ANSI/NFRC 100

Procedure for Determining Fenestration Product U-factors

ANSI/NFRC 200

Procedure for Determining Fenestration Product Solar Heat Gain Coefficient and Visible Transmittance at Normal Incidence

NFRC 500

Procedure for Determining Fenestration Product Condensation Resistance Values

Fenestration Simulation Report

5400 HTP Curtain Wall

Report Number

WIN20M00933

Monday, July 20, 2020

Prepared For

Oren Anava

Windspec Inc.

1310 Creditstone Road

Concord, Ontario

L4K 5T7

(905) 738-8311

Prepared By

WSP

582 Lancaster, West

Kitchener, Ontario, N2K 1M3

519-743-8777

TABLE OF CONTENTS

Manufacturer:	Windspec Inc.
Report Number:	WIN20M00933
Product Line:	5400 HTP Curtain Wall
Frame:	Aluminum w/ Thermal Breaks - All Members
Sash:	N/A
Thermal Break:	P
Edge of Glass:	Interior and exterior edges of the glazing is held by EPDM.
Glazing:	Vitro Solarban 60 on 6mm Clear (SB60), 6mm Vitro Clear glass (VCl), 90% Argon/10% Air fill (arg90).
Spacer:	Superspacer Triseal Premium Plus. Silicone Foam with PIB Primary and Silicone Secondary Sealant (st).
Weatherstripping:	N/A
General:	This product line includes the 5400 HTP Curtain Wall manufactured by Windspec Inc. 3 mullions are used in the product line and are groupable per ANSI/NFRC 100-2017 section 4.2.1.H. A group leader calculation was performed for the mullions and the 5" mullion is the group leader.

Chris Thuss

Digitally signed by Chris Thuss
Date: 2020.07.23 14:56:00 -04'00'

Chris Thuss

Simulator

Zeljka Lazarevic

Digitally signed by Zeljka Lazarevic
DN: dc=net, dc=pbwan, dc=corp, ou=Canada, ou=FORESTS, ou=MMM, ou=MMMGROUP, ou=Kitchener, cn=Zeljka Lazarevic, email=Zeljka.Lazarevic@wsp.com
Date: 2020.07.23 15:08:43 -04'00'

Simulator in Responsible Charge

The windows documented in this report were simulated in accordance with the ANSI/NFRC 100: Procedure for Determining Fenestration Product U-Factors (2017), ANSI/NFRC 200: Procedure for Determining Fenestration Product Solar Heat Gain Coefficient and Visible Transmittance at Normal Incidence (2017) and NFRC 500: Procedure for Determining Fenestration Product Condensation Resistance Values (2017).

The windows were simulated using WINDOW 7 and THERM 7 computer programs as specified in ANSI/NFRC 100 and ANSI/NFRC 200. The most currently approved spectral data files from NFRC were also used. The WINDOW program models the one-dimensional heat flow through the center-of-glass portion of the window. The THERM program models the two-dimensional heat flow through the frame, edge-of-glass, divider, and divider-edge portions of the window. The input data for both programs is based on manufacturer's specifications. Defaults for material thermal and optical properties are given in the computer programs. When values other than defaults were used, they are documented.

Ratings values included in this report are for submittal to an NFRC licenced IA and are not meant to be used directly for labeling purposes. Only those values identified on a valid Certificate of Authorization (CA) by an NFRC accredited Inspection Agency (IA) are to be used for labeling purposes.

The values included in this report are not considered in compliance with ANSI/NFRC 100, ANSI/NFRC 200, and/or NFRC 500 unless the associated validation test requirements have been satisfied, as applicable.

This report will be retained by WSP Canada Group Limited for a period of at least 5 years from date of issue.

DISCLAIMER:

This window simulation report was generated by WSP Canada Group Limited of Kitchener, ON. The report relates only to the items specified.

WSP Canada Group Limited and its employees neither endorse nor warrant the suitability of the product simulated. Every effort was taken to accurately model the performance of the windows documented in this report. Because of the large amount of input data and analyses, it is possible that errors or omissions could occur.

Neither WSP Canada Group Limited nor any of its employees shall be responsible for any loss or damage resulting directly or indirectly from any default, error, or omission.

SIMULATION NOTES

1 This is an "ANSI/NFRC 100: Procedure for Determining Fenestration Product U-Factors" Certification Report.

2 This is an "ANSI/NFRC 200: Procedure for Determining Fenestration Product Solar Heat Gain Coefficient and Visible Transmittance at Normal Incidence" Certification Report.

3 This is an "NFRC 500: Procedure for Determining Fenestration Product Condensation Resistance Values" Certification Report.

4 Unit conversions and rounding are performed according to NFRC 601.

5 All glazing surface emissivities are assumed to be 0.84 unless otherwise stated.

6 The gas fill method is single probe with 90% argon fill.

7 Unless otherwise stated. All non-continuous hardware that does not create a thermal bridge such as hinges, balances, locks etc. are not modeled.

8 Where applicable, the following materials are used (Conductivity in W/mK): ADCO PIB (0.146), Cardinal Stainless Steel (14.187), Superspacer Silicone Foam S1 (0.178), Superspacer S2 Premium (0.125), Superspacer S2 Premium Plus (0.127), Superspacer Standard EPDM (0.179), Superspacer TriSeal (0.141), Superspacer T-Spacer (0.130), GED Intercept Ultra Stainless Steel (13.63), Quanex Butyl 761-71X (0.177), San Gobain SAN 35% Glass Fiber (0.142), Tremco EnerEDGE Silicone Warm-Edge Spacer, non-white (0.118), Tremco EnerEDGE Silicone Warm-Edge Spacer, white (0.194).

ID	Name	No. of Layers	Mode	Tilt	Environmental Conditions	Keff (Btu/h*ft*F)	Overall Thickness (in)	Uval (Btu/h*ft²F)	SHGC	Visible Transmittance
1	VCl-arg90-SB60	2	#	90	NFRC 100-2010	0.026	0.972	0.244	0.464	0.704
2	VCl-arg90-VCl-arg90-SB60	3	#	90	NFRC 100-2010	0.030	1.709	0.173	0.430	0.631

NFRC Simulation Data – Summary

Manufacturer: Windspec Inc.
Series/Model #: 5400 HTP Curtain Wall

Spacer: Superspacer Triseal Premium Plus. Silicone Foam with PIB Primary and Silicone Secondary Sealant (st).

