

**NFRC 102-2004 THERMAL PERFORMANCE
TEST REPORT**

Rendered to:

CORAL ARCHITECTURAL PRODUCTS

SERIES/MODEL: FS400T Storefront System

TYPE: Glazed Wall Systems (Site-built)

Summary of Results	
Standardized Thermal Transmittance (U-Factor)	0.44
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) Annealed

Reference must be made to Report No. 93279.01-116-46, dated 10/08/09 for complete test specimen description and data.

NFRC 102-2004 THERMAL PERFORMANCE TEST REPORT

Rendered to:

CORAL ARCHITECTURAL PRODUCTS
3010 Rice Mine Road
Tuscaloosa, Alabama 35406

Report Number: 93279.01-116-46
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)

Overall Size: 78-7/8" x 78-3/4" (2003 mm x 2000 mm) (Model Size)

NFRC Standard Size: 78.7" x 78.7" (2000 mm wide x 2000 mm high)

Test Sample Submitted by: Client

Test Sample Submitted for: 0

Test Procedure: U-factor tests were performed in a Guarded Hot Box in accordance with NFRC 102-2004, *Test Procedure for Measuring the Steady-State Thermal Transmittance of Fenestration Systems*.

Test Results Summary:

Standardized U-factor (U_{st}): 0.44 Btu/hr·ft²·F CTS Method

Test Sample Description:

CONSTRUCTION	Frame
Size (in.)	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) Annealed
Gas Fill Method	N/A*

**Stated per Client/Manufacturer*

N/A 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		

Thermal Transmittance (U-factor)

Measured Test Data

Heat Flows

1. Total Measured Input into Metering Box (Q_{total})	1473.04 Btu/hr
2. Surround Panel Heat Flow (Q_{sp})	47.25 Btu/hr
3. Surround Panel Thickness	8.00 inches
4. Surround Panel Conductance	0.0261 Btu/hr-ft ² -F
5. Metering Box Wall Heat Flow (Q_{mb})	20.81 Btu/hr
6. EMF vs Heat Flow Equation (equivalent information)	0.0196*EMF + 0.020
7. Flanking Loss Heat Flow (Q_{fl})	17.90 Btu/hr
8. Net Specimen Heat Loss (Q_s)	1387.08 Btu/hr

Areas

1. Test Specimen Projected Area (A_s)	43.13 ft ²
2. Test Specimen Interior Total (3-D) Surface Area (A_h)	57.06 ft ²
3. Test Specimen Exterior Total (3-D) Surface Area (A_c)	50.83 ft ²
4. Metering Box Opening Area (A_{mb})	69.44 ft ²
5. Metering Box Baffle Area (A_{bi})	60.74 ft ²
6. Surround Panel Interior Exposed Area (A_{sp})	26.31 ft ²

Test Conditions

1. Average Metering Room Air Temperature (t_h)	69.80 F
2. Average Cold Side Air Temperature (t_c)	-0.39 F
3. Average Guard/Environmental Air Temperature	71.26 F
4. Metering Room Average Relative Humidity	4.98 %
5. Measured Cold Side Wind Velocity (Perpendicular Flow)	17.07 mph
6. Measured Static Pressure Difference Across Test Specimen	0.00" ± 0.04"H ₂ O

Results

1. Thermal Transmittance of Test Specimen (U_s)	0.46 Btu/hr-ft ² -F
2. Standardized Thermal Transmittance of Test Specimen (U_{st})	0.44 Btu/hr-ft ² -F

Thermal Transmittance (U-factor)

