Architectural Testing

Test sample complies with these details.
Deviations are noted.

Report# 13279 01

Date 10/06/09 Tech BLK

ABBREVIATIONS:
D.L.O. = DAY LIGHT OPENING

THERMAL TEST REPORT DRAWINGS
FOR FS400T FRAMING SYSTEM
INDEX TO DRAWINGS

DATE	6-28-09		
DRAWN	CHECKED	APPROVED	
FILED	DCP		
PROJECT # THERMAL TEST			
DRAWING NO.			
FS400T 02			
SHEET		1 OF 5	

REV	BY	DATE	DESCRIPTION

Architectural Products
 3079 HOLE ME ROAD, TUSCALOOSA AL 35603
 PHONE: 205-772-7171 FAX: 205-255-7370

BILL OF MATERIALS

ITEM NO.	PART #	DESCRIPTION	DIMENSIONS	MATERIAL	MANUFACTURER	NOTES
1	NG1	GLAZING GASKET EXTERIOR/INTERIOR	.197 SPACE	EPDM	VARIES	EXTERIOR/INTERIOR @ GLASS
2	SB3	SETTING BLOCK AT INTERM. HORIZONTAL	0.625 X 4.000 X 1.500	EPDM	VARIES	4" LONG
3	NOT USED					
4	NOT USED					
5	FS401T	THERMAL HEAD	2.000 X 4.500 X 0.700	6036-T6 ALUMINUM	CORAL	
6	FS407T	THERMAL JAMB	2.000 X 4.500 X 0.700	6036-T6 ALUMINUM	CORAL	
7	ED339-1	END DAM	3.313 X 4.813 X 0.063	RIGID PVC	CORAL	
8	FS404T	VERTICAL MULLION	2.000 X 4.500 X 0.070	6063-T6 ALUMINUM	CORAL	
9	FS405	MULLION FILLER	0.265 X 2.50 X 0.062	6063-T6 ALUMINUM	CORAL	
10	NOT USED					
11	FS403	GLASS STOP	1.135 X 2.792 X 0.050	6063-T6 ALUMINUM	CORAL	
12	FS402T	SILL	2.000 X 4.500 X 0.700	6063-T6 ALUMINUM	CORAL	
13	FL339T	SUBSILL FLASHING	2.312 X 4.788 X 0.078	6063-T6 ALUMINUM	CORAL	
14	AS16	SPLINE ASSEMBLY SCREW	#14 X 1" HHSTS	STEEL	VARIES	TYPICAL SPLINE SCREW
15	AS31	ASSEMBLY SCREW	#6 X 1/4" PPH	STEEL	VARIES	
16	NOT USED					
17	NOT USED					
18	NOT USED					
19	SM5601	JOINT SEALANT TAPE	1/8" X 1/2/" VARIES	BUTYL	SCHNEE-MORE-HEAD	USED AT HORIZ. TO VERT. JOINT INTERSECTIONS

GLAZING SCHEDULE			
GLASS MARK SYMBOL	GLASS TYPE	MANUFACTURER	MAXIMUM SQUARE FEET
A	1" IG - 1/4" SOLAR COOL GRAY, 1/2" SPACER, 1/4" LOW E CLEAR #5 SURFACE	VARIES	36 3/8' X 74 3/4' 18,882



Test sample complies with these details. Deviations are noted.

Report# 03279.01
Date 10/06/08 Tech BWA

Architectural Products
2010 HIGHT ME ROAD TUCACACOA, FL 32110
PHONE 850.772.7127 FAX 850.265.7220

BILL OF MATERIALS
FOR FL300T FRAMING SYSTEM
THERMAL TEST REPORT DRAWINGS

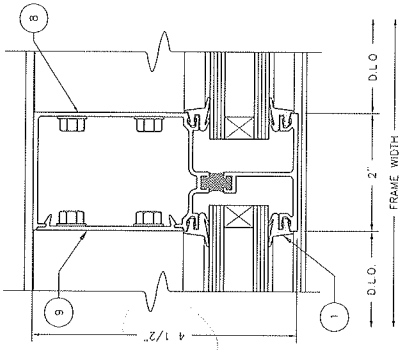
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PROJECT NO. 020
BILL NO. 001
BILL THERMAL TEST
DRAWING NO.
FS400T_02
SHEET 5 OF 5

NO.	DESCRIPTION

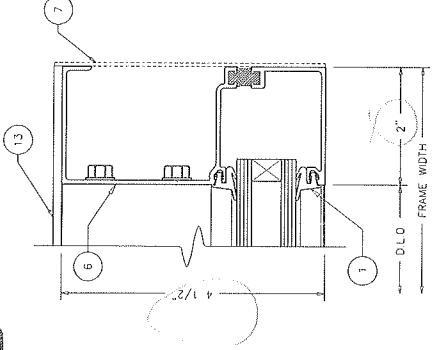
Architectural Products
Comet
 210 RICE NE ROAD TUSCALOOSA, AL 35450
 PHONE: 800/712-2757 FAX: 205/55-2320

THERMAL TEST REPORT DRAWINGS
 FOR FS400T FRAMING SYSTEM
FRAMING DETAILS

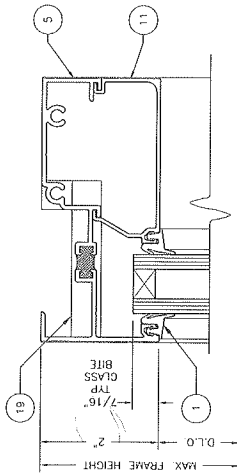
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BY	DATE
PROJECT TITLE THERMAL TEST	
DRAWING NO. FS400T 02	
SHEET 3 OF 5	



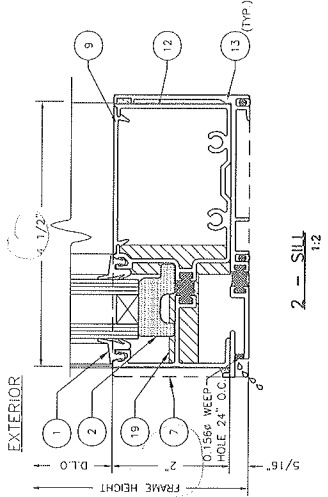
3 - INT. VERTICAL MULLION 1:2



4 - JAMB 1:2



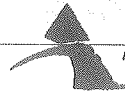
1 - STANDARD HEAD 1:2



2 - SILL 1:2

Architectural Testing
 Test sample complies with these details.
 Deviations are noted.