Operator Type:	CWCW	Sim Lab Code:	SEEL
Model Size:	2000 x 2000	Report number:	WIN20M00933
Thermal Break:	P	Date:	7/20/2020
		Revised Date:	
		Rating Procedure:	2017

Mfr Product Code	Product Number	Gap 1 (in)	Gap 2 (in)	Gap Fill 1	Gap Fill 2	Emissivity Surface 2	Emissivity Surface 3	Emissivity Surface 4	Emissivity Surface 5	Emissivity Surface 6	Tint	Spacer	Grid Type	Grid Size	U-Factor (Btu/h*ft²F)	SHGC	VT	*CR
VCI-arg90-SB60, st	0001	0.50		ARG			0.03				CL	ZF-D	N		0.30	0.43	0.65	57
VCI-arg90-VCI-arg90-SB60, st	0002	0.50	0.50	ARG	ARG				0.03		CL	ZF-D	N		0.22	0.40	0.58	68

* Note: The Condensation Resistance results obtained from this procedure are for controlled laboratory conditions and do not include the effects of air movement through the specimen, solar radiation, and the thermal bridging that may occur due to the specific design and construction of the fenestration system opening.

APPENDIX A

Group Leader Calculation

Appendix A - Group Leader Calculations

Manufacturer:	Windspec Inc.	Sim Lab Code:	SEEL
Series/Model #:	5400 HTP Curtain Wall	Report number:	WIN20M00933
Operator Type:	CWCW	Date:	7/20/2020
Model Size:	2000 x 2000	Revised Date:	
		Rating Procedure:	2017

Mullion Group Leader

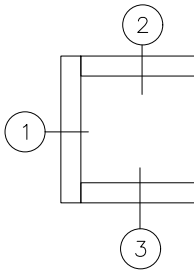
Product Description	U-Factor (Btu/ h* ft² F)	Group Leader
VCl-arg90-VCl-arg90-SB60, st, 5inML	0.215	Yes
VCl-arg90-VCl-arg90-SB60, st, 4inML	0.214	No
VCl-arg90-VCl-arg90-SB60, st, 2-3-4inML	0.213	No

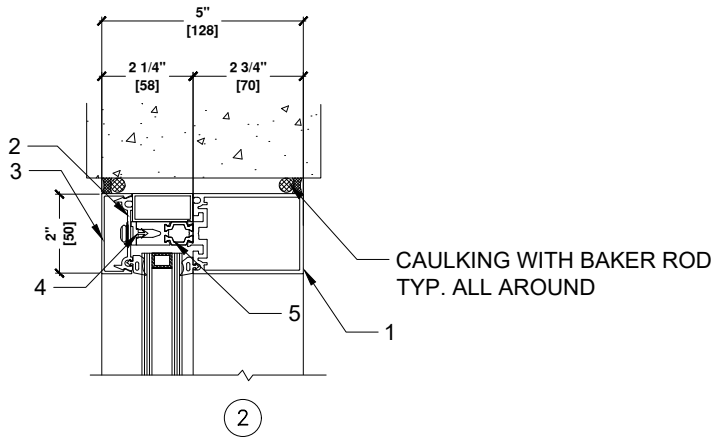
APPENDIX B

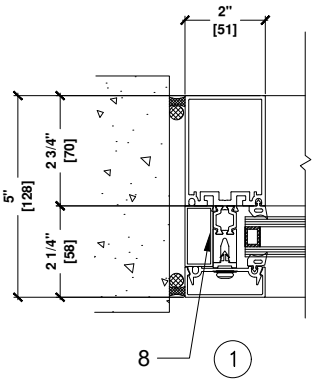
Product Drawings

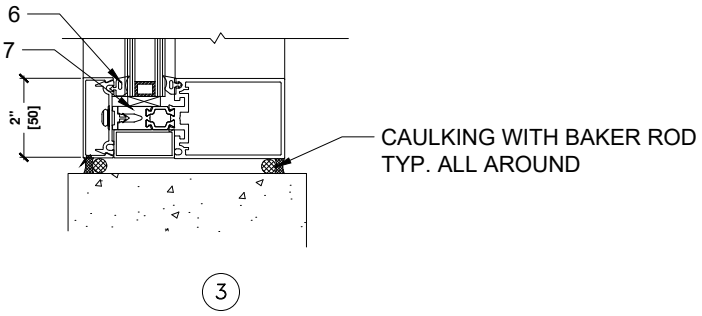
DRAWING NO: 003

5400 HTP CURTAIN WALL
2" x 2 3/4" (50.8 mm x 69.85 mm) Mullion









#	DIE #	DESCRIPTION
1	CA-54201	New HTP Mullion
2	CA-54006	Pressure Plate
3	CA-54004	Alum. Snap-on Cap
4	R-55202	Flexible PVC Thermal break
5	N/A	Bautec Strip Nylon 18mm Wide
6	N/A	Epdem Gasket
7	N/A	New Aluminum Neck
8	N/A	PVC Pocket Filler

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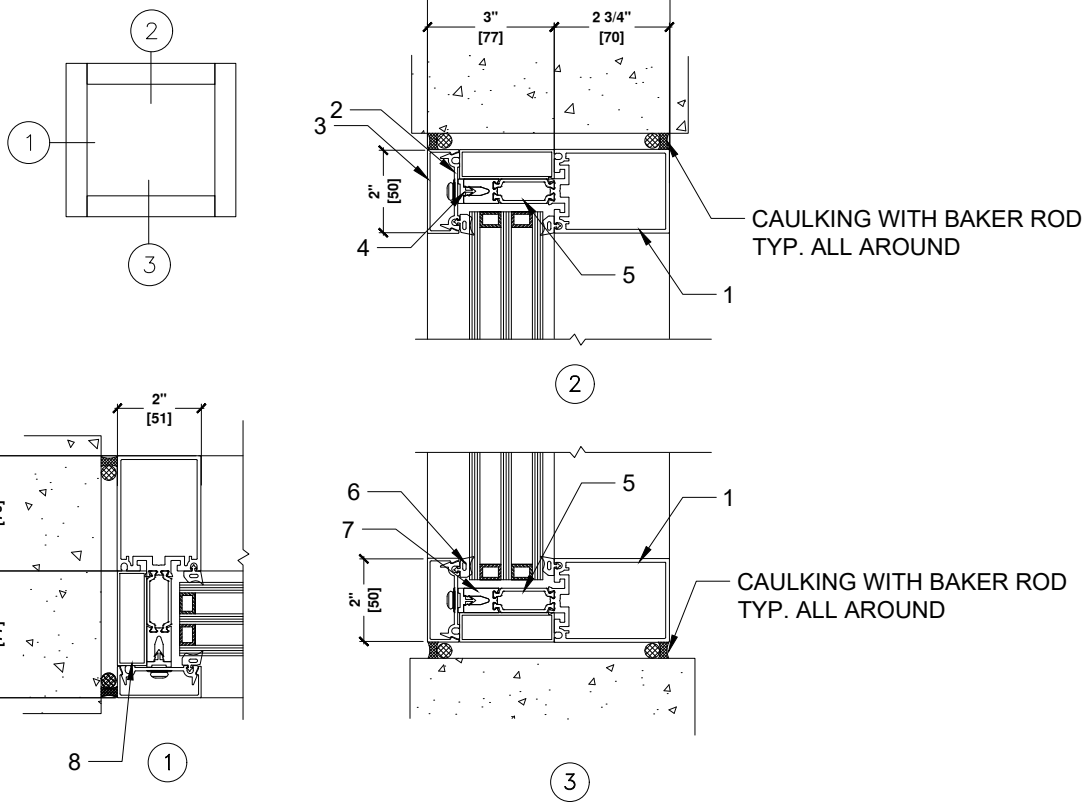
JUNE 2020