Calculated Test Data

CTS Method

1. Emittance of Glass (e_1)	0.84
2. Warm Side Baffle Emittance (e_{b1})	0.92
3. Equivalent Warm Side Surface Temperature	46.03 F
4. Equivalent Cold Side Surface Temperature	5.56 F
5. Warm Side Baffle Surface Temperature	67.89 F
6. Measured Warm Side Surface Conductance (h_h)	1.35 Btu/hr·ft ² ·F
7. Measured Cold Side Surface Conductance (h_c)	5.40 Btu/hr·ft ² ·F
8. Test Specimen Thermal Conductance (C_s)	0.79 Btu/hr·ft ² ·F
9. Convection Coefficient (K_c)	0.31 Btu/(hr·ft ² ·F ^{1.25})
10. Radiative Test Specimen Heat Flow (Q_{r1})	697.44 Btu/hr
11. Conductive Test Specimen Heat Flow (Q_{c1})	689.64 Btu/hr
12. Radiative Heat Flux of Test Specimen (q_{r1})	16.17 Btu/hr·ft ² ·F
13. Convective Heat Flux of Test Specimen (q_{c1})	15.99 Btu/hr·ft ² ·F
14. Standardized Warm Side Surface Conductance (h_{sth})	1.21 Btu/hr·ft ² ·F
15. Standardized Cold Side Surface Conductance (h_{stc})	5.28 Btu/hr·ft ² ·F
16. Standardized Thermal Transmittance (U_{st})	0.44 Btu/hr·ft ² ·F

Test Duration

1. The environmental systems were started at 16:39 hours, 10/02/09.
2. The test parameters were considered stable for two consecutive four hour test periods from 06:56 hours, 10/03/09 to 14:56 hours, 10/03/09.
3. The thermal performance test results were derived from 10:56 hours, 10/03/09 to 14:56 hours, 10/03/09.

The reported Standardized Thermal Transmittance (U_{st}) was determined using CTS Method, per Section 8.2(A) of NFRC 102.

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.

"This test method does not include procedures to determine the heat flow due to either air movement through the specimen or solar radiation effects. As a consequence, the thermal transmittance results obtained do not reflect performances which may be expected from field installations due to not accounting for solar radiation, air leakage effects, and the thermal bridge effects that may occur due to the specific design and construction of the fenestration system opening. Therefore, it should be recognized that the thermal transmittance results obtained from this test method are for ideal laboratory conditions and should only be used for fenestration product comparisons and as input to thermal performance analyses which also include solar, air leakage and thermal bridge effects."

"Ratings included in this report are for submittal to an NFRC-licensed IA for certification purposes and are not meant to be used for labeling purposes. Only those values identified on a valid Certification Authorization Report (CAR) are to be used for labeling purposes."

The test sample was installed in a vertical orientation, the exterior of the specimen was exposed to the cold side. The direction of heat transfer was from the interior (warm side) to the exterior (cold side) of the specimen.

ANSI/NCSL Z540-2-1997 type B uncertainty for this test was 1.53%.

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. Ratings included in this report are for submittal to an NFRC licensed IA for certification purposes and are not meant to be used for labeling purposes. Only those values identified on a valid Certification Authorization Report (CAR) are to be used for labeling purposes. 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.

Tested By:

Reviewed By:

Benjamin W. Green
Technician

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

BWG:kmm
93279.01-116-46

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

Rev. #	Date	Page(s)	Revision(s)
.01R0	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
PI	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 >= 1"

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

Appendix B: Submittal Form and Drawings

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

DATE 6-26-08
DRAWN BY [] CHECKED BY []
PROJECT NO. []
BILL NO. []
BILL THERMAL TEST
DRAWING NO. FS400T_02
SHEET 5 OF 5

REV	BY	DATE	DESCRIPTION


 Comal Architectural Products
 2010 HIGHWAY 190 ROAD, TUSCALOOSA, AL 35602
 PHONE: 205/717-7171 FAX: 205/265-7120