Report# 9327981
 Date 10/06/09 Tech BLUB



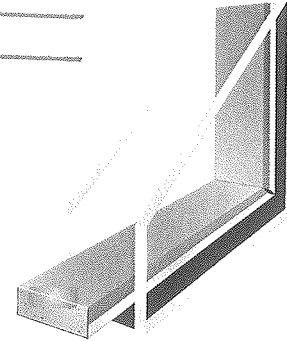
Architectural Testing

Super Spacer®

Test sample complies with these details.
Deviations are noted.

Report# Q3279.01
Date 10/06/00 Tech BU6

Super Spacer Standard is a flexible, organic foam spacer product that provides excellent perimeter insulation for sealed glazing units. Desiccant-filled with pre-applied side adhesive, the structural foam spacer significantly simplifies insulating glass production. Featuring a vapour barrier backing, the product must be used in combination with conventional IG sealants such as hot melt butyl, polyurethane or solvent-free polysulfide. Dual seal equivalent sealants may also be used (reference IG sealants Technical Bulletin RD0018).



Characteristics	Norm	Specification / Typical Value
Composition:	—	Foam EPDM (Ethylene Propylene Diene Monomer) base with desiccant pre-fill
Performance Characteristics: Thermal conductivity Colours Gas / Moisture vapour barrier Primary structural seal	ASTM C518 — ASTM F1249 ASTM D3985	0.162 W/mK Light Grey, Medium Grey, Black WVTR < 0.020 gm/m ² /day Oxygen < 0.009 cc/m ² /day Acrylic adhesive
Physical Characteristics: Density Specific Gravity Hardness	ASTM D1056 ASTM D1056 ASTM D2240	50 - 65 pcf 0.800 - 1.041 g/cm ³ 88 shore 00
Dimensions:	—	Reference attached table
Desiccant fill	—	40% by weight
Intermittent temperature range	—	-40°C to 121°C / -40°F to 250°F
Compatible secondary sealants	—	HMB, PU, PS, DSE (Curable HMB) Reference IG sealants Technical Bulletin RD0018
Fogging	EN 1279 - 6 ASTM 774 HIGS 2190 CGSB 12.8	No fog in visual area No fog in visual area No fog in visual area No fog in visual area
Gas Retention	EN 1279 - 3	Pass
I.G. Durability	EN 1279 - 2 ASTM 773 CGSB 12.8	Pass Pass Pass

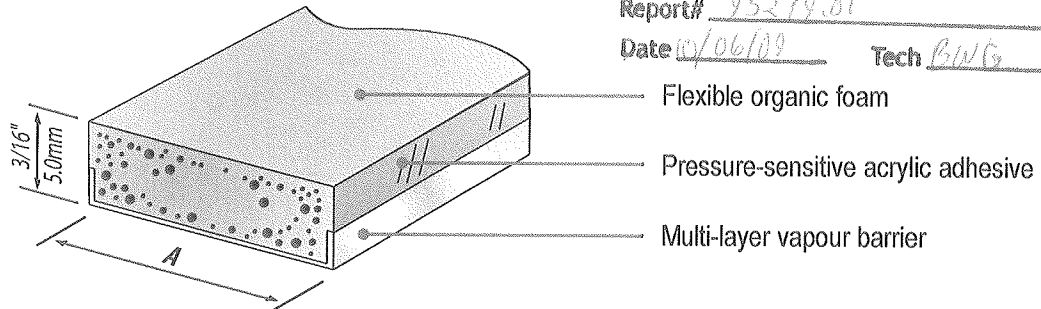
Super Spacer®



Test sample complies with these details.
Deviations are noted.

Report# 93279.01

Date 10/06/09 Tech BWG



(A) Width mm	(A) Width inches	Meter/ Reel 3.281	Feet/ Reel	Meter/ Auto Reel	Feet/ Auto Reel
4.8	3/16	610	2000	N/A	N/A
6.4	1/4	457	1500	1372	4500
7.9	5/16	335	1100	1006	3300
9.5	3/8	305	1000	914	3000
11.1	7/16	274	900	823	2700
11.9	15/32	244	800	731	2400
12.7	1/2	244	800	731	2400
14.3	9/16	213	700	640	2100
15.9	5/8	206	675	617	2025
17.5	11/16	183	600	549	1800
19.1	3/4	175	575	526	1725
20	0.798	152	500	457	1500

Spacer Sizes

Super Spacer Standard is available in a standard 5mm (3/16") thickness and a full range of spacer widths from 4.8mm (3/16") to 20mm (.798").

Continuous Packaged Length

For regular insulating-glass production, Super Spacer Standard is supplied on reels with the continuous packaged length varying depending on the spacer width.

Protective Packaging

To provide desiccant protection, the reels are sealed in moisture-proof foil bags and then packaged in high-density polyethylene bags. These double-packaged reels are then shipped in recyclable cardboard boxes.

Desiccant Systems

Over 40% by spacer weight is desiccant material, and the low-deflection blend primarily consists of 3A molecular-sieve material.