DRAWING NO: 003

5400 HTP CURTAIN WALL
2" x 2 3/4" (50.8 mm x 69.85 mm) Mullion for Triple Glazed



#	DIE #	DESCRIPTION
1	CA-54201	New HTP Mullion
2	CA-54006	Pressure Plate
3	CA-54004	Alum. Snap-on Cap
4	R-55202	Flexible PVC Thermal break
5	N/A	Bautec Strip Nylon 37mm Wide
6	N/A	Epdem Gasket
7	N/A	New Aluminum Neck
8	N/A	PVC Pocket Filler

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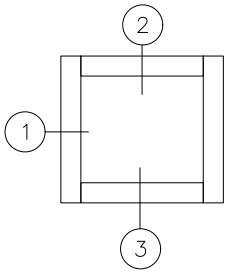
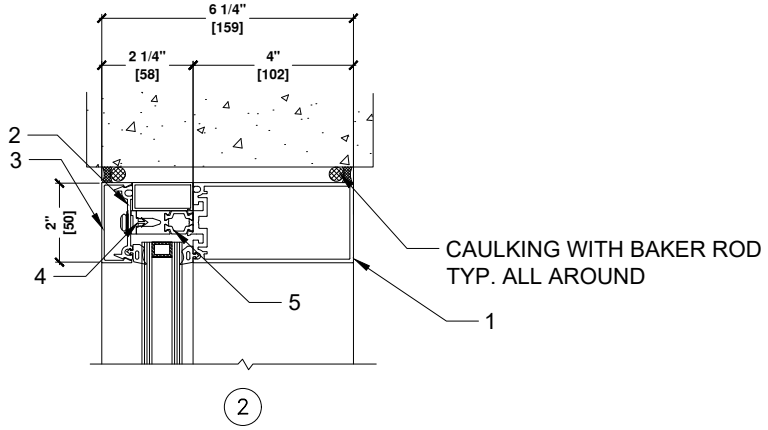
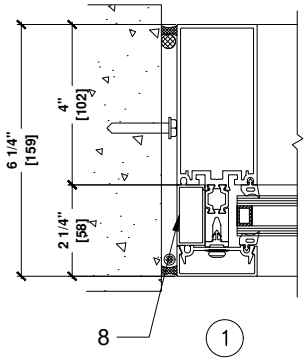
JULY2020

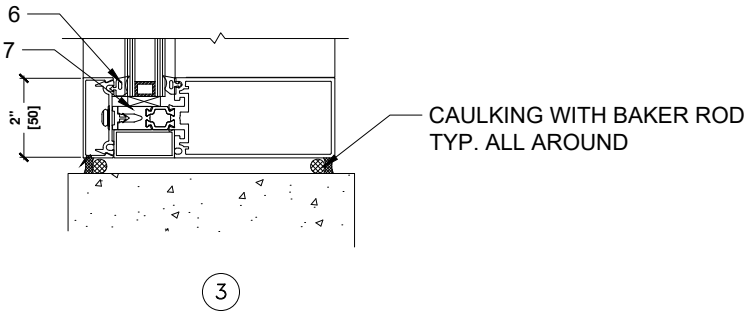
DRAWING NO: 001

5400 HTP CURTAIN WALL
2" x 4" (50.8 mmx101.6 mm) Mullion









#	DIE #	DESCRIPTION
1	CA-54202	New HTP Mullion
2	CA-54006	Pressure Plate
3	CA-54004	Alum. Snap-on Cap
4	R-55202	Flexible PVC Thermal break
5	N/A	Bautec Strip Nylon 18mm Wide
6	N/A	Epdem Gasket
7	N/A	New Aluminum Neck
8	N/A	PVC Pocket Filler

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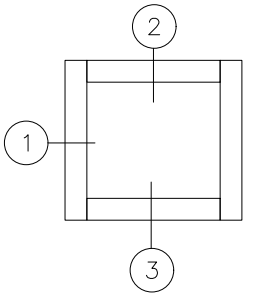
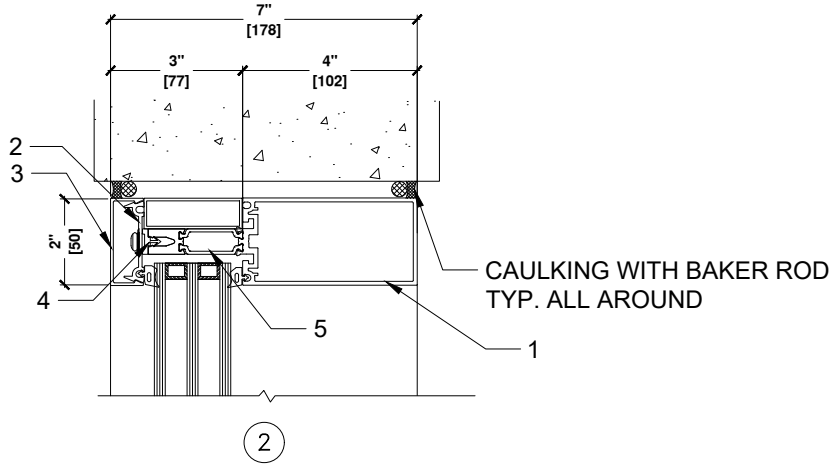
DRAWING NO: 001