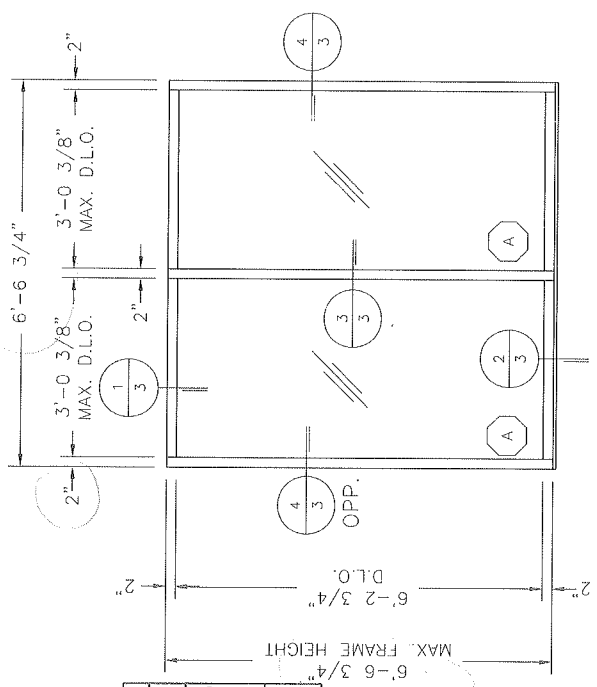
THERMAL TEST REPORT DRAWINGS
 FOR FS400T FRAMING SYSTEM
 TYPICAL ELEVATION STANDARD
 MULLION

DATE	6-26-08
ISSUED	
REVISION	
BY	
DATE	
PROJECT NO.	
PROJECT NAME	
DRAWING NO.	FS400T-02
SHEET	2 OF 5

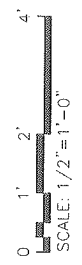


Test sample complies with these details.
 Deviations are noted.

Report# 9327901
 Date 6/26/08 Tech BLG



**E1 - LIGHT ALUMINUM MULLION
 EXTERIOR GLAZED**



STEEL TEST BUCK

SPECIMEN #1	TEST SPECIFICATIONS
AAMA 1503-98	VOLUNTARY TEST METHOD FOR THERMAL TRANSMITTANCE AND CONDENSATION RESISTANCE OF WINDOWS, DOORS AND GLAZED WALL SECTIONS
NFRC 102-2004	NFRC TEST PROCEDURES FOR MEASURING THE STEADY-STATE THERMAL TRANSMITTANCE OF PENETRATION SYSTEMS

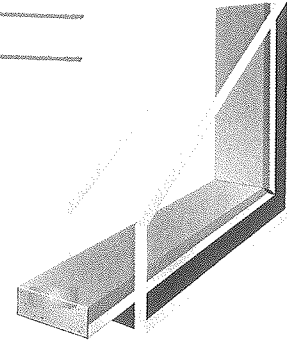


Super Spacer®

Test sample complies with these details.
Deviations are noted.

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

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	ASTM C518	0.162 W/mK
Colours	—	Light Grey, Medium Grey, Black
Gas / Moisture vapour barrier	ASTM F1249 ASTM D3985	WVTR < 0.020 gm/m ² /day Oxygen < 0.009 cc/m ² /day
Primary structural seal		Acrylic adhesive
Physical Characteristics:		
Density	ASTM D1056	50 - 65 pcf
Specific Gravity	ASTM D1056	0.800 - 1.041 g/cm ³
Hardness	ASTM D2240	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

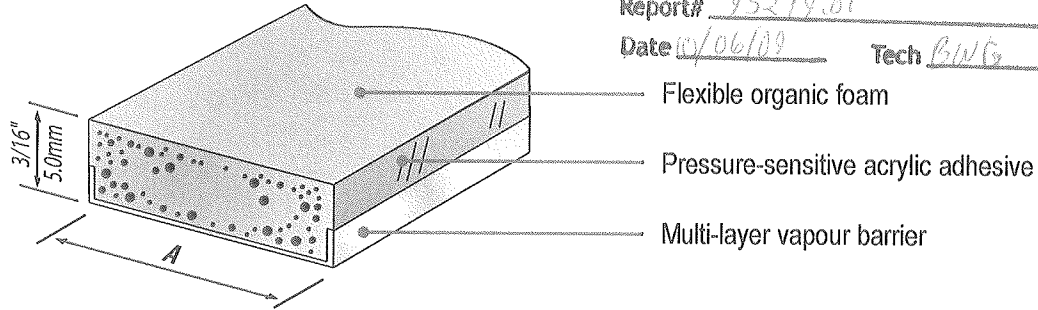
Super Spacer®



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.