5400 HTP CURTAIN WALL
2" x 4" (50.8 mmx101.6 mm) Mullion





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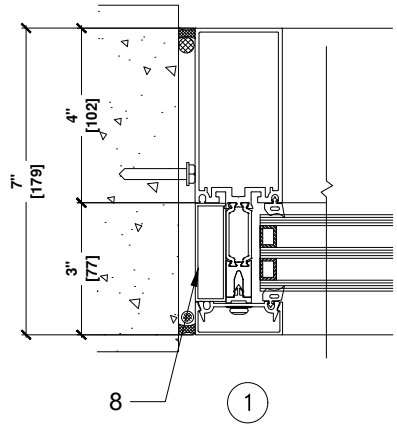

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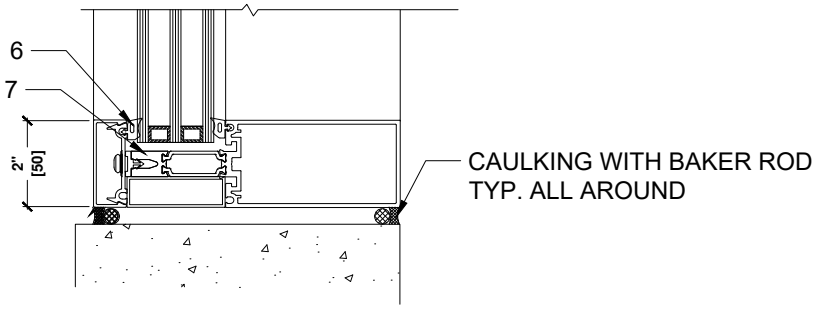

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#	DIE #	DESCRIPTION
1	CA-54202	New HTP Mullion
2	CA-54006	Pressure Plate
3	CA-54004	Alum. Snap-on Cap
4	R-55202	Flexible PVC Thermal break
5	N/A	Bautec Strip Nylon 37mm Wide
6	N/A	Epdem Gasket
7	N/A	New Aluminum Neck
8	N/A	PVC Pocket Filler

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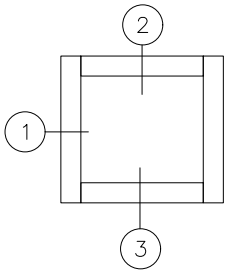
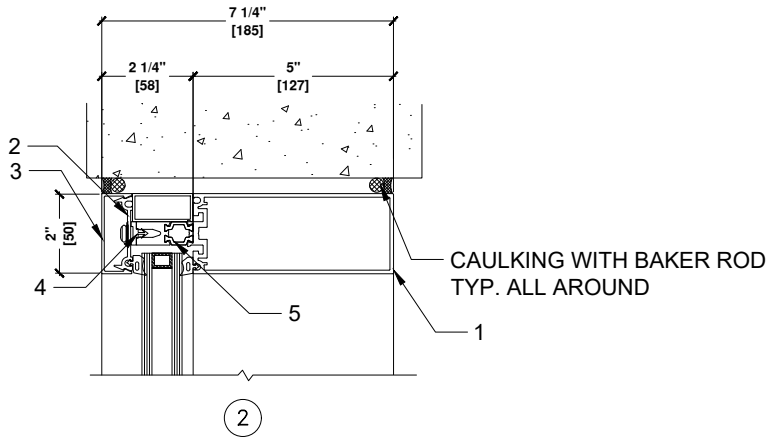
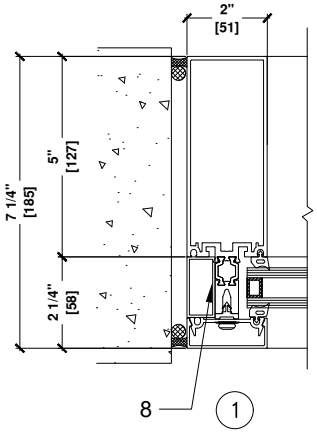
JULY2020

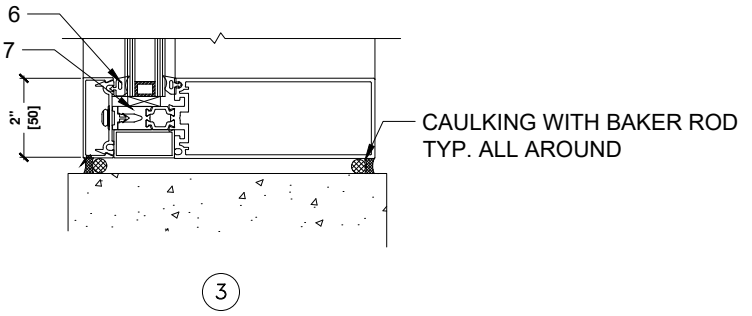
DRAWING
NO: 005

5400 HTP CURTAIN WALL
2" x 5" (50.8mm x127 mm) Mullion









#	DIE #	DESCRIPTION
1	CA-54203	New HTP Mullion
2	CA-54006	Pressure Plate
3	CA-54004	Alum. Snap-on Cap
4	R-55202	Flexible PVC Thermal break
5	N/A	Bautec Strip Nylon 18mm Wide
6	N/A	Epdem Gasket
7	N/A	New Aluminum Neck
8	N/A	PVC Pocket Filler

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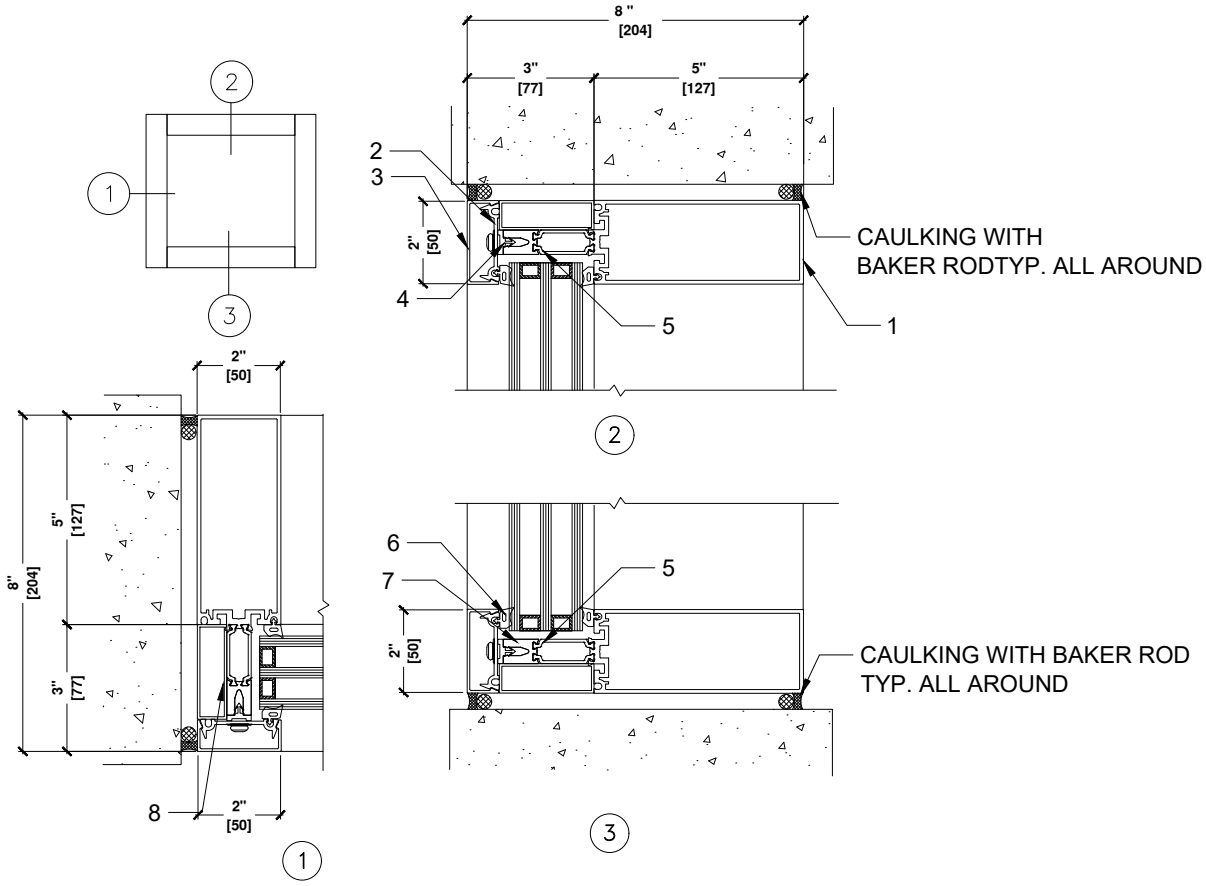
JUNE 2020

DRAWING NO: 005

5400 HTP CURTAIN WALL
2" x 5" (50.8mm x127 mm) Mullion for Triple Glazed



#	DIE #	DESCRIPTION
1	CA-54203	New HTP Mullion
2	CA-54006	Pressure Plate
3	CA-54004	Alum. Snap-on Cap
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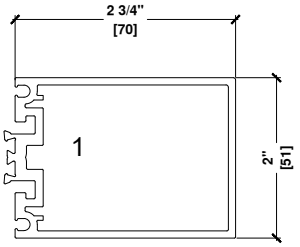
JULY2020

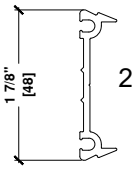
DRAWING NO: 004

5400 HTP CURTAIN WALL PART LIST



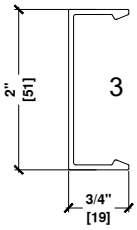
1 NEW ALUM. HTP MULLION

Aluminum Alloys (Annodized)



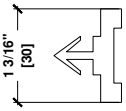
2 NEW ALUM. PRESSURE PLATE

Aluminum Alloys (Mill Finish)



3 NEW ALUM. SNAP ON CAP

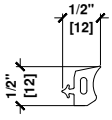
Aluminum Alloys (Annodized)



4 FLEXIBLE PVC THERMAL BREAK

5 BAEUTEC STRIP NYLON 18mm WIDE

Polyamide



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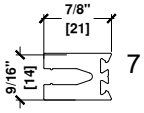
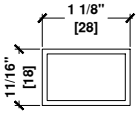


7 NEW ALUMINUM NECK

Aluminum Alloys (Mill Finish)



8 PVC POCKET FILLER

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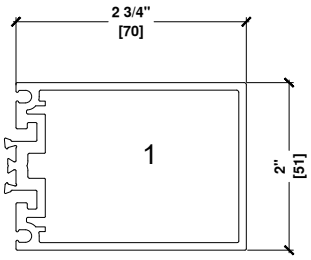
JUNE 2020

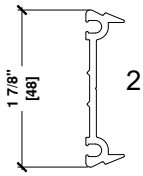
DRAWING NO: 004

5400 HTP CURTAIN WALL PART LIST



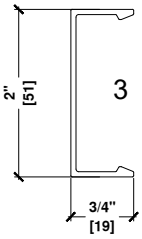
1 NEW ALUM. HTP MULLION

Aluminum Alloys (Annodized)



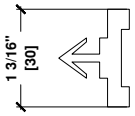
2 NEW ALUM. PRESSURE PLATE

Aluminum Alloys (Mill Finish)

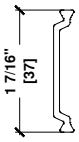


3 NEW ALUM. SNAP ON CAP

Aluminum Alloys (Annodized)

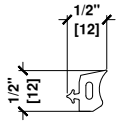


4 FLEXIBLE PVC THERMAL BREAK

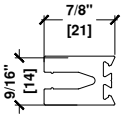


5 BAEUTEC STRIP NYLON 37mm WIDE

Polyamide

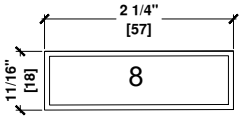


6 EPDM GASCKET



7 NEW ALUMINUM NECK

Aluminum Alloys (Mill Finish)



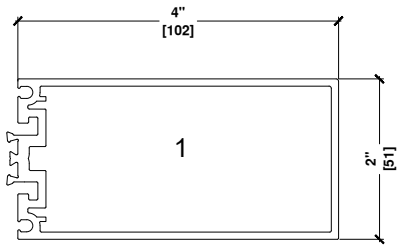
PVC POCKET FILLER

WINDSPEC INC.
MANUFACTURERS OF HIGH PERFORMANCE 'WINDSPEC' WINDOWS
ALUMINUM ENTRANCE SYSTEMS AND ARCHITECTURAL PANELS
1310 CREDITSTONE RD, CONCORD, ONTARIO L4K 5T7
Telephone (905) 738 -8311 Fax (905) 738 - 6188

JULY2020

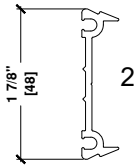
DRAWING NO: 002

5400 HTP CURTAIN WALL PART LIST



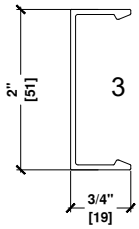
1 NEW ALUM. HTP MULLION

Aluminum Alloys (Annodized)



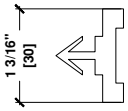
2 NEW ALUM. PRESSURE PLATE

Aluminum Alloys (Mill Finish)



3 NEW ALUM. SNAP ON CAP

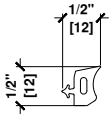
Aluminum Alloys (Annodized)



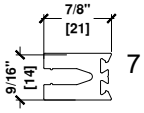
4 FLEXIBLE PVC THERMAL BREAK

5 BAEUTEC STRIP NYLON 18mm WIDE

Polyamide

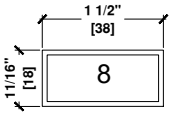


6 EPDM GASCKET



7 NEW ALUMINUM NECK

Aluminum Alloys (Mill Finish)



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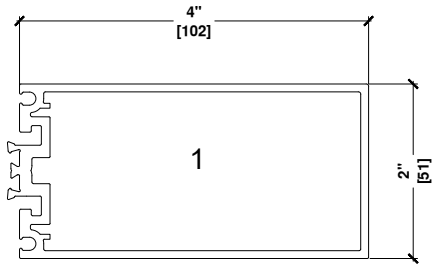
Telephone (905) 738 -8311 Fax (905) 738 - 6188

JUNE 2020

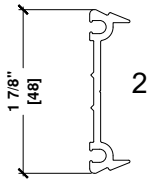
DRAWING NO: 002

5400 HTP CURTAIN WALL PART LIST



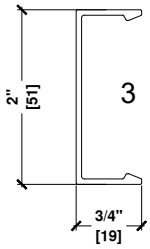
NEW ALUM. HTP MULLION

Aluminum Alloys (Annodized)



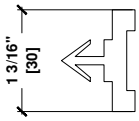
2 NEW ALUM. PRESSURE PLATE

Aluminum Alloys (Mill Finish)

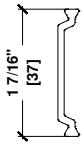


3 NEW ALUM. SNAP ON CAP

Aluminum Alloys (Annodized)

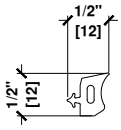


4 FLEXIBLE PVC THERMAL BREAK

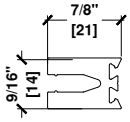


5 BAEUTEC STRIP NYLON 37mm WIDE

Polyamide

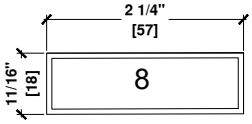


6 EPDM GASCKET



7 NEW ALUMINUM NECK

Aluminum Alloys (Mill Finish)



PVC POCKET FILLER

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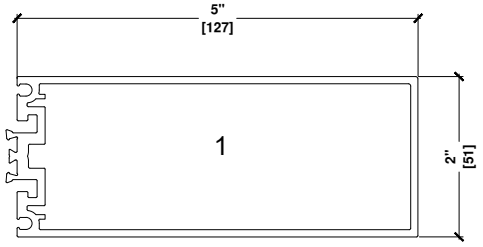
Telephone (905) 738 -8311 Fax (905) 738 - 6188

JULY 2020

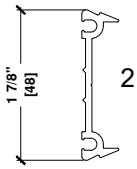
DRAWING NO: 006

5400 HTP CURTAIN WALL PART LIST



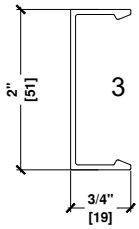
NEW ALUM. HTP MULLION

Aluminum Alloys (Annodized)



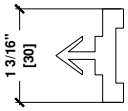
2 NEW ALUM. PRESSURE PLATE

Aluminum Alloys (Mill Finish)



3 NEW ALUM. SNAP ON CAP

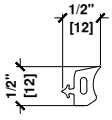
Aluminum Alloys (Annodized)



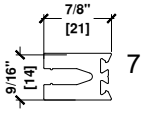
4 FLEXIBLE PVC THERMAL BREAK

5 BAEUTEC STRIP NYLON 18mm WIDE

Polyamide

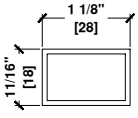


6 EPDM GASCKET



7 NEW ALUMINUM NECK

Aluminum Alloys (Mill Finish)



8 PVC POCKET FILLER

WINDSPEC INC.
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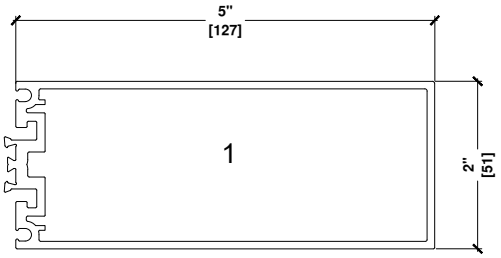
1310 CREDITSTONE RD, CONCORD, ONTARIO L4K 5T7
Telephone (905) 738 -8311 Fax (905) 738 - 6188

JUNE 2020

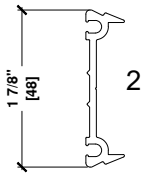
DRAWING NO: 006

5400 HTP CURTAIN WALL PART LIST



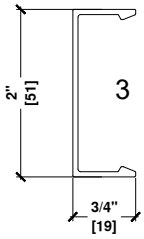
NEW ALUM. HTP MULLION

Aluminum Alloys (Annodized)



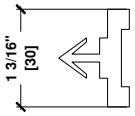
2 NEW ALUM. PRESSURE PLATE

Aluminum Alloys (Mill Finish)

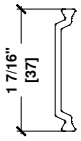


3 NEW ALUM. SNAP ON CAP

Aluminum Alloys (Annodized)

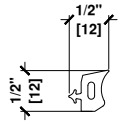


4 FLEXIBLE PVC THERMAL BREAK

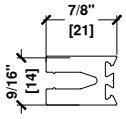


5 BAEUTEC STRIP NYLON 37mm WIDE

Polyamide

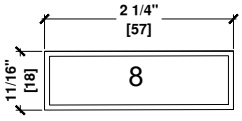


6 EPDM GASCKET



7 NEW ALUMINUM NECK

Aluminum Alloys (Mill Finish)



PVC POCKET FILLER

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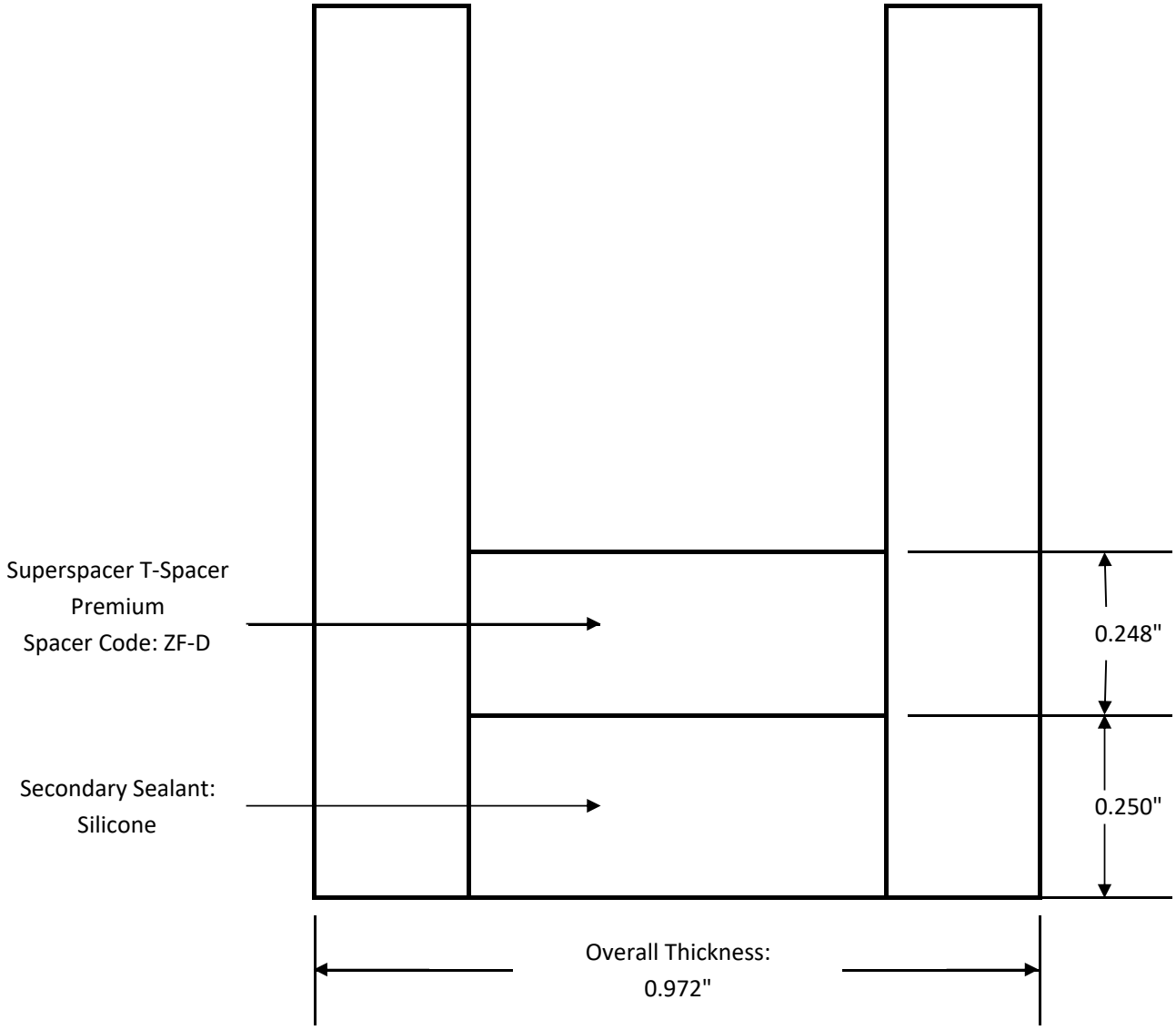
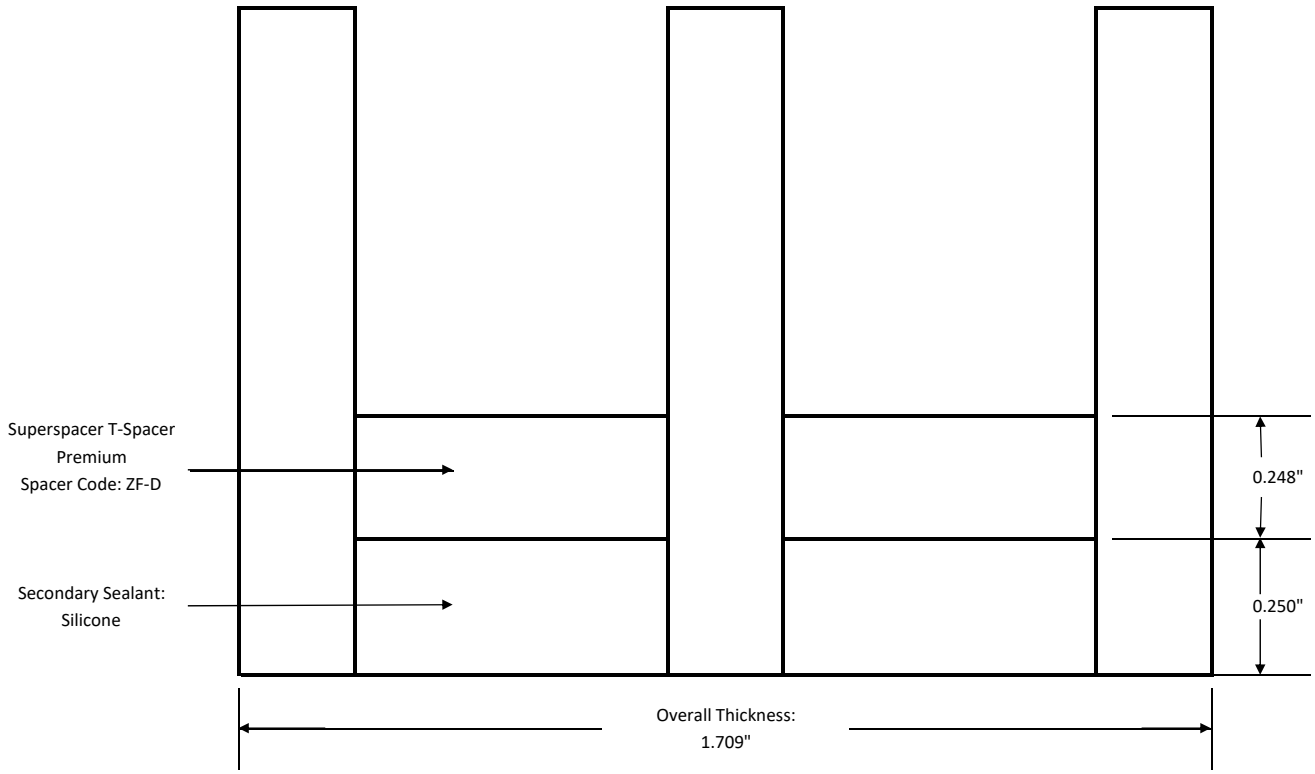
JULY2020

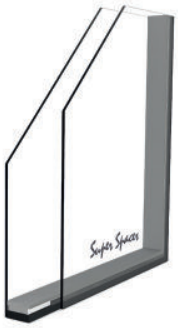

Superspacer T-Spacer
Premium
Spacer Code: ZF-D
Secondary Sealant:
Silicone
0.248"
0.250"
Overall Thickness:
0.972"


Superspacer T-Spacer
Premium
Spacer Code: ZF-D
Secondary Sealant:
Silicone
0.248"
0.250"
Overall Thickness:
1.709"

Quanex
building products

Insulating Glass Systems

Super Spacer® T-Spacer™ Premium



Super Spacer® T-Spacer™ Premium is a flexible, silicone spacer designed to satisfy the toughest commercial and residential captured glazing demands. T-spacer is the base product for creating the unique triple seal design of Super Spacer TriSeal. It incorporates an inner acrylic adhesive seal for immediate unit handling.

Basic Use

Super Spacer is a dual seal insulating glass spacer system that uses a high-performance acrylic adhesive for its structural seal and is backed with a proprietary multi-layer moisture vapor seal.

A polyisobutylene primary seal is required for enhanced gas retention and low moisture vapor transmission. Featuring a vapor barrier backing, the product must be used in combination with conventional IG sealants. T-Spacer, polyisobutylene, and structural sealant are all customer-applied using automated equipment.

Colors

Black, Aluminum, and Grey.

Composition

Silicone base with desiccant pre-fill.

Desiccant Fill

Molecular-sieve.

Protective Packaging

To provide desiccant protection, the reels are sealed in moisture-proof foil bags. The reels are then shipped in recyclable cardboard boxes.

Performance	Norm
Thermal conductivity 0.141 W/m°K	ASTM C 518
Gas / Moisture vapor barrier WVTR: Below detectable limits Oxygen: Below detectable limits	ASTM F 1249 ASTM D 3985
Primary structural seal Acrylic adhesive	
Fogging No fog in visual area.	ASTM E 2190 EN 1279 - 6 CAN/CGSB 12.8
Gas Retention	EN 1279 - 3
I.G. Durability	ASTM E 2190 EN 1279 - 2

Quanex building products

Insulating Glass Systems

Super Spacer® T-Spacer™ Premium

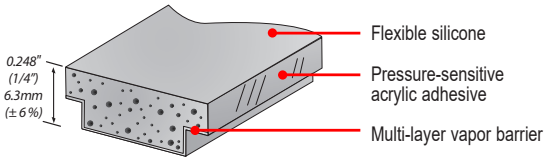
Warm-Edge Silicone Features & Benefits
- Superior silicone insulation
- Low thermal conductivity
- Substantially reduced perimeter condensation
- Typical overall 0.2 W/m^{2}K (0.04 BTU/h-ft^2-°F) U-factor window improvement (vs. aluminum)
- Excellent UV resistance
- Excellent temperature performance
- Fast dew-point drop
- Superior compression-set resistance
- Excellent color stability
- Enhanced sound dampening

Edge-Seal Durability
- High performance multi-layer vapor barrier film
- Continuous vapor barrier at corners
- No chemical fogging
- Very high desiccant content
- Proven edge-seal technology
- Thermoset silicone durability

Unique Triple-Seal Design
- Inner acrylic adhesive seal for immediate unit handling
- Customer applied polyisobutylene primary seal for enhanced gas retention and low moisture vapor transmission
- Outer secondary seal for proven performance

Improved Productivity
- Fast spacer application
- Elimination of desiccant filling
- No corner key assembly
- No butyl extruding of frames
- Simplified production of shaped units
- High-volume production with reduced labor force

Pleasing Aesthetic Appearance
- Smooth matte surface finish
- No surface blistering or bubbling
- Straight-line application with sharp 90° corners



Reel Sizes

Width mm	Width inches	Meter/ Reel	Feet/ Reel	Final Corner Sealing Strip* Nominal Wdith	Final Corner Sealing Strip* Part Number	Final Corner Sealing Strip* pieces per bag
8.2 mm	.323"	884	2900	8 mm	002064	150
10.2 mm	.402"	731	2400	10 mm	002455	150
12.2 mm	.480"	610	2000	12 mm	002456	150
12.7 mm	.500"	549	1800	12 mm	002456	150
14.2 mm	.559"	526	1725	14 mm	002457	150
16.2 mm	.638"	457	1500	16 mm	002063	150
18.2 mm	.717"	389	1275	18 mm	002458	150
20.2 mm	.795"	366	1200	20 mm	002065	150
22.2 mm	.874"	335	1100	22 mm	002459	150

Note: Nominal sizes larger than 0.375" (3/8”) have a tolerance of +/- 3% for the width (airspace) and +/- 6% for the height (thickness). For nominal sizes 0.375" (3/8”) and lower the tolerance is +/- 0.010” on the width (airspace) and +/- 6% for the height (thickness).
Note: All metric dimension equivalent sizes are for reference only.

*Based upon testing, for systems using secondary sealants other than hot melt butyl or curative butyl, sealing of final corner with PIB backed strips are mandatory for inert gas retention and resistance to moisture ingression.

Quanex’s Quality Management System is certified to ISO 9001 by Smithers Quality Assessments

Quanex IG Systems | 800 Cochran Avenue, Cambridge, OH 43725 | T 800-233-4383 | F 740-439-0121 | www.quanex